European
Historical
Economics
Society

EHES WORKING PAPERS IN ECONOMIC HISTORY | NO. 109

Measuring Extractive Institutions: Colonial Trade and Price Gaps in French Africa

Federico Tadei
Department of Economic History, Universitat de Barcelona

MARCH 2017

EHES Working Paper | No. 109 | March 2017

Measuring Extractive Institutions: Colonial Trade and Price Gaps in French Africa

Federico Tadei*
Department of Economic History, Universitat de Barcelona

Abstract

A common explanation for current African underdevelopment is the extractive character of institutions established during the colonial period. Yet, since colonial extraction is hard to quantify, the magnitude of this phenomenon is still unclear. In this paper, I address this gap in the literature by focusing on monopsonistic colonial trade in French Africa. By using new archival data on export prices, I provide yearly-estimates of colonial extraction via trade, measured as the gap between actual prices that the colonial trading companies paid to African agricultural producers and prices that should have been paid in a counter-factual competitive market (i.e. world prices minus trade costs). The results show that African prices were about half than what they would have been in competitive markets. This suggests that colonial trade dynamics was characterized by a considerable amount of extraction.

JEL classification: N17, O43

Keywords: Africa, Development, Extractive Institutions, Colonization, Trade, Price Gaps

***** Department of Economic History, Universitat de Barcelona. Avenida Diagonal 690, 08012 Barcelona, Spain. Email: federico.tadei@ub.edu. A previous, substantially different, version of this paper was previously circulated with the title *Extractive Institutions and Gains from Trade: Evidence from Colonial Africa,* and constituted the second chapter of my dissertation. I would like to thank my advisor Jean-Laurent Rosenthal for his guidance. I also thank Nektarios Aslanidis, Jonathan Chapman, Jean Ensminger, Alfonso Herranz, Philip Hoffman, Nathan Nunn, Claudia Rei, Erik Snowberg, Matt Shum, and the participants to the Caltech HSS Proseminar, Caltech Social Science-History Lunch, All-UC Economic History Workshop at UC Berkeley, UCLA Economic History Proseminar, European Economic Association Conference at Toulouse, African Economic History Workshop at LSE, American Economic Association Meeting in Boston, and Economic History Association Conference in Nashville, the Editor of this journal, and anonymous referees for very helpful comments and suggestions.

Notice
The material presented in the EHES Working Paper Series is property of the author(s) and should be quoted as such. The views expressed in this Paper are those of the author(s) and do not necessarily represent the views of the EHES or its members

I Introduction

Many leading hypotheses about current African underdevelopment emphasize the role of colonialism. While early literature explored how colonial rule relegated Africa to the role of exporter of primary commodities (Rodney, 1972), more recent works have instead focused on the long-term consequences of colonial extractive institutions (Acemoglu, Johnson, and Robinson, 2001 and 2002; Englebert, 2000; Herbst, 2000; Nunn, 2007).[1] Yet, to explain how colonial institutions affect *current* development, we need to understand the extent of extraction *during* the colonial period. Many of the institutions established by the colonizers were, in fact, maintained in the post-independence period. Moreover, the extent to which they were extractive in the colonial period affects how extractive they are after independence (Acemoglu, Johnson, and Robinson, 2001; Bates, 1981).

However, since colonial extraction is hard to quantify and its exact mechanisms are unclear, we still do not know precisely how successful the colonizers were in extracting wealth from Africans. While historians have collected information about colonial institutions, they have not systematically quantified the level of extraction. In this same vein, economists have often overlooked the temporal variation in colonial extraction, increasing the risk of "compression of history" and making it difficult to understand how extractive institutions vary over time (Austin, 2008).[2] One of the main reason for this gap in the literature is that colonial extraction is particularly difficult to quantify since extractive institutions were used in all colonies and it is difficult to find appropriate counterfactuals.

---

[1] Extractive institutions can be defined as those arrangements "designed to extract incomes and wealth from one subset of society [masses, African populations] to benefit a different subset [elite, colonizers]" (Acemoglu and Robinson, 2012). In general, economic extractive institutions, by creating barriers to entry and limiting access to opportunities only to a small elite, eliminate the incentives to develop innovations and entrepreneurship in the society. Specific examples from colonial times include forced labor and land alienation policies, monopolistic trade arrangements, and high levels of taxation combined with little provision of public goods.

[2] Previous works by economists often exploited spatial variation in some colonial policy or institution, observed at one point in time. Huillery (2009) studied the impact of colonial investments in education in French Africa. Gallego and Woodbery (2010) and Nunn (2010) analyzed the effect of colonial missionary activity on schooling and religious conversion. Michalopoulos and Papaioannou (2011) estimated the effect of arbitrary colonial borders on civil war. Berger (2009) studied the modern impact of colonial policies on public good provision in Nigeria. Notable exceptions are Cogneau and Moradi (2012)'s analysis of colonial policies across the border between French and British Togo, Huillery (2014)'s study of the costs of colonization for France, Frankema (2011)'s work on public finance in the British colonies, and Frankema and Van Waijenburg (2012)'s analysis of real wages in colonial Africa.

In this paper, I tackle this issue by exploiting the peculiar structure of labor and trade policies implemented by the French colonizers. In French Africa, because of the low population density and the high cost of labor relative to land, the colonizers faced powerful incentives to implement extractive institutions such as labor coercion and trade monopsonies.[3] Thanks to these arrangements, colonial trading companies were able to obtain agricultural commodities from African producers at very low prices and resell them in Europe for large profits.[4] This specific feature of French trade allows us to estimate the magnitude of colonial extraction by looking at the difference between the prices that the African producers received and the prices that they should have received if the colonizer did not implement trade monopsonies and coercive labor institutions. In other words, we can use producer prices in a competitive market- calculated as the difference between world market prices and trading costs - as a counterfactual against to which measure the extent of colonial extraction via trade.

To implement this idea, I build a new yearly dataset of prices at the African ports and in France for the main commodities exported from each French colony in Sub-Saharan Africa between 1898 and 1959. I collect these data from a variety of colonial publications, including statistical reports of the Ministry of the Colonies, customs statistics, and *Bulletins Economiques* of the different colonies. To recover prices at the producer level, I rely on the fact that colonial publications reported prices at the African port as the sum of producer prices and trade costs between the producer and the port. Thus, by measuring these inland trade costs, I am able to estimate producer prices.[5] To evaluate what these prices should have been in a competitive market, I first construct estimates of trading costs including Atlantic shipping, insurance, inland transportation, port charges, and export taxes, by using a variety of historical sources. Then, I compute competitive producer prices by subtracting these costs from the prices at the French port. As a robustness check, I also used world prices yielding similar results. Finally, by comparing actual and competitive producer prices, I estimate the level of colonial extraction related to export trade for the different colonies, commodities, and years. The

[3] When coercion is a feasible option, a higher land/labor ratio might not translate into higher wages, but in an increase of coercion of labor (Domar, 1969). Fenske (2013) tests this hypothesis in the African context showing that lower population density is correlated to the extent of indigenous slavery.

[4] Trade monopsonies as a mechanism of rent extraction were first emphasized by Bates (1981) in his analysis of marketing boards in British Africa.

[5] The reason for adopting this procedure is that available records report only sparse information on prices at the producer level, which are not enough to provide systematic estimates of colonial extraction. As I will show in section III.2, direct data on cotton producer prices from Ubangi-Shari allows us to test these assumptions and confirm the validity of the proposed approach.

results show that actual producer prices were much lower than what they should have been in a competitive market: extraction rates varied by colony, commodity, and over time, and ranged from 20% to over 70%.

The procedure described above relies on correctly taking into account all trading costs. Yet, even if we estimate correctly observable trade costs, one could still worry that the measured difference between actual and competitive producer prices might be due to other unobservable factors. These could include costs related to quality differences, market frictions, mechanism of insurance for producers, compensation for risk and uncertainty in colonial trade, and productivity differences. To address these issues, I use two different approaches. First, I compare the estimated price differentials to the ones that we can measure in other markets not subject to colonial extraction, such as the cotton or wheat trade between the United States and the United Kingdom and the trade of commodities produced in Africa by European settlers. Results from this analysis suggest that price gaps were much smaller in these markets than in colonial French Africa. Second, I regress actual prices on competitive prices, while taking into account unobservable costs by using colony, commodity, and year fixed effects. The idea here is to see how much of an increase in the competitive price is reflected in an increase in the producer price and how much of it increases the profit of the colonizer. As an additional approach to control for unobservable factors, I also use instrumental variables by instrumenting the competitive producer price with the world market price. The key identifying assumption is that, since French trade from Africa accounted for only a very small part of world trade, world prices are uncorrelated with unobservable trade costs within the French colonies. The results from both regression approaches show that, even after taking into account unobservable factors, the difference between actual and competitive producer prices remains very large and significant.

Together, the evidence suggests that prices to African producers were much lower than competitive prices and that this difference cannot be explained by observable or unobservable costs. On average, prices to African producers were about half of what they would have been in the absence of monopsonies and coercive institutions.[6] To interpret these estimates, it is important to recognize the counter-factual that we are examining. We are not comparing African prices to what they would have been without colonization, but instead to

[6] This result can be related to the finding by Yeats (1990), who shows that even in the postcolonial period the former French colonies paid, for import from France, prices which were 20-30% higher than world market prices.

what they would have been if colonizers had implemented non-extractive institutions. The results of the paper do not dismiss the fact that Africans might have benefited from the increased access to international markets brought by colonization; rather, they underline that it was the colonizers (and not the colonies) who captured most of these benefits.

The rest of the paper is structured as follows. After a short summary of the relevant literature, section II presents the data. Section III discusses the methodology used to quantify colonial extraction. Section IV provides and interprets the price-gap estimates. Section V presents robustness checks and the methodology to account for unobservable costs. Section VI offers concluding remarks and delineates directions of future research.

Related Literature

Looking at the difference between actual and competitive producer prices is one of the possible approaches to measure colonial extraction. Alternative methodologies include considering the colony's balance of payment, comparing taxes and expenditures, and focusing on inequality.

By looking at the balance of payments, one could measure the net income which is transferred from the colony to the colonizing country in terms of import/exports and cash transfers. For example, Manning (1982) argued that in 1910 only 40% of Dahomey government revenue was spent in the colony, while the rest was sent to Dakar and Paris. Roberts (1976) reported that between1930 and 1940, "Britain had kept for itself 2,400,000 pounds in taxes from the Copper-belt, while Northern Rhodesia received from Britain only 136,000 pounds in grants for development."[7] The level of taxation can also be taken as a measure of extraction. For instance, to describe the extractive character of the colonial state, Acemoglu, Johnson, and Robinson (2001) cited Young (1994) who noticed that tax rates in Tunisia were four times larger than in France and Peemans (1975) who demonstrated that African tax rates in Congo reached almost 60%. In addition to the absolute level of taxation, it is also important to examine tax revenue expenditure. Frankema (2011) analyzed public finances in the British African colonies and constructed a measure of the extractive character of the State, based on "the ratio of investments in 'human resources', i.e. education and health care, versus the costs of establishing and maintaining 'colonial order' represented by the expenses on administration, domestic security and the military." Similarly, Huillery (2014)

[7] Both references are cited in Acemoglu, Johnson, and Robinson (2001).

found that transfers from France accounted for only 2% of the revenue of French West Africa, and that most of it was spent for administration and the army. Furthermore, Milanovic, Lindert, and Williamson (2011) presented a different approach to measure extraction. In their work, they introduced the concept of *inequality extraction ratio,* defined as the ratio between the actual level of inequality in a society and the maximum feasible level of inequality, considering that everyone needs to have a subsistence income.

The aforementioned methodologies are based on a macro approach, focusing on the state's public finance and the overall level of inequality in the society. In contrast, the methodology proposed in this paper applies a more micro-oriented approach to estimate colonial extraction, by focusing on a specific type of extractive institution: colonial trade policies. All these methodologies are nevertheless complementary. Since "colonial extractive institutions" is a general term which includes many institutional arrangements— ranging from trade policies, land and labor systems, and public finance— different approaches to measure colonial extraction can shed light on different aspects of colonial rule and help us having a clearer understanding of extractive institutions during colonialism.

II Data

Although both economists and historians agree on the importance of trade monopsonies and labor coercion during the French colonization of Africa, the extent of colonial extraction has been difficult to assess. In order to answer this research question, we need to identify a proper counterfactual. Since in a competitive market, without monopsonies and coercive labor markets, the prices to African producers should be equal to the difference between world market prices and trading costs, we can check for the presence of colonial extraction by analyzing whether prices to African producers in the French colonies were lower than these counterfactual competitive prices.

Ideally, we would like to observe prices at the producer level. However, the remaining records report only sparse information for some colonies/commodities and years. Therefore, it is not possible to use them in order to provide a general assessment of colonial extraction. Instead, what available records report is information on prices at the African and French ports and on trade costs, which I will describe in the following sub-sections.

II.1 Prices in Africa and in France

I collected price data for four main agricultural commodities exported from French Africa between 1898 and 1959: peanuts (shelled and unshelled), palm kernels, ginned cotton, and cocoa. I included only commodities which were produced by African farmers. This is because, in the case of commodities produced under European plantations, the port price included also the profit of the concessionary company and it would not be a good measure of colonial extraction. Nevertheless, the commodities in the dataset account for about two-thirds of the value of all exports from West and Equatorial French Africa during the whole colonial period.

Prices in Africa

Colonial customs statistics reported the total quantity and value of commodities exported from each colony every year. These statistics were registered at the local customs offices and then aggregated at the colony level. The reported values (*valeurs mercuriales*) were measured at the exit port and included the price paid to African producers together with processing, inland transport, warehousing and port costs, and in some cases customs duties.[8] To construct the price dataset, I used numerous yearly issues of different colonial publications, including statistical reports of the Ministry of Colonies, *Bulletins Economiques* of the various colonies, and *Annuaire Statistiques* of West and Equatorial Africa.[9]

To estimate extraction at the colony level, we need to exactly identify where these commodities were produced and exclude all re-exports. Given the variety of the sources and the length of the period considered, the names of the territorial units for which the customs statistics were registered changed over time and in some cases data were reported only for larger territorial units. To solve these issues, I first tracked the variation in the names of colonies. Then, I assigned the commodity price from larger territorial units to a specific colony only when we can be sure that only that colony produced that commodity in that specific year. Whenever this was not possible, observations had to be eliminated. In addition, given the unreliability of unit-values for low-quantity observations, I also dropped all exports below 10 tons.

[8] Values include customs duties since 1945 for Cameroon, since 1947 for Equatorial Africa, and since 1950 for West Africa.
[9] See the appendix for more details on the sources.

Prices in France

I collected prices in France from various issues of the *Statistiques Mensuelles du Commerce Extérieur de la France*, a monthly publication by the *Direction Générale des Douanes* reporting the total values and quantities of the commodities imported from the French colonies every year. As a control, I also used different issues of the *Annuaire Statistiques de France* reporting similar information.

Not all exports from French Africa went to France. Yet, given the importance of the French market, using import prices in France is a good benchmark against which to compare African export prices. By 1949, for instance, France was the destination of about 80% of the total exports originating from its African colonies (Duignan and Gahan, 1975). Moreover, as shown in section V, extraction estimates are also robust to using world prices.

II.2 Trading Costs

In addition to price data, to estimate competitive prices we need to measure trade costs. They include shipping and insurance costs between the African and the French port, and inland transport, processing, warehousing, port costs, and export taxes between the producer and the African port. Below, I discuss how we can estimate each of these costs.

Shipping Costs

Extensive data on shipping costs between Africa and France are unfortunately not available. To solve this problem, I constructed estimates for each colony-commodity-year in my dataset according to the following procedure. First, I computed the distance to Marseilles from the main African port for each colony.[10] Then, I used data on average freight rates from the West African coast to France for the main exports in 1938 and 1949 to compute the average shipping cost per km for each commodity. [11] Finally, I multiplied this measure by the distance to Marseilles for each colony (both West and Equatorial Africa) and by an index of transportation costs between 1898 and 1959 from Mohammed and Williamson (2004), taking 1938 and 1949 as base-years. [12] To reduce the impact of measurement errors and increase the

[10] The main ports are identified from the map reported at page 149 of Duignan and Gahan (1975). The distance to Marseilles is computed by using http://ports.com/sea-route.
[11] Documents et statistiques - Ministère de la France d'Outremer, Service de statistique, 1949-52.
[12] I constructed this index from the global real freight rate deflated by commodity prices.

reliability of estimates, final shipping costs are obtained as the average of the estimates computed from 1938 and from 1949.

Insurance Costs

Marine insurance costs were computed as a percentage of the value of goods in France. As transportation technology improved over time, risk and insurance rates decreased. Studying transatlantic wheat trade, Persson (2004) reported rates of about 1% of the value since the 1920s and rates of 1.75% to 1.5% between 1850 and 1920. Thus, it seems reasonable to estimate insurance costs from Africa to France as 2% of the French price before 1920 and 1% after 1920. Direct data from French Africa show that this is likely to be even an overestimate at least for the later period. For example, insurance rates for cocoa from Ivory Coast in 1958-59 amounted at about 0.6% (France, 1967).

Inland Transports Costs

I computed inland transport costs by using colonial maps and reports. To do so, I reconstructed transportation networks of French Africa between 1900 and 1960, including railroads, roads, and navigable rivers, estimated the locations of production and costs per km, and computed total transport costs to the closest port along the cheapest route, for each colony, commodity, and year.

To reconstruct the transportation network, I first put together a map of current ports, rivers, and railroads. According to Thomas (1957), four ports (Dakar, Conakry, Abidjan, and Cotonou) handled 95% of all the trade from French West Africa and 75% of exports were moved to ports via railroads. Then, to take into account the variation in transport infrastructure over time, for any given year, I eliminated the following: 1) all railroads segments that were not yet constructed; 2), all portions of rivers that were not navigable; and 3) all ports that were not used during the colonial period. These eliminations were informed by a map of colonial transports in French Africa (Duignan and Gahan, 1975, p.149), the accounts in Suret-Canale (1971) and Thomas (1957), and the history of each railroad (see figure I for an example of this map in the 1950s).

To identify the areas of production of each crop and colony at the end of the colonial period in 1950s, I took the centroid of the total suitable area by using maps of soil suitability from FAO (2016). In addition, to take into account the fact that production centers were likely to be much closer to ports in the early periods (due to worse infrastructure and lower political

control of the colonies), I created new centroids for each previous decade by proportionally moving the 1950s centroid closer to the port, reaching the port or the colony border in the year of the first recorded production of that colony/crop. For example, the centroid for cotton production in Ubangi-Shari was at about 2,200 km from the port in 1950s, while the colony border was at 1,300 km from the port. Cotton production was recorded in Ubangi-Shari from the 1920s to the 1950s. I then computed the distance of production center from the port as 2,200 km in the 1950s, 1900 km in the 1940s, 1600 km in the 1930s, and 1,300 km in the 1920s.

To construct estimates of the cost for each transportation mean (railroad, river, and roads) over time, I used several sources reporting cost per km for different African colonies in specific years between the 1900s and the 1950s. Data on cost were averaged across colonies for the available years and missing years were computed by interpolation. [13] As the last step, by using the maps described above, I computed the number of km which were traveled by road, river, or railroad for every year, commodity, and colony. Finally, by applying the estimates of cost per km, I computed the total cost from the centroid of production to the closest port, along the cheapest route.

Processing Costs

For raw materials, such as cocoa beans, palm kernels, and peanuts, processing costs were negligible. The drying of peanuts and cocoa beans was often done directly by African farmers, while palm kernels were subject to even less processing. However, processing costs were more substantial for cotton, which needed to be ginned. In this process, raw cotton was separated into lint and seeds. To estimate these costs, I relied on Baffes' (2007) report of ginning costs per ton in several countries in West and Equatorial ex-French Africa from 1970 to 1998. After obtaining this data, I proceeded with two additional steps. First, I computed ginning costs as a percentage of port prices for every available year. Then, to take into account the change in technology, I interpolated back these proportions to get the percentage of processing costs from 1959 to 1898. On average, ginning accounted for about 40% the total port value in the early 1900s. Over time, as technology improved with the introduction of

[13] The main sources are Chaves (2013), Dampierre (1960), Hopkins (1973), Jedwab and Moradi (2013), Jedwab (2013), and Onyewuenyi (2015). Even if many of these sources report unit costs for British colonies, we can assume that similar cost can be applied to French colonies as well, since transportation technology is the same.

ginning machines, ginning cost slightly decreased to about one third of the value at the port in the late colonial period.

Port Charges and Export Taxes

Port charges included warehousing, loading, and unloading costs. I used the estimates from Persson (2004), who showed that port costs accounted for about 1-1.5% of the total price at the port. Data on export taxes on the different commodities and years come from the *Annuaire Statistiques de l'AOF, 1950-54*, *Annuaire Statistiques de l'AEF, 1951-55*, and Thompson and Adloff (1957). When levied, they ranged from 6% to 15% of the port price for cocoa, from 1% to 35% for cotton, and from 3% to 14% for palm kernels and peanuts, depending on the year. In general, more valuable commodities were subject to higher export taxes. Average yearly rates across all colonies were 3.7% for cocoa, 3.5% for cotton, 2.4% for peanuts, and 1.9% for palm kernels.

III How to Measure the Reduction of Producer Prices?

III.1 Methodology

The price data described in section II refer to prices at the African port. Yet, we are interested in measuring colonial extraction faced by the producers. A key question to answer then is how we can use the available data on port prices to measure colonial extraction at the producer level. To begin answering this question, let us first explore what an ideal measure of extraction would look like. If we had data on producer prices, we could measure extraction as the percentage gap between competitive and actual producer price

$$E = \frac{(p - t - s) - p_A}{p - t - s} \tag{1}$$

where $p - t - s$ is the competitive producer price (computed as difference between price in France p and trading costs from the African port to France t and from the producer to the African port s) and p_A is the actual price paid to the producers. We can interpret this measure as how much the producers lost with respect to a situation of free trade.

How can we estimate equation (1) without information on producer prices p_A? The solution is provided by the specific way in which colonial customs offices reported values at the African port. These valuations included in fact the price paid to Africans p_A producers together with inland trading costs s (processing, inland transport, warehousing and port costs, customs duties). It is important to notice that this does not depend on the assumption of competition or lack of extraction in the internal markets, but just on how values were reported by customs offices. The valuations at the port were not the prices paid by the trading company to the intermediary at the port, but they were, by law, the sum of official producer prices and inland trading costs.

Several sources confirm this interpretation. *Annuaire Statistiques,* both from West and Equatorial Africa, report that the evaluations at customs offices were *valeurs au point de sortie* (exit point values) or *valeurs mercuriales*. The latter is defined as the sum of *valeur d'achat* (purchase value) from the producer, transport, and processing costs. These valuations were reported in such a way because customs offices were required to record the value of the good on which to levy duties (*valeur imposable si la merchandise devait aquitter un droit ad valorem*). In the later colonial period, in particular after WW2, these valuations also included customs duties and can be considered as Freight-On-Board (FOB) prices (*Annuaire Statistique de l'AEF 1951-1955*, *Annuaire Statistique de l'AOF 1949-1951* and *1950-1954*). Other sources confirm what was reported in the *Annuaire Statistiques*. For example, Dampierre (1960), describing cotton prices in Ubangi-Shari, mentioned how the *prix de revient la cote* (equivalent to the valuation at the exit port) was determined as the sum of the producer price fixed by the government and processing and inland transport costs. Similarly, Nabe (1999) reported that in Togo within the value at the exit port were included the producer price, taxes, and inland trading costs.

Defining the price p_P at the African port as $p_P = p_A + s$, we can thus estimate colonial extraction from known quantities as

$$e = \frac{p - t - p_P}{p - t - s} \tag{2}$$

III.2 Testing the Methodology

To use the proposed approach, we need to make sure that estimating producer prices as the difference between port prices and inland trade costs is correct. As mentioned before, both primary and secondary sources show that port prices were registered as the sum of producer prices and inland trade costs. In addition, available data on cotton producer prices in Equatorial Africa allow us to test this directly.

Compulsory cotton production was introduced by Governor Felix Eboué in Ubangi-Shari and Chad between 1924 and 1927 and abolished in 1956, just four years before independence. Under this arrangement, every village had to produce amounts of cotton in proportion to its population and sell it to one of four trading companies with monopsony power over given territories. Dampierre (1960) analyzed the process of price formation for cotton in Ubangi-Shari in the 1950s. The price paid to farmers for cotton-grains was 15% of the FOB price of cotton-fibers in New York. The trading company (the *Compagnie Coloniale Cottoniere Ouham-Nana - Cotouna* in this specific example) had monopsony power and was in charge of buying cotton from producers, ginning, and transporting it to the ports in Bangui and Pointe-Noire. By adding all these processing and transport costs to the producer price, the exit port price was recorded by customs offices. Given the low level at which producer prices were fixed, the exit price calculated in this way was much smaller than the actual FOB price (price at the French port net of insurance and shipping costs). This difference generated revenue for both the colonial government and the trading company: the government benefited in the form of customs duties (about 15% of FOB price), while the trading company was granted a commission equal to 3% of the price at French port. In addition, the trading company also obtained 20% of the remaining difference between FOB and exit prices. The rest was left to the colonial government in order to accrue the reserves of the *Caisse de Soutien du Coton*, an organization with the formal goal of supporting cotton producers.[14]

Direct data on producer prices and trading costs from the producer to the African port allow us to see that port values were indeed the sum of producer prices and costs. To do so, I gathered cotton data on producer prices in Ubangi-Shari between 1927 and 1955 and estimated inland trading costs (including transport costs, ginning, port charges, and export

[14] It is possible that at least part of this profit was used to finance public investments in Africa, but, as I will show in the section V.1, these investments were too small to justify the presence of large price gaps.

taxes), as described in section II.2.[15] Figure II shows that prices to producers accounted for about 40-50% of the total port price, ginning costs for about one third, inland transport costs ranged from about 10% to 20%, the rest being completely accounted by export taxes and port costs.

To further test the proposed approach, I compared the extraction rates computed from actual producer prices to those computed from producer prices estimated as the difference between port prices and inland trade costs. The results in figure III shows that the average difference between actual and estimated extraction rates is around 3.5% and not statistically different than zero. We can thus be confident that we can estimate producer prices as the difference between port prices and inland trade costs. In addition, the results suggest that the procedure to estimate inland transport cost, processing, port charges and taxes is correct.

III.3 Historical Background

How did colonial policies affect colonial extraction *e* as defined in equation (2)? To see this, we need to go back to the history of French colonization in Africa. Most of the military conquest of French Africa occurred between 1880 and 1900 and at the beginning of the 20th century more permanent institutions could be established (Coquery-Vidrovich, 1969; Suret-Canale, 1971). The French government organized the colonies in two federations: French West Africa (1895) - including Senegal, French Sudan (now Mali), Niger, Upper Volta (now Burkina Faso), Guinea, Ivory Coast, and Dahomey (now Benin)—and French Equatorial Africa (1908)—including Gabon, Congo, Ubangi-Shari (now Central African Republic), and Chad. After WW1, part of Togo and almost all of Cameroon were added to the French colonies in continental Sub-Saharan Africa (see figure IV). The extension of French possessions was reflected in the heterogeneity of their natural environment, including, from the coast towards the interior, tropical forests, savannas, and arid regions. The coastal forestry regions were suitable to produce bananas, coffee, cocoa, and rubber, while the drier interior areas were suitable for peanuts and cotton. In general, Western colonies were more prosperous than Equatorial colonies and, with the exception of the peanut-producing areas of Senegal, coastal regions were usually wealthier with respect to interior regions because of the higher value of their crops and lower transportation costs (Hopkins, 1973).

[15] The source for the producer price series is the *Annuaire Statistique de l'Obangui-Chari, 1940-55*.

Most of colonial economic activity revolved around trade. Exports were mainly based on production by African farmers, while European trading companies limited themselves to collect crops from Africans at trade posts and resell them at higher prices in Europe.[16] The colonial government benefited from this trade by establishing customs duties and by taxing part of the companies' profit (Suret-Canale, 1971). Nevertheless, given French Africa's low population densities and abundant cultivable land in the indigenous sector, African incentives to produce export crops were very limited. If the trading companies had been to pay free market prices, this would have greatly reduced their profit. For these reasons, they lobbied the colonial government to establish trade monopsonies and coercive labor market institutions, such as compulsory cultivations and various forms of forced labor.[17] Some monopsonies were conceded *de jure* from the colonial government to specific companies, while others came into being *de facto* as a consequence of economic crises and protectionist policies (Coquery-Vidrovitch, 1972; Manning, 1998; Suret-Canale, 1971; Thompson, 1957). Formal monopsonies were established in the Equatorial colonies. Since the early XX century, the French government divided the territory of Equatorial Africa among concessionary companies with monopsony power. African laborers were forced to collect crops for the concessionaires who employed harsh coercive methods.

In West Africa, instead, *de facto* monopsonies became the norm. At the beginning of the 20th century, trade in the Senegal/Mali region was controlled by a group of eight Bordeaux trading firms, while Guinea was in the hands of business houses from Marseilles or Paris. Smaller traders were allowed a share of exports as long as they respected the prices fixed by the main trading firms.[18] After WW1, the *de facto* monopsony of these companies grew stronger: economic crises eliminated competition from smaller companies, German business interests were canceled by the war, and protectionist measures were taken against British trade. Protectionist policies were not applied everywhere and did not completely eliminate non-French trade (especially in Guinea and Dahomey). Nevertheless, the number of the remaining trading firms became sufficiently small to allow agreement and ban entry into the African market (Suret-Canale, 1971). As a result, at the beginning of WW2, about a dozen

[16] After WW1, Europeans began to enter the productive sector, establishing plantations (e.g. coffee in Ivory Coast, bananas in Guinea) and exploiting forestry concessions, but this remained a minor activity.
[17] We can interpret these institutions as subsidies given by the colonial government to the European trading companies.
[18] The fact that smaller trading firms were able to operate show that de *de facto* monopsonies which appeared in West Africa resulted more from a political plan to prevent entry in the market than from a market structure with high fixed costs.

companies monopolized almost all of trade from French West Africa, and two French companies (S*ociété Commerciale de l'Ouest Africain*, *Compagnie Française de l'Afrique Occidentale*), and a British-Dutch company (*Unilever*) controlled between 50% and 90% of exports (Suret-Canale, 1971, p. 167).

In addition to creating monopsony power for the trading companies, the colonizers attempted to reduce prices to Africans by interfering with labor markets and implementing coercive institutions. One option was to introduce compulsory cultivations. In this case, quotas were set of produce that Africans had to cultivate and sell for a fixed price to the colonizers. Moreover, in addition to compulsory cultivations, the colonizers also used indirect methods such as poll taxes. Introduced to raise the revenue of colonial governments, they also served the function of forcing Africans to produce cash crops in order to earn the money needed to fulfill their fiscal obligations. In Equatorial Africa, for example, poll taxes were introduced in 1902 as a way to facilitate rubber collection for the concessionary companies.

What was the impact of these monopsony and labor coercion policies on producer prices? Figure V summarizes the relationships among price to producers, price at the exit port in Africa, competitive price, and price in France. The French administration fixed the price to African producers, in accord with the trading companies, as a percentage of the world price. Customs statistics registered prices at the African exit port by simply adding inland transport, warehousing, and port costs to the producer price fixed by the colonial government. Under free trade and free labor (panel A), the reported price at the exit port must be equal to the competitive price, defined as the difference between price in France and trading costs. In this case, $p - t = p_P$ and extraction $e = 0$. With monopsony and labor coercion (panel B), the colonizers were able to reduce the price to African producers so that the exit port price was lower than the competitive price. In this case, $p - t > p_P$ and extraction $e > 0$.

IV Results: Price Gap Estimates

To evaluate how effective these institutions were in reducing producer prices, we can compute the price-gap extraction measure defined in equation (3).

IV.1 Main Result

Table II presents the main estimates. The first six columns show means and standard deviations of French prices, competitive producer prices, and actual producer prices. Correlations between prices in France and at the producer level are also reported. The column labelled "extraction" reports estimates of *e*. We can interpret these values as how much lower African prices were with respect to what they should have been if trade had been competitive. In the second-to-last column, I test the hypothesis that extraction is positive, by regressing the extraction measure on a constant. Standard errors are clustered at the colony/commodity level.

The first row tests for the presence of colonial extraction considering the full sample: extraction *e*, as defined in equation (3), is positive and statistically different from zero at 1% level. We can thus reject the null hypothesis of no colonial extraction. On average, prices at the producer were only two thirds of what they should have been in a competitive market, without monopsony and labor coercion. In the following rows, I check whether this result depends on specific periods, colonies, or commodities. In all samples, *e* is positive and almost always statistically significant. All periods were subject to some extraction, ranging from 20% to 50%. Looking at differences across commodities, we notice that extraction was particularly large for cotton (39%), while it was lower for palm kernels, peanuts, and cocoa (27-33%). Across colonies, average extraction ranged from 19% to 74% and coefficients are almost always statically significant.

IV.2 Trends over Time

Overall, the estimates suggest that the colonizers reduced prices to African producers with respect to competitive prices. It is interesting to analyze more in detail the trend over time. Figure VI shows average level of colonial extraction across all commodities and colonies, between 1898 and 1959. At the beginning of colonial rule, in 1900, extraction was low at about 20%. In the following years, as colonial rule became more established and trade monopsonies got stronger, it appears there was a steep rise in extraction, reaching 40-50% in the 1910s. Similar levels persisted between the late 1920s and the Great Depression, when the decline of world market prices reduced the gap between competitive and actual African producer prices to about 30%. After this period, colonial extraction reverted back to its

previous levels until the end of WW2. After the war, it became more difficult for the colonizers to justify the use of coercive institutions in front of the public opinion both in France and in the colonies. Forced labor, for example, was abolished in 1946 in the entire French Africa. Compulsory productions in Equatorial Africa persisted for a little longer, but were also abolished in 1956. This trend was reflected in a reduction of colonial extraction: in the post-war period price gaps declined to about 20%. Despite this improvement, at the eve of independence prices to African producers were still lower than competitive prices. Even if the colonizers relied less on labor coercion during the post-WW2 period, trade monopsonies persisted and so did colonial extraction.

Was this general trend common to all colonies? Figure VII presents the extraction measure over time in each French territory. Equatorial colonies (Gabon, Congo, Ubangi-Shari, and since mid-1920s, Chad and Cameron) followed the general trend very closely, with higher average extraction. From low levels in 1900, extraction quickly rose to almost 60%, a level which was maintained until the Great Depression. The rapid increase in colonial extraction can be linked to the intensifying of the operations of concessionary companies in the French Congo at the beginning of the XX century (Coquery-Vidrovitch, 1972). In the late 1920s to early 1930s, price gaps decreased, consistently with both the abolition of the concession system and the 1929 crisis which reduced the profit margin of the trading companies (Suret-Canale, 1971). Then in the late 1930s, extraction increased again to about 40-60%. The consolidation of cotton compulsory cultivation in Ubangi-Shari and Chad can partly explain this rise (Dampierre, 1960).[19] After WW2, as coercive institutions lost their prominence, colonial extraction gradually diminished, reaching 20% at the end of the colonial period. In West Africa, the general trend was followed, but variations over time in the level of extraction were less pronounced than in Equatorial colonies: extraction levels oscillated between 20% and 40-50% until independence. The lower level of extraction in West Africa is consistent with historical accounts of the less prominent use of coercion in Western with respect to Equatorial colonies (Manning, 1998; Suret-Canale, 1971; Thompson and Adloff; 1957).

Observing extraction across territories, it is clear that, even if the general trend is common, there are important differences in the level and timing of variations. Did similar

[19] This result is consistent with the historical evidence documenting the increase of rent extraction after the introduction of coercive labor institutions. Suret-Canale (1971, p.223) for example, reports that, after compulsory cultivations were established for cotton in Equatorial Africa, a rise in world prices would have implied an increase of profit for the trading companies which was twice as much as that for African farmers.

differences exist also across commodities? Figure VIII shows the evolution of extraction on cocoa, cotton, palm kernels, and peanuts, pooling the different colonies together. Despite some variation, cocoa, palm kernels, and peanuts followed the general trend. From low levels at the beginning of the period, price gaps rose to almost 40%. Then, after the temporary reduction during the Great Depression, extraction rates decreased finally to 20% near independence. Cotton, instead, experienced high levels of extraction already at the beginning of the colonial period (almost 60%), which decreased to 40% in the 1920s and to 20% in the post-war period.[20]

V Robustness Checks

The results of section IV show that there existed a large gap between actual and competitive producer prices. Yet, to be able to interpret this as evidence of colonial extraction, we need to make sure that we have not mismeasured prices or underestimated trading costs. In addition, we need to be able to rule out alternative explanations for price gaps.

V.1 Discussing Alternative Explanations for Price Gaps

Measurement Errors in Prices

Commodity prices might be measured with errors. First, prices are computed as unit values (total value divided by total quantity) and can be prone to errors especially in the case of low-quantity observations. To check the robustness of the results against this type of inaccuracy, I test whether extraction is positive ($e > 0$) when we exclude price data coming from observations with total quantity of 1000 tons or less. Doing so, the sample is reduced to 312 observations, but e is still positive and statistically significant (average =0.29, st. err. =0.01).

Second, one might worry that, since exports were taxed on value, the trading companies underreported prices in order to reduce taxes. Nevertheless, this cannot be the case since values were registered by customs offices on the basis of prices fixed by the colonial government. Since one the objectives of the colonial administrators was to increase the value

[20] Estimates of extraction by commodity and period are also reported in table III.

of trade from the colonies, their incentives, if anything, must have been toward reporting higher and not lower prices at the African ports.

French Prices and World Prices

One might wonder about the comparability between French and world market prices. Historians have in fact claimed that the French firms enjoyed prices lower than world prices for raw materials from the colonies (Emmanuel, 1973; Samir, 1973). Following this reasoning, it could be argued then that prices in France net of trading costs would not be a good counterfactual for African prices in the absence of colonial extraction. Nevertheless, if this is the case, the results of this papers are actually even stronger. If French prices were lower than world prices, then the gap between African and French prices is actually a lower bound of the gap between African and world prices.

To see how close French prices are to world prices, I estimated world prices in the following way. First, by using data from FAO (2016), I computed import unit-values in 1960 for each of the commodities, by averaging unit-values from all importing countries. Unit-values are directly comparable to my data on French port prices. In addition, by averaging across all countries we get a better estimate of world prices than if we just compared French prices to prices of other specific countries, such as the UK or the US. I then used the index of world price variation from Jacks (2013) to estimate world prices in every year from 1898 to 1959. As expected, French prices were almost always lower than world prices (see figure IX and X). On average, prices at the French port were only about 80% of world prices.

Figure XI reports the estimates of extraction over time, computed by using world instead that French prices. As expected, the extraction rate is even larger ranging from 40% to almost 80%. With the exception of the initial period, the trend is also similar to the one in figure VI, computing extraction rates from French prices.

Missing Data

Given the nature of historical records, some data are missing. This would be a problem if somehow French prices were reported only when particularly high and African prices were reported only when particularly low. In this case, we would observe price gaps which are due to the non-random missing data. This seems, however, very unlikely. In general, data are missing because statistical publications disappeared or were too damaged to be consulted in

the archives. For these reasons, it is plausible that the data will be missing due to random historical circumstances.

To check this, I test whether specific colonies, commodities, or periods are particularly prone to missing data. For each colony and commodity, I consider all those observations for which we do not have information in years after the first year of recorded production as missing. To see whether data are missing at random, I regress a dummy equal to one if data are missing and zero otherwise on 13 colony, 4 commodity, and 5 decade fixed effects. Despite the large number of independent variables, the R-squared of the regression is very low, which supports the hypothesis that data are not missing selectively. [21]

Market Frictions

One might argue that we observe price gaps just because prices in Africa did not respond immediately to variations in world prices. These frictions can be due the slowness in the transmission of price information and inefficient arbitrage which characterized early twentieth century trade. In particular, if, because of these market rigidities, African prices would tend to remain low when world prices increased, we would observe positive gaps between African and French prices which could not be attributed to colonial extraction.

To address this concern, consider that if $p_A = p - t - s$ at time 0 (no extraction) and African prices are "sticky", gaps at time 1 should be positive when the world price net of trading costs increases, but negative when the world price net of trading costs decreases. Thus, if we limit our analysis to years in which world prices net of trading costs decrease and we still find positive gaps, we can be confident that this is not due to market rigidities, but instead to colonial policies. In effect, when we reduce the sample to just those observations for which the competitive price at time 1 is lower than at time 0, the average price gap is still positive (29%) and statistically significant (N=261).

Insurance of African Producers

Bates (1981) reports that, in the case of British colonies, trade monopsonies had the *de jure* aim to insure African producers against fluctuations of world market prices through the mechanism of marketing boards. Farmers had to sell their production to the government and were paid less than world prices when prices were high. The difference was collected by the

[21] A probit regression yields an adjusted pseudo-R2 of just 14%.

marketing board and was used, in theory, to pay higher prices to farmers whenever world prices were low. Similar institutions were established in French Africa with the name of *caisses de stabilisation*. We could then think that the observed gap between prices in Africa and France might actually be an "insurance premium" which Africans had to pay in order to stabilize commodity prices.

This interpretation however is not likely. First, marketing boards did not fully reach their objective of insuring producers and soon became a way to transfer resources from farmers to urban sectors of the society in order to gain political support (Bates, 1981). Moreover, marketing boards and *caisses de stabilisation* were established only late in the colonial period (since 1940 in British Africa and since 1954 in French Africa; Nabe, 1999) and cannot explain price gaps that we observe from the 1900s to the 1940s.

Quality Differences

Since prices to producers were fixed by the colonial government as a percentage of an average world price computed across different qualities (see Dampierre, 1960, for cotton), we do not need to worry about observing different grades of the same crop in Africa with respect to France. Nevertheless, one might think that we observe gaps just because the quality of African commodities was lower than the average world quality. However, this is unlikely: African commodities are often of quality higher or comparable to the world average. For example, the quality of African cotton, characterized by longer fibers, is higher than average (Basset, 2005, cited in Moseley and Gray, 2008); while the *forastero* cocoa cultivated in Africa, despite being of lower quality than the *criollo* and *trinitario* varieties, represents the greatest majority of world cocoa production (today, about 85%).

Investments in Africa

Even if it is now clear the described price gaps do exist, one might still be skeptical about interpreting them as evidence of extraction. In particular, one might argue that price differentials were used for colonial investments in public goods (transports, education, and health) that would benefit African populations.[22] A closer look to colonial budgets shows, however, that this could not be the case. Colonial investments were very small with respect to

[22] The part of the colonizer's profit which was used to run the colonies and implement coercive trade and labor institutions just decreases the net profit and must be still included when we measure colonial extraction.

the profit from price differentials. Huillery (2014) provides relevant information on French West Africa. Colonial public investments included education, health, infrastructure, and support to productive sectors. Investments in health and education were extremely low: in an average year between 1907 and 1956 there were about 1,000 teachers and 1,400 doctors covering a population ranging from 12 to 25 million. Support to productive sectors was equally low while investments for infrastructure represented the majority of public investments. Before WW2, investments in infrastructure amounted at about 25 million 1914 francs per year, on average. The profits from price differentials from West Africa in the same period amounted at about 38 million.[23] Even if the colonizers had used only price differentials to fund public investments, which is extremely unlikely, they would have still made a significant profit.[24]

V.2 Taking into Account Unobservable Costs: A Regression Approach

The previous section ruled out several alternative explanations for price gaps. The observed differences between actual and competitive producer prices cannot be explained neither by measurement errors or missing data, nor by observable trading costs and relatively observable factors such as quality differences, market frictions, insurance of producers, or colonial investments.

Nevertheless, there might be other unobservable costs which could explain the difference between African and French prices. Since trade in Africa was risky, companies might pay lower prices as a compensation against world price volatility or production shocks within Africa. Low producer prices could be necessary to compensate for the cost of building trade posts and maintaining trade routes. There might also be other unobservable transaction costs related to adulteration, spoilage during shipping, and bulking. Finally, productivity differences might also contribute to explain price gaps.

Unfortunately, all these costs are very difficult to measure. The evidence suggests however that they were not as important as we might think. Consider that the producer price was on average 50% of the price at the French port and observable trading costs were about

[23] The estimate of colonizer's profit is constructed as the difference between prices in France minus trade cost and African port prices, multiplied by the total quantity exported for all commodities from all West African colonies.
[24] After WW2, the situation might be different as investments in infrastructure increased to 119 million, while extra-profits from trade in 1947 remained stable at 44 million.

28% (see table I): if price gaps were due to unobservable costs, these should be almost 75% of all observables costs, including shipping, insurance, inland transport, port charges, export taxes, and processing costs – which seems quite unlikely.

Methodology

Yet, to be able to construct precise estimates of extraction, we need to take these costs into account explicitly. To solve this problem, I regress the actual producer price p_A on the competitive producer price $p - t - s$

$$pA_{cit} = \beta\,(p_{ct} - t_{cit} - s_{cit}) + u_{cit} \qquad (3)$$

where c identifies the commodity, i the colony, t the year, and u_{cit} is the error term.[25] Under the null hypothesis of no colonial extraction, $\beta = 1$ and $p_A = p - t - s$; otherwise $\beta < 1$ and $p_A = \beta(p - t - s)$. The level of extraction can thus be measured as $[(p - t - s) - \beta(p - t - s)]/(p - t - s)$, which is equal to $1 - \beta$. If we have a consistent estimator of β, then we have a measure of colonial extraction.

However, the estimation of β could be inconsistent if trade costs t and s do not include all of the costs that the trading companies had to face to export commodities from Africa to France. To see why, suppose that the true regression is $pA_{cit} = \beta\,(p_{ct} - t_{cit} - s_{cit} - c_{cit}) + v_{cit}$, where c_{cit} represents unobservable costs and v_{cit} is the new error term. Assume $Cov(p,v)=Cov(t,v)=Cov(s,v)=0$. Standard results imply that, estimating β by OLS from (3), $plim\ \beta_{OLS} = \beta\,[\,1 - (\,Cov(p,c)-Cov(t,c)-Cov(s,c)\,)\,/\,Var(p-t-s)\,]$. Thus, if $Cov\,(p,c) - Cov(t,c) - Cov(s,c) > 0$, then the estimated coefficient would be biased against the null hypothesis of no extraction.

Even if it is reasonable to think that the correlation between unobservable costs c and observable costs t and s is positive (implying a likely bias in favor of the null), the correlation between prices in France and omitted costs could also be positive, leaving the direction of the bias ambiguous. To reduce the impact of unobservable factors, I pursue two strategies. First, I control for unobservable costs by using fixed effects. Second, I use world prices as an instrument for competitive producer prices.

Fixed effects

I model unobservable costs as $c_{cit} = k_{ci} + \theta_t$. The first component k captures the differences in unobservable costs due to each commodity-colony; the second component θ captures the

[25] This approach is partly inspired by Atkin and Donaldson (2015).

variation over time, common to all commodities-colonies. This is a mild assumption: I allow unobservable costs to vary across commodity-colony and time, just assuming a common trend over time in all colonies and commodities. In the empirical specification, I implement this idea by including commodity/colony and time fixed effects in equation (2). In this way, the relationship between competitive and actual prices in Africa is identified exclusively from the variation within each commodity/colony over time, after taking into account common time shocks affecting all commodities and all colonies.

Instrumental variables

Another strategy to consistently estimate β is to use instrumental variables. If we find a variable which is correlated with the competitive price and uncorrelated with unobservable trade costs, then we can use it as an instrument to produce consistent estimates of the coefficient β. The index of world prices by Jacks (2013) could serve as such an instrument. World prices are obviously related to African competitive prices, but are very unlikely to be affected by unobservable costs between each French African colony and France since French Africa only accounted for a minimal proportion of total world exports. In the late 1940s, for example, peanuts from Senegal, the main peanuts producer of French Africa, accounted for just 2% of world exports, while cocoa from Ivory Coast, the main cocoa producer, and palm kernels from Cameroon, the main palm kernels producer, accounted for only 4%. Cotton from Chad, its main producer, reached 0.2% of total world exports only after independence. In the earlier years of the colonial period these shares were even lower. In general, variations in world prices are likely to be exogenous since they are due to shocks in world supply and demand and are not affect by local factors.

Results

Tables IV and V report the results. Table IV shows the OLS estimates of the relationship between actual and competitive producer price. To control for differences in inflation, both competitive and actual producer prices are deflated in constant francs by using inflation rates in France and in French Africa (see appendix). In the first column, a simple regression is presented: the coefficient of the relationship is less than one and statistically significant. A one-franc increase in the competitive producer price generates only a 60-cents increase in the actual producer price.

In column (2), I allow for commodity-specific differences in inflation. Instead of deflating prices by inflation rates, I control for commodity-specific price deflators by interacting the

inflation rates in France and French Africa with commodity dummies. In columns (3) and (4), I control for differences in productivity, proxied by the total quantity exported and indexes of soil suitability. These indexes are constructed by FAO by dividing each country in a series of 5x5 km squares and estimating total potential production per hectare in each of these squares for each commodity. My measure of productivity is the average of these values for each colony and commodity, computed with GIS. In all specifications, the coefficient of interest is statistically lower than one, suggesting that the hypothesis of colonial extraction is robust to differences in inflation across commodities and differences in productivity across colonies/commodities.

In column (5), I use fixed effects to control for unobservable factors such as trade risk, uncertainty, and difficult-to-estimate transaction costs. I include both colony/commodity and year fixed effects. The coefficient of the competitive price is still lower than one. Even within the same colony and commodity, taken into account unobservable costs common to all observations in a given year, an increase in the competitive price is reflected in a less-than-proportional increase in the price that African producers received. In addition, it is interesting to notice that the coefficient with fixed effects is actually lower than the one from the simple OLS estimates. This suggest that unobservable costs are likely to bias the coefficient towards one and it is consistent with the fact that observable and unobservable costs are likely to be correlated.

In table V, I pursue the other strategy to control for unobservable cost, by instrumenting the competitive price with the world price index. Each column corresponds to the same specification of table IV, estimated with instrumental variables. Panel A reports the second stage where the actual producer prices is regressed on the instrumented competitive price, while panel B shows the first stage regression of competitive price on the world price index. The first stage shows that, as expected, world prices are positively correlated with competitive producer prices in Africa. In the second stage, the coefficient of the competitive prices is less than one in all specifications.

According to the estimates from most conservative specification (column 5), when the competitive producer price increases by one franc, the actual producer price increases by only 52 cents. In addition, notice that the coefficient from this specification, which includes both instrumental variables and fixed effects, is not statistically different than the coefficient of the simple regression (table IV, column 1). This suggests that unobservable costs play at most

only a minor role and gives us some confidence that the estimates of extraction presented in the section IV are correct.

V.3 Comparing Price Gaps in Competitive Markets

The results of the last section suggest that colonial extraction was particularly high: on average, prices to African producers were only half than what they should have been in presence of competitive markets.

Additional evidence comes from comparing the price gaps from French Africa to those that we observe in other markets not subject to colonial institutions. One first option is to compare price gaps between Africa and France to those between US and UK. The idea is that, if the Africa-France price gap was larger than the gap between the United States and Britain, this would suggest that the difference between prices in Africa and in France cannot be explained by normal market mechanisms, but it is attributable to colonial extraction. To check this, I collected yearly data on wholesale cotton prices in New York and Liverpool between 1903 and 1938.[26] Figure XII reports the (log) percentage price gap in the two markets over time. The results show that the relative price difference between France and the colonies was much larger than the difference between US and UK. Given its magnitude, the result is unlikely to be driven by differences in trading costs.

As another approach, we can look at Persson (2004) who estimates the wheat price gap between UK and US prices as 13.3% of the US price in 1900, shipping costs as 6.9%, and insurance and ports charges as 3%. Prices at the export port were thus about 97% of the competitive price, the residual 3% being explained by inefficient arbitrage. In French African colonial markets, port prices were instead a much lower percentage of competitive prices, ranging from about 60% to 80%.

Alternatively, we could focus on commodities which were mostly produced by European settlers, instead that by African farmers, such as coffee. In this case, one should expect extraction to be lower since settlers could at least partly oppose the monopsonistic policies of trading companies. To check this, I compute extraction rates by using coffee data collected in colonial archives and compared them to the rates that we observe for African-produced commodities (cocoa, cotton, palm kernels, and peanuts). Table VI reports the results. Despite

[26] My sources are the *Historical Statistics of the United States* (1975) and the Mitchell's *Abstract of British Historical Statistics* (1988).

not being zero, extraction for coffee was, as expected, 25% lower than for the other commodities and the difference is statistically significant at 1%.

VI Conclusions

Extractive colonial institutions are considered one of the main causes of current African underdevelopment (Acemoglu, Johnson, and Robinson, 2001; Nunn, 2007). Yet, since colonial extraction is hard to quantify and its precise mechanisms are not well understood, a paucity of research has examined exactly how successful the colonizers were in extracting wealth from Africans.

In this paper, I sought to address this research gap by exploiting the peculiar structure of monopsonistic trade and coercive labor policies employed by the French colonizers. By using a newly-collected dataset of export prices and trade costs, I constructed yearly estimates of extraction at the colony/commodity level for almost the entire colonial period, as proxied by the gap between actual prices to Africans and prices in a counterfactual competitive world. The findings of this research suggest that African prices were substantially lower than world market prices and that this difference cannot be explained by observables trading costs or other unobservable factors. According to the estimates, African producers would have enjoyed prices almost double if the colonizers had not employed extractive institutions.

Having quantified the extent of extraction through trade during the colonial period, the next step is to understand the details of the impact of colonial trade monopsonies and coercive institutions on current economic development. The level of extraction, in fact, varied greatly across colonies and commodities and this variation can help explaining the different paths of growth in African countries and regions. Moreover, there are reasons to believe that the extractive character of these specific institutions persisted in the post-colonial era. Coercive labor institutions were abolished by independence, but trade monopsonies persisted and post-independence governments kept practicing price policies that discriminated against agricultural producers (Bates and Block, 2009). Given our clearer understanding of extraction during colonialism, future research aimed at examining how institutions established in colonial times still affect current agricultural trade policies and economic development is warranted.

References

D. Acemoglu and J. Robinson. Why nations fail: The origins of power, prosperity, and poverty. Crown Publishing Group, 2012.

D. Acemoglu, S. Johnson, and J. Robinson. The colonial origins of comparative development: An empirical investigation. American Economic Review, 91:1369-1401, 2001.

D. Acemoglu, S. Johnson, and J. Robinson. Reversal of fortune: Geography and institutions in the making of the modern world income distribution. Quarterly Journal of Economics, 117: 1232-1294, 2002.

D. Atkin and D. Donaldson. Who's getting globalized? The size and implications of intra-national trade costs. NBER Working Paper No. 21439, 2015.

G. Austin. The “reversal of fortune" thesis and the compression of history: Perspectives from African and comparative economic history. Journal of International Development, 20:996-1027, 2008.

J. Baffes. Distortions to cotton sector incentives in West and Central Africa. World Bank Agricultural Distortions Working Paper 50, 2007.

J. Basset. Price formation and power relations in cotton value chains of Mali, Burkina Faso and Cote d’Ivoire. Report prepared for Oxfam America, 2005.

R. Bates. Markets and States in Tropical Africa: The Political Basis of Agricultural Policies. University of California Press, 1981.

R. Bates and S. Block. Political economy of agricultural trade interventions in Africa. Agricultural Distortions Working Paper, 87, 2009.

D. Berger. Taxes, institutions, and local government: evidence from a natural experiment in colonial Nigeria. Working Paper, 2009.

A. Cameron, Gelbach J. B., and Miller D. L. Robust inference with multi-way clustering. NBER Technical Working Paper No. 327, 2006.

Cameroun. Statistiques Commerciales. Chambre de Commerce du Cameroun, 1935-37.

Cameroun. Annuaire statistique du Cameroun, v.1, 1938/45. Service de la Statistique Générale, 1947.

Engerman S., L. Chaves I. N. and Robinson J. A. Reinventing the wheel: The economic benefits of wheeled transportation in early colonial British West Africa. NBER Working Paper No. 19673, 2013.

C. Coquery-Vidrovitch. Colonialism in Africa, 1870-1970, vol. 1, chapter French Colonization in Africa to 1920: administration and economic development, p. 165-198. Cambridge University Press, 1969.

C. Coquery-Vidrovitch. Le Congo au temps des grandes compagnies concessionnaires, 1898-1930. Mouton De Gruyter, 1972.

E. De Dampierre. Coton noir, café blanc. Deux cultures du Haut-Oubangui à la veille de la loi-cadre. Cahiers d'études africaines, 1(2):128-147, 1960.

E. Domar. The causes of slavery: a hypothesis. Journal of Economic History, 30:18-32, 1969.

P. Duignan and L. H. Gahan. Colonialism in Africa, 1870-1960. Cambridge University Press, 1975.

A. Emmanuel. L`échange inégal. Essai sur les antagonismes dans les rapports economiques internationaux. Editions Franois Maspero, 1969.

P. Englebert. Pre-colonial institutions, post-colonial states, and economic development in tropical Africa. Political Research Quarterly, 53:7-36, 2000.

FAO. Faostat Trade Database, URL http://faostat.fao.org/, 2016.

J. Fenske. Does land abundance explain African institutions? Economic Journal, 123:1363-1390, 2013.

France. Statistiques coloniales. Commerce. Ministère des Colonies. Office Colonial, 1898-1906.

France. Statistiques du commerce exterieur de la France. Direction Générale des Douanes et Droits Indirects, volumes from 1902 to 1959.

France. Statistiques du commerce de colonies françaises. Ministère des Colonies. Office Colonial, 1909-1914.

France. Reinsegnements généraux sur le commerce des colonies françaises. Documents statistiques sur les principaux produits exportés. Ministère des Colonies. Office Colonial, 1920-28.

France. Statistiques du commerce exterieur de l'AEF, 1936-47. Ministère de la France d'Outremer, 1948.

France. Documents et Statistiques, 1949-1967. Ministère de la France d'Outremer, 1967.

France-Inflation.com, URL http://france-inflation.com/, 2013.

E. Frankema. Colonial taxation and government spending in British Africa, 1880-1940: Maximizing revenue or minimizing effort? Explorations in Economic History, 48(1):136-149, 2011.

E. Frankema and M. van Waijenburg. Structural impediments to African growth? New evidence from real wages in British Africa, 1880-1965. Journal of Economic History, 72(4):895-926, 2012.

French Equatorial Africa. Annuaire Statistique de l'AEF, vol. 1936-50 and 1951-55. Service de la Statistique Générale.

French Equatorial Africa. Bulletin economique de l'Afrique Equatoriale Française. Gouvernement Général de l'Afrique Equatoriale Française, 1931-36.

French West Africa. Bulletin de la Statistique Générale de l'AOF, 1946-1956. Service de la statistique générale.

French West Africa. Bulletin mensuel. Agence Economique du Gouvernement Général de l'Afrique Occidentale Française, 1930-39.

French West Africa. Annuaire Statistique de l'Afrique Occidentale Française. Service de la Statistique Générale, 1933-38.

French West Africa. Annuaire Statistique de l'Afrique Occidentale Française. Service de la Statistique Générale, 1949.

French West Africa. Annuaire Statistique de l'Afrique Occidentale Française, 1950-54. Service de la Statistique Générale, 1955.

French West Africa. Bulletin Statistique et Economique Mensuel. Service de la Statistique Générale, 1959-60.

F. Gallego and R. Woodberry. Christian missionaries and education in former colonies: How competition mattered. Journal of African Economies, 19(3):294-329, 2010.

J. Herbst. States and Power in Africa: Comparative Lessons in Authority and Control. Princeton University Press, 2000.

Hopkins. An economic history of West Africa. Columbia University Press, 1973.

E. Huillery. History matters: The long term impact of colonial public investments in French West Africa. American Economic Journal - Applied Economics, 1(2):176-215, 2009.

E. Huillery. The black man's burden: The cost of colonization of French West Africa. Journal of Economic History, 74:1-38, 2014.

D. Jacks. From boom to bust: A typology of real commodity prices in the long run. NBER Working Paper No. 18874, 2013.

R. Jedwab and A. Moradi. Transportation technology and economic change: The impact of colonial railroads on city growth in Africa. Working Paper, Department of Economics, George Washington, University, 2013.

Kerby E. Jedwab R. and A. Moradi. Out of Africa: Colonial railroads, white settlement and path-dependence in Kenya. Working Paper, 2013.

P. Manning. Slavery, colonialism, and economic growth in Dahomey, 1640-1980. Cambridge University Pres, 1982.

P. Manning. Francophone Sub-Saharan Africa 1880-1995. Cambridge University Press, 1998.

S. Michalopoulos and E. Papaioannou. The long-run effects of the scramble for Africa. Working Paper, 2011.

P. Lindert, J. Williamson, and B. Milanovic. Pre-industrial inequality. Economic Journal, 121: 255-272, 2011.

B. Mitchell. Abstract of British Historical Statistics. Cambridge University Press, 1988.

S. Mohammed and J. Williamson. Freight rates and productivity gains in British tramp shipping 1869-1950. Explorations in Economic History, 41(2):172-203, 2004.

W. Moseley and L. C. Gray. Hanging by a Thread: Cotton, Globalization, and Poverty in Africa. Ohio University Press, 2008.

B. Nabe. Les instruments de regulation des prix des produits d'exportation et de la production agricole au Togo (1948-1964). CAMES, Série B, vol. 1, 1999.

N. Nunn. Historical legacies: A model linking Africa's past to its current underdevelopment. Journal of Development Economics, 83:157-175, 2007.

N. Nunn. Religious conversion in colonial Africa. American Economic Review Papers and Proceedings, 100(2):147-152, 2010.

L. H. Officer. Exchange rates between the United States dollar and 41 currencies. Measuring Worth, URL: http://www.measuringworth.com/exchangeglobal/, 2013.

J-P. Peemans. Capital accumulation in the Congo under colonialism: The role of the state. In Colonialism in Africa 1870-1960, volume 4, The Economics of Colonialism by Lewis H. Gann and Peter Duignan, 1975.

K. G. Persson. Mind the gap! Transport costs and price convergence in the nineteenth century Atlantic economy. Journal of Economic History, 02:125-147, 2004.

R. Onyewuenyi. The effect of railway construction on the growth of export-agriculture: the Nigerian experience. Working Paper, Faculty of Environmental Sciences, Caritas University, Amorji-Nike, 2015.

A. Roberts. A history of Zambia. Heineman, 1976.

W. Rodney. How Europe underdeveloped Africa. Bogle-L'Ouverture Publications, 1972.

A. Samir. L'échange inégal et la loi de la valeur. Editions Anthropos, 1973.

J. Suret-Canale. French colonialism in tropical Africa, 1900-1945. Pica Press, 1971.

B. E. Thomas. Railways and ports in French West Africa. Economic Geography, 33(1):1-15, 1957.

V. Thompson and R. Adloff. French West Africa. Stanford University Press, 1957.

Togo. Bulletin statistique mensuel. Service de la Statistique Générale, 1957.

Togo-Cameroun. Bulletin mensuel d'information. Agence économique des territoires africains sous-mandat, 1933-37.

United States. Historical Statistics of the United States, Colonial Times to 1970. Bureau of the Census, 1975.

J. Yeats. Do African countries pay more for imports? Yes. The World Bank Economic Review, 4(1):1-20, 1990.

C. Young. The African colonial State in comparative perspective. Yale University Press, 1994.

Figures and Tables

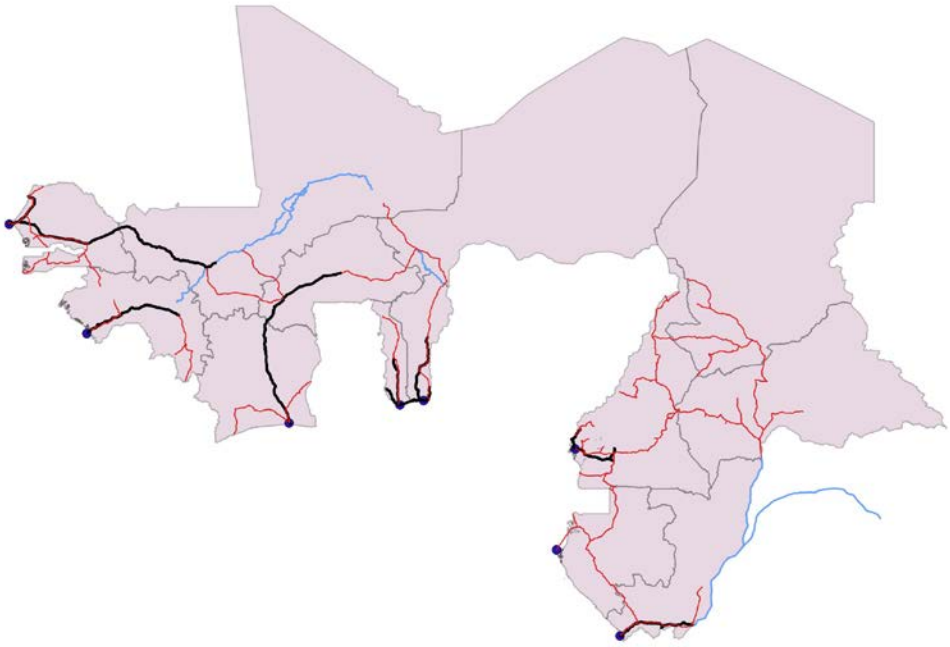


Figure I
Transportation Network in Colonial French Africa, 1950s

The figure represents the transportation network of French Africa during the colonial period, including railroads (black), navigable rivers (blue), roads (red), and main ports (dark blue).

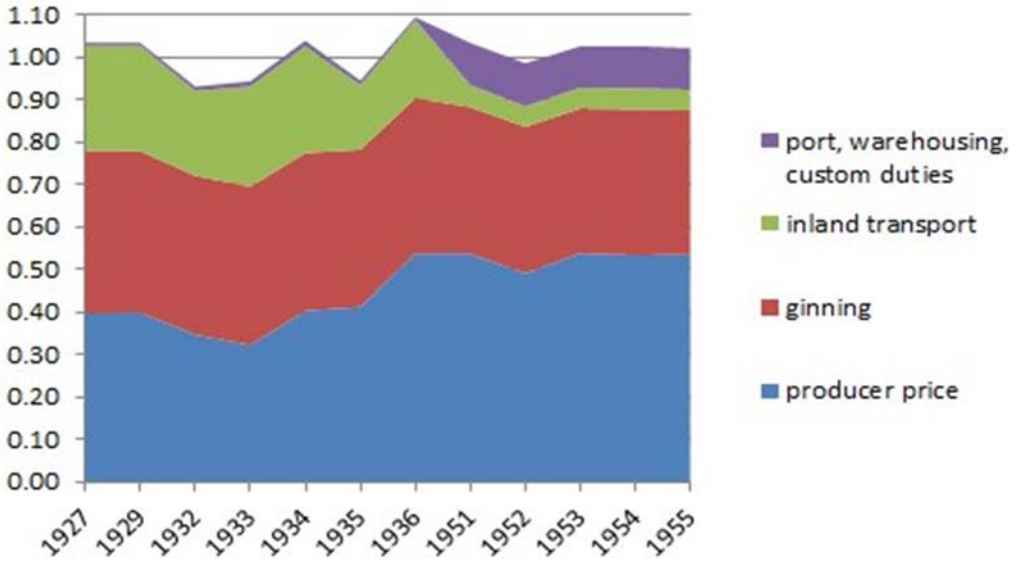


Figure II
Producer Prices and Inland Trade Costs as Percentage of Port Price

Data are for cotton in Ubangi-Shari

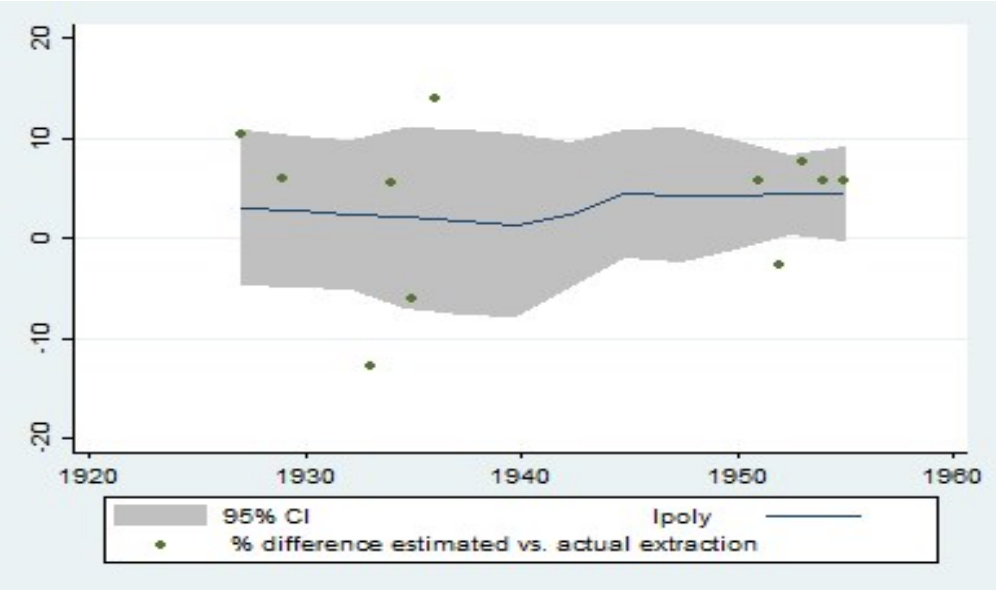


Figure III
Testing the Approach to Estimate Producer Prices

The figure shows the percentage difference between the extraction rate computed from actual producer prices to the one computed from producer prices estimated as the difference between port prices and inland trade costs.

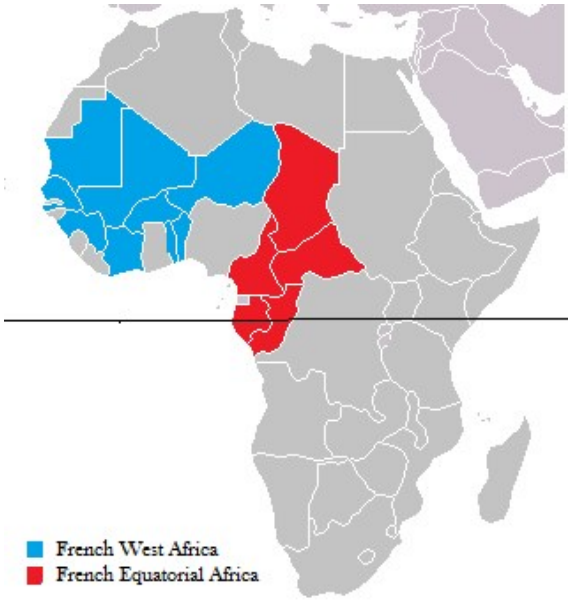
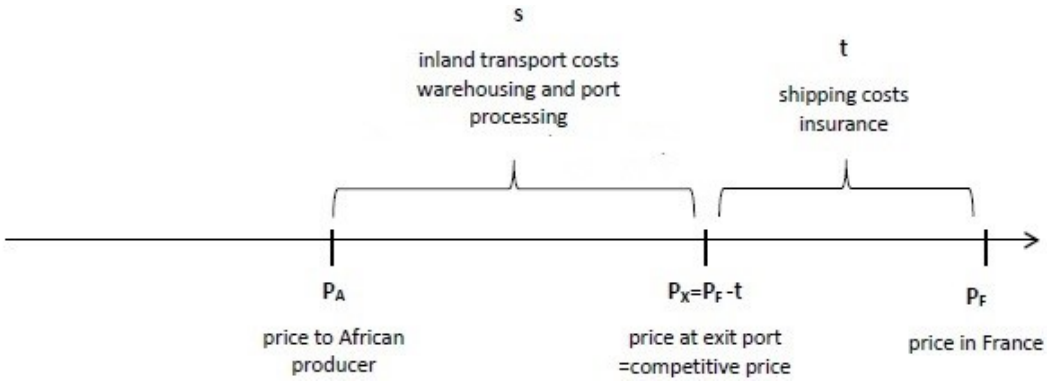
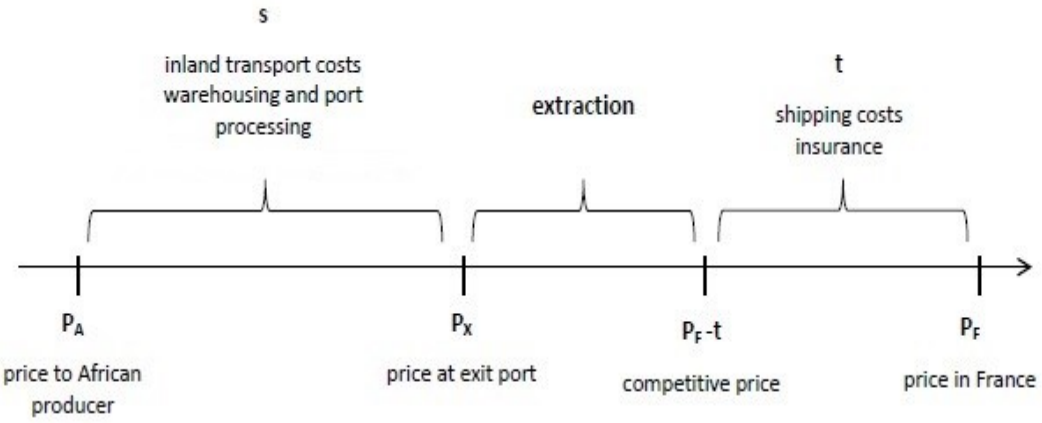


Figure IV
French West and Equatorial Africa

Togo and Cameroon were not formally part of the two main federations, but they were traditionally included in West and Equatorial French Africa, respectively.



(a) Without colonial extraction



(b) With colonial extraction

Figure V
Price Formation With and Without Extractive Institutions

The top and bottom panel report the relationships among price to African producers, at the exit port, price in France, and trading costs, without and with colonial extraction.

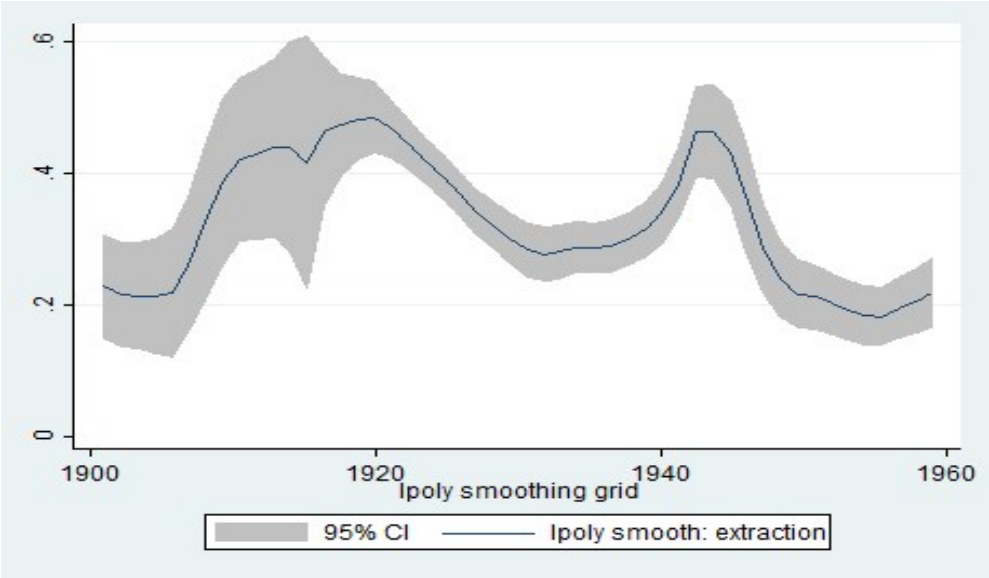


Figure VI
Colonial Extraction over Time (French prices)

The figure shows the trend (local mean smoothing) of colonial extraction, defined as one minus the ratio between actual and competitive price at the producer level. All colonies and commodities are pooled together.

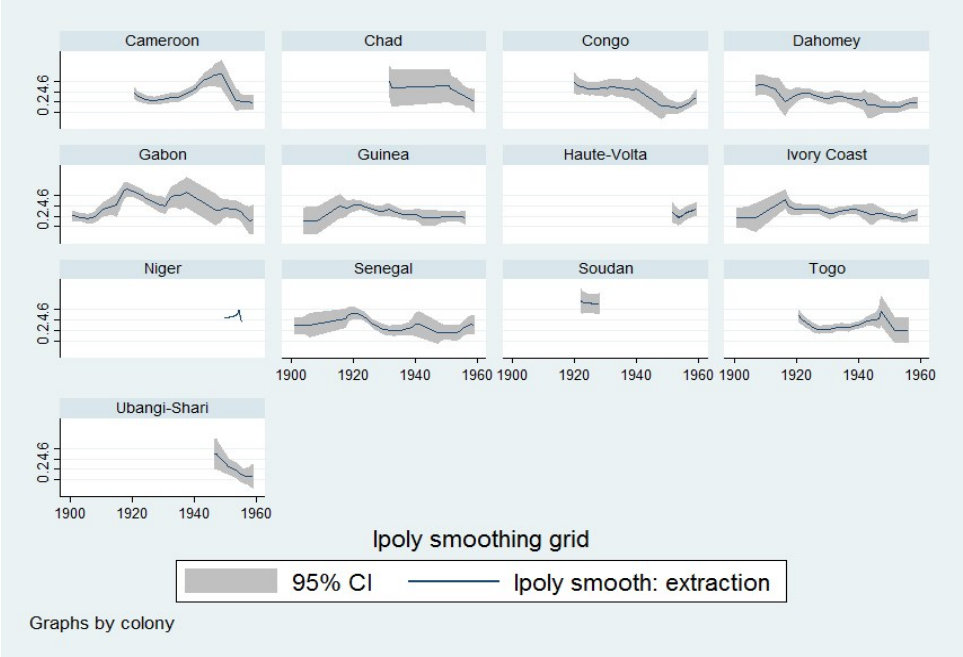


Figure VII
Colonial Extraction over Time, by Colony (French prices)

The figure shows the trend (local mean smoothing) of colonial extraction, defined as one minus the ratio between actual and competitive price at the producer level. Graphs are presented separately by colony.

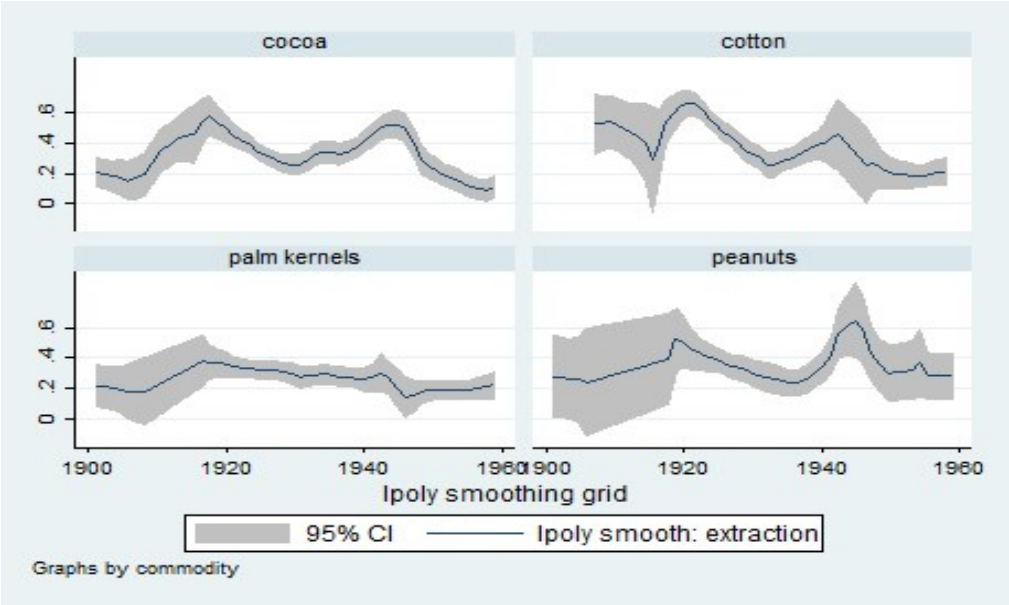


Figure VIII
Colonial Extraction over Time, by Commodity (French Prices)

The figure shows the trend (local mean smoothing) of colonial extraction, defined as one minus the ratio between actual and competitive price at the producer level. Graphs are presented separately by commodity.

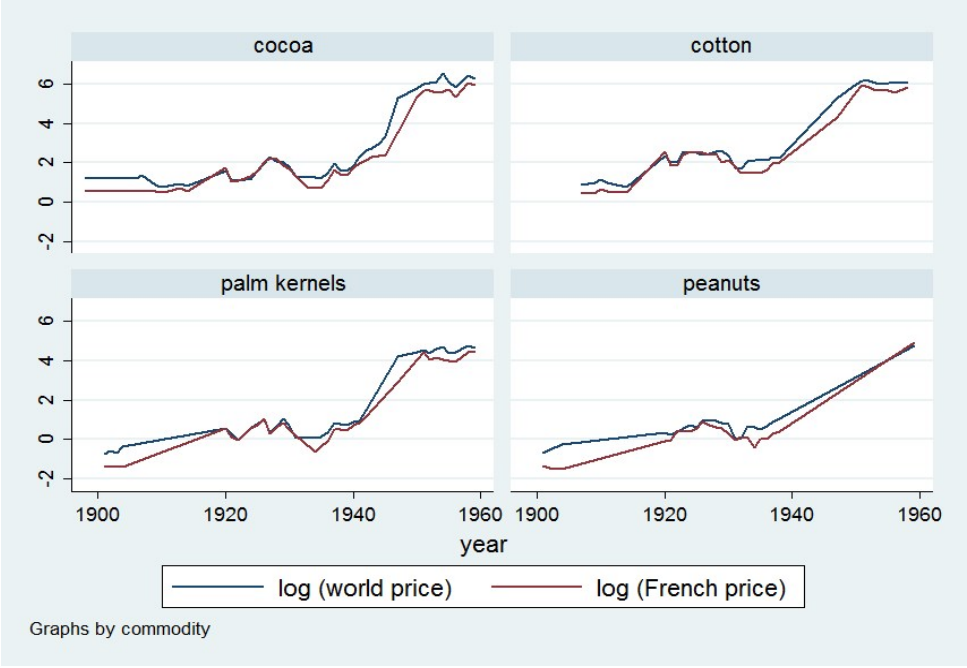


Figure IX
World and French Prices, by Commodity

The figure compares (log) prices at the French ports and world market prices.

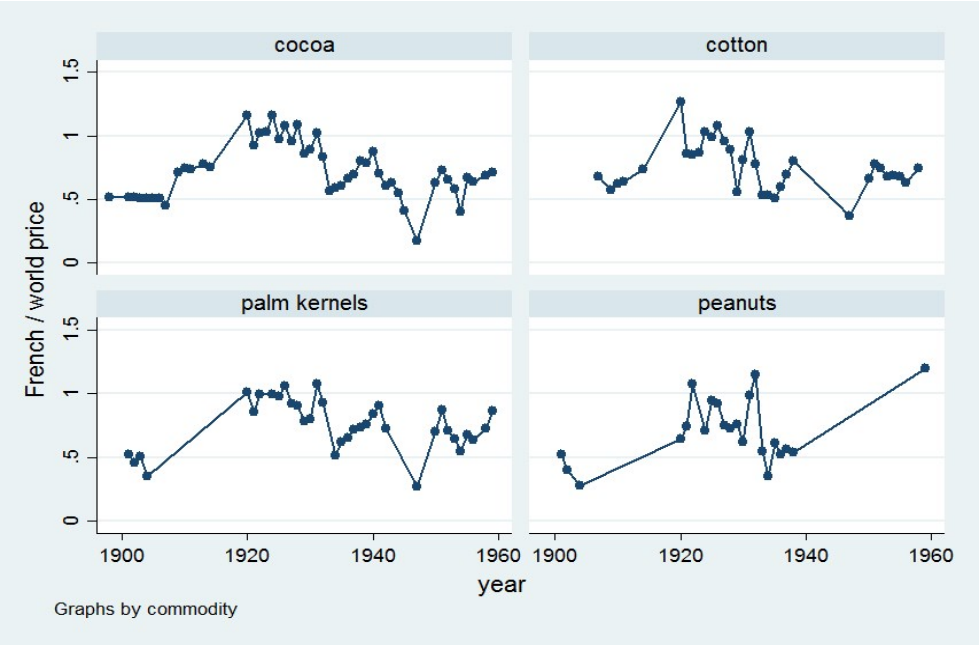


Figure X
French Price as Percentage of World Price, by Commodity

The figure shows the ratio between French and world price, by commodity over time.

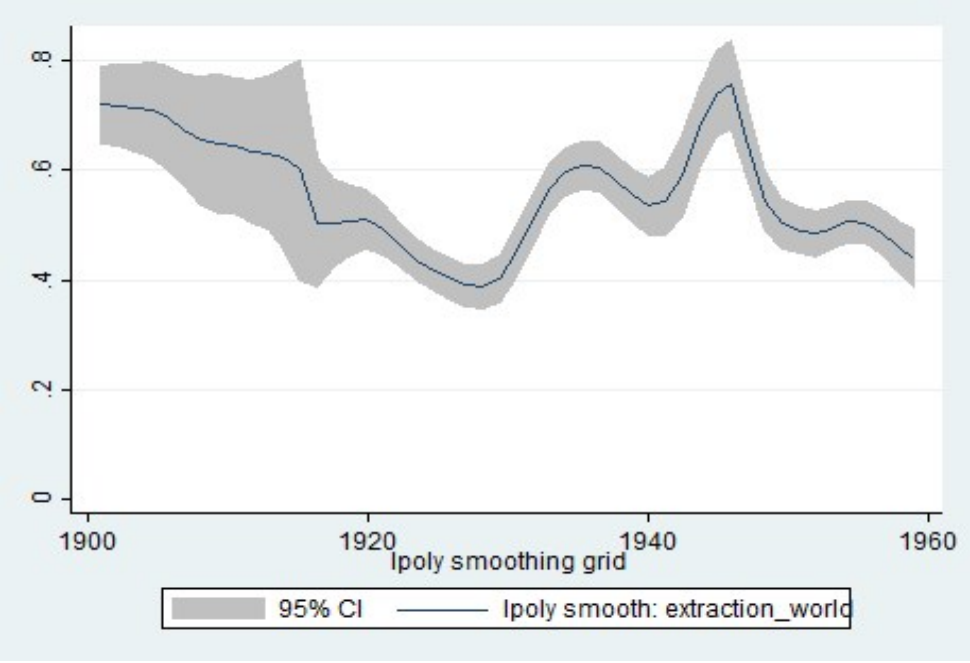


Figure XI
Colonial Extraction over Time (World Prices)

The figure shows the trend (local mean smoothing) of colonial extraction, defined as one minus the ratio between actual and competitive price at the producer level. Competitive prices are computed from world prices. All colonies and commodities are pooled together.

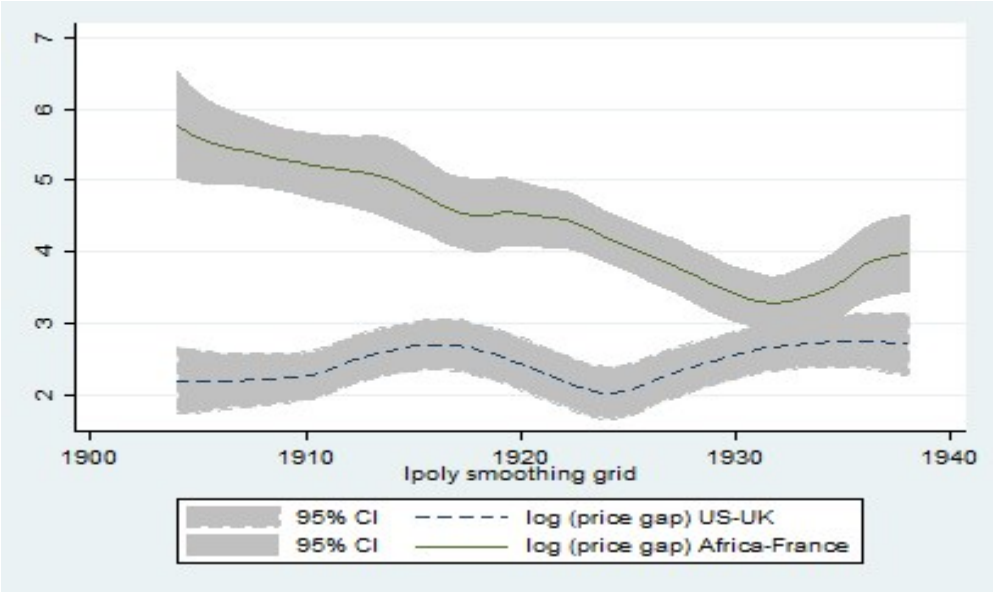


Figure XII
Cotton Price Gap between UK and US vs. France and French Africa

The figure shows the trend (local mean smoothing) of (log) price gaps in the US-UK and in the Africa-France cotton markets. Price gaps are defined as the difference between price at destination and price at the origin, divided by price at the origin.

Table I
Prices in Africa, Trading Costs, and Prices in France

variable	mean	sd	min	max	average % of price at French port
producer price	*22.82*	*55.19*	*0.0032*	*346.60*	*50%*
total trading costs	*11.70*	*30.24*	*0.0892*	*205.99*	*28%*
processing	*4.55*	*19.18*	*0.0000*	*123.98*	*5%*
inland transport	*2.85*	*8.07*	*0.0038*	*64.14*	*10%*
port	*0.32*	*0.75*	*0.0013*	*3.58*	*1%*
export taxes	*1.97*	*6.41*	*0.0000*	*43.74*	*1%*
insurance	*0.40*	*0.88*	*0.0044*	*4.21*	*1%*
shipping	*1.60*	*2.89*	*0.0308*	*13.79*	*10%*
price at French port	*39.80*	*88.20*	*0.2200*	*421.12*	*100%*

Price per kg in current French francs. Trading costs include both cost between the producer and the African port and costs from the African port to the French port. N=448

.

Table II
Testing for Presence of Colonial Extraction

	French port price		compet. prod. price		actual prod. price		correlation	extraction		test extraction=0	N
	mean	st.dev.	mean	st.dev.	mean	st.dev.		mean	st.dev.	p-value	
Overall	39,80	88,20	28,76	65,31	22,82	55,19	0,95	0,32	0,21	0,000	448
By period:											
pre-WW1	1,18	0,76	0,93	0,66	0,63	0,50	0,84	0,29	0,17	0,001	26
1914-1929	5,06	3,98	3,83	2,97	2,21	1,83	0,78	0,39	0,22	0,000	178
1930s	2,57	1,81	1,80	1,32	1,27	0,90	0,88	0,28	0,16	0,000	122
WW2	6,19	3,15	4,68	2,63	2,23	1,51	0,62	0,50	0,22	0,001	23
post-WW2	166,10	121,46	119,72	93,27	97,02	82,12	0,90	0,20	0,15	0,000	99
By commodity:											
cocoa	52,98	113,14	46,41	99,89	38,80	86,96	0,99	0,32	0,18	0,000	113
cotton	75,21	127,17	44,25	74,61	33,87	60,68	0,97	0,39	0,22	0,000	96
palm kernels	20,31	31,10	15,81	24,95	12,59	20,26	0,95	0,27	0,18	0,000	146
peanuts	17,84	37,07	11,67	25,54	8,05	17,80	0,93	0,33	0,23	0,000	93
By colony:											
Cameroon	28,37	86,48	22,78	74,06	18,78	66,09	0,96	0,34	0,21	0,008	57
Chad	171,22	150,51	68,73	66,77	45,16	45,98	0,97	0,39	0,21	0,075	6
Congo	58,55	89,74	45,49	77,17	39,16	72,30	0,97	0,34	0,23	0,000	26
Dahomey	42,63	90,16	30,12	59,29	24,99	50,22	0,99	0,28	0,19	0,032	60
Gabon	55,73	117,15	47,08	103,41	37,87	87,46	0,99	0,41	0,24	0,198	40
Guinea	15,17	36,04	11,94	30,36	8,89	22,60	1,00	0,29	0,17	0,007	44
Haute-Volta	200,87	121,04	139,03	78,21	98,46	56,14	0,95	0,30	0,16	0,126	4
Ivory Coast	51,83	96,35	39,75	73,15	31,69	61,59	0,98	0,28	0,16	0,001	71
Niger	91,73	14,02	40,56	11,59	22,90	3,72	-1,00	0,40	0,18	.	3
Senegal	15,06	43,03	12,77	37,24	9,71	30,35	1,00	0,31	0,19	0,007	56
Soudan	6,90	4,96	4,23	3,36	1,45	1,84	0,78	0,74	0,23	0,087	9
Togo	9,61	33,66	7,21	23,56	4,92	15,55	0,99	0,29	0,18	0,006	61
Ubangi-Shari	178,19	147,91	98,44	75,64	80,71	62,42	0,98	0,19	0,21	0,035	11

Correlations between French port price and actual producer prices are reported. Standard errors are clustered at the colony/commodity level.

Table III
Testing for Presence of Colonial Extraction

	French port price		**competitive prod. price**		**actual prod. price**		**correlation**	**extraction**		**test extraction=0**	N
By period and commodity:		st.dev.	mean	st.dev.	mean	st.dev.		mean	st.dev.	p-value	
COCOA											
pre-WW1	1,77	0,12	1,51	0,21	1,11	0,26	-0,31	0,26	0,17	0,127	12
1914-1929	5,73	2,42	5,09	2,30	3,43	2,02	0,88	0,35	0,20	0,001	45
1930s	3,36	1,23	2,90	1,20	2,00	0,98	0,92	0,32	0,11	0,000	26
WW2	8,59	1,97	6,97	1,37	3,32	1,37	0,33	0,52	0,16	0,099	11
post-WW2	290,85	88,41	255,01	82,69	217,27	81,33	0,96	0,17	0,10	0,001	19
COTTON											
pre-WW1	1,71	0,16	1,15	0,14	0,52	0,08	0,45	0,55	0,08	.	4
1914-1929	10,62	2,56	7,37	2,05	3,48	1,66	0,60	0,52	0,21	0,000	44
1930s	5,19	1,20	3,16	1,00	2,15	0,51	0,64	0,30	0,14	0,000	26
WW2	.	.	.	.	.	.	.	.	.	.	0
post-WW2	300,50	64,28	174,41	46,14	138,20	43,07	0,68	0,20	0,16	0,000	22
PALM KERNELS											
pre-WW1	0,25	0,00	0,15	0,01	0,12	0,02	0,46	0,21	0,13	0,075	7
1914-1929	1,91	0,62	1,46	0,56	0,99	0,53	0,67	0,34	0,20	0,001	52
1930s	1,15	0,42	0,80	0,38	0,62	0,35	0,91	0,26	0,17	0,001	38
WW2	2,56	0,57	1,70	0,39	1,14	0,40	0,60	0,34	0,15	0,228	6
post-WW2	65,23	20,25	50,94	18,88	40,81	16,15	0,72	0,19	0,16	0,000	43
PEANUTS											
pre-WW1	0,24	0,02	0,12	0,02	0,09	0,02	0,88	0,26	0,08	0,102	3
1914-1929	2,08	0,50	1,44	0,48	0,94	0,47	0,58	0,36	0,24	0,003	37
1930s	1,46	0,46	0,96	0,36	0,74	0,36	0,64	0,25	0,18	0,005	32
WW2	5,45	2,53	3,46	1,61	1,31	1,01	-0,13	0,61	0,31	0,237	6
post-WW2	100,13	19,16	65,33	24,57	45,45	17,16	0,25	0,29	0,16	0,000	15

Correlations between French port price and actual producer prices are reported. Standard errors are clustered at the colony/commodity level

Table IV
Relationship between Competitive and Actual Producer Price (OLS estimates)

	(1)	(2)	(3)	(4)	(5)
competitive producer price, deflated	0.602***		0.600***	0.599***	0.352***
	(0.088)		(0.090)	(0.085)	(0.120)
competitive producer price		0.682***			
		(0.099)			
quantity (in 000s tons)			-0.000159		
			(0.000251)		
cotton productivity				-0.169	
				(2.230)	
cocoa productivity				0.203	
				(0.400)	
palm kernels productivity				-0.023	
				(0.237)	
peanuts productivity				-0.010	
				(0.29)	
N	448	448	448	448	448
R-sq	0.50	0.98	0.50	0.51	0.83
commodity fixed effects		yes			
inflation France*commodity		yes			
inflation French Africa*commodity		yes			
commodity*colony fixed effects					yes
year fixed effects					yes

***, **, and * indicate statistical significance at 1%, 5%, and 10% level with standard error clustered at the colony/commodity level.

Table V
Relationship between Competitive and Actual Producer Price (IV estimates)

	(1)	(2)	(3)	(4)	(5)
PANEL A					
Second Stage: dependent variable is the actual producer price					
competitive producer price, deflated	0.336*		0.326*	0.429**	0.523***
	(0.169)		(0.171)	(0.184)	(0.154)
competitive producer price		0.528**			
		(0.237)			
quantity (in 000s tons)			-0.000492**		
			(0.000210)		
cotton productivity				-0.746	
				(3.07)	
cocoa productivity				0.0419	
				(0.577)	
palm kernels productivity				0.0649	
				(0.343)	
peanuts productivity				0.143	
				(0.415)	
N	448	448	448	448	448
R-sq	0.400	0.978	0.398	0.472	0.821
commodity fixed effects		yes			
inflation France*commodity		yes			
inflation French Africa*commodity		yes			
commodity*colony fixed effects					yes
year fixed effects					yes
PANEL B					
First Stage: dependent variable is the competitive producer price					
world price index	0.450*	1.080***	0.440*	0.494**	1.310***
	(0.226)	(0.181)	(0.22)	(0.235)	(0.172)
F-stat IV	3.98**	35.63***	4.01*	4.42**	57.87***

***, **, and * indicate statistical significance at 1%, 5%, and 10% level with standard error clustered at the colony/commodity level.

Table VI
Comparing Extraction between Peasant and Settler Commodities

	coffee	other commodities
mean	0.24	0.32
dev.st.	0.19	0.21
25th percentile	0.13	0.17
median	0.21	0.28
75th percentile	0.28	0.44
obs.	98	448

The table compares extraction measures of commodities mainly produced by settlers (coffee) and by African farmers (cocoa, cotton, peanuts, and palm).

Price Data Appendix[27]

Prices in Africa

I obtained price in Africa by diving the total value by the total quantity of exports. Quantities are in tons. Values in Africa are either in French francs or in francs CFA (franc des Colonies françaises d'Afrique). The conversion rate is 1 franc CFA=1 FF before 1946, =1.7 FF between 1946 and 1948, =2 FF after 1949. Exchange rates between francs, pounds, and dollars come from Officer (2013). The sources are: *Statistiques coloniales. Commerce* volumes from 1898 to 1906; *Statistiques du commerce des colonies françaises*, volumes from 1907 to 1914 (excluding 1908); *Renseignements généraux sur le commerce des colonies françaises et la navigation* volumes from 1920 to 1928; *Bulletin Economique de l'Afrique Equatoriale française*, volumes from 1931 to 1936; *Bulletin mensuel de l'Agence économique de l'Afrique Occidentale Française*, volumes from 1930 to 1939; *Bulletin mensuel d'information. Cameroun, Togo*, volumes from 1933 to 1937; *Annuaire statistique de France*, volumes from 1930 to 1935; *Annuaire Statistique de l'AOF, 1933-38*; *Chambre de Commerce du Cameroun. Statistiques Commerciales 1935-37*; *Statistique du Commerce Exterieur de l'AEF, 1936-47*; *Annuaire Statistique du Cameroun, 1938-45*; *Annuaire Statistique de l'AOF et du Togo* volumes 1949 and 1950-54; *Annuaire Statistique de l'AEF* volumes 1936-50 and 1951-55; *Bulletin de la Statistique Générale de l'AOF*, 1956*; Bulletin Statistique Mensuel du Togo*, 1957*; Bulletin Mensuel Statistique et Economique 1959-60; Ministère de la France d'Outremer, Documents et Statistiques*, 1949-67. For some colonies and years, sources are not available. In particular: *1922,*1945-55, 1957-59 for Togo; 1922-23, 1929-31, 1946-57 for Cameroon; 1908, 1915-19, 1954-55, 1957 for West Africa colonies; 1908, 1915-19, 1956-57 for Equatorial Africa colonies.

Prices in France

I obtained them by dividing the total value by the total quantity of imports to France from the colonies. The sources are *Statistiques du commerce extérieur de la France*, volumes from 1902 to 1959, and various issues of the *Annuaire Statistique de France*.

Inflation and Currencies

Prices in Africa were quoted in francs CFA (francs of the *Communauté Financiére d'Afrique*), while prices in France were quoted in French francs (FF). To ensure comparability, I converted all African

[27] Details about the sources used for each specific colony, commodity, and year are available upon request.

prices in French francs by using official exchange rates: parity until 1945, 1.7 FF per franc CFA between 1946 and 1948, and 2 FF after 1948.

In addition, since prices refer to different years, one might worry that differences in prices might just be due to differences in inflation between Africa and France. To solve this problem, I deflated French prices by a France-specific deflator and African prices by an African-specific deflator. Trade costs were also deflated by the same location-specific deflator according to whether they were paid in France or in Africa. To choose among possible deflators (CPI, GDP deflator, or consumer price index), I followed Jacks (2013) who suggests that using the CPI is the standard procedure in the literature. Data on the French CPI come from France-Inflation.com (2013). The African CPI was computed with the following procedure. Since I did not have direct data on consumer prices in the French colonies, I used data on the British colonies from Frankema and Van Waijenburg (2012) and assumed that inflation in French Africa was related to inflation in British Africa proportionally to the ratio between the inflation in France and in Great Britain. As a robustness check, in the regression analysis I also took into account the possibility of commodity-specific differences in inflation by interacting French and African CPI with commodity dummies.

European Historical Economics Society

EHES Working Paper Series

Recent EHES Working Papers

2016

EHES.108 Between war and peace: The Ottoman economy and foreign exchange trading at the Istanbul bourse
Avni Önder Hanedar, Hatice Gaye Gencer, Sercan Demiralay and İsmail Altay

EHES.107 Why did Argentina become a super-exporter of agricultural and food products during the *Belle Époque* (1880-1929)?
Vicente Pinilla and Agustina Rayes

EHES.106 Plague and long-term development: the lasting effects of the 1629-30 epidemic on the Italian cities
Guido Alfani and Marco Percoco

EHES.105 The mining sectors in Chile and Norway, ca. 1870 -1940: the development of a knowledge gap
Kristin Ranestad

EHES.104 Accounting for the 'Little Divergence' What drove economic growth in pre-industrial Europe, 1300-1800?
Alexandra M. de Pleijt and Jan Luiten van Zanden

EHES.103 Spain's Historical National Accounts: Expenditure and Output, 1850-2015
Leandro Prados de la Escosura

EHES.102 Darwin beats Malthus: Medicalization, Evolutionary Anthropology and the Demographic Transition
Katharina Mühlhoff

EHES.101 You Reap What You Know: Observability of Soil Quality, and Political Fragmentation
Thilo R. Huning and Fabian Wahl

All papers may be downloaded free of charge from: www.ehes.org

The European Historical Economics Society is concerned with advancing education in European economic history through study of European economies and economic history. The society is registered with the Charity Commissioners of England and Wales number: 1052680