The Integration of West Africa in the Global Economy, 1842-1938

Nektarios Aslanidis[*], Oscar Martinez[†], Federico Tadei[‡]

Abstract

Despite the essential role that international trade has historically played for resource-rich African economies, growth possibilities have been hindered by considerable trade barriers. Yet, in the large literature on commodity market integration, Africa is a blank spot and little is known about the origins of high trade costs in the African export markets. In this article, we contribute to fill this gap by analyzing West African trade costs from the mid-nineteenth century to the eve of World War II. We construct estimates of international trade costs by applying a flexible threshold model to a representative sample of West African export prices and European import prices. Our results show that trade costs for West Africa experienced a substantial reduction from the 1840s to 1880, similar to the one we observe in other areas of the world. After the 1880s, however, they declined in the rest of the world, but not in West Africa. Consequently, since the late nineteenth century, trade for West Africa became relatively more expensive than for other world regions and Africa became relatively less integrated into the global economy. Our findings shed new light on the debate about the origins of African underdevelopment by emphasizing the role of increased trade costs and limited access to global markets.

Keywords: Market Integration; West Africa; Commodity Trade; Trade Costs; Threshold Autoregressions

JEL classification: F1; N7; O43

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1. Introduction

Africa's development and economic well-being are heavily dependent on the export of primary products (Deaton, 1999; Jerven, 2011). Still, despite the essential role that external trade played for African economies especially during the nineteenth-century commodity export boom, little is known about trade costs and about the process of integration of African export markets into the world economy. From the large literature on commodity market integration in the nineteenth and twentieth-century, we have a good knowledge of international trade costs between Europe, the Americas, and Asia (Jacks, 2005 and 2006; Jacks, Meissner and Novy, 2011; Federico, 2012, Hynes, Jacks, and O' Rourke, 2012; Chilosi and Federico, 2015, among others), yet Africa is still a blank spot. Was Africa different compared to the rest of the world? Did Africa suffer from higher international trade costs than other world regions?

In this article, we contribute to fill this gap by analyzing the integration of Africa with the international markets from the mid-nineteenth century to the eve of World War II. To do so, we provide estimates of international trade costs, by applying threshold autoregressions (Jacks, 2005; Hynes, Jacks and O' Rourke, 2012) to a representative sample of West African export prices and corresponding European import prices. In particular, we focus on palm oil and cocoa exports from the Gold Coast (roughly correspondent to modern-day Ghana), Nigeria, and Sierra Leone. Palm oil and cocoa were in fact the two most important commodities exported from West Africa to Great Britain in the nineteenth and early twentieth centuries respectively, while the Gold Coast, Nigeria, and Sierra Leone accounted for a major part of West African trade.

Our approach enables a more in-depth analysis of West African markets than attempted in previous studies[1]. First, it allows us to offer a systematic and finely detailed quantitative

[1] A relatively large literature has focused on inland transport costs, by developing maps of colonial infrastructure and estimating their impact. Chaves, Engerman, and Robinson (2014) analyzed the benefit of wheeled transportation in British Africa, while Bertazzini (2018) looked at the role of roads in Ethiopia, Somaliland, and Eritrea. Jedwab and Storeygard (2019) constructed a database of railways in Africa between 1862 and 2015. Jedwab, Kerby, and Moradi (2015), Jedwab and Moradi (2016), Okoye, Pongou, and Yokossi (2017), and Herranz-Loncan and Fourie (2018) focused on railroads in Kenya, Ghana, Nigeria, and the Cape

assessment of the evolution of international trade costs over a longer period since the beginning of the "commercial transition" from slave to commodity exports (Law, 1995). Second, our methodology let us assess the development of West African trade costs in a global comparative perspective, answering the question of whether and when the relatively high African trade costs arose.

We consider trade costs in a broad sense as in Anderson and van Wincoop (2004) and Jacks (2005), among others. Trade costs are defined as "all costs incurred in getting a good to a final user other than the marginal cost of producing the good itself" (Anderson and van Wincoop 2004, p. 691). Following Federico and Chilosi (2015), these trade costs consist of all transaction costs, inclusive of monopoly mark-ups. In the case of Africa, monopoly mark-ups are particularly relevant due to the activity of colonial trading companies, which increased the cost of African producers in accessing world commodity markets. Other components of trade costs include observable barriers to trade (e.g., transportation costs, brokerage and insurance costs, storage costs, policy barriers, tariffs, and spoilage) and other costs which are more difficult to observe such as costs related to information (Steinwender, 2018), contract enforcement, and regulations.

Our results show that international trade costs for West Africa decreased considerably during the time of the "commercial transition" from the early 1840s to around 1880, with a similar decline being also observed in other world regions due to the introduction of new shipping technologies and the liberalization of commercial policies. After the 1880s, however, trade costs continued to decline in the rest of the world, but not in West Africa, as a consequence of the Long Depression of 1873-1896 and the increase in monopsony

Colony, respectively. Tadei (2018) and Tadei (2020) collected estimates of inland transport costs for French West and Equatorial Africa.

International trade costs have been somewhat disregarded. Some papers provide information only on specific components of international trade costs, such as freights. Limiting our review to Africa, Pascali (2017) gathered data on freight rates between the UK and Algeria, Cape Verde, Cape of Good Hope, Mauritius, Sierra Leone, and Tunisia in the second half of the nineteenth century. Federico and Tena (2019) collected freight rates between the UK and Alexandria, Cape Verde, and Cape Town between 1848 and 1938.

Most closely related to our work are Tadei (2020) who estimated international trade costs for French West and Equatorial Africa and Tadei (2020b) who extended these estimates to British West and East Africa. In both cases, however, the estimates are limited to the first half of the twentieth century, not allowing to evaluate the evolution of African trade costs in the long run.

power of colonial trading companies after the Scramble for Africa. In the twentieth century, until World War I, trade costs were on the decline again across the globe. Yet since the 1920s, and in particular during the Great Depression, West African trade costs became more volatile and rose more rapidly than in other world regions. Overall, since the late nineteenth-century trade for West Africa became relatively more expensive than for the rest of the world.

To the best of our knowledge, this paper provides the first systematic estimates of West African trade costs from the mid-nineteenth century to World War II, allowing us to compare the process of integration in the global economy of Africa to those experienced by the other world regions.

The rest of the paper is structured as follows. In Section 2, we describe the price data. In Section 3, we discuss the historical and institutional background of West African trade. Section 4 presents the empirical strategy that we adopt to estimate international trade costs. The main results of the paper are shown and discussed in Section 5, while Section 6 draws comparisons between international trade costs for West Africa and the rest of the world. Section 7 provides concluding remarks.

2. Data

To estimate trade costs, we use annual data on palm oil exports from Sierra Leone (1842-1938), Nigeria (1865-1938) and Gold Coast (1875-1938) and data on cocoa exports from Nigeria (1888-1938) and Gold Coast (1892-1938). African port prices are unit values of the exported item (total export value over total quantity) and are obtained from the African Commodity Trade Database (Frankema, Williamson and Woltjer, 2018). The original sources are colonial yearly custom statistics, which reported the total value and the total quantity of exports by commodity.

British wholesale palm oil prices come from Sauerbeck (1886, 1893, 1908, 1917), The Statist (1930, 1950) and the Liverpool Mercury as reported in Lynn (1997), while British cocoa prices come from Federico-Tena (2019) World Trade Database and are originally

obtained from the Trade Statistics of the United Kingdom. We convert all prices in British pounds per ton.

Our focus on West Africa is justified because the "commercial transition" from slave to commodity exports occurred first there and only later in Central and East Africa (Frankema, Williamson, and Woltjer, 2018). Similarly, starting the analysis in 1842 is motivated by the fact that it was in the 1840s that the value of commodity exports from West Africa overcame the value of slave exports (see Frankema, Williamson, and Woltjer (2018), Figure 1, p. 234).

Our study is based on three West African major export markets, namely the Gold Coast, Nigeria, and Sierra Leone, which were highly representative of West African trade flows. Figure 1 plots the share of these three markets over the total value of exports from West Africa. On average, Gold Coast, Nigeria, and Sierra Leone accounted for more than one-third of all West African exports, share which tended to increase towards the end of the period.

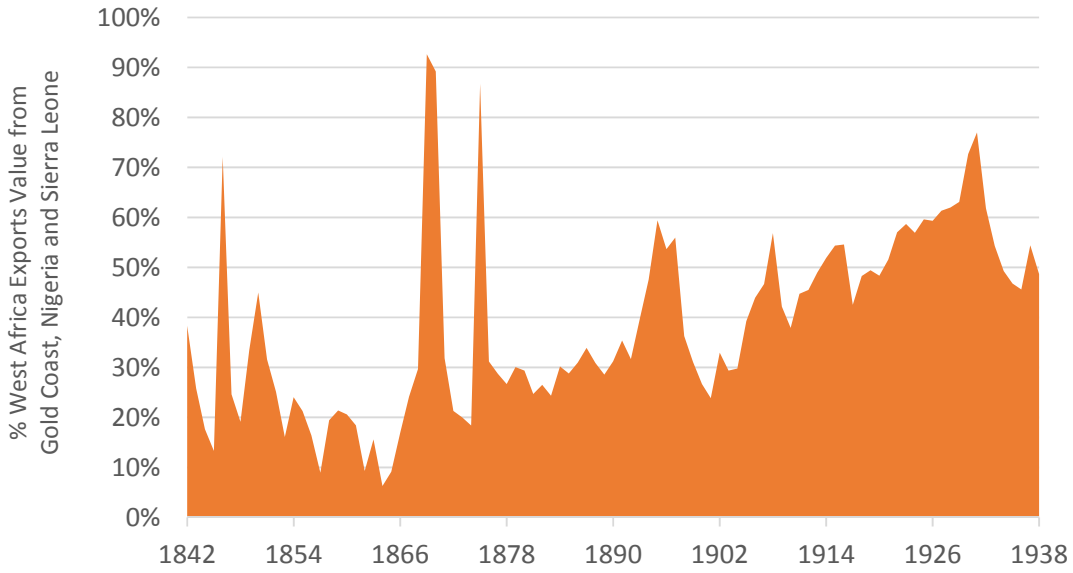

Figure 1. *Percentage of West African exports from Gold Coast, Nigeria, and Sierra Leone*

Source: African Commodity Trade Database (Frankema, Williamson and Woltjer, 2018)

Palm oil and cocoa represented the bulk of their exports. Palm oil was West Africa's most important export commodity in the nineteenth century. Cocoa exports picked up only

later in the early twentieth century becoming afterward the major commodity (see Figure 2). In addition to their representativeness, these two commodities were exported from more than one colony in our sample, so the obtained trade cost estimates are not colony-specific.

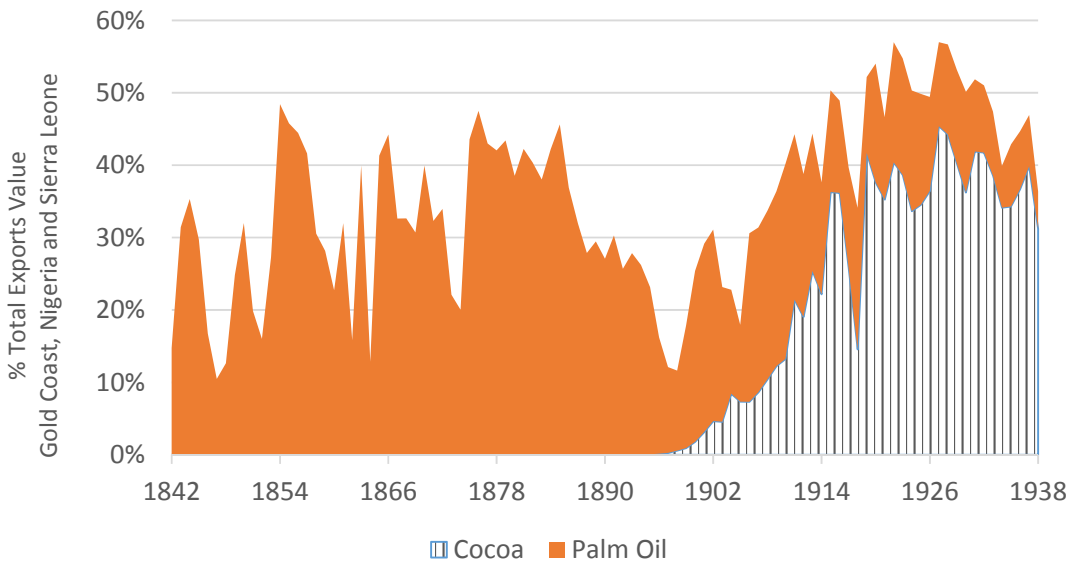

Figure 2. *Percentage of palm oil and cocoa over total exports value from Gold Coast, Nigeria, and Sierra Leone*

Source: African Commodity Trade Database (Frankema, Williamson and Woltjer, 2018)

Following Federico and Chilosi (2015), using price gaps between the two markets to estimate trade costs requires three conditions.

(1) First, there must be actual trade between the two markets, otherwise, there is no arbitrage, and prices move independently from each other. In our case, this condition is satisfied since Britain was the main trading partner of West Africa.

(2) Second, the quality of goods must be the same in export and import markets. Since for Gold Coast, Nigeria, and Sierra Leone, Britain was the main destination market accounting for two-thirds of their overall exports (estimation from the RiCardo Project, Dedinger and Girard, 2017) and, at the same time, most of the British palm

oil and cocoa imports came from West Africa, then the qualities of goods in the two markets were comparable[2].

(3) Third, the traded goods must be representative of trade flows between the two markets. As stated in our previous analysis in Figures 1-2, this requirement is well satisfied.

Overall, our dataset not only is particularly appropriate to estimate trade costs, but also sheds light on important events in African economic history such as the commercial transition, the Scramble and the beginning of the colonization, and the role of global shocks such as World War I and the Great Depression.

3. Historical and Institutional Background

To understand how such events impacted the integration of Africa into the world economy, in this section, we provide a short overview of the historical setting. For palm oil trade, in particular, we refer to Lynn (1997), while for cocoa to Gordon (2009).

For West Africa, the nineteenth century marked the beginning of legitimate trade with palm oil being, at least initially, the most important commodity. West Africa was the world's leading supplier of palm oil during most of this period. However, the development of the palm oil trade did not represent a break in West Africa's economic history. Specifically, during the first half of the nineteenth century, the palm oil trade was determined to a large degree by the foundations, organization, and practices (port facilities, merchant relations, and credit instruments) that had characterized the slave trade era. Palm oil commerce relied heavily on shipping (initially on sail but later in the century on steam) and on water transportation by canoes, making extensive use of broking and trading networks established during the slave trade. Slave labor was used in the production as well as in the transportation of palm oil.

[2] For example, between 1934-1938 British cocoa imports from West Africa amounted to around 91 percent of total British cocoa imports (see Montgomery and Taylor (1947), Table 74, p. 138-139). In the case of palm oil, as we will discuss in Section 3, West Africa was the largest producer in the world with Britain being the main destination market (Lynn, 1997, p. 12).

Palm oil merchants were largely British and bought palm oil from West Africa (from the regions of Bonny, Old Calabar, Elem Kalabari, among others) and shipped it to major British ports (Liverpool, Bristol, and London). By the 1850s, palm oil was by far the most important West African export, while Britain had become the largest importer of palm oil in the world. The determinant factor here was the industrialization of Britain and the soaring demand that this generated for raw materials and industrial intermediates (e.g., fuels, oils, fibers). Furthermore, palm oil was a lubricant for industrial machinery and railway stock, and an important ingredient in the manufacture of soap, candles, and tinplate production. During this period, the merchant community was thriving. From the middle of the century, trade in palm kernels also grew with Germany becoming the major importer of palm kernels, suggesting an increasing integration of West Africa into the world market.

Until the middle of the nineteenth century, there were the formidable barriers to entry into the palm oil trade which derived from the way it was structured (high start-up capital, large costs for buying or chartering shipping, expert knowledge and experience of the African market). However, later in the century, the adoption of steamship propulsion as a new transport technology represented a major change in the organization and practices of the palm oil trade. In particular, it significantly reduced risks, while opening at the same time the palm oil market to new sources of competition, with several French and German entering the trade. Furthermore, technological change increased the incentives to access the British market of exporters of other oils (petroleum together with its derivative kerosene, or cotton oil) and the opening of the Suez Canal in 1869 increased competition from other palm oil-producing regions (India, South East Asia, Australia).

Overall, the second half of the 19th century saw falling palm oil prices and a reduction in the value of trade. In the 1890s, the US tariff policies hit the British tinplate manufacture, causing a drop in the demand for palm oil. During the oil price declines of the 1880s and 1890s, amalgamations (e.g., the African Association in 1889) were put forward as a way to face difficulties in the palm oil market, while some palm oil producers switched to palm kernel. However, the increase in the value of palm kernel exports from West Africa failed

to compensate for the decline in returns from palm oil trade and cocoa became the focus of economic activity especially in the Gold Coast.[3]

In subsequent years, cocoa was to witness the most spectacular growth of all West African cash crops. With the increasing commercialization of the chocolate production and the invention of new cocoa presses, it became the most important West African export since the end of the nineteenth century. By 1911, the Gold Coast was the world's largest producer of cocoa beans and Africa overtook Latin America from 1919 onwards.

As with palm oil trade, cocoa trade made use of existing African broking and trading networks up until the 1930s. Cocoa cultivation had a particularly noticeable influence on the occupation of land, being a perennial crop with a life span of around 50 years. As a result, there were significant organizational innovations in this period. Cocoa farmers in the Gold Coast and Nigeria, for example, formed companies or lineage groups in order to buy land collectively and organize labor recruitment. Cocoa production earned many farmers prosperity and the Gold Coast became one of the richest colonies until independence.

Technological and infrastructural developments during the 1910s and 1920s, such as the construction railways, helped to spread cocoa very fast. However, in the 1930s cocoa prices experienced a sharp fall with producers expanding output in order to compensate for the fall in prices but without success.

4. Empirical Strategy

Overall, palm oil and cocoa exports played a fundamental role in the development of West Africa. Yet, their importance can be fully understood only by analyzing the integration of West African markets in the global economy.

A relevant element in the process of market integration is trade costs. To measure them, we use a threshold autoregression (TAR) model, first developed by Tsay (1989). This approach is generally considered as 'state-of-the-art' in economic history and in recent

[3] The volume of British palm oil imports peaked in 1895 with steep increases in early 1850s, early 1870s, and early 1890s.

years a burgeoning literature has emerged on measuring market integration by using TAR-type models (see, for example, the seminal papers of Canjels, Prakash-Canjels, and Taylor, 2004, Jacks 2005 and Hynes, Jacks and O' Rourke, 2012, among others). The popularity of the TAR models is attributed to their flexibility in measuring trade costs and market efficiency.

Unlike some other studies, in our case the trade only has one direction: the commodities move from Africa (source market) to Britain (destination market). This implies that in the presence of efficient goods-market arbitrage there is only one condition that describes the relationship between the two prices:

$$p_{b,t} \leq p_{af,t} + TC \Rightarrow PM_t \leq TC \qquad (1)$$

where $p_{b,t}$ is the British import price, $p_{af,t}$ the African export price, $PM_t = (p_{b,t} - p_{af,t})$ defines the price margin and TC measures the *nominal* trade cost. An increase in market integration implies lower price gaps between exporter and importer and thus lower trade costs. Then, we adopt the *TAR* model of Hynes, Jacks, and O' Rourke, (2012) which takes the form:

$$\Delta \mathrm{P}M_t = \begin{cases} \lambda(PM_{t-1} - TC) + \varepsilon_t & if\ PM_{t-1} > TC \\ \varepsilon_t & if\ PM_{t-1} \leq TC \end{cases},\ t = 1, \dots, T \qquad (2)$$

where the threshold parameter indicates the nominal trade cost term, *TC*, while λ is the so-called efficiency parameter that measures the speed of adjustment to equilibrium. The threshold model in equation (2) has two regimes, defined by the value of the previous period's price margin.

Intuitively, when the previous price margin is lower than the nominal trade cost, $(p_{b,t-1} - p_{af,t-1}) \leq TC$, there is no arbitrage, and the market follows a random walk (that is, $\lambda = 0$). This regime is defined as the *no-arbitrage regime*. On the other hand, when the previous price margin is larger than the nominal trade cost, $(p_{b,t-1} - p_{af,t-1}) > TC$,

arbitrage forces correct any deviations and the market tends to move back to equilibrium (that is, $-1 < \lambda < 0$). The latter regime defines the *arbitrage regime*. In that regime ($PM_{t-1} \leq TC$), for $-1 < \lambda < 0$ the price margin PM follows a mean-reverting process with mean equal to TC.

Following the literature on threshold models, we estimate the parameters, $\beta = (\lambda, TC)$, by using a grid-search procedure. Firstly, we sort the values of the price margin variable, PM_t, and then eliminate the *p* percent smallest and largest values[4]. Secondly, for a given value of *TC*, the parameter λ is estimated by least squares (LS), $\hat{\lambda}(TC)$. Finally, the estimate of *TC* is the one that minimizes the sum of squared residuals[5] giving $\widehat{\beta} = \left(\hat{\lambda}\left(\widehat{TC}\right), \widehat{TC}\right)$. For theoretical results on all sorts of threshold models, see seminal papers, Tong and Lim (1980), and Hansen (1996, 2000).

Since we are interested in analyzing the evolution of commodity market integration over time, we re-weight the trade cost by performing a rolling window estimation of the TAR over 20 annual observations for each pair of commodities/countries[6]. In practice, the nominal trade cost assigned to year *t* is calculated as the average of the $\widehat{TC}$ rolling window estimates that included the year *t*. We define this as the *smoothed nominal* trade cost.

More importantly, we also calculate the *smoothed real* trade cost estimate as a share of destination British market prices to obtain a unit-less measure of the trade cost comparable across commodities, countries, and years[7]. The choice of the commodity price as a deflator for nominal trade costs is in line with the literature (Persson, 2004, Shah Mohammed and Williamson, 2004 and Hynes, Jacks and O' Rourke, 2012, among others). Other options such as GDP deflator are not appropriate as they include non-traded goods and services (Persson, 2004).

[4] Theoretical results show the best choices for *p* trimming parameter are [5%,15%]. Given the size of our sample size we select *p*=15 percent.

[5] A detailed description of the estimation procedure can be founded in Appendix A.

[6] There is a trade-off in the size selection of the rolling-windows sample. On the one size, a larger size is preferred to get a lower variance, and on the other, a smaller size better captures the changes in the trade cost.

[7] In Appendix A, it can be found a detailed description of the procedure followed to get the *smoothed nominal* and *real* trade cost.

5. Results

Figure 3 shows the evolution of real trade cost estimates for West Africa. To calculate overall trade costs from our colony/commodity series, we first compute simple average trade costs over Sierra Leone, Nigeria, and Gold Coast, for each commodity separately. Then, we weight the obtained palm oil and cocoa trade costs by the relative shares of these commodities from Figure 2[8].

At the beginning of our period of analysis, trade costs were high in real terms, hovering around 80 percent of the British price. Since the early-1850s, on the eve of the First Era of Globalization, they experienced a sharp decline to 40 percent until around 1880, partly driven by the introduction of new shipping technologies. In particular, the rise of steamship represented a major change in the West Africa trade by significantly reducing risks and opening the market to new sources of competition. Interestingly, the timing of this impressive decline in trade costs coincides with the boom in West Africa terms of trade reported in Frankema, Williamson, and Woltjer (2018, Fig. 4 on p. 247), though the latter peaked a bit later as the terms of trade of French West African exports (e.g., groundnuts and gum) continued to rise until the mid-1880s. The reason behind this correspondence is clear. Since world commodity prices were determined by world demand, then a reduction in international trade costs for West Africa implied an increase in African export prices. At the same time, the decline in trade costs made West African imports cheaper. Thus, the fall of trade costs between 1850 and 1880 could at least partly explain the boom in terms of trade experienced by West Africa during the same period. In this regard, Africa followed a similar pattern to Asia. Our findings are consistent with the results by Chilosi and Federico (2015, p. 16) who link the boom in terms of trade for Asian countries to their increased integration with the global economy.

However, in the 1880s and the 1890s, this declining trend inverted and real trade costs rose abruptly reaching 60 percent of the British price. Since during the same period British

[8] Figures B.1, B.2, and B.3 in Appendix B plot the real trade costs for each commodity and for each colony separately. The main results are basically unchanged.

prices decreased, the question to ask is then whether these trends in *real* trade costs were simply due to movements in the British prices. Yet, since African prices were largely determined by world commodity demand, if the British prices declined also the African prices should have declined in the same proportion. Consequently, the *real* trade costs should have been constant.[9] To fully explain this rise in West African trade cost, it is important to consider instead the role of other factors such as the Long Depression of 1873-1896 and the increase in monopsony power of colonial trading companies after the Scramble for Africa, as we will discuss later in this section.

From the last years of the nineteenth century to World War I, the declining trend resumed and trade costs steadily decreased to 30 percent. In the Inter-War period and in particular during the Great Depression, however, they rose rapidly again and in the 1930s, trade costs reached similar or even higher levels than those experienced 80 years earlier.

[9] A similar argument can be made for the early twentieth century when *real* trade costs dropped, while British prices were on the rise.

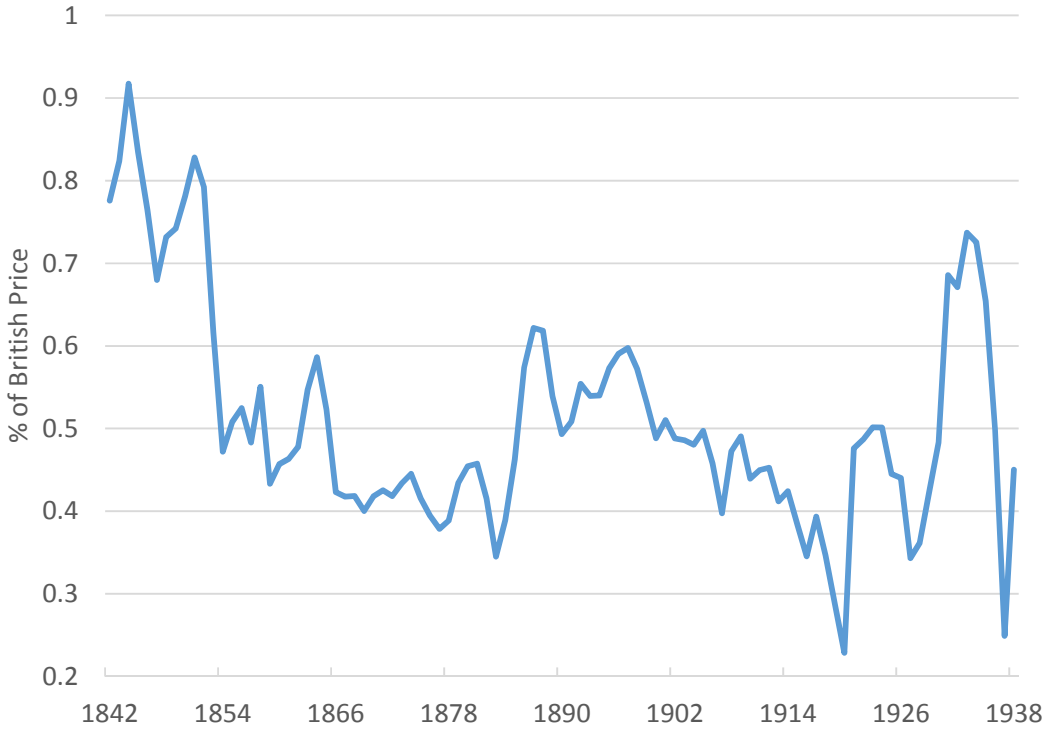

Figure 3. *Real Trade Costs from West Africa*

Rolling window estimates over 20 years. Trade costs are averaged over Sierra Leone, Nigeria, Gold Coast and weighted by the relative share of palm oil and cocoa. Sources: original data from African Commodity Trade Database (Frankema, Williamson and Woltjer, 2018), Sauerbeck (1886, 1893, 1908, 1917), The Statist (1930, 1950), Lynn (1997), and Federico-Tena (2019).

To better understand the main drivers behind the dynamics of West African trade costs, we examine the importance of their major observable components such as shipping, insurance, and export duties[10].

Firstly, we estimate nominal shipping costs for palm oil by applying the methodology of Tadei (2020) to shipping costs in base year 1881 from Lynn (1997, p. 109), and then deflate them by the British palm oil price. Our estimates show that shipping costs represented generally a small share of total trade costs, accounting at the start of our period for about 15 percent. Later on, with the dominance of the steam over sail in the 1870s, shipping costs

[10] British import prices are measured net of import duties (Federico and Tena, 2016, p. 18 and p. 20), so such duties are not included in our trade costs estimates.

temporarily dropped to around 10 percent of trade costs to go up again during World War I and the early 1920s.

Insurance also represented a small portion of trade costs. During the first half of the nineteenth century, it accounted for at most 8 percent of trade costs since insurance for palm oil was 5-7 percent of the value of the goods transported (Lynn, 1997, p. 96) and trade costs accounted for about 90 percent of the value of goods (see Figure 3). Subsequently, with the introduction of steam and iron ships, the risk of transporting cargos declined substantially and so did the insurance rates. For example, for the case of transatlantic trade, Perssons (2004) estimates insurance rates after the 1920s at 1 percent of the value of the goods, which is equivalent to around 2 percent of our trade costs estimates.

Similarly, also the share of trade costs accounted for by export duties was small (Frankema, Williamson and Woltjer, 2018). By using information from the Bluebooks, we calculate customs export duties for the period 1903-1938 and find they represented only 3-5 percent of total trade costs. In the previous period, duties were likely to account for an even smaller share as taxes on exports were uncommon (Frankema, Williamson and Woltjer, 2018).

Overall, observable components of trade costs such as shipping, insurance, and export duties accounted for at most 30 percent of our trade costs estimates.[11] Unobservable factors seem to have played a larger role in affecting trade cost dynamics. This echoes previous studies examining trade costs for Europe and the US: Steinwender (2018) emphasizes the role of information frictions, Jacks, Meissner and Novy (2011) highlights the importance of monetary regimes, while Jacks (2006) finds evidence of trade costs driven by the choice of monetary regime and of commercial policies more than by changes in freight rates.[12]

Commercial policies, in fact, were an important determinant of the structure of export markets in West Africa. For the twentieth century, Tadei (2020) finds evidence of

[11] Other observables such as storage and spoilage must have been very small for palm oil and cocoa, two highly durable commodities.

[12] On a general note, Anderson and van Wincoop (2004) suggest that trade costs remain very important in international trade, even in highly integrated present-day economies where policy barriers (tariffs) are relatively small.

monopsony power of colonial trading companies over West African producers: in French West Africa during the first half of the twentieth century, producer prices were substantially lower than what they would have been in a competitive market. Based on the author's figures (see Tadei, 2020, Table 2), we calculate that monopsony profit amounted to about 20 percent of the European price, while trade costs inclusive of monopsonistic profits were 50 percent of that price. Similar estimates can be found for twentieth-century British West Africa where monopsony profits were also significant (Tadei 2020b). Thus, monopsony power in the early twentieth century can account for nearly half of our trade cost estimates[13].

The importance of monopsony power is further seen in the similarity between the evolution in trade costs (Fig. 3) and the trend in market concentration among West African trading firms. From the 1880s to the 1910s, the share of the three largest British firms operating in West Africa dropped from 90 percent to 40 percent of total market capitalization in the London Stock Exchange. Similarly, in the same period, our trade costs estimates declined. During the Inter-War period, market concentration increased again reaching 60-70 percent in the 1930s (Rönnbäck and Broberg 2019, p.105) and our trade costs show a substantial rise.

Overall, from the mid-nineteenth century to the eve of World War II, African trade costs declined, suggesting that African economies became more integrated with the international markets. Another dimension of market integration is market efficiency, defined as the speed of price adjustment after a shock. Our methodology also allows us to estimate efficiency as captured by the parameter λ of Eq. (2). Most of the time, λ is rather stable and large in absolute value (around unity) implying that commodity markets were highly efficient.

This result is not unexpected given that we use yearly data while other studies employ monthly or even weekly data frequencies (e.g., Jacks, 2005, Hynes, Jacks, and O' Rourke, 2012). To analyze the effect of this data frequency difference on the efficiency estimate, we

[13] Monopsony profit could also increase if inland trade costs declined (e.g., due to improvements in transportation technology or new infrastructure) and European trading companies did not raise African producer prices by the same amount.

carry out a Monte Carlo experiment by generating "monthly" data and then estimating the model using "yearly" data. The results (reported in Table A.1 of Appendix A) show that the "yearly" efficiency estimates tend to be substantially higher in absolute value compared to the "monthly" ones. Note that the large standard deviation of the efficiency estimates is due to the fact that while the identification of trade costs is based on the entire sample (30 yearly observations, in practice), efficiency λ is identified only from a small subset of this sample (when the price margin is larger than trade costs), which results in less precise efficiency estimates.

6. International Comparisons

How did the trend in West African trade costs compare to other world regions? In Figure 4, we plot our trade cost estimates together with estimates of trade costs between North America and Europe, South America and Europe, and Asia and Europe over 1870-1938 as obtained from Jacks, Meissner, and Novy (2011). For the previous period (1842-1870), we report trade costs between the US and Europe as obtained from Jacks (2005). Since Jacks, Meissner, and Novy (2011) report a trade cost index rather than *actual* trade costs, we convert all estimates into indexes with base year 1870.

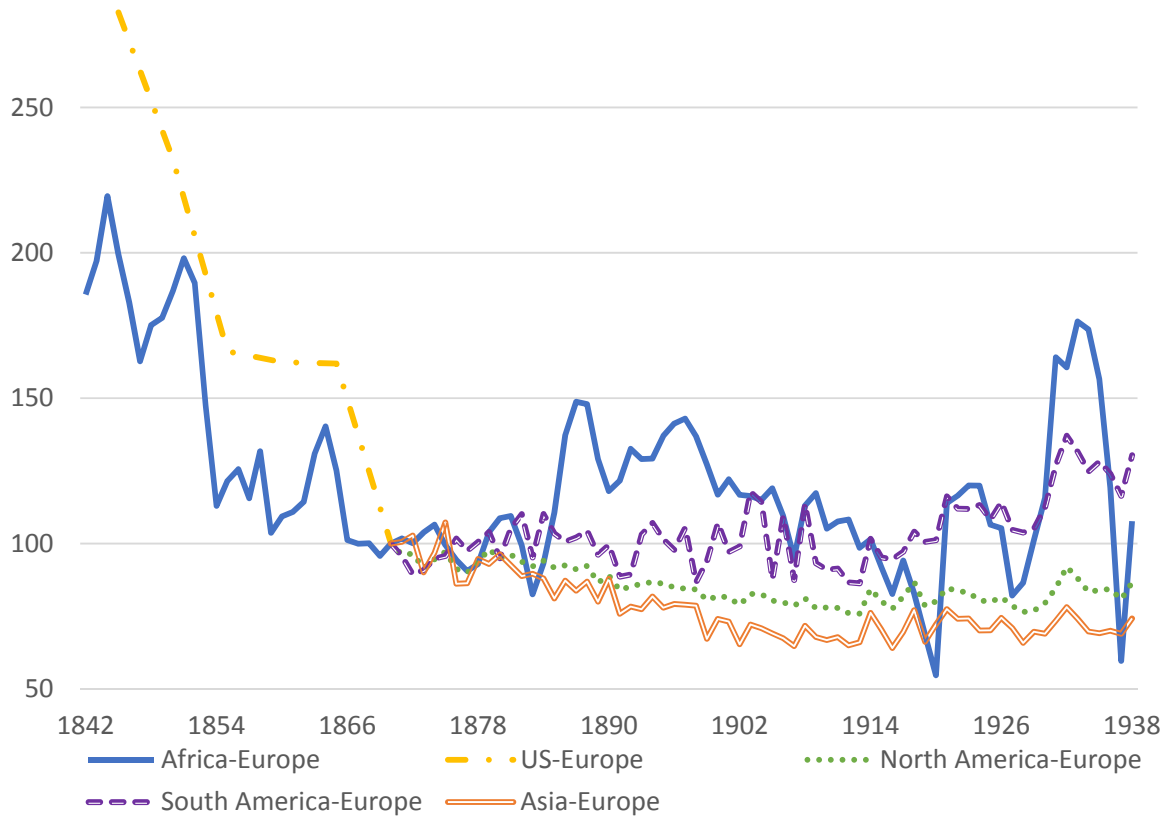

Figure 4. *Real Trade Cost Index (1870=100)*

Sources: African trade costs: original data from African Commodity Trade Database (Frankema, Williamson and Woltjer, 2018), Sauerbeck (1886, 1893, 1908, 1917), The Statist (1930, 1950), Lynn (1997), and Federico-Tena (2019); US trade costs: Jacks (2005); other regions: Jacks, Meissner, and Novy (2011)

From the mid-nineteenth century to the 1880s, international trade costs declined substantially. For West Africa, they halved as they did for the United States. Since the 1880s, however, the trends in international and West African trade costs diverged. While trade costs in the rest of the world showed a steady decline, in West Africa they suddenly increased. Later, at the beginning of the twentieth century, West African trade costs were again on the decline, reaching at the eve of World War I similar levels to those experienced in the 1870s. Still, during the same period, trade costs for North America and Asia

experienced an even stronger reduction. Since the 1920s, and in particular during the Great Depression, trade costs rose in all regions, but in West Africa they rose substantially more.

Overall, it appears that in periods of declining global trade costs, such as during the First Globalization, West Africa's decline was lower than in the rest of the world. At the same time, when global trade costs rose, such as during the Inter-War period, West African's ones rose even more. As a result, over time trade for West Africa became relatively more expensive than for other world regions.

To investigate whether these different trends in trade costs are due to differences in the composition of exports between West Africa and North America or Asia, we can compare West Africa to South America, which was also an important exporter of primary commodities. As shown in previous studies, the specialization in primary products reduced the ability of developing regions to industrialize (Williamson, 2008, 2011, and 2013) and the instability in commodity prices has a negative impact on economic growth (Deaton, 1999), both factors which can affect trade costs.

Generally, since 1870, South American trade costs experienced similar patterns to West Africa becoming more expensive over time. However, West African countries suffered from a higher variability in trade costs due to African-specific shocks, such as the Scramble for Africa in the 1880s, and to a general higher vulnerability to global shocks, such as the Great Depression. Even though specialization in primary commodities can partly explain the trends in West African trade costs, the role of other factors should be further explored.

First, as total trade costs can be divided into two components, one depending on the volume of trade and the other fixed (e.g., information and other market frictions), a change in the volume of trade would affect the unit trade cost. Since fixed trade costs were a larger portion of total trade costs in West Africa than in other world regions, then a variation in trade volume affected African unit trade costs to a greater extent.

Moreover, since West Africa was a newer and less established market, emerging as an important commodity exporter only in the nineteenth century, West African trade costs were likely to be more susceptible to shocks, such as the Great Depression or other sudden drops in world demand, compared to other more developed markets. Also, weaker

institutions and legal systems in West Africa might be another important determinant of higher trade costs, particularly during economic downturns.

Finally, colonial rule and the activity of monopsonistic trading companies are likely to have been important determinants of the higher and more volatile African trade costs. As reported in the previous section, monopsony profits could account for about half of the trade costs and West Africa's trend in trade costs started diverged from the global trend precisely at the time of the Scramble for Africa.

7. Conclusions

Although there are a plethora of studies on commodity market integration in Europe, the Americas, and Asia, little is known about trade costs in Africa. Yet, assessing the magnitude and the evolution of international trade costs is essential to explain the path of economic growth of African countries since, given the continent's specialization and dependence on primary commodity exports, African economic growth has historically relied on its ability to access international markets.

To fill this gap, in this article we provided yearly estimates of trade costs between West Africa and Europe from 1842 to 1938. Several conclusions are drawn from our empirical analysis. First, we show that overall West African trade costs declined from the mid-nineteenth century to the eve of World War II.

Second, compared to the other world regions, this decline was small. From the 1840s to around 1880, international trade costs decreased at a similar rate both in West Africa and in the rest of the world. Yet, in the subsequent period, the picture changed. During the First Globalization, West African trade costs fell less than the world average, while, in the Inter-War Years, trade costs for West Africa increased more than in the rest of the world. Consequently, since the late nineteenth-century, trade for West Africa became relatively more expensive than for other world regions.

Third, not only West Africa suffered from higher trade costs but also from an increased trade cost volatility due to the greater vulnerability of African economies to local and global shocks.

The implications of our results suggest a new research agenda to explain long-term African development. Since African countries suffered from higher international trade costs precisely during a period in which the world economy expanded and became more integrated, this can potentially explain their slower rate of economic growth. Moreover, the higher volatility and uncertainty surrounding these trade costs are likely to have magnified their negative impact and made Africa less competitive in the global economy.

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Appendix A: Methodology

A1. Grid Search Least Squares Method

Here we provide a detailed description of the grid search estimation employed in the present paper. Let $(PM_1, \dots, PM_T)$ be the sample values of the price margin variable *PM* used in estimating the model in Eq. (1), and $(PM^1, \dots, PM^T)$ be the sorted values of the variable *PM*, such that $PM^{i-1} \leq PM^i$ for all *i=1,…, T*. It is worth pointing out that these are the relevant candidate estimates of the parameter *TC*, given that any value of TC in $\left[PM^{i-1}, PM^i\right)$ gives the same result as PM^{i-1}. Let $\lfloor a \rfloor$ the integer part of the number *a*. The parameters $\beta = (\lambda, TC)'$ are estimated as follows:

1. Select $i = \lfloor pT \rfloor$
2. Assume $TC = PM^i$ and estimate λ in Eq. (1) by Least Squares (LS):

$$\hat{\lambda}(TC) = \left(X'(TC)X(TC)\right)^{-1} X(TC)\, \Delta PM$$

with $X(TC) = [(PM_1 - TC)1(PM_1 > TC), \dots, (PM_{T-1} - TC)1(PM_{T-1} > TC)]'$ and $\Delta PM = [\Delta PM_2, \dots, \Delta PM_T]'$.

3. Calculate the Sum of Squared Residuals *SSR(TC)=E'E* with $E = \Delta PM - \hat{\lambda}(TC)X(TC)$
4. Select $i = i + 1$ and go back to Step 2 until $i = T - \lfloor pT \rfloor$.
5. Compute $\hat{\beta} = \left(\hat{\lambda}\left(\widehat{TC}\right), \widehat{TC}\right)$ such that $\widehat{TC}$ minimize *SSR(TC).*

In our empirical application, given the rolling-window sample size, 20, and the trimming parameter, 0.15, in each estimation, we search over 20*0.7=14 observations.

A2. Calculation of the Smooth Trade Cost Estimates

Here we provide a detailed description of the procedure followed to get the smooth trade cost estimate. As in the previous subsection let T be the sample size. In the performed rolling window estimation, the sample of the window is 20. Let $\hat{\beta}^j = \left(\hat{\lambda}\left(\widehat{TC}\right)^j, \widehat{TC}^j\right)$ the estimated parameters in the sample window *j*, that is, for sample $SW_j \equiv \left\{PM_j, \dots, PM_{20+j}\right\}$,

for *j=1,…,T-20*. The *smoothed nominal* trade cost assigned to year *t*, $\widehat{TC}_t$, is calculated as the average of the $\widehat{TC}^j$ rolling window estimates that included the year *t*, that is

$$\widehat{TC}_t = \frac{\sum_{j=1}^{T-20} 1(PM_t \in SW_j)\, \widehat{TC}^j}{\sum_{j=1}^{T-20} 1(PM_t \in SW_j)}$$

With $1\left(PM_t \in SW_j\right)$ an indicator function that takes value 1 if $PM_t \in SW_j$ and 0 otherwise. The *smoothed real* trade cost estimate, $\widehat{TC}_{r,t}$, used as a measure of the trade cost comparable across commodities, countries and years, is calculated as

$$\widehat{TC}_{r,t} = \frac{\widehat{TC}_t}{p_{b,t}}$$

A3. Monte Carlo Simulation and Efficiency Estimates

The Monte Carlo simulations are carried out as follows:

1. Assume $i = 1, M = 360$ (monthly data) and $T = 30$ (yearly data). Assuming we have monthly data implies yearly data of 30 years.
2. Simulate $\left\{\varepsilon_m^i\right\}_{m=1}^M$ and generate $\left\{PM_m^i\right\}_{m=1}^M$ from the model in Eq. (1) and for (λ_o, TC_o).
3. Remove the yearly frequency sample, $\left\{Y_t^i\right\}_{t=1}^T$, such that $Y_t^i = PM_{1+12(t-1)}^i$
4. Estimate $\hat{\beta}^i = \left(\hat{\lambda}^i, \widehat{TC}^i\right)$ using Eq. (1) and the yearly frequency sample $\left\{Y_t^i\right\}_{t=1}^T$.
5. Select $i = i + 1$ and go back to Step 2 until $i = 1000$.
6. Calculate the relevant statistics from $\left\{\hat{\lambda}^i\right\}_{i=1}^{1000}$.

For the efficiency parameter, we consider $\lambda_o = (-0.1, -0.3, -0.5, -0.7, -0.9)$, while for the nominal trade cost parameter TC_o = 0.0209 comes from our estimates in Section 5. The $\left\{\varepsilon_m^i\right\}_{m=1}^M$ are drawn from a Normal distribution ensuring that the percentage of times the "arbitrage regime" applies is generally similar to that obtained from our estimates.

Table A1: Efficiency estimates (yearly vs. monthly data)

λ	-0.1	-0.3	-0.5	-0.7	-0.9
$\bar{\hat{\lambda}}$ (average)	-0.903	-1.196	-1.020	-1.077	-1.134
$\hat{\lambda}^{0.95}$ (95% quantile)	-0.183	-0.228	-0.244	-0.292	-0.322
$\hat{\lambda}^{0.05}$ (5% quantile)	-2.901	-2.705	-2.260	-2.168	-2.523

Notes: $\bar{\hat{\lambda}}$ is the average efficiency estimate, $\hat{\lambda}^{0.95}$ is the 95% quantile efficiency estimate, while $\hat{\lambda}^{0.05}$ is the 5% quantile efficiency estimate.

Appendix B: **Additional Results**

B.1 Trade Costs by Commodity

Figure B.1 plots the real trade costs for each commodity separately. During the second half of the nineteenth century, since palm oil was the main export from West Africa, the palm oil trade cost in Figure B.1 mirrors the average trade cost in Figure 3. Similarly, during the first part of the twentieth century, cocoa became the most important commodity and thus the weighted average trade cost follows closely the one of cocoa.

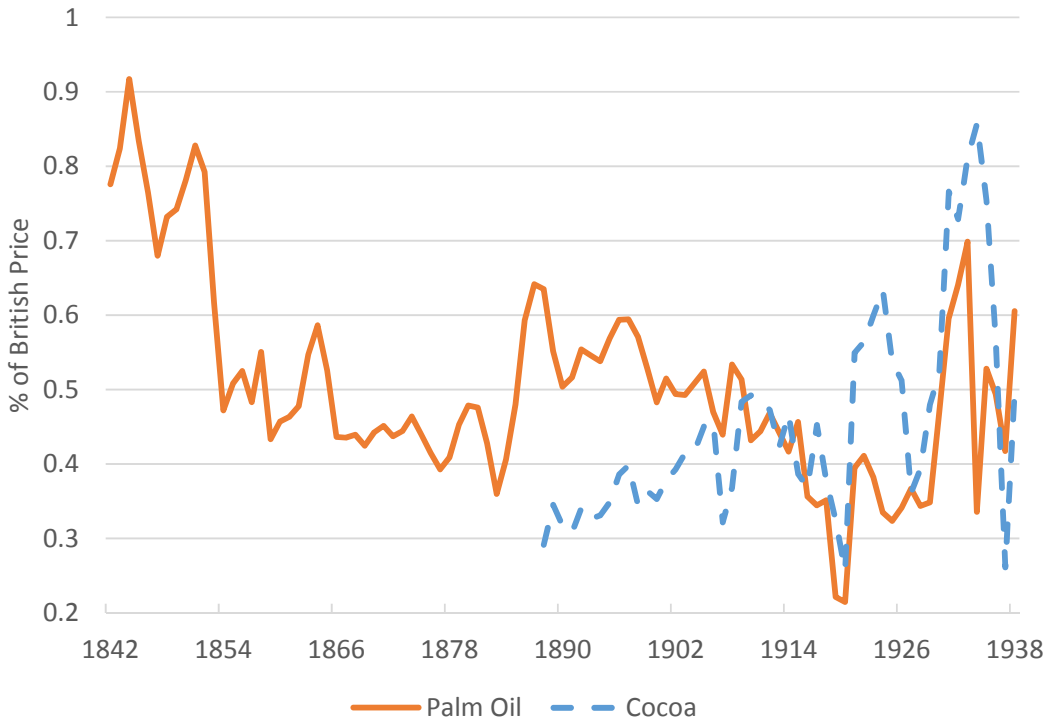


Figure B.1. *Real Trade Costs for Palm Oil and Cocoa*

Rolling window estimates over 20 years. Trade costs averaged over the Gold Coast, Nigeria, and Sierra Leone. Sources: African trade costs: original data from African Commodity Trade Database (Frankema, Williamson and Woltjer, 2018), Sauerbeck (1886, 1893, 1908, 1917), The Statist (1930, 1950), Lynn (1997), and Federico-Tena (2019).

B.2 Trade Costs by Colony

Figure B.2 plots the real trade costs for each colony separately. The three territories experienced similar trade costs, both in level and in trends, until World War I. Afterwards, trade costs in Gold Coast and Nigeria increased more than the one in Sierra Leone, to be similar again at the end of the period.

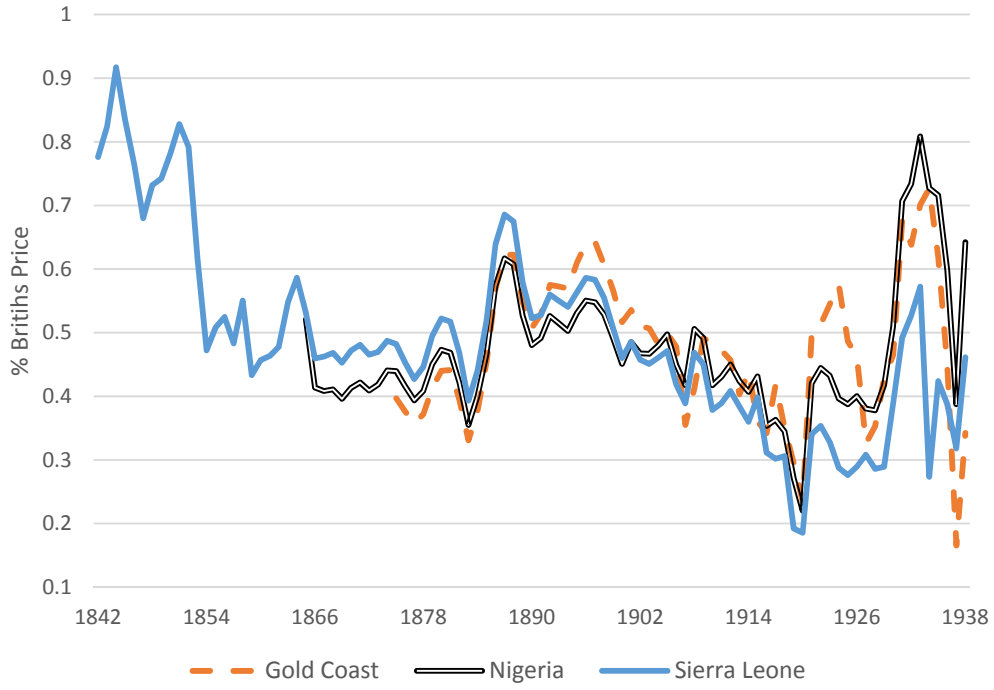
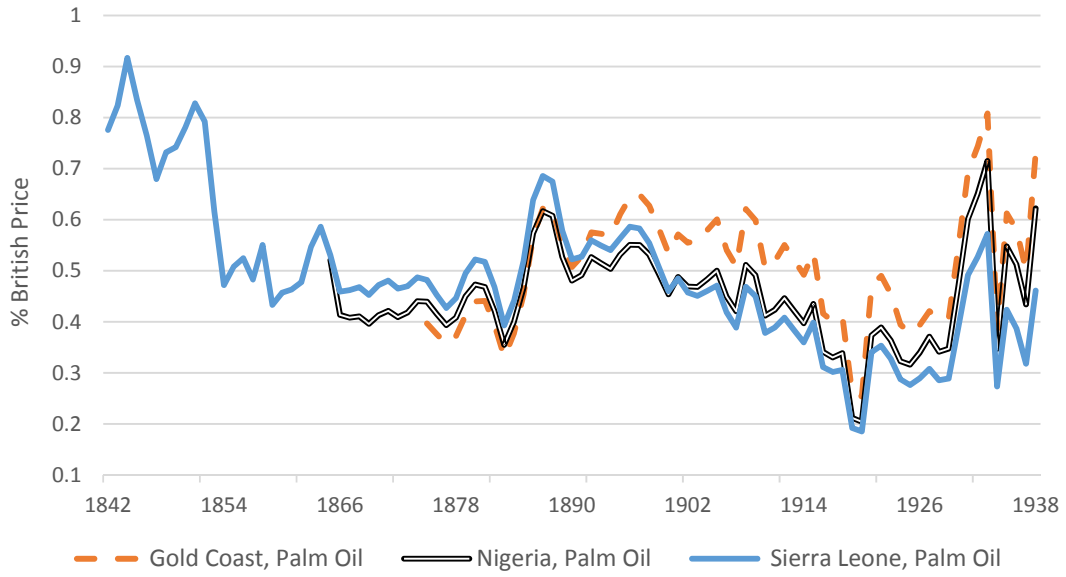


Figure B.2. *Real Trade Costs for Gold Coast, Nigeria, and Sierra Leone*

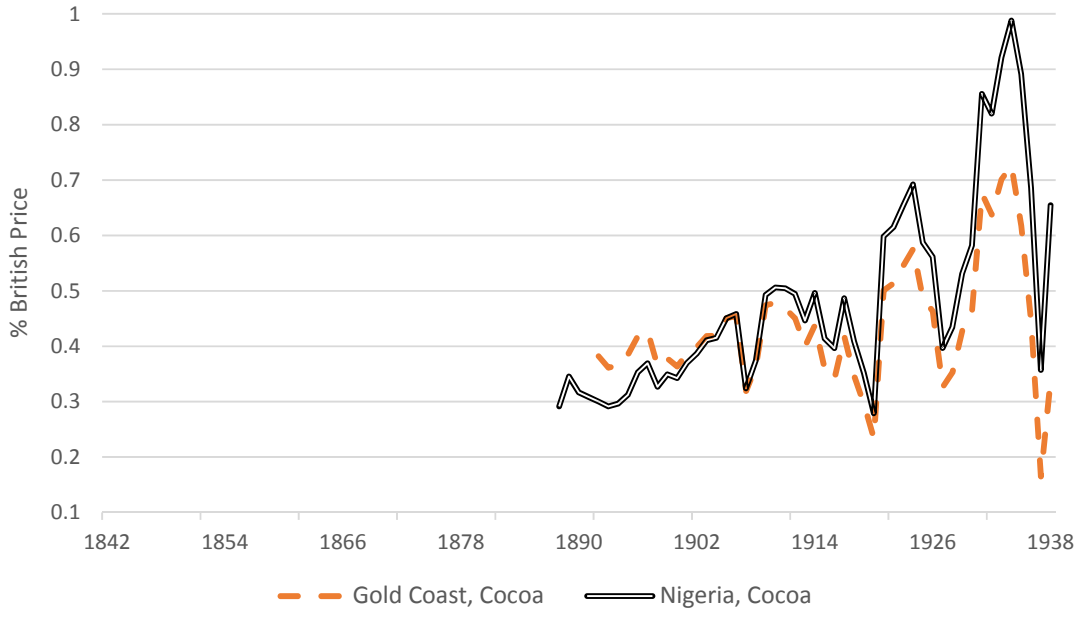
Rolling window estimates over 20 years. Trade costs weighted by the relative value of cocoa and palm oil exports, for each territory. Sources: African trade costs: original data from African Commodity Trade Database (Frankema, Williamson and Woltjer, 2018), Sauerbeck (1886, 1893, 1908, 1917), The Statist (1930, 1950), Lynn (1997), and Federico-Tena (2019).

B.3 Trade Costs by Colony and Commodity

Figure B.3 shows the real trade costs for each colony/commodity separately. Panel (a) shows palm oil trade costs, while panel (b) shows the ones relative to cocoa.



Panel (a)



Panel (b)

Figure B.3. *Real Trade Costs by Colony/Commodity*

Unweighted. Rolling window estimates over 20 years. Sources: African trade costs: original data from African Commodity Trade Database (Frankema, Williamson and Woltjer, 2018), Sauerbeck (1886, 1893, 1908, 1917), The Statist (1930, 1950), Lynn (1997), and Federico-Tena (2019).