

Documentos CEDE

ISSN 1657-7191 Edición electrónica

Colonial Mestizaje and its Consequences for
Human Capital and Early Twentieth Century
Regional Industrialization in Colombia

Irina Rosa España Eljaiek
Fabio Sánchez Torres

21

SEPTIEMBRE DE 2012

Serie Documentos Cede, 2012-21
ISSN 1657-7191 Edición electrónica

Septiembre de 2012

© 2012, Universidad de los Andes–Facultad de Economía–CEDE
Calle 19A No. 1 – 37 Este, Bloque W.
Bogotá, D. C., Colombia
Teléfonos: 3394949- 3394999, extensiones 2400, 2049, 3233
infocede@uniandes.edu.co
<http://economia.uniandes.edu.co>

Ediciones Uniandes
Carrera 1ª Este No. 19 – 27, edificio Aulas 6, A. A. 4976
Bogotá, D. C., Colombia
Teléfonos: 3394949- 3394999, extensión 2133, Fax: extensión 2158
infeduni@uniandes.edu.co

Edición y prensa digital:
Cadena S.A. • Bogotá
Calle 17 A N° 68 - 92
Tel: 57(4) 405 02 00 Ext. 307
Bogotá, D. C., Colombia
www.cadena.com.co

Impreso en Colombia – *Printed in Colombia*

El contenido de la presente publicación se encuentra protegido por las normas internacionales y nacionales vigentes sobre propiedad intelectual, por tanto su utilización, reproducción, comunicación pública, transformación, distribución, alquiler, préstamo público e importación, total o parcial, en todo o en parte, en formato impreso, digital o en cualquier formato conocido o por conocer, se encuentran prohibidos, y sólo serán lícitos en la medida en que se cuente con la autorización previa y expresa por escrito del autor o titular. Las limitaciones y excepciones al Derecho de Autor, sólo serán aplicables en la medida en que se den dentro de los denominados Usos Honrados (Fair use), estén previa y expresamente establecidas, no causen un grave e injustificado perjuicio a los intereses legítimos del autor o titular, y no atenten contra la normal explotación de la obra.

**Colonial Mestizaje and its Consequences for Human Capital and Early
Twentieth Century Regional Industrialization in Colombia¹**

Irina Rosa España Eljaiek

Researcher at CEDE, Department of Economics, Universidad de los Andes,
Calle 19a # 1-37 Este, Bloque W, Bogotá, D.C. Colombia.
E-mail: ir.espana41@uniandes.edu.co.

Fabio Sánchez Torres

Full Professor, Department of Economics, Universidad de los Andes, Calle 19a # 1-37
Este, Bloque W, Office W-915 Bogotá, D.C. Colombia.
E-mail: fasanche@uniandes.edu.co.

¹ We thank María Teresa Ramirez, Andrés Córdoba, Alejandro Gaviria, Miguel Urrutia, Santiago Montenegro, Samuel Jaramillo, Maria Pala Saffon, Valentina Duque and the participants of the Seminars at Universidad de los Andes and Columbia University for the useful and insightful comments.

Colonial Mestizaje and its Consequences for Human Capital and Early Twentieth Century Regional Industrialization in Colombia

Abstract

This paper quantitatively shows that the 1945 regional differences in the degree of development of manufacturing industry are explained by human capital accumulation prior to industrial development. Human capital accumulation was more intense in the regions with higher presence of non white free population – the “Free of all Colors” caste - at the end of the colonial times. Once the country began industrializing at the beginning of the twentieth century the former “Free of all Colors” regions were better prepared to adapt and to use the industrial technology and hence manufacturing industry rose with greater strength in those regions.

Key words: Industrialization, human capital, coffee, gold, foreign crises, free population.

Classification JEL: N36, N66, N96, O18, O14.

Mestizaje colonial y sus consecuencias para el capital humano y la industrialización de principios del siglo XX en Colombia

Resumen

El documento muestra cuantitativamente que las diferencias regionales en el grado de desarrollo de la industria manufacturera están explicadas por la acumulación de capital humano anterior al desarrollo industrial. La acumulación del capital humano fue más intensa en las regiones con mayor presencia de población libre no blanca –la casta de libres de todos los colores- al final del periodo colonial. Una vez el país inicia el proceso de industrialización a principios del siglo XX las antiguas regiones con mayor porcentaje de “libres de todos los colores” estuvieron mejor preparadas para adaptar y usar la tecnología industrial y por lo tanto la industria manufacturera surgió con mayor fortaleza en esos lugares.

Palabras claves: Industrialización, capital humano, café, crisis internacionales, población libre.

Clasificación JEL: N36, N66, N96, O18, O14.

Introduction

Colombian industrial development in the first half of the twentieth Century was not only a tardy process within the international context, but unequal across regions. Among the latter, Antioquia consolidated itself as an industrial epicenter during the first half of the twentieth century not only in traditional industry such as food and beverages but also in modern one such the chemicals and metallurgic. According to the 1945 Colombian manufacturing industry census Antioquia concentrated 23% of the country's total industrial capital stock and 25% of the industrial labor force followed by Bogota with 22% and 16% and by Valle with 13% and 13% respectively. The most renowned hypotheses explaining Antioquia's pattern are related to the previous existence of coffee production and gold exploitation. Authors have stated that coffee and gold economic activities prompted the accumulation of financial capital fundamental for the investment in manufacturing². Nonetheless, other regions of the country -Cauca, Chocó, Santander- which also produced coffee and gold did not undergo a similar pattern of industrial development.

This paper explores the hypothesis -without discarding the role of coffee and gold- that the differences in human capital accumulation were at the root of unequal industrial development of Colombian regions at the beginning of the twentieth century. The literacy rate in Antioquia in 1912 was 34%, while in Bogota and Valle were 23% and 13% respectively. We maintain, at the same time, that the regional disparities of human capital were a long-run consequence of the geographical differences in the caste structure of population at the end of the colonial period. Places with greater influence of *Free of all Colors* (non-white free population) generated conditions for the provision of education during the nineteenth century and were consequently better prepared for the advent of the manufacturing production -which required a more skilled labor force- during the early twentieth century. Authors such as Richard Nelson, Edmund Phelps, Joel Mokyr, Oded Galor, Sascha O Becker, Erik Hornung, Ludger Woessmann and Jan Luiten Van Zanden, consider human capital as a key factor for industrial development as it facilitates the connection between theoretical and applied knowledge and the adaptation and diffusion of new technologies³.

The present paper uses information for 772 Colombian municipalities extracted from different sources including population censuses and the manufacturing census of 1945. In fact, the results show a positive correlation between the indicators of 1912 and 1938 human capital and different

² Botero, *La Industrialización en Antioquia*; Bejarano, *El Despegue Cafetero*; Brew, *El Desarrollo Económico De Antioquia*; and Montenegro, *El Arduo Tránsito Hacia la Modernidad* -among others.

³ Nelson and Phelps, "Investment in Humans"; Joel Mokyr, *The British Industrial Revolution*; Galor, *From Stagnation to Growth*; Becker, Hornung, Woessmann, "Education and Cath-Up"; and Van Zanden, *The Long Road to the Industrial Revolution*.

indicators of 1945 industrial development including per capita industrial capital stock and the proportion of workers employed in manufacturing.

However, there are evident endogeneity concerns between industrial development and human capital accumulation. For instance, the industrialists may have promoted the provision of education, as they needed more skilled workers. Thus, it was necessary to recur to the instrumental variable technique-IV. We maintain that the “Free of all Colors” population at the end of the colonial period, having capacity of self-determination and agency, created political and social structures that induced a greater provision of education and hence favored a relatively higher accumulation of human capital. Hence, regions with relatively more influence of “Free of all Colors” population were better prepared to host the industrial development of the early twentieth century. In this regard, the late eighteenth century proportion of “Free of all Colors” is not only a plausible explanatory factor of the regional differences in educational indicators, but may also be used as an instrumental variable of early twentieth century indicators of human capital.

This paper is divided into 6 sections. The first is this introduction; the second briefly reviews the literature relevant for our approach and presents the explanations for the rise and consolidation of the manufacturing industry related to our approach. The third section succinctly describes stages of the country’s industrial development and reviews hypotheses on Colombian industrialization –coffee and gold production- pinpointing their likely deficiencies. Section four examines the role of “Free of all Colors” population for the regional accumulation of human capital and role of the latter for industrialization. Section five describes the quantitative strategy and explains the econometric results. Section six concludes.

Related Literature

The modern manufacturing industry was born in Western Europe radically transforming the behavior of households and the development of science and technology⁴. The North Sea region and England in particular industrialized earlier than the rest of Europe as the inventions and the new technologies of the eighteenth and nineteenth centuries spread across all manufacturing sectors. Some economic historians assert that the conditions required for the rise of the manufacturing industry go beyond the generation of inventions⁵. According to Joel Mokyr what made England an exceptional territory for manufacturing, was the adaptation of inventions -either local or foreign – induced by the practical scientific knowledge that British workers possessed⁶.

⁴ Mokyr, *The British Industrial Revolution*.

⁵ Ibid; Van Zanden, *The Long Road to the Industrial Revolution*; and Crafts, “The First Industrial Revolution”

⁶ Mokyr, *The British Industrial Revolution*

Jan Luiten Van Zanden and Nicholas Crafts claim that the British industrial development did not depend on new inventions as much as it did on human capital accumulation⁷ -which made easier the absorption and implementation of new technologies-. In the same direction E. G. West establishes that the existence of threshold of literate population was a key condition of the Industrial Revolution while Oded Galor stresses the importance of human capital during 1830-1900 precisely in the second phase of Industrial Revolution⁸. Becker, Hornung and Woessmann examine for Prussia the effect of enrollment and literacy rates on regional industrial employment and find -using information from 334 Prussian regions- that the places that exhibited higher-levels of human capital during the eighteenth century experienced a deeper industrialization process during the nineteenth century⁹.

However, accumulation of human capital could have not taken place without stronger individual freedoms as emphasized by Douglass North, Robert Fogel, S.R. Epstein, David Meyer, and Van Zanden¹⁰. According to Epstein, England and Holland enjoyed political regimes that favored individual liberties and property rights and achieved higher levels of economic development than Spain or France with less individual liberties. In the same direction, Van Zanden argues that the increase of individual freedoms originated in the transformation of family patterns during the late European Middle Ages prompted changes in the labor and capital markets, which were key in the long term economic development¹¹. North, Fogel and Meyer argue -for the case of the South of the United States- that slavery brought about low levels of human capital and lower demand for manufactured goods and limited the long run human and economic progress of the blacks.. Daron Acemoglu, Simon Johnson, and James Robinson maintain that in regions with weak property rights and high concentrations of the political and economic power -and *de facto* with low voice and freedom for the majority- relatively less education was provided and hence were ill-prepared to absorb the nineteenth century industrial technologies¹². With the

⁷ Van Zanden, *The Long Road to the Industrial Revolution*; and Nicholas Crafts, "The First Industrial Revolution". For Van Zanden this accumulation of human capital in Europe occurred thanks to the adequate institutional conditions developed in a long-term process that started in the 11th and 12th centuries.

⁸ E. G. West, "Literacy and the Industrial Revolution" and Galor, "From Stagnation to Growth"

⁹ Becker, Hornung, Woessmann "Education and Catch-Up"

¹⁰ North, . *The Economic Growth of the United States, 1790-1860*; Fogel, . *Time on the Cross : the Economics of American Negro Slavery*; S.R. Epstein, *Freedom and Growth*; Meyer, David R. *The Roots of American Industrialization*; Van Zanden, *The Long Road to the Industrial Revolution*.

¹¹ The changes in family patterns were the bases for the decline of the parental authority over the decisions of individuals, ie, greater enjoyment of individual freedoms for decision-making. During the late Middle Ages "balance of power" between parents and children, men and women was radically transformed, a situation that encouraged labor force participation, the need to accumulate human capital and the increase of income inter temporal transfers. Weak family ties increased the need for people to secure their lives and future. Thus, strong institutions to regulate property rights, financial and labor markets were created favoring long-term development (see Van Zanden, *The Long Road to the Industrial Revolution*).

¹² Acemoglu, Johnson, and Robinson, "Reversal of Fortune"

same perspective Galor argues that in places where the landed elites are powerful the provision of education is low as those elites do not benefit from a more educated labor force¹³.

This paper combines the two types of literatures mentioned above. On the one hand, it stresses the importance of human capital for the rise of the manufacturing industry and, on the other; it claims that the threshold of human capital stock that facilitated the adaptation and absorption of the industrial technology was first achieved in those regions whose populations enjoyed higher individual freedoms.

The Onset of the Colombian Manufacturing Industry

Stages of the industrial production

Modern Colombian industry emerged in the twentieth century -after a significant part of Latin America was already industrialized- and concentrated itself in the western region¹⁴. The colonial “*Obraje*” system, mainly devoted to the production of low-cost textiles¹⁵ was marginal in Colombia compared to countries like Mexico and Peru. The system used was instead “putting out industry” which localized in the country’s eastern region and in the southern Province of Pasto, which was intense in female labor who worked at home producing handcrafted textiles and hats.

In the nineteenth Century most manufacturing production took place in the largest urban centers and specialized in low complex goods such as beverages, rustic textiles, candles, soap and tiles¹⁶. For Salomón Kalmanovitz the nineteenth century Andean region was more suitable for manufacturing industry since most of the population was free and homogeneous, thus facilitating the emergence of wage earning workers and of capitalist entrepreneurs¹⁷.

Nonetheless the nineteenth century attempts of industrialization were with few exceptions just simply failed attempts¹⁸. Jesús Antonio Bejarano pinpoints that such failure may have obeyed among other factors to deficient government policies, underdeveloped transportation systems,

¹³ Galor, “*From Stagnation to Growth*”.

¹⁴ Around 1915, Antioquia concentrated 70% of the manufacturing investment and 52% of the textile industry (Bell, quoted by Bejarano in “*El Despegue Cafetero*”).

¹⁵ Gomez-Galvarriato, “*Premoder Manufacturing*”.

¹⁶ In Bogotá, for instance, a cotton-weaving factory was established in 1836 and in 1852 a wool weaving factory. Nevertheless, due to the competition of English manufactures with better quality and lower prices in addition to the difficult access to raw materials such as cotton and to the low market potential made these experiences of the first half of the nineteenth century unsuccessful (Montenegro, *El Arduo Tránsito hacia la Modernidad*).

¹⁷ Kalmanovitz, “*Los Origenes de la Industrialización en Colombia: 1890-1929*”.

¹⁸ For example, Bavaria, a brewery founded in 1889. See Kalmanovitz, “*Los Origenes de la Industrialización en Colombia: 1890-1929*” and Montenegro, *El Arduo Tránsito hacia la Modernidad*.

unavailability of energy sources, lack of credit markets and “social limitations” namely the inability of workers to receive instructions, to follow procedures and to administer processes¹⁹. Some of these factors may have changed over time since most of the industries established in the first two decades of the twentieth century were able to survive and became some of the largest companies of the country²⁰. At last industrial growth flourished between the 1930s and the 1950s yet concentrated in a few regions of the country particularly in Antioquia, Bogotá, Atlántico and Valle²¹.

As in the rest of Latin America, scholars have explained the rise of modern Colombian industry as a consequence of events such as the Great Depression and World War II and active tariff policies which stimulated the industrial production for the local markets²². Nonetheless, external shocks and tariffs may help to explain the industrialization of a country but they cannot explain the differences in industrialization within a country.

The role of Coffee and Gold in Industrialization

Scholarly research has attempted to establish why the Antioquia’s manufacturing industry during the first half of the twentieth century was stronger and relatively more diversified than in the rest of the country. Coffee production, of utmost importance for western Colombia, has been the hypothesis most recurred to explain the onset of Colombian industry. Production and coffee trade prompted the accumulation of sizably financial capital at the end of the nineteenth and the start of the twentieth centuries and allowed wealthy traders and exporters to become prosperous industrialists. In addition, for Mariano Arango the coffee business helped to give birth to the urban population that later would become the industrial proletariat²³. For Santiago Montenegro and Roger Brew, the expansion of coffee production promoted the accumulation of capital, enhanced the country’s import capacity, strengthened the public finances and enlarged the domestic market for industrial goods²⁴.

For other authors the democratic structure of Antioquia’s coffee landholding favored the rise of the industry by creating a rural middle-class that multiplied the demand for industrial goods²⁵. Adolfo Meisel states nonetheless that the development of the coffee economy was not beneficial

¹⁹ Bejarano, *Historia Económica y Desarrollo*.

²⁰ Fabricato, Coltejer, in textiles, Coltabaco in cigarettes, Postobón in beverages, Fosforera de Colombia in matches, and Cementos Samper in cement. Bejarano, “*El Despegue Cafetero 1900-1928*.”

²¹ See Chu, “*The Great Depression and Industrialization in Colombia*.” And Echavarría, “*El Proceso Colombiano de Desindustrialización*.”

²² Fitzgerald, “*La CEPAL y la Teoría de la Industrialización por medio de la Sustitución de Importaciones*.”

²³ Arango, *Café e Industria*.

²⁴ Montenegro, *El Arduo Tránsito hacia la Modernidad* and Brew, *El Desarrollo Económico de Antioquia*.

²⁵ Urrutia, *Cincuenta Años de Desarrollo Económico Colombiano*; Parson, *La Colonización antioqueña en el occidente de Colombia* and Brew, *El Desarrollo Económico de Antioquia*.

for the industrial development of the country as a whole due to political economy reasons. In fact, the politically powerful of the coffee growers pressured the Central Government to invest in ports and roads in the Andean Region, which adversely affected the Caribbean Region²⁶.

The industrial development of the western region has also been related to the rise of an entrepreneurial class that transformed itself from gold producers and traders into coffee exporters and importers of manufactured goods and then finally into industrial capitalists²⁷. Production and trade of gold would be the catalyzing factor of Antioquia's economic activity, triggering capital accumulation, trade expansion, technological change of mining²⁸ and the development of credit activities all of them necessary conditions for the consolidation of the manufacturing industry at the beginning of the twentieth century. Medellín –Antioquia's capital city- became the center of gold trade and of the distribution of imported merchandise²⁹.

Can the Production of Coffee and Gold explain Regional Industrialization?

Although Antioquia had significant productions of gold and coffee, these items were also produced in other regions of the country where the manufacturing industry did not flourish -not even in the late twentieth century. For instance, in the nineteenth century, Chocó and Cauca were also strong gold producing regions and yet only Antioquia's gold merchants became traders and -afterwards- industrialists. Gold was a product for the foreign markets in the nineteenth century, which fomented the accumulation of capital, but it did not seem to trigger an industrial takeoff in all the regions it was produced.

As for coffee, Montenegro argues that it was only after it became a product for the foreign markets in the early twentieth century, that a transition into a modern manufacturing industry was possible -as coffee export revenues enabled the accumulation of foreign currency and increased import capacity³⁰. Nevertheless coffee also had a robust expansion in Santander -eastern Colombia- and

²⁶ Meisel Roca, “¿Por qué perdió la Costa Caribe el siglo XX?”; Meisel Roca, “¿Por qué se disipó el dinamismo industrial de Barranquilla?”, Meisel Roca, “Bancos y Banqueros de Barranquilla 1873-1925.”; Meisel Roca, “La fábrica de tejidos Obregon de Barranquilla 1910-1957”

²⁷ Botero, *La Industrialización en Antioquia*; Bejarano, *El Despegue Cafetero*; Brew, *El Desarrollo Económico de Antioquia*

²⁸ As mining required more complex processes and the implementation of new technologies specialized educational institutions such as the School of Arts and Occupations in 1864 and the National School of Mines (*Escuela Nacional de Minas*) in 1879 were founded in Medellín. It was complemented with; the arrival of foreign technicians and engineers (Kalmanovitz, “*Los Orígenes de la Industrialización en Colombia: 1890-1929.*” and Botero, *La ruta del oro Una Economía primaria exportadora.*

²⁹ Botero, *La ruta del oro Una Economía primaria exportadora.* For Brew Antioquia's mining began to be more democratic since the eighteenth century after a contraction of the number of slaves took place. That phenomenon provoked the insertion of other segments of the population in economic activities namely the non white free. Brew, *El Desarrollo Económico de Antioquia.*

³⁰ Montenegro, *El Arduo Tránsito hacia la Modernidad.*

yet this region did not build the economic and political structures required to transfer the benefits derived from coffee growing to the manufacturing industry. For Miguel Urrutia, James Parson and Brew the more equalitarian landholding structure developed in Antioquia stimulated parcel coffee production, which favored the creation of a market for industrial goods. In Santander, in contrast, the prevalent renting and sharecropping systems used in coffee production did not promote the formation of potential markets for manufacturing products³¹. However, the discussion on the role of gold and coffee for regional industrialization brings up a different and perhaps more fundamental questions that we intend to address in the present paper: Why were there more egalitarian production structures in some regions than in others? How did these emerge in certain regions affecting their long-term economic development?

According to Van Zanden, Acemoglu and Johnson and Robinson industrialization required the adaptation and usage of new technologies and a vast participation of the population in invention³². So as to perform those activities Western Europe counted in the late eighteenth century with specialized human capital namely literate apprentices trained in reading and calculations³³. Thus, the long run accumulation of human capital prior to the industrial revolution paved the way for the modern economic growth of the eighteenth and nineteenth centuries. Likewise, the Colombian industrial development should have required preconditions that surely involved aspects prior to the situation of the twentieth century. We claim that industrial development occurred in the regions with relatively higher stock of human capital as it was essential to introduce, to adapt and to utilize the industrial technologies. Western Colombia achieved higher educational attainment as well as greater industrialization indicators in the early the twentieth century³⁴. Thus, the link between the two variables is apparent. The obvious question is then: Why Western Colombia was able to accumulate higher levels of human capital prior to industrialization? What economic and political factors made possible such accumulation?

“Free of all Colors”, Human Capital and Industrialization in Colombia

The widespread accumulation of human capital is a long run process that entails the provision of education not only for small elites but for a wider segment of the population. Increasing the provision of education requires obviously a greater demand for this public good but also the allocation of taxes for schools and teachers. The latter is possible when the local communities

³¹ Urrutia, *Cincuenta Años de Desarrollo Económico Colombiano*; Parson, *La Colonización antioqueña en el occidente de Colombiano* and Brew, *El Desarrollo Económico de Antioquia*.

³² Van Zanden, *The Long Road to the Industrial Revolution*; Acemoglu, Johnson, and Robinson, “*Institutions as the Fundamental Cause of Long-run Growth*”.

³³ Van Zanden, *The Long Road to the Industrial Revolution*.

³⁴ Echavarría in *Crisis e Industrialización* asserts that as of the second half of the 1930s it was required to know how to read and write to be hired by an Antioquian manufacturing company.

are willing to tax themselves to provide education or when those communities have enough voice and political power to pressure some other agent –for instance the Central government –to provide financial resources destined to education. We argue that Colombia experienced since the end of the colonial period through the nineteenth century the rise and consolidation of new and influential social groups that reduced the economic and political power of the traditional white Spanish descendant landed class. These new groups slowly broke the political balance of the colonial period and consolidated as modern elites in the places they settled. These new elites had weaker ties to the colonial institutions such as the *Encomienda*, the *Hacienda* and Slavery and rather built market oriented institutions and enjoyed the provision of growth enhancing public goods –such as education-. The emergence of these new elites was the combined result of the colonial “mestizaje” and reaction to the regulations and barriers that Spanish crown imposed the mestizos.

At the beginning of Colonial period the population was divided into frees –the white Spaniards- and not free –slaves and indigenous population. The mixing process – *mestizaje*- of the Spanish with the indigenous population and slaves led to the emergence of new groups of free population. As white descendants yet with “*stain of blood*” (*mancha de sangre*) they were neither legally tied to a landlord nor had the obligation to serve him³⁵. However and despite their free condition, they lacked of social status, suffered discrimination and were excluded from the high rank posts of the government or army. This group of mixed races was classified in the Spanish caste system as “Free of all Colors” (*libre de todos los colores*). At the end of the Colonial period –circa 1800- the “Free of all Colors” comprised around 50% of the population and yet in Antioquia or Atlántico that percentage was close 75%. In place such as Cauca, Nariño or Cundinamarca that had at the beginning of the Colonial period a numerous indigenous population the percentage of “Free of all Colors” circa 1800 was less than 35%.

“Free of all Colors” is then a category used at the end of the Colonial period to name *mestizos* (Indian-white half -breeds) natives, *mulatos* (black-white half-breeds), *zambos* (black-indian half-breeds) or tanned and blacks who achieved freedom by “forbidden half-breeds, illegitimate migrations and/or banishments”³⁶ or by purchase or a slave master’s voluntary concession of freedom³⁷. They were free because their actions such as geographic displacement or economic initiatives did not depend on a third-party called owner, chief or lord but on the individual’s initiative.

³⁵ Meisel Roca, “*Esclavitud, mestizaje y haciendas en la provincia de cartagena*”.

³⁶ Garrido, “*Libres de todos los colores en la Nueva Granda*” p. 249

³⁷ Tovar, Tovar and Tovar, *Convocatoria al Poder del Número. Censos y Estadísticas de la Nueva Granada, 1750-1830*.

The “Free of all Colors” became artisans, merchants, settlers at the frontier and generators of wealth. This social group was important in long-term development as they slowly broke the colonial political balance founded on coercive labor institutions such as the “*Encomienda*”, the *Hacienda* and slavery. Several historians note that those “Free of all Colors” had a relative independence from the colonial *Haciendas* and rather obtained their own land by settling the agricultural frontier and occupying the territory in sets of interconnected plots (*parcelas*) in places with scarce presence of indigenous population or slaves³⁸. In this regard, the institutions that emerged in places with relatively high presence of “Free of all Colors” were somehow different of the institutions of the early colonial times. “Free of all colors” competed with the traditional white elite in towns and cities with both types of “castes” and became the dominant group in the new land settlements. As they sought social status³⁹, political influence and economic power they

attempted to obtain seats in public office, to hold political positions and to engage in commercial activities⁴⁰. Thus, the regions occupied by “Free of all Colors” population were relatively more homogeneous, and had more provision of public goods such as education, and therefore would exhibit in the long run greater accumulation of human capital⁴¹.

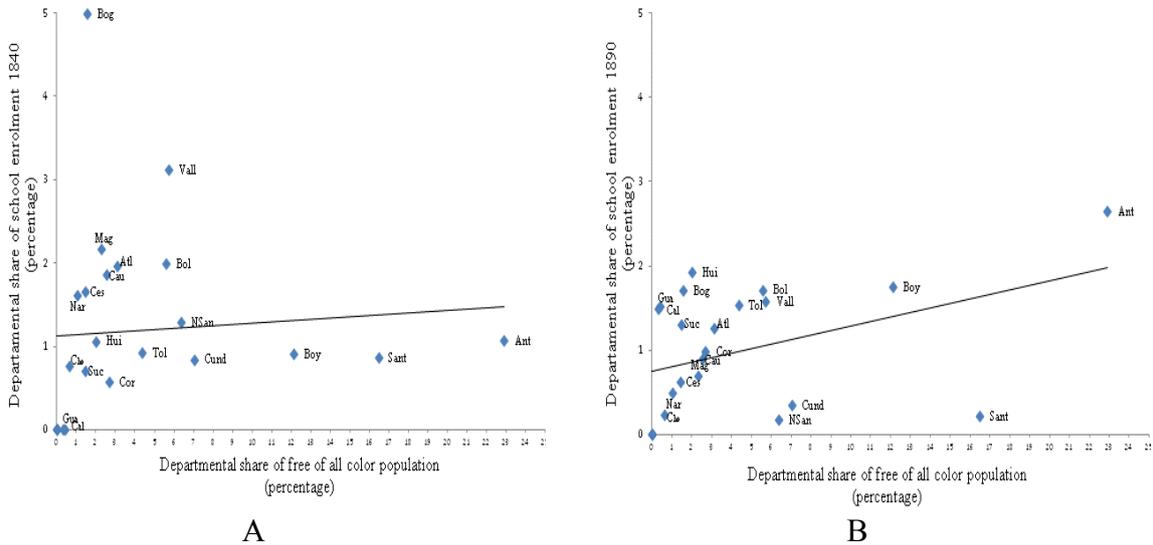
³⁸ See Meisel Roca, “*Esclavitud, mestizaje y haciendas en la provincia de cartagena*”; Herrera, *La Construcción de la cultura política en Colombia* and Mejía Prado, *Campesinos, Poblamiento y Conflicto*.

³⁹ Garrido argues that the desire of recognition of the free population led them to undertake actions in favor of “the valuation of their honor”; loyalty, recognition of their moral qualities, honesty etc. Garrido, “*Libres de todos los colores en la Nueva Granda*”.

⁴⁰ Some the Bourbon Reforms, such as the recognition of the military rank of free individuals, indirectly improves the democratization of society. Additionally, after the Independence, “caste” categories were eliminated and “a formal recognition of citizenship to all free men and women, including the Indians, but not slaves was made” (Ibid, p 264)

⁴¹ Colombia exhibited two trends in relation to the “Free of all Colors”. In the Colombian Caribbean part of the non white free population was bound to servitude by the traditional elites through control of the land, violence and the concentration of the population. This pattern curtailed social mobility and curbed the provision of public goods. On the other hand, in Antioquia and Valle del Cauca, in the west of the country, the free population “eroded the existing social barriers by offering the *mestizos* and poor whites, opportunities to link economic activity with social mobility” (López cited in Meisel Roca, “*Esclavitud, mestizaje y haciendas en la provincia de cartagena*”.

Figure 1. 1840 and 1890 School Enrolment Rates and 1800 “Free of all Colors” as share of total



Source: Tovar, Tovar and Tovar, *Convocatoria al Poder del Número. Censos y Estadísticas de la Nueva Granada, 1750-1830*. Archivo General de la Nación, *Miscelánea (República)*. Tomo 303 f 771R-771V; Tomo 305: f 971R-971V; Tomo 313: f 322R-322V.

Figure 1 that shows the relationship between the participation of the “Free of all Colors” of a particular department in the total “Free of all Colors” of the country circa 1800 and the proportion of the population enrolled in the school for 1840 and 1890. It is observed that the (today’s) departments with the highest enrollment rates in 1840 (Figure 1A) –around 20 years after Independence- were Bogota, Cundinamarca, Valle, some of the Caribbean coast such as Magdalena, Bolivar and Atlántico and Cauca and Nariño in the south of the country. Bogota was the capital of the Viceroyalty of New Granada and hence the provision of public goods such as education might have been greater than in other regions. Besides (today’s) departments such as Bolivar, Cundinamarca, Magdalena, Cauca, Nariño were important centers of the economic and political power during the colonial times and might have had a relatively higher provision of education which persisted some decades after Independence. In these departments there was a relatively large presence of indians and slaves populations as well as stronger incidence of Colonial institutions such as *Encomienda*, *Resguardos* (Indian reservations) and slavery.

Figure 1B depicts for 1890 a totally different picture. It is clearly observed that (today’s) Antioquia with the highest percentage of “Free of all Colors” in 1800 exhibited the highest enrollment rates in 1890. In fact, Antioquia’s school enrolment rate jumped from 1% to 2.6% between 1840 and 1890 while the regions with the stronger presence of indians and slaves during the colonial times –Bolivar, Cauca and Nariño- and relatively lower “Free of all Colors” population seemed to experience declines in their school enrollment rates during the second half of the nineteenth

century. Thus, as argued above the institutions that the “Free of all Colors” built at the end in the colonial period in the places they located may have fostered the provision of education during the decades that followed Independence during the nineteenth century and during the early twentieth. In this regard, these regions counted with a more literate labor force and were in consequence better prepared for manufacturing production.

Industrialization required of innovative ideas in an institutional environment that allows adapting them⁴². In Colombia, the industrial innovations, just like in the rest of Latin America, were imported, and hence the industrial development more than depending on new technological inventions would rely on how they were adapted. So as to succeed in technology adaptation it was essential the existence of relative high levels of human capital⁴³. Nonetheless, according María Teresa Ramírez and Irene Salazar Colombian human capital accumulation during the nineteenth and early twentieth centuries was scarce, weak, uneven across regions and lagged behind of most Latin-American countries due among other factors to inequality, poverty, civil wars, geography and the close State-Church relations⁴⁴. Antioquia exhibited however high indicators of education in the early twentieth century despite it suffered as the rest of the county civil conflicts in the nineteenth century and had a strong social participation of the Catholic Church besides been located in a mountainous geographic zone.

Figure 2 shows the literacy rates of 1912 and 1938 and departmental industrial employment as proportion of the national one for 1916 and 1945 respectively indicating the existence of a positive correlation between these two variables (0.73 for panel A and 0.61 for panel B).

One can observed that Bogotá and Antioquia concentrated the majority of the manufacturing employment and had together around 50% of the industrial employment in 1916. In Antioquia the percentage of literate population in 1912 was 34.6% the highest in the country followed by Bogotá with 23.3%. The departments without a significant share of manufacturing industry –Bolívar, Tolima, Huila, Guajira, and Chocó- had the lowest literacy rates. In 1938, Antioquia (53.5%), Caldas (54.3%) and Valle (53.2%) ranked at the top of literacy rates while Antioquia, Bogotá and Valle exhibited in 1945 the largest the share of industrial employment with 25.6%, 16.1% and 13.3% respectively. It is noticeable that the department of Valle del Cauca with tiny share of industrial employment in 1916 emerged as one of the country’s industrial centers. As for other regions Atlántico’s share of industrial employment in dropped from 11.1 % in 1916 to 10.6%

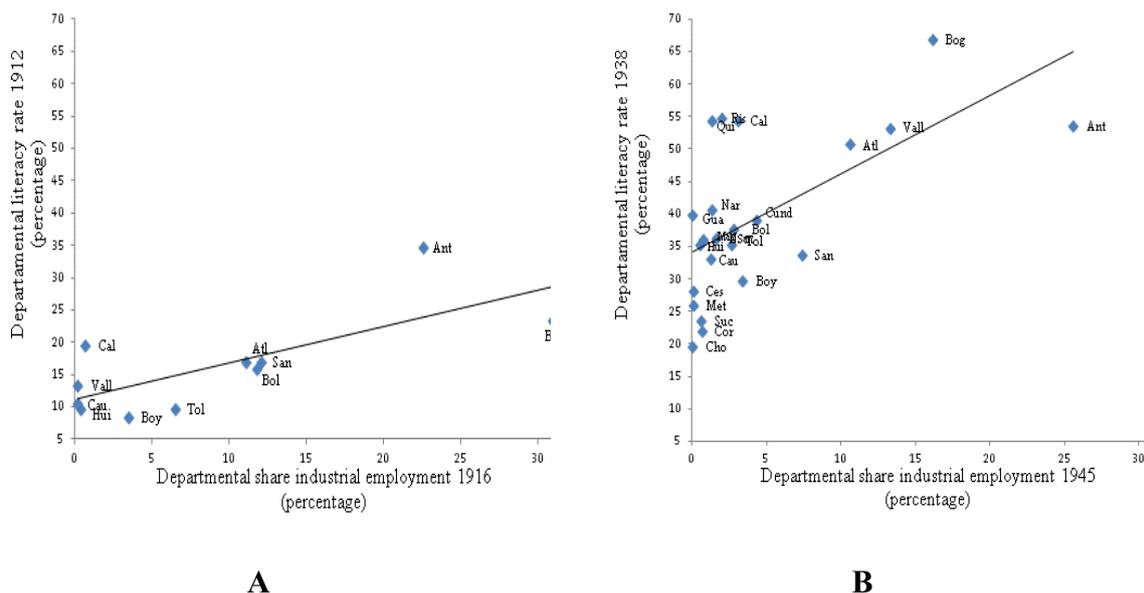
⁴² Acemoglu, Johnson, and Robinson. “*Institutions as the Fundamental Cause of Long-run Growth*”; Acemoglu, and Robinson, “*Economic Backwardness in Political Perspective*.”

⁴³ Engerman, and Sokoloff, “*Dotación de Factores, Instituciones y Vías de Crecimiento diferentes entre las Economías del Nuevo Mundo*”.

⁴⁴ Ramírez and Salazar, “*Surgimiento de la Educación en Colombia*”.

in 1945 while Bolívar's plummeted from 11.8% in 1916 to 2.8% in 1945. Thus, greater literacy rates were associated both in 1912 and 1938 with higher departmental participation in industrial employment in 1916 and 1945 respectively.

Figure 2. Literacy rates and Industrial Employment as share of the total



Source: *Memorias de Hacienda de 1916, (Finance Report for 1916), 1945 Censo Industrial (Industrial Census), Censos de Población 1912 and 1938 (Population Census for 1912 and 1938)*. For the data see appendix.

The historical research has revealed that Antioquia's textile companies during the 1930s required spinning and weaving workers capable of reading and writing⁴⁵. In fact, those companies invested in innovative technologies to improve spinning, weaving, printing and mercerization so as to avoid being displaced by imported textiles of considerably better-quality. The adoption

of new technologies as found by Montenegro entailed the existence of labor force with some education⁴⁶.

Econometric Model

The Model and the Instrumental Variable

In this section we intend to test the hypothesis that the early Colombian regional industrial development depended upon human capital as it facilitated the adaption and usage of the

⁴⁵ Echavarría, *Crisis e Industrialización*.

⁴⁶ Montenegro, *El arduo Tránsito hacia la Modernidad*.

manufacturing technology. Although we do not discard the traditional hypotheses on the role of coffee or gold we argue that these factors influenced at much lesser extend the regional rise of the manufacturing industry. So as to test the hypothesis we will estimate several econometric models having as dependent variables measures of industrial development for 772 municipalities extracted from the 1945 Colombian first industrial census and from other primary and secondary sources (see appendix). The econometric model to be estimated is the following:

$$IND-DEV_i = \beta_0 + \beta_1*Human-K_i + \beta_2*Coffee_i + \beta_3*Coffee_i*Frontier_i + \beta_4*Gold_i + \beta_5*Dist-Markets_i + \beta_6*Population-1870_i + \beta_7*Geography_i + \varepsilon_i (1)$$

Where $IND-DEV_i$ is a variable that measures the industrial development in municipality i and stands either for the per capita manufacturing industry capital stock⁴⁷ or the participation of industrial employment in the total labor force- in 1945. $Human-K_i$ is defined as the percentage of the population reported as being able to read in either 1912 or 1938. $Coffee_i$ is the number of coffee trees in 1925. By 1925 the coffee production was already consolidated in western Colombia and was capable of generating as stated by Bejarano the economic and social conditions for the rise of industry namely capacity to import industrial machinery and domestic markets for industrial goods⁴⁸. In the specification of the model is interacted coffee production with a dummy variable that specifies whether the municipality belonged to the agricultural frontier $Frontier_i$ and hence experienced between 1893 and 1925 titling of public lands as shown by Fabio Sanchez, Pilar Lopez-Urbe and Antonella Fazio⁴⁹. $Gold_i$ is a dummy variable which takes the value of 1 if there was gold production in municipality i in the nineteenth century and zero if not. $Dis-Markets_i$ is the weighted distance from municipality i to the main urban markets⁵⁰. This variable measures the economies of agglomeration and it is expected to positively impact industrial development⁵¹. $Geography_i$ represents variables as rain precipitation and temperature and controls for the effects that these may have on industrial development. $Pob-1870$ is the population of each municipality according to the 1870 Census. This variable measures market potential before early twentieth century industrialization.

⁴⁷ The total capital of manufacturing establishments includes capital in pesos plus fixed assets.

⁴⁸ Bejarano, "El Despegue Cafetero".

⁴⁹ Sanchez, Lopez-Urbe, and Fazio, "Land Conflicts, Property Rights, and the Rise of the Export Economy in Colombia, 1850-1925 during 1890-1930". Coffee production evolved from the hacienda to a parcel system. Such transformation occurred in the regions where expansion of the agricultural frontier took place particularly in the western part of the country. Authors such as Urrutia, Parson, Arango and Bejarano argue that parcel production was fundamental for coffee expansion and had important consequences for industrial development. See Urrutia, *Cincuenta Años de Desarrollo Económico Colombiano*; Parson, *La Colonización antioqueña en el occidente de Colombia*; Arango, *Café e Industria en Colombia* and Bejarano, "El Despegue Cafetero 1900-1928."

⁵⁰ The distance of each municipality to the cities of Bogotá, Barranquilla, Cali y Medellín is weighted by the 1912 population of these cities.

⁵¹ Economies of agglomeration refers to the advantages of being close to large markets that reduce transaction and search costs which improves the efficiency of the economic activity.

Since human capital may also be consequence of industrialization, the coefficient β_7 can be biased. Additionally, the direction of the bias is not clear *a priori*. On one hand, industrial activity itself may encourage an increase in human capital to meet the needs of a more skilled workforce. Similarly prosperity prompted by industrial activity can increase the demand for education and hence the stock of human capital. On the other hand, if the industry requires personnel with low qualifications, it would prevent investment in human capital. This can occur according to Becker, Hornung and Woessmann in the early stages of industrialization⁵². For research purposes it is then necessary to find an instrumental variable associated with human capital but not with 1945 industrial capital or industrial employment. As stated above the regions with higher presence of “Free of all Colors” at the end of the colonial period accumulated more human capital during the nineteenth century, had higher literacy indicators at the beginning of the early twentieth century and hence were better suited to adapt and use the modern industrial technology. In this regard, the presence of “Free of all Colors” at the end of the Colonial period should explain industrial development only through human capital and in consequence is a valid instrument. Others factors that the presence of “Free of all Colors” population may have brought about – larger markets, economies of agglomeration- are already controlled for in equation (1).

However, to consider not only the “Free of all Colors” population of each municipality circa 1800, but additionally to take into account their expansion to the neighboring ones we use a spatial distance weight matrix W ⁵³. The cells of matrix W (772x772) contains the inverse standardized distances of each municipality i to the rest of j municipalities (where the distance from i to i is equal to zero). Once matrix W is constructed it is multiplied by the vector of the proportion of the “Free of all Colors” population in the municipality circa 1800 obtaining the vector $W_{free} = W_{ij} * (\%free\ of\ all\ colors\ -\ circa\ 1800\ in\ i)$. This vector measures the degree of influence of this group in municipality i on the remaining ones (see appendix 2 and Rubiana Chamarbagwala for the details of the calculations)⁵⁴. Subsequently, we add to the vector W_{free} the percentage of local “Free of all Colors” population to get an indicator of the total influence of this caste in each municipality i . Thus, the instrument can be expressed as:

$$Influence-Free-1800_i = \%free\ of\ all\ colors-circa\ 1800_i + W_{free} \quad (2)$$

⁵² Becker, Hornung, Woessmann, “*Education and Cath-Up*”

⁵³ This spatial distance matrix takes the inverse of the relative distances of the i -th municipality to the $n-1$ remaining municipalities.

⁵⁴ Chamarbagwala, “*Social Interactions, Spatial Dependence, and Children’s Activities: Evidence From India.*”

The first stage regression will be then as follows:

$$Human-K_i = \sigma_0 + \sigma_1 * Influence-Free-1800_i + \sigma_2 * Coffee_i + \sigma_3 * Coffee_i * Frontier_i + \sigma_4 * Gold_i + \sigma_5 * Dist-Markets_i + \sigma_6 * Population-1870_i + \sigma_7 * Geography_i + \mu_i \quad (3)$$

It is expected that σ_7 will be positive which would indicate that the municipalities with higher influence of “Free of all Colors” at the end of eighteenth century experienced a greater accumulation of human capital and had, in consequence, higher indicators of literacy rate at the onset of the twentieth century.

Model's Results

Table 1 displays the estimations of the regressions using OLS and IV. The first column present the descriptive statistics of the variables used in the models. In panel A, the dependent variable corresponds to the per capita manufacturing capital stock of each municipality in 1945. The OLS model in column 2- suggests that there exists a positive relationship between human capital –measured as the percentage of population that read in 1912 - and the 1945 per capita manufacturing capital. The variables coffee and coffee interacted with agricultural frontier have as well a positive correlation which may confirm the traditional hypothesis on the importance of coffee for the regional rise of manufacturing industry. The presence of gold is not significantly correlated with industrial capital. As expected the potential markets –measured with the 1870 population – are positively correlated with the indicator of industrial development. Distance to the main urban markets is –as anticipated - negatively correlated industrial development confirming the key role played by the economies of agglomeration for industrial development.

Columns (3) and (4) display the first and second stage of the instrumental variable model for 1945 per capita industrial capital. The first stage reveals that the instrument is valid and highly correlated with the endogenous variable. Thus, the presence of “Free of all Colors” in the municipality and in the neighboring ones is positive and significantly correlated with the 1912 municipal literacy rates. Cragg Donald Wald F-statistics of the first stage equals 86.4 well above 16.3 -the Stock-Yogo weak ID test critical values at 10% maximal IV size. The rest the variables of the first stage equation have the expected signs. The results of the second stage confirm the positive relation between human capital -the 1912 literacy rate- and the indicator of municipal industrialization - measured by the manufacturing capital per capita. It is noticeable that the coefficients of the OLS and IV models are quite similar suggesting that the endogeneity or

omitted variable biases of the OLS estimation are negligible. In fact, the endogeneity test implies that the null hypothesis that the difference between the OLS and IV coefficients is equal to zero cannot be rejected. Now, we will examine in some detail the IV estimations. The results imply that an increase of one standard deviation of the 1912 literacy rate would increase 1945 per capita industrial capital in 0.21 standard deviations $((11.67 \cdot 0.1) / 5.49)$.

Table 1. Models for 1945 Per Capita Industrial Capital

Variables	Descriptive statistics	(A) Municipal per capita capital 1945 (in Log)			(B) Municipal per capita capital in modern industry	
		OLS	Stage I	Stage II	OLS	Stage II
Per capita manufacturing industry capital stock (log) (IND-DEV _i)	1.68 (5.49)					
Per capita manufacturing industry capital stock (log) (IND-DEV _i modern)	0.41 (4.49)					
Human Capital (Human-K _i)	0.15 (0.10)	9.351*** (5.061)		11.67** (2.052)	10.47*** (6.928)	12.14*** (2.611)
Coffe Production (Coffee _i)	0.45 (1.02)	0.508** (2.301)	0.0103*** (2.49)	0.487** (2.165)	0.514*** (2.847)	0.498*** (2.712)
Coffee _i *Frontier _i	0.15 (0.60)	0.807** (2.242)	-0.009 (-1.43)	0.826** (2.291)	0.924*** (3.142)	0.938*** (3.183)
Gold _i	0.1 (0.30)	-0.58 (-0.855)	0.053*** (4.16)	-0.744 (-0.960)	-0.121 (-0.218)	-0.239 (-0.378)
Market Distance (Dist-Markets _i)	5.21 (1.96)	-0.353*** (-3.390)	-0.004** (-2.09)	-0.342*** (-3.215)	-0.0202 (-0.238)	-0.0125 (-0.144)
Population-1870	1.2 (0.74)	1.593*** (5.874)	-0.025*** (-4.78)	1.630*** (5.759)	1.354*** (6.107)	1.381*** (5.968)
Precipitation	1.74 (1.07)	-0.440** (-2.252)	-0.0005 (-0.12)	-0.428** (-2.180)	-0.0343 (-0.215)	-0.0256 (-0.159)
Temperature	20.68 (5.0)	-0.839** (-2.283)	0.023*** (3.4)	-0.886** (-2.322)	-0.0112 (-0.0373)	-0.0454 (-0.145)
Temperature ²	452.42 (205.35)	0.0210** (2.338)	-0.0007*** (-4.19)	0.0222** (2.368)	0.00202 (0.275)	0.00292 (0.381)
Influence-Free-1800 _i	0.26 (0.32)		0.12*** (9.3)			
Number of Observations	772	751		751	751	751
Endogeneity Test				0.185 (0.6668)		0.145 (0.7038)
Cragg-Donald Wald F Statistic				86.404		86.40

* = Significant at the 10%, ** = Significant at the 5% percent level, *** = Significant at the 1%. Notes: T-Statistics in brackets. The table reports the OLS and the first- and second-stage of the IV Reg. Critical values for the Stock and Yogo weak instrument test (5 percent significance) based on TSLS size with exact identification are 16.38, 8.96, 6.66, and 5.53, for the 10 percent, 15 percent, 20 percent, and 25 percent sizes respectively.

As for coffee the estimations point out that it did in fact influence regional industrialization. Thus, a positive change in one standard deviation of the number of 1925 coffee trees would bring about a positive change of 0.09 standard deviations of per capita industrial capital stock. In addition, if coffee production took place in municipalities belonging to the agricultural frontier the 1945 per capita industrial capital stock would rise by an additional 0.09 standard deviations. These calculations may suggest that the traditional hypotheses on the role played in industrialization of the coffee production in general and of the one that occurred using a parcel system –common at the frontier – in particular may be empirically grounded. As for nineteenth century gold production the coefficient obtained is not statistically significant, which might imply that it did not play an essential role for regional industrialization.

Population in 1870 as indicator of potential markets –as expected- influenced positive and significantly industrialization. The negative coefficient of the variable weighted distance to the major urban markets indicates that the farther the municipality was to the 1912 most populated urban centers the less benefited it would obtain from agglomeration economies and had in consequence less per capita manufacturing capital 1945. According to estimations an increase of the standard deviation in the distance to main markets would decrease in 0.11 standard deviations the per capita manufacturing capital. Geographical variables are statistically and present the expected sign. Thus, greater level of precipitation and temperature are associated with less industrial capital.

Panel B in table 1 displays the results of similar models in Panel A but having as a dependent variable 1945 per capita modern industrial capital stock⁵⁵. The IV estimations suggest an increase of one standard deviation of the population that read in 1912 would raise by 0.27 standard deviations the 1945 per capita capital stock of the modern industry. It is then apparent that impact of human capital on modern industry is stronger than in the total industry. 1925 coffee production had as well a same positive effect on per capita modern capital yet a somehow greater than on total industry. The estimations imply that an increase of a standard deviation of the 1925 coffee production would augment in 0.11 standard deviations the 1945 per capita modern industrial capital. The interaction between coffee production and agricultural frontier would lead to an additional increase of 0.12 standard deviations in the mentioned variable. 1870 Population has a positive impact in modern industrial development in 1945. The coefficients obtained either for the geographical variables or for distance to the main urban markets were not

⁵⁵ Based on Joan Rosés we defined modern industry as: Chemical and Pharmaceutical, Metallurgy, Textiles, Computer Professional, scientific, optical instruments, electrical machinery, Industrial Chemicals, Machinery and Manufactures of Metal, Mineral Fuels.
Traditional Industry: Food, beverages, wood, tobacco.

statistically significant. Additional estimations presented in appendix 2 were carried out using an indicator of human capital the 1938 literacy rates obtaining similar results.

Table 2 displays the estimations of the OLS and IV models for industrial employment as share of the total population. The results are somehow similar to the per capita industrial capital ones and empirically validate the hypothesis on the fundamental role played by the accumulation of human capital on industrial development.

Table 2. Models for 1945 Industrial Employment

Variables	Descriptive statistics	(A) Occupied manufacturing industry municipal 1945 (Log)		
		OLS	Stage I	Stage II
Per capita manufacturing industry employment(IND-DEV _i)	0.05 (0.014)			
Human capital (Human-K _i)	0.15 (0.10)	0.027*** (5.5)		0.034** (2.26)
Coffe production (Coffee _i)	0.45 (1.02)	-0.0009* (-1.66)	0.01** (2.49)	-0.0010* (-1.74)
Coffee _i *Frontier _i	0.15 (0.60)	0.0016* (1.71)	-0.009 (-1.49)	0.0017* (1.76)
Gold _i	0.1 (0.30)	-0.002 (-1.1)	0.052*** (4.16)	-0.0025 (-1.22)
MarketdDistance (Dist-Markets _i)	5.21 (1.96)	-0.00079*** (-2.86)	-0.004** (-2.09)	-0.0007*** (-2.68)
Population-1870 _i (log)	1.2 (0.74)	0.004*** (4.88)	-0.024*** (-4.78)	0.003*** (4.83)
Precipitation	1.74 (1.07)	-0.0012** (-2.24)	-0.001 (0.12)	-0.0011** (-2.16)
Temperature	20.68 (5.0)	-0.0002 (-0.2)	0.023*** (3.40)	-0.0003 (-0.34)
Temperature 2	452.42 (205.35)	1.11E-05 (0.46)	-0.007*** (-4.19)	1.51E-05 (0.602)
Influence-Free-1800 _i	0.26 (0.32)		0.12*** (9.3)	
Number of observations	751	751	751	751
Endogeneity Test				0.25 (0.61)
Cragg-Donald Wald F Statistic				86.04

* = Significant at the 10 percent level, ** = Significant at the 5 percent level, *** = Significant at the 1percent level.

Notes: T-Statistics in brackets. The table reports the OLS and the first- and second-stage of the IV Reg. Critical values for the Stock and Yogo weak instrument test (5 percent significance) based on TSLs size with exact identification are 16.38, 8.96, 6.66, and 5.53, for the 10 percent, 15 percent, 20 percent, and 25 percent sizes respectively.

Using the coefficients of the IV model it is found that an increase of one standard deviation in the 1912 literacy rate would augment by 0.24 standard deviation of the proportion of the

total population employed in manufacturing in 1945. With respect to coffee production one can observe that is negatively correlated with industrial employment. In fact, a positive change of one standard deviation in the 1925 number of coffee trees would reduce in 0.072 standard the proportion of the total population employed in manufacturing in 1945. This result would indicate as well that there was competition for labor between manufacturing and coffee production. Similarly, we find that an increase of one standard deviation of the interaction between coffee production and agricultural frontier would bring about an increase of 0.1 standard deviations in industrial employment indicating that the expansion of the frontier may have helped to develop an urban proletariat available for manufacturing industry as suggested by Arango⁵⁶.

The variables 1870 population– a measure of potential markets- and distance to the main urban markets both have the expected signs indicating that manufacturing industry developed more intense in the most populous areas and exploiting the economies of agglomeration.

Conclusions

This paper has examined the various hypotheses explaining the unequal regional industrial development in Colombia during the first half of the twentieth century. The econometric results would indicate that industrialization in Colombia was related to coffee production, market potential and agglomeration economies. However, the most important factor for the emergence and location of modern industry was human capital measured as literacy rates. Thus, it was not complex levels of human capital but instead minimum levels of skills that allowed workers to receive basic instructions and perform simple calculations. Without these minimum education requirements of the labor force an entrepreneur could not establish a factory with some degree of technological complexity.

One of the key findings of the paper's approach is that the differences of human capital across regions originated in the caste structure of the population at the end of the colonial period. It is established that regions with higher presence of non white free population –“Free of all Colors”- prompted the rise of institutions that fostered the accumulation of human capital during the nineteenth century and hence the labor force of those regions was better suited to use the manufacturing technology at the beginning of the twentieth century. Variables such as coffee production traditionally linked to the rise of the manufacturing industry were found in fact positively associated to indicators of industrial development. Nevertheless, its impact on industrial development seemed to be much lower than human capital's.

⁵⁶ Arango, *Café e Industria*.

Appendix 1. Data Sources

Per capita manufacturing industry capital stock (*IND-DEV*) is the logarithm of the total capital of manufacturing establishments (includes capital in pesos plus fixed assets) or the participation of industrial employment in the total population- in 1945 extracted from the 1945 Colombian First Industrial Census.

Human Capital accumulation (Human-K) is defined as the percentage of the population reported as being able to read in either 1912 or 1938. The data were provided by Population Censuses for 1912 and 1938. Ministry of State 1912 (Ministerio de Gobierno) General Census of the nation (Censo General de la República de Colombia) conducted on 5 March 1912. Bogotá: Imprenta Nacional; and General Census of the nation (Censo general de población), 5 July 1938 Contraloría General de la República. Dirección Nacional de Estadística.

Coffee production (*Coffee_i*) is the number of coffee trees in 1925 (in millions). The data were provided by Monsalve, Colombia Cafetera.

Interaction between coffee production with a dummy variable that specifies whether the municipality belonged to the agricultural frontier is the variable *Coffee_i*Frontier_i*, the variable *Frontier_i* is calculated as titling of public lands experienced between 1893 and 1925 and *Coffee* is a dummy variable which takes the value of 1 if there was coffee production in municipality township *i* in 1925 and zero if not. The data were provided by Monsalve, *Colombia Cafetera* and Sanchez, Lopez-Uribe and Fazio, “*Land Conflicts, Property Rights, and the Rise of the Export Economy in Colombia, 1850–1925.*”

Gold Production (Gold_i), is a dummy variable which takes the value of 1 if there was gold production in municipality township *i* in the nineteenth century and zero if not. The data were extracted from: Compendio de geografía de la república de Colombia by Angel María Díaz Lemos; Jeografía física y política de las provincias de la nueva granada por la comisión corográfica directed by Agustín Codazzi; Compendio de geografía general de los Estados Unidos de Colombia dedicado al Congreso general de la Unión by Tomas Cipriano de Mosquera; Diccionario jeográfico de los Estados unidos de Colombia by Joaquín esguerra Ortiz; Esposición que hace al congreso constitucional de la nueva granada en 1836 el secretario de estado en el despacho de hacienda sobre los negocios de su departamento (Table of mines that are made in the provinces of New Granada) by Francisco Soto; El Informe del presidente de la confederacion i las propuestas de elaboración de las salinas de Cipaquirá, Nemocon, Tausa i Sesquilé by Jacobo Sánchez;

Documentos relativos a las salinas de Chita by Secretary of State Finance Office; Informe del Administrador Principal del ramo al Secretario de Hacienda i Fomento by R Perez.

Market distance (*Dis-Markets*) is the weighted distance in KM from municipality *i* to the main urban markets. The distance in km of each municipality to the cities of Bogotá, Barranquilla, Cali y Medellin is weighted by the 1912 population of these cities. Data came from census of population in 1912 and the National Administrative Department of Statistics -DANE- for municipal geographic coordinates.

We used two geographic variables that rain precipitation (Precipitation) in cubic centimeters and Temperature in centigrade degrees. Data were provided by Sánchez and Nuñez, “La Geografía.”

Population of 1870 (*Pob-1870*) is the population of each municipality according to the 1870 Census.

Population Free Influence (*Influence-Free-1800*) is calculated with the percentage of free of all colors population in the total population circa 1800 obtaining %free of all colors-circa 1800 in *i*. this variable is add the vector *Wfree* which is calculated as $Wfree = Wij * (\%free \text{ of all colors-circa } 1800 \text{ in } i)$ and *Wij* is calculated as we shown in appendix 2. Data for free of all colors population are taken from Tovar, Tovar and Tovar, Convocatoria al Poder del Número. Censos y Estadísticas de la Nueva Granada, 1750-1830.

Appendix 2. Construction of the Spatial Matrix

$$W_{ij} = \left\{ X_{ij} / \sum_{k=1}^n X_{ik} \right.$$

Where X_{ij} is the inverse of the distance *D* between municipalities *i* and *j*, with the condition that for municipalities at a distance greater than some threshold *U* or that correspond to the same municipality (when *i* = *j*) X_{ij} is equal to zero:

$$X_{ij} = \begin{cases} 0 & Si D_{ij} = 0 \\ 0 & Si D_{ij} > U \\ 1/D_{ij} & d.l.c. \end{cases}$$

Appendix 3. Education Capital Per Capita Results for 1938

Table 3. Education Capital Per Capita Results for 1938

Variables	Descriptive statistics	(A) Municipal capital per capita 1945 (Log)			(B) Municipal capital per capita in modern industry	
		OLS	Stage I	Stage II	OLS	Stage II
Per capita manufacturing industry capital stock (log) (IND-DEV _i)	1.68 (5.49)					
Per capita manufacturing industry capital stock (log) (IND-DEV _i modern)	0.48 (4.49)					
Human capital (Human-K) _i	0.36 (0.13)	10.74*** (7.2)		16.03** (2.07)	11.85*** (10.02)	14.32** (2.12)
Coffee production (Coffee) _i	0.45 (1.02)	0.48** (2.2)	0.011** 2.22	0.42* (1.82)	0.49*** (2.82)	0.46** (2.45)
Coffee _i *Frontier _i	0.15 (0.60)	0.55 (1.55)	0.015 (1.82)	0.46 (1.23)	0.63** (2.23)	0.58* (1.93)
Gold _i	0.1 (0.30)	-0.62 (-0.94)	0.052*** (3.26)	-0.96 (-1.16)	-0.12 (-0.22)	-0.28 (-0.41)
Market distance (Dist-Markets) _i	5.21 (1.96)	-0.29*** (-2.9)	-0.01*** (-3.53)	-0.25** (-2.01)	0.039 (0.48)	0.06 (0.61)
Population-1870 _i (log)	1.2 (0.74)	1.52*** (5.72)	-0.013 (-2.01)	1.55*** (5.74)	1.23*** (5.84)	1.25*** (5.79)
Precipitation	1.74 (1.07)	-0.27 (-1.4)	-0.02*** (-3.55)	-0.17 (-0.67)	0.18 (1.18)	0.23 (1.14)
Temperature	20.68 (5.0)	-0.76** (-2.1)	0.01 (1.46)	-0.82** (-2.21)	0.12 (0.41)	0.095 (0.33)
Temperature 2	452.42 (205.35)	0.02** (2.27)	-0.01** (-2.35)	0.02** (2.37)	-0.0004 (-0.06)	0.001 (0.064)
Influence-Free-1800 _i	0.26 (0.32)	0.089 (5.36)	0.09*** (5.36)			
Number of observations	772	751		751	771	771
Endogeneity test				0.493 (0.4826)		0.137 (0.7112)
Cragg-Donald Wald F Statistic				28.714		23.824

* = Significant at the 10%, ** = Significant at the 5% percent level, *** = Significant at the 1%. Notes: T-Statistics in brackets. The table reports the OLS and the first- and second-stage of the IV Reg. Critical values for the Stock and Yogo weak instrument test (5 percent significance) based on TSLS size with exact identification are 16.38, 8.96, 6.66, and 5.53, for the 10 percent, 15 percent, 20 percent, and 25 percent sizes respectively.

References

- Ministerio de Gobierno. *Censo General de la República de Colombia*. Bogotá: Imprenta Nacional, 1912.
- Acemoglu, Daron, and James Robinson. "Economic Backwardness in Political Perspective." *American Political Science Review* 100, no. 1 (2005): 115-31.
- Acemoglu, Daron, Simon Johnson, and James Robinson. *Institutions as the Fundamental Cause of Long-run Growth*. Vol. 1, in *Handbook of Economic Growth*, edited by Philippe Aghion and Steven N. Durlauf, 385-472. Amsterdam: Elsevier, 2005.
- Acemoglu, Daron, Simon Johnson, and James Robinson. "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution." *Quarterly Journal of Economics* (The MIT Press) 117, no. 4 (2002): 1231-94.
- Adams, Richard N. «The Pattern of Development in Latin America.» *Annals of the American Academy of Political and Social Science* 360, nº Latin America Tomorrow (1965): 1-10.
- A'Hearn, Brian. "Institutions, Externalities, and Economic Growth in Southern Italy: Evidence from the Cotton Textile Industry, 1861-1914." *The Economic History Review* 51, no. 4 (1998): 734-62.
- Arango, Mariano. *Café e Industria en Colombia*. Bogotá: Carlos Valencia Editores, 1977. Reimpresión 1981.
- Becker, Sascha O, Erik Hornung, and Ludger Woessmann. "Education and Catch-Up in the Industrial Revolution." *American Economic Journal: Macroeconomics* 3, no. 3 (2011): 92-126.
- Bejarano, Jesús Antonio. "El Despegue Cafetero 1900-1928." In *Historia Económica de Colombia*, edited by José Antonio Ocampo, 195-227. Bogotá: Planeta, 2007.
- . *Historia económica y desarrollo : la histografía económica sobre los siglo XIX y XX en Colombia*. Bogotá: Cerec, 1994.
- Berry, Albert. "A Descriptive History of Colombian Industrial Development in the Twentieth Century." In *Essays on industrialization in Colombia*, edited by Albert Berry. Tempe, Ariz: Center for Latin American Studies, Arizona State University, 1983.

- Botero, Fernando. *La industrialización en Antioquia : génesis y consolidación 1900 - 1930*. Medellín: L. Vieco Cia., 1985.
- Botero, María Mercedes. *La ruta del oro Una Economía primaria exportadora. Antioquia 1850-1890*. Medellín: Fonod Editorial Universidad EAFIT, 2007.
- Brew, Roger. *El Desarrollo Económico de Antioquia desde la Independencia hasta 1920*. 2a. ed. Medellín: Editorial Universidad de Antioquia, 2000.
- Cárdenas, Enrique. "El proceso de industrialización acelerado en México (1929-1982)." Chap. 6 in *Industrialización y Estado en la América Latina. La Leyenda Negra de la Postguerra, compiled*, by Enrique Cárdenas, José Antonio Ocampo and Rosemary Thorp, 240-74. México: Fondo de Cultura Económica, 2003.
- Chamabagwala, Rubiana. "Social Interactions, Spatial Dependence, and Children's Activities: Evidence From India." *Journal of Developing Areas* 42, no. 2 (2009): 157-78.
- Chu, David. "The Great Depression and Industrialization in Colombia." In *Essays on Industrialization in Colombia*, edited by Albert Berry. Tempe, Ariz: Center for Latin American Studies, Arizona State University, 1983.
- Contraloría General de la República. *Primer Censo Industrial de Colombia*. Imprenta Nacional, 1945.
- Crafts, Nicholas F. R. «The First Industrial Revolution: A Guided Tour for Growth Economists.» *The American Economic Review*, 1996: 197-201.
- De Paiva Abreu, Marcelo, Alfonso Bevilaquia, and Demosthenes Pinho. "Sustitución de Importaciones y Crecimiento en Brasil (1890-1970)." In *Industrialización y Estado en la América Latina. La Leyenda Negra de la Postguerra, compiled*, by Enrique Cárdenas, José Antonio Ocampo and Rosemary Thorp, 210-236. México: Fondo de Cultura Económica, 2003.
- Echavarría, Juan José. *Crisis e Industrialización: Las Lecciones de los Treintas*. Bogotá: Tercer Mundo, 1999.
- Echavarría, Juan José. "El Proceso Colombiano de Desindustrialización." *Coyuntura Económica* 14, no. 1 (1984): 213-53.

- Engerman, Stanley, and Kenneth Sokoloff. "Dotación de Factores, Instituciones y Vías de Crecimiento diferentes entre las Economías del Nuevo Mundo. Una visión de historiadores de economía estadounidense." In *Comó se rezagó la América Latina: Ensayos sobre las Historias Económicas de Brasil y México, 1800-1914, compiled*, by Stephen Haber, 307-52. México: Fondo de Cultura Económica, 1997.
- Epstein, S.R. *Freedom and Growth. The rise of states and markets in Europe, 1300-1750*. New York: Routledge, 2000.
- Field, Alexander J. "Sectoral Shift in Antebellum Massachusetts: A Reconsideration." *Explorations in Economic History* 15, no. 2 (1978): 146-71.
- Fitzgerald, E.V.K. "La CEPAL y la Teoría de la Industrialización por medio de la Sustitución de Importaciones." In *Industrialización y Estado en la América Latina. La Leyenda Negra de la Postguerra, compiled*, by Enrique Cárdenas and José Antonio, Thorp, Rosemary Ocampo, 85-133. México: Fondo de Cultura Económica, 2003.
- Fleisig, Heywood. "Slavery, the Supply of Agricultural Labor, and the Industrialization of the South." *The Journal of Economic History* 36, no. 3 (1976): 572-97.
- Fogel, Robert William. *Time on the cross : the economics of American Negro slavery*. New York: Norton, 1989.
- French-Davis, Ricardo, Oscar Muñoz, José Miguel Benavente, and Gustavo Crespi. "La industrialización chilena durante el proteccionismo (1940-1982)." In *Industrialización y Estado en la América Latina. La Leyenda Negra de la Posguerra, compiled*, by Enrique Cárdenas, José Antonio Ocampo and Rosemary Thorp, 159-206. México: Fondo de Cultura Económica, 2003.
- Gallman, Robert E. "Slavery and Southern Economic Growth." *Southern Economic Journal* 45, no. 4 (1979): 1007-22.
- Galor, Oded. *From Stagnation to Growth: Unified Growth Theory*. Vol. 1, in *Handbook of Economic Growth*, edited by Philippe Aghion and Steven N. Durlauf, 171-293. Elsevier, 2005.
- Garrido, Margarita. "Libres de todos los colores en la Nueva Granda: Identidad y Obediencia antes de la Independencia." In *Cultura Política en los Andes 1750-1950*, edited by Cristóbal Aljovín de Losada and Nils Jacobsen, 245-66. Lima: Embajada de Francia en el Perú-Instituto Francés de Estudios Andinos-Fondo Editorial de la UNMSM, 2007.

- Goldin, Claudia, and Kenneth Sokoloff. "Women, Children, and Industrialization in the Early Republic: Evidence from the Manufacturing Censuses." *The Journal of Economic History* 42, no. 4 (1982): 741-74.
- Gomez-Galvarriato, Aurora. *Premoder Manufacturing*. Vol. 1, in *The Cambridge Economic History of Latin America*, edited by Victor Bulmer-Thomas, John H. Coatsworth and Roberto Cortés Conde, 357-94. New York: Cambridge University Press, 2006.
- Grunwald, Joseph. "Some Reflections on Latin American Industrialization Policy." *Journal of Political Economy* 78, no. 4 (1970): 826-56.
- Herrera, Martha. *La Construcción de la cultura política en Colombia: Proyectos Hegemónicos y resistencias culturales*. Bogotá D.C.: Universidad Pedagógica Nacional, 2005.
- Kalmanovitz, Salomón. *Economía y Nación: Una Breve Historia de Colombia*. Bogotá: Grupo Editorial Norma, 2007.
- Kalmanovitz, Salomón. "Los Orígenes de la Industrialización en Colombia: 1890-1929." *Cuadernos de Economía* 5, no. 5 (1983): 79-126.
- Luiten, Van Zanden Jan. *The Long Road to the Industrial Revolution: The European Economy in a Global Perspective, 1000-1800*. Leiden: Koninklijke Brill, 2009.
- McCloskey, Deirdre. *Bourgeois Dignity: Why Economics Can't Explain the Modern World*. Chicago: The University of Chicago Press, 2010.
- Meisel Roca, Adolfo. "¿Por qué perdió la Costa Caribe el siglo XX?" In *El rezago de la Costa Caribe Colombiana*, edited by Haroldo Calvo Stevenson and Adolfo Meisel Roca, 69-102. Barranquilla: Banco de la República-Fundesarrollo-Uninorte-Universidad Jorge Tadeo Lozano (seccional caribe), 1999.
- Meisel Roca, Adolfo. "¿Por qué se disipó el dinamismo industrial de Barranquilla?" *Lecturas de Economía*, no. 23 (1987).
- Meisel Roca, Adolfo. "Bancos y Banqueros de Barranquilla 1873-1925." In *¿Por qué se disipó el dinamismo industrial de Barranquilla? Y otros ensayos de historia económica de la Costa Caribe*, edited by Adolfo Meisel Roca. Barranquilla: Gobernación del Atlántico, 1993.

- Meisel Roca, Adolfo. «Esclavitud, mestizaje y haciendas en la provincia de cartagena 1533-1851.» *Desarrollo y Sociedad* , no. 4 (Julio 1980): 229-77.
- Meisel Roca, Adolfo. “La fábrica de tejidos Obregon de Barranquilla 1910-1957.” *Cuadernos de Historia Económica y Empresarial Banco de la República Número 21 Septiembre*, 2008: 1-61.
- Mejía Prado, E. *Campesinos, Poblamiento y Conflicto: Valle del Cauca 1800-1848*. Cali: Universidad del Valle Facultad de Ciencias Humanas Departamento de Historia. Centro de Estudios Regionales, 2002.
- Mejía Prado, Eduardo. *Campesinos, Poblamiento y Conflicto: Valle del Cauca 1800-1848*. Cali: Univesidad del Valle Facultad de Ciencias Humanas Departamento de Historia: Centro de Estudios Regionales Región, 2002.
- Melo, Jorge Orlando. “Las Vicisitudes del Modelo Liberal 1850-1899.” In *Historia Económica de Colombia*, edited by José Antonio Ocampo, 135-89. Bogotá: Planeta, 2007.
- Meyer, David R. *The Roots of American Industrialization*. Baltimore, Maryland: The John Hopkins University Press, 2003.
- Ministerio de Gobierno. *Censo General de la República de Colombia*. Bogotá: Imprenta Nacional, 1938.
- Ministerio de Hacienda. *Informe del Ministro de Hacienda al Congreso*. 1916.
- Mokyr, Joel. *The British Industrial Revolution: An Economic Perspective*. Boulder : Westview, 1999.
- Monsalve, Diego. *Colombia Cafetera*. . Barcelona: Artes Gráficas, 1927.
- Montenegro, Santiago. *El Arduo Tránsito hacia la Modernidad: Historia de la industria textil colombiana durante la primera mitad del siglo XX*. Medellín: Universidad de Antioquia, 2002.
- Nelson, Richard R, and Edmund S . Phelps. “Investment in Humans, Technological Diffusion, and Economic Growth.” *The American Economic Review* 56, no. 1/2 (1966): 69-75.

North, Douglass Cecil. *The economic growth of the United States, 1790-1860*. Englewood Cliffs: Prentice-Hall, 1961.

Ocampo, José Antonio, and Camilo Tovar. "Colombia en la Era Clásica de "Desarrollo Hacia Adentro" 1930-1974." In *Industrialización y Estado en la América Latina. La Leyenda Negra de la Posguerra, compiled*, by Enrique Cárdenas, José Antonio Ocampo and Rosemary Thorp, 321-68. México: Fondo de Cultura Económica, 2003.

Ospina Vásquez, Luis. *Industria y Protección en Colombia*. Medellín: Santa Fé, 1955.

Parker, William N. "Slavery and Southern Economic Development: An Hypothesis and Some Evidence." *Agricultural History* 44, no. 1 (1970): 115-25.

Parson, James. *La Colonización antioqueña en el occidente de Colombia*. 3a ed. Santafé de Bogotá: Carlos Valencia Editores, 1979.

Posada Carbó, Eduardo, and Louise Fawcett. "Árabes y judíos en el desarrollo del Caribe colombiano, 1850-1950." *Boletín Cultural y Bibliográfico* 35, no. 49 (1998): 3-29.

Ramírez, María Teresa, and Irene Salazar. "Surgimiento de la Educación en Colombia ¿En qué Fallamos?" In *Economía Colombiana del Siglo XIX*, edited by Ramírez, María Teresa and Meisel Roca Adolfo, 419-69. Bogotá: Banco de la República- Fondo de Cultura Económica, 2010.

Rosés, Joan R. "Why Isn't the Whole of Spain Industrialized? New Economic Geography and Early Industrialization, 1797-1910." *The Journal of Economic History* 63, no. 4 (2003): 995-1022.

Safford, F. *Significación de los antioqueños en el desarrollo económico colombiano: Un análisis crítico de la tesis de Everett Hagen*. Berkeley, Ca: Center of Latin American Studies, 1967.

Safford, Frank. "Empresarios Nacionales y Extranjeros en Colombia durante el siglo XIX." *Anuario Colombiano de Historia Social y de la Cultura* 4 (1965): 87-99.

Sánchez, Fabio, and Jairo Nuñez. "La Geografía y el Desarrollo Económico: Una Aproximación Municipal." *Desarrollo y Sociedad* 46 (2000): 43-108.

- Sanchez, Fabio, Pilar Lopez-Urbe, and Antonella Fazio. "Land Conflicts, Property Rights, and the Rise of the Export Economy in Colombia, 1850–1925." *The Journal of Economic History* 70, no. 2 (2010): 378-99.
- Sokoloff, Keimeth L, and Viken Tchakerian. "Manufacturing where Agriculture Predominates: Evidence from the South and Midwest in 1860." *NBER WORKING PAPER SERIES ON HISTORICAL FACTORS IN LONG RUN GROWTH* Historical Paper 100 (1997): 1-26.
- Sokoloff, Kenneth L, and Stanley L Engerman. "History Lessons: Institutions, Factors Endowments, and Paths of Development in the New World." *The Journal of Economic Perspectives* 14, no. 3 (2000): 217-32.
- Summerhill, W. «Colonial institutions, slavery, inequality and development: evidence from Sao Paulo, Brazil.» *Munich Personal RePEc Archive*, 2010: 1-59.
- Tovar, Hermes, Camilo Tovar, and Jorge Tovar. *Convocatoria al Poder del Número. Censos y Estadísticas de la Nueva Granada, 1750-1830*. Bogotá: Archivo General de la Nación, 1994.
- Urrutia, Miguel. *Cincuenta Años de Desarrollo Económico Colombiano*. Bogotá: La Carreta Ineditos LTDA, 1979.
- Van Zanden, Jan Luiten. *The Long Road to the Industrial Revolution: The European Economy in a Global Perspective, 1000-1800*. Leiden: Koninklijke Brill NV, 2009.
- West, E. G. "Literacy and the Industrial Revolution." *The Economic History Review* 31, no. 3 (1978): 369-83.