Mexican Exceptionalism: Globalization and De-Industrialization, 1750–1877

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Like the rest of the poor periphery, Mexico fought with de-industrialization in the century before the 1870s. Yet, Mexican manufacturing defended itself better than did the rest of the poor periphery. Why Mexican *exceptionalism*? This article decomposes the sources of de-industrialization into productivity events abroad, globalization forces connecting Mexico to those markets, and domestic forces. It uses a neo-Ricardian model to implement the decomposition, advocates a price dual approach, and develops a new price and wage data base. Mexican *exceptionalism* was due to weaker Dutch disease effects, better wage competitiveness, and the policy autonomy to foster industry.

The economic impact of industrializing Europe (what we call the core) on the poor periphery (Asia, Africa, and Latin America) between 1750 and 1913 had its source in three forces. The first was the shift in European policy away from antiglobal mercantilism and towards proglobal free trade.[1] The second was a worldwide transport revolution that served to further integrate world commodity markets.[2] Both helped provoke a boom in trade between core and periphery and contributed to commodity price convergence for tradable goods in all

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[1] Findlay and O'Rourke, "Commodity Market Integration."

[2] O'Rourke and Williamson, *Globalization and History*, chap. 3; Mohammed and Williamson, "Freight Rates"; and Williamson, *Globalization in the Poor Periphery*, chaps. 2 and 3.

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world markets. The transport revolution also contributed to a rise in every country's external terms of trade (the price of their exports relative to the price of their imports), especially in the poor periphery. The third force was the derived demand for raw material intermediate goods used in manufacturing, such as cotton, rubber and metals, which soared as manufacturing production led the way in the core. Thus, as industrial economies raised their manufacturing output shares, manufacturing output growth raced ahead of GDP growth. These forces were reinforced by accelerating income per capita growth in Europe and a high income elasticity of demand there for luxury consumption goods, such as meat, tea, and coffee. Because European industrialization was driven by unbalanced productivity advances favoring manufacturing relative to agriculture and other natural-resource-based activities, the relative price of manufactures fell everywhere. All three forces produced a powerful secular terms-of-trade boom in the poor periphery, raising the relative price of their primary product exports during an epoch that stretched over a century. Mass migration within the poor periphery (especially from China and India) and capital flows from Europe (especially from Britain) helped the poor periphery exploit the export price boom, expanding their export sectors and reinforcing their comparative advantage in primary products. De-industrialization was the other side of this globalization coin. We have come to call these Dutch disease effects, and never were they more powerful before or since.

Eventually these three forces abated. A globalization backlash hit most of the world (except Britain, the Netherlands, their colonies, and dependent Asia), causing a partial shift backwards to protection.[3] The rate of decline in real transport costs along sea lanes slowed down before 1913, approaching a steady state constant over the rest of the twentieth century.[4] The rate of growth of manufacturing in Europe and its offshoots slowed down as the transition to industrial maturity was completed. As these three forces abated, the resulting slow down in primary product demand growth was reinforced by resource-saving innovations in industrial centers, induced, in large part, by expensive primary products whose prices had soared during the nineteenth-century terms-of-trade upswing. Thus, the secular boom faded, eventually turning into a secular bust. Exactly when the boom turned to bust depended on the export commodity in which each periphery region specialized, but all of them reached a terms-of-trade peak somewhere between the 1860s and World War I.

[3] Williamson, "Explaining World Tariffs."
[4] Mohammed and Williamson, "Freight Rates."

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This secular boom in the periphery terms of trade is illustrated well by Latin America. The region's terms of trade underwent a steady increase from the 1810s to the early 1890s, and the improvement was especially dramatic during the first five decades. Furthermore, the increase is understated to the extent that it fails to take account of the likely quality improvement in manufactures relative to primary products: the quality-adjusted terms of trade in Latin America probably grew at a little more than 2.2 percent per annum between 1815 and 1819 and 1855 and 1859, and at a little more than 1.4 percent per annum between 1815 and 1819 and 1890 and 1894.[5] This was a very big terms-of-trade boom, but Latin American experience was hardly unique as the increase was even bigger for Egypt, the Ottoman Empire, Indonesia, and elsewhere in the poor periphery.[6]

Unfortunately, a terms-of-trade boom does not guarantee fast growth. Indeed, during the terms-of-trade boom, rates of technological advance and human capital accumulation were so modest in the poor periphery that the living-standard gap between it and the industrial countries rose to levels that were much wider at the end of the boom than at the beginning. Whether the modest rates of technological advance and human capital accumulation in the poor periphery were *caused* by de-industrialization has, of course, been a central issue in historical debate since the core-periphery income per capita gap opened up so dramatically. All scholars agree, however, that the terms-of-trade boom caused de-industrialization in the poor periphery through Dutch disease and other effects.[7]

This article establishes that Mexico obeyed the same laws of motion as the rest of the poor periphery between 1750 and 1877 (before the economic changes of the *Porfiriato* began). However, we think the dif-

[5] Williamson, *Globalization in the Poor Periphery*, figure 1; and Appendix 1.

[6] See Figures 4A and 4B. Based on ongoing research by Williamson, the Mexican terms-of-trade boom up to the 1860s was also modest compared with those in Ceylon, China, Italy, Russia, and Spain (starting from the 1780s), but not India's (Clingingsmith and Williamson, "Mughal Decline").

[7] For some time now, economists have been using the term "Dutch disease" to describe the response of an economy to global price shocks, technological change, or resource discovery. It is being used in this article to describe forces that caused de-industrialization in pre-*Porfiriato* Mexico. Thus, as the world price of textiles fell in Mexican markets due to declining transport costs and trade barriers in the Atlantic economy, and as the industrial revolution spread and deepened in Europe, the Mexican textile industry became less competitive. As its output fell relative to economy-wide GDP, labor migrated from industry to employment in its booming mining export sector, or agriculture and domestic services. Although economic historians may still disagree as to whether these globalization forces fostered growth in the poor periphery as they exploited comparative advantage and specialized in primary products, they can agree that de-industrialization was induced by globalization. Regardless of the reader's position on this old issue, it has been shown that *insurgencia* and post-independence violence and political instability also suppressed growth in Latin America (Bates et al., "Lost Decades"), complicating issues.

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ferences between Mexico and the rest of the poor periphery were sufficiently pronounced to allow us to speak of Mexican *exceptionalism*. As we shall see, the rate of de-industrialization was far less than elsewhere in the periphery, suggesting that Dutch disease forces were weaker and that there were offsetting local forces at work, and that both served to distinguish Mexican experience from the rest.

MEXICAN DE-INDUSTRIALIZATION IN THE TRANSITION BEFORE THE *PORFIRIATO*

It is very important to distinguish between economy-wide productivity levels and rates of growth, on the one hand, and industrial output and employment performance, on the other. This section starts with the former before dealing with the latter.

Mexican Economic Growth: Bourbon Reform, Insurgencia*, and Lost Decades*

Debates about colonial growth have been lively, mostly because the evidence is so scarce. Still, an optimistic view is on the rise.[8] Mexico produced two-thirds of total world silver output by 1800 and most of it was exported to an expanding international economy. In addition, while Mexican GDP per capita may have been lower than that of the western European core, it was higher than many in the European periphery (such as Greece and Russia), and similar to others.[9] Furthermore, Mexico was well ahead of Asia and Africa. There is, however, a more pessimistic view, such as that of John Coatsworth. Coatsworth's pessimism emerges from his documented stagnation between 1700 and 1800, followed by the economic disruption caused by the *Insurgencia*.[10] Angus Maddison's optimism emerges from his substantially lower GDP per capita estimate for 1700 and, surprisingly, the apparent belief that economic disruption during the *Insurgencia* had no lasting impact. Note, however, that both authors document a significant increase in Mexico's GDP during the eighteenth century: Maddison estimates a doubling between 1700 and 1820, whereas Coatsworth estimates an increase by 2.3 times between 1700 and 1800. Thus, the difference in their per capita GDP growth estimates lies with very dif-

[8] Klein, *American Finances*; Dobado and Marrero, "Minería, crecimiento económico y costes" and "Mining-Led Growth"; and Ponzio, "Globalisation and Economic Growth."

[9] Maddison, *World Economy*.

[10] Coatsworth, "Mexico" and "Structures, Endowments, and Institutions." The *Insurgencia* started in 1810, and, after years of violence and economic dislocation, the Mexican Republic emerged in 1821.

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ferent views about population change.[11] In any case, Maddison estimates that Mexican per capita GDP was about 77 percent of the continental European periphery in 1820.[12]

Debate over GDP per capita growth before 1820 will, no doubt, continue, as will debate over relative GDP per capita levels at the start of the nineteenth century. But there is other evidence supporting significant economic achievement of the eighteenth-century pre-industrial Mexican economy. For example, the urban share of the population was at least 9.1 percent around 1800.[13] This 1800 urbanization rate was higher than that of Scandinavia, Ireland, Germany, France, Switzerland, Portugal, Austria-Hungary, and Poland, and very close to the European 10 percent average.[14] Growing towns implied declining agricultural self-sufficiency, rising commercialization, developing internal markets, and an industrial base equivalent to the proto-industrial platform from which Germany, France, Switzerland, and so much of the rest of the European continent were to develop their industrial revolutions between 1800 and 1870.

Although the debate about Mexican growth before the *Insurgencia* may be intense, there is little disagreement with the view that Mexican GDP per capita did not grow at all between the *Insurgencia* and the start of the *Porfiriato*. During the five "lost decades" from 1820 to 1870, the per capita GDP growth rate estimates range between –0.2 percent and +0.3 percent, for an average of hardly any growth at all.[15] These Mexican lost decades took place when the European and North American economies were undergoing industrial revolutions and showing features of vigorous modern economic growth. Even when compared with slow-growing nineteenth-century Spain, Mexico underperformed.[16] Most analysts of the poor economic performance during the lost decades

[11] Maddison estimates a 0.32 percent annual rate of population growth, and Coatsworth estimates 0.73 percent. While Coatsworth's estimates are much more carefully constructed and defended, it is clear that further research on the demographic aspects of eighteenth-century Mexico is needed to resolve this immense difference.

[12] The "continental European periphery" is here taken as the unweighted average of Czechoslovakia, Denmark, Finland, Italy, Norway, Spain, Sweden, and Russia.

[13] Calculated circa 1800 from cities with 10,000 inhabitants or more reported in Humboldt, *Political Essay*.

[14] de Vries, *European Urbanization*, table 3.8.

[15] The low figure comes from Maddison, *World Economy*, and the high figure is from Coatsworth, "Mexico" and "Structures, Endowments, and Institutions." Part of the difference in these GDP per capita growth estimates is due to different views regarding demographic change, but part of it may also be due to Maddison's reliance on Humboldt (*Political Essay*) who neglected a sizeable amount of agricultural output.

[16] According to Maddison's (*World Economy*) estimates, the ratio of Spanish to Mexican per capita GDP decreased between 1700 and 1820 (from 150 to 133), but rose between 1820 and 1870 (from 133 to 179).

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point to postindependence institutional weakness and political instability.[17] Others would, no doubt, emphasize the legacy of inefficient colonial institutions, inequality, and culture.[18] Still others believe that it was an interruption of colonial "mining led growth" that explains the underperformance of the Mexican economy after the *Insurgencia*.[19]

The important point for this article is that the rising economic gap between Mexico and Western Europe between 1800 and 1870 was largely the result of the *Insurgencia* and the postindependence lost decades, not just colonial legacies.

Foreign Trade and Openness

Commerce between Spain and Spanish America was strictly regulated until 1765. Only one port in Spain—Cádiz—and four in America—Cartagena, Portobelo, La Habana, and Veracruz—were authorized to trade. The rationale for this system was to make it easier for the Crown to collect taxes on its colonial trade. Early in the eighteenth century, some observers claimed that the trade regulations actually hurt the Crown because they limited commerce and thus the tax potential. Lower taxes, more ports, fewer smugglers, and a proglobal policy would, it was argued, increase revenue for the Crown. Eventually, the Crown listened, and in 1765 it endorsed the *Decree of Free Trade*, by which restrictions regulating commerce between Spain and Spanish America were substantially reduced. By 1789 colonial Mexico had gone open.

Figure 1 offers estimates of late colonial openness, and it also extends the measure to the late 1860s. As is common in the trade-development literature, the openness variable is simply the trade share, that is, exports plus imports as a share of GDP. The average trade share was 9.6 percent between 1796 and 1820, 12.5 percent between the mid 1820s and the mid 1850s, and 17 percent by 1872. The 1796–1820 trade share was higher than that of France in 1815 (8.4 percent) and comparable to that of the United States.[20] Thus, the late colonial and the early postcolonial Mexican economy was open, if only by the standards of that time.

Furthermore, the structure of Mexican foreign trade with the Atlantic economy can be summarized without much exaggeration as an exchange

[17] Ponzio, "Looking at the Dark Side"; and Bates et al., "Lost Decades."

[18] Acemoglu et al., "Reversal of Fortune"; Engerman and Sokoloff, "Factor Endowments"; Harrison, *Underdevelopment*; and Landes, *Wealth and Poverty*.

[19] Dobado and Marrero, "Minería, crecimiento económico y costes" and "Mining-Led Growth."

[20] For France, see Mitchell, *International Historical Statistics*, pp. 571 and 905.

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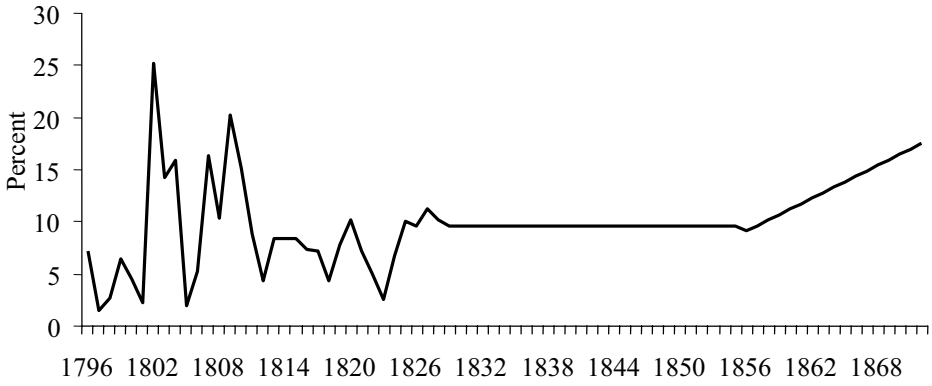


FIGURE 1
MEXICAN FOREIGN TRADE SHARE ($X + M$) IN GDP, 1796–1872

Source: See the notes to Table 1.

of silver, augmented by cochineal, for textiles (see Table 1).[21] Pacific trade with Asia was similar, mainly consisting of textile (and handicraft) imports and silver exports through the Galeón de Manila. Independence did not bring about a substantial change in the structure of Mexican foreign trade, dictated as it was by fundamental resource endowments and geographical location. Indeed, export specialization was reinforced, and textiles kept their dominant position among imported items. The textile import share in total imports was 64.8 percent in the decade before the *Insurgencia* and 63.4 percent in the decade thereafter.[22] Machinery and tools were virtually zero in the 1820s, and these imported capital goods only became important as Mexico quickened its growth and accumulation at the beginning of the Porfiriato period.[23] Still, Mexico's nineteenth-century foreign trade mix was much like that of the colonial period—silver in exchange for textiles. Thus, Mexican import capacity depended on silver exports and silver production. Because silver production fell from late colonial levels and underwent only a slow and incomplete recovery after independence, import capacity rose only slowly as well. Thus, while textile imports rose as a share of total imports in the 1820s, they did not quickly recover their pre-*Insurgencia* absolute levels. In short, there was no export-led growth boom until the Porfiriato. But why? Was it because the relative price of silver was stable in world markets? Was it because the Spanish mercury

[21] Between 1796 and 1828, cochineal export values averaged more than 15 percent of total exports (Baskes, "Colonial Institutions," pp. 192–93). Cochineal was used to dye textiles.

[22] The pre-*Insurgencia* average excludes the years 1805–1806 and 1809, when international hostilities sharply reduced Atlantic trade.

[23] Catão, "Export Growth," table 6.

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TABLE 1
TEXTILE IMPORTS/TOTAL IMPORTS AND SILVER EXPORTS/TOTAL EXPORTS, 1802–1872

	Textiles (percent)	Silver (percent)
1802	72.9	63.7
1803	84.9	42.2
1804	53.0	56.3
1805	23.8	3.5
1806	39.4	36.5
1807	62.8	52.0
1808	50.4	56.4
1809	40.1	57.9
1821	62.5	84.0
1823	59.0	56.5
1824	68.1	62.2
1825	63.9	72.5
1826	63.9	77.6
1827	70.5	79.5
1828	58.6	85.5
1856	59.9	96.3
1872	52.0	80.1

Sources: Coatsworth, "Decadencia"; Fisher, *Commercial Relations* and *El comercia entre España*; Herrera, *Canales El Comercia Exterior*; and Lerdo de Tejada, *Comercio esterior*.

subsidy (for silver extraction) evaporated? Was it because of other Mexican supply-side factors?

DE-INDUSTRIALIZATION AND INDUSTRIALIZATION IN MEXICO

Textiles are a very big share of manufacturing activity in all economies embarking on modern economic growth, whether the gauge is employment or output. For example, Manuel Miño Grijalva estimates that cotton textile production in New Spain was a little more than 5 million pesos by the end of the eighteenth century, or between 60 and 70 percent of total manufacturing production (7 to 8 million pesos).[24] Fortunately, textiles are also the best-documented manufacturing activity. Thus, our account of Mexican de-industrialization over the century or so before 1877 will focus on woolens and cottons.

[24] Miño, *Obrajes y Tejedores*, p. 244. The economy-wide manufacturing estimate comes from Humboldt, *Political Essay*, p. 451. Humboldt's estimate suggests that manufacturing was only about 5 percent of GDP, a figure that understates considerably the role of cottage industry. In any case, while the Mexican manufacturing share appears to have been very small by modern standards, it was very high by the standards of the rest of the periphery at that time (table 3).

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Domestic Textiles and Industry Before 1820

The postconquest Mexican textile industry began as early as the 1530s with the establishment of the first *obrajes*, integrated woolen textile manufactories with from 20 to 100 workers. Richard Salvucci estimates that *obraje* production rose from about 1.5 million pesos in 1600 to between 1.5 and 2 million pesos in 1700.[25] Woolen textiles underwent a sharp secular decline late in the colonial era, so that by the end of the eighteenth century production had decreased to between 1 and 1.5 million pesos, and was negligible by 1812. The *obrajes* heyday had passed by the 1810s. While 40 *obrajes* were operating in New Spain in 1579, there were only 30 in 1770, and 19 in 1810.[26] Increasingly, woolen textile production was carried out in domestic workshops (*trapiches*) which "expanded in Querétaro from 30 to 340 between 1693 and 1803."[27] The rise of *trapiches* was part of a cost-reducing response to the inflow of cheap foreign cloth, reflected by a steep decline in the price of textiles relative to corn.[28] After 1750 the Mexican woolen industry had to face increasingly fierce competition from imported British and Catalan cloth as well as from a growing domestic cotton textile industry.[29] Although foreign cotton goods certainly penetrated the Mexican market, domestic cotton textile firms fared much better than did *obrajes* in the competition. Indeed, cotton textiles expanded in New Spain between 1750 and 1800, and by the end of the century cotton production was far more important than woolens: there were about 11,000 Castilian treadle looms working in New Spain by 1800, of which 87 percent were weaving cotton.[30]

Mexican cotton textile production was based on a putting-out system similar to that which flourished in proto-industrial Europe. Merchants distributed raw cotton to artisans who did the spinning and weaving, after which these merchants sold the finished product throughout the region. This expansion took place most prominently around the cities of Puebla, Tlaxcala, Mexico, and Guadalajara.[31]

The cotton textile industry diversified in the second half of the eighteenth century, evolving from the production of only basic cotton drill

[25] *Textiles y capitalismo*, pp. 222–23, 237.

[26] *Obrajes* expanded from 1570 to 1630 mostly in the Puebla-Mexico City region. The prohibition of international trade that cut off the Peruvian market posed great difficulties for the industry. Thereafter, production moved to the Querétaro where wool was more abundant (Miño, *Obrajes y Tejedores,* pp. 30–31).

[27] Salvucci, *Textiles y capitalismo*, p. 211.

[28] See Figure 6.

[29] Ibid., p. 234.

[30] Miño, "Espacio económico," p. 583.

[31] Miño, *Obrajes y Tejedores*, pp. 79–107 and *Protoindustria*, p. 170.

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(*manta*) to calico prints (*indianas*, *pintadas*, or *zarazas*).[32] Several *indianilla* factories were established in New Spain that specialized in printing and finishing cotton yarn and cloth produced by the domestic putting-out system or imported from China and India. These factories were similar to those that were being developed in Catalonia, and they represented the most elaborate manufacturing organization that had yet appeared in New Spain.[33] It is not clear how many of these factories existed, but there appear to have been several.[34] Records exist for an *indianilla* factory in Mexico City which document that by 1804 it employed close to 500 workers.[35]

Although *obrajes* underwent a steep secular decline throughout the eighteenth century, cotton textiles underwent an even steeper rise, and total textile production expanded. The number of looms in New Spain increased from 1,323 in 1781, to 9,981 in 1793, and 11,692 in 1801, providing work for approximately 90,000 spinners and weavers in 1800.[36] Late-eighteenth-century cotton textile manufacturing in New Spain flourished given the relative absence of European imports cut off by wartime conflict. But the good times ended after 1802 when a change in Spanish policy allowed neutral powers to trade directly with Mexico, triggering an invasion of foreign cloth.[37] Between 1802 and the 1830s, Mexican textiles faced the most intense foreign competition they had ever experienced.

The War of Independence (1810–1821) raised de-industrialization forces to "apocalyptic" proportions, and it hit hardest those regions in which the textile industry was concentrated, Bajío and Puebla-Tlaxcala.[38] Raw materials became scarce, and the commercial routes to the north, traditionally an important market for domestic textile production, were cut. Mortgage registries from the city of Puebla show that from 1816 to 1820 private lending decreased considerably and clerical lending collapsed completely.[39] Many textile workers abandoned their looms to join the contending armies, and many died as a consequence of epidemics.[40] The *Insurgencia* delivered the death blow to the woolen

[32] Thomson, "Continuity and Change," p. 259.
[33] Miño, *Obrajes y Tejedores*, pp. 185–93.
[34] Humboldt, *Political Essay*, p. 451.
[35] Based on capital invested, this *indianilla* factory was bigger than the largest *obraje* in New Spain, Tacuba in 1752 (Miño *Obrajes and Tejedores*, pp. 48 and 191).
[36] Miño, *Obrajes y Tejedores*, pp. 285–87 and Thomson, "Continuity and Change," p. 258.
[37] Miño, *Obrajes y Tejedores*, pp. 266-67. Table 1 estimates that textile imports were 55.5 percent of total imports between 1802 and 1828, while another estimate places the figure even higher at 85 percent (between 1806 and 1818: Thomson, *Puebla de los Angeles*, p. 105).
[38] Miño, *Obrajes y Tejedores*, p. 270.
[39] Thomson, *Puebla de los Angeles*, p. 96.
[40] Salvucci, *Textiles y capitalismo*, p. 238; Miño, *Obrajes y Tejedores*, pp. 269–72; and Thomson, *Puebla de los Angeles*, p. 245.

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obrajes. There were still 19 *obrajes* with 291 looms operating in Querétaro in 1810, but only four were still working in 1812. By 1831 the looms in Querétaro were producing only 1,200 pieces of woolen cloth yearly, compared with 7,000 pieces produced there at the end of the eighteenth century.

Cotton textile production was also greatly affected by the intense post-1802 foreign competition. The Consulate of Mexico reported that in 1818 foreign trade had left 12,000 textile workers unemployed. The city of Puebla, where an important part of the cotton cloth industry was located, experienced a population decrease of 19 percent from 1791 to 1821. Guadalajara's cotton textile production "was virtually eliminated by competition from imports through the newly opened Pacific ports."[41] Although the cotton textiles sector was heavily damaged, it survived these three decades of foreign competition and *Insurgencia*, but it did not fully recover until the 1830s.[42]

The literature offers several competing explanations for the demise of Mexico's woolen textile sector. Salvucci favors domestic demand.[43] His argument is that woolen textiles were an inferior good: as household incomes and living standards rose, consumption and thus production of *obrajes* fell. But, as we saw above, it is not clear that Mexican income per capita actually rose in the eighteenth century. Given the more recent evidence (unavailable to Salvucci) of slow population growth, modest increases in per capita income, and real wage decline, Salvucci's domestic-demand-led hypothesis loses its plausibility.[44] In any case, because the logic of Salvucci's domestic-demand-led hypothesis requires that New Spain be viewed as a closed economy, it must be rejected.[45] Colonial Mexico certainly was not a closed economy; indeed, we have already argued that New Spain was relatively open to trade (see Figure 1). If, instead, the reader thinks that the economy *was* closed, and that income or taste changes were causing domestic demand to shift away from woolens to cottons, then we ought to see a rise in the price of cotton relative to woolen cloth across the eighteenth century. We do not. Mexico mimics world relative cloth price trends, and they certainly do not confirm Salvucci's hypothesis. Instead, relatively rapid productivity events in cotton spinning and weaving abroad served to drive down the

[41] Miño, *Obrajes y Tejedores*, p. 269.

[42] Thomson, "Continuity and Change," pp. 244–45 and *Puebla de los Angeles*, pp. 260 and 275.

[43] *Textiles and Capitalism*.

[44] For Mexican grain wages, see Figure 7.

[45] To be fair, note that Salvucci was writing this important work in the 1980s when ISI and closed-economy policies were still mainstream in Latin America. We are writing 20 years later when open-economy and supply-side thinking are now mainstream.

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relative price of cotton goods. In a small open economy such as colonial Mexico, domestic demand could not have influenced the relative price of goods actively traded in world markets. Imported factory goods were competing with Mexican spinning and weaving, and such competition was also taking place in India, Egypt, the Ottoman Empire, and elsewhere in the poor periphery.[46] The evidence also suggests that, as in Mexico, there was no significant increase in Indian and Ottoman per capita income that might have had the local demand effects Salvucci hypothesizes.

Enrique Florescano thought that the agrarian crisis at the end of the eighteenth century must have had depressing effects on manufacturing.[47] According to Florescano, the sharp increase in corn prices that took place in 1771/72, 1785/86, and from 1809 to 1811 affected the *obrajes* and the cotton textile workshops in several ways. First, it raised the cost of raw materials (cotton and wool), energy, and transport, the latter due to the crisis-induced rise in livestock prices. Second, the crisis reduced available textile workers, as many either left for the countryside, given that they could no longer support themselves on prevailing urban wages, or were victims of famine and epidemics. Finally, and most importantly, Florescano thinks that the agrarian crisis resulted in a general collapse in purchasing power. For him, the upward pressure on food costs reduced the household surplus available for other goods such as textiles, causing a fall in textile demand and a decrease in *obraje* output. We agree with the first step in Florescano's argument: indeed, later in this article we document a large decline in real wages from the 1750s to the 1800s (around 60 percent).[48] However, we do not agree with his last step: we have already argued that domestic demand could not have played anything but a modest role between 1750 and 1820.

We think that the rise in food costs that Florescano stressed put upward pressure on the nominal wage and thus served to reduce competitiveness in domestic textiles: labor costs must have risen while textile prices fell.[49] We have shown that while wool production declined during the last decades of the eighteenth century, cotton production grew until 1802. Thus, the effects of the agrarian crisis were different for cotton and wool manufacturing, which indicates that cotton textiles were in

[46] For India, see Clingingsmith and Williamson "Mughal Decline"; for the Ottoman Empire, see Pamuk, *Ottoman Empire*; and Williamson and Yousef, "Egypt and the Ottoman Empire"; and for the rest of the poor periphery, see Williamson, "Globalization, De-Industrialization and Underdevelopment" and *Globalization in the Poor Periphery*.

[47] Florescano, *Precios Agricolas*, pp. 68–82. A later version of the Florescano thesis can be found in Brian Hamnett, "Economic and Social Dimensions."

[48] See Figure 7.

[49] The rise in food costs is confirmed in Figure 5.

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FIGURE 2
MEXICAN EXTERNAL TERMS OF TRADE
(1828 = 100)

Source: See Appendix Table 1, columns 4/5.

a better position to adapt to rising input costs than were woolens. We shall return to these supply-side forces emanating from the "agrarian crisis" because we think they may be central to understanding Mexican de-industrialization.

Although falling domestic demand did not cause the demise of woolen textiles after the 1790s, the invasion of foreign textiles clearly did. That invasion was carried in large part by rapid, factory-based productivity advances in Britain, which increased British competitiveness and lowered textile prices the world around, thereby crowding out cottage industry in Mexico and everywhere else in the world's periphery. Driven by those productivity gains, the cost of British cottons fell by as much as 70 percent between 1790 and 1812.[50] Compared with Mexico's key export product, silver, textile prices collapsed after around 1805 or so (Figure 2). This dramatic increase in the terms of trade (the price of silver exports relative to imported manufactures) provoked de-industrialization, although, as we shall see, its effects were cushioned by a persistent wage competitiveness and, probably to a lesser extent, by protectionist and other pro-industrial policies introduced by the first republican governments.[51]

[50] Salvucci, *Textiles and Capitalism*, pp. 156 and 158; and Gómez Galvarriato, "Manufacturing in Latin America," p. 36.

[51] According to Hamnett, the value of domestically produced textiles fell by one-half between the 1800s and the 1820s ("Economic and Social Dimensions," p. 23).

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Domestic Textiles and Industry, 1820–1877

While Mexican (and other Latin American) textile manufactures struggled against foreign imports during the first third of the nineteenth century, some observers thought it was a losing battle. In 1827 the English diplomat Henry George Ward saw a dismal future for local textiles. He wrote:

> . . . until the end of the last century the value of cotton manufactures was estimated in five million dollars. Currently, they are gradually disappearing, as a result of the more abundant supply of European manufactures, and probably they will cease to exist in the course of a few years.[52]

There was clear evidence of Mexican de-industrialization when Ward was writing. Indeed, he must have been well aware of the fact that "in the capital of Oaxaca, where once 500 looms had clattered in the production of cotton cloth, a mere 50 were working in 1827."[53] But Ward's gloomy prediction did not materialize: just a decade later, the industry was experiencing substantial growth and supplying a large domestic market. Mexico had 5.9 million inhabitants in 1820, the second largest population in the Western Hemisphere after the United States.[54] Thus, in spite of the low incomes received by a very large share of its population, Mexico had a large domestic market in which to foster industrialization through protectionist policies.[55] And textile artisans from Puebla and the merchants involved in the putting-out system were sufficiently powerful politically to obtain higher tariffs on textiles that would help defend them from the fierce foreign competition. Moreover, the deep economic downturn between 1821 and 1826 gave way to an era of moderate growth that gained speed in the 1840s and did not end until the outbreak of the Ayutla Revolution (1854) and the Reform war (1858—1861).[56]

Although textile producers were united for protection during the 1820s, they were less united regarding the benefits of mechanization. With the pro-industrialist Lucas Alamán at the head of the Ministry of Interior and Foreign Affairs in the early 1830s, the government began to support the establishment of mechanized factories through credit provided

[52] Ward, *México en 1827*, p. 73.

[53] Potash, *Mexican Government*, p. 27.

[54] McCaa, "The Peopling of Mexico," p. 278. Gómez Galvarriato, "Industrial Development," p. 196.

[55] Bernecker, *De Agiotistas a Empresarios*, pp. 56–58.

[56] The material destruction and loss of life during the war with the United States (1846–1848) was relatively small compared with the war episodes of 1810–1821 and 1854–1867 (Sheina, *Latin America's Wars*, pp. 179–97 and 295–311). It thus represented a brief obstacle in economic terms (Sánchez-Santiró, "Recuperación y expansion," p. 2).

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TABLE 2
GROWTH IN THE MEXICAN COTTON TEXTILE INDUSTRY, 1837–1879

Year	Number of Factories	Number of Active Spindles	Yarn (000 Kilos)	Cloth Pieces (1000's)
1837				45
1838			29	109
1839			15	125
1840			257	88
1841			467	196
1842			358	218
1843	59	106,708	3,738	327
1844		112,188		508
1845	55	113,813	1,317	657
1853			3,348	875
1850–1857	48	119,278	3,351	727
1862	57	133,122	3,615	1,259
1879	89	253,594	2,925	3,255

Notes: 1850–1857 is a mid-point average.
Sources: Dirección de Agricultura e Industria "Memoria 1843," table 5, and "Memoria 1845," tables 2, 3, 4; Dirección General de Estadística "Memoria 1857"; Pérez Hernández, *Estadisticas 1862*, 136–39; Secretaría de Hacienda *Estadisticas 1880*; and Dirección General de Estadística *Annuario Estadistico 1894*.

by the Banco de Avío, a development bank that supported industrialization, of which more will be said.

From 1835 onwards, mechanized textile mills began to be established in Mexico, and the industry grew at impressive rates during the following decade:

> These mills were established 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 while ten years earlier Mexico's textile manufacture included 59 mills with more than 100,000 spindles.[57]

As in other places, mechanization of spinning preceded that of weaving, but, as time went by, weaving began gradually to be carried out in factories as well. Cotton textile factory production grew rapidly in the late 1830s and early 1840s rising from 29 thousand kilos of yarn produced in 1838 to more than 3.7 million kilos in 1843 (Table 2), while cloth production grew at an annual rate of 11 percent from 1838 to 1843. Growth in cotton textile production slowed down after that date for several reasons: a fall in the price of imported textiles compared with that of mineral exports after 1845; a high price for domestic raw cotton (pro-

[57] Gómez Galvarriato, "Industrial Development," p. 192.

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tected by very high tariffs); much larger levels of political and economic instability in the second part of the 1840s due to foreign invasion and domestic civil war; and a reduction in government support for industry, exemplified by the closure of the Banco de Avío in 1842 and a decrease in tariffs.[58]

Nonetheless, the textile industry continued to grow between 1843 and 1877. The number of looms and spindles increased by 138 percent and 241 percent respectively during that period. Moreover, the average firm increased in size as measured by spindles (up 58 percent) and looms (up 126 percent).[59] The Mexican cotton textile industry also modernized between 1843 and 1879. Whereas 37 percent of the mills in 1843 used men or mules as their source of power and only 3 percent ran on steam, by 1879 no textile mill operated with animal or human power, and 64 percent employed steam power.[60]

The growth of the Mexican textile industry between the mid 1830s and late 1870s contrasts sharply with the devastating de-industrialization that took place in most parts the poor periphery. Table 3 uses Paul Bairoch's data to show that whereas per capita industrialization in the European core was only about 1.2 times that of the Asian and Latin American periphery in 1750, the figure was 1.6 in 1800, 2.4 in 1830, and 5.6 in 1860. The table also shows that it was not simply a matter of faster European industrialization over the century, as per capita industrialization in the periphery fell by about 15 percent between 1750 and 1800, and by 30 percent between 1800 and 1860. There were powerful de-industrialization forces at work everywhere in the periphery after 1750.[61]

However, Mexico underwent less dramatic de-industrialization up to the 1870s and 1880s than did Asia and the rest of Latin America. Table 3 documents "only" a 17 percent fall in Mexico's per capita

[58] On political and economic instability, see Ponzio, "Looking at the Dark Side" and Sáchez-Santiró "El desempeño."

[59] However, Mexican mills were smaller. While the average Mexican mill in 1843—in terms of spindles per mill—was not much smaller than the average United States mill in 1831, by 1879 it was only 20 percent of the average 1880 American mill.

[60] Gómez Galvarriato, "Industrial Development," pp. 204–07. True, growth did not take place evenly during this period. Whereas the number of cloth pieces produced increased at an annual rate of 4 percent between 1845 and 1862, the rate rose to 6 percent between 1862 and 1879, and if we had yearly data we would probably see that most of the growth in this last period took place after Mexico regained political stability in 1867.

[61] De-industrialization in the eighteenth century was not an event confined solely to colonies such as Mexico, as even colonizing Iberia felt it: "The competitiveness of Spanish manufacturing fell . . . and Spain became more and more dependent upon the goods produced in other European countries" (Márquez Colín, "Monopoly and Trade," p. 5). Ever since Earl Hamilton (*American Treasure*) wrote about the inflations following the import of American (mainly Mexican) silver, Dutch disease has been invoked to explain de-industrialization in Spain, and Mauricio Drelichman ("The Curse of Montezuma") has now shown how it worked.

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TABLE 3
PER CAPITA LEVELS OF INDUSTRIALIZATION, 1750–1913

	1750	1800	1830	1860	1913
European Core	8	9.2	12.1	22.2	64.6
Asian and Latin American Periphery	6.75	5.75	5	4	4.75
China	8	6	6	4	3
India	7	6	6	3	2
Brazil	6	5	4	4	7
Mexico	6	6	4	5	7
Ratio Core/Periphery	1.2	1.6	2.4	5.6	13.6

Notes: The European core is an unweighted average of Hungary, Belgium, France, Germany, Italy, Spain, Sweden, Switzerland, and the United Kingdom. The Asian and Latin American periphery is an unweighted average of China, India (plus Pakistan in 1953), Brazil and Mexico.
Source: Bairoch, "Economic Inequalities," table 1, p. 3. Bairoch's lengthy definition of his industrialization per capita index can be found in his papers cited in "Economic Inequalities."

industrialization index between 1800 and 1860 (30 percent for the whole periphery), and the Mexican index actually *rose* between 1830 and 1860. Table 4 offers some additional comparative evidence where de-industrialization is measured by foreign import penetration and the share of domestic demand supplied by the home industry.[62] Early in the nineteenth century, the percentage of the home textile market supplied by foreign imports was higher in Mexico (21 percent) than in either India (5 percent) or the Ottoman Empire (3 percent). This is consistent with our view that Mexico was relatively open to trade at that time, in part due to its closeness to the industrial core and the booming Atlantic economy. In spite of the de-industrialization damage, by 1842 Mexico still ranked ninth in machine cotton spinning world-wide, its spindles per capita just below those of Germany and Austria-Hungary, and far above Russia's.[63] Most importantly, note the contrast by the 1870s and

[62] For Mexico, we estimate the ratio of textile imports to domestic production to have ranged between 27 and 41 percent around 1800. The difference is influenced by the percentage of total textile production assumed to have been carried out in households for home consumption using traditional technology. The first figure (27 percent) assumes that such production was half of total textile production. The second figure (41 percent) ignores household production entirely. To make the Mexican estimates comparable with those of Ottoman and India in Table 4, the first figure is used. To calculate these figures, we have used average textile imports for the years 1796–1801 (Lerdo de Tejada, *Comercio exterior*) before the "invasion" of foreign textiles. Textile imports 1796–1801 were calculated using the share of textile imports in total imports for the period 1802–1810 (when the estimates are available) and applying that share to total imports 1796–1801. Textile production estimates include the production of cotton textiles, estimated to have been 5 million pesos by the end of the eighteenth century (Miño, *Obrajes y Tejedores*, p. 244), and woolen textiles, estimated to have been 1.25 million pesos (Salvucci, *Textiles and Capitalism*, p. 159). A ratio of textile imports to domestic textile production = 0.27 implies a ratio of textile imports to domestic consumption = 0.21.

[63] Batou, *Between Development and Underdevelopment*, p. 185.

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TABLE 4
COMPARATIVE DE-INDUSTRIALIZATION: TEXTILE IMPORT PENETRATION, 1800s–1880s
(MEXICO VS INDIA AND THE OTTOMAN EMPIRE)

	Percentage of Home Textile Market Supplied by	
	Foreign Imports	Domestic Industry
India 1833	5	95
India 1877	58 to 65	35 to 42
Ottoman 1820s	3	97
Ottoman 1870s	62 to 89	11 to 38
Mexico 1800	21	79
Mexico 1879	40	60

Notes: See footnotes 62, 64, and 65.

1880s revealed in Table 4. By then, foreign textile imports claimed "only" 40 percent of the Mexican market, leaving 60 percent for domestic producers, a fairly big number for a country that had been attacked by cheap European textiles for almost a century. Indeed, the figure for de-industrializing India was only 35–42 percent in 1887, *much* lower than Mexico's 60 percent in 1879.[64] The de-industrialization evidence is even more dramatic for the Ottoman Empire where the share of domestic supply in total local consumption was only 11–38 percent in the early 1870s.[65] Thus, despite the importance of foreign imports, the Mexican textile industry was doing fairly well by 1879, at least compared with the rest of the periphery.

A NEO-RICARDIAN MODEL OF MEXICAN DE-INDUSTRIALIZATION

What were the domestic supply-side conditions that influenced Mexican competitiveness with foreign manufactures? During the century before the Porfiriato, when foodstuffs for peasants and urban workers (such as corn and beans) were not traded internationally and when foodstuff expenditures represented a very large share of family budgets, agricultural productivity must have influenced manufacturing competitiveness, as Alexander Gerschenkron, W. Arthur Lewis, and even Adam Smith argued long ago.[66] After all, in a pre-industrial economy with relatively stable subsistence wages, any decline in agricultural produc-

[64] For India: The 1833 estimate and the smaller of the two 1887 estimates are from Roy (*Economic History of India*, p. 126). The larger 1887 estimate comes from Tomlinson (*Economy of Modern India*, table 3.3, p. 107).

[65] Pamuk, "Ottoman Cotton Textiles," table 1, p. 211. The wide range for 1870–1872 is due to assumptions about the treatment of yarn imports. Both estimates are, however, far lower than Mexico.

[66] Gerschenkron, *Economic Backwardness*; and Lewis, *International Economic Order*.

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tivity must put upward pressure on food prices and thus also on nominal wages in every nonfood sector, eroding competitiveness in import-competing manufacturing.[67] This would have been manifested by rising food prices relative to other products, by falling profitability in manufacturing, and by a decline in its output (as Florescano believed). This story seems to work well in accounting for the spectacular demise of Indian, Egyptian, and Ottoman manufacturing in the face of British competition after 1750.[68] It has also been cited by Lewis as a cause of de-industrialization in the tropical periphery more generally.[69]

In order to formalize our intuitions about the relationship between relative prices and de-industrialization, we use a simple neo-Ricardian model.[70] We must stress that it is only a very simple model, and, like all models, makes assumptions that held only approximately at best anywhere in the poor periphery or even in Europe during the eighteenth and most of nineteenth century. Still, like the models of Malthus, Ricardo, and W. Arthur Lewis, the neo-Ricardian model developed here helps greatly to organize our thinking about de-industrialization in the poor periphery in the face of world globalization and industrial revolutions by their trading partners. Consider a perfectly competitive economy in which there are three sectors: textiles, the importable[71] (T); silver, the exportable (S); and corn, the nontradable[72] (C). To be absolutely clear, the model takes the price of textiles (p_T) to be the price of imports and the price of silver (p_S) to be the price of exports. In addition, the model assumes that textiles and silver are traded in the world market and sell for the world prices p_T and p_S, respectively, while p_C is determined endogenously by local supply and demand. Labor (L) is mobile between all three sectors, is the only factor of production, and costs nominal wage w per unit. We abstract from capital and land for simplicity, but in any case we do not need either of them to make our point. Finally, when we talk about a decrease in textile employment, L_T, we refer to this contraction as *strong* de-industrialization, and when we talk about a decrease in the textile employment share, L_T/L, we refer to this contraction as *weak* de-industrialization. Table 3, for example, has already been

[67] Lewis, "Unlimited Supplies of Labour."

[68] Clingingsmith and Williamson, "Mughal Decline"; and Williamson and Yousef, "Egypt and the Ottoman Empire."

[69] Lewis, *International Economic Order*.

[70] This model was first used in Clingingsmith and Williamson, "Mughal Decline."

[71] Textiles were the canonical import-competing activity in Mexico. First, they dominated import values. In the mid-late eighteenth century, textiles probably accounted for more than 80 percent of total import values (Stein and Stein, *Apogee of Empire*, pp. 75, 368), and most of that was non-Spanish (ibid., p. 416). See Table 1. Second, the textile industry employed by far the largest share of the industrial labor force.

[72] We use the words corn, Indian corn, and maize interchangeably.

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used to describe *weak de-industrialization* around the poor periphery between 1750 and 1913.

To create a link between agricultural productivity and wages in the textile sector, we follow Lewis in assuming that the real wage in corn units was constant, at least in the short run and medium term.[73] This assumption is critical, and it may have been violated in the very long run. We only require that it was quite sticky in the short run and medium term, and the evidence (as we shall see) seems to confirm that.[74] The Lewis assumption implies the possibility of unemployment, so L represents employment rather than the population, which we denote by P.

Suppose output in each of the three sectors is produced according to a Cobb-Douglas production function

$$Y_C = CL_C^{\alpha} \tag{1}$$

$$Y_S = SL_S^{\beta} \tag{2}$$

$$Y_T = TL_T^{\gamma} \tag{3}$$

C, S, and T are technology parameters (or include the impact of fixed endowments, such as land) and the elasticities α, β, and γ are all less than one, insuring diminishing returns. The labor market is such that each individual will supply one unit of labor as long as the corn or maize wage w/p_C is at or above the reservation price of one. We assume that there is no rationing of labor, so that $L = L_C + L_S + L_T < P$. Profit maximization in each sector ensures that labor demand will be given by

$$L_C = (\alpha p_C C/w)^{(1/1-\alpha)} = (\alpha C)^{(1/1-\alpha)}, \text{ since } p_C = w, \tag{4}$$

$$L_S = (\beta p_S S/w)^{(1/1-\beta)} \tag{5}$$

$$L_T = (\gamma p_T T/w)^{(1/1-\gamma)} \tag{6}$$

If we assume that there is no technical change, the growth rates of labor demand are

$$L_C^* = 0 \tag{7}$$

[73] Lewis, "Unlimited Supplies of Labour" and *International Economic Order*.

[74] The Lewis assumption has been criticized extensively since his famous labor surplus article appeared in 1954. Yet, development economists and economic historians still find it a useful way to assess economy-wide behavior in low-income societies. Figure 7 suggests that the assumption is confirmed by Mexican experience over the half century 1780–1830, but not before or after. We will deal with these pre-1780 and post-1830 deviations in what follows.

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$$L_S^* = -(1/1-\beta)(w^* - p_S^*) \tag{8}$$

$$L_T^* = -(1/1-\gamma)(w^* - p_T^*) \tag{9}$$

Because the nominal wage is equal to the price of corn, employment in the corn sector is fixed. Growth in the own wage in either silver mining (w/p_S) or textile production (w/p_T) leads to a decline in the absolute number of workers employed there. Thus, *strong de-industrialization results from an increase in the own wage in textiles.* The own wage in either sector could increase due to a decline in the world price for its output. It could also increase if the price of corn rose, induced, for example, by some negative productivity shock to agricultural output.

The growth rate of the share of textile workers in total employment, our measure of *weak de-industrialization*, is

$$L_T^* - L^* = \frac{-1}{(1-\beta)(1-\gamma)}\left(\left[(1-\beta)(1-\theta_{TL})(w^* - p_T^*)\right] - \left[(1-\gamma)\theta_{SL}(w^* - p_S^*)\right]\right) \tag{10}$$

The shares of textile production and silver mining in total employment are given by θ_{TL} and θ_{SL}, respectively. Thus, *weak de-industrialization will result whenever the own wage in textiles is growing sufficiently fast compared to the own wage in silver and other commodity exports*. Moreover, holding employment shares constant, weak de-industrialization will be most severe when the difference in own wage growth rates is largest, and this can only result when the external terms of trade boom ($p_S^* > p_T^*$), because, by assumption, w^* is everywhere the same in the domestic economy. How much the terms of trade have to rise depends on β, γ, θ_{TL}, and θ_{SL}. As it turns out, the condition that must be satisfied for *weak de-industrialization* is

$$w^* - p_T^* > \frac{(1-\gamma)\theta_{SL}}{(1-\beta)(1-\theta_{TL})}(w^* - p_S^*) \tag{11}$$

To the extent that β and γ are similar, and that $(1-\theta_{TL}) > \theta_{SL}$, the ratio on the right-hand side will certainly be less than one. This implies that own wage growth in silver and other commodity exports would have to be even higher to counteract the weak de-industrialization effect of own

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wage growth in textiles.[75] In short, we expect to see weak de-industrialization whenever own wage growth in textiles is positive, unless own wage growth in commodity exports is *much* greater (e.g., when the external terms of trade deteriorates dramatically). Own wage growth in silver mining dampens the weak de-industrialization effect because it reduces L_S, which is in the denominator of our weak de-industrialization measure. As the share of the labor force employed in silver, cochineal, and other commodity exports increases, the greater the growth in the own wage in textiles needs to be to overcome growth of the own wage in silver and other commodity exports, and thus for de-industrialization to ensue. We can also rewrite condition (11) to relate nominal wage growth to the terms of trade between textiles and silver.

$$\frac{(1-\gamma)\theta_{SL}+(1-\beta)(1-\theta_{TL})}{(1-\beta)(1-\theta_{TL})}w^{*} > p_{T}^{*} - p_{S}^{*} \qquad (11')$$

Weak de-industrialization results when nominal wage growth, which deters production in both noncorn sectors, is sufficiently greater than the growth of the terms-of-trade favoring textiles, which encourages production in textiles over silver and other commodity exports. Thus, *weak de-industrialization should have been most severe when nominal wage growth was strongest and when the terms of trade were shifting most strongly in favor of silver and other commodity exports*.

In summary, the predictions of this neo-Ricardian model are: industrial employment (L_T) will decrease if the own wage in textiles increases (*strong de-industrialization)*; and the industrial employment share (L_T/L) will decrease if own wage growth in textiles increases sufficiently faster than the own wage growth in silver and other commodity exports (*weak de-industrialization)*.[76]

[75] How much higher? As a rough guide, in 1895 $\theta_{SL} = 0.018$ (mining) and $\theta_{TL} = 0.115$ (manufacturing), so $\theta_{SL} / (1 - \theta_{TL}) = 0.02$ (Catão, "Mexico and export-led growth," table 11, p. 70), implying that P_T* would have to exceed P_S* by almost 50 times (sic!), an immense deterioration in the terms of trade.

[76] Three technical issues need attention before we leave this section. First, note that these predictions are made *ceteris paribus*. If other important forces were not constant—such as productivity growth in *T* and *S*, then these predictions might be technically correct but historically unimportant. However, we shall show below that they *were* historically important. Second, the assumption of perfect competition and perfectly integrated domestic labor markets is not critical to these predictions. However, and third, the small country assumption *is* important: we assume that P_T (textile price) and P_S (silver price) were both exogenous to Mexico, determined in world markets. It is easy to justify the P_T assumption, because Mexico was such a small market compared with Europe or even England. The P_S assumption is another matter: was the price of silver exogenous to the Mexican economy? We think so. Recall that silver is held as a *stock*: it is not consumed as an annual flow as are wheat, coffee, or rubber. Thus, whereas Mexico certainly was a major silver producer (50 percent 1801–1820, but only 14 percent 1861–1875: Schmidt,

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TRENDS IN MEXICAN TERMS OF TRADE, 1750–1877

A rise in the terms of trade for a primary product exporter implies a fall in the relative price of import-competing manufactures, the bigger the rise, the bigger the penalty to home manufacturers. The timing and magnitude of such secular terms-of-trade shocks should have a powerful influence on de-industrialization experience. Mexico's increasing reliance on imported manufactures meant that as the world price of textiles, specifically, and manufactures, more generally, fell, Mexico's terms of trade improved. Relative textile prices certainly fell dramatically the world around up to the 1850s "as the Industrial Revolution drove down the unit cost of production in the exporting countries" and "as technological innovations shifted supply curves downward."[77] But was that relative price decline *less dramatic* for Mexico?

Terms-of-Trade Trends Before 1828

For the half century before 1800, we estimate Mexico's terms-of-trade trends by simply plotting the ratio of silver to textile prices, P_S/P_T.[78] This estimate may seem crude, but we doubt that terms-of-trade reality deviated much from what is plotted in Figure 2. After all, silver exports accounted for more than three-quarters of total exports and textiles accounted for almost two-thirds of total imports (Table 1). For the period 1800–1828, we estimate the terms of trade, P_X/P_M, by using the British export price index to proxy P_M, and, as before, by using silver prices to proxy P_X (section 4.1.2 in the Appendix). The price of textiles, P_T, and the British export price index, P_M, were highly correlated for those years, 1800–1828.

The Mexican external terms of trade estimates in Figure 2 suggest a surprising moral. De-industrialization or Dutch disease forces could not have been very strong during the half century before the change in Spanish policy around 1802, as the relative price of import-competing textiles did not fall. Rather, it rose. True, the terms of trade jumped up

World Non-Ferrous Metal Production), its annual production and export was a tiny share of the *stock* of world silver. Between 1750 and 1800, the share of Mexican production in the world stock was less than 2 percent, and from 1810 to 1870 it was less than 1 percent. Thus, the conventional literature (e.g., Schell "Silver Symbiosis"; Flynn and Giraldez, *Metals and Monies*) argues that the price of silver was determined by *demand to hold the stock*, and that meant Chinese and Indian households plus governments on silver or bimetallic standards.

[77] Bulmer-Thomas, *Economic History of Latin America*, p. 43.

[78] Appendix 4.1.1. For 1750–1800, unobserved Mexican P_T trends are proxied by two Spanish textile price series, from Palencia and Madrid.

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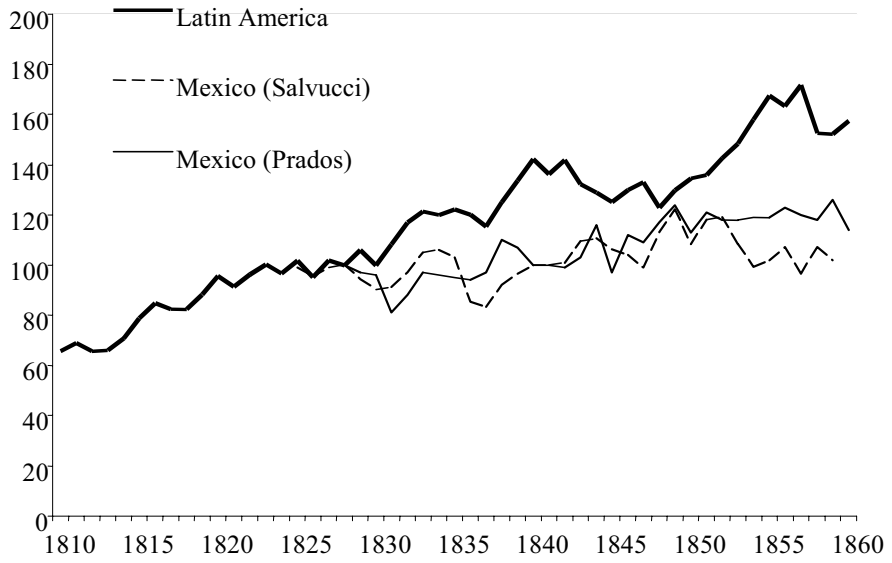


FIGURE 3
TERMS-OF-TRADE TRENDS MEXICO VERSUS LATIN AMERICA, 1810–1860
(1828 = 100)

Source: See the text.

by 81 percent between 1802 and 1830, but, as we shall discuss in a moment, it was stable afterwards (Figure 2), and especially so when compared to the rest of Latin America (Figure 3). Mexican *exceptionalism* indeed! Of course, while the price of importable textiles fell relative to exportable silver after 1802, textile prices may have risen relative to *nontradables*. The Dutch disease literature reminds us that the terms of trade between tradables and nontradables can be at least as important as the external terms of trade, and we will explore this issue at length. For now, we simply note that Mexico failed to undergo the same kind of external terms of trade boom between 1750 and 1830 that the rest of the periphery did, and also that the boom was limited to the two or three decades after 1802.[79]

Terms-of-Trade Trends after 1828

Although primary product export prices were on a steep rise almost everywhere in the periphery in the first half of the nineteenth century, it

[79] As we suggested in the introduction and footnote 6, the comparative terms-of-trade evidence for the poor periphery for most of the eighteenth century is thin, but it is abundant afterwards, starting from the 1780s.

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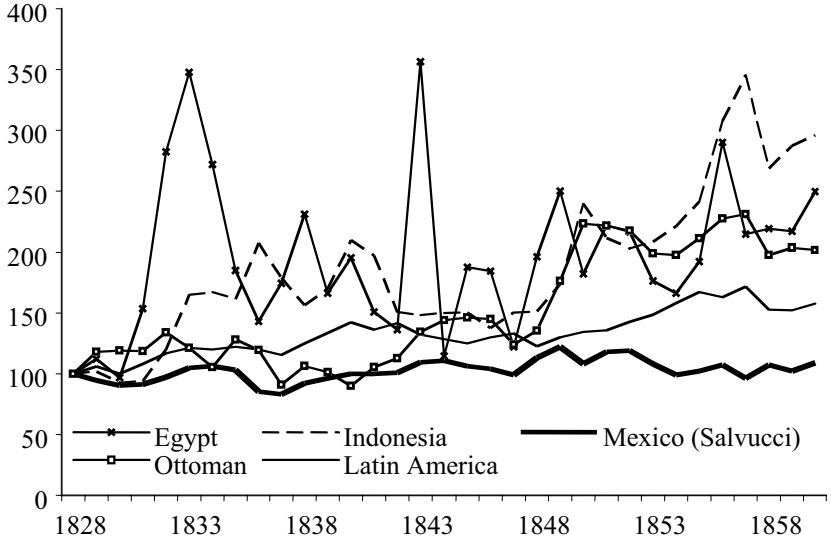


FIGURE 4A
TERMS-OF-TRADE TRENDS 1828–1860: MEXICO (BASED ON SALVUCCI) VERSUS OTHER PERIPHERY

Source: See the text.

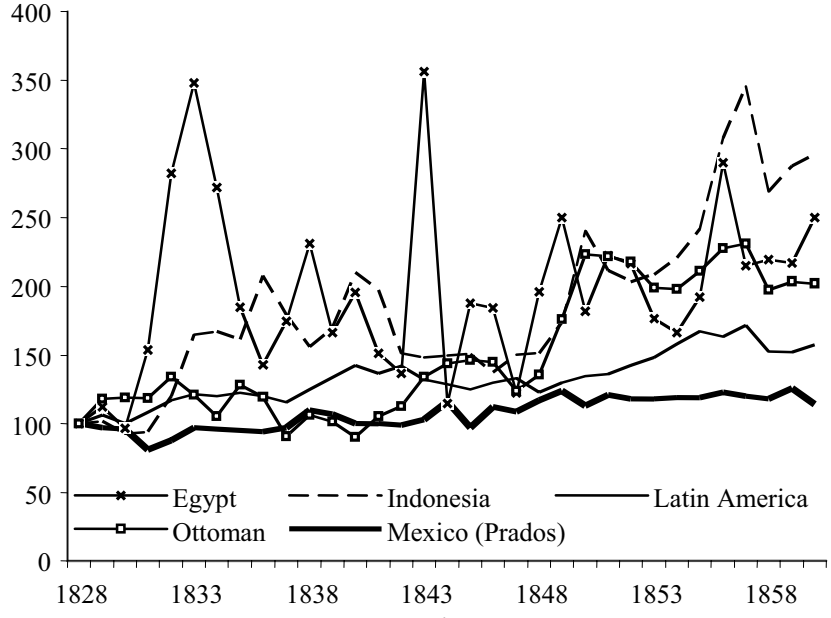


FIGURE 4B
TERMS-OF-TRADE TRENDS, 1828–1860: MEXICO (BASED ON PRADOS) VERSUS OTHER PERIPHERY

Source: See the text.

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appears that Mexico missed much of the boom (Figures 3, 4A, 4B).[80] Over the full half century between 1828 and 1881, Leandro Prados estimates that Mexico's terms of trade did indeed rise, and at 1.4 percent per annum.[81] However, all of that increase appears to have taken place *after* mid-century, as there was no upward trend in Prados's terms-of-trade series between 1828 and the early 1840s (Figure 3).[82] The Salvucci index of Mexican terms of trade (with the United States, the United Kingdom, and France combined) starts in 1825, and it confirms the Prados series. Indeed, the Salvucci series drops in the 1850s back to the levels of the late 1820s (Figure 3). How did Mexican terms-of-trade movements up to mid-century compare with those of the rest of the periphery, including the rest of Latin America? Figures 4A and 4B document the secular boom in the terms of trade across the poor periphery.[83] Between 1820–1824 and 1850–1854, the terms of trade in Latin America rose at 1.4 percent per annum, implying that Dutch disease forces were much weaker in Mexico than elsewhere in Latin America, perhaps even absent. The story is repeated when comparisons are made with other parts of the poor periphery: Egypt's terms of trade rose at 2.7 percent per annum between 1820–1824 and 1855–1859; the terms of trade for the Ottoman Empire increased by 2.4 percent per annum between 1815–1819 and 1855–1859; and Indonesian terms of trade increased by 2.5 percent per annum between 1825–1829 and 1865–1869. The least dramatic rise in terms of trade was in India between 1800–1804 and 1855–1859, when they rose at about 0.5 percent per annum, but even this was more than in Mexico.[84] In addition, Mexico appears to have been exceptional relative to the poor European periphery, having undergone a less dramatic terms-of-trade boom up to the 1860s compared with Spain, Italy, and Russia.[85]

What accounts for the relatively weak terms-of-trade boom in Mexico? It cannot be explained by a less dramatic fall in import prices, as every member of the poor periphery imported pretty much the same

[80] The sources of the terms-of-trade estimates for 1810–1940 throughout the poor periphery are given in Appendix 4.2.

[81] Prados, "Economic Consequences," pp. 34–35.

[82] The true increase in Mexico's terms of trade may have been somewhat "larger because of the tradition of using export prices of a major exporter as a proxy for Latin American import prices—meaning that the statistics tend to understate the improvement in Latin America's [net barter terms of trade] by neglecting declining transport costs, which lower import prices" (Prados, "Economic Consequences," p. 80). But any downward bias would be shared by other regions in the periphery, so it should not affect any comparisons.

[83] Based on Williamson, "Globalization, De-Industrialization and Underdevelopment" and *Globalization in the Poor Periphery*. See Appendix 4.2.

[84] Clingingsmith and Williamson, "Mughal Decline."

[85] Spain is based on data from Leandro Prados; Italy is based on Glazier et al., "Terms of Trade," pp. 30–31; and the source of the Russian data is described in footnote 6.

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products (dominated by factory-made manufactures from Europe). Rather, the explanation lies with export prices, namely, silver prices, which were stable during a period when other primary product prices soared.

In summary, globalization-induced de-industrialization forces were relatively weak in Mexico between independence and the *Porfiriato*. Thus, Mexican manufactures should have been in a stronger competitive position than those of the rest of a poor periphery where de-industrialization was more dramatic. Whether their competitive position was strong enough to repel or only retard the advance of invading foreign manufactures is, of course, another matter entirely.

WAGE COMPETITIVENESS AND OTHER FORCES

Food Productivity and Wage Competitiveness

It appears that de-industrialization forces were less pronounced in Mexico than in the rest of the poor periphery. Part of the explanation lies with the much weaker Mexican terms-of-trade boom, price trends that minimized the penalty which import-competing manufacturing had to absorb. But were there other underlying causes of this Mexican exceptionalism? One possibility might have been relatively stable agricultural productivity, an event that would have kept the price of nontradable foodstuffs from rising too fast. We are not denying that agricultural productivity and living standards were low in Mexico: indeed, as early as 1822 Alexander von Humboldt argued that Mexican agricultural productivity was low compared to that in Western Europe. But we are not talking about levels; rather, we are talking about trends. Nor do we assert that there were no agrarian crises over those 150 years, but only that they were less deep and frequent than elsewhere. Our hypothesis is that the absence of any secular deterioration in agricultural labor productivity would have implied no upward pressure on the nominal wage from this source, and that import-competing manufacturing would have had a better chance of maintaining its wage competitiveness with foreign producers. What are the facts?

Let us start with the trend in relative commodity prices. Figure 5 plots P_M/P_C and P_X/P_C, that is, the price of exports and imports relative to the key nontradable (P_C). These relative price trends trace out two distinct epochs. First, there was the dramatic decline in the relative price of tradables in the 60 or 70 years up to the *Insurgencia* and independence. This decline penalized both the mining export industry and the textile import-competing industry, helping to contribute to de-industrialization

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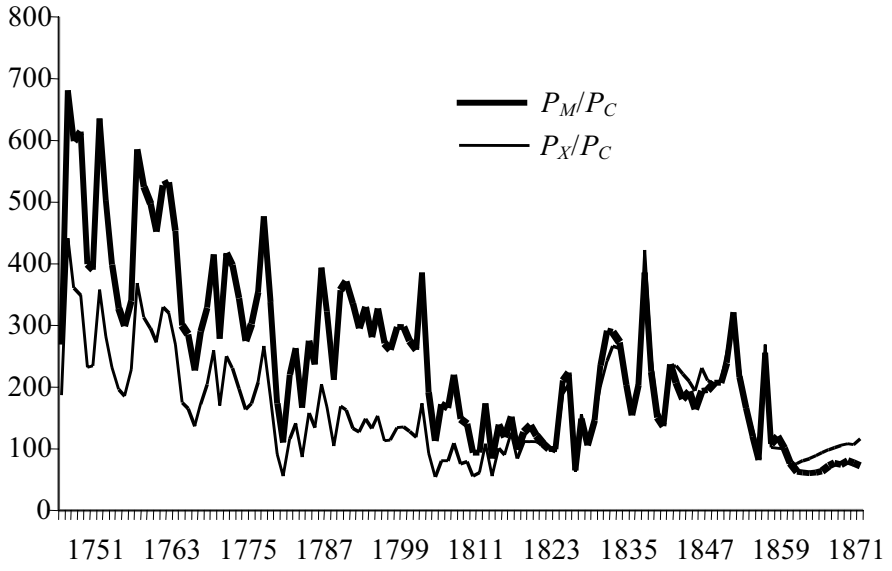


FIGURE 5
THE PRICE OF TRADABLES RELATIVE TO NONTRADABLE CORN IN MEXICO, 1751–1877
(1828 = 100)

Source: See the Appendix.

by pulling resources out of manufacturing (and mining) and into agriculture. Note that the external terms of trade did not rise over this period (Figure 3), so it was not a source of de-industrialization. But the rise in the price of corn relative to silver and textiles was a de-industrialization source, and it looks as though it was powerful. But how powerful depended critically on what was happening in textiles-exporting England and India, something we shall explore below. In any case, it is obvious that we need to know a lot more about the agrarian crises that pushed up corn prices during this epoch.[86] The second epoch begins when that secular decline flattened out in the 1810s and turned around in the 1820s. Over the half-century before the Porfiriato, there was one big cycle but no trend: there was a rise in P_M/P_C and P_X/P_C up to around 1850, an event that favored both mining and industry, and a fall thereafter. In fact, the historiography suggests that after independence more people had access to land, and that there was an increase in the cultivated land area. Between 1821 and 1870 there were no famine episodes like those that took place earlier between 1785/86 and 1809/10. Trends

[86] Florescano's (*Precios Agricoolas*) extensive work on agricultural crises in Mexico has blazed the trail, but even his work focused on consequences rather than causes.

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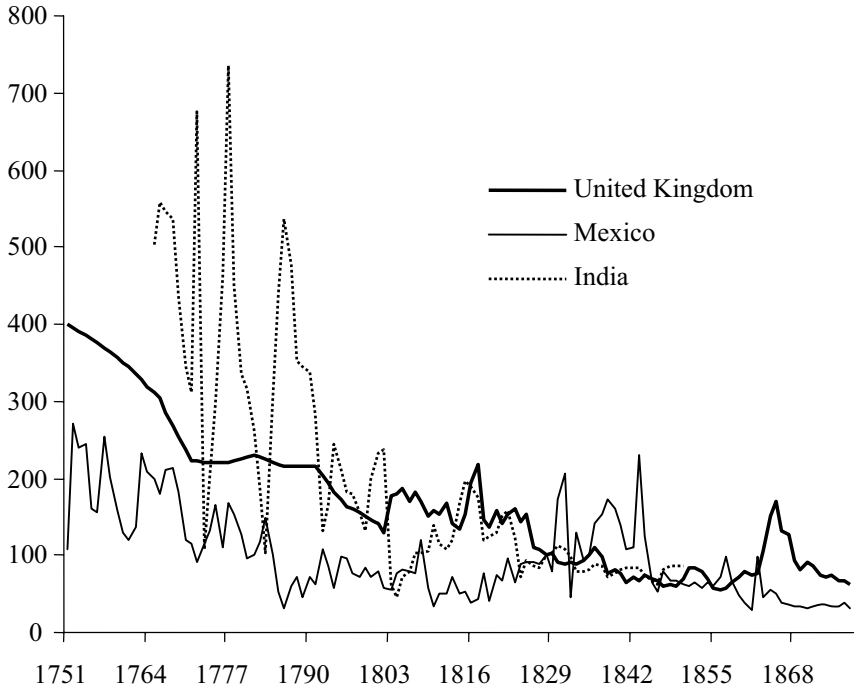


FIGURE 6
THE GRAIN PRICE OF TEXTILES, MEXICO VS ENGLAND AND INDIA, 1751–1877
(P_T/P_C 1828 = 100)

Sources: See the Appendix; and Clingingsmith and Williamson, "Mughal Decline."

in land values in Michoacán and sugar production in Morelos suggest that there was a recovery in agricultural production from 1821 to 1851 that was followed by a period of stagnation from 1851 to 1875.[87] Figures 2 and 3 show that the post-1810s were also years of rising external terms of trade (albeit, much more modest than elsewhere in the poor periphery), events that penalized Mexican manufacturing and contributed to de-industrialization (albeit, much more modestly than elsewhere in the poor periphery). But trends in the internal terms of trade with agriculture had the opposite influence, and it looks as though it may have dominated.

Next, what happened to the corn price of textiles (P_T/P_C) in Mexico relative to its main competitors, England and India? England was undergoing impressive improvements in agricultural productivity at this time, events that should have cushioned the fall in P_T/P_C there, kept the upward pressure on the nominal wage modest, and, therefore, maintained English wage competitiveness. Did they, at least compared to Mexico? Figure 6 plots P_T/P_C for England, India, and Mexico. The

[87] Sánchez-Santiró, "Recuperación y expansión"; and Chowning, "Reassessing the Prospects."

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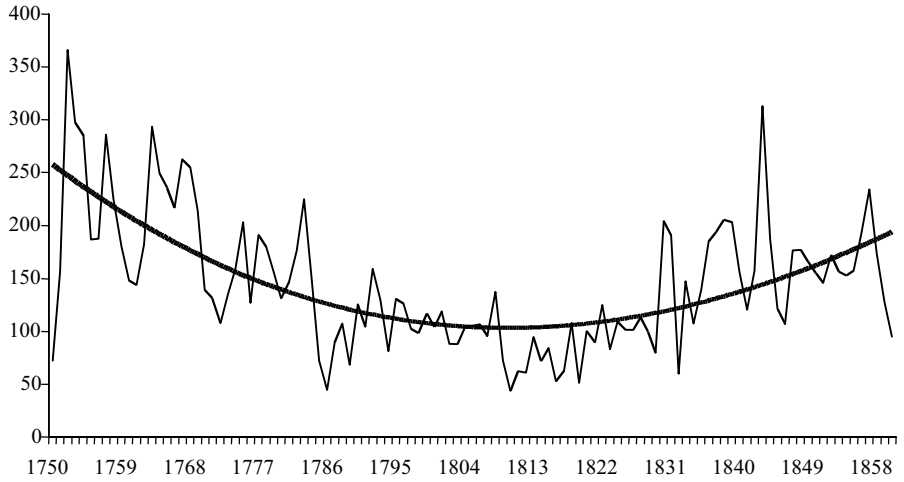


FIGURE 7
MEXICAN GRAIN WAGES (W/P_C), 1750–1860

Sources: See the Appendix.

result is surprising: after about 1810, the relative price of textiles fell *faster* in England and India than it did in Mexico! Thus, while the rise in grain prices tended to lower the relative price of textiles in all three countries, the grain price rise was bigger in England and much bigger in India. Note that the explanation for this cannot be faster productivity growth in English factories (although it certainly was faster), because textiles were internationally traded and textile prices moved the same way the world around. Thus, the explanation must lie with local productivity events in agriculture, where the most important nontradable commodity was produced. The fact that the relative price of textiles fell (the relative price of grain rose) faster in England than it did in Mexico is especially notable when compared with India where a collapse in agricultural productivity after the mid-late eighteenth century produced a spectacular rise in the relative price of grains, generated immense upward pressure on the nominal wage, and contributed to diminished wage competitiveness in Indian textiles.[88] While a lagging agriculture pushed up the relative price of foodstuffs in England, India, *and* Mexico, it was far less dramatic in Mexico.[89] As all three countries were competing with the rest of the world for textile market shares at home and abroad, Mexico appears to have been relatively favored by a more

[88] Clingingsmith and Williamson, "Mughal Decline."

[89] As we noted earlier, Mexico may have had relatively low agricultural productivity, and certainly compared with England. But the text refers to *trends* in agricultural productivity, not levels.

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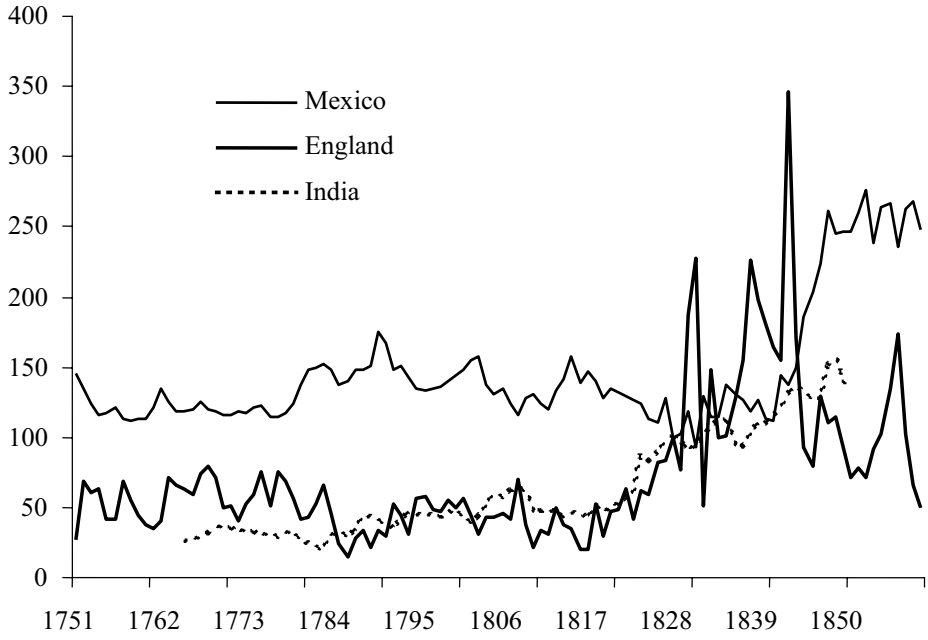


FIGURE 8
OWN WAGE IN MEXICAN, ENGLISH, AND INDIAN TEXTILES, 1751–1860
(W/P_T 1828 = 100)

Sources: See the Appendix; and Clingingsmith and Williamson "Mughal Decline."

modest rise in P_C. Of course, the fact that Britain took the technological lead in textiles gave it a big edge in world markets. But the point of Figure 6 is that there were other (domestic) forces that partially offset the British de-industrialization impact on Mexico.

Figure 7 shows quite clearly that there were other forces at work eroding Mexican grain wages causing them to fall quite steeply from the mid-eighteenth century until the 1810s. The downward trend in real wages just before independence speaks badly for the impact of late colonial conditions on the working poor, and the upward trend after about 1820 speaks well for the impact of independence on them. That pre-1820 fall should have strengthened wage competitiveness in textiles, while the post-1820 rise should have eroded it, at least to the extent that productivity growth in Mexican textiles was modest compared with that of England. Indeed, Figure 8 shows that while the own wage in textiles (w/P_T) was very stable in Mexico up to the late 1830s, it doubled from then to the 1850s. If we are looking for domestic de-industrialization sources, we have found them here in the three decades or so between the 1820s and 1850s.

To summarize, from 1751 to about 1810, w/P_T showed no trend in any of the three countries: Mexico maintained wage competitiveness

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with both England and India. Thus, while Mexican textiles may have increasingly lost its competitive edge in domestic markets by lagging behind in adapting modern technology, at least the industry did not make matters worse by undergoing a rise in its own wage (w/P_T). Between about 1810 and 1840, Mexican wage competitiveness *improved* relative to that of England and India, helping domestic industry deal with de-industrialization forces coming from world markets. After about 1840 Mexico lost all the relative wage competitiveness it had gained. During the century 1750–1877 as a whole, the combination of strong wage competitiveness and weak terms of trade effects minimized de-industrialization in Mexico relative to the rest of the periphery.

WHY DID NOT MEXICAN MANUFACTURES COMPETE EVEN MORE EFFECTIVELY?

Was Mexico's inability to compete more effectively with foreign producers before the 1820s, and perhaps even before the 1850s, due to the fact that Mexican wages were too high (even though their growth rates were not)? Of course! After all, Mexico and the rest of Latin America had a comparative advantage in primary products because they were relatively abundant in land and natural resources compared to Europe, and they had a comparative disadvantage in manufactures because they were relative scarce in labor compared to Europe. Thus, import-competing textiles and other manufactures *should* have faced heavy competition from European imports, just as Europe *should* have faced heavy competition from American grains, fish, metals, dyes, and other resource-intensive products. But what this article confronts is the significant *decline* in the relative importance of industry in the Mexican economy (e.g., de-industrialization), not its low levels of industrial activity dictated by initial comparative advantage.

Another common explanation offered for Mexican industry's inability to compete more effectively is its low labor quality and the culture of its labor market: "In the largest republics (Brazil and Mexico) the primary-education system remained woefully inadequate, forcing employers to rely on a work force with virtually none of the attributes required for technical progress and innovation."[90] This claim assumes that textile production required a lot of skilled labor, something other authors, such as Gregory Clark, have questioned at length.[91] Indeed, before the 1840s and the great mass migrations to the New World, New England firms hired unskilled (but literate) native-born girls, and after-

[90] Bulmer-Thomas, *Economic History of Latin America*, p. 102.
[91] Clark, "Why Isn't the Whole World Developed?"

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wards they hired unskilled (and illiterate) European immigrants. Because the New England example can be easily multiplied by reference to early factory-based textile development in Catalonia, Japan, India, and even Britain, one is left wondering how the low-labor-quality hypothesis could help explain any lack of industrial competitiveness in Mexico or, indeed, its exceptionalism. It bears repeating that while skilled labor was certainly scarce in Mexico, things were no better anywhere else in the periphery, including the Ottoman Empire, Russia, India, and the rest of the poor periphery. And if Mexican labor was of such low quality, why did the textile industry survive foreign competition better than elsewhere in the poor periphery?

Alternatively, it has been suggested that "Mexican cotton manufacture suffered from technological [backwardness], which limited its capacity to supply the market and vitiated its ability to compete."[92] This sounds very much like a culture-of-the-labor-market thesis whereby Mexico was unable to compete more effectively because Mexican labor resisted the introduction of the new hard-driving technologies. Although domestic producers certainly faced some severe competitive disadvantages due to poor labor quality and technological backwardness, the literature suggests that the main reason for its relative demise was the increasing productivity abroad, which induced a relative decline in manufacture's prices world-wide. To that extent, Mexican de-industrialization must have depended on when and how much the relative price of manufactures fell. The most dramatic de-industrialization should have occurred when the relative price of textiles and other manufactures was falling most dramatically in world markets (and thus in Mexico), and that was between 1810 and 1850.

Historians have always added politics and policy to the explanations for Mexican de-industrialization and for troubles in domestic textiles. Thus, even after accounting for the many reasons why Mexico was unable to compete with foreign producers between 1810 and 1850, Aurora Gómez-Galvarriato argues that domestic textiles were not necessarily inherently uncompetitive, they just needed support from the government and a stable political environment in which to develop. According to this view, the Mexican government failed to take the steps needed to protect domestic industry, so that textile producers were not able to compete successfully with imports. If, however, the government had moved to subsidize and protect the textile sector, it would have had a chance to develop the skills and efficiency necessary to compete successfully with foreign imports after the subsequent removal of the tariff

[92] Hamnett, "Economic and Social Dimensions," p. 13.

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wall. This infant industry argument certainly had become very popular with Alexander Hamilton's followers in the United States and with Frederick List's followers in Germany. After all, government support of industrial development in the form of financial assistance and protective tariffs has always been considered crucial for the American textile industry take-off.[93] Support for it in Mexico comes from the fact that when the government there finally did take an interest in protecting and developing textiles, the industry did show strong signs of resisting import competition. Only "when political instability was briefly surmounted during the 1830s and 1840s, [did] the mechanization of the industry finally take place" and it occurred with the "support of government policies that gave [the sector] both the necessary protection and the financial support required, through the creation of a development bank: the Banco de Avío."[94]

Many scholars share this infant industry view. After all, without active state intervention private interests would have had little incentive to invest in local industry given that foreign competition had already deeply penetrated the market. Guy Thomson feels that once foreign competition grew too intense, Mexican merchants were reluctant to invest in restructuring the cotton textile industry:

> Demand for New Spain's cotton cloth became ever more volatile as a result of trade liberalization (comercio libre) within the Empire (increasing competition from Catalan cottons), increased contraband from without, Spain's involvement in the Napoleonic wars, and the licensing of neutral powers to trade directly with the Indies (chiefly, the United States).[95]

In other words, only a deliberate government program could have forced Mexican textiles to modernize; economic agents were not going to do it alone given the costs, uncertainty, and risks. According to this view, protective tariffs starting in the 1820s and subsidies to mechanization starting in the 1830s were central to improving manufacturing competitiveness and offsetting the de-industrialization forces coming from abroad.

TARIFFS AND OTHER PRO-INDUSTRIAL POLICIES

We have argued that Mexican *exceptionalism* can be explained in part by modest terms-of-trade gains and weak Dutch disease effects. We have also argued that it can be explained in part by the maintenance of

[93] Rose, *Firms, Networks and Business Values*, p. 44.
[94] Gómez Galvarriato, "Manufacturing in Latin America," pp. 52–55.
[95] Thomson, "Continuity and Change," pp. 267–68.

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wage competitiveness. Does policy offer a third explanation? After all, independence gave Mexico the autonomy to choose tariff and industrial policies that most of the periphery did not have.

Early Anti-Industrial Policy

Coherent pro-industrial trade policy was not typical of any periphery country during the nineteenth century. One reason is that revenue needs dominated. So it was that tariff revenues were the most important source of income for the Mexican federal government. Import duties accounted for about half of federal revenue between 1825 and 1845.[96] Given that textiles represented between 60 and 70 percent of total imports from 1821 to 1830 (Table 1), tariffs on foreign textiles obviously generated critical fiscal resources.

Some time ago, Robert Potash noted that Mexican tariffs in the 1820s were designed primarily to increase government revenue instead of directly protecting domestic manufacturers, and this has been confirmed by many scholars since. For example, "the first law to regulate the foreign trade of the new Mexican Empire" passed 15 December 1821 imposed an *ad valorem* tax of 25 percent on all imports, regardless of their nature.[97] As the primary goal was to generate revenue, imported cotton textiles were not taxed at higher rates than other goods. Victor Bulmer-Thomas also stresses that the motivation behind early Mexican tariffs was the need to generate revenue, not some desire to protect infant industries.[98] This view has been confirmed more generally for all of Latin America before the 1860s.[99]

What is harder to explain, however, is the Mexican government's decision to prohibit a small number of items from being imported altogether, especially since "of the nine categories of excluded items, three were related to the . . . manufacture of cotton [textiles]: cotton, cotton yarn up to weight number sixty, and cotton ribbon were barred from importation."[100] These prohibited items were mostly inputs into textile production. Indeed, raw cotton accounted for two-thirds of the total cost of cotton cloth, while the share was even higher for cotton yarn.[101] Obviously, this policy could hardly have helped the domestic producer be-

[96] Marichal "Paradojas fiscals y financieras." See also Coatsworth and Williamson, "Always Protectionist?"

[97] Potash, *Mexican Government*, p. 13.

[98] Bulmer-Thomas, *Economic History of Latin America*, p. 33.

[99] Coatsworth and Williamson, "Latin American Protectionism" and "Always Protectionist?"; and Williamson, "Explaining World Tariffs."

[100] Potash, *Mexican Government*, p. 14.

[101] Clark, "Why Isn't the Whole World Developed?," p. 144.

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cause it lowered the *effective rate* of protection on textiles, perhaps even erasing its protective impact entirely. Perhaps the only legislation that offered some net protection was the fact that domestic cotton and woolen textiles were exempted from the 4 percent increase in the sales tax (up from 8 to 12 percent) which was imposed on foreign textiles.[102]

The Gradual Move to More Pro-Industrial Protection

Mexican tariff policies became more obviously protectionist when Guadalupe Victoria became president in 1824. Victoria eliminated the 12 percent duty on foreign goods and replaced it with the higher *derecho de internación*, a duty of "18 ¾ percent of the value of imported articles . . . levied when they left the port of entry for any interior destination."[103] Moreover, state governments were allowed to impose an additional 3 percent tax:

> (*derecho de consumo*) on foreign goods sold within their respective jurisdictions. Imported merchandise thus paid a series of duties, state and federal, which totaled 51 3/8 percent of their appraised value. Domestic textiles, in contrast, were subject only to the state *alcabala* of 8 percent.[104]

Under the tariff act of 1827, a single *ad valorem* tax of 40 percent was placed on all imports, an effective strategy in terms of short-term revenue collection as well as offering high protection for domestic manufactures.

Puebla textile producers certainly had political clout, but their demand for a prohibition of ordinary cloth imports had to be counterbalanced by the loss of state revenue that the prohibition would have generated.[105] Thus, while the government did set relatively high tariff barriers, it did not comply with Puebla's demands for the prohibition on ordinary cloth imports. The protection they got was not enough to erase the difficulties facing Puebla's textile producers from sharply falling world prices, and social unrest increased. Two riots of unprecedented scale and duration erupted in Puebla during December 1828, events which finally precipitated a pro-industrial policy shift.[106] On 22 May 1829, Vicente Guerrero signed into law a bill prohibiting the importation of coarse cotton and wool textiles—a measure unambiguously designed to protect domestic industries as opposed to just generating reve-

[102] Potash, *Mexican Government*, p. 15.
[103] Ibid., p. 20.
[104] Ibid., p. 21.
[105] Ordinary cotton cloth represented about 32 percent of total import value in 1826 and 46 percent in 1827 (Thomson, *Puebla de los Angeles*, p. 288).
[106] Ibid., pp. 292–93.

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nues. Thus, "for the first time since independence, an outright ban was placed on the entry of inexpensive cotton textiles."[107] Of course, there was a big gap between legislated prohibition and smuggled reality. Indeed, by the 1840s there was a widespread contraband trade, and smuggled European cottons were displacing Mexican textiles.[108] The size of this contraband trade was not trivial.

First Best Principles: Subsidies and the Move to Mechanization in the 1830s

The replacement of Guerrero by Anastasio Bustamente in 1830 marked a shift in the tactics but not in philosophy. Indeed, the new administration moved to more efficient methods for encouraging better industrial performance, that is, from tariffs to direct subsidy. This was done by dropping the prohibitions on cotton textile imports, imposing modest tariffs in their place, and using a portion of the revenue to subsidize the textile industry. This industrial strategy was illustrated most clearly with the creation of the Banco de Avío in October 1830, the state development bank funded by tariff revenues, which granted loans for the purchase of industrial machinery, particularly in textiles.[109] The goal of the bank was to replace rather than preserve the inefficient handicrafts industries: "The Banco de Avío was the first to stipulate that industrial companies should receive loans and machinery, the first, in short, that fixed the establishment of the factory system as its goal."[110]

Potash thinks that the Banco de Avio accomplished its objective: "the bank contributed directly to the establishment of some half-dozen spinning and weaving factories" and helped make possible the rapid development of a modernized cotton textile industry in the decade 1835–1845.[111] Still, it is noteworthy that most of the investment came from private sources: total investment in the textile industry during this period was 10 to 12 million pesos, of which only about $750,000 (less than a fifth) came the Banco de Avío.[112]

Potash's optimistic assessment of the impact of the Banco de Avío and the stage of Mexico's textile industry in the 1840s is eroded still further by evidence that he himself cites. The government issued a de-

[107] Potash, *Mexican Government*, p. 31.
[108] Salvucci, *Textiles and Capitalism*, p. 154.
[109] Potash, *Mexican Government*, pp. 39-45.
[110] Ibid., p. 46.
[111] Ibid., p. 125. However, it may be of interest to note that the bank was officially dissolved in 1842 because of a lack of capital, losses from war, political interference, and default on outstanding loans.
[112] Potash, *Mexican Government*, p. 153.

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cree in March 1837 banning the importation of foreign yarn and *tejidos ordinarios de algodón* (ordinary cotton textiles). Another tariff act was passed in 1843 that excluded all cotton cloth having fewer than 30 threads per 0.98 inch square and placed an ad valorem tariff of 30 percent on other imports, up from 25 percent. The list of prohibited goods was also extended by some 180 items. These protective measures introduced in the late 1830s and early 1840s do not suggest a healthy and flourishing industry, but rather one in trouble. Still, one should set this policy response in comparative perspective. Tariff policy in the rest of the autonomous periphery was equally, if not more, protectionist. For example, U.S. northern manufacturing interests had lobbied to raise tariffs to about 52 percent on dutiable imports in 1830, before an angry export-oriented South demanded a compromise at a lower, but still high, range of 30 to 40 percent on dutiable imports.[113] Things were much the same in Australia, New Zealand, and Canada,—as well as the United States in the 1840s, Catalonia between the 1830s and the 1860s, and late Meiji and early Taisho Japan.[114]

What about the *effective* rate of protection? The prohibition on raw cotton imports—a sop for domestic cotton growing interests—remained unchanged through all these years, and it posed a serious constraint on industrial development.[115] From 1841 onwards, Estevan de Antuñano, Mexico's most important industrialist, wrote numerous newspaper articles, pamphlets, and letters to the President and the Congress, every time more desperate, explaining the terrible effects that the prohibition of raw cotton imports was having on the textile industry.[116] In 1843 Lucas Alamán, then chairman of the Dirección General de la Industria Nacional, pleaded that the national cotton crop was not sufficient to supply established factories. Domestic cotton prices rose up through the 1840s—partially because of the prohibitions, and partially because of crop failures, labor shortages and the unsuitable climate for growing the cotton needed for mechanical spinning.[117] To make matters worse, the increase in raw cotton prices induced the government to grant licenses for the import of raw cotton, which in turn led to a monopoly for raw cotton suppliers. The predictable result was an "inadequate, irregular

[113] Irwin, "New Estimates," pp. 13–14.

[114] On Australia, New Zealand, and Canada, see Williamson, "Explaining World Tariffs." On the antebellum United States, see Bils, "Tariff Protection"; and Harley "International Competitiveness." On Catolonia, see Rosés, "Catalan Industrialisation"; and Thomson, "Catalan cotton industry." On Japan, see Clark, "Why Isn't the Whole World Developed?"

[115] Raw cotton was grown extensively in Mexico, but it was not competitive in world markets. Thus, behind tariffs and prohibitions domestic cotton prices were higher than world prices.

[116] Antuñano, *Documentos para la historia,* includes a vast collection of these documents.

[117] On labor shortages, see Potash, *Mexican Government*, p. 134. On climate, see Thomson, "Continuity and Change," p. 287.

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and costly supply of raw cotton became a major obstacle preventing the cotton textile industry from . . . competing successfully with imports."[118] It became clear that it had been a wrong policy, but one difficult to change. After all, the many short-lived governments that Mexico had during that period were too busy solving urgent fiscal, political, and military problems to think carefully about long-term development projects and policies.

Although imports were always a significant threat to domestic producers, the fact of the matter is that imports did not rise during the 1830s and early 1840s. Whatever the inadequacy of protectionist policy, foreign competition was not enough to shut domestic producers down.[119]

Tariff Policy after 1850

Dawn Keremitsis continues the story of Mexican tariff policies where Potash leaves off by describing the rise of the liberals in the 1850s and the consequent end of the protectionist philosophy that characterized the second quarter of the century.[120] The political economy of conservative Lucas Alamán (the brain behind Banco de Avío) was replaced by a new view, proposed by Miguel Lerdo de Tejada, favoring the liberalization of trade by reducing tariffs and the promotion of Mexico's comparative advantage in mining, agriculture and other primary products.[121]

There was a substantial reduction in the tariffs on cotton manufactures in 1856.[122] The ad valorem tariff on manta declined steeply from 76.9 percent in 1855 to 23.1 percent in 1856.[123] However, these new, liberal policies did not have the strong negative impact on the industry that the literature has generally assumed, because the prohibition on raw cotton was replaced by an ad valorem duty of around 9.5 percent.[124] Thus, the effective rate of protection for the industry did not necessarily

[118] Thomson, "Continuity and Change," p. 287.

[119] In Thomson's words, "the plains of Mexico were far from being bleached by the bones of hand loom weavers" (Thomson, "Continuity and Change," p. 274). Thomson is, of course, paraphrasing Karl Marx (who seems to have paraphrased Sir William Bentinck) on Indian deindustrialization. To state the obvious, British India did not have the tariff autonomy that a newly independent Mexico had, and free trade, not protection, ruled there.

[120] Keremitsis, "La Industria Textil Algodonera."

[121] Lerdo de Tejada, *Comercio esterior*.

[122] Cosio Villegas, *La Cuestión Arancelaria*, pp. 13, 43, 92; and Gómez Galvarriato, "Industrial Development," p. 208.

[123] This calculation assumes a price of manta of 0.13 pesos per vara, which we think is more realistic than the price of 0.23 pesos assumed in Gómez Galvarriato (ibid., p. 208). The duty was reduced from 0.10 in 1855 to 0.03 pesos per vara in 1856 (ibid., table 4).

[124] The duty was 1.5 pesos per quintal, and the price of cotton is assumed to have been 15.87 pesos per quintal (*Memoria 1843*, p. 48).

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decline steeply, or even at all. Because raw cotton accounted for between 48 and 72 percent of cotton textile costs, the liberal tariff structure (which allowed the import of much cheaper raw cotton) reduced input costs to domestic cotton textile producers by 23 to 35 percent. In the first case, costs would have fallen less than prices, implying that profits should have fallen by 7.1 percent, penalizing domestic textiles. In the second case, however, costs should have fallen more than prices, implying that profits should have increased by 4.8 percent, rewarding domestic textiles.[125] The average of these two figures implies a very small penalty. Furthermore, while tariffs fell in 1856, they rose thereafter. Also, the number of products paying duties rose from 293 in 1845 to 524 in 1856 and to 775 in 1872. In addition, Mexican states with textile industries raised their tax on all manta crossing each state's border, generally an 8 percent duty, and imposed an additional tax on foreign products (14 percent for the state of Puebla).[126]

In short, despite the free trade rhetoric, "liberal" policies after 1856 were probably not any worse for industrial development than the "protectionist" policies had been before.[127] Thus, policy autonomy is a necessary but not a sufficient condition for effective pro-industrial and pro-growth policy. Postindependence political instability, civil violence, and foreign invasion did not provide an environment for good industrial policy. Mexican governments were driven by the short-run needs of survival, thus making them easy prey for short-sighted and self-centered interest groups. So, while Mexican governments were able to give domestic industry some effective protection from foreign competition—something colonial regions elsewhere in the periphery could not offer, it was not enough to matter as much as did the external terms of trade and wage competitiveness.

MEXICO IN A COMPARATIVE MIRROR

Imports satisfied a significant part of the total Mexican textile demand in the 1870s. Mexico imported 40 million square meters of cloth in 1879, compared with 60 million square meters produced domesti-

[125] Based on Bazant, "Estudio sobre la productividad"; and Gómez Galvarriato, "Industrial Development," p. 210. This also assumes a reduction in the price of raw cotton from $34 to $17.37 pesos per quintal (ibid., p. 208).

[126] Keremitsis, "La Industria Textil Algodonera," pp. 697, 700.

[127] The issues are even more complex than this section suggests. For example, the elimination of domestic geographic barriers to trade—especially with the introduction of the railroads—exposed domestic producers to greater foreign competition, raising their lobbying efforts for protection, efforts which were successful (Coatsworth and Williamson, "Latin American Protectionism" and "Always Protectionist?").

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cally. That is, foreign textile imports claimed 40 percent of the Mexican market (Table 4). Yet, these same data imply that domestic producers were able to claim 60 percent of the local market, a much bigger number than that for India in 1887 (35–42 percent) or the Ottoman Empire in the early 1870s (11–38 percent). Thus, by the 1870s, the Mexican textile industry was doing quite well compared with that of the rest of the poor periphery.

What accounts for this Mexican *exceptionalism*? This article uses a neo-Ricardian three-sector model to help decompose the sources Mexican industrial experience in the century before 1877 in to three forces: first, the terms of trade and Dutch disease effects were weak—compared with the rest of the periphery; second, based on a better relative agricultural productivity performance over time, Mexico maintained better wage competitiveness *vis a vis* the core—compared with the rest of the periphery; and third, Mexico had the autonomy to devise policies to foster industry—something the rest of the periphery did not have the autonomy to do. Regarding the third force, Mexican tariffs may have been high but they were not high by the standards of other autonomous nations: Mexican average tariffs in 1870 were 16 percent versus 25.6 percent for the rest of Latin America, and 40.9 percent for the United States.[128] In any case, over the century before the *Porfiriato*, we think that weak terms of trade shocks and strong wage competitiveness were much more important than were tariffs.

What about after 1877? Stephen Haber thinks the true liftoff of Mexico's textile industry came only in the late 1880s. A half century after Mexico's initial mechanization efforts, the 1888 industry was, according to Haber, still small and unproductive (although bigger and more productive than elsewhere in the poor periphery). But in the decade that followed:

> the industry more than doubled in size. By 1911, the industry had grown an additional 50 percent. Estimates of total factor productivity (TFP) growth . . . indicate increases of between 1.5 percent (lower bound) and 3.3 percent (upper bound) per year. Labor productivity grew even faster . . . … between 3.0 and 4.7 percent per year.[129]

Such growth rates meant that Mexican textile producers had displaced most imported cloth by 1914.[130] The only foreign textiles still being imported were high quality, fine-weave cloth.

[128] Average tariffs are calculated as total import revenues as a share of total import values, from the data underlying Williamson, "Explaining World Tariffs."

[129] Haber, "It Wasn't All Prebisch's Fault," pp. 7–8.

[130] Ibid., p. 11.

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What explains the timing and the pace of the lift off? Based on what we have learned about the century before the Porfiriato, it seems to us that there are three likely candidates: first, a secular decline in the terms of trade facing the Mexican economy, price trends that no longer penalized local manufacturing; second, the possibility of importing cheaper foodstuffs, making for improved wage competitiveness in manufacturing; and third, a more effective pro-manufacturing tariff policy. It seems to us that mainstream historiography greatly exaggerates the impact of policy while ignoring the terms of trade and wage competition. For example, Graciela Márquez has argued that the introduction of a modern pro-industrial policy and a coherent structure of protection mattered most.[131] Haber appears to agree: "In 1891 Mexico was using tariffs to protect the cotton textile industry," which perhaps would have otherwise been uncompetitive. "This meant high tariffs on competing goods and low tariffs on inputs. The tariff on imported cloth tended to be twice that of the tariff on imported raw cotton. The result was an effective rate of protection that varied from 39 to 78 percent."[132]

We do not deny that policy mattered, and that Mexican policy led the way in Latin America. But should not world prices and the terms of trade have mattered as well? As we have seen, a good part of Mexican exceptionalism in the century before 1877 can be explained by a far weaker terms-of-trade shock (and weaker Dutch disease effects) compared to the rest of Latin America, Asia, and the Middle East. Could the same be true of the half century after 1877, but in reverse sign? Figure 9 suggests the answer might well be yes. There we see that the Mexican terms of trade fell after the 1880s much more sharply than they did elsewhere in the poor periphery. Indeed, the Mexican terms of trade were cut in half between 1890 and 1902, twice as much as the rest of Latin America. If that fall was driven by world market events outside Mexico, it implied a rise in the price of imported manufactures relative to mining exports, an event that should have favored industrialization. If, instead, the decline in Mexican export prices was driven by rapid productivity advances in Mexican mining, and if the price elasticity of demand for exports was greater than unity, then industrialization would have been driven by an export boom rather than by any diminution in the Dutch disease forces that characterized so much of the pre-Porfiriato period.[133] In addition, what about the "invasion" of world markets by cheap foodstuffs from the United States, Russia, and Canada? To the extent that Mexican policy allowed even a modest grain invasion,

[131] Márquez Colin, "Political Economy."
[132] Haber, "It Wasn't All Prebisch's Fault," p. 16.
[133] See especially Beatty, "Impact of Foreign Trade."

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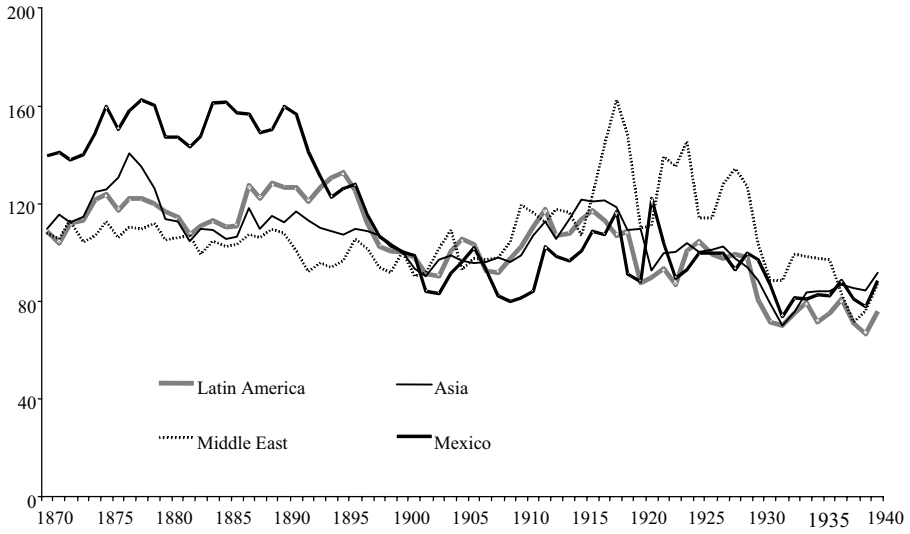


FIGURE 9
TERMS-OF-TRADE TRENDS, MEXICO VERSUS REST OF PERIPHERY, 1870–1940
(1900 = 100)

Source: See the Appendix.

would not this have put downward pressure on nominal wages, thus making Mexican manufacturing more competitive? It seems to us that these relative price movements may have accounted for much of Mexican exceptional industrialization experience between the 1870s and the Revolution. We intend to pursue this hypothesis in future work, and, once again, we will do so by comparing Mexico with the rest of the periphery.

Appendix

This appendix describes the sources of the wage and price data used in the analysis underlying the general equilibrium price dual model. Every price and wage series was converted in to common currency (typically pesos, and 8 reales = 1 peso) and quantity units before linking them together for the 1750–1878 series. The following definitions and notation, taken from the model exposition in the text, are used in this Appendix: P_X = export price, P_M = import price, P_C = price of nontradable grains (corn), P_T = price of import-competing manufacturing textiles (usually cotton and usually cloth), and W = nominal wage rate (daily, urban unskilled *peón*).

1. MEXICAN TEXTILE PRICES 1751–1878 (P_T: Appendix Table 1, col. 1)

1.1 *1751–1777*: We were unable to find any useable Mexican textile price quotes before 1778. Because Spain was the main foreign supplier of textiles to Mexico (e.g., Nueva España), and because transport costs on the westward leg of the Atlantic trade were quite stable during mid-eighteenth-century peacetime years, we take these prices series as proxies for Mexican P_T 1751–1777. We use an average of two Spanish cloth price series: Palencia (now in Castila and Leon) textile prices, where P_{TP} is the aver-

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age of linen, and two woolen price series (Moreno, "El nivel de vida": made available by the author); and Madrid textile prices, where P_{TM} is the average of estameña, sayal and paño blanco prices (Hamilton, *War and Prices*: supplied by Joan Rosés. See also 4.1 below.)

1.2 *1777–1878 Benchmarks*: Here we use scattered wholesale price quotes for manta cloth per vara from Guadalajara, Mexico City, Puebla and Oaxaca to establish prices in benchmark years = series A. These benchmark years are: multi-observation averages for 1777 (3), 1831 (3), 1836 (4), 1843 (4), 1850 (3), and 1867 (4); and single observations for 1787, 1803, 1809, 1810, 1827, 1834, 1835, 1839, 1842, 1845, 1857, 1859 and 1867. Sources for prices: 1777, 1787, 1803, 1810, 1827, 1834, 1836, 1842, 1843, 1847, and 1867 (Thomson, *Puebla de los Angeles,* p. 373); for 1781, 1782 and 1804 (Miño, *Obrajes y Tejedores*, pp. 231 and 235); for 1800, 1835, 1836, 1839, 1843, 1845, 1847, 1853 (Walker, *Parentesco*); for 1809, 1836, 1839, 1842, 1843, 1845 (Potash, *Mexican Government*, p. 163); for 1843 (Dirección de Agricultura e Industria, "Memoria 1843"; Bazant, "Estudio sobre la productividad"); for 1850 (Banco Nacional de Comercio Exterior S.A., *Los Industriales* and *El Comercio Exterior*); for 1859 (Butterfield, *United States and Mexico*); for 1867 (Herrera, *El Comercio Exterior*, p. 38); for 1871 (*The Two Republics,* 9 December 1871: p. 2); for 1874–1877 (*La Colonia Española,* 1 February 1874, 1 March 1875, 15 February 1876, and 30 June 1877); for 1877 (Keremitsis, *La industria texil*, p. 71). Notes for prices: Prices are stated in pesos per vara. One piece of cloth may have measured between 30 and 36 varas, but we assumed the piece to be equal to 32 varas following Bazant ("Estudio sobre la productividad"): 1 vara = 36 inches = 0.8359 meters.

1.3 *1777–1878 Interpolations and Projections*: The next step was to interpolate between the benchmark years.

1.3.1 1777–1827: For the period 1777–1827, we used the P_{TP} data for interpolations. Thus, for 1777–1787, 1787–1803, 1803–1809, and 1810–1827: (1) we computed a geometric (exponential) trend between the benchmark years in the A series (see above in 1.1); (2) we then computed percent deviations from geometric trend between same years in the P_{TP} series; finally, we applied the percent deviations from (2) to the trend in (1). Thus, we preserve the Mexican benchmarks and the implied trends between them, but infer (unobserved) short-run movements between them from the volatility in the Spanish series. Prices for the following years were ignored because they were ones during which there was a war-induced shut down in trade: 1781, 1797/98, 1800/01, and 1805/06. Instead, we interpolated those war years. The year 1812 was retained because the shock was induced by the *Insurgencia*, not European conflict.

1.3.2 1827–1877: For the period 1827–1877, we interpolated using unit values of British cotton textile exports reported in the *Parliamentary Papers* = P_{GB}. Thus, for 1827–1831, 1831–1834, 1836–1839, 1839–1842, 1843–1850, 1850–1857, 1859–1867, and 1867–1877: (1) we computed the geometric (exponential) trend between benchmark years in the A series; (2) we then computed percent deviations from the geometric trend between the same years in the P_{GB} series; finally, we applied the percent deviations from (2) to the trend in (1). Thus, we preserve the trends between Mexican benchmarks, but infer (unobserved) short-run movements between them from the volatility in the British price series. For 1843–1845 and 1857–1859, we interpolate the middle year by using geometric trend between these years.

1.3.3 The 1878 observation is constructed by projection from the 1877 observation (see above in 1.1), using series P_{GB}.

1.4 *Linking the results* of 1.1–1.3 yields the P_T series 1750–1878 (1828 = 100).

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2. MEXICAN GRAIN PRICES 1750–1877 (P_C: Appendix Table 1, col. 2)

2.1 *Corn prices 1750–1810*: Reales per fanega, wholesale prices quoted in Mexico City markets (Garner, *Economic Growth*).

2.2 *Maize prices 1810–1833*: Reales per fanega (estimated from Thomson, "Traditional and Modern Manufacturing").

2.3 *Maize prices 1833–1863*: Reales per fanega, wholesale prices quoted in Comanja and Leon, annual averages (Brading, *Haciendas*, p. 332).

2.4 *Maize prices 1863–1877*: We have prices for arroz, frijol and maize 1859–1877 (from Amilcar Challu's ongoing research on eighteenth and nineteenth century living standards in Mexico), but use only maize prices to be consistent with earlier corn and maize price series.

2.5 *Linking the results* of 2.1–2.4 yields the P_C series 1750–1877 (1828 = 100).

3. MEXICAN UNSKILLED, URBAN WAGES 1750–1860 (W: Appendix Table 1, col. 3)

3.1 *Peón obra wages 1750–1838*: Reales per day, collected by Amilcar Challu for his ongoing research on eighteenth- and nineteenth-century living standards in Mexico. The data here refer to his "all Mexico—peons, sobrestante, and official" series.

3.2 *Peón obra wages 1838–1860*: Reales per day, multiple observations taken from the records of convents, hospitals and other institutions. Also collected by Amilcar Challu.

3.3 *Linking the results* of 3.1 and 3.2 yields the W series 1750–1860 (1828 = 100). Thus far, we have been unsuccessful in finding nominal wage rate data 1860–1878.

4. MEXICAN PRICES OF TRADABLES 1750–1940 (P_X, P_M and P_X/P_M: Appendix Table 1, cols. 4 and 5)

4.1 *1750–1828*:

4.1.1 P_M 1750–1800: As a proxy for (unobserved) Mexican P_M, we used the average of the two Spanish textile price series, quoted for Palencia and Madrid. For Palencia (P_{TP}: 1750–1800), we took the average of linen, and two woolen, price series. We interpolate geometrically to fill in missing years. These three textile price series are highly correlated. For Madrid (P_{TM}: 1751–1800), we took the average of estameña, sayal and paño blanco prices to construct a Madrid cloth price (Bona, *Anuario 1868*: supplied by Hector Garcia). It turned out that because P_{TM} and P_{TP} were so highly correlated, we simply used the Madrid P_{TM} series as the proxy 1751–1800 (although 1750 was taken from the Palencia P_{TP} series, because the Madrid series starts with 1751).

4.1.2 P_M 1800–1828: As a proxy for (unobserved) Mexican P_M, we used the British export price index to proxy trends in the Mexican import price index (Mitchell, *Abstract*, p. 331).

4.1.3 P_X 1750–1828: Because silver was such a large share of export receipts, we used silver prices (pesos per gram of coined silver) to proxy Mexican export prices (Burzio, *Diccionario*).

4.2 P_X, P_M and P_X/P_M *1828–1940*:

4.2.1 Mexico 1828–1870: We rely on Prados ("Economic Consequences") and Salvucci (*Textiles and Capitalism*).

4.2.2 Mexico 1870–1940: Data underlying Catáo ("Export Growth").

4.2.3 Latin America 1810–1870: Data underlying Williamson ("Globalization, De-Industrialization and Underdevelopment").

4.2.4 Latin America, Asia, Ottoman 1870–1940: Data underlying Williamson (ibid.)

4.3 *Linking yields series* 1750–1940 for P_X, P_M and P_X/P_M (1828 = 100).

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APPENDIX TABLE 1
MEXICAN PRICES AND WAGES, 1750–1878

	(1) P_T	(2) P_C	(3) W	(4) P_X	(5) P_M
1750		114.1	82.3	97.7	
1751	56.0	52.2	81.7	97.7	140.4
1752	60.2	22.1	81.0	97.7	150.9
1753	64.7	27.1	80.4	97.7	162.2
1754	68.7	28.0	79.8	97.7	172.2
1755	67.1	42.0	78.3	97.7	168.4
1756	64.8	41.7	78.1	97.7	162.5
1757	69.2	27.3	77.9	97.7	173.4
1758	69.3	34.6	77.7	97.7	173.8
1759	66.9	42.1	75.8	97.7	167.8
1760	65.0	49.8	73.9	97.7	162.9
1761	62.6	52.5	75.8	97.7	156.9
1762	58.0	42.7	77.7	97.7	145.5
1763	61.9	26.5	77.7	97.7	155.1
1764	65.4	31.2	77.7	97.7	163.9
1765	65.6	33.0	77.7	97.7	164.6
1766	64.8	35.9	77.7	97.7	162.4
1767	62.3	29.6	77.7	97.7	156.1
1768	64.8	30.5	77.7	97.7	162.5
1769	65.8	36.3	77.7	97.7	165.0
1770	66.9	55.9	77.7	97.7	167.8
1771	67.1	59.0	77.7	97.7	168.4
1772	65.4	72.0	77.7	98.5	164.0
1773	66.6	57.5	77.7	99.2	166.9
1774	63.8	48.6	77.4	99.2	159.9
1775	63.2	38.2	77.4	99.2	158.5
1776	64.8	58.3	74.2	99.2	162.5
1777	66.2	39.7	75.8	99.2	165.9
1778	66.2	43.0	77.4	99.2	171.1
1779	63.6	50.2	78.9	99.2	172.9
1780	57.5	60.4	79.2	99.2	166.4
1781	56.9	56.9	84.0	99.2	171.9
1782	56.2	47.6	83.8	99.2	168.2
1783	55.2	37.2	83.7	99.2	177.2
1784	54.5	54.1	80.7	99.2	183.3
1785	57.3	108.9	78.6	99.2	189.6
1786	56.1	176.6	78.6	99.2	194.8
1787	52.0	85.7	77.1	100.0	189.0
1788	51.1	70.3	75.7	100.0	185.1
1789	51.6	114.3	78.0	100.0	190.4
1790	45.3	63.1	79.2	100.0	173.6
1791	46.2	74.1	77.4	100.0	175.7
1792	52.7	48.8	77.7	100.0	192.4
1793	51.4	59.8	77.7	100.0	192.7
1794	54.4	95.2	77.6	100.0	202.0
1795	57.6	59.3	77.5	100.0	211.7
1796	57.9	61.2	77.4	100.0	227.0
1797	57.4	75.3	77.4	100.0	253.3
1798	56.9	78.5	77.4	100.0	232.1

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APPENDIX TABLE 1 — continued

	(1) P_T	(2) P_C	(3) W	(4) P_X	(5) P_M
1799	56.3	67.1	78.6	100.0	221.4
1800	54.2	74.9	78.0	100.0	210.7
1801	52.1	64.9	77.2	100.0	212.7
1802	49.9	88.0	77.4	100.0	238.4
1803	48.8	87.5	77.2	100.0	227.9
1804	56.6	74.5	77.4	100.0	221.9
1805	59.2	73.6	77.4	100.0	219.2
1806	61.8	78.0	83.1	100.0	214.3
1807	64.3	83.7	79.8	100.0	218.3
1808	68.1	57.4	78.9	100.0	221.1
1809	61.1	108.1	78.3	100.0	207.6
1810	61.1	183.2	80.1	100.0	207.3
1811	62.2	123.1	76.9	100.0	212.1
1812	63.4	124.3	76.0	100.0	207.4
1813	64.6	90.9	86.1	100.0	200.3
1814	65.8	130.3	93.5	100.0	193.5
1815	67.1	125.5	105.6	100.0	176.1
1816	68.3	176.9	94.7	100.0	166.5
1817	69.6	162.6	102.7	100.0	152.2
1818	70.9	92.1	99.4	100.0	159.6
1819	72.3	180.5	92.9	100.0	151.9
1820	73.7	99.2	99.4	100.0	137.8
1821	75.1	110.0	99.1	100.0	131.3
1822	76.5	78.9	98.8	100.0	120.7
1823	77.9	118.4	98.5	100.0	116.7
1824	79.4	89.7	97.9	100.0	113.8
1825	80.9	89.7	91.4	100.0	123.4
1826	82.4	89.7	90.8	100.0	108.7
1827	84.0	94.8	107.4	100.0	102.5
1828	100.0	100.0	100.0	100.0	100.0
1829	82.6	105.2	84.0	100.0	105.8
1830	90.2	52.6	107.4	100.0	110.7
1831	100.5	49.0	93.5	100.0	109.7
1832	73.3	157.8	94.4	100.0	102.9
1833	83.5	64.6	95.2	101.0	96.1
1834	84.0	89.4	96.1	101.0	95.1
1835	68.1	67.0	93.5	101.0	98.1
1836	70.9	50.2	92.9	101.0	118.4
1837	63.9	41.6	80.7	101.0	121.4
1838	66.4	38.3	78.6	102.0	110.7
1839	62.0	38.7	78.6	102.0	105.8
1840	69.8	50.2	78.6	102.0	101.9
1841	70.1	65.0	78.6	101.0	101.0
1842	53.5	48.8	76.7	100.0	99.0
1843	54.7	23.9	74.9	101.0	92.2
1844	50.3	40.2	75.1	100.0	90.3
1845	40.5	62.2	75.4	100.0	94.2
1846	37.2	70.8	75.6	101.0	97.1
1847	33.9	43.0	75.9	101.0	101.9
1848	29.2	43.0	76.1	101.0	89.3
1849	31.1	46.0	76.4	102.0	83.5

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APPENDIX TABLE 1 — continued

	(1) P_T	(2) P_C	(3) W	(4) P_X	(5) P_M
1850	31.1	49.2	76.6	103.0	95.1
1851	31.2	52.6	76.9	102.0	86.4
1852	29.6	45.0	77.1	104.0	87.4
1853	28.0	49.3	77.4	104.0	96.1
1854	32.6	50.7	77.6	104.0	104.9
1855	29.5	49.3	77.9	104.0	101.9
1856	29.4	40.6	78.1	104.0	97.1
1857	33.2	33.5	78.4	104.0	107.8
1858	30.0	45.3	78.6	105.1	98.1
1859	29.3	61.2	78.6	104.0	101.9
1860	31.8	82.8	78.6	108.1	99.0
1861	31.8	111.9		107.0	91.6
1862	39.4	40.2		108.1	102.6
1863	48.7	105.2		108.1	114.0
1864	58.9	106.5		108.1	128.3
1865	54.5	107.8		108.1	109.6
1866	56.4	145.5		107.0	111.8
1867	49.6	138.3		106.0	87.2
1868	43.6	131.4		106.0	81.4
1869	41.4	124.9		106.0	75.8
1870	36.5	118.7		106.0	73.8
1871	36.9	112.8		106.1	73.1
1872	38.5	107.2		106.2	78.2
1873	37.2	101.9		104.8	78.5
1874	31.4	96.8		102.9	73.1
1875	30.0	92.1		100.1	74.0
1876	32.6	87.5		94.0	67.5
1877	24.9	83.1		97.4	60.6
1878	25.8			89.6	55.4

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