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INDUSTRIAL DEVELOPMENT

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FORWARD AND BACKWARD LINKAGES IN A PLANTATION ECONOMY:  
IMMIGRANT ENTREPRENEURSHIP AND INDUSTRIAL DEVELOPMENT  
IN YUCATAN, MEXICO

Eric N. Baklanoff and Jeffrey Brannon\*

1. Introduction

Beyond the primary processing of agricultural crops, rarely have plantation economies given rise to significant manufacturing activities through forward or backward linkages.<sup>1</sup> As Albert O. Hirschman put it: "Agriculture certainly stands convicted on the count of its lack of direct stimulus to the setting up of new activities through linkage effects: the superiority of manufacturing in this respect is crushing."<sup>2</sup> This absence of linkage is also the focus of Ruth Young's article, "The Plantation Economy and Industrial Development in Latin America." She concludes that the "type of participation in the international economic community that appears necessary to industrial growth is the antithesis of the dependent circumscribed relation a plantation economy maintains with a patron nation."<sup>3</sup> In their classic article, "Haciendas and Plantations in Middle America and the Antilles," anthropologists Eric Wolf and Sidney Mintz observed that in modern tropical agriculture "machinery is imported from the industrial country which also furnishes the capital and managerial skills for plantation enterprise."<sup>4</sup>

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The Mexican state of Yucatan proved to be an exception to these generalizations. Unlike the experience of other tropical plantation systems in the Caribbean and Latin America in which foreign investors transformed the traditional family-owned plantations into large, efficient corporate holdings, local entrepreneurs in Yucatan continued to own and control the henequen estates. Again, unlike the experiences of Cuba, Central America, Northeast Brazil, and other parts of Mexico--where foreign direct investment organized and controlled the railways, ports, electric power and telephone systems--in Yucatan local creole enterprise initiated, owned and maintained control over their railroads and most of their public utilities.<sup>5</sup> Furthermore, by 1910, Yucatan had in place a modern machinery industry that was backwardly-linked to the needs of the henequen plantations and during the mid-1920s a modern cordage industry was initiated. Among the leading national producers of hard fiber in the early 1960s--Tanzania, Brazil, the Philippines, and Mexico--only Yucatan in Mexico possessed a large, well-established export-oriented cordage industry.<sup>6</sup>

The intent of this paper is to examine the special entrepreneurial and economic factors that made it possible for Yucatan's monocrop plantation economy to achieve a significant level of industrial development based on henequen fiber production. Section 2 focuses on the region's "Golden Age" from around 1880 to World War I. The third section traces the development of the machinery industry, including the prominent role of immigrant mechanics and entrepreneurs. Section 4 analyzes the organization and structure of the cordage

industry from its inception during the mid-1920s to its nationalization between 1961-64. The "Discussion" section integrates the substance of the three parts.

## 2. Yucatan's Golden Age: The Plantation Economy

Yucatan's production and exports of henequen fiber expanded rapidly after 1880 and reached historic peaks during World War I. This period of accelerated growth was based on the state's total commitment to henequen exports, mainly to the United States. By 1910, over 70 percent of all cultivated land in Yucatan was sown in henequen and the state's henequen plantations were supplying 95 percent of North America's binder twine requirements.<sup>7</sup> Henequen exports from Yucatan which were less than 10,000 tons in 1879 were averaging 100,000 tons annually by 1910.<sup>8</sup> Two major demand factors--the invention by Cyrus McCormick of a twine-binding reaper in 1878 and the rapid expansion of North American grain production--provided the continuing stimulus to Yucatan's premier export industry. The traditional subsistence-oriented haciendas in Yucatan's henequen zone<sup>9</sup> had become, according to Roland Chardon, ". . . plantation(s) in the classical sense: large scale agricultural-industrial producer(s) of one main crop destined for a distant foreign market."<sup>10</sup> With the development of the highly specialized plantation economy in Yucatan, growers began to send their raw fiber to cordage mills in the United States. The local mills that continued to operate were unable to penetrate the United States agricultural market and declined rapidly in importance after 1880.

The capital requirements of converting a subsistence hacienda into a large scale henequen plantation were heavy. The owner had to purchase defibration and packing equipment and build sheds to house the machinery. Small railroad lines had to be laid throughout the hacienda to transport the harvested leaves from the field to the processing plant and to move the baled raw fiber to the nearest railhead. Further costs were incurred to maintain newly planted fields until they began to produce, usually four to seven years after planting. this investment alone was sizable since many henequen plantations exceeded 2,000 hectares. In the accelerated transition from corn and cattle to henequen, land owners continued to plow their profits back into expanded plantings. To circumvent the capital-scarce environment of Yucatan, planters gained increasing access to American financial resources. By pledging future fiber production, hacendados could obtain the credit they needed directly or indirectly from U. S. bankers and henequen brokers.

In Yucatan the rise of the modern plantation economy was largely associated with the enterprise of the great creole families. Their economic initiative extended beyond the agricultural estate to encompass as well the organization of railways, electric power service, ports and docks, banking, commerce, and the beginnings of industry during the final decades of the 19th century. The period of exceptional henequen prosperity saw the progressive concentration of land, productive capacity, and political power in the hands of fewer and fewer families. By 1910 there were slightly more than one thousand plantations devoted exclusively to henequen cultivation and

these agriindustrial units were distributed among 300 to 400 families.<sup>11</sup> Among the family names that loom importantly in the entrepreneurial landscape of that formative period are Escalante, Ancona, Camara, Casares, Espinosa, Canton, Gutierrez, Manzanilla, Molina, Peon, Bolio, Regil, Palma, and Peniche.<sup>12</sup> Following the uncompensated expropriation of the large estates associated with the Agricultural Reform of the late 1930's, many of the old plantation families left Yucatan for Mexico City or the United States. Of those that remained in Yucatan, some continued to work their greatly-diminished estate, the pequeña propiedad, and others diversified into such varied activities as industry, including the manufacture of henequen products in cordage mills (cordelerias), commerce, tourism services, banking and cattle raising.

At the turn of the century, Yucatan, which had been one of Mexico's poorest provinces, became one of its wealthiest. "Mérida blossomed," writes Nelson Reed. "The streets were paved with macadam, had electricity to light them at night, were traversed by horse-drawn streetcars, and numbered in the scientific way--all of this in advance of Mexico City."<sup>13</sup> The regional economy, while making only modest progress toward manufacturing industry, nevertheless offered an increasing number of skilled and semi-skilled jobs to the humble but ambitious laborers. Carpenters and other craftsmen were increasingly engaged in the manufacture of coaches, carts, and buggies in response to the growing demand for the transportation of people and cargo within the peninsula. Other industries that made their appearance during the latter decades of the 19th century included ice plants,

factories for the manufacture of chocolate and safety matches, pharmaceutical laboratories, and in 1899 Yucatan's only brewery, José M. Ponce y Cia.<sup>14</sup> The operation of defibration machines, railways, telegraph and telephone systems, blacksmith shops, hardware stores, and machine shops and foundries demanded new talents and skills. And "everywhere the construction trades felt the influence of new money as shops, houses, and the marvelous Paseo Montejo residences were built."<sup>15</sup> Though still predominantly a rural economy--with 62 percent of the labor force in agriculture--the state led the nation as a whole in the proportion of the total working population engaged in industry in 1910: 17.5 percent vs. 15 percent.<sup>16</sup> In short, on the eve of the Revolution, Yucatan achieved a level of prosperity that was the envy of Mexico.

This period of exceptional henequen prosperity coincided with the Diaz era in Mexico (1876-1910), Porfirio Diaz's economic advisers, who called themselves científicos, promoted the development of new export industries in primary commodities and the construction of railways and ports; they practiced fiscal orthodoxy and maintained law and order--two conditions deemed essential for the attraction of foreign direct investments in railways, mines, oil wells, ranches and plantations, and for the placement of Mexican government bonds in the principal capital markets abroad. Indian lands, held in common as traditional ejidos, passed by various methods into the hands of foreigners or Mexican hacendados. Debt peonage--the de facto permanent attachment of landless campesinos to the agricultural estate--characterized the socio-economic status of the rural masses in Yucatan and other parts of Mexico.<sup>17</sup>

### 3. The Machine Industry

The most imposing technical obstacle to large scale henequen production had been surmounted by the late 1850s when Yucatecans invented low-cost mechanical rasping or defibrating machines that separated the raw fiber from the leaves. Among the inventors and developers of these machines were José Esteban Solís, José Dolores Espinosa Rendón, Manuel Prieto, and Manuel Celilio Villamor y Armandaris. Successive improvements by local mechanics greatly increased the speed, safety, and reliability of these mechanical processors. By the last decade of the nineteenth century, thirteen hundred steam-powered defibrators were in use in Yucatan, some of which were capable of processing twenty thousand leaves per hour.<sup>18</sup>

Although the prototype rasper or defibrator was invented and developed in Yucatan, the production of machines passed initially to the industrially-advanced nations, mainly the United Kingdom and France. Early on, then, Yucatan satisfied most of its equipment needs through imports. Between 1868 and 1971, for example, Yucatan imported 300 iron flywheels for henequen defibrators and 160 steam engines.<sup>19</sup> During the 1880s local machine shops were set up at large haciendas to expedite the repair of equipment and provide a ready source of replacement parts.

The U. S. artisan John G. Stephens, while working several years at the Hacienda Idzincab of Eusebio Escalante, designed a rasping machine. The Spanish brothers Manuel and Demetrio Prieto, who worked for some time as mechanics at the Hacienda of Miguel Espinosa Rendon, later formed their own machine shop.

By the turn of the century, however, several of these machine shops had developed the capability to build defibration machines and henequen presses and even to improve upon their design. The most important metal working shops and foundries were established by two immigrants, the Armenian Carlos Pascal Caracashian and the Catalán mechanic José Torroella. Both men found ways to improve on the old equipment and invented new, more efficient machines. Whereas the earlier standard rasping machine could only handle long fibers, a new model invented by Carlos Caracashian could process both short and long fibers. Two of the machines developed by Caracashian, "La Pascalita" and "La Reforma," were recognized for their advanced technical features and were adopted throughout the henequen zone. At the peak of its operation Caracashian's mechanical shop and foundry employed eighty individuals, worked in both bronze and steel, and contributed substantial tax revenue to the government.<sup>20</sup> The Cuban Loret de Mola, a mechanical engineer with a U. S. degree, and his brother emigrated from that turbulent island colony in 1896 and set up a modern machine shop and foundry. More than ten additional machine shops and foundries were organized during the first decade of the twentieth century, including those of the Englishman Tomas Dutton and Carlos Rojas, an immigrant mechanic from the Canary Islands.<sup>21</sup>

The presence of a local machinery complex enabled the henequen industry to operate at its most efficient level. Unlike plantations in other parts of the Americas, the Yucatecan haciendas could satisfy rapidly their needs for spare parts, and machinery repair and replacement. Before, when spare parts had to be imported or equipment

sent abroad for repairs, haciendas often had to suspend operations with its attendant large cost.

As with the cordage industry, which was to make its appearance in the peninsula two decades later, the Yucatecan machine industry was characterized by labor intensity and its small-scale; perhaps as many as two dozen shops of various sizes, offering some differentiation in product and service, could effectively compete in a small regional market. Further, the market was close at hand and the necessary enterprise and metal working and forging skills, embodied mainly in the persons of immigrants, had been accumulated over several decades.

#### 4. Organization and Structure of the Cordage Industry

In Yucatan local entrepreneurs developed a full-blown cordage industry that eventually transformed most of the peninsula's raw henequen fiber into manufactured products, both for export and domestic markets. The privately-owned industry, encompassing at various times between 40-100 cordage mills, employed 2,500-4,000 industrial workers and became after World War II the main source of U. S. harvest twine. Other industry products elaborated from the raw fiber included packing twine, ropes, cables and sacks. The cordage industry (as with the plantation economy decades earlier) also gave rise to significant backward linkages as mechanical shops in Mérida geared up to manufacture equipment, machinery, and replacement parts used by the local mills.

It was not until the 1920's--with the convergence of propitious demand and cost factors--that Yucatan initiated a modern cordage

industry. By 1930, local mills were absorbing 10 percent of the state's henequen fiber and producing manufactured articles for the Mexican market. Increasingly, they were able to compete against U. S. mills and eventually displace U. S. production with cordage exports from Yucatan. Because of the industry's labor intensive character and relatively simple technology, Yucatan was able to develop a comparative advantage over the United States in the manufacture of cordage products. Further, Yucatan's penetration of the American market for ropes, harvest twine, and other henequen products was reinforced by the peninsula's proximity to the United States and the absence of U. S. tariff barriers against such products.<sup>22</sup> In the 1930's, the reaper was gradually replaced by the combine harvester, which does not use binder twine, and the demand for binder twine declined. Meanwhile, the rise in U. S. farm wage rates stimulated the introduction of automatic baling machines. With fuller utilization of American grasslands to support a growing cattle population, the use of baling machines expanded greatly, and with it, the demand for baler twine. Local elaboration of raw fiber, which had consumed less than 1 percent of Yucatan's total raw fiber output in 1925, rose to 25 percent, or over 22,000 tons in 1940.

World War II created highly favorable conditions for Yucatecan mills. Allied military and naval operations greatly increased the demand for ropes and cables. American mills running at full capacity were unable to satisfy the wartime demand for these articles.<sup>23</sup> The conflict also disrupted the Allies' supplies of the two other major hard fibers, sisal and abaca. World production of sisal fell from

260,495 tons in 1939 to 201,301 tons in 1947.<sup>24</sup> More importantly, as the Philippines was in enemy hands, cordage mills in the allied nations were deprived of their source of abaca, the hardest fiber which was preferred for rope and cable production. Cut off from other suppliers of hard fiber, the United States contracted to purchase Yucatan's henequen production during World War II at prices well above the depression lows of the 1930's. On top of abnormal wartime demand, other factors also intervened to stimulate the growth of the cordage industry. Henequeneros de Yucatan, the association of henequen growers, subsidized the industry's expansion by selling to local mills raw fiber at less than the world market price. Federal and local export taxes on manufactured articles were also reduced.<sup>25</sup> Given these favorable circumstances, the number of mills multiplied, and by the end of World War II, there were some ninety mills operating in and around Mérida. Exports of henequen manufactures increased from 10,472 tons valued at 4.4 million pesos in 1940 to 39,580 tons in 1945 with a value of 34.7 million pesos in 1945.

Most of the mills were located in Mérida, the capital city, where there was adequate manpower, repair shops, and urban services such as transportation and communication, water, and electricity. Mérida is also near Progreso (36 KM), the principal maritime port for the shipment of henequen products. Further, Mérida's proximity to the United States facilitated the marketing of the industry's North American operations and the provision of working capital financing through American banks.

Yucatan's modern cordage industry was initiated by the Lebanese Cabalan Macari, who immigrated to the state in 1919. His Cordelerfa San Juan, S. A. was organized in 1925 and led the other private mills in cordage output.<sup>26</sup> One of the foremost entrepreneurs in the peninsula, Cabalan Macari's ventures extended to cattle raising in eastern Yucatan and the sugar industry in the neighbor state of Campeche. Table I lists the 38 active cordage mills operating in April 1951. Their joint production capacity, measured in terms of weekly fiber consumption, was 6,645 bales. Significantly, of the 13 largest mills (which consumed 68 percent of total fiber), 8 were owned by recent immigrants and three were in the hands of former plantation owners (Escalante, Manzanilla, and Cáceres). Of the 8 immigrant-owned mills, 5 were controlled by Lebanese<sup>27</sup> (Macari with two plants; Suari, Sauma, and Jacobo with one plant each), and one each by Spanish (Castro), Scott (Fitzmaurice), and Turkish (Gaber) immigrants.

Notwithstanding great annual variations in the output of henequen manufactures, the cordage industry's production was on an upward trend from the latter 1930 to the early 1960s, as indicated below:<sup>28</sup>

<u>Years</u>	<u>Annual Average Quantities (m.t.)</u>
1935-39	15,510
1940-44	31,383
1945-49	44,081
1950-54	47,433
1955-59	84,127

In 1962 cordage production reached 120,590 tons of which 83,000 tons were exported. The national market absorbed between one-fourth and one-third of Yucatan's cordage sales during the 1950s and early 1960s.

Table 1

INDUSTRIAL CAPACITY OF YUCATAN'S CORDAGE INDUSTRY,  
BY OWNERSHIP SOURCE  
(April 1951)

NAME OF ENTERPRISE	WEEKLY HENEQUEN CONSUMPTION (bales of 185 ks.)	OWNER
1. Cordelería San Juan, S. A.	800	Juan Macari C.
2. Industrializadora del Sisal, S. A.	500	Alberto Suari
3. Sub-Arrendatarios de La Industrial, S. A.	400	Jóse M. Castro
4. Fabricantes de Hilos Sisal, S. A.	400	J. L. Fitzmaurice
5. Henequén Industrial, S. de R. L. de C. V.	400	P. Manzanilla
6. Compañía Industrial Peninsular, S. A.	300	A. Cetina A.
7. Productores y Exportadores de Artefactos de Henequén, S. A.	300	M. Escalante
8. Sisal, S. A.	300	Juan Macari C.
9. Cordelería El Progreso, S. A. de C. V.	300	Halim R. Gáber
10. Cordelería Modelo, S. A.	250	Augusto Iturralde
11. Cordelería Tipo, S. A.	200	Humberto Sauma
12. Cordelería Providencia, S. A.	200	M. Cáceres B.
13. Cordelería Uxmal, S. A.	200	Chaff Jacobo
Other 25 cordage mills	1,095	
Total Consumption	<u>6,645</u>	

Source: Tomás Marentes Miranda, Notas sobre agricultura, ganadería e industrias de transformación en Yucatán, Mexico, 1951, Anexo No. 6, pp. 97-101.

During periods of peak demand and high prices, dozens of make-shift mills began production. When activity slackened, the small, marginal mills simply ceased production and waited for market conditions to improve. The ease of entry, in conjunction with the moderate degree of concentration, suggests that any significant economies of scale were exhausted at low levels of output, but that subsequently average costs were relatively constant over a large range of output. Entry into the industry was facilitated by the relative simplicity of cordage making technology and by the highly elastic local labor supply. The permanent cordage mill labor force numbered about 2,500 workers. During periods of strong demand, the labor force could be quickly augmented by using underemployed campesinos from around Mérida.

Although the most advanced machinery used for the elaboration of knotless baler twine was imported from James Mackie & Sons of England, a large part of the machinery used in the cordage industry, particularly in the smaller mills, was of local origin, built in mechanical shops in Mérida or in the repair shops of the mills themselves. "The experience gained in machine shops and foundries in the construction of defibration equipment," writes Tomassi, "was later applied to the fabrication of replacement parts and less complicated machines used by cordage mills."<sup>29</sup>

## 5. Discussion

Modern plantation economies were typically characterized by the practice of income remission among the different imported factors of production, i.e., entrepreneurship, capital, and technicians.<sup>30</sup> Yucatan, partly because of its relative autonomy in factor mobilization (except for the need to import financial capital), achieved a level of prosperity that was the envy of Mexico. It should be emphasized, that on the eve of the Mexican Revolution, the state led the nation as a whole in the share of the total labor force engaged in industry--a fact especially surprising considering that the state's population represented only a small fraction of the national population.

During Yucatan's Golden Age, the henequen zone developed into a compact region of intense economic activity. In turn, the region's burgeoning prosperity attracted immigrants whose contribution as entrepreneurs and artisans has been greatly disproportionate to their small numbers. Less than one percent of Yucatan's population, the number of foreign born residents in Yucatan numbered 2,500 in 1900, of which 1,479 were Spaniards, and 576 were classified as "Turks," i.e., persons who emigrated from Middle Eastern places under Turkish control.<sup>31</sup> The latter, particularly Christian Lebanese, played a decisive role in the development of the forwardly-linked, export-oriented cordage industry from the mid-1920s until its nationalization by the Mexican government between 1961 to 1964. Immigrants, notably Spanish mechanics, figured prominently in the creation of a backwardly-linked machine industry that served the

requirements of the large agroindustrial henequen estates. By the turn of the century, the leading machine shops and foundries had developed the capability to build defibration machines and even to improve upon their design.

Both the machine and cordage industries were characterized by non-complex, labor-intensive technology and a high degree of competition. And the absence of U. S. tariff barriers against cordage products, permitted Yucatan's penetration of North American markets for harvest twine, cables, and other henequen products. Further, the peninsula's proximity to the United States facilitated marketing operations and financing the cordage industry's working capital needs through American banks.

The convergence of these special technical and entrepreneurial factors helps explain how Yucatan could unexpectedly industrialize from its plantation base.

## NOTES

<sup>1</sup>The success of export-led growth is dependent upon the existence of "spill-over" or linkage effects from initial export activities. If the expansion of export industry A induces industry B to locate in the region or to increase its existing production for the purpose of supplying inputs to industry A, then backward linkage effects are said to emanate from industry A to industry B. A forward linkage, on the other hand, exists between industry A and industry B if the expansion of industry A's output causes industry B to expand production or locate locally for the purpose of using industry A's output as an input. Because of the weight-loss cost factor, primary processing must be located at or near the plantation. Hence, sugar mills and sisal or henequen defibration plants are typically "factories in the field." Beyond primary processing, however, linkage effects are typically weak in less-developed regions or countries. See Douglas North, "Location Theory and Regional Economic Growth," in Regional Economics, ed. David L. McKee, et al. (New York: The Free Press, 1970), pp. 26-49, and Melville Watkins, "A Staple Theory of Economic Growth," in Readings in Economic Development, ed. Walter L. Johnson and David R. Kamerschen (Cincinnati: Southwest Publishing Co., 1972), pp. 458-476.

<sup>2</sup>Albert d. Hirschman, The Strategy of Economic Development (New Haven: Yale University Press, 1958), pp. 109-110.

<sup>3</sup>Ruth C. Young, "The Plantation Economy and Industrial Development in Latin America," Economic Development and Cultural Change, Vol. 18, No. 3 (April 1, 1970), Chicago, p. 356.

<sup>4</sup>Eric R. Wolfe and Sidney W. Mintz, "Haciendas and Plantations in Middle America and the Antilles," Social and Economic Studies, 6, No. 3 (September 1957).

<sup>5</sup>Foreign interests shared in the development of some of Yucatan's public utilities. See Eric N. Baklanoff, "The Diversification Quest: A Monocrop Export Economy in Transition," in Yucatan: A World Apart, ed. by Edward H. Moseley and Edward D. Terry (University: The University of Alabama Press, 1980), pp. 208-209.

<sup>6</sup>Carolos Tappan de Arrigunada, "Trade, Development, and Structural Change: The Future of Mexico's Henequen Industry," (Ph.D. dissertation, Texas A&M University, 1971), p. 24.

<sup>7</sup>A. J. Graham Knox, "Henequen Haciendas, Maya Peones, and the Mexican Revolution Promises of 1910: Reform and Reaction in Yucatan, 1910-1940," Caribbean Studies, Vol. 17, No. 1-2 (April-July, 1977), p. 64.

<sup>8</sup> Enrique Aznar Mendoza, "La Industria Henequenera des de 1919 hasta Nuestros Dias," Enciclopedia Yucatanense, ed. Carlos A. Echanove Trujillo, Vol. 3 (Mexico, D. F.: Edición Oficial, 1946), pp. 778-80.

<sup>9</sup> The northwest quarter of Yucatan is commonly referred to as the "henequen zone" because most of the state's henequen producing lands are located there.

<sup>10</sup> Roland E. Chardon, "some Geographic Aspects of Plantation Agriculture in Yucatan," (Ph.D. Dissertation, University of Minnesota, 1961), p. 60.

<sup>11</sup> Gilbert M. Joseph and Allen Wells, "Corporate Control of a Monocrop Economy: International Harvester and Yucatan's Henequen Industry During the Porfiriato," Latin American Research Review, Vol. 17, No. 1 (1982), p. 77.

<sup>12</sup> Victor M. Suarez Molina, La Evolución Económica de Yucatán, Vol. I (Mérida: La Universidad de Yucatan, 1977), pp. 153-154.

<sup>13</sup> Nelson Reed, The Caste War of Yucatan (Stanford, Calif.: Stanford University Press, 1964), p. 232.

<sup>14</sup> Suarez Molina, La Evolución Económica I, pp. 329 and 339.

<sup>15</sup> Keith Hartman, "The Henequen Empire in Yucatan: 1870-1910," (Ph.D. dissertation, University of Iowa), 1966, p. 128.

<sup>16</sup> El Colegio de Mexico, Fuerza de Trabajo y Actividad Económica por Sectores, pp. 45-60, cited in Laura Randall, A Comparative Economic History of Latin America 1500-1914, Vol. I, Mexico (Ann Arbor, Mich.: University Microfilms Int., 1977), p. 251, Table 5-15.

<sup>17</sup> For an authoritative discussion of the issues concerning debt peonage in Yucatan, see Allan Wells, "Debt Peonage and Mechanisms of Social Control on Yucatan's Henequen Plantations during the Porfiriato," paper presented at the annual meeting of the Southeastern Council on Latin American Studies, University of Alabama, April 1981.

<sup>18</sup> Camara Zuvala, "Historia de la Industria Henequenera," Enciclopedia Yucatanense, 3:696-697.

<sup>19</sup> Talleres Macánicos y de Fundación de Mérida en el Siglo XIX," Diario de Yucatán, March 13, 1977, p. 3.

<sup>20</sup> Interview with Anna Rosa Caracashian, daughter of Don Carlos Caracashian, May 1977.

<sup>21</sup> "Talleres Mecánicos . . ."

<sup>22</sup>Tappan de Arrigunada, "Trade, Development, and Structural Change," p. 104.

<sup>23</sup>Armour Research Foundation of Illinois Institute of Technology, Technical Audit of Selected Mexican Industries with Industrial Research Recommendations (Ann Arbor: Edward Bros., 1946), p. 93.

<sup>24</sup>Humberto Carranca Tomassi, La Industrializacion del Henequen en Yucatan (Mexico, D. F.: Banco de Mexico, 1953), p. 151.

<sup>25</sup>Ibid., p. 24.

<sup>26</sup>Francisco D. Montejo Baqueiro, "La Colonia Sirio-Libanesa," Enciclopedia Yucateca (Merida, Yuc.: Ed. Oficial del Gobierno de Yucatan, 1981), pp. 463-516.

<sup>27</sup>On the economic role of the Lebanese, see Maria Caceres Menendez and Maria Loret de Mola, La Migracion Libanesa a Yucatan (Mérida: Escuela de Ciencias Antropologicas de la Universidad de Yucatan, 1977).

<sup>28</sup>Tappan de Arrigunada, "Trade, Development, and Structural Change," p. 68, Table 11.

<sup>29</sup>Carranca Tomassi, La Industrializacion, p. 59.

<sup>30</sup>Jonathan V. Levin, The Export Economies: Their Pattern of Development in Historical Perspective (Cambridge: Harvard University Press, 1960), pp. 169-171.

<sup>31</sup>Suarez Molina, La Evolucion Economica, p. 51.