Prison Labor: The Price of Prisons and the Lasting Effects of Incarceration*

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Abstract

Institutions of justice, like prisons, can be used to serve economic and other extra-judicial interests, with lasting deleterious effects. We study the effects on incarceration when prisoners are used primarily as a source of labor using evidence from British colonial Nigeria. We digitized sixty-five years of archival records on prisons from 1920 to 1995 and provide new estimates on the value of prison labor and the effects of labor demand shocks on incarceration. We find that prison labor was economically valuable to the colonial regime, making up a significant share of colonial public works expenditure. Positive economic shocks increased incarceration rates over the colonial period. This result is reversed in the postcolonial period, where prison labor is not a notable feature of state public finance. We document a significant reduction in contemporary trust in legal institutions, like police, in areas with high historic exposure to colonial imprisonment. The resulting reduction in trust is specific to legal institutions today.

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1 Introduction

> *"The Prison at Port Harcourt has been considerably developed and at the close of the year there were 829 prisoners in custody and these are employed by the Eastern Railway. The Engineer in charge at Port Harcourt is highly pleased with the way the prisoners are worked; they have given no trouble and have been of great assistance in developing that station. It was my intention to have 1,000 prisoners stationed there before the close of the year, but this was impossible as two prisons...which should have supplied the drafts to make up the number, had an outbreak of chicken-pox..."*
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> - E. Jackson, Acting Inspector of Prisons, *Lagos, April 23, 1915*

There are more people incarcerated today than at any other point in human history[1]. The current global prison population is estimated at around 11 million people; rising rates of incarceration around the world have turned policy discussions to what states should do with the large reserve of incarcerated people (Jacobson, Heard, and Fair, 2017). One suggestion that has risen to prominence in recent years in countries such as Tanzania, the US, China and the UK, is to use prisoners for labor in, for example, manufacturing and public works projects, and to address labor shortages in various industries (Campbell, 2020; Chapman, 2019; Doston and Vanfleet, 2014; Race, 2021; Yuvejwattana and Thanthong-Knight, 2021). This suggestion, spearheaded by governments advocating the use of prison labor to serve economic interests of states, raises important questions around the incentive issues that may arise when prisoners are viewed primarily as a reserve of labor by governments. What are the effects on incarceration when prisoners are viewed and used primarily as a source of labor to serve economic interests? And what are the potential implications for populations' views of state legitimacy, when an institution of state justice, like prisons, is used to serve

[1]Sources: World Prison Brief and Prison Policy Initiative

economic or extrajudicial interests?

The use of prison labor by governments is not new, although its forms have changed over the years and varied in different contexts. In this paper, we examine one particular context, namely the colonial period over the 19th and 20th centuries, where the use of convict labor was documented as a feature of European colonial administration in Africa and Asia (De Vito and Lichtenstein, 2013). Prison labor in Africa was used extensively for the construction of colonial infrastructure, like roads and railroads, needed to extract, transport and export agricultural and mineral resources, with the aim of raising revenues for Europe's colonial empire (Bernault, 2007; Hynd, 2015). These colonial prison systems provide a detailed account of the economics of incarceration, under a system where the government explicitly, as a matter of legal policy and practice, used prisoners and prison labor to serve economic interests. Europe's African colonies, in particular, with their well-documented use of prison labor, provide an informative setting to examine the incentive issues that might arise when prisoners are viewed primarily as a reserve of labor by governments. We examine these questions using evidence from British colonial Nigeria, covering a period between 1920 and 1959[2], where prison labor was a feature of state public finance; and from postcolonial Nigeria, covering a period between 1971 and 1995, when prison labor was not a major feature of state finance. We construct a novel dataset from 65 years of archival records on prisons from 1920 to 1995. We assemble data on prisons, wages, prices, and colonial public finance from colonial and postcolonial archives, along with geocoded climate information from high-resolution NASA data to test our hypotheses.

An aim of this paper is to examine how incarceration responds to economic shocks when prison labor is a major feature of state policy and public finance. To investigate this

[2]Nigeria as an amalgamated entity was a British colony from 1914 to 1960. Hence, our dataset covers almost 40 of the 47 years of the colonial period. The country was under military rule for most of 1960 to 1999, before transitioning to democracy in 1999.

topic, we conduct our analysis in three steps. First, we assess the importance of prison labor by calculating the value of unpaid prison labor, and estimating the share of prison labor in colonial public finance. A key insight from the historical archives is that, as part of explicit colonial policy, prison labor on government public works was a mandated part of incarceration[3]. Unpaid prison labor was an input in the construction and maintenance of key revenue-generating public works such as the railroad, which was used to transport agricultural commodities for export. To the best of our knowledge, we provide the first set of estimates of the value of unpaid prison labor in British colonial Africa. We measure the overall value of prison labor as the amount of unpaid wages to prison laborers.

We find that prison labor was economically valuable to the colonial regime. The overall gross value of prison labor is strictly positive over the entire colonial period. Even after accounting for the most expansive set of prisoner maintenance costs, the net value of prison labor is nonnegative and strictly positive in 60% and 57% of the years from 1920 to 1959, respectively, in Nigeria. Prison labor constituted a significant share of colonial public works expenditure. The share of overall prison labor in public works expenditure ranged between 40% and 249%, with an average of 101%, over 1920 to 1959. After adjusting for extensive measures of prisoner maintenance costs, the share of the net value of prison labor in colonial public works expenditure remains economically significant, with a mean of 5% and a maximum of up to 42%, during this period.

Having established the value of convict labor for the colonial regime, next, we assess the effects of shocks to economic productivity on incarceration, and the use of prison labor using a panel regression framework. We construct two measures of shocks to economic productivity: The first measure exploits district-level rainfall deviations in a primarily agricultural setting; the second measure uses agricultural commodity export prices and district-level

[3]The 1916 Prison Ordinance outlined the use of convict labor explicitly (Kingdon, 1923).

crop suitability. We show that the incarceration rate is procyclical during the colonial period. Positive economic shocks increase the colonial incarceration rate and the use of prison labor. The positive effect is specific to the short-term incarceration rate only, with temporary shocks increasing the share of prisoners with sentences fewer than six months. There is no effect of positive shocks on long-term imprisonment, or the share of prisoners with sentences longer than two years. In one specification, moderate positive rainfall shocks that raise agricultural productivity increase the short-term incarceration rate by 16.7 prisoners per 100,000 population, that is, a 12% increase relative to a mean of 134.7 prisoners per 100,000 population. This effect is reversed in the postcolonial period wherein prison labor is not a main feature of state policy, and negative productivity shocks, such as droughts, increase the incarceration rate. Using an index of export crop prices, we also show that a 10% increase in export prices for a major cash crop in producing regions is associated with a 5% increase in short-term incarceration relative to the sample mean.

We provide evidence from the historical literature to show that a primary reason for the procyclical behavior of incarceration rates during the colonial period was increased labor demand for construction and maintenance of public works like railroads, which were needed to intensify exports of agricultural commodities during periods of positive productivity shocks. Labor shortages and tight labor markets, worsened by wage ceilings in the government public works sector, increased the demand for unpaid prison labor, in line with predictions from theoretical models of labor coercion (Acemoglu and Wolitzky, 2011). One way colonial authorities addressed these labor shortages was to increase the share of incarcerated people by, for example, switching the punishment of minor, misdemeanor crimes from fines to imprisonment (Killingray, 1999). We test the tight labor market hypothesis by examining the effects of rising wages on the incarceration rate by distance to the colonial railroad. The results show that, while prisons closer to the railroad have a higher short-term incarceration rate, higher wages increase the share of short-term prisoners from prisons farther away

from the railroad. The quantitative estimates support historical accounts of prisoners being transported from prisons throughout districts to work on railroad and other colonial public works projects during periods of labor shortages (Killingray, 1999).

Finally, to explore the implications of colonial use of prison labor for present-day views of the state's judicial legitimacy, we present a brief discussion and suggestive evidence of the long-run effects of colonial incarceration on contemporary trust in legal institutions. Since the origins of the modern prison and accompanying legal system in Nigeria and other former British colonies are rooted in the use of state policy around labor coercion, what are the long-term effects, if any, of exposure to these systems on populations' trust in these institutions today? We use Afrobarometer data from Nigeria on trust in historical legal institutions (e.g., police, courts, and tax administration) to test whether past exposure to coercive, ostensibly economically influenced, colonial prison systems is associated with trust in legal institutions today. We document a significant reduction in contemporary trust in legal institutions, and police, in particular, in areas with high historic exposure to colonial imprisonment. The resulting reduction in trust is specific to legal institutions, with no effect of colonial imprisonment on interpersonal trust in individuals.

Colonial Nigeria is an informative region to study these issues for a number of reasons. First, colonial Nigeria had relatively high incarceration rates. As of 1940, the British colonial government in Nigeria was incarcerating more people (0.3-0.4% in 1940) than countries in Europe over a similar period (0.06% in 1950)[4]. In fact, colonial Nigeria was incarcerating about the same fraction of people as the US prison system was incarcerating its Black population under the notorious Jim Crow laws of racial segregation over the same time period, and at a higher rate than the overall US incarceration average of less than 0.2%[5].

[4]Source: Author estimates from archival data and World Prison Brief.

[5]Colonial Nigeria at a rate of between 0.2-0.4% on average compared to the US Black incarceration rate of around 0.4% over the same period. Source: (Muller, 2012).

To put these figures in context with contemporary data, Figure 1 shows the top 40 of 222 countries/jurisdictions by incarceration rate in the world as of 2018. If we place colonial Nigeria's incarceration rate in 1940 on the chart, it would have ranked at number 15 of 222 today, right between Seychelles and Panama. Nigeria incarcerates a much lower share of people today, ranking at around 211 of 222 by World Prison Brief estimates.

We add to several distinct literatures. First, we add to the literature on the economics of forced labor and coercive labor contracts (Acemoglu and Wolitzky, 2011; Bobonis and Morrow, 2014; Dell, 2010; Gregory and Lazarev, 2013; Juif and Frankema, 2018; Lowes and Montero, 2021*a*; Naidu and Yuchtman, 2013; van Waijenburg, 2018; Saleh, 2019; Dippel, Greif, and Trefler, 2020; Sokoloff and Engerman, 2000). Research in this area has examined the impacts of economic shocks on coercive contract enforcement (Naidu and Yuchtman, 2013), and estimated the share of forced labor in colonial public finance (van Waijenburg, 2018). However, there is very little evidence on the economics of prison labor. Most research on convict labor is concentrated on the United States and focused on the institution of convict leasing in the 19th century when Black-Americans, in particular, were economically exploited by the US government, in concert with private employers, for their labor (Muller, 2018, 2021; Poyker, 2019; Travis, Western, and Redburn, 2014; Cox, 2010), and the Soviet Union's use of forced labor camps over the 20th century (Gregory and Lazarev, 2013). We also add to the literature on the economics of incarceration (Becker, 1968; Avio, 1998; Katz, Levitt, and Shustorovich, 2003). While previous work has focused on the effects of crime and prison conditions on incarceration rates and recidivism (Becker, 1968; Freeman, 1999; Bhuller et al., 2020; Katz, Levitt, and Shustorovich, 2003), we highlight the role of economic shocks in increasing incarceration under coercive state institutions.

There is almost no social science research providing quantitative estimates on the economics of prison labor. Of the 95,916 articles on prison labor in the scholarly archive JSTOR,

just 4% are classified in 'economics' journals. And of those, only two papers provide quantitative estimates on the value and economic drivers of prison labor, with research focused on estimating the value of British convict labor in 18th century America (Grubb, 2000, 2001). Although there exists a robust, qualitative literature in history, political science, and sociology on convict labor, previous efforts toward providing quantitative estimates of the economic drivers of prison labor have been stymied by the paucity of detailed, micro-level data on incarceration and the value of prison labor. Our study is the first, to our knowledge, to provide quantitative estimates on both the value of prison labor and the effects of economic shocks on the use of prison labor- particularly when convict labor is a major part of state policy and public finance- using evidence from extensive archival data.

We also add to a growing literature on the effects of historic, particularly colonial era, institutions on development outcomes (Lowes and Montero, 2021*a*; Dell and Olken, 2020; Michalopoulos and Papaioannou, 2016, 2014; Acemoglu and Robinson, 2001). While previous work has examined the long-run impacts of institutions like the slave trade (Nunn, 2008), colonial labor concessions (Dell, 2010; Lowes and Montero, 2021*a*; Dell and Olken, 2020) and health (Lowes and Montero, 2021*b*; Alsan and Wanamaker, 2018) on development outcomes, interpersonal trust (Nunn and Wantchekon, 2011; Okoye, 2021) and trust in modern medicine (Lowes and Montero, 2021*b*; Alsan and Wanamaker, 2018), our paper is the first, to our knowledge, to explore the incentive effects of colonial prison labor systems and their long-term impacts on trust in legal institutions, like police, and views of state legitimacy. This kind of exploration is needed, particularly in light of research linking environments of low trust in legal institutions and low views of state legitimacy with conflict (Rohner, Thoenig, and Zilibotti, 2013), low domestic investment and higher transaction costs from weak contract enforcement (Knack and Keefer, 1997), as well as issues with effective policing, crime, and law enforcement (O'Flaherty and Sethi, 2019).

The paper is organized as follows: Section 2 provides historical background on prison labor in colonial Africa. Section 3 reports quantitative estimates of the value of prison labor to the colonial regime. Section 4 describes the data on incarceration and economic shocks, and presents the results on the effects of economic shocks on the incarceration rate and the use of prison labor. Section 5 discusses the links between colonial imprisonment and contemporary trust in legal institutions. Section 6 concludes.

2 Prison Labor in Colonial Africa

2.1 A History of Forced Labor

Prison labor was a small part of a larger regime of domestic forced labor in colonial Africa. European colonial governments were tasked with pursuing strategies to maximize revenue while minimizing the cost of administration in Africa (Gardner, 2012). Attempts to raise revenue to fund expenditures on key public works projects, such as roads and railroads, which were necessary for both revenue extraction from cash crop exports and expansion of control of colonies, depended crucially on the colonial government's ability to raise revenue through direct or indirect taxation, and cut costs associated with spending on capital and labor. Labor shortages were an endemic feature of African colonies (Okia, 2012; Ash, 2006). Shortages were driven partly by an unattractive wage labor market for government projects, which itself was partly spurred by artificially imposed below market wage compensation, set both as a cost-cutting measure and to prevent competition with the private sector[6] (Okia, 2012; Maul, 2007; Ofonagoro, 1982).

European colonialists were particularly concerned with the "Africa labor question", where, faced with the joint realities of labor shortages and colonial objectives to minimize labor costs and maximize revenues, colonial administrators questioned how much coercion a

[6]And also to satisfy the economic and political demands of white settler employers in colonies like Kenya (Okia, 2012).

"civilized government" could use to attain labor (Cooper, 1996; Buell, 1965). After numerous colonial forced labor scandals[7], the Forced Labor Convention at the 1930 International Labor Organization (ILO) conference was passed. The Forced Labor Convention prohibited the use of forced labor for private industry where forced labor was defined as "all work or service which is extracted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily" (Cooper, 1996)[8]. Crucially, the Convention made exceptions for the use of forced labor for public works, 'penal and communal labor in the public sector and compulsory military service' (Kunkel, 2018; Killingray, 1989).

The answer to European colonial administrators' 'Africa labor question' involved the institution of various coercive labor regimes, enforced by legislation and through the participation of local chiefs or Native Administrators. Among these strategies included the use of direct taxation such as hut and poll taxes requiring cash payment to induce Africans into the colonial wage labor market; the use of labor tax legislation to force Africans to donate a certain number of hours of often unpaid labor to private and public sector work; and the use of precolonial communal labor requirements to compel Africans, under the direction of the chiefs, to provide unpaid labor for private and public works projects[9] (Okia, 2012; Harris, 1914; Trevor, 1936; van Waijenburg, 2018; Cooper, 1996). The consequences for flouting this legislation were often fines and imprisonment (Okia, 2012). Another important source of

[7]Most infamous of which was the torture and murder of millions of Congolese for the rubber extraction trade under Belgium's King Leopold (Lowes and Montero, 2021*a*).

[8]ILO 29, Article 2 s 2a, c, e, Articles 4 and 5

[9]Forced labor was recognized by the colonial regime as so essential to the functioning of the state, that, in one instance, when the colonial office in Nigeria surveyed commissioners in 1911 on their preferences for terminating the House Rule Ordinance, which bolstered the authority of chiefs to coerce labor for the government, the minutes from the meeting report that "Perhaps most interesting evidence of all is that of the Commissioners who with one lament ask how is the administration to be carried out if we cannot go to the Head of a House and demand carriers and paddlers? How is the work of sanitation, road making and clearing to be carried on if we cannot hold the Head of the House responsible for finishing the necessary labour? They are all of the opinion that the necessary labour cannot be got, even at a ruinous price, and that thus the progress and development of the country would be retarded." (Ofonagoro, 1982), p. 213. Ward-Price, op. cit., p.213. See also CO/520/107, 'Native House Rule Ordinance', minutes by Sir Percy Anderson, 18/12/1911.

forced labor for the colonial public sector, sanctioned by the ILO Forced Labor Convention, was convicts (Hynd, 2015).

2.2 The Prison System in British Colonial Nigeria

Prison was not a main feature of judicial punishment prior to colonial rule across much of Africa[10] (Bernault, 2007). In British colonial Nigeria, which lasted formally from 1914 to 1960[11], labor taxes and labor laws worked in concert with Masters and Servants Ordinances, vagrancy laws, labor registration, pass laws, and Native Authority Ordinances that mandated the conscription of African laborers to work on colonial public works projects[12] (Hynd, 2015). As mentioned previously, the consequences for flouting this legislation were often fines and imprisonment. The goal of the prison system, codified in colonial law with the 1916 Prisons Ordinance, was twofold. First, prisoners were employed to work as punishment for crimes, as defined by the colonial government; and second, unpaid prison labor was viewed as a source of cheap labor, particularly for work on public infrastructure projects in the colonies (Adamson, 1984). In Nigeria, prisoners, by law, were only allowed to work for government agencies in the public sector and not for private sector employers[13] (Kingdon, 1923; Abiodun, 2017; Foreign and Office, 1947). Additionally, prisoners could not be transported across long distances and were legally bound to work only within their provincial districts (Foreign and Office, 1947).

Nigeria's colonial prison system, under the 1916 ordinance, was initially administered as a dual system with colonial prisons under the direct supervision of colonial government officials and the management of the Director of Prisons, and Native Authority prisons di-

[10]The popular punishment for transgressions within communities was ridicule ceremonies, community sanction and exile in the most severe cases (Bernault, 2007; Onoge, 1993).

[11]Although the British colonial presence dated back to 1860 in the region (Archibong, 2019).

[12]These laws were widely used throughout colonial Africa, and very similar to the Black Codes used to coerce African-American labor in the US over the 19th century (Adamson, 1984).

[13]This is unlike in another well-known prison labor system, the US convict leasing system in the 19th century where prisoners were leased to private companies (Muller, 2018).

rectly overseen by the local chiefs and indirectly supervised by colonial government officials[14] (Kingdon, 1923). Figure 2 shows the distribution of colonial prisons, provinces and regions in Nigeria. Figure 2b shows the distribution of the colonial railroad. The colonial railroad was mostly constructed between 1900 and 1930, and functional only through the end of the colonial period (Okoye, Pongou, and Yokossi, 2019). The railroad, like the road networks and other colonial public works infrastructure, was largely used to transport agricultural commodity and mineral resources to the coast for export. Prisoners made up a major part of the labor on colonial public works like the railraod, and prisons were frequently located along key public works infrastructure like the railroad, as shown in Figure 2b, to minimize costs of transportation, and adhere to the 1916 Ordinance prohibiting transport of prisoners across provinces[15] (Ekechi, 1989; Foreign and Office, 1960). Colonial prisons were also strictly classified by prisoner sentence. Under the 1916 Order in Council Act, colonial prisons were classified into three types: convict prisons, with prisoners serving two or more years to life sentences, provincial prisons, with prisoners serving greater than six months and less than two years sentences, and divisional prisons, with prisoners serving less than or equal to six months sentences (Kingdon, 1923; Abiodun, 2017). Most prisoners had shorter sentences of fewer than two years, with 65% to 90% of convicts in provincial or divisional prisons (Hynd, 2015).

2.3 Labor Shortages, Public Works and Prison Labor

To address chronic labor shortages and minimize costs associated with hiring wage labor to construct and maintain public works like the railroad and roads, colonial governments regularly used prisoners for labor. While prison labor across British colonial Africa was used

[14]There is little historical information on the functioning of the Native Authority prisons, and we use records on colonial prisons here. This means the number of prisoners presented here represent only a fraction of the total number of people imprisoned during this period. We discuss this further in Section 3 and in Appendix A.2. Prisons were also administered by northern and southern regions, with further detail on this provided in Appendix A.2.

[15]This strategic placement of prisons and prisoners around key infrastructure like the railway, is highlighted in the opening quote from Inspector Jackson.

in almost every sector, including for farming on plantations in settler colonies of Kenya and Southern Rhodesia (Zimbabwe), prisoners in Nigeria and the Gold Coast (Ghana) worked almost entirely on public works projects, and not on large scale plantations (Hynd, 2015; Akurang-Parry, 2000; Bernault, 2007). In Nigeria, by law, all able-bodied prisoners were mandated to work, and only prisoners who had been sentenced could work[16] (Report, 1925). Additionally, prisoners were completely unpaid for their labor. Particularly during periods of labor shortages, prison departments would hire out unpaid prison labor to other colonial government departments. These departments would then pay a small fee to the Prison department based on the assessed skill needed from the prisoner.

Prisoners were largely engaged in unskilled labor, and prison departments classified prisoners' labor into three types: unskilled hard labor, skilled hard labor, sometimes referred to as industrial labor, and light or domestic labor[17]. Unskilled hard labor included tasks like quarrying, breaking rocks, felling trees and other activities for road-making and railway station upkeep, and was largely assigned to prisoners with short-term sentences of less than six months. Skilled hard labor included tasks like basket-weaving, brick-making, tailoring and carpentry, and was usually assigned to prisoners with long-term sentences of greater than two years[18]. Light labor was frequently assigned to sick or old prisoners, or the 6% of female prisoners within the colonial prison system. In southern Nigeria, between 73% and 91% of prisoners were engaged in either hard or light labor between 1920 and 1938[19]. Prisoners

[16]Between 9% and 26% of prisoners were considered 'unfit' for work either due to being non-sentenced debtors or other not yet sentenced individuals in custody awaiting trial or being too sick to work. Source: British Blue Books, Nigeria, multiple years.

[17]Source: Annual Report on Prisons in Nigeria, 1940.

[18]The rationale provided by colonial prison officials was that these prisoners could be taught a skill given their long sentences, whereas, prisoners with short-term sentences would not have enough time to learn a skill. Prisoners in this skilled hard labor category produced items like uniforms that were then sold to other government departments for profit. Prison labor was reserved exclusively for government use, and colonial officials were careful to choose sectors for convict labor in order to avoid competing with private industries. Source: "Annual report on the Treatment of Offenders, 1947, British Blue Books and Annual Report on Prisons, 1920-1959

[19]Source: British colonial Blue Books, multiple years.

engaged in hard labor alone constituted over 70% of convicts over the same period. The top consumers of this unpaid prison labor were government departments including Public Works, Railways and Harbors, Native Administration, Police, Public Health and Education (Hynd, 2015; Report, 1925).

Prison labor, sourced primarily from prisoners with short-term sentences who made up the vast majority of the prison population (76% of sentenced prisoners in Nigeria between 1920 and 1938), was invaluable to the construction of colonial public works and infrastructure. A regular section in the colonial prison reports highlighted the value of prison labor as shown in Figure 3. Their labor contributed significantly to public works projects such as quarries in Abeokuta province, coalfields in Enugu, and industries in Lagos in southern Nigeria; the Eastern Railway extending from Port-Harcourt in Owerri province was constructed using large gangs of prison labor, and prisoners engaged in station upkeep worked across southeastern Nigeria through the 1950s (Hynd, 2015; Ekechi, 1989; Abiodun, 2017; Foreign and Office, 1960). Prisoner maintenance costs included the costs of feeding, clothing and housing prisoners, the costs of prison staff salaries, and all other expenses involved in operating the prisons. Tight labor markets worsened labor shortages, with periods of higher average annual wages positively correlated with a larger daily number of people in prisons as shown in Figure 4[20].

The recruitment of prisoners to address labor shortages was also stated explicitly by colonial officials. In one infamous account, a British sanitary inspector wrote to colonial government officials to request increased funds to employ more wage labor. The officials denied his request, and "The officials asked the prison department to find ways to either increase the prison population or recruit convicts from outstation prisons to complete the

[20]The correlation between the daily average numbers in prison and the average annual wage to unskilled laborers is 0.87, $p < .001$. We discuss these trends in detail in Section 3.

tasks."[21]. In another example, the Inspector of Prisons, W.H. Beverley, in the 1916 Annual Report on Prisons lists two main reasons for creating categories of prisons according to prison sentence as:

> *"(a) to place 'special prisons' in townships which are on good lines of communication and afford the most suitable description of penal labour. (Abeokuta, Enugu, Lagos, and Port Harcourt, on the eastern and western lines of the Nigerian Railway, provide quarrying, industrial work, labour connected with shipping and transport, etc.)" and (b) "the ensuring, as far as possible, of an automatic and constant supply of prisoners to each class of prisons. At the end of the year, the system appeared to be working well; the prison population was evenly distributed, and nowhere was there shortage of convict labour."*

So significant was the role of prison labor in colonial fiscal accounting, that in 1911, the Governor of Northern Nigeria remarked that "The value (calculated at 2/3 of the market rate) of prisoners' labor in connection with public works, which would otherwise have had to be paid for in cash was 3,878 pounds. If calculated at the ordinary market rates the value of the prisoners' useful labor would have exceeded the entire cost of the Prison Department" (Salau, 2015).

The use of prison labor to address labor shortages in the public works sector continued through the end of the colonial period. By the time of independence in 1960, both incarceration rates and the use of prison labor fell as shown in Figure 5. As of 1938, 0.2% of the local population was incarcerated; that share had fallen to 0.06% of the population by 1995. While the laws allowing prison labor for government use remained in place through the postcolonial period[22], the discovery of oil in 1956, followed by an oil price boom in the

[21]NAI, CSO 26/2 09591 Vol.1 'Lieutenant Governor Southern Province to Resident Calabar Province: Memorandum on Prison labor' 23rd April 1923.

[22]Prison labor was never completely abolished as a feature of imprisonment in Nigeria- and prison labor as mandated by constitutions in Nigeria since independence (e.g. in the 1979 and 1999 constitutions) continues

1970s, changed the tax revenue structure of Nigeria so that the majority of government revenue switched from agricultural commodity revenues over the colonial period to direct taxes from petroleum as shown in Figure 6. With the switch to a capital intensive oil revenue base, the need for a large base of unskilled labor for public works construction and maintenance with the goal of agricultural commodity extraction declined in the postcolonial period. This change in the government revenue base, along with increased protests from labor unions, led to the decline in the use of prison labor in postcolonial Nigeria (Killingray, 1999; Abiodun, 2017).

2.4 Crime and Punishment

Although there is limited disaggregated data on the types of crimes individuals were convicted of over the colonial period, available data from colonial records in Nigeria show that, on average, 61% of total convictions in colonial courts were from "offences against revenue laws, municipal, road and other laws relating to social economy of the colony" between 1920 and 1939, as shown in Figure 7[23]. These offenses included defaulting on tax payments, and violations of vagrancy, labor ordinance, township ordinance (which restricted the movement of Africans in the provinces) and other similar, minor, 'misdemeanor' laws[24]. Together, with "miscellaneous minor offences" which included crimes like 'breach of peace', 'drunk and disorderly', 'witchcraft' and other crimes against 'public morality', these misdemeanor offenses accounted for 76% of colonial court convictions between 1920 and 1939. Fines were most frequently assigned as the main punishment for these misdemeanor crimes, with imprisonment sometimes assigned as punishment, or assigned for individuals unable to pay the

to be a feature in prison (Shajobi-Ibikunle, 2014). More recent changes in constitution have placed stricter mandates about work of prisoners, in many cases, limiting work to within the prisons, with more rhetoric around rehabilitation and reformation of prisoners under The Nigerian Prisons Service and Article 9 of the 1972 Prison Act (Tanimu, 2010).

[23]Source: British colonial Blue Books, multiple years. There is no disaggregated crime data by the categories listed in the colonial records between 1940 and 1960.

[24]Source: "Policing in Lagos and Provinces, 1899-1929". Reference: 73242C-01; "Judicial and Police, 1899-1960", British Foreign and Commonwealth Office.

fines, following the discretion of the colonial court magistrate (Hynd, 2015). An important lever for colonial governments seeking to increase the prison labor base, was by increasing prosecutions of the aforementioned minor offenses, and switching punishment from fines to imprisonment (Hynd, 2015; Ojomo and Alemika, 1993). In contrast, over the postcolonial period, when prison labor was no longer used intensively by governments, a major share (46% on average between 1977 and 1993) of crimes people were incarcerated for were for property theft (Figure 7).

2.5 Policing and Enforcement

The judicial system in colonial Nigeria was highly centralized, with the colonial courts working in concert with prison officials and police to "maintain law and order", protect European property and meet the revenue imperative objectives of the colonial government[25] (Rotimi, 1993; Onoge, 1993). The colonial police force was headed by colonial officials with rank and file constables, constituting the majority of the base, recruited from local populations across the country[26]. The police were often the first point of contact with the judicial system for local populations (Rotimi, 1993; Onoge, 1993). The police were especially involved in enforcing tax collection and frequently involved in tax raids and arrests associated with violations of colonial crimes. The police were notoriously feared for their frequent use of violence against local populations[27]. The 1930s saw multiple protests against police brutality; one infamous protest against the use of police by the Egba native administration in tax collection, came

[25]The colonial police was administered under 2 separate, but jointly legislated forces in northern and southern Nigeria and amalgamated into a national police force in 1930.

[26]A popular strategy by colonial officials was to divide police from local populations by hiring rank and file officers from separate ethnic regions of the country. The strategy was elaborated by colonial official Freeman in a letter to the Duke of Newcastle in December 1863 where he argued that by raising a police force for Lagos (which had a majority Yoruba ethnic population) from mainly Hausas, it would be difficult for a rapport to develop between the police and the people of Lagos against whom they were to enforce repressive laws (Ojomo and Alemika, 1993).

[27]Colonial police fear as a feature of local memory is reflected in local songs like the ones from the Urhobo ethnic group recalling the humiliation of men who fell victim to police ambush during tax raids and were subsequently locked up in police cells. The songs crystallized colonial policemen as 'terroristic bogeys' in local communities (Onoge, 1993).

with reports from observers like a local reverend commenting on being horrified by the sight of women "hunted down and dragged about on public streets" by local police for defaulting on tax payment (Rotimi, 1993). Much of the administrative structure of the police force remained in place through the postcolonial period. The police in Nigeria, and across much of colonial Africa, where similar systems were implemented, remain a national body, and there have been multiple critiques from scholars highlighting "tremendous continuity in the country's policing traditions and goals in spite of a series of organizational reforms" (Ojomo and Alemika, 1993; Sanny and Logan, 2020). These critiques have also linked continuity in coercive policing practices to relatively high levels of mistrust in police in these regions today (Sanny and Logan, 2020).

3 Estimating the Value of Prison Labor

The qualitative accounts from colonial records, described in Section 2, highlight the value of prison labor in Nigeria, but can we estimate quantitatively how valuable prison labor was for colonial public finance? To assess the significance of unpaid prison labor for colonial public works expenditures, or the value of prison labor, we digitized archival records on the prison population, wages, public works expenditure, and revenue from the British colonial Blue Books and Annual Report on the Administration of the Prisons Department[28] between 1920 and 1959. The Blue Books were statistical returns that governors of British dependencies were required to submit on an annual basis and report a complete record of prisons and colonial public finance between 1920 and 1959 in Nigeria[29]. The Blue Books and the Annual Report also include qualitative descriptions of the activities undertaken by prison departments, as reported by the Director of Prisons. An example of the archival

[28]Referred to as the Annual Report subsequently.

[29]Nigeria is amalgamated from separate regions into a single country in 1914 and although the Blue Books data extend back to 1914, some information is missing between 1914 and 1920, so we start our analysis in 1920 for completeness. The Blue Books data on prisons and public finance ends in 1938. For prison data after 1938, we use records from the Annual Report on the Administration of the Prisons Department.

data is shown in Figure 8. These data sources and the variables we use in our analysis are described in detail in Appendix A.1. As mentioned in Section 2.2, the colonial prisons data represent only a fraction of the overall prison population in Nigeria. There are no detailed data on Native prisons administered by local chiefs in the colonial archives prior to 1940. Available data on Native prisons in the Annual Reports from 1940 show that the addition of Native prison estimates to the colonial estimates presented in this paper would almost double the incarceration rate in 1940 from around 224 per 100,000 population to 399 per 100,000 population. This suggests that the data we present here from 1920 to 1959 may be an underestimate of the total level of incarceration, and the total value of prison labor, during this period[30].

3.1 Empirical Strategy

We measure the value of convict labor to the colonial regime by adapting the strategy from van Waijenburg (2018) to estimate the value of unpaid prison labor, and its relative share in expenditure on new construction of colonial public works[31]. In essence we ask, "How much would the colonial state have had to pay if they had to hire non-remunerated prison workers for a market rate wage?"

We calculate the overall value of unpaid prison labor in each year t as:

$$\text{Value of prison labor}_t = \text{Annual wages}_t \times \frac{1}{N} \sum_{n=1}^{N} \text{Prisoners}_{nt} \tag{1}$$

This gives us an overall gross value of benefits accruing to government consumers of prison labor. As a measure of wages, we use the average annual market wages paid to

[30]We provide further discussion on this in Appendix A.2.1.

[31]We use expenditure on new public works construction only here as a comparison as it reflects value-adding investment in productive public works rather than just upkeep or maintenance. New expenditure represents about 40% of total, new and maintenance, public works expenditure between 1920 and 1959. In Appendix A.3.3, we compare the value of prison labor figures to total public works spending, including recurrent expenditure on regular maintenance of public works reported in the archives.

unskilled laborers. The wage measure comes from the colonial Blue Books which reports annual wages paid to people classified as "Labourers and Carriers" and other "Unskilled Labour". This captures the wages for some of the types of work that prisoners were required to perform, including felling trees and breaking rocks to clear areas for road and railroad construction, as discussed in Section 2. $Prisoners_{nt}$ is the daily average number of people in prisons over n days in the year from the archival records[32]. This measure captures the amount of convict labor that was available on any given day. As discussed in Section 2, prison officials measured the value of prison labor based on the funds generated from hiring out prisoners to other government departments for a small per diem fee[33]. We compare our estimated total value of prison labor to the colonial reported value of prison labor in the results in Section 3.2.

The specification in Equation 1 does not factor in the costs of prisoner maintenance, including food, clothing, and prison staff salaries. The archival data report two sets of costs for prisoner maintenance: (i) food costs, which is reported as the main cost of prisoner upkeep; and (ii) total prisoner maintenance costs, a measure that includes all expenses involved in operating the prisons (i.e., everything from food costs, to staff salaries, costs of transporting prisoners, equipment purchases, uniforms for staff, and any other spending on prisons)[34]. Food costs represent an average of 35% of the total prisoner cost for 1920 to 1959,

[32] N is the total amount of prison days in the year recorded in the prison data. While the exact value of N is not explicitly listed in the archival data, we use the explicitly recorded 'daily average number of prisoners' category in the colonial archives. A snapshot of the description of this category from the 1925 Annual Report on the Prisons Department, Southern Provinces, is shown in Figure A5 in the Appendix.

[33] The Directors of Prisons, for example, W.H. Beverly, E. Jackson or W. Reeder in the southern provinces over 1915 to 1921, recorded per diem estimates of the value of labor between 1916 and 1921 in the Lagos colony and southern provinces for Nigeria. Using the classification of labor into skilled hard labor, unskilled hard labor and light labor, described in Section 2, hard labor, both unskilled and skilled are given a value of 5 pence per day, with light labor given a value of 3 pence per day in 1916. Starting in 1917, skilled hard labor is given a value of 1 shilling and 6 pence or 18 pence, unskilled hard labor is assigned a value of 5 pence and light labor is assigned a value of 3 pence. The rates for unskilled hard labor stay the same from 1918 through 1921, with no reporting on the exact value assigned to skilled hard labor or light labor over this time. After 1921, the reports stop including information on the per diem value assigned to the different classes of labor.

[34] An example of one breakdown of these costs over 1919 to 1921 from the colonial archives for prisons in

and ranges from 27% to 51% of the total prisoner costs over the study period. Food costs and staff salaries account for over 50% of the total prisoner costs from 1920 to 1959. The total prisoner maintenance cost is the most expansive measure of the prison upkeep cost. The net value of prison labor is the difference between the total value of prison labor in Equation 1 and total prisoner maintenance costs. To estimate the relative value of prison labor, we divide the results from Equation 1 by public works expenditures, prison expenditures and overall expenditure figures from the Blue Books. We present the results on the net and relative values of prison labor in Section 3.3.

Figure 4(a) shows the trends in the reported average annual wage and prisoner food and overall maintenance costs. The total reported prisoner upkeep cost closely tracks the wage, reflecting increases in staff salaries over time, with a steep increase after 1940. Prisoner food cost follows a similar pattern, although the post-1940 increase in cost is less steep than the wage and total prisoner cost. Figure 4b shows the daily average number in prison over the study period. The wage is above prisoner food costs in all years, and above total prisoner costs in over 51% of the years between 1920 and 1959. The daily average number in prison fluctuates notably between 1920 and 1940, increasing through 1930, then decreasing between 1930 and 1940, before sharply increasing after 1943. Interestingly, the daily average number in prison also appears to track the average annual wage in Figure 4a. There is a positive correlation (0.87, $p < .001$) between the daily average numbers in prison and the average annual wage to unskilled laborers.

We estimate various versions of Equation 1 in alternate specifications, including estimates using alternate wage measures, adjusting for inflation, and addressing any potential bias in prisoner estimates by computing a weighted average measure of people committed to prison for penal imprisonment in each year. The trends in the results remain unchanged

the southern provinces is shown in Figure A7 in Appendix A.3.

and are detailed in Appendix A.3.

3.2 Value of Prison Labor Results

Figure 9 reports our estimates of the total gross value of prison labor based on Equation 1, along with a comparison to the colonial prison officials' own reports of the value of prison labor based on fees remitted to the Prison department for prisoners' labor[35]. While our estimates of the value of prison labor are consistently higher than the colonial governments' own reports, both measures follow similar trends, and the values are close to each other prior to 1945. There is a positive correlation (0.7, $p < 0.001$) between our estimates and the colonial reported values of prison labor. The estimated total gross value of prison labor starts out around 178,498 pounds in 1920 and fluctuates- first decreasing, and then increasing through 1927, before mostly declining through 1943, then increasing sharply afterwards, peaking at 1,532,634 pounds in 1959[36]. The average estimated gross value of prison labor is 313,742 pounds over the colonial period.

Although prisoners were not paid, the exact per diem amount of the payment remitted to the Prisons department from other government agencies for their labor was recorded in a few years between 1919 and 1925 for the southern provinces. These payments were the prices set by the Prisons department for a prisoner's labor based on the level of skilled labor required as discussed in Section 2.3. We compile these estimates, and compare these prisoner prices to the daily market wage rate for similarly skilled workers in the southern provinces[37]. Prisoners performing unskilled hard labor, who made up the majority of the prison population as discussed in Section 2, were assigned a value between 60% to 80% below the market wage rate. Colonial prison officials were consistently undervaluing prisoners' labor

[35]We provide more detail and numbers in Table A2 of Appendix A.3.

[36]Given the debates around the choice of the price index for colonial Africa, we present the figures in nominal terms here (Frankema and Van Waijenburg, 2012). We present the real estimates in Appendix A.3. The trends remain unchanged.

[37]The estimates are shown in Figure A6 of Appendix A.3.

to keep administration costs for their peer departments in government low while attempting to balance their budgets[38].

3.3 Prisoner Costs and Relative Value of Prison Labor

We calculate the difference between the total value of prison labor and the total prisoner maintenance costs, or the net value of prison labor, and compare these estimates to the colonial prison officials' reports of the value of prison labor in Figure 10. Our estimates of the value of prison labor are consistently larger than the colonial government's reported values as mentioned previously and shown in Figure 10a. When we compare the net value of prison labor estimates to the colonial government's reported values in Figure 10b, the results show that our net value of prison labor estimates are lower than the colonial reported values in most of the study years from 1920 to 1959. By calculating the total value of prison labor using only the value of unpaid wages to (unskilled) prison laborers, our net value estimates may be undervaluing the benefits of prison labor to the colonial government. There is still a positive correlation (0.5, $p < 0.01$) between our net value estimates and the colonial reported value of prison labor. The net prison labor value estimates and colonial reported values appear to line up more clearly along the 45 degree line of equality in Figure 10b. Even after subtracting out the extensive measures of prisoner maintenance costs described in Section 3.1, the net value of prison labor is nonnegative and strictly positive in 60% and 57% of years respectively in colonial Nigeria.

Figure 11 reports the estimated net value of prison labor results, along with the relative value of prison labor, comparing our estimates to reported colonial spending on public works, prisons and overall colonial expenditure[39]. We observe similar trends with the net value of

[38]This is confirmed in the report written by Prison Inspector Beverley in the 1915 Annual Report on Prisons where he states that values assigned to prisoners' labor is below "wages demanded by workmen in civil life". He recommends a doubling of values to balance prison expenditure amounts, illustrating the balance sheet calculus that appeared to drive the setting of values of prison labor.

[39]We provide more detail and numbers in Table A2 of Appendix A.3.

prison labor, less prisoner food costs; the net value of prison labor less food costs remains strictly positive over the study period with the average falling to 195,260 pounds. When we estimate the net value of prison labor using all prisoner maintenance costs reported, the mean falls to 31,674 pounds. Figure 11(b) reports the estimates for the share of prison labor in public works expenditure from 1920 to 1959. The share, using the gross value of prison labor, fluctuates throughout the colonial period; it starts out at 133% in 1920, and then declines through 1932, before increasing through 1936 and again declining through the 1940s. The prison labor share in public works expenditure increases sharply after 1943, peaking in 1952 and 1953 at 249%, before declining through 1959. The share of overall prison labor in colonial public works expenditure ranges between 40% and 249%, with an average of 101% over 1920 to 1959. After adjusting for extensive measures of prisoner maintenance costs, the share of the net value of prison labor in colonial public works expenditure remains economically significant, with a mean of 5% and a maximum of up to 42% during this period.

We show similar trends for the prison labor share of total prison expenditures and overall colonial expenditures over this period in Figure 11(c) and Figure 11(d), respectively. Given the relatively small share of new public works expenditure in overall colonial spending[40], the prison labor share in the overall colonial expenditure is low, constituting an average of 2% and 0.1% of total expenditure, using the gross and net values of prison labor (including total prisoner maintenance costs), respectively. The quantitative results support the qualitative accounts from the historical records that prison labor was economically valuable to the colonial regime.

[40] An average of 2.2% between 1920 and 1959.

4 The Effects of Economic Shocks on Incarceration Rates and the Use of Prison Labor

4.1 Conceptual Framework

As illustrated in the historical accounts in Section 2 and the accounting in Section 3, prison labor was an important resource used by colonial governments to address labor shortages in the public works sector. Prisoners' labor was valued for work on infrastructure projects like roads and the railroad, needed to extract agricultural commodities from the interior of the colony to the coast for export. To fix ideas about the links between labor shortages and the use of prison labor, we adapt insights from a recent theoretical literature on the effects of economic shocks on labor demand and coercion under forced labor institutions (Acemoglu and Wolitzky, 2011; Naidu and Yuchtman, 2013), and outline a simple conceptual framework as follows.

We highlight two main predictions on the effects of economic shocks on incarceration rates under forced labor institutions during the colonial period versus non-forced labor institutions over the postcolonial period. The economic setting in both periods is primarily agricultural, with the majority of the local population employed in the agricultural sector[41]. Within this setting, there are two types of shocks that directly affect agricultural revenues or surplus, namely shocks to quantity and shocks to price. Positive (negative) shocks that directly increase (decrease) the quantity of agricultural output or crops, increase (decrease) the demand for labor in the agricultural sector, and can lead to an increase (decrease) in wages in this sector. Similarly, exogenous shocks that raise the prices of agricultural output can also increase wages in the agricultural sector by creating demand for the output and hence associated labor demand. These labor demand shocks can increase or decrease wages

[41]This is the case in Nigeria, where a major share of workers is employed in agriculture. Estimates range between 37% and 70% as of 2016 by World Bank and Food and Agriculture Organization (FAO) statistics respectively.

in the agricultural sector.

The simple principal-agent framework (with the African worker as the agent and the colonial government as the principal), where the assumption that the principal must pay higher wages to induce more effort on the part of the agent does not hold when the principal can coerce the agent to work. We assume there is excess demand in the labor market and the principal is a cost minimizer with a preference for lower wages, following the historical account in Section 2. We also assume the colonial government, P, can coerce the African worker, A. A chooses whether or not to work for P relative to her reservation wage in the agricultural sector, $\overline{w}$. The wage contract offered by P, $w*$, must be greater than $\overline{w}$ to attract A's labor. If $w* < \overline{w}$, the agent chooses not to work for the principal. In this scenario, P can choose to coerce A to work through, for example, increasing the incarceration rate and the use of prison labor. Following the historical account in Section 2, the ways the colonial government could and did this were manifold and included, switching punishments for crimes from fines to incarceration, increased prosecution and arrests for so-called "crimes against the social economy of the colony" or minor, misdemeanor crimes like vagrancy, labor ordinance and breach of peace violations or, potentially, increased prison time for already incarcerated prisoners. P chooses coercion if the benefits of coercion (in the form of increasing output revenue and closing the excess demand gap) outweigh the costs of coercion (e.g. enforcement, risk of riots and conflict with local populations) or the net benefits are positive. A key insight here is that the colonial government was able to reduce the costs of coercion through the use of incarceration and prison labor with an expansive definition of what constituted a criminal act, and a centralized system of enforcement and punishment for these crimes as discussed in Section 2.

The first prediction from this framework is that positive economic or labor demand shocks, in the form of rising agricultural commodity export prices, or higher rainfall that

increases agricultural output and associated agricultural wages of workers, will increase incarceration rates and the use of prison labor under forced labor regimes, as over the colonial period. Symmetrically, negative shocks, will, all else being equal, have the opposite effect and reduce the demand for prison labor under these regimes.

Under non-forced labor institutions, positive economic shocks that increase agricultural wages or workers' reservation wage, also increase the opportunity cost of participating in economic crimes like property theft or related assault following previous models from the economics of crime literature (Freeman, 1999; Becker, 1968). Conversely, negative economic shocks that reduce wages, increase the likelihood of participating in economic crimes. This results in the second prediction, that negative shocks will increase incarceration rates under non-forced/non prison labor regimes, as in the postcolonial period in Nigeria. We test the predictions of this framework using data on incarceration rates and economic shocks outlined in Section 4.2.

4.2 Description of Data

4.2.1 Incarceration Rates

To assess the effects of economic shocks on incarceration and the use of prison labor, we digitized sixty-five years of archival data on prisons from 1920 to 1995. Available disaggregated data on incarceration rates at the subnational level spans the colonial period (1920-1938) and the postcolonial period (1971-1995). The Blue Books report incarceration data at the prison level, and we aggregate up to the district level, where the district is the colonial province between 1920 and 1938; we calculate the incarceration rate as the number of newly admitted prisoners per 100,000 population for each province in each year[42]. The incarceration data are broken down by length of prison sentence, classified as short-term (less than six

[42]The population data also comes from the Blue Books, and we use population of provinces in 1939 to calculate incarceration rates from 1920 to 1938. We discuss the population estimates in further detail in Appendix A.5.3.

months), medium-term (between six months and two years) and long-term (greater than two years) prisoners. We also assemble available data on postcolonial incarceration rates at the current administrative state level between 1971 and 1995 from Nigeria's Annual Abstract of Statistics[43].

Table 1 presents the summary statistics. The average incarceration rate falls by almost a third between the colonial and postcolonial periods from around 241 prisoners per 100,000 people to 92, respectively, as shown in Figure 5. The spatial distribution of incarceration between the colonial and postcolonial period also changes significantly, with prisoners being clustered in the southern provinces over the colonial period, and significantly more spatial dispersion in the postcolonial period, as shown in Figure 12. Short-term prisoners make-up the majority of the colonial prison population at 53% of all newly committed prisoners and 76% of penal imprisonment, on average, between 1920 and 1938, as shown in Table 1 and Figure 13. The share of long-term prisoners in penal imprisonment is comparatively smaller, at 11% over the same period. The share of prisoners with previous convictions is similarly low, with 11% of prisoners having one previous conviction and only 2% of prisoners with two or three previous convictions.

4.2.2 Economic Shocks

Rainfall

We use two different measures of economic shocks, namely rainfall and agricultural commodity export prices. The measures capture economic shocks in a primarily agricultural setting[44]. A major share of workers are employed in agriculture in Nigeria, and this has remained the case for the last few decades[45]. Agriculture is primarily rain-fed with irrigated

[43]The postcolonial data does not include breakdown by sentence.

[44]The share of agriculture in GDP has ranged between 40% and 60% between 1960 and 2012 by some estimates (Ahungwa, Haruna, and Abdusalam, 2014).

[45]Estimates range between 37% and 70% as of 2016 by World Bank and Food and Agriculture Organization (FAO) statistics respectively.

agriculture accounting for only 1% of cultivated area in the country, and government investment in agriculture has remained relatively stagnant at 1% of total government expenditure since 1920[46] (Xie, You, and Takeshima, 2017). The combination of these facts means that economic conditions of domestic populations are sensitive to sudden, unexpected changes or deviations in rainfall that may reduce crop yields and respective agricultural incomes (e.g. through droughts or floods). For the colonial period, we use rainfall data from 69 weather stations recorded in the Blue Books to construct measures of rainfall deviations, or z-scores, as deviations from the district or colonial province long-term mean[47]. For the postcolonial period, we use precipitation data from the NASA MERRA-2 database, and calculate rainfall deviations as deviations from the district or postcolonial administrative state long-term mean[48].

Cash Crop Export Prices

The second measure of productivity shocks we use is agricultural commodity export prices. The measure uses data on the major cash crop exports in colonial Nigeria, which include cocoa, palm oil and groundnuts; the data are global export prices from the Wageningen University African Commodity Trade Database (Frankema, Williamson, and Woltjer, 2018). Altogether, exports from palm products, cocoa and groundnuts accounted for 93% of the volume of agricultural commodity exports and 78% of total exports in Nigeria over the colonial period. We combine the price data with land suitability and crop production data from the Global Agro-Ecological Zones and Blue Books databases, respectively, to identify which prices would have theoretically affected which districts. Figure 14 shows the spatial

[46] As shown in Figure A11 in Appendix A.4.

[47] In alternate specifications, we test results with interpolated data from the University of Delaware database, and confirm that while there is a significant positive correlation between the rainfall values, the correlation is low and does not translate to the z-scores which are the main explanatory variable used here. Given that the Delaware values from 1920 are less fine interpolations than the weather station data, we use the weather station data here for our main results.

[48] The NASA MERRA-2 data is not available prior to 1980. The dataset is viewed as the gold standard for climate/weather analysis among climate researchers (Gelaro et al., 2017).

distribution of cash crop production, along with a time series of export prices over the colonial study period. Palm oil and cocoa are produced in the southern provinces, while groundnut is the major cash crop export produced in the northern provinces. Prices for cash crops in the southern provinces, namely cocoa and palm oil, are 2 times and 1.5 times higher, on average, than prices for groundnut produced in the northern provinces over 1920 to 1938. The most productive cash crops, by price, were palm oil and cocoa over the colonial period. Palm oil was particularly valuable given the relatively high share of provinces (29%) involved in its production (Table 1); it also had the highest volume of trade of the three cash crops over the colonial period[49].

4.3 Empirical Strategy

To test the predictions of the conceptual framework in Section 4.1, we use three main estimating equations: (1a) a nonlinear, quadratic specification that allows the effect of rainfall shocks on incarceration to vary more flexibly with the level of district-level rainfall deviation, and estimates the effects of positive economic shocks on incarceration rates; (1b) a linear specification that identifies the effects of moderate positive, productivity enhancing, rainfall shocks, on incarceration; and (2) a linear specification that identifies the effects of productivity shocks with an interaction term for agricultural export commodity prices. We include district (province or current state for colonial or postcolonial data respectively) and year fixed effects in all specifications, along with clustered standard errors at the district level. Following Cameron, Gelbach, and Miller (2008), we apply wild bootstrap-based tests to our estimates to account for potentially low numbers of clusters in estimating our standard errors, and include wild cluster bootstrap p-values in our results. The rationale behind each empirical strategy is discussed in further detail in Section 4.3.1 and Section 4.3.2. Our main specifications will be related models (1a) and (1b), although we interpret the results

[49]Between 1863 and 1947, 25% of the value of agricultural commodity exports came from palm oil, and the figure rises to 61% when we include palm kernels, a byproduct of palm oil production (Frankema, Williamson, and Woltjer, 2018).

from all three models in Section 4.4.

4.3.1 Rainfall Shocks and Incarceration Rates

Nonlinear Effects of Economic Shocks on Incarceration Rates

The conceptual framework in Section 4.1, following the historical accounts in Section 2, predicts that positive economic or labor demand shocks, in the form of rising agricultural commodity export prices, or higher rainfall that increases agricultural output and associated agricultural wages of workers, will increase incarceration rates and the use of prison labor under forced labor regimes, as over the colonial period; while conversely, negative shocks will increase incarceration rates under non-forced/non prison labor regimes, as in the postcolonial period in Nigeria. Following the framework, one hypothesis is that the main functional form of the relationship between rainfall shocks and incarceration rates in the colonial period is an inverted-U. The demand for prison labor peaks during periods of moderate positive rainfall shocks which reflect increases in agricultural productivity. In contrast, extremes in rainfall deviations, like droughts and floods which lower agricultural productivity, lower the demand for prison labor. As a falsification test, these effects should only hold for short-term incarceration, which is more elastic and should be more responsive to short-term economic shocks than long-term imprisonment.

A further, testable implication of the framework is that, as a falsification test, the effect of rainfall shocks on incarceration rates should be U-shaped if a major motive for state incarceration is not prison labor. Under a non-convict labor motivated prison system, as in postcolonial Nigeria, droughts and floods that lower agricultural productivity should increase incarceration rates through a rise in economic crimes like theft as outlined in Section 4.1.

We can then estimate the causal effect of rainfall shocks on incarceration rates by assessing panel regressions of the following nonlinear, quadratic form:

$$\text{Prisoners}_{it} = \beta_1 \text{RainfallDev}_{it} + \beta_2 \text{RainfallDev}_{it}^2 + \mu_i + \delta_t + \epsilon_{it} \quad (2)$$

where $Prisoners_{it}$ is the incarceration rate or number of newly committed prisoners per 100,000 population[50] in district i at year t; $RainfallDev_{it}$ is the rainfall deviation or z-score for each district in each year relative to the district's long-term expectation[51]; μ_i and δ_t are district and year fixed effects respectively. Errors are clustered at the district level to allow for arbitrary correlations[52]. Our key parameter of interest is β_2 which should be significantly negative if the inverted-U hypothesis holds and positive if the U-shaped hypothesis holds.

Identifying the Effects of Positive Productivity Shocks on Incarceration Rates

While Equation 2 allows us to more flexibly identify the effects of rainfall shocks on incarceration rates and the use of colonial prison labor, it does not allow us to distinguish between positive and negative productivity shocks. Specifically, Equation 2 does not allow us to distinguish between moderate positive rainfall shocks that signal increases in agricultural productivity, and extreme positive and negative shocks that respectively signal floods and droughts that can reduce productivity.

Since we do not have data on agricultural output from the colonial period, we adapt definitions of rainfall shocks in Africa from the literature (Dillon, McGee, and Oseni, 2015; Amare et al., 2018; Jensen, 2000) and estimate transition points in Equation 2 from non-parametric loess models linking rainfall deviations to colonial incarceration rates. From the transition points, we distinguish between moderate positive shocks, extreme positive shocks,

[50]The results remain unchanged if we standardize by the adult population only.

[51]We find no effects when we test the specification using lagged rainfall deviations instead following results in previous literature (Amare et al., 2018). The results are discussed in Appendix A5.

[52]We estimate all models with standard errors clustered at the district level and Conley standard errors with a cut-off window of 100 km to account for spatial auto-correlation (Conley, 1999). The results are robust to both specifications, and we present the district level clustering results here.

and extreme negative shocks as follows: (a) Positive shock (M), where 'M' is moderate, is an indicator equal to 1 if $0 < RainfallDev_{it} < 0.75$ and a proxy for increases in agricultural productivity; (b) Positive shock (E), where 'E' is extreme, is an indicator equal to 1 if $RainfallDev_{it} > 0.75$, and signifies floods that reduce agricultural productivity and (c) Negative shock (E), is an indicator equal to 1 if $RainfallDev_{it} < -0.5$, and signifies droughts that also reduce agricultural productivity.

We can then directly estimate the causal effect of moderate positive rainfall shocks on incarceration rates by estimating the following linear specification:

$$\text{Prisoners}_{it} = \alpha \text{Positive shock (M)}_{it} + \mu_i + \delta_t + \epsilon_{it} \tag{3}$$

where Positive shock $(\text{M})_{it}$ is the moderate positive rainfall shock. The main parameter of interest in Equation 3 is α, defined as the effect of moderate positive shocks that increase agricultural productivity on the incarceration rate. In alternate specifications, we include the extreme positive and negative rainfall shock variables to check the robustness of our results.

Rainfall and Crop Yields

A key assumption motivating the empirical strategy in Equation 2 and Equation 3 is that rainfall deviations have a causal effect on crop yields, and that this effect is nonlinear with extremes in rainfall, like droughts or floods, resulting in a decrease in crop yields or agricultural output. The change in crop yield changes the demand for labor and corresponding agricultural wages as outlined in the conceptual framework. This labor demand shock is what affects incarceration rates and the demand for prison labor over the colonial period.

Is this key assumption accurate? There is a robust literature on the nonlinear relationship between rainfall and agricultural output (Dell, Jones, and Olken, 2014; Lesk, Rowhani,

and Ramankutty, 2016; Sarsons, 2015; Kaur, 2019; Jayachandran, 2006; Fishman, 2016; Lesk, Coffel, and Horton, 2020). Most models linking weather and crop yields, particularly in hotter climates, generally find inverted-U trends between rainfall and crop yields, where more rain increases yields up to a certain optimal point, but extremes in rainfall, either too much or too little, relative to some setting-dependent threshold, reduce yields (Fishman, 2016; Lesk, Coffel, and Horton, 2020). In colonial Nigeria, while we do not have detailed data on crop yields, numerous reports from the Agricultural Department from 1921 to 1952 highlight the sensitivity of crop yields to extremes in rainfall[53]. One example is from the 1923 report on cotton yields, stating:

> *"The annual reports of the Southern Agricultural Department record remarkable variations in the crops grown from year to year... The bad crops were from time to time ascribed to one or other the following causes: (a) To the direct effect of climatic conditions on the crop-* ***too much rain in November or too sudden drought in December****..."*

The climate in Nigeria has remained largely stable between the colonial and postcolonial period (Xie, You, and Takeshima, 2017). As discussed in Section 4.2.2, the practice of and investment in agriculture has also remained largely stable in Nigeria since 1920. Hence, we can use data on crop yields from the postcolonial period to infer the relationship between rainfall shocks and crop yields in the colonial period as well. In the postcolonial period, although there is relatively little disaggregated data on crop yields, we digitized four years of available data from 1992 to 1995 from the Annual Abstract of Statistics, with details provided in Appendix A.4. The data include seven major crops representing almost one-fifth of domestic production by Food and Agriculture Organization (FAO) estimates[54]. Crop yield is calculated as the average of volume of crop produced/area cropped, following previous

[53]We highlight more evidence from the Agricultural Department reports in Appendix A.4.

[54]The crops include cowpea, mango, palm oil, pepper, soyabeans, tomatoes, and leafy vegetables.

literature (Jayachandran, 2006). We estimate Equation 2 and Equation 3 using crop yields as the outcome. The results in Table A4 in Appendix A.4 confirm the inverted-U relationship between rainfall deviations and crop yields (column (1) of Table A4). Extreme negative rainfall shocks like droughts and extreme positive rainfall shocks like floods decrease crop yields (column (2) of Table A4). We discuss the crop yield data and results further in Appendix A.4.

4.3.2 Cash Crop Export Prices and Incarceration Rates

Do higher agricultural commodity export prices that increase agricultural output and associated agricultural wages of workers, also increase incarceration rates and the use of prison labor under the colonial, prison labor regime? To answer this question, we estimate equations of the following form, following previous specifications in the literature (Dube and Vargas, 2013; Naidu and Yuchtman, 2013):

$$\text{Prisoners}_{it} = \sum_{c=1}^{3} \gamma_c \text{Cash Crop}_{ci} \times \text{Cash Crop Price}_{ct} + \mu_i + \delta_t + \epsilon_{it} \tag{4}$$

where Cash Crop_{ci} is an indicator that equals 1 if province i produces one of the 3 major export cash crops c $\in (palmoil, cocoa, groundnut)$ over the colonial period, and $\text{Cash Crop Price}_{ct}$ is the natural log of the export price of c in year t (Figure 14). The coefficient of interest is the interaction term γ_c which measures the effect of increases in cash crop prices in producing provinces on the incarceration rate.

4.4 Economic Shocks and Incarceration Rates Results

4.4.1 Rainfall Shocks

Table 2 presents the results from Equation 4 on the effects of rainfall shocks on incarceration rates following the quadratic specification. While the quadratic term is negative but not significant when we examine all penal imprisonment over the colonial period in column

(1), the effect is significant and negative for short-term incarceration rates. The negative quadratic coefficient for short-term incarceration is consistent with an inverted-U relationship between rainfall deviation and short-term imprisonment or the use of prison labor. β_2, the squared rainfall deviation term is not significant for medium or long-term incarceration rates, in line with the predictions in Section 4.3.1.

The results of the falsification test for postcolonial imprisonment are shown in column (5) of Table 2. β_2 from Equation 2 is positive and significant for postcolonial incarceration rates. The positive significant estimate for postcolonial incarceration is consistent with the hypothesis that the effects of rainfall shocks on incarceration rates should be U-shaped under non-prison labor regimes; instead, imprisonment increases primarily as a response to increases in economic crimes like theft in the aftermath of negative productivity shocks (e.g., drought or floods).

Table 3 reports the results from the linear specification in Equation 3, which identifies the effects of moderate positive rainfall shocks that raise agricultural productivity, versus extreme positive or negative rainfall shocks (respectively signifying floods or droughts that reduce productivity) on incarceration rates. The results from our main specification in column (1) show that moderate positive rainfall shocks have a significant positive effect on short-term imprisonment over the colonial period. A moderate positive rainfall shock increases the short-term incarceration rate by 16.7 per 100,000 population, or around 12%, relative to the sample mean of 135 per 100,000 people. The effect remains significant, increasing the short-term incarceration rate by about 9% when we add controls for extreme negative and positive rainfall shocks in column (3) of Table 3.

In line with the inverted U-shape prediction, column (2) and column (3) of Table 3 show the opposite result for extreme negative rainfall shocks, which reduce short-term colonial imprisonment. Extreme negative rainfall shocks like droughts signal a decrease in

agricultural productivity and decrease demand for unpaid prison labor under the colonial prison labor system; this is reflected in the lowered incarceration rates, with extreme negative rainfall shocks associated with a 13% to 15% decline in short-term incarceration relative to the sample mean. There are no effects of rainfall shocks on long-term incarceration, as shown in columns (4) to (6) of Table 3.

In contrast, the postcolonial results show that, while moderate positive rainfall shocks have no significant effect on postcolonial incarceration rates (column (7) and column (9)), extreme negative (column (8)) and extreme positive (column (9)) rainfall shocks increase the postcolonial imprisonment rate. From column (9), the magnitude of the increase in postcolonial imprisonment from droughts/extreme negative rainfall shocks and floods/extreme positive rainfall shocks is a 21% and 19% increase in incarceration rates relative to a sample mean of 105 per 100,000 people. The linear specification results are consistent with the results from the quadratic specification in Equation 2 showing an inverted U-shape relationship between rainfall deviation and incarceration rates in the colonial era, with a reversal/U-shape relationship in the postcolonial period.

4.4.2 Cash Crop Export Prices

Table 4 presents the results from Equation 4 on the effects of cash crop export prices on colonial incarceration rates. The results show that the effect of plausibly exogenous positive agricultural export price shocks signaling increases in agricultural productivity on colonial incarceration rates and the use of prison labor is concentrated in relatively higher value cash crops, like palm oil as discussed in Section 4.2.2[55]. The effects are particularly significant for palm oil, the most productive cash crop by volume over the colonial period (Frankema, Williamson, and Woltjer, 2018).

[55]There is no correlation between domestic rainfall shocks and agricultural export prices as discussed in Appendix A.4.

We interpret the coefficients from the full specification of the model in column (1) of Table 4, with short-term incarceration rates as the outcome of interest. A 10% increase in palm oil prices in palm oil producing regions is associated with an increase in the short-term incarceration rate by around 7 per 100,000 people, or a 5% increase in short-term incarceration relative to the sample mean. Short-term incarceration rates are elastic and responsive to increases in palm oil prices, signaling increases in agricultural productivity. There is no effect of the palm oil price interaction on long-term incarceration rates in column (5). The results for short-term incarceration are similar for cocoa, another high value crop, in column (1), though the effects are more robust for palm oil[56].

4.4.3 Robustness

We conduct numerous robustness checks on our results, with a subset of checks presented in Appendix A.5. We show that contemporaneous, not lagged, rainfall shocks affect incarceration rates in Table A5; and that our cash crop export price results are robust to the inclusion of rainfall controls (Table A6) and using raw prices instead of logs (Table A7). The results are also robust to trimming provinces to account for potential concerns around district population estimates (Table A8).

4.5 Further Evidence on Mechanisms

Our analysis so far shows that positive productivity shocks increased incarceration rates and the use of prison labor during the colonial period. The historical account in Section 2 suggests that colonial governments used multiple methods to intensify the use of prison labor during periods of labor shortages to work on key public works like the railroad needed to transport agricultural commodity exports for revenue. Among these methods were: (1) increasing short-term incarceration around prisons close to public works like the railroad, (2) sentence-switching, or changing the punishment for crimes (most of which were minor misdemeanor

[56]The patterns of crop-specific prices and crop-specific incarceration rates are also shown in the six graphs in Figure A14 of Appendix A.5.2.

crimes as discussed in Section 2.4) from fines to imprisonment, and (3) potentially increasing prison sentences as punishment for already incarcerated populations. We evaluate each of these three hypotheses around colonial government methods below.

4.5.1 Wages, Prices and the Railroad

A major use of prison labor was for public works and construction and maintenance of the railroad, which was essential for the transport of cash crops for export. Railroad construction began in 1898, and had expanded to its full extent across the country by the 1950s (Figure 2b). One test of the labor market tightness hypothesis described in this historical account and the conceptual framework is that when market wages are higher, demand for coerced prison labor should increase as well. Although, there is no available disaggregated data on wages, one way to test this hypothesis, is to examine the correlation between wages and incarceration rates at prisons near the railroad, given the intensive use of prison labor for railroad work[57]. Table 5 reports the estimates for the reduced form relationship between wages and distance from prisons to the railroad and colonial incarceration rates. The regressions are at the prison level and show that while prisons closer to the railroad generally have higher short-term incarceration rates (column (1)), during periods of higher wages, short-term incarceration rates also increase in prisons further away from the railroad but within the same colonial province (column (2)).

The interpretation of the result is intuitive. While short-term sentenced prisoners near the railroad were generally used as a reserve of unpaid labor for railroad construction and maintenance, increasing wages intensified the demand for unpaid prison labor and worsened labor shortages and labor market tightness. To increase the share of prison labor, colonial officials would need to increase the share of prisoners in prisons farther away from the railroad as well. Prisoners, by law, could not be transferred across provinces, as discussed in Section

[57]Market wages are endogenous in this context, and we interpret the results as suggestive correlations only.

2. Colonial officials could then transport prisoners within the province to conduct work on the railroad and associated public works as needed (Foreign and Office, 1960). The effects are specific to short-term sentenced prisoners, with no effects for long-term sentenced prisoners (column (3) and column (4) of Table 5). Table 6 shows similar effects for cash crop export prices. Rising cash crop prices increase short-term incarceration rates in prisons further away from the railroad but within the same colonial province (column (2)-column (4)).

4.5.2 Sentence-Switching

Although there is no available disaggregated colonial data on crime and punishment, to test the "sentence-switching" hypothesis, we estimate Equation 3 using the difference between custody/awaiting trial and short-term incarceration figures as an outcome. The rationale here is that, given that only sentenced prisoners could legally be used for prison labor, if there is more sentence switching from 'awaiting trial' to short-term imprisonment in response to positive economic shocks, α will be significantly negative for the difference. Table A11 in Appendix A.5.5 provides suggestive evidence of 'sentence-switching' as a strategy to increase the share of short-term prisoners for prison labor in response to positive productivity shocks. While the specifications in columns (1) to (4) confirm a positive, mostly significant relationship between moderate positive rainfall shocks and both 'custody/awaiting trial' and short-term incarceration rates, the effect of shocks on their difference, in columns (5) and (6), is negative. Given that the coefficients on both custody and short term incarceration rates are positive, the only way for their difference to be negative is if short-term incarceration is rising faster than the custody category in response to moderate positive rainfall shocks. One interpretation is that people may have been transferred at a faster rate from custody/awaiting trial to short-term sentences so that the state could take advantage of unpaid prison labor when moderate positive rainfall shocks increased labor demand and worsened labor shortages. The α coefficient is not robust to the inclusion of the other rainfall

shock terms, as shown in column (6), and should be interpreted with caution, but provides suggestive evidence of the switching hypothesis.

The qualitative accounts of officials in the colonial archives also provide suggestive evidence of the sentence-switching channel[58]. For example, in 1926 the Inspector-General of Police of the southern provinces, C.W. Duncan, notes the uptick in cases and convictions in that year in his report. He then highlights that while 'offences against property show a decrease of 198 cases compared with those of the previous year', and there has been a decrease in 'offences against persons', prosecutions of minor offenses have increased that year, accounting for the increase in cases and convictions[59].

4.5.3 Punishment

The previous two methods focused on the ways colonial governments increased incarceration rates in response to labor demand shocks. To test the hypothesis that increasing prison sentences of already incarcerated prisoners may be one, albeit more minor, way colonial officials intensified the use of prison labor during these shocks, we digitized data from the colonial Annual Report on Prisons on the punishments assigned by colonial officials to prisoners for infractions while in prison. In line with the cost-cutting objectives of colonial officials, the most popular punishment was reduced diet, accounting for 53%, on average, of punishment to prisoners between 1920 and 1938 as shown in Figure 15[60]. After reduced diet, the top categories for punishment of prisoners were flogging (21%), solitary confinement (8%), forfeiture of 'marks' or credits for good behavior which could be used to reduce a prison sentence (6%), and extra prison time (4%). To examine the effects of observable cash crop price

[58]Accounts from the "Policing in Lagos and Provinces, 1899-1929". Reference: 73242C-01 document from the British Foreign and Commonwealth Office."

[59]Duncan highlights one notable case of tax default in the southern provinces where "The inhabitants of these villages had fallen into arrears in the payment of their taxes and the Assistant District officers, having failed to collect these arrears in March, warned the people that their property would be seized if they persisted in their obstinate attitude". Source: "Policing in Lagos and Provinces, 1899-1929". Reference: 73242C-01.

[60]Food costs were often the major cost of maintaining a prisoner as discussed in Section 3.

shocks on punishment of prisoners, we estimate Equation 4 with shares of each punishment in total punishment assigned to prisoners as the outcome. The results in Table 7 provide suggestive evidence that prison officials may have also employed a 'carrot and stick' approach to motivate prisoners to work (carrot) and punish detractors with more prison time (stick) during periods of increased prices or labor shortages. Increases in palm oil prices in palm oil producing areas were associated with more prison time assigned as punishment to prisoners (column (1), 'stick'), but less forfeiture of marks assigned as punishment (column (5), 'carrot').

5 Colonial Imprisonment and Contemporary Trust in Legal Institutions

In the historical account in Section 2.5, we discussed the role of policing in, often violently, enforcing the colonial prison labor system, and its reported long-term effects on contemporary mistrust in police. To explore the implications of the colonial prison labor system for present-day views of police and contemporary trust in legal institutions more broadly, we present a brief discussion and suggestive evidence of the long-run effects of colonial imprisonment. Given that the origins of the modern prison and accompanying legal system in Nigeria and other former British colonies are rooted in the use of state policy around labor coercion, what are the long-term effects, if any, of exposure to these systems on populations' trust in these institutions today? We use Afrobarometer data from Nigeria from surveys over 2003 to 2014 recording respondents' stated trust in historical legal institutions (e.g., police, courts, and tax administration) to test whether past exposure to coercive, ostensibly economically influenced, colonial prison systems affects trust in legal institutions today. To assess if these effects, if any, are about legal institutions and not broader interpersonal trust, we also check trust in individuals (e.g., neighbors, relatives, and elected local governing council members) as an outcome. Previous research has shown that interpersonal trust is linked to longer term

historical events like the slave trade (Nunn and Wantchekon, 2011).

To test these hypotheses, we estimate equations of the following form:

$$\text{Trust}_{aigst} = \beta \text{Colonial Imprisonment}_i + \mathbf{X}'_{aigst}\theta + \mathbf{X}'_{gs}\phi + \mu_s + \delta_t + \epsilon_{aigst} \tag{5}$$

where Trust_{asit} is the contemporary trust outcome of interest for individual a residing in historical colonial province i, in current sub-district or local government area (LGA) g, in one of Nigeria's six geopolitical zone regions s for the Afrobarometer survey administered in year t. Nigeria's ethnic distribution is proxied by six geopolitical zones delineating ethnic homelands of populations[61], and the region fixed effects are included to capture culturally specific factors, like values around social status or age-based hierarchy, that may affect trust (Archibong, 2018; Nunn and Wantchekon, 2011; Lowes et al., 2017).

Following the historical account in Section 2 and the analysis in Section 4 linking primarily short-term sentenced prisoners to the use of prison labor for public works in response to labor demand shocks, we measure colonial imprisonment, Prisoners_i, as the long-run average share of short-term sentenced prisoners in overall penal imprisonment over 1920 to 1938 in each colonial province i. The value captures the intensity of the use of prisoners as convict labor to satisfy economic incentives over the colonial period, with higher values indicating that more incarcerated people were being used for prison labor on public works in a province. The share of short-term sentenced prisoners may more strongly reflect the level of coercive policing and legal practices in colonial provinces over time, given that this category of prisoners was most intensely exploited for prison labor. Using available data on

[61]Broadly, three ethnic groups- the Hausa, Yoruba and Igbo dominate three zones- the Northwest, Southwest and Southeast respectively. The Kanuri are the majority group in the Northeast, the Ijaw/Edo/Bini/Ibibio weakly dominate the Southsouth zone, and the Northcentral is home to the Tiv, Nupe and other smaller ethnic populations (Archibong, 2018).

the distribution of rank and file police across colonial provinces over 1920 to 1938, we show a strong, positive correlation between the share of rank and file, 'boots on the ground' police in the total police force and the share of short-term colonial imprisonment (Table A14). There is no correlation between the share of rank and file police and the share of long-term colonial imprisonment (column (2)), and the correlation is weaker with overall year to year short-term incarceration rates (column (3)). As a falsification test, we estimate Equation 5 using the share of long-term sentenced prisoners as well.

To check that the associations in Equation 5 are not being driven by differences in crime between high and low colonial imprisonment areas, we also test the following "crime propensity" outcomes from the Afrobarometer: whether the respondent has feared being the victim of a crime in their home, and how often an individual had to bribe a government official to obtain a document or permit in the last year. We include vectors of individual level covariates, $\mathbf{X}'_{aigst}$, including a respondent's age, age squared, a gender indicator variable, an indicator that equals one if the respondent lives in an urban location, and educational attainment fixed effects. The sub-district level covariates, $\mathbf{X}'_{gs}$, include controls for geography, disease suitability and precolonial and colonial institutional features[62]. Geography controls include land suitability for agriculture, ruggedness, elevation, and indicators for the presence of petroleum and access to a seacoast. Controls for disease suitability include the mean malaria ecology index and tse tse fly suitability. Precolonial and colonial institutional controls include the level of precolonial centralization and the total number of slaves exported from each ethnic region during the Atlantic slave trade. All regressions include region and survey-year fixed effects, μ_s and δ_t, respectively. Standard errors are clustered at the district (colonial province) level and wild cluster bootstrap p-values are included to account for potentially low numbers of clusters as before.

[62]Data is described in detail in Appendix A.6.

Figure 16 shows the visual relationship between colonial imprisonment and trust in legal institutions. The simple binscatter in the top panel, using the share of short-term sentenced prisoners colonial imprisonment measure suggests a strong negative relationship between short-term colonial imprisonment and trust in legal institutions. The picture is largely flipped using the share of long-term sentenced imprisonment measure in the bottom panel. We present OLS estimates for the effects of colonial imprisonment, using our main short-term sentenced measure, on trust outcomes in Panel A of Table 8. Columns (1) to (3) of Panel A show a negative association between colonial imprisonment and contemporary trust in legal institutions, with effects particularly robust for trust in police (column (1)). Increasing the share of short-term sentenced colonial imprisonment in a province from none to all decreases the reported trust in police by current day residents of the region by 0.4 points, or a 57% reduction in reported trust in police relative to the sample mean. There is no significant association between colonial imprisonment and contemporary interpersonal trust (column (4) to column (6) of Panel A). Panel B shows that there is no significant association between the long-term colonial imprisonment measure and contemporary trust outcomes.

To check that the result on the negative association between colonial imprisonment and trust in legal institutions is not being driven by underlying differences in crime rates between regions of high versus low levels of colonial imprisonment, we present the results on crime in Table 9. There is no significant association between colonial imprisonment and propensity for reported criminal/bribery behavior (column (1) and (2)); and if anything, residents from areas with high levels of (short-term) colonial imprisonment are less likely to report fearing being a victim of a crime in their homes (column (3)). There is no association between long-term colonial imprisonment and reported crime (columns (4) to (6)).

The results presented in Table 8 suggest that there is a negative correlation between

colonial imprisonment and contemporary trust in legal institutions, but do not identify the causal effect of colonial imprisonment on trust. The results provide a first exploration of the potential detrimental long-run effects of coercive colonial prison labor systems on current day trust in legal institutions like police. The qualitative history in Section 2.5, and the historically high share of rank and file colonial police in these areas suggest that persistence in coercive policing may be one channel through which these effects persist[63].

6 Conclusion

What are the effects on incarceration when prisoners are viewed and used primarily as a source of labor to serve economic interests? And what are the potential implications for citizens' views of state legitimacy, when an institution of state justice, like prison, is used to serve economic interests? To answer these questions, we first digitized annual data from archival sources for British colonial Nigeria. First, we show that prisons were economically valuable to the colonial regime. We present the first quantitative estimates on the value of prison labor in British colonial Africa, and find that the value of prison labor is strictly positive over the colonial period. Even after accounting for an extensive set of prisoner maintenance costs, the net value of prison labor is strictly positive in the majority of years in colonial Nigeria. Prison labor constituted a significant share of public works expenditures, up to 249% and 42%, using our gross and net values of prison labor respectively.

We examine the effects of shocks to economic productivity on incarceration and the use of prison labor. We find that incarceration rates during the colonial period are procyclical. Moderate positive rainfall shocks and positive export price shocks that proxy increased agricultural productivity increase incarceration rates and the use of prison labor in the colonial period. We provide quantitative and qualitative evidence that to show that a primary reason for the procyclical behavior of incarceration rates during the colonial period was increased

[63]We discuss other possible channels and avenues for estimating more causal effects in Appendix A.6.

labor demand for construction and maintenance of public works like railroads, needed to intensify exports of agricultural commodities during periods of positive productivity shocks. Labor shortages and tight labor markets increased the demand for unpaid prison labor, reflected in the rise in incarceration rates. The effect is reversed in the postcolonial period, where prison labor is not a major feature of state policy and public finance, and thus negative shocks increase incarceration rates.

We explore the implications of exposure to prison labor systems for present-day views of state judicial legitimacy and provide suggestive evidence of the negative long-term effects of colonial incarceration on contemporary trust in legal institutions. We document a significant reduction in contemporary trust in legal institutions like police in areas with high historical levels of colonial imprisonment. The reduction in contemporary trust is specific to legal institutions, with no effect on interpersonal trust. The results on trust opens up avenues for future work to explore channels through which these effects on reduced trust may persist over time. Given the renewed debates on the use of prison labor and the judicial system globally, our paper is the first, to our knowledge, to provide quantitative estimates on the effects on incarceration when prisoners are used as a store of labor, and its potentially detrimental effects on citizens' trust in legal institutions.

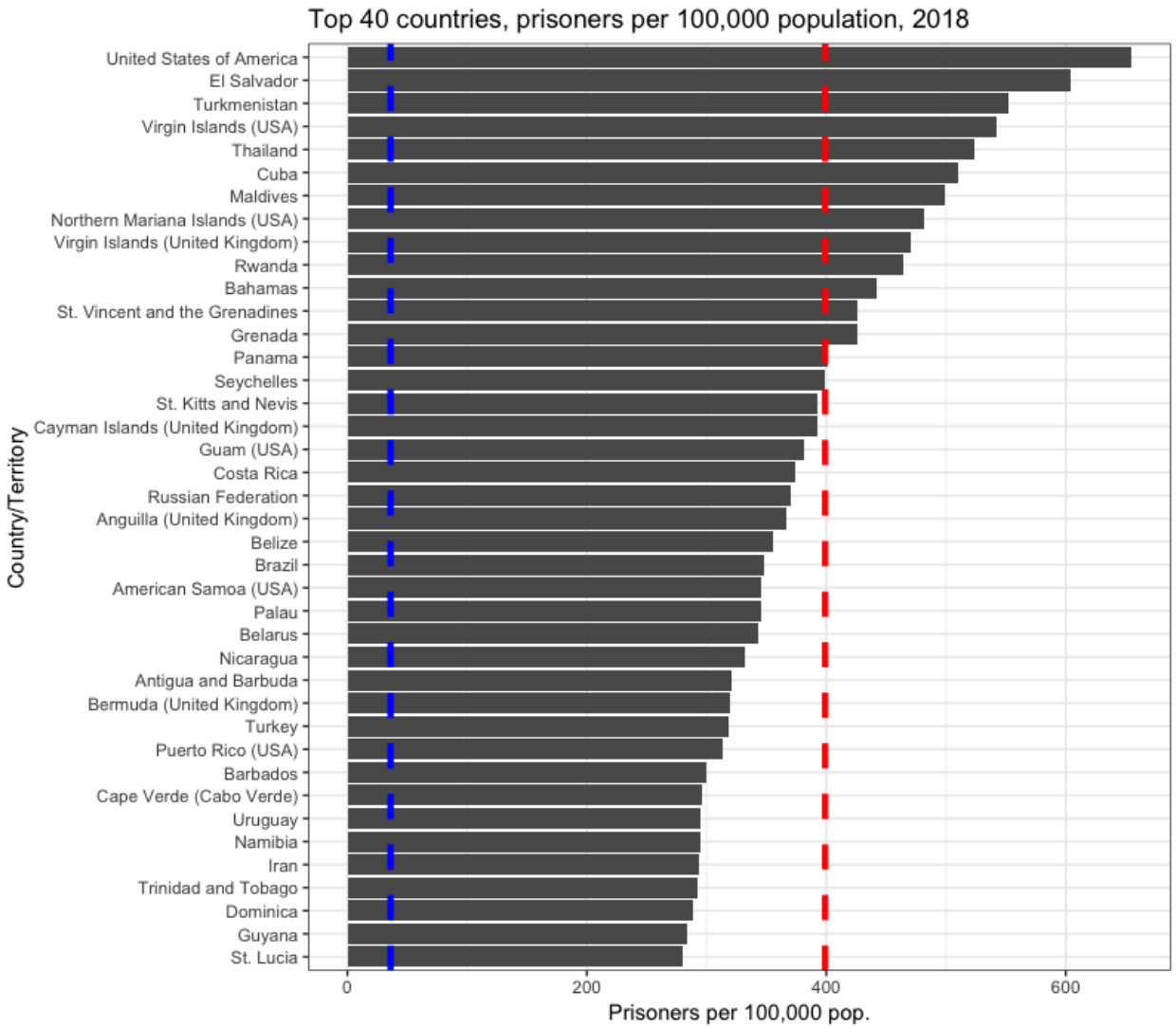

Figure 1: Top 40 countries/territories for incarceration rates, 2018 with Nigeria incarceration rates in red (year 1940) and blue (year 2018). Source: World Prison Brief

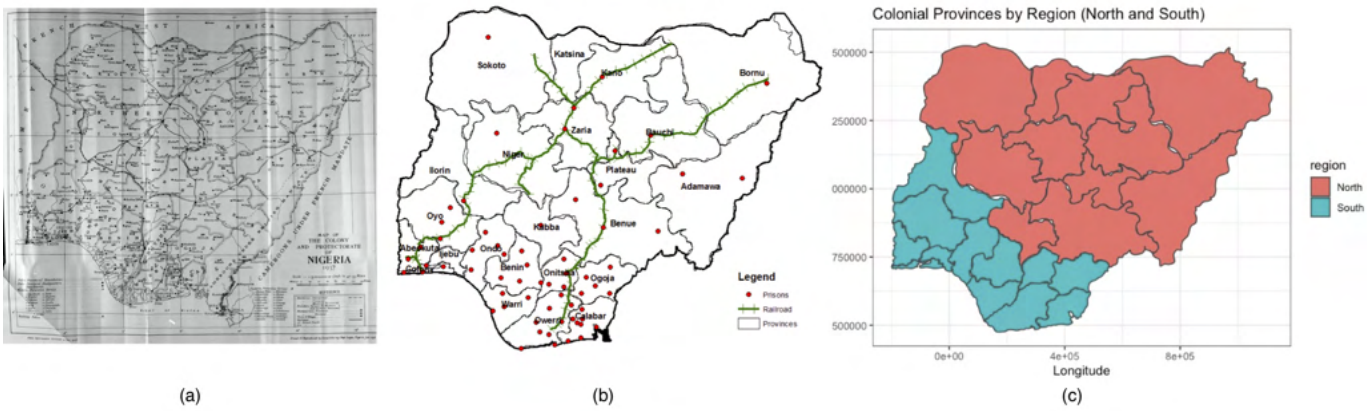

Figure 2: Colonial Nigeria with provinces outlined in 1937 (a), colonial prison locations and railroad network shown (b), and colonial provinces by region (c)

PRISON LABOUR.

22. The work done has been as usual of varied character, sanitary work at all stations taking a large number of able bodied men. The Public Works Department also took full advantage of prison labour, and employed all the men available at Lagos, Calabar, Port Harcourt and Enugu Prisons, on the various works as detailed in previous reports. The Eastern Railway Department also utilised large gangs on similar works, in addition to loading coal for the Colliery. At Abeokuta, they were employed at the quarries, and a credit of 5d. per diem is taken, and the total amount earned was £46,992, whilst the cost of rations was £73,500. It should be noted that the fall in the earnings compared with 1919, was due entirely to the decrease in the prison population. The year under review was a notable one generally, foodstuffs were scarce, and enhanced prices had, of necessity, to be paid, the Government having no alternative but to raise the contract prices in nearly all the prisons to relieve the situation, and this accounted for the high cost of expenditure on rations for the year.

Figure 3: Excerpt from the colonial archives highlighting the value of prison labor for public works (Source: Annual Report on the Prisons Department, Colony and Southern Provinces, 1920)

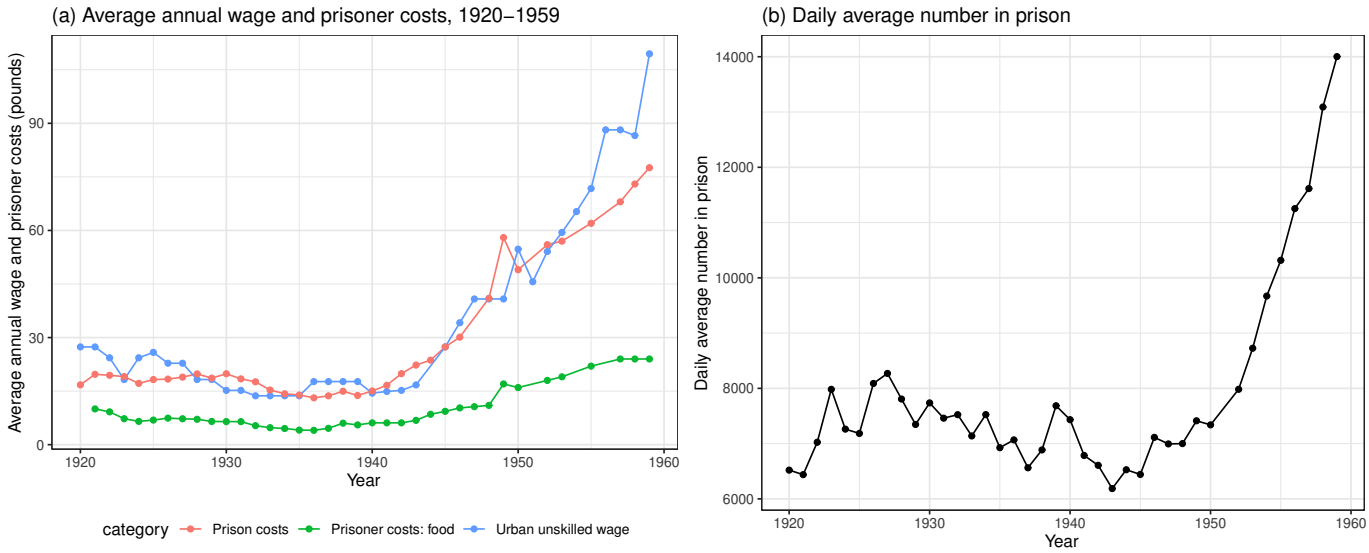

Figure 4: Wages, prisoner costs (a) and daily average number in prisons (b) in colonial Nigeria, 1920-1959

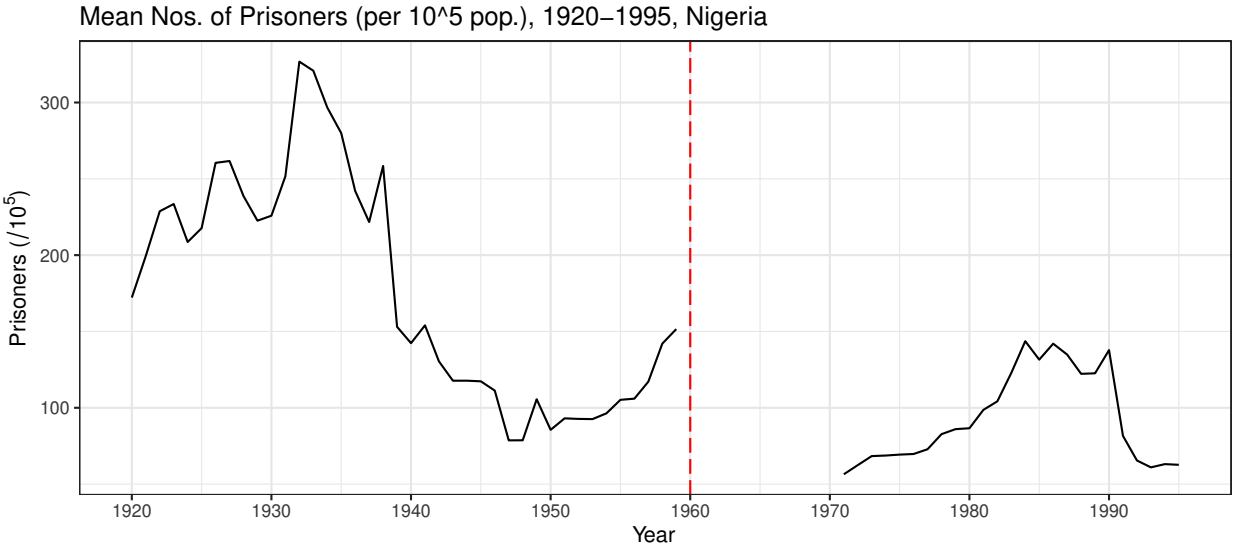

Figure 5: Mean number of prisoners per 100,000 population in colonial and postcolonial Nigeria with independence year highlighted, 1920-1995

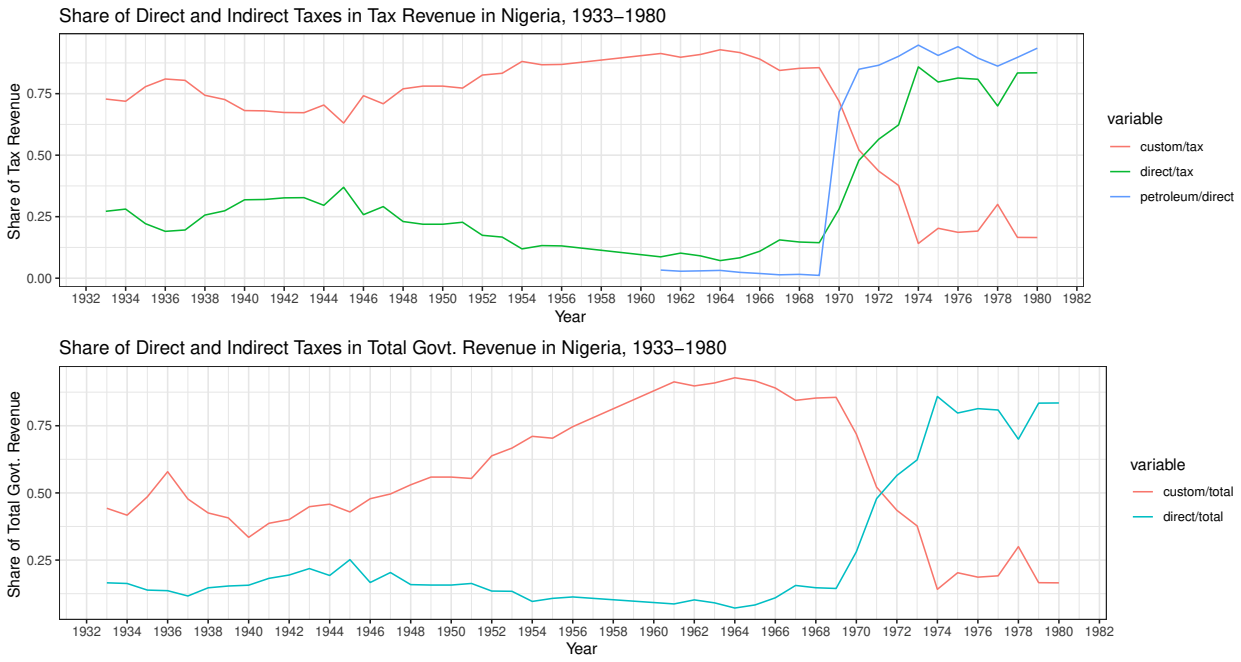

Figure 6: Composition of tax revenue in colonial and postcolonial Nigeria, 1930-1980. Top figure shows the share of direct, petroleum, and indirect (custom/excise) taxes in total tax revenue in Nigeria. Bottom figure shows the share of direct and indirect taxes in total government revenue

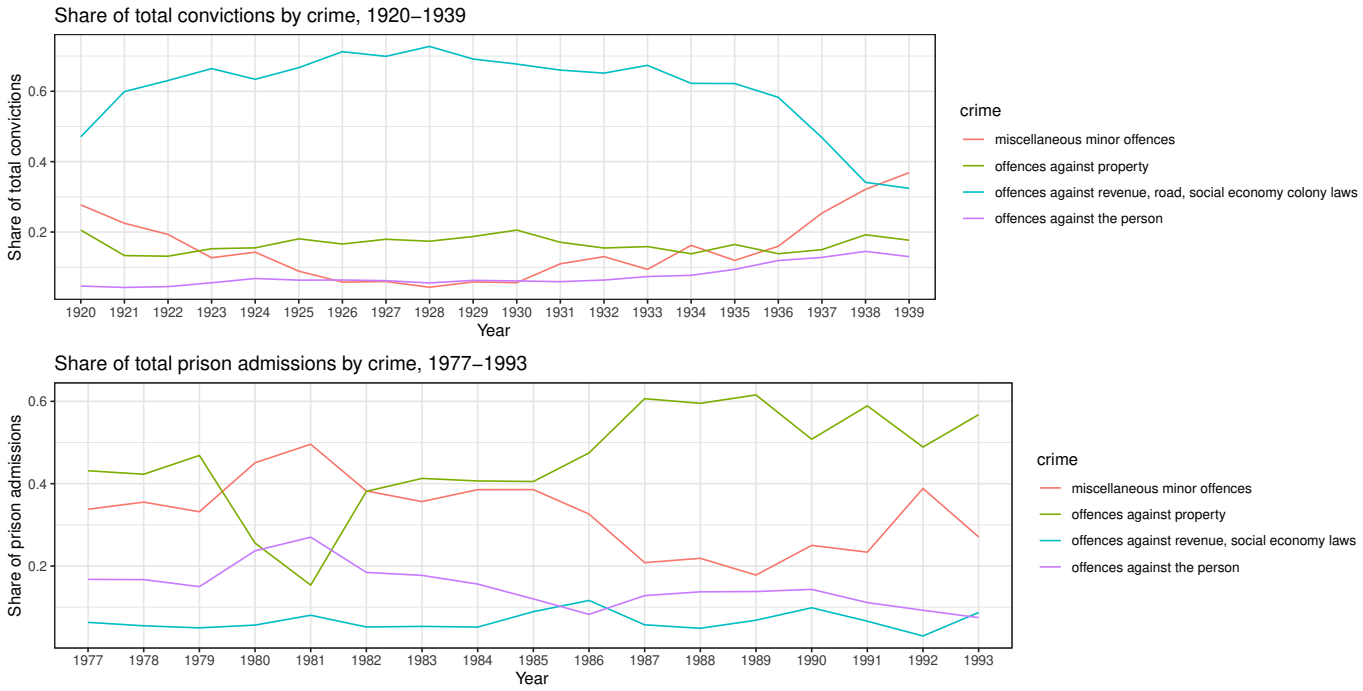

Figure 7: Share of total convictions in colonial courts (top figure) and share of total prison admissions in postcolonial period (bottom figure) by crime in Nigeria, 1920-1993

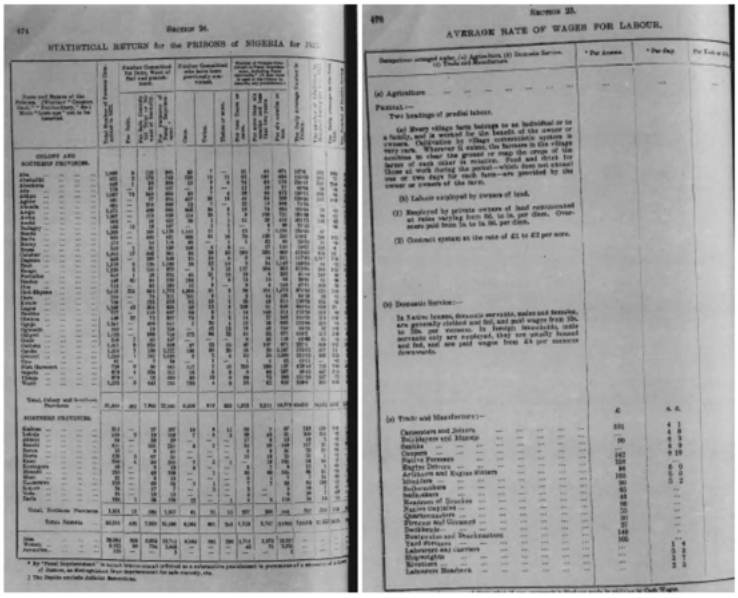

Figure 8: Example of colonial archival data on prisons and wages from the British Blue Books (1922)

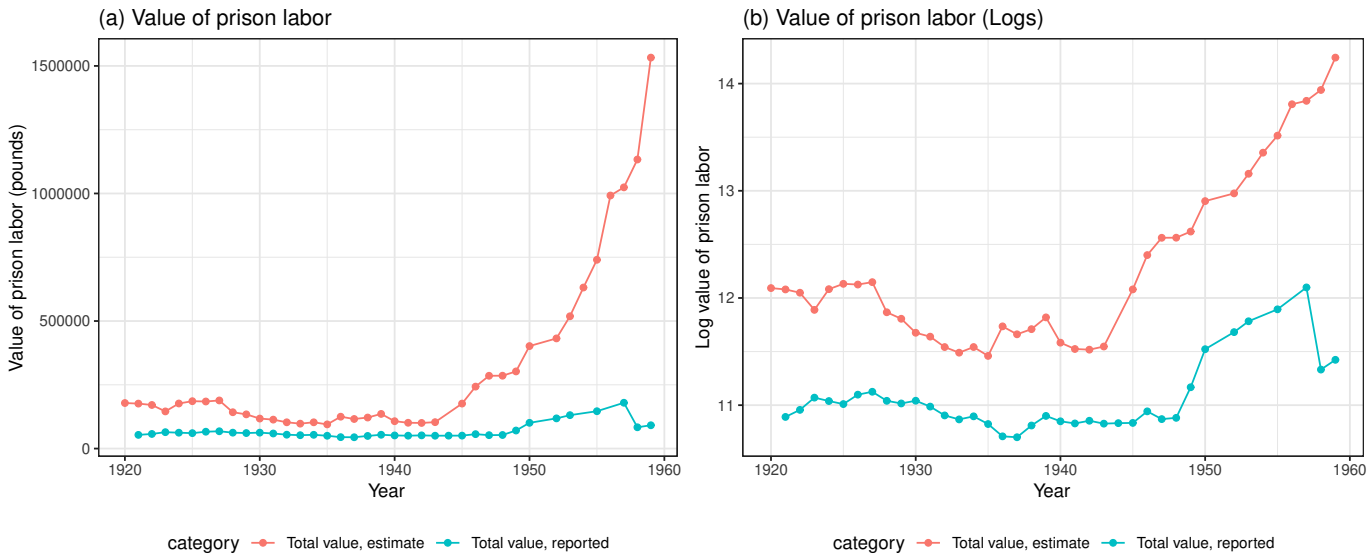

Figure 9: Total value of prison labor estimates versus value of prison labor reported by colonial government in pounds (a) and in log values (b), 1920-1959. Figure shows values in pounds (a) and log values (b)

Figure 10: Comparing total values of prison labor estimates with value of prison labor reported by colonial government (a), and net value of prison labor estimates with reported colonial value of prison labor (b), plotted against the 45 degree line of equality, 1920-1959

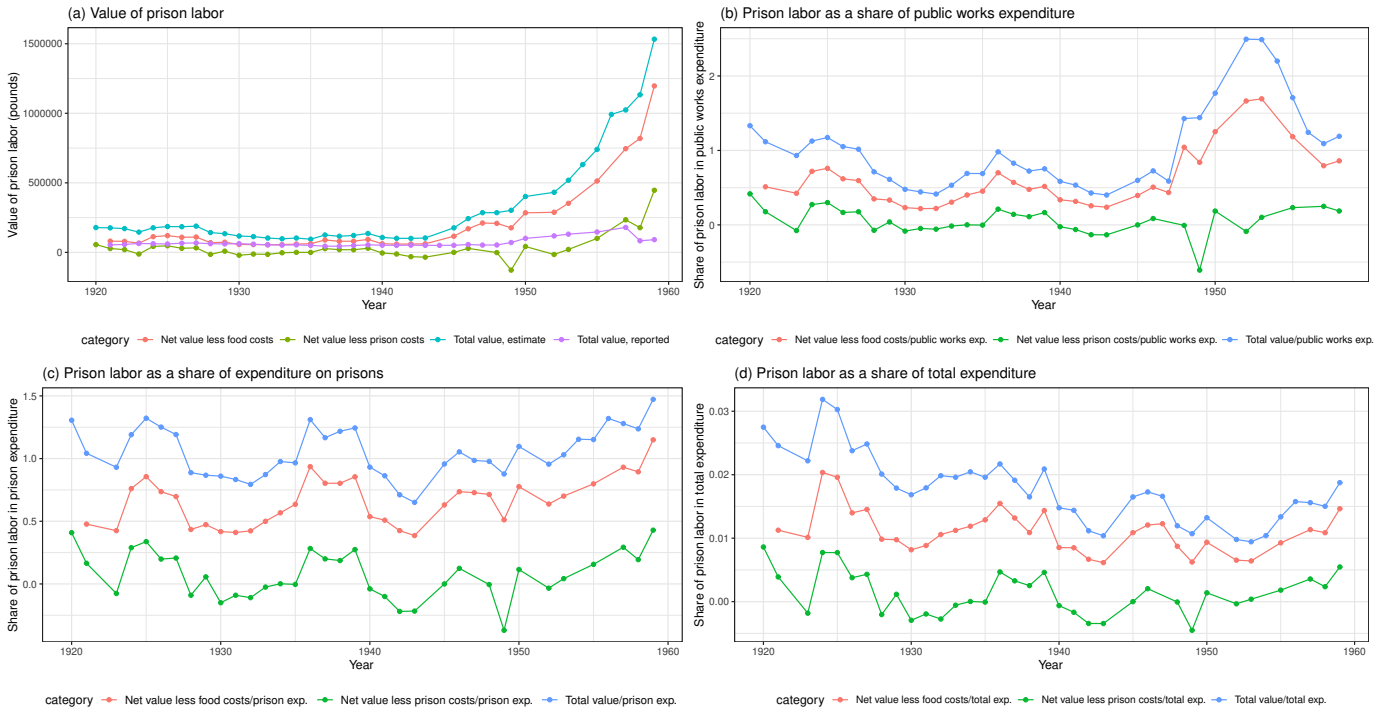

Figure 11: Relative value of prison labor in colonial Nigeria showing value of prison labor (estimated and colonial reports) in (a), value of prison labor as a share of public works expenditure (b), value of prison labor as a share of expenditure on prisons (c), and value of prison labor as a share of total colonial expenditure (d)

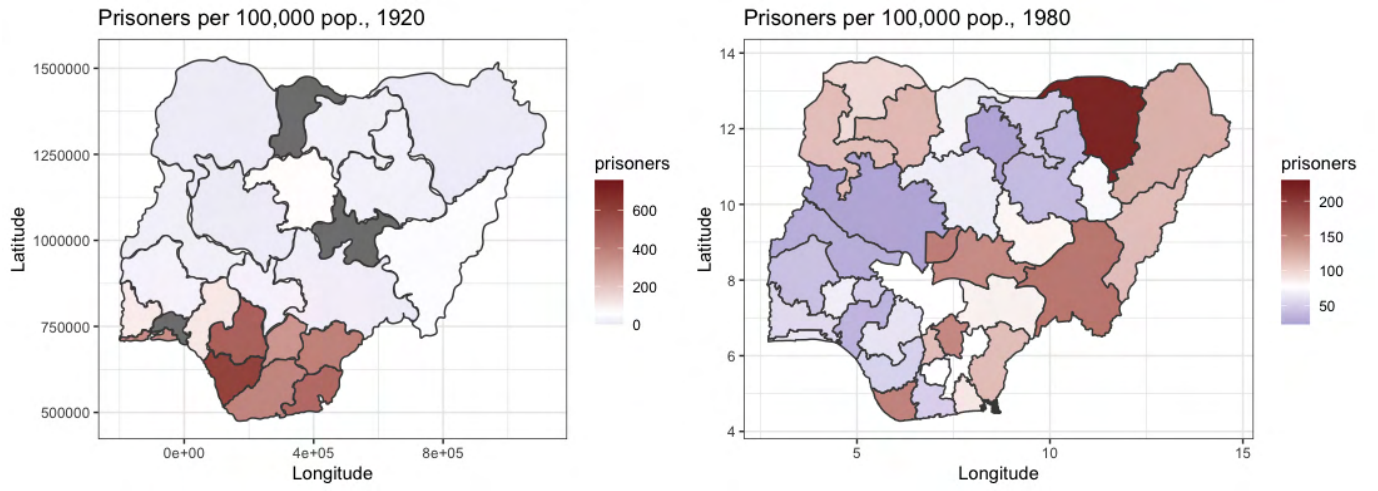

Figure 12: Prison populations in colonial (1920) and postcolonial (1980) Nigeria

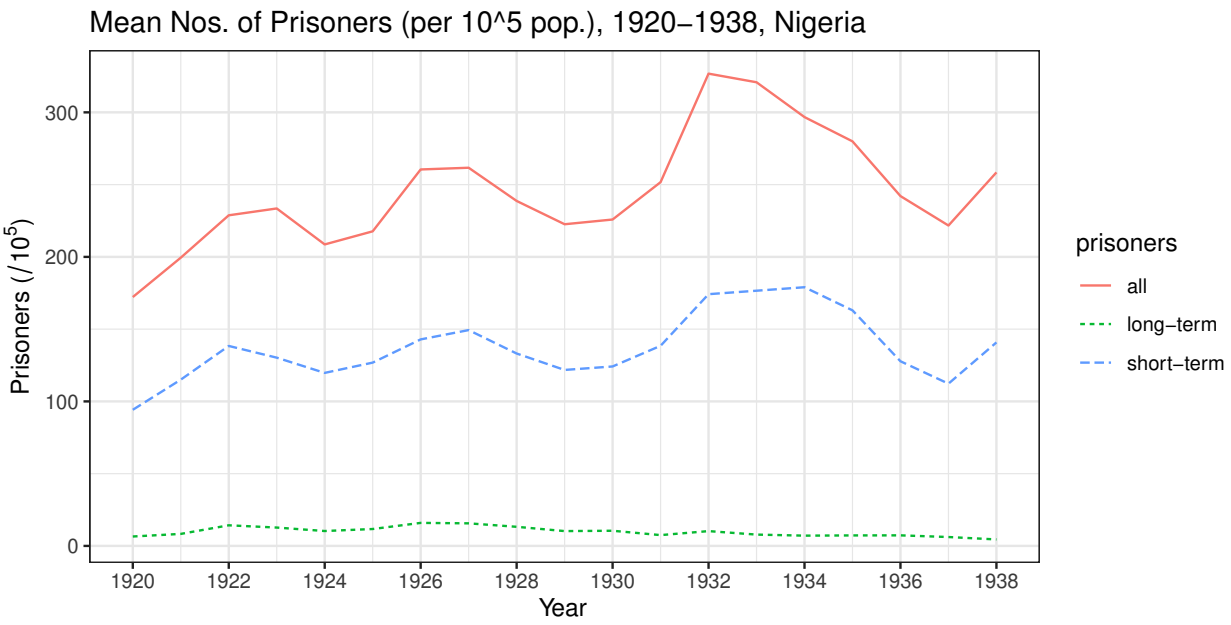

Figure 13: Incarceration rates by sentence in colonial Nigeria

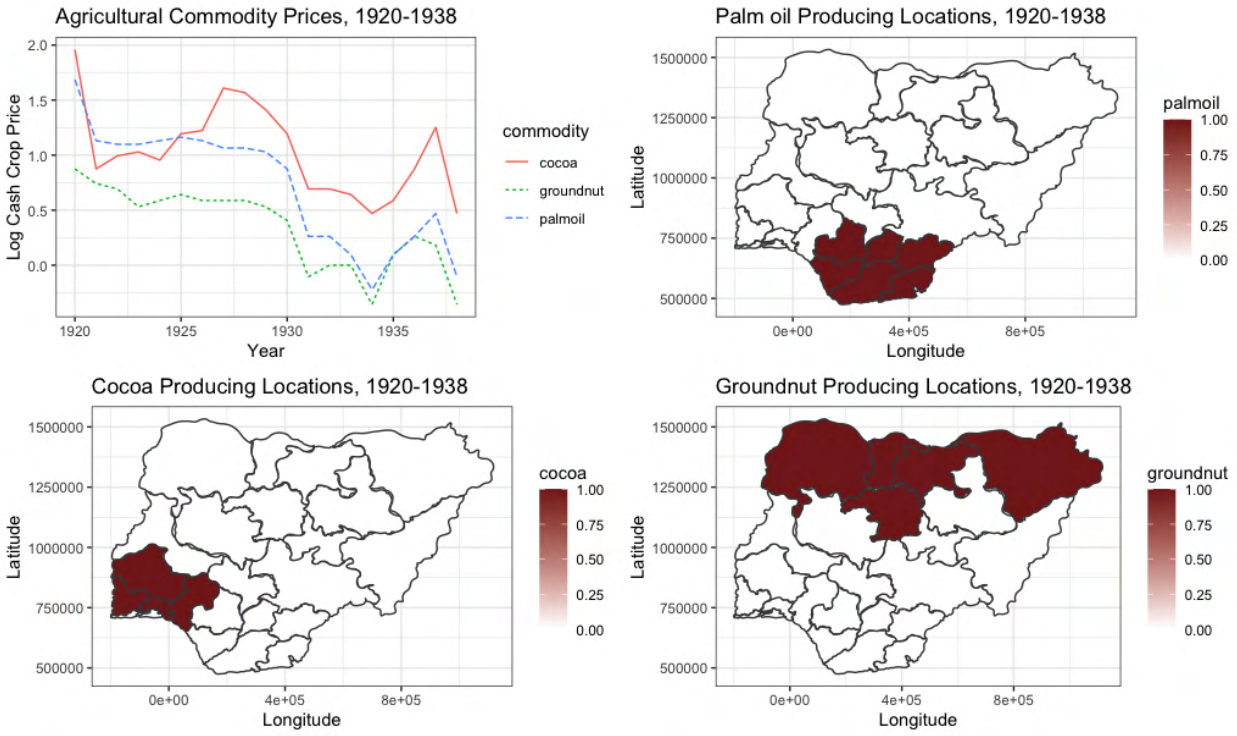

Figure 14: Agricultural commodity export prices and production areas for the three major cash crops (palm oil, cocoa, and groundnut) in colonial Nigeria

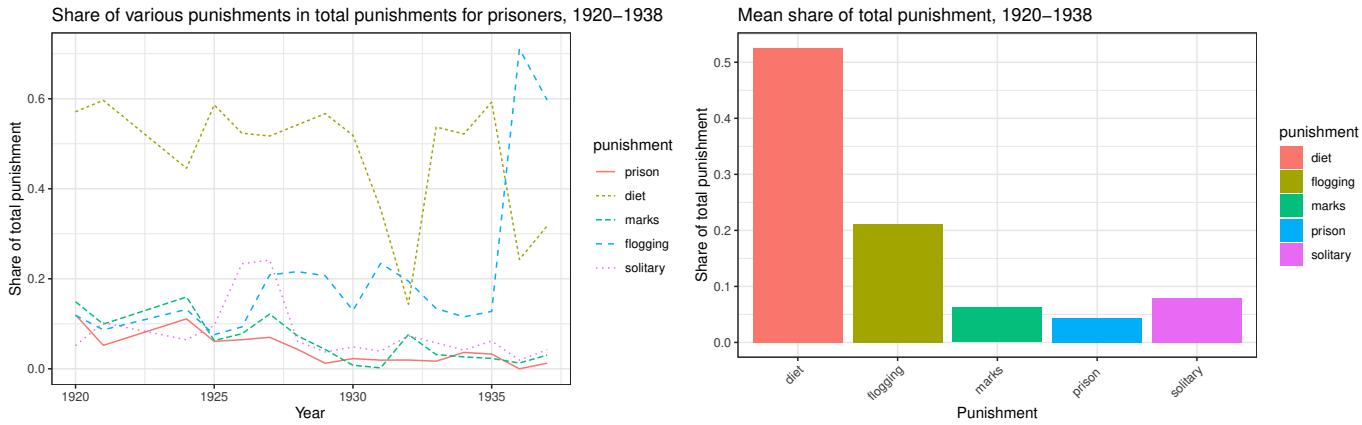

Figure 15: Share of various punishments in total punishments of prisoners for infractions while in prison in colonial Nigeria

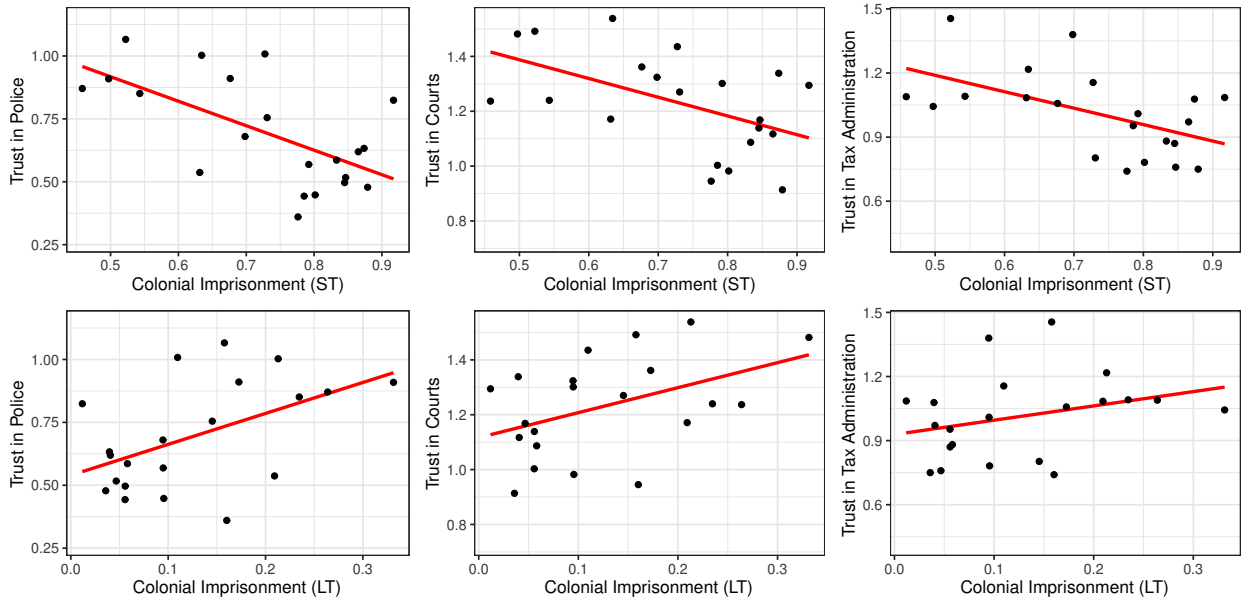

Figure 16: Colonial imprisonment and contemporary trust in legal institutions. Top panel uses the main measure of colonial imprisonment, the share of short-term prisoners in penal imprisonment. Bottom panel uses the share of long-term colonial imprisonment

Table 1: Summary Statistics: Economic shocks and incarceration rates

Statistic	N	Mean	St. Dev.	Min	Max
			Prisoners, 1920-1938		
All Prisoners Total	324	1,811.76	2,286.76	3.00	10,231.00
Penal Imprisonment Total	324	1,251.83	1,626.78	2.00	7,010.00
Custody Total	324	509.59	635.57	0.00	3,039.00
Short-Term (<= 6 Months) Total	324	1,051.05	1,409.20	2.00	6,377.00
Medium-Term (6Mo-2Y) Total	324	127.15	171.34	0.00	882.00
Long-Term (>=2yr) Total	324	68.93	84.10	0.00	417.00
All Prisoners /100,000	324	240.73	254.56	0.26	1,123.30
Penal Imprisonment /100,000	324	162.03	169.55	0.26	759.99
Custody /100,000	324	71.73	83.47	0.00	333.66
Short-Term /100,000	324	134.66	144.95	0.16	649.43
Medium-Term /100,000	324	16.56	18.26	0.00	80.45
Long-Term /100,000	324	10.18	12.88	0.00	83.45
Share w/ 1 Previous Conviction	324	0.11	0.15	0.00	0.90
Share w/ 2 Previous Convictions	324	0.02	0.03	0.00	0.32
Share w/ 3 Previous Convictions	324	0.02	0.03	0.00	0.18
			Agricultural Commodities and Rainfall Deviation, 1920-1938		
Cocoa Producing	393	0.15	0.35	0.00	1.00
Groundnut Producing	393	0.18	0.39	0.00	1.00
Palm Oil Producing	393	0.29	0.45	0.00	1.00
Log Cocoa Price	393	1.04	0.40	0.47	1.96
Log Groundnut Price	393	0.35	0.36	−0.36	0.88
Log Palm Oil Price	393	0.72	0.53	−0.22	1.69
Rainfall Dev.	393	−0.00	0.97	−2.21	4.08
Rainfall Dev. Sq.	393	0.95	1.83	0.00	16.67
Positive Rainfall Shock (M)	393	0.17	0.38	0.00	1.00
Negative Rainfall Shock (E)	393	0.30	0.46	0.00	1.00
Positive Rainfall Shock (E)	393	0.21	0.41	0.00	1.00
			Prisoners and Rainfall Deviation, 1971-1995		
All Prisoners Total	871	2,005.81	1,210.56	104.00	7,092.00
All Prisoners /100,000	871	92.48	60.43	9.91	361.99
Share w/ 1 Previous Conviction*	6	0.21	0.02	0.18	0.23
Share w/ 2 Previous Convictions*	6	0.12	0.02	0.10	0.16
Share w/ 3 Previous Convictions*	6	0.13	0.04	0.05	0.18
Rainfall Dev.	560	0.01	0.30	−0.62	1.06
Rainfall Dev. Sq.	560	0.09	0.12	0.00	1.11
Positive Rainfall Shock (M)	560	0.49	0.50	0.00	1.00
Negative Rainfall Shock (E)	560	0.04	0.19	0.00	1.00
Positive Rainfall Shock (E)	560	0.01	0.11	0.00	1.00

Notes: See text and online appendix for details. *denotes that data is based on available time series information from 1975-1980.

Table 2: Rainfall shocks and colonial (1920-1938) and postcolonial (1971-1995) incarceration rates, quadratic specification

Period:	**Colonial**				**Postcolonial**
Outcome:	All Penal	Short-Term	Medium-Term	Long-Term	All 1971-1995
	(1)	(2)	(3)	(4)	(5)
Rainfall Dev	14.147**	11.995*	1.796	0.759	−6.237
	(6.041)	(6.433)	(1.276)	(1.227)	(8.570)
	[0.038]	[0.065]	[0.212]	[0.655]	[0.454]
Rainfall Dev Sq	−3.569	−4.884*	0.205	0.752	34.275***
	(2.479)	(2.816)	(0.387)	(0.739)	(9.692)
	[0.246]	[0.068]	[0.629]	[0.494]	[<.001]
Mean of outcome	162.032	134.659	16.556	10.175	104.802
Observations	324	324	324	324	556
Clusters	21	21	21	21	36
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data, and postcolonial state for postcolonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are provinces. Dependent variables in column (1)-(4) are prisoners per 100,000 population (1939 pop.) by province in Nigeria broken down by all prisoners, penal imprisonment, custody/awaiting trial, short-term (less than 6 months) sentence and medium-term (between 6 months and 2 years) sentence and long-term (greater than 2 years) sentence over 1920-1938. Dependent variable in (5) is prisoners per 100,000 population (1990 pop.) by state in Nigeria over 1971-1995. Results remain unchanged when we replace the denominator for the incarceration rates with the adult population of the province only. Rainfall deviation, and rainfall deviation squared (Rainfall Dev and Rainfall Dev Sq) as defined in text. District FE are colonial province fixed effects in (1)-(4), and postcolonial state fixed effects in (5). ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

Table 3: Rainfall shocks and colonial (1920-1938) and postcolonial (1971-1995) incarceration rates, linear specification

Period:	**Colonial**						**Postcolonial**		
Outcome:	Short-Term			Long-Term			All 1971-1995		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Positive rainfall shock (M)	16.727***		12.142*	−1.638		−0.695	−4.387		−2.320
	(5.456)		(6.964)	(1.319)		(1.437)	(4.132)		(4.564)
	[0.016]		[0.093]	[0.336]		[0.683]	[0.320]		[0.620]
Negative rainfall shock (E)		−20.290**	−17.225*		−1.060	−0.429		22.722***	22.545***
		(9.484)	(10.259)		(2.894)	(3.530)		(7.814)	(7.807)
		[0.057]	[0.139]		[0.762]	[0.886]		[0.016]	[0.012]
Positive rainfall shock (E)			−0.404			3.358			20.423**
			(13.973)			(2.654)			(8.268)
			[0.977]			[0.293]			[0.046]
Mean of outcome	134.659	134.659	134.659	10.175	10.175	10.175	104.802	104.802	104.802
Observations	324	324	324	324	324	324	556	556	556
Clusters	21	21	21	21	21	21	36	36	36
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data, and postcolonial state for postcolonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are districts. Dependent variables in columns (1)-(6) are prisoners per 100,000 population (1939 pop.) by province in Nigeria broken down by short-term (less than 6 months) sentence ((1)-(3)) and long-term (greater than 2 years) sentence ((4)-(6)) over 1920-1938. Dependent variable in columns (7)-(9) is prisoners per 100,000 population (1990 pop.) by state in Nigeria over 1971-1995. Positive rainfall shock (M) where (M) is moderate, and (E) is extreme as defined in text. District FE are colonial province fixed effects in (1)-(6), and postcolonial state fixed effects in (7)-(9). ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

Table 4: Agricultural commodity export prices and colonial incarceration rates

Outcome:	Short-Term				Long-Term			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Palm oil x Palm oil price	66.681**	56.546**			2.738	5.481		
	(27.920)	(22.867)			(5.448)	(3.490)		
	[0.048]	[0.045]			[0.745]	[0.166]		
Cocoa x Cocoa price	41.965*		4.146		−6.000		−6.535***	
	(23.638)		(16.434)		(5.952)		(2.491)	
	[0.185]		[0.830]		[0.521]		[0.013]	
Groundnut x Groundnut price	2.809			−49.111**	−8.532			−9.130***
	(29.852)			(24.763)	(6.905)			(3.208)
	[0.956]			[0.092]	[0.416]			[0.015]
Mean of outcome	134.659	134.659	134.659	134.659	10.175	10.175	10.175	10.175
Observations	324	324	324	324	324	324	324	324
Clusters	21	21	21	21	21	21	21	21
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are provinces. Dependent variables are prisoners per 100,000 population (1939 pop.) by province in Nigeria broken down by short-term (less than 6 months) sentence in columns (1) to (4) and long-term (greater than 2 years) sentence in columns (5) to (8) over 1920-1938. Prices are in logs. District FE are colonial province fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

Table 5: Reduced-form estimates of the relationship between wages and distance to railroad and colonial incarceration rates

Outcome:	Short-Term		Long-Term	
	(1)	(2)	(3)	(4)
Distance to railroad	−0.301*	−1.479**	−0.018	−0.029
	(0.157)	(0.681)	(0.023)	(0.099)
	[0.144]	[0.074]	[0.941]	[0.778]
Distance x Log wages		0.401**		0.004
		(0.191)		(0.033)
		[0.078]		[0.917]
Mean of outcome	46.198	46.198	3.990	3.990
Observations	938	938	822	822
Clusters	21	21	21	21
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are individual prisons. Dependent variables in (1)-(4) are prisoners in each prison per 100,000 population of the province broken down by short-term (less than 6 months) sentence and long-term (greater than 2 years) sentence over 1920-1938. Covariates are distance to railroad in km and log urban unskilled wages. District FE are colonial province fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

Table 6: Reduced-form estimates of the relationship between agricultural commodity export prices and distance to railroad and colonial incarceration rates

Outcome:	Short-Term				Long-Term			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance to railroad	−0.301*	−0.456**	−0.460**	−0.407**	−0.018	−0.022	−0.007	−0.019
	(0.157)	(0.216)	(0.213)	(0.194)	(0.023)	(0.023)	(0.024)	(0.023)
	[0.144]	[0.042]	[0.028]	[0.038]	[0.941]	[0.403]	[0.792]	[0.455]
Distance x Palm oil price		0.214**				0.005		
		(0.096)				(0.019)		
		[0.059]				[0.871]		
Distance x Cocoa price			0.151**				−0.010	
			(0.068)				(0.018)	
			[0.063]				[0.789]	
Distance x Groundnut price				0.306**				0.001
				(0.129)				(0.028)
				[0.045]				[0.984]
Mean of outcome	46.198	46.198	46.198	46.198	3.990	3.990	3.990	3.990
Observations	938	938	938	938	822	822	822	822
Clusters	21	21	21	21	21	21	21	21
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are individual prisons. Dependent variables are prisoners in each prison per 100,000 population of the province broken down by short-term (less than 6 months) sentence in columns (1)-(4) and long-term (greater than 2 years) sentence in columns (5)-(8) over 1920-1938. Prices are in logs, and distance to railroad in km. District FE are colonial province fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

Table 7: Agricultural commodity export prices and punishment of prisoners

Outcome:	Extra Imprisonment	Reduced Diet	Flogging	Solitary Confinement	Forfeit Marks
	(1)	(2)	(3)	(4)	(5)
Palm oil x Palm oil price	0.061**	0.040	0.028	−0.047	−0.114**
	(0.031)	(0.179)	(0.055)	(0.038)	(0.049)
	[0.075]	[0.846]	[0.657]	[0.260]	[0.115]
Cocoa x Cocoa price	0.133	0.542	−0.036	0.244	−0.089*
	(0.100)	(0.652)	(0.094)	(0.160)	(0.048)
	[0.494]	[0.580]	[0.738]	[0.226]	[0.240]
Groundnut x Groundnut price	0.066	0.135	0.084	−0.065	−0.129
	(0.040)	(0.339)	(0.142)	(0.049)	(0.168)
	[0.207]	[0.742]	[0.635]	[0.179]	[0.624]
Mean of outcome	0.050	0.556	0.166	0.087	0.071
Observations	228	228	228	228	228
Clusters	21	21	21	21	21
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are provinces. Dependent variables are shares of total punishment assigned to prisoners from extra prison time (1), reduced diet (2), flogging (3), solitary confinement (4), and forfeiture of marks (5), as described in the text. Prices are in logs. District FE are colonial province fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

Table 8: Reduced-form estimates of the relationship between colonial imprisonment and present-day trust in historical legal Institutions versus interpersonal trust

Outcome:	**Panel A: Colonial Imprisonment (Short-Term) and Contemporary Trust Outcomes**					
	Trust in Historical Legal Institutions			**Interpersonal Trust**		
	Police	Courts	Tax	Neighbors	Relatives	Local Gov
	(1)	(2)	(3)	(4)	(5)	(6)
Colonial imprisonment (ST)	−0.401***	−0.541*	−0.750**	−0.382	0.878	−0.255
	(0.143)	(0.279)	(0.383)	(0.555)	(0.675)	(0.220)
	[0.002]	[0.212]	[0.144]	[0.544]	[0.376]	[0.354]
Mean of outcome	0.709	1.274	0.976	1.334	1.913	0.948
Outcome:	**Panel B: Colonial Imprisonment (Long-Term) and Contemporary Trust Outcomes**					
	Trust in Historical Legal Institutions			**Interpersonal Trust**		
	Police	Courts	Tax	Neighbors	Relatives	Local Gov
	(1)	(2)	(3)	(4)	(5)	(6)
Colonial imprisonment (LT)	0.285	0.401	0.304	0.635	−0.563	−0.061
	(0.291)	(0.386)	(0.523)	(0.619)	(0.908)	(0.375)
	[0.510]	[0.527]	[0.649]	[0.423]	[0.658]	[0.887]
Mean of outcome	0.709	1.274	0.976	1.334	1.913	0.948
Observations	6,642	6,590	3,126	3,439	3,317	4,899
Clusters	21	21	21	21	21	21
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Disease Controls	Yes	Yes	Yes	Yes	Yes	Yes
Precolonial and Colonial Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by colonial province. Wild cluster bootstrap (by district) p-values are in brackets. The unit of observation is an individual. Colonial imprisonment (ST or LT) is the average share of short-term (ST) or long-term (LT) incarcerated populations in each colonial province over 1920 to 1938 as defined in the text. Trust variables are from the Afrobarometer samples over 2003 to 2014 and as defined in the main text. Trust outcomes are reported trust levels on a scale of 0-3, where "Not at all"= "0", "Just a little"="1", "Somewhat"="2", "A lot"="3". All regressions use region fixed effects at the geopolitical zone level in Nigeria (for 6 geopolitical zones), year fixed effects and educational attainment fixed effects. Individual controls include age, age squared and gender. Geographic controls include an indicator for whether the respondent lives in an urban location, and, at the sub-district or local government area level, include, ruggedness, indicators for petroleum, seacoast and mean land suitability for agriculture and mean elevation in alternate specifications. Disease controls at the sub-district level include malaria suitability and tse tse fly suitability in alternate specifications with results unchanged. Precolonial and colonial controls at the ethnicity-level include the level of precolonial centralization and total exports of slaves from the region during the Atlantic slave trade. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level.

Table 9: Reduced-form estimates of the relationship between colonial imprisonment and present-day crime outcomes

Outcome:	Bribe Doc	Bribe HHS	Fear Crime	Bribe Doc	Bribe HHS	Fear Crime
Covariate:	Colonial Imprisonment (ST)			Colonial Imprisonment (LT)		
	(1)	(2)	(3)	(4)	(5)	(6)
Colonial imprisonment	0.026	−0.151	−0.467**	−0.263	0.108	0.256
	(0.139)	(0.175)	(0.231)	(0.245)	(0.246)	(0.404)
	[0.890]	[0.544]	[0.117]	[0.426]	[0.737]	[0.669]
Mean of outcome	0.225	0.229	0.571	0.225	0.229	0.571
Observations	4,279	4,343	6,700	4,279	4,343	6,700
Clusters	21	21	21	21	21	21
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Disease Controls	Yes	Yes	Yes	Yes	Yes	Yes
Precolonial and Colonial Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by colonial province. Wild cluster bootstrap (by district) p-values are in brackets. The unit of observation is an individual. Colonial imprisonment (ST or LT) is the average share of short-term (ST), in columns (1)-(3), or long-term (LT), in columns (4)-(6), incarcerated populations in each colonial province over 1920 to 1938 as defined in the text. Outcome variables are from the Afrobarometer samples over 2003 to 2014 and as defined in the main text. Bribe Doc and Bribe HHS is reported frequency of respondent bribery of government official for document and household services respectively where "Never"="0", "Once or Twice"="1", "A Few Times "="2", "Often"="3". Fear Crime is how often respondent or family has feared crime in their home where "Never"="0", "Just once or twice"="1", "Several times"="2", "Many times"="3", "Always"="4". All regressions use region fixed effects at the geopolitical zone level in Nigeria (for 6 geopolitical zones), year fixed effects and educational attainment fixed effects. Individual controls include age, age squared and gender. Geographic controls include an indicator for whether the respondent lives in an urban location, and, at the sub-district or local government area level, include, ruggedness, indicators for petroleum, seacoast and mean land suitability for agriculture and mean elevation in alternate specifications. Disease controls at the sub-district level include malaria suitability and tse tse fly suitability in alternate specifications with results unchanged. Precolonial and colonial controls at the ethnicity-level include the level of precolonial centralization and total exports of slaves from the region during the Atlantic slave trade. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level.

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A Appendix (For Online Publication)

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- Primary data from British Online Archives, Nigeria [Colony and Protectorate] Blue Books, 1914-1940. British Foreign and Commonwealth Office
- Nigeria, Annual Report on the Prisons Department, Northern and Southern Provinces, 1914-1960
- NAI, CSO 26/2 09591 Vol.1 'Lieutenant Governor Southern Province to Resident Calabar Province: Memorandum on Prison labor' 23rd April 1923
- Annual Report on the Treatment of Offenders, 1947, Nigeria
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- Nigeria, Agricultural Dept, 1921-1952. Reference: 73242D-04

A.2 A Further History of Prison Labor in Colonial Nigeria

In colonial Nigeria, forced labor regulation included the Native House Rule Ordinance of 1901 and the Roads and Creek Proclamation of 1903, both of which mandated labor for 'public purposes' for all men between 15 and 50 years old and all women between 15 and 45 years old (Ofonagoro, 1982). The Masters and Servants Proclamations of 1901 and 1903 also instituted forced labor in colonial Nigeria, granting Native Administrators or chiefs the authority to coerce local laborers for up to 24 working days in a year or 1 out of 12 months. Laborers were frequently employed on public works projects and physically intensive manual tasks like porterage, carrying pounds of baggage for British officials through often dangerous environments like military expeditions for "miserable" below market-wage pay (Ofonagoro, 1982; Okia, 2012). This is exemplified by one account, recorded in Ofonagoro (1982), where in 1925, to defend forced labor recruitment practices under labor taxes and the use of precolonial communal labor requirements for the construction of the railroad in the northern provinces, a colonial official stated:

> *"Were the Government to rely on such labour as can be recruited individually at current labour rate, it would be impossible to build railways or to undertake any other public work of any magnitude." (Ofonagoro, 1982), p. 230.*

Although prisoners were most often employed on public works, public works expenditure was a small fraction of overall colonial expenditures between 1920 and 1940, composing an average of 2.8% of colonial expenditures over the period[64]. As of 1920, 30% of expenditure was on railways, 12% on servicing public debt, and 19% of expenditure was devoted to defense spending on 'marine, political and West African Frontier Force'. The majority of revenues in 1920 were from customs (46%) and railways (23%). By 1936, the share of

[64]Author's estimates from Annual Report on Prisons Data over 1920 to 1940.

expenditure on railways had dropped to 8% of overall expenditure, with public debt, and pensions and gratuities remaining as the top spending categories for the colonial regime. Public works expenditure in both years remained low at around 2%. While revenue from the railway could be used to service railroad expenditure, only 2.8% of colonial expenditures, on average, was allocated for less costly public works projects, like spending on civil roads, canals, bridges and "buildings not of a military nature" (e.g. court houses and hospitals).

A breakdown of the top ten, where available, categories for estimated public works expenditure in 1920 and 1935 for the Northern and Southern provinces is shown in Figure A1[65]. In the Northern provinces in 1920, roads, public offices, hospitals and court houses accounted for 80% of overall public works expenditure, while government quarters, industrial plants and roads accounted for 68% of overall public works expenditure in Southern provinces in the same year. By 1935, the major public works expenditure categories in both the Northern and Southern provinces were waterworks, electricity infrastructure projects and government offices with 100% and 95% of overall public works expenditure in Northern and Southern Provinces respectively. Convict labor, by colonial officials' own admissions, was an essential part of funding these public works projects (Foreign and Office, 1960). The use of prison labor for colonial public works projects continued through the 1950s in British colonial Africa with an estimated between 1 in 300 and 1 in 500 Africans imprisoned over 1930 through the 1950s, in contrast with 1 in 2000 British natives in Britain (Hynd, 2015).

A.2.1 North-South Differences in the Distribution of Colonial versus Native Prisons

There was a dual system of prison administration in Nigeria, under the Native Administration, overseen by local chiefs under indirect rule. Under indirect rule, areas with more

[65]We use estimated rather than actual expenditure in a given year to reflect colonial government expectation around expenditure and to account for unfinished projects and multiple missing entries in the 'spending to date' values provided in the Blue Books records.

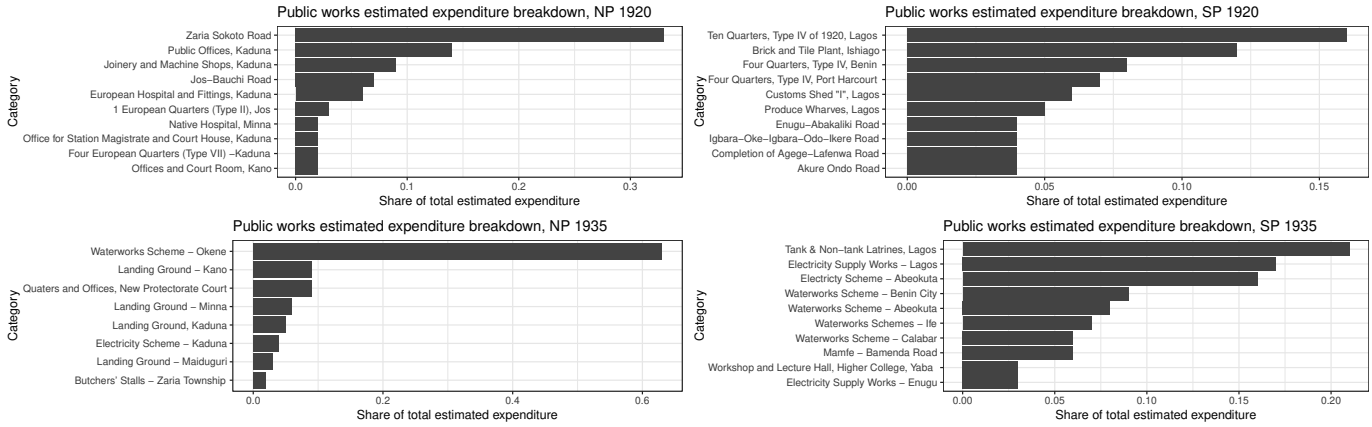


Figure A1: Breakdown of estimated public works expenditure, Northern (NP) and Southern (SP) Provinces, 1920 and 1935

centralized precolonial institutions were granted more autonomy to oversee local administration, including on the creation and administering of Native Authority prisons. Results from Table A1 confirm a significant positive correlation between the level of precolonial centralization and the numbers of native prisons (Archibong, 2019). Although we don't have detailed Native Administration prisons data over the 1920 to 1938 period, Figure A2 shows the distribution of Native Administration prisons in 1940, for the first year of available data in the colonial archives.

Native Authority or Administration prisons were more heavily concentrated in the Northern provinces, which had a more extensive history of organized precolonial institutions around courts than their southern counterparts (Killingray, 1999). Precolonial political institutions are proxied using Murdock's (1967) "Jurisdictional Hierarchy Beyond the Local Community Level" called the precolonial centralization index here. The precolonial centralization index or "Jurisdictional Hierarchy Beyond the Local Community Level" variable is an index of "political complexity" that assigns a score between 0 to 4 to each ethnic region unit and describes the number of political jurisdictional hierarchies above the local community level for each unit. The score is defined as follows: 0 represents so-called "stateless soci-

eties",“lacking any form of political organization”, 1 and 2 are petty and larger paramount chiefdoms, 3 and 4 are large, more organized states. Table A1 provides suggestive evidence of the positive correlation between precolonial centralization and the number of native prisons in a colonial province. While prison labor was a feature of all colonial era prisons, both Native Administration and colonial government prisons, since Native Authority prisons were more numerous than colonial prisons[66], Native Authority prisons processed more prisoners than colonial prisons in the north, with the share of prison labor coming primarily from Native Authority prisons in the Northern provinces.

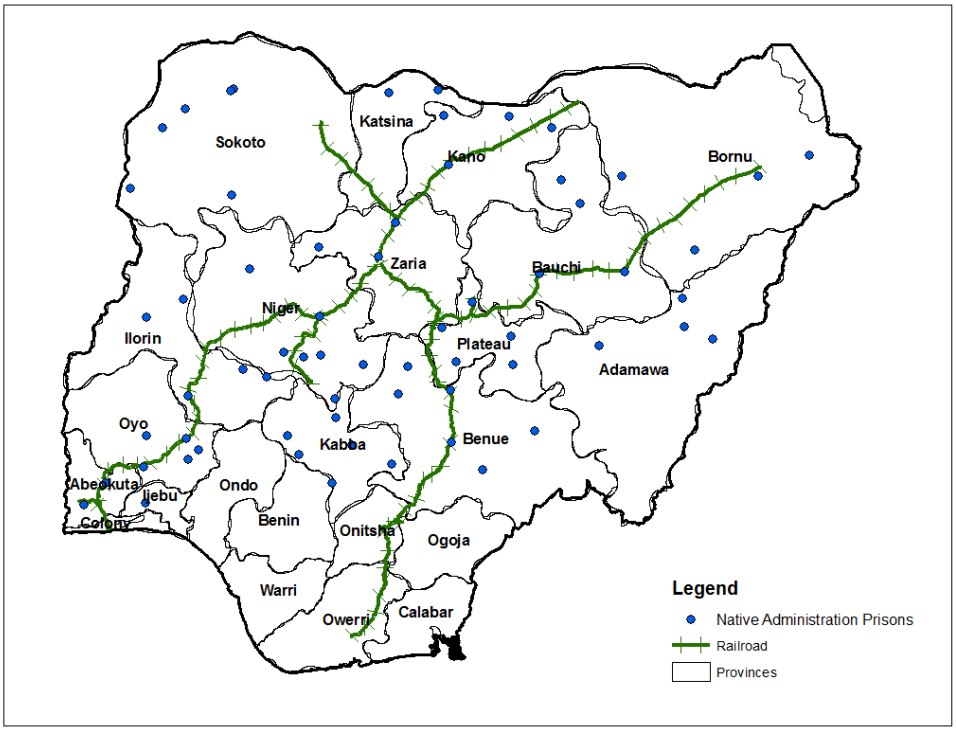


Figure A2: Native administration prisons, 1940

[66]On average there were 18 colonial prisons over 1920 to 1938 in the Northern provinces vs 56 Native Authority prisons in 1940. The ratio for Southern provinces over those periods was 54 to 9. Source: colonial archives.

Table A1: Relationship between precolonial centralization and number of colonial vs native prisons

	Native prisons	Colonial prisons
	(1)	(2)
Precolonial centralization	0.599*	0.515
	(0.316)	(0.339)
Constant	1.447***	2.112**
	(0.265)	(0.969)
Observations	22	19
R^2	0.124	0.026

Notes: Regressions estimated by OLS. Robust standard errors in parentheses. Unit of observation is Murdock ethnic region. Precolonial centralization is Murdock centralization index as defined in text.
***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level.

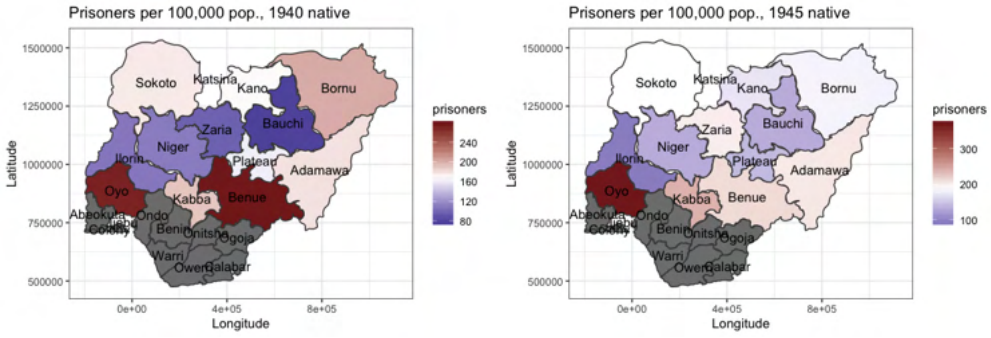
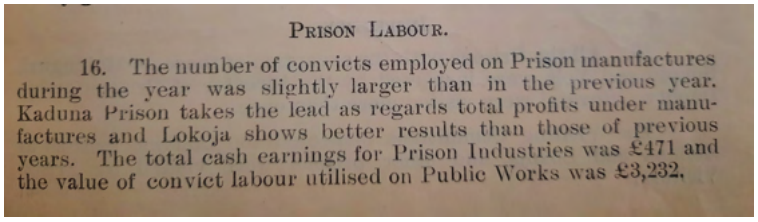


Figure A3: Native prison incarceration rates, 1940 and 1945

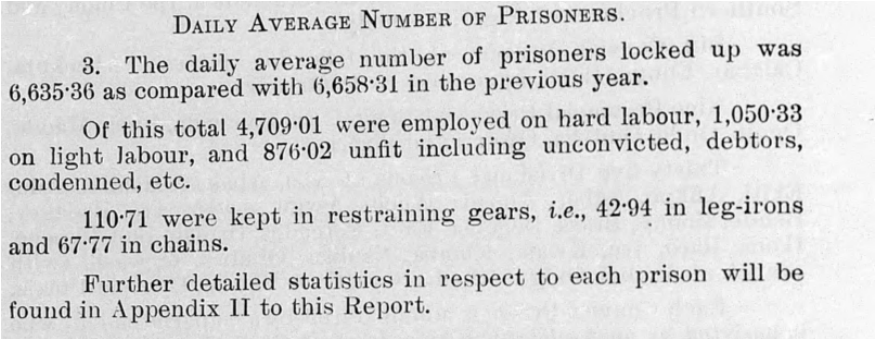


PRISON LABOUR.

16. The number of convicts employed on Prison manufactures during the year was slightly larger than in the previous year. Kaduna Prison takes the lead as regards total profits under manufactures and Lokoja shows better results than those of previous years. The total cash earnings for Prison Industries was £471 and the value of convict labour utilised on Public Works was £3,232.

Figure A4: Excerpt from the colonial archives highlighting the value of prison labor for public works in the northern provinces (Source: Annual Report on the Prisons Department, Northern Provinces, 1925)

A.3 Value of Prison Labor Specification Checks



DAILY AVERAGE NUMBER OF PRISONERS.

3. The daily average number of prisoners locked up was 6,635·36 as compared with 6,658·31 in the previous year.

Of this total 4,709·01 were employed on hard labour, 1,050·33 on light labour, and 876·02 unfit including unconvicted, debtors, condemned, etc.

110·71 were kept in restraining gears, *i.e.*, 42·94 in leg-irons and 67·77 in chains.

Further detailed statistics in respect to each prison will be found in Appendix II to this Report.

Figure A5: Excerpt from the 1925 Annual Report on the Prisons Department, Southern Provinces on the daily average number of prisoners

Figure A6: Value of wages for different skill categories in prison and market sectors, 1919-1925

A.3.1 Value of Prison Labor: Adjusting for Inflation

The measures of values of prison labor used so far have been calculated using nominal values as shown in Figure A8(a) and Table A2. One potential side effect of using nominal values when observing trends over time is that is it difficult disentangle the difference between changes in the observed variable and changes in the price level. To ensure that the trends in our measure of prison labor are not driven by changes in the price level, we convert the values

APPENDIX I.

COMPARATIVE TABLES.

Expenditure.	Amount. 1919.	1920.	1921.	Amount Allowed in Estimates.
	£	£	£	£
1. Personal Emoluments	21,401	23,554	24,384	34,356
1a. War Bonus	...	7,099	7,855	
2. Rations for Government Prisoners	55,841	74,872	92,641	82,500
3. Rations for Lock-up Prisoners	1,506	1,816	3,287	3,000
4. Clothing, Bedding and Necessaries	9,896	12,816	8,682	25,000
5. Clothing, Bedding and Necessaries, Lock-up Prisoners	...	574	188	700
6. Uniform for Staff	1,053	1,947	1,522	3,000
7. Tools for Prison Labour	237	180	142	240
8. Manufacturing Materials	924	1,683	1,688	2,000
9. Uniform Allowances to European Officers	90	105	113	105
10. Transport Allowances	112	144	150	260
11. Travelling and Bush Allowances	51	160	110	130
12. Passages	732	408	818	600
13. Transport of Prisoners	461	498	603	700
14. Transport, including Stores	220	305	408	350
15. Railway Transport	232	204	438	400
16. Contingencies	10	10	17	15
17. Rewards for Capture of Escaped Prisoners	9	10	15	15
Total	92,778	126,383	143,061	153,371
Total (Revised by Treasury figures)	93,279	123,691	...	*

ITEM 1. Including pay of Lock-up Guards, (£420) fines on Staff (£278) and overpayments recovered and paid into Revenue (£228).
ITEM 2. Including cost of maintenance, etc., of 30 Lunatics, which was £1,369.
ITEM 4. Including gear to the value of approximately £2,000 for Station tools and Sanitary Equipment.
* Not available at date of Report.

Figure A7: Prison expenditures in colonial Nigeria, Southern provinces, 1919-1921 (Source: Annual Report on the Prisons Department, Colony and Southern Provinces, Nigeria, 1921)

into real values using 1920 as the base year, following the technique outlined in Frankema (2011)[67]. Figure A8(b) and Table A3 show trends in the value of prison labor, adjusted for inflation. The trends remain unchanged using real versus nominal estimates of prison labor and the value of prison labor is not driven by changes in the price level.

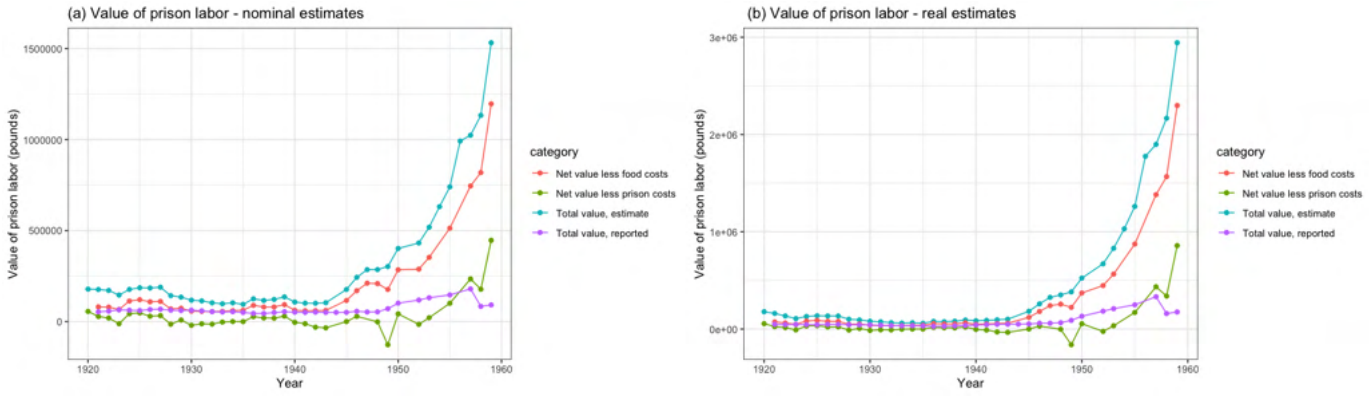


Figure A8: Value of prison labor, real vs nominal estimates

[67]Using Feinstein (1972)'s British price index data.

Table A2: Value of prison labor, 1920-1959

Year	Total value of prison labor (PL), estimate	Net value of PL-less food costs	Net value of PL-less prison costs	Total value of PL, reported	Share of total PL value in public works exp.	Share of net PL value (food) in public works exp.	Share of net PL value (prison) in public works exp.
1920	178,498.10		55,889.37		1.33		0.42
1921	176,260.50	80,740.86	27,912.67	53,661	1.12	0.51	0.18
1922	170,936.80	79,406.14	19,618.41	57,312			
1923	145,679.00	66,501.46	-11905.93	64,244	0.93	0.43	-0.08
1924	176,716.20	112,860.10	42,908.14	62,222	1.13	0.72	0.27
1925	185,745.60	120,236.40	47,427.82	60,492	1.17	0.76	0.30
1926	184,522.30	108,556.80	29,269.52	66,052	1.05	0.62	0.17
1927	188,665.80	110,374.10	32,701.03	67,859	1.02	0.59	0.18
1928	142,465.90	69,713.27	-14,449.62	62,358	0.71	0.35	-0.07
1929	134,080.40	73,090.61	8,683.13	60,851	0.61	0.33	0.04
1930	117,659.00	57,097.79	-20,521.35	62,408	0.48	0.23	-0.08
1931	113,460.70	55,957.54	-12,285.62	59,090	0.44	0.22	-0.05
1932	102,978.70	54,870.35	-14,204.48	54,415	0.41	0.22	-0.06
1933	97,714.65	55,956.14	-2,798.60	52,434	0.53	0.31	-0.02
1934	102,992.10	59,841.23	133.75	53,956	0.69	0.40	0.001
1935	94,803.18	62,325.81	-343.81	50,216	0.69	0.45	-0.002
1936	124,892.90	89,130.29	26,931.63	44,767	0.98	0.70	0.21
1937	115,976.10	79,873.06	19,874.01	44,393	0.83	0.57	0.14
1938	121,687.10	80,217.16	18,640.54	49,536	0.72	0.48	0.11
1939	135,812.80	93,269.02	29,920.89	54,167	0.75	0.52	0.17
1940	107,276.90	61,833.98	-4,521.68	51,517	0.58	0.34	-0.02
1941	101,133.10	59,647.90	-11,764.46	50,495	0.53	0.32	-0.06
1942	100,486.60	60,091.00	-30,949.88	51,780	0.43	0.26	-0.13
1943	103,498.80	61,346.58	-34,436.89	50,397	0.40	0.24	-0.13
1944				50,640			
1945	176,359.10	116,201.00	0	50,744	0.60	0.39	0
1946	242,852.30	169,618.00	28,666.32	56,525	0.73	0.51	0.09
1947	285,395.90	210,935.60		52,581	0.59	0.43	
1948	285,624.40	208,625.30	-1,372.28	53,208	1.43	1.04	-0.01
1949	302,473.20	176,454.90	-127,471.50	70,781	1.44	0.84	-0.61
1950	401,825.60	284,397.10	42,200.86	100,942	1.77	1.25	0.19
1951							
1952	431,855.70	288,159.40	-15,199.55	118,364	2.49	1.66	-0.09
1953	518,616.60	352,824.50	21,240.32	130,981	2.49	1.69	0.10
1954	631,327.40				2.20		
1955	740,092.80	513,126.50	100,460.50	146,406	1.71	1.18	0.23
1956	992,023.60				1.24		
1957	1,023,998.00	745,241.50	234,187.20	179,610	1.09	0.79	0.25
1958	1,133,155.00	818,992.30	177,577.90	83,461	1.19	0.86	0.19
1959	1,532,634.00	1,196,574.00	446,565.70	91,417			

A.3.2 Value of Prison Labor: Measuring Bias in Estimates

Using the daily average number of prisoners might not properly capture the entire sample of prisoners whose labor was appropriated by the colonial government. Those who were charged but sent out on bail for instance would still have to commit their labor but would not be counted as being in prison.

As an alternative measure to the daily average in prison, we use the number of people committed to penal imprisonment in each year, that is the number of people who were arrested and sent to jail for one reason or another and who were expected to serve penal labor. The number of people committed to prison however does not imply that they spend the entire year there. Since the Blue Books break down sentences into 3 categories: those committed for over 2 years, those committed for between 6 months and 2 years, and those committed for less than 6 months, we weight the number of people committed to prison by the categories of their duration of stay. Specifically, we assume that those with more than two-year sentences spend 2 years in prison, those between six-month and two-year sentences spend 1 year and 3 months in prison, and those with less than six-month sentences spend 3 months in prison. Finally, we assume that imprisonment started at the beginning of the year hence 1 year in prison would run from January 1st until December 31st.

Figure A9(a) compares the daily average number in prison to our weighted average measure of people committed to prison for penal imprisonment in each year. The daily average as measured in the Blue Books tends to be much lower than our weighted average measure of those committed to prison. This is true especially in the earlier years of our sample. There however seems to be a convergence in both measures over time.

Recalculating the value of prison labor using our weighted measure of people committed to prisons shows that using the average number in prison underestimates the value of prison labor. At its peak, the value of prison labor is more than 60% larger when using the weighted

Table A3: Value of prison labor, real estimates

Year	Real total value of prison labor (PL), estimate	Real net value of PL- less food costs	Real net value of PL- less prison costs	Real total value of PL, reported
1920	178,498.10		55,889.37	
1921	160,933.50	73,719.91	25,485.49	48,994.83
1922	134,452.30	62,457.80	15,431.08	45,079.40
1923	107,675.80	49,153.25	-8,800.04	47,484.70
1924	129,917.90	82,972.27	31,545.12	45,744.24
1925	136,556.10	88,395.16	34,867.89	44,472.38
1926	134,927.40	79,379.46	21,402.61	48,298.89
1927	134,228.60	78,527.04	23,265.56	48,279.13
1928	101,359.10	49,598.37	-10,280.36	44,365.37
1929	94,333.23	51,423.43	6,109.08	42,812.17
1930	80,454.55	39,043.15	-14,032.38	42,674.24
1931	74,444.58	36,715.22	-8,060.92	38,770.51
1932	65,938.95	35,134.37	-9,095.36	34,842.81
1933	61,023.38	34,944.94	-1,747.74	32,745.34
1934	64,319.20	37,371.20	83.53	33,695.84
1935	59,579.86	39,169.19	-216.07	31,558.67
1936	78,983.62	56,366.98	17,031.86	28,311.15
1937	76,094.96	52,406.83	13,039.86	29,127.42
1938	80,804.11	53,266.73	12,377.91	32,893.47
1939	92,868.03	63,776.84	20,459.74	37,039.09
1940	85,651.90	49,369.43	-3,610.20	41,132.15
1941	89,540.79	52,810.79	-10,415.97	44,707.04
1942	95,323.28	57,003.32	-29,359.57	49,119.37
1943	101,453.40	60,134.20	-33,756.32	49,401.01
1944				51,040.32
1945	182,632.70	120,334.70	0	52,549.12
1946	259,170.50	181,015.30	30,592.51	60,323.12
1947	326,005.60	240,950.10		60,062.88
1948	351,103.60	256,452.50	-1,686.87	65,405.88
1949	382,574.80	223,184.10	-161,228.80	89,525.38
1950	524,120.30	370,952.70	55,044.60	131,663.50
1951				
1952	670,827.30	447,615.20	-23,610.36	183,861.90
1953	830,196.60	564,798.20	34,001.31	209,673.10
1954	1,030,586.00			
1955	1,260,790.00	874,140.40	171,140.20	249,411.00
1956	1,776,232.00			
1957	1,898,242.00	1,381,495.00	434,125.80	332,952.90
1958	2,167,774.00	1,566,768.00	339,714.30	159,664.50
1959	2,944,111.00	2,298,557.00	857,829.70	175,607.40

average of people committed for penal imprisonment compared to using the average number in prison as shown in Figure A9(b). The trend however remains the same with the value declining over time.

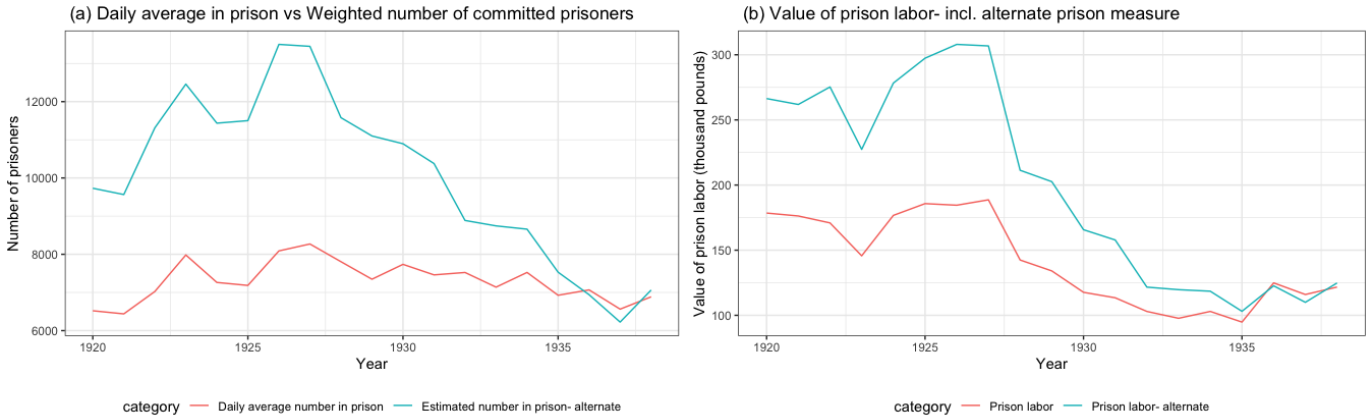


Figure A9: Alternate prison and value of labor coercion measures, 1920-1938

A.3.3 Relative Value of Prison Labor: Comparison to Recurrent Maintenance Public Works Expenditure

The relative value of prison labor measures, comparing the value of prison labor to public works expenditure in the main results used expenditure on new public works construction as the main category for comparison. The rationale is that new construction represents value-adding investment in productive public works, as opposed to just upkeep or maintenance. The archival data also records information on recurrent maintenance public works expenditure, and, in some years between 1920 and 1938 only, an undefined category of public works expenditure called "extraordinary" expenditure. We estimate the share of prison labor in total (new and maintenance) public works expenditure and overall (new, maintenance and the extraordinary category) public works spending. The results are in Figure A10.

Figure A10(c) reports estimates for the share of prison labor in total (new and maintenance) public works expenditure from 1920 to 1959. The gross share average is 35% with the share ranging from 12% to 119%. The net share including the most extensive measures

of prisoner maintenance costs is 3%, with a maximum of up to 24% during this period. Figure A10(d) reports estimates for the share of prison labor in overall (new, maintenance and extraordinary) public works expenditure. The gross share average is 25% with the share ranging from 8% to 119%. The net share including the most extensive measures of prisoner maintenance costs is 2%, with a maximum of up to 19% during this period.

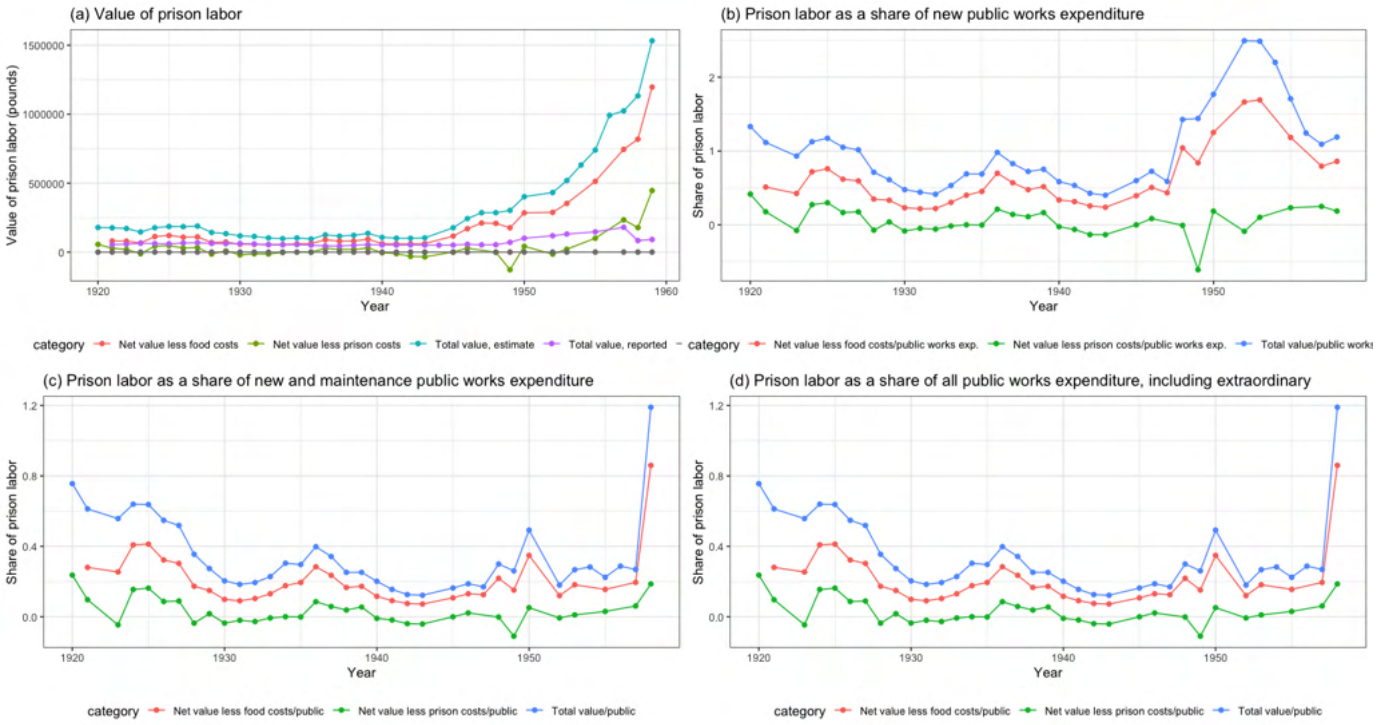


Figure A10: Relative value of prison labor, 1920-1959

A.4 Rainfall Shocks and Crop Yields

The share of agriculture spending in total government expenditures in Nigeria has remained relatively low at around 1% of total expenditures, on average, over the colonial and post-colonial periods as shown in Figure A11. Farming, which accounts for the major share of employment, is largely subsistence farming, and irrigated agriculture accounts for only 1% of cultivated area in the country (Xie, You, and Takeshima, 2017).

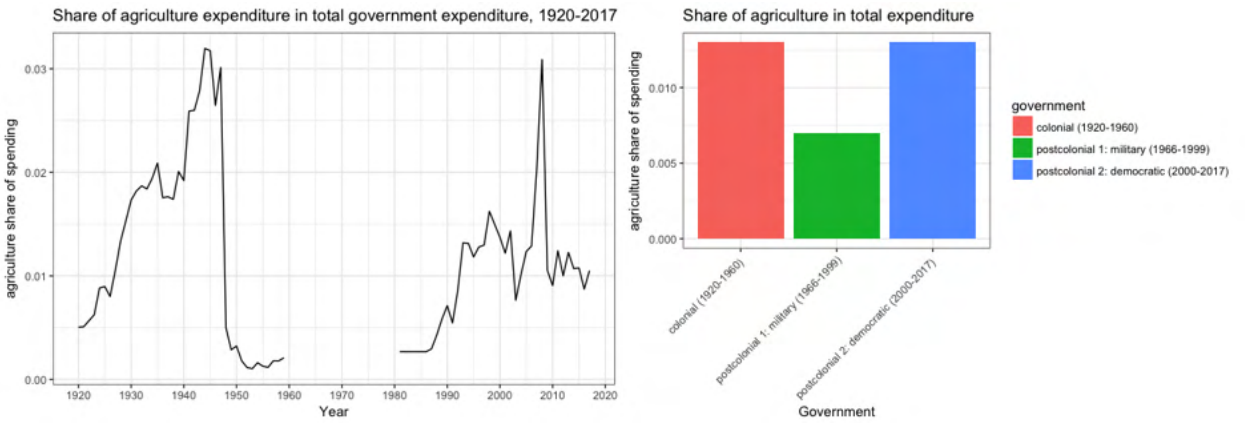


Figure A11: Share of agriculture spending in total government expenditure, 1920-2017

The colonial Annual Report on the Agricultural Department documents multiple mentions of the links between rainfall shocks and crop yields from 1921 to 1952. Among some of the excerpts are the following:

- On experimental coffee growth between 1931 and 1932 in Ibadan: "The long dry season is the limiting factor in the successful cultivation of these better types of coffee, but the effects of drought can be greatly alleviated by the use of shade trees"
- 1942-1943 season: "Unfortunately at a time when maximum production of both food and export crops was required the whole of Nigeria except the Eastern Provinces experienced a season in which the rainfall was both very short and badly distributed. In the North good early rains are followed by a severe drought in June and July and the

total for the year was very much below average in most areas... The groundnut and cotton crops suffered severely as a result of the drought."

- 1950 season, referring to rice cultivation: "Work in the river rain Massagha Swamp which is being opened by hand, is being extended but considerable damage was done to a very promising crop by unusually high floods in September. Such losses must be faced in riverain areas in years of exceptional flood and cannot be prevented without the construction of elaborate levees and sluices, the cost of which is likely to prove uneconomic."

- 1933 season, referring to yields of cotton and export crops: "The weather in the "export belt" was unfavorable, partly because the rainfall in July, August, September, when it is always more than adequate, was exceptionally heavy, but chiefly because only a fraction of an inch of rain (in some places none at all) fell in October, instead of the two, three, or four inches in that month which make so much difference to cotton. These factors caused an exceptionally low yield per acre..."

- 1937-38 (1937) season: "Reports from all agricultural stations throughout Nigeria show that the rainfall in 1937 was below average. In the Southern Provinces, there was a lack of rain during the early part of the season which resulted in very low yields of maize, and handicapped the progress of palm planting."

In the postcolonial period, the Annual Abstract of Statistics provides some disaggregated data on crop yields at the state level in Nigeria between 1992 and 1995 as shown in Figure A12. The crops include cowpea, mango, palm oil, pepper, soyabeans, tomatoes, and leafy vegetables, and represent almost one-fifth of domestic production by Food and Agriculture Organization (FAO) estimates. The nonlinear relationship between rainfall shocks and crop yields is shown in Table A4. The results in Table A4 confirm the inverted-U relationship between rainfall deviations and crop yields (column (1) of Table A4). Extreme negative

rainfall shocks like droughts and extreme positive rainfall shocks like floods decrease crop yields (column (2) of Table A4).

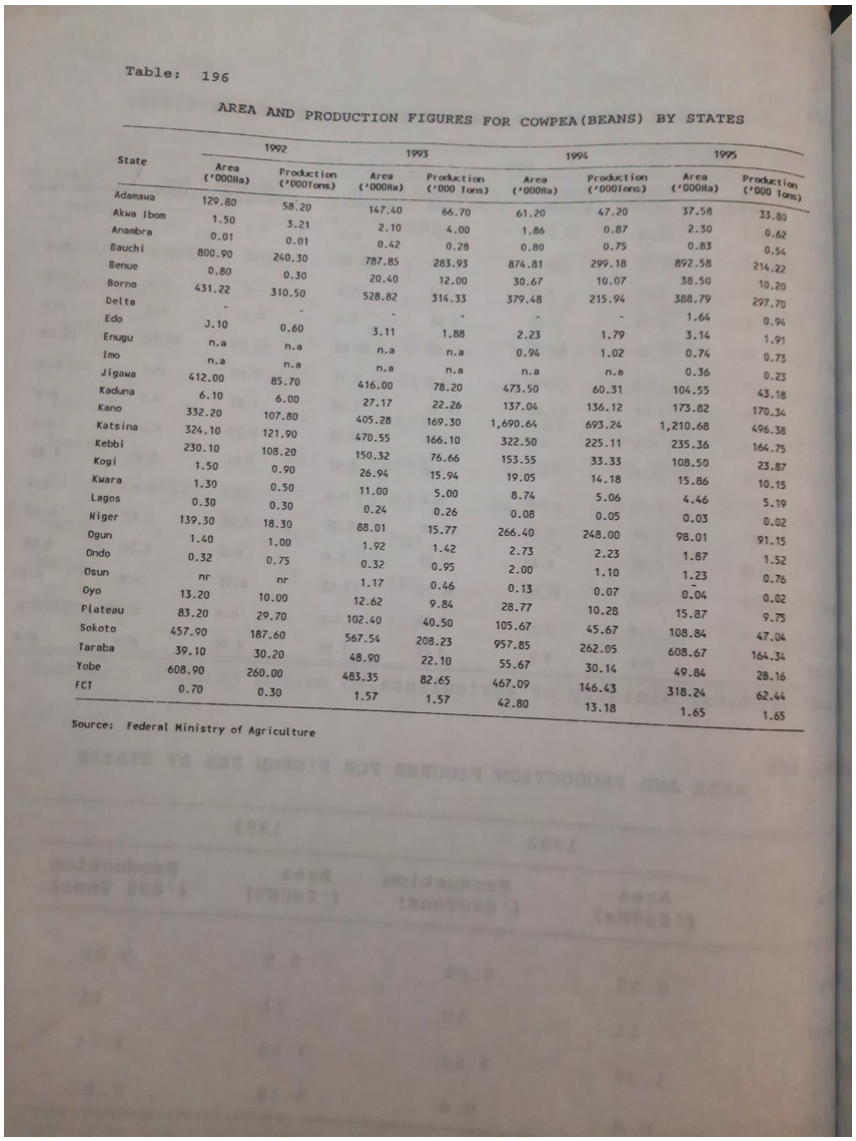


Table: 196

AREA AND PRODUCTION FIGURES FOR COWPEA(BEANS) BY STATES

State	1992		1993		1994		1995	
	Area ('000Ha)	Production ('000Tons)	Area ('000Ha)	Production ('000 Tons)	Area ('000Ha)	Production ('000Tons)	Area ('000Ha)	Production ('000 Tons)
Adamawa	129.80	58.20	147.40	66.70	61.20	47.20	37.58	33.80
Akwa Ibom	1.50	3.21	2.10	4.00	1.86	0.87	2.30	0.62
Anambra	0.01	0.01	0.42	0.28	0.80	0.75	0.83	0.54
Bauchi	800.90	240.30	787.85	283.93	874.81	299.18	892.58	214.22
Benue	0.80	0.30	20.40	12.00	30.67	10.07	38.50	10.20
Borno	431.22	310.50	528.82	314.33	379.48	215.94	388.79	297.70
Delta	-	-	-	-	-	-	1.64	0.94
Edo	3.10	0.60	3.11	1.88	2.23	1.79	3.14	1.91
Enugu	n.a	n.a	n.a	n.a	0.94	1.02	0.74	0.73
Imo	n.a	n.a	n.a	n.a	n.a	n.a	0.36	0.23
Jigawa	412.00	85.70	416.00	78.20	473.50	60.31	104.55	43.18
Kaduna	6.10	6.00	27.17	22.26	137.04	136.12	173.82	170.34
Kano	332.20	107.80	405.28	169.30	1,690.64	693.24	1,210.68	496.38
Katsina	324.10	121.90	470.55	166.10	322.50	225.11	235.36	164.75
Kebbi	230.10	108.20	150.32	76.66	153.55	33.33	108.50	23.87
Kogi	1.50	0.90	26.94	15.94	19.05	14.18	15.86	10.15
Kwara	1.30	0.50	11.00	5.00	8.74	5.06	4.46	5.19
Lagos	0.30	0.30	0.24	0.26	0.08	0.05	0.03	0.02
Niger	139.30	18.30	88.01	15.77	266.40	248.00	98.01	91.15
Ogun	1.40	1.00	1.92	1.42	2.73	2.23	1.87	1.52
Ondo	0.32	0.75	0.32	0.95	2.00	1.10	1.23	0.76
Osun	nr	nr	1.17	0.46	0.13	0.07	0.04	0.02
Oyo	13.20	10.00	12.62	9.84	28.77	10.28	15.87	9.75
Plateau	83.20	29.70	102.40	40.50	105.67	45.67	108.84	47.04
Sokoto	457.90	187.60	567.54	208.23	957.85	262.05	608.67	164.34
Taraba	39.10	30.20	48.90	22.10	55.67	30.14	49.84	28.16
Yobe	608.90	260.00	483.35	82.65	467.09	146.43	318.24	62.44
FCT	0.70	0.30	1.57	1.57	42.80	13.18	1.65	1.65

Source: Federal Ministry of Agriculture

Figure A12: Excerpt from archival material: cowpea yields from the Nigeria AAS and Federal Ministry of Agriculture

Table A4: Rainfall shocks and crop yields, 1992-1995

Outcome:	Yield per area				
	(1)	(2)	(3)	(4)	(5)
Rainfall Dev	−0.114				
	(4.254)				
	[0.985]				
Rainfall Dev Sq	−17.309***				
	(4.479)				
	[0.000]				
Positive rainfall shock (M)		−2.433	−0.952		
		(1.984)	(0.985)		
		[0.287]	[0.353]		
Negative rainfall shock (E)		−3.195*		−3.523**	
		(1.718)		(1.679)	
		[0.109]		[0.078]	
Positive rainfall shock (E)		−17.081***			−14.587***
		(2.275)			(0.723)
		[0.000]			[0.000]
Mean of outcome	2.827	2.827	2.827	2.827	2.827
Observations	122	122	122	122	122
Clusters	31	31	31	31	31
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district or postcolonial state. Wild cluster bootstrap (by district) p-values are in brackets. Observations are postcolonial states. Dependent variable is average yield per area, measured in tons per hectare for 7 major crops recorded in the Nigerian Annual Abstract of Statistics: cowpea, mango, palm oil, pepper, soya beans, tomatoes and leafy vegetables from 1992 to 1995. Rainfall Dev and Rainfall Dev Sq are rainfall deviation and the squared rainfall deviation term as defined in the text. Positive rainfall shock (M) where (M) is moderate, and (E) is extreme as defined in text. District FE are postcolonial state fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

A.5 Effects of Economic Shocks on Incarceration Rates, Robustness Tables

A.5.1 Accounting for Lags in Rainfall, Rainfall Controls

Table A5: Rainfall shocks and colonial (1920-1938) and postcolonial (1971-1995) incarceration rates (lags)

Panel A: Rainfall Shocks and Incarceration Rates, Quadratic Specification						
Period:	**Colonial**				**Postcolonial**	
Outcome:	ST, t+1	LT, t+1	ST, t+2	LT, t+2	PC, t+1	PC, t+2
	(1)	(2)	(3)	(4)	(5)	(6)
Rainfall Dev	8.125	0.638	3.129	0.0005	−22.836***	6.114
	(6.208)	(1.361)	(7.472)	(1.287)	(8.453)	(9.394)
	[0.252]	[0.709]	[0.704]	[1.000]	[0.013]	[0.539]
Rainfall Dev Sq	−3.347	0.454	−0.365	0.327	−0.746	1.633
	(2.797)	(0.754)	(2.117)	(0.494)	(14.796)	(13.400)
	[0.353]	[0.765]	[0.913]	[0.628]	[0.960]	[0.893]
Mean of outcome	134.381	10.432	135.426	10.634	106.348	107.592
Panel B: Rainfall Shocks and Incarceration Rates, Linear Specification						
Period:	**Colonial**				**Postcolonial**	
Outcome:	ST, t+1	LT, t+1	ST, t+2	LT, t+2	PC, t+1	PC, t+2
	(1)	(2)	(3)	(4)	(5)	(6)
Positive rainfall shock (M)	−0.112	−1.796*	−3.892	2.201	−6.504	0.183
	(8.073)	(1.027)	(8.632)	(2.530)	(6.488)	(4.804)
	[0.990]	[0.092]	[0.668]	[0.558]	[0.345]	[0.977]
Negative rainfall shock (E)	−27.309**	−2.054	−17.044	0.536	20.871**	14.779*
	(13.399)	(3.075)	(14.496)	(2.226)	(9.760)	(7.951)
	[0.074]	[0.608]	[0.340]	[0.861]	[0.042]	[0.098]
Positive rainfall shock (E)	−9.815	1.405	−10.440	0.565	−2.906	19.127**
	(12.121)	(2.345)	(13.238)	(1.695)	(11.747)	(8.176)
	[0.492]	[0.584]	[0.546]	[0.737]	[0.826]	[0.035]
Mean of outcome	134.381	10.432	135.426	10.634	106.348	107.592
Observations	310	310	296	296	555	554
Clusters	21	21	21	21	36	36
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data, and postcolonial state for postcolonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are districts. Dependent variables in column (1)-(4) are colonial-era prisoners per 100,000 population (1939 pop.) by province in Nigeria broken down by short-term (ST) (less than 6 months) sentence and long-term (LT) (greater than 2 years) sentence over 1920-1938. Dependent variable in (5) and (6) are postcolonial period prisoners per 100,000 population (1990 pop.) by state in Nigeria from 1971-1995. Outcomes are denoted $t+1$ for outcomes 1 year later and $t+2$ for outcomes 2 years later. Rainfall deviation as defined in text. District FE are colonial province fixed effects in (1)-(4), and postcolonial state fixed effects in (5)-(6). ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

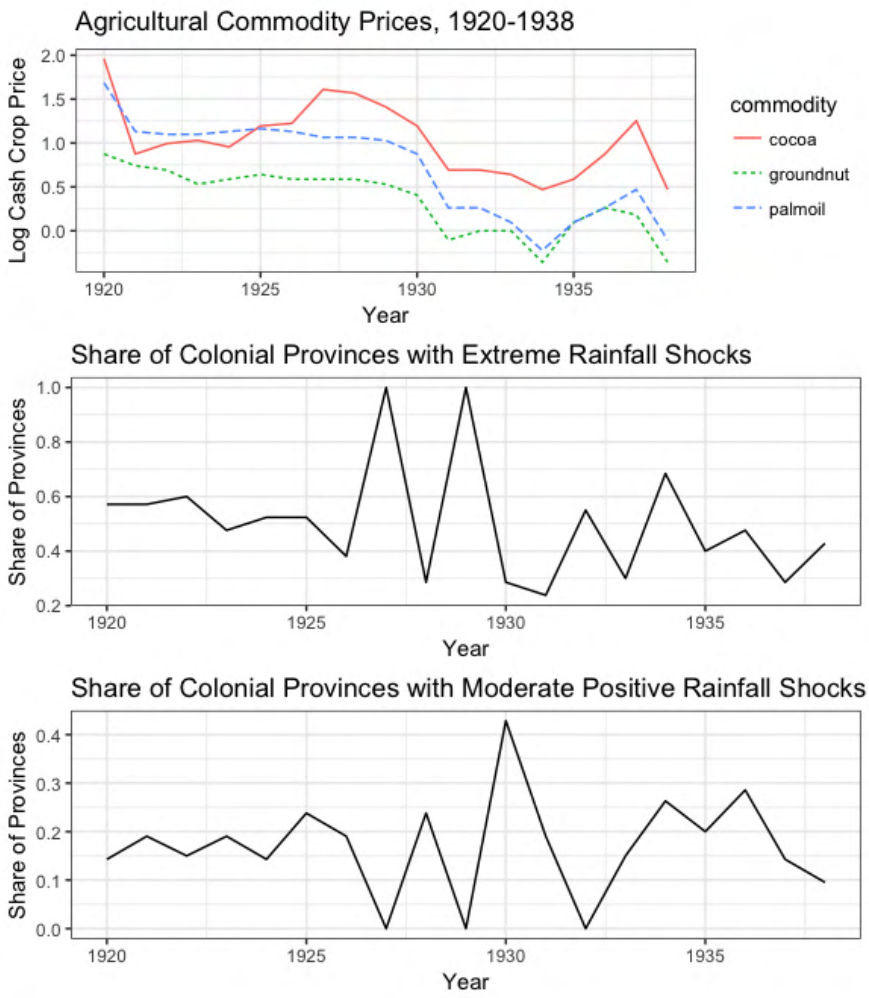


Figure A13: No correlation between agricultural commodity export prices and share of colonial provinces with rainfall shocks, 1920-1938

Table A6: Agricultural commodity export prices and colonial incarceration rates (w/ rainfall controls)

Outcome:	Short-Term				Long-Term			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Palm oil x Palm oil price	70.236***	59.364***			2.667	5.192		
	(26.508)	(21.520)			(5.358)	(3.436)		
	[0.038]	[0.019]			[0.732]	[0.201]		
Cocoa x Cocoa price	43.104*		4.306		−6.023		−6.501***	
	(23.885)		(15.868)		(5.918)		(2.517)	
	[0.205]		[0.809]		[0.537]		[0.014]	
Groundnut x Groundnut price	−3.179			−45.769*	−8.412			−8.270**
	(31.778)			(27.028)	(7.111)			(4.017)
	[0.949]			[0.149]	[0.465]			[0.071]
Mean of outcome	134.659	134.659	134.659	134.659	10.175	10.175	10.175	10.175
Observations	324	324	324	324	324	324	324	324
Clusters	21	21	21	21	21	21	21	21
Rainfall control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are provinces. Dependent variables are prisoners per 100,000 population (1939 pop.) by province in Nigeria broken down by short-term (less than 6 months) sentence in columns (1) to (4) and long-term (greater than 2 years) sentence in columns (5) to (8) over 1920-1938. Prices are in logs. District FE are colonial province fixed effects. Rainfall control is total rainfall (in inches) in the district within each year. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

A.5.2 Cash Crop Export Price Shock Results Using Raw Prices

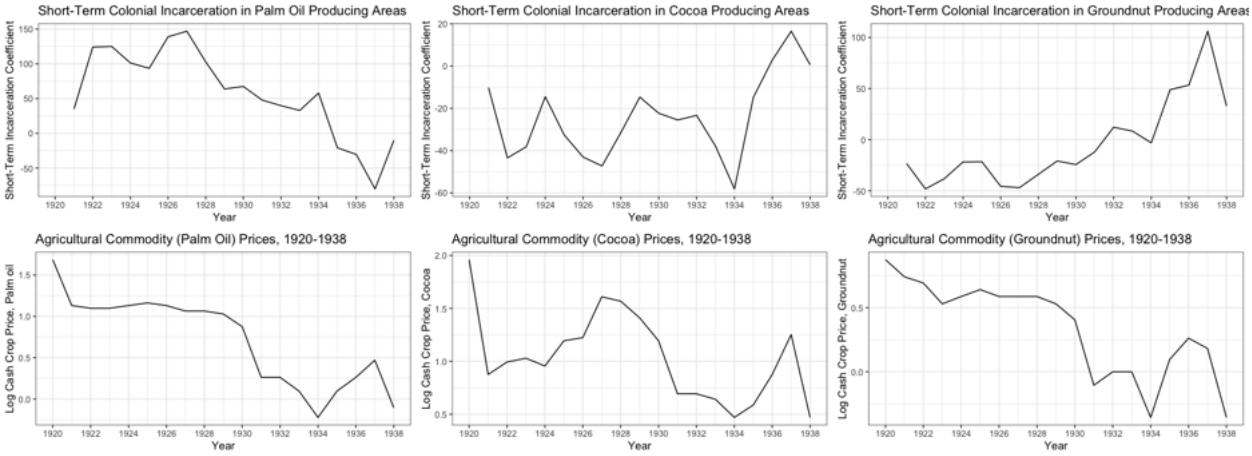


Figure A14: Agricultural commodity export prices and short-term incarceration rates over the colonial period (1920-1938). Coefficients are from individual regressions of short-term incarceration on colonial province and year fixed effects and the interaction between an agricultural commodity presence variable and year fixed effects; the interaction coefficients are plotted above.

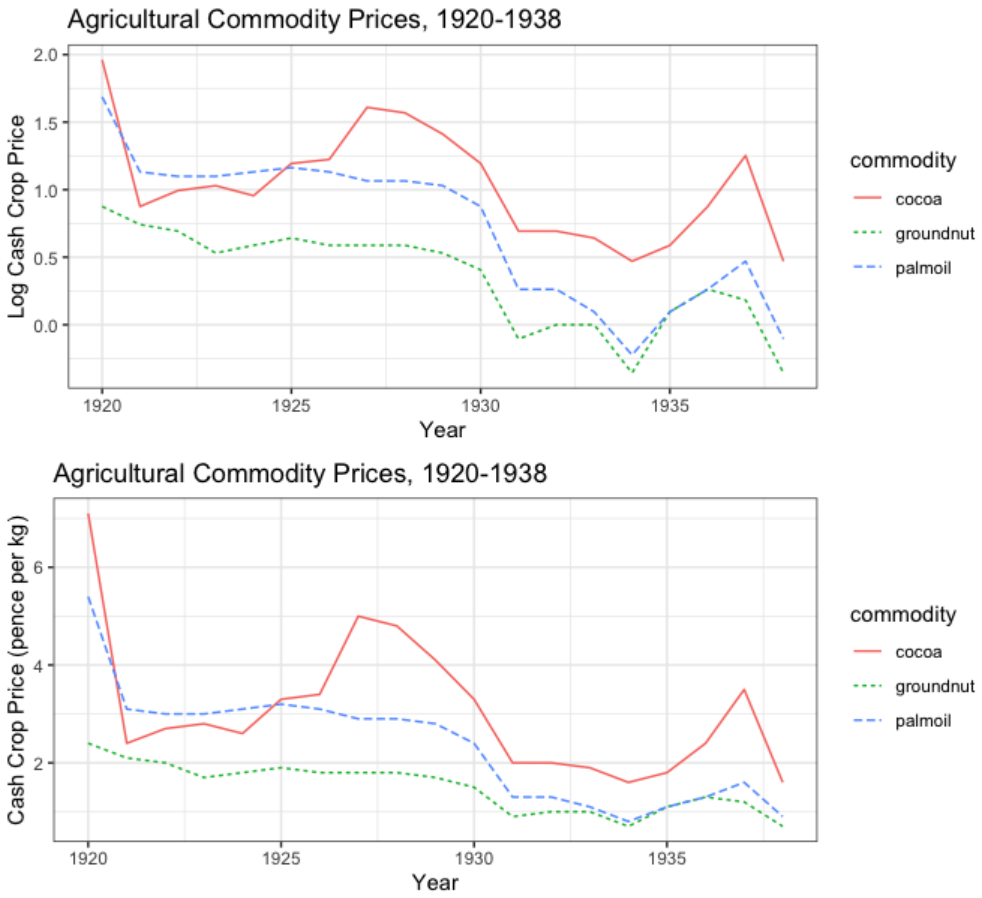


Figure A15: Agricultural commodity export prices over the colonial period (1920-1938)

Table A7: Agricultural commodity export prices and colonial incarceration rates (raw prices)

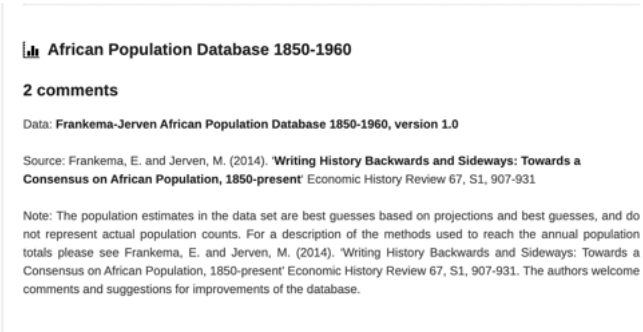
Outcome:	Short-Term				Long-Term			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Palm oil x Palm oil price	20.891*	19.221*			1.028	2.116		
	(11.955)	(9.920)			(1.960)	(1.393)		
	[0.131]	[0.091]			[0.709]	[0.201]		
Cocoa x Cocoa price	7.949		1.607		−1.537		−1.602***	
	(6.011)		(4.026)		(1.267)		(0.582)	
	[0.304]		[0.729]		[0.420]		[0.018]	
Groundnut x Groundnut price	−8.749			−34.540*	−5.926			−6.289***
	(22.672)			(19.243)	(4.093)			(2.375)
	[0.788]			[0.122]	[0.306]			[0.023]
Mean of outcome	134.659	134.659	134.659	134.659	10.175	10.175	10.175	10.175
Observations	324	324	324	324	324	324	324	324
Clusters	21	21	21	21	21	21	21	21
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are provinces. Dependent variables are prisoners per 100,000 population (1939 pop.) by province in Nigeria broken down by short-term (less than 6 months) sentence in columns (1) to (4) and long-term (greater than 2 years) sentence in columns (5) to (8) over 1920-1938. Prices are in pence per kg. District FE are colonial province fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

A.5.3 Robustness to Population Estimates- Trimming Provinces

The colonial incarceration rates presented in the paper are calculated using the population of the colonial provinces in 1939. One question that may arise is how reliable these population estimates are, and if any measurement errors in the calculation of these estimates may affect the results. In their review of historical population estimates in Africa, Frankema and Jerven (2014) argue that African population estimates in the colonial era are often underestimates from 1950s period, and that population figures are best guesses as shown in their note in Figure A16. Any underestimates to the population figures will not substantially affect our results unless the underestimates vary systematically by province. One way to test this is to conduct trimming exercises, dropping potentially significant provinces from the sample to see if the results hold.

One assumption is that any error in population estimates would be in the most populous provinces (Kano is the most popular province in 1939) and centered around the capitals of the southern (Lagos/Colony province) and northern (Niger till 1923, and Zaria from 1923-1966) regions which may attract relatively higher levels of migration, then we can examine robustness of the results by trimming or dropping these provinces. The results in Table A8 are largely stable and qualitatively similar to the main results in Table 3.


African Population Database 1850-1960

2 comments

Data: **Frankema-Jerven African Population Database 1850-1960, version 1.0**

Source: Frankema, E. and Jerven, M. (2014). '**Writing History Backwards and Sideways: Towards a Consensus on African Population, 1850-present**' Economic History Review 67, S1, 907-931

Note: The population estimates in the data set are best guesses based on projections and best guesses, and do not represent actual population counts. For a description of the methods used to reach the annual population totals please see Frankema, E. and Jerven, M. (2014). 'Writing History Backwards and Sideways: Towards a Consensus on African Population, 1850-present' Economic History Review 67, S1, 907-931. The authors welcome comments and suggestions for improvements of the database.

Figure A16: Population estimates note from Frankema and Jerven (2014)

Table A8: Rainfall shocks and colonial incarceration rates, robustness

Outcome:	Short-Term				Long-Term			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Positive rainfall shock (M)	14.075*	12.144*	10.975	11.909	−0.907	−0.692	−1.129	−0.695
	(7.912)	(6.967)	(7.255)	(7.521)	(1.237)	(1.438)	(1.526)	(1.525)
	[0.119]	[0.106]	[0.171]	[0.138]	[0.548]	[0.655]	[0.514]	[0.670]
Negative rainfall shock (E)	−8.590	−17.141*	−16.771	−15.290	−3.528	−0.403	−0.335	−0.166
	(7.350)	(10.361)	(10.864)	(10.891)	(2.284)	(3.554)	(3.607)	(3.597)
	[0.268]	[0.152]	[0.197]	[0.243]	[0.187]	[0.897]	[0.901]	[0.954]
Positive rainfall shock (E)	3.102	−0.469	−3.586	−2.238	1.712	3.337	2.997	2.902
	(14.613)	(14.146)	(14.364)	(13.988)	(2.211)	(2.632)	(2.716)	(2.692)
	[0.835]	[0.980]	[0.824]	[0.882]	[0.517]	[0.280]	[0.311]	[0.333]
Mean of outcome	126.542	136.751	140.583	138.096	8.843	10.324	10.661	9.825
Observations	305	319	309	305	305	319	309	305
Clusters	20	20	20	20	20	20	20	20
Province dropped	Lagos	Niger	Kano	Zaria	Lagos	Niger	Kano	Zaria
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data, and postcolonial state for postcolonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are districts.Dependent variables are prisoners per 100,000 population (1939 pop.) by province in Nigeria broken down by short-term (less than 6 months) sentence in columns (1) to (4) and long-term (greater than 2 years) sentence in columns (5) to (8) over 1920-1938. Positive rainfall shock (M) where (M) is moderate, and (E) is extreme as defined in text. District FE are colonial province fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

A.5.4 Effects By Previous Incarceration Status, Alternate Incarceration Measure

Table A9: Rainfall shocks, agricultural commodity export prices and colonial incarceration rates by previous incarceration status

Outcome:	**Panel A: Rainfall Shocks and Incarceration**		
	One Previous	Two Previous	Three Previous
	(1)	(2)	(3)
Positive rainfall shock (M)	−2.601	1.106	−0.604
	(10.213)	(1.220)	(0.765)
	[0.830]	[0.477]	[0.523]
Negative rainfall shock (E)	−19.525**	−0.446	−1.085
	(8.446)	(1.234)	(1.833)
	[0.037]	[0.792]	[0.826]
Positive rainfall shock (E)	−1.816	−0.311	−0.968
	(6.334)	(0.815)	(1.035)
	[0.781]	[0.692]	[0.412]
Mean of outcome	38.330	6.413	4.704
Observations	324	324	324
Clusters	21	21	21
Outcome:	**Panel B: Agricultural Commodity Prices and Incarceration**		
	One Previous	Two Previous	Three Previous
	(1)	(2)	(3)
Palm oil x Palm oil price	32.964***	0.024	3.335
	(7.587)	(2.471)	(5.487)
	[0.003]	[0.996]	[0.727]
Cocoa x Cocoa price	−4.440	3.363*	7.595
	(8.805)	(1.879)	(5.427)
	[0.628]	[0.246]	[0.372]
Groundnut x Groundnut price	−20.032	−2.329	3.691
	(20.498)	(3.170)	(7.572)
	[0.507]	[0.597]	[0.798]
Mean of outcome	38.330	6.413	4.704
Observations	324	324	324
Clusters	21	21	21
District FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are provinces. Dependent variables are incarceration rates or prisoners per 100,000 population (1939 pop.) by province in Nigeria broken down by number of prisoners with one previous sentence (1), two previous sentences (2), and 3 or more previous sentences (3). Positive rainfall shock (M) where (M) is moderate, and (E) is extreme as defined in text. Prices are in logs. District FE are colonial province fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

Table A10: Rainfall shocks, agricultural commodity export prices and colonial incarceration rates, alternate incarceration measure

Outcome:	Share Short-Term			Share Long-Term		
	(1)	(2)	(3)	(4)	(5)	(6)
Rainfall Dev	−0.003			0.008		
	(0.016)			(0.007)		
	[0.877]			[0.283]		
Rainfall Dev Sq	−0.005			0.002		
	(0.004)			(0.003)		
	[0.250]			[0.612]		
Positive rainfall shock (M)		−0.006			0.010	
		(0.017)			(0.014)	
		[0.748]			[0.537]	
Negative rainfall shock (E)		−0.021			0.028	
		(0.031)			(0.018)	
		[0.544]			[0.202]	
Positive rainfall shock (E)		−0.032			0.048***	
		(0.022)			(0.013)	
		[0.194]			[0.006]	
Palm oil x Palm oil price			−0.026			−0.004
			(0.051)			(0.031)
			[0.647]			[0.901]
Cocoa x Cocoa price			0.032			−0.053
			(0.050)			(0.035)
			[0.567]			[0.284]
Groundnut x Groundnut price			−0.003			−0.034
			(0.076)			(0.063)
			[0.975]			[0.681]
Mean of outcome	0.764	0.764	0.764	0.111	0.111	0.111
Observations	324	324	324	324	324	324
Clusters	21	21	21	21	21	21
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data, and postcolonial state for postcolonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are districts. Dependent variables are the share of short-term sentenced ((1)-(3)) and share of long-term sentenced ((3)-(6)) prisoners in sentenced prisoners by province in Nigeria over 1920-1938. Rainfall deviation, and rainfall deviation squared (Rainfall Dev and Rainfall Dev Sq) as defined in text. Positive rainfall shock (M) where (M) is moderate, and (E) is extreme as defined in text. Prices are in logs. District FE are colonial province fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

A.5.5 Suggestive Evidence of Sentence-Switching in Response to Short-Term Economic Shocks: Custody and Short-Term Incarceration Rates and Further Robustness

Table A11: Rainfall shocks and colonial incarceration rates by custody/awaiting trial category

Outcome:	Custody		Short-Term		Custody − Short-Term	
	(1)	(2)	(3)	(4)	(5)	(6)
Positive rainfall shock (M)	5.623**	1.774	16.727***	12.142*	−11.104**	−10.368
	(2.201)	(2.795)	(5.456)	(6.964)	(4.554)	(6.475)
	[0.014]	[0.558]	[0.016]	[0.093]	[0.040]	[0.154]
Negative rainfall shock (E)		−6.703		−17.225*		10.523
		(6.396)		(10.259)		(8.004)
		[0.371]		[0.139]		[0.241]
Positive rainfall shock (E)		−6.734*		−0.404		−6.331
		(4.044)		(13.973)		(13.161)
		[0.093]		[0.977]		[0.615]
Mean of outcome	71.727	71.727	134.659	134.659	−62.932	−62.932
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	324	324	324	324	324	324
Clusters	21	21	21	21	21	21

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data, and postcolonial state for postcolonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are provinces. Dependent variables in (1)-(2) and (3)-(4) are prisoners awaiting custody or trial per 100,000 population (1939 pop.) and short-term prisoners with less than 6 months sentences respectively. Outcome in (5)-(6) is the difference between the custody/awaiting trial incarceration rate and the short-term, less than 6 months sentence incarceration rate. Positive rainfall shock (M) where (M) is moderate, and (E) is extreme as defined in text. District FE are colonial province fixed effects in (1)-(6). ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

A.5.6 Rainfall Shocks and Colonial Incarceration Rates by Region

Table A12 reports estimates from the heterogeneity by region analysis. The positive relationship between moderate positive rainfall shocks and colonial incarceration rates is driven by short-term incarceration in the southern provinces where the most productive cash crops, palm oil and cocoa, are located.

Table A12: Rainfall shocks and colonial incarceration rates by region

	Panel A: Rainfall Shocks and Colonial Incarceration Rates, Quadratic Specification					
Outcome:	Short-Term			Long-Term		
Sample:	All	South	North	All	South	North
	(1)	(2)	(3)	(4)	(5)	(6)
Rainfall Dev	11.995**	18.884*	1.978	0.759	−0.071	0.236
	(5.876)	(11.046)	(1.234)	(1.227)	(2.201)	(0.338)
	[0.065]	[0.142]	[0.205]	[0.655]	[0.989]	[0.454]
Rainfall Dev Sq	−4.884*	−8.686**	0.860***	0.752	1.381	0.062
	(2.572)	(4.235)	(0.309)	(0.739)	(1.346)	(0.098)
	[0.068]	[0.046]	[<.001]	[0.494]	[0.541]	[0.675]
Mean of outcome	134.659	217.517	18.657	10.175	14.743	3.781
Observations	324	189	135	324	189	135
Clusters	21	10	11	21	10	11
	Panel B: Rainfall Shocks and Colonial Incarceration Rates, Linear Specification					
Outcome:	Short-Term			Long-Term		
Sample:	All	South	North	All	South	North
	(1)	(2)	(3)	(4)	(5)	(6)
Positive rainfall shock (M)	16.727***	24.826***	0.392	−1.638	−2.609	−0.573
	(5.456)	(7.795)	(1.086)	(1.319)	(2.127)	(0.446)
	[0.016]	[0.009]	[0.729]	[0.336]	[0.408]	[0.174]
Mean of outcome	134.659	217.517	18.657	10.175	14.743	3.781
Observations	324	189	135	324	189	135
Clusters	21	10	11	21	10	11
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are provinces. Dependent variables are prisoners per 100,000 population (1939 pop.) by province in Nigeria broken down by short-term (less than 6 months) sentence((1)-(3))and long-term (greater than 2 years) sentence((4)-(6)) over 1920-1938. Rainfall Dev is rainfall deviation from the quadratic specification as defined in the text. Positive rainfall shock (M) where (M) is moderate as defined in the text. District FE are colonial province fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

A.5.7 Gender

Women account for just 6% of incarcerated populations between 1920 and 1938, and also had to work in prisons. They were usually assigned to light labor, cleaning and cooking in prisons. The effects of economic shocks on incarceration rates are largely driven by male prisoners as shown in the figures and table below. In ongoing research we explore the effects of women led protests on the female incarceration rates, particularly for long-term incarceration as well.

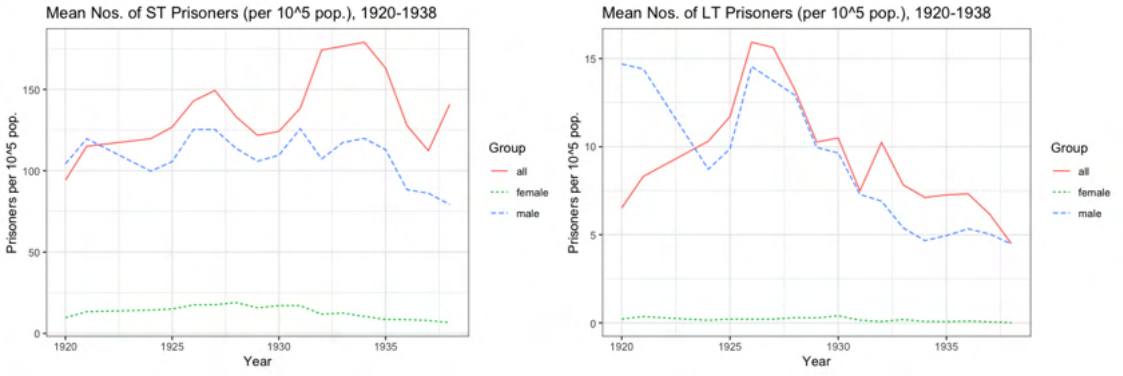


Figure A17: Incarceration rates by gender and sentence, for short-term (ST) and long-term (LT) sentence, 1920-1938

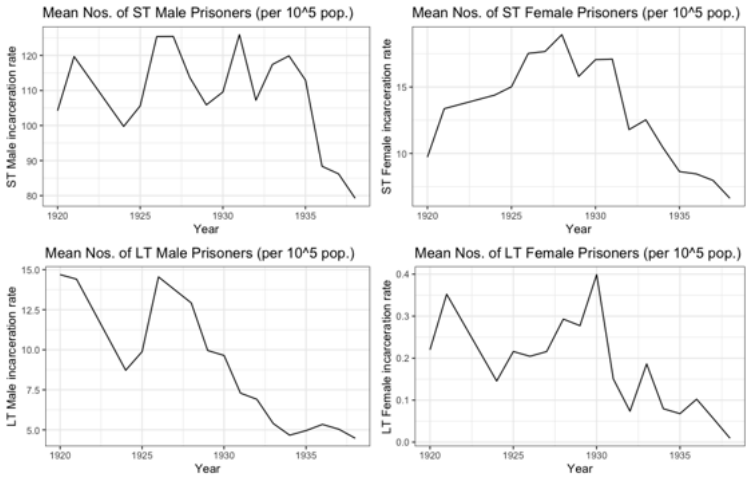


Figure A18: Incarceration rates for male and female prisoners, by short-term (ST) and long-term (LT) sentence, 1920-1938

Table A13: Rainfall shocks, agricultural commodity prices and colonial incarceration rates by gender

	Panel A: Rainfall Shocks and Colonial Incarceration Rates					
Outcome:	**Short-Term**			**Long-Term**		
Group:	All	Male	Female	All	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Positive rainfall shock (M)	12.142*	6.057	0.156	−0.695	−0.524	−0.117**
	(6.964)	(4.489)	(1.300)	(1.437)	(1.172)	(0.051)
	[0.093]	[0.212]	[0.926]	[0.683]	[0.678]	[0.020]
Negative rainfall shock (E)	−17.225*	−19.949**	−5.677***	−0.429	−0.498	−0.140**
	(10.259)	(7.980)	(1.539)	(3.530)	(3.408)	(0.071)
	[0.139]	[0.025]	[0.004]	[0.886]	[0.808]	[0.093]
Positive rainfall shock (E)	−0.404	5.199	0.680	3.358	1.844	0.100
	(13.973)	(8.665)	(2.460)	(2.654)	(1.840)	(0.106)
	[0.977]	[0.576]	[0.781]	[0.293]	[0.367]	[0.426]
Mean of outcome	134.659	109.005	13.282	10.175	9.164	0.184
Observations	324	316	316	324	316	316
Clusters	21	21	21	21	21	21
	Panel B: Agricultural Commodity Prices and Colonial Incarceration Rates					
Outcome:	**Short-Term**			**Long-Term**		
Group:	All	Male	Female	All	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Palm oil x Palm oil price	66.681**	56.482***	16.112***	2.738	4.382	0.375**
	(27.920)	(17.015)	(3.680)	(5.448)	(5.033)	(0.164)
	[0.048]	[0.009]	[0.008]	[0.745]	[0.618]	[0.053]
Cocoa x Cocoa price	41.965*	28.612**	0.874	−6.000	−5.294	−0.036
	(23.638)	(13.577)	(1.238)	(5.952)	(5.712)	(0.042)
	[0.185]	[0.070]	[0.517]	[0.521]	[0.570]	[0.434]
Groundnut x Groundnut price	2.809	0.171	1.181	−8.532	−7.468	−0.087**
	(29.852)	(23.161)	(1.960)	(6.905)	(7.534)	(0.039)
	[0.956]	[0.998]	[0.611]	[0.416]	[0.530]	[0.063]
Mean of outcome	134.659	109.005	13.282	10.175	9.164	0.184
Observations	324	316	316	324	316	316
Clusters	21	21	21	21	21	21
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by district, where district is colonial province for colonial data. Wild cluster bootstrap (by district) p-values are in brackets. Observations are provinces. Dependent variables are incarceration rates or prisoners per 100,000 population (1939 pop.) by province in Nigeria broken down by short-term (less than 6 months) sentence ((1)-(3))and long-term (greater than 2 years) sentence ((4)-(6)) over 1920-1938; incarceration rates for all, male and female prisoners as specified in the table. Positive rainfall shock (M) where (M) is moderate, and (E) is extreme as defined in text. Prices are in logs. District FE are colonial province fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level based on clustered standard errors in parentheses.

A.6 Colonial Imprisonment and Contemporary Trust in Legal Institutions, Robustness

A.6.1 Afrobarometer Summary Statistics and Colonial Imprisonment

Given the rich literature on the long-term impacts of historical institutions, and coercive labor institutions in particular, on contemporary attitudes and outcomes, to explore the long-term impacts of exposure to colonial imprisonment driven primarily by economic motives around prison labor, on views of state legitimacy, we use geocoded data from all rounds of the Afrobarometer surveys for Nigeria. We use Afrobarometer surveys from all 5 rounds from 2003, 2005, 2008, 2012 and 2014. Our main outcomes of interest are, following previous literature (Nunn and Wantchekon, 2011; Lowes and Montero, 2021*b*), respondent reported trust in institutions or individuals variables. Trust outcomes are reported trust levels on a scale of 0-3, where "Not at all"= "0", "Just a little"="1", "Somewhat"="2", "A lot"="3". Specifically, we use data on trust in historical legal institutions namely: trust in courts, police, and trust in tax administration and interpersonal trust: trust in neighbors, trust in relatives, trust in the president and trust in the local governing council member to test the hypothesis that long-term exposure to colonial imprisonment centered around prison labor reduces views of state legitimacy through lowered trust in legal institutions, with no effect on interpersonal trust.

In addition to individual level controls for age and gender and education fixed effects, to control for potential covariates that could impact both exposure to long-term colonial imprisonment and trust in legal institutions, we combine the Afrobarometer data with population density, geographic controls, disease controls and controls for precolonial and colonial institutions, with descriptions of the data and summary statistics shown in Table A15. Precolonial political institutions are proxied using Murdock's (1967) "Jurisdictional Hierarchy Beyond the Local Community Level" called the Precolonial centralization index here. The

precolonial centralization index or "Jurisdictional Hierarchy Beyond the Local Community Level" variable is an index of "political complexity" that assigns a score between 0 to 4 to each ethnic region unit and describes the number of political jurisdictional hierarchies above the local community level for each unit. The score is defined as follows: 0 represents so-called "stateless societies","lacking any form of political organization", 1 and 2 are petty and larger paramount chiefdoms, 3 and 4 are large, more organized states. The colonial institutions Nunn and Wantchekon (2011)'s total number of exported slaves in the trans Atlantic and Indian ocean slave trades from 1400-1900. Disease controls are included for malaria by using climatic suitability for malaria transmission from Adjuik et al. (1998) to address the various hypotheses in the literature on the negative impacts of malaria on African development outcomes (Gallup and Sachs, 2001) and tse tse fly suitability following Alsan (2015). Geographic controls include land suitability for agriculture, mean elevation in km, ruggedness, and indicators for sea coast and petrol, to control for access to trade routes and mineral wealth on trust outcomes.

Table A14: Relationship between share of rank and file police in total police force and colonial imprisonment

Outcome:	Colonial Imprisonment (ST)	Colonial Imprisonment (LT)	Short-Term	Long-Term
	(1)	(2)	(3)	(4)
Share of rank and file police	0.021***	−0.001	5.000*	0.433
	(0.005)	(0.003)	(2.743)	(0.587)
	[0.000]	[0.692]	[0.078]	[0.547]
Mean of outcome	0.764	0.111	134.659	10.175
Observations	234	234	234	234
Clusters	19	19	19	19
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by colonial province. Wild cluster bootstrap (by district) p-values are in brackets. Observations are provinces. Covariate is the share of rank and file police in the total police force. Outcomes in columns (1) and (2) are Colonial imprisonment (ST or LT), which is the average share of short-term (ST) or long-term (LT) incarcerated populations in each colonial province over 1920 to 1938 as defined in the text. Outcomes in columns (3) and (4) are prisoners per 100,000 population (1939 pop.) by province in Nigeria broken down by short-term (less than 6 months) sentence ((3)) and long-term (greater than 2 years) sentence ((4)) over 1920-1938. District FE are colonial province fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level.

Table A15: Summary Statistics: Afrobarometer Results

Statistic	N	Mean	St. Dev.	Min	Max
		Trust and Crime Outcomes			
Trust in Courts	11,354	1.21	0.92	0.00	3.00
Trust in Police	11,486	0.69	0.87	0.00	3.00
Trust in Tax Admin.	4,480	1.01	0.85	0.00	3.00
Trust Relatives	4,596	1.97	1.03	0.00	3.00
Trust Neighbors	4,682	1.37	1.00	0.00	3.00
Trust Local Gov.	8,961	0.93	0.87	0.00	3.00
Fear Crime	11,584	0.59	1.00	0.00	4.00
Bribe (HHS)	8,082	0.27	0.68	0.00	3.00
Bribe (Doc)	7,987	0.29	0.66	0.00	3.00
		Individual Controls and Fixed Effects			
Age	11,603	31.94	12.05	18.00	95.00
Age Squared	11,603	1,165.29	987.34	324.00	9,025.00
Female	11,654	0.50	0.50	0	1
Education	11,629	3.27	1.92	0.00	7.00
		Geographic and Disease Controls			
Population Density 2006	11,526	450.97	693.01	41.04	2,694.63
Agricultural Land Suitability	8,453	4.71	0.76	1.80	6.00
Malaria	9,095	1.00	0.02	0.79	1.00
Ruggedness	9,095	0.26	0.22	0.03	2.28
Mean Elevation	8,332	248.09	234.70	−0.25	1,284.11
Sea Coast	9,095	0.29	0.45	0.00	1.00
Petrol	9,095	0.34	0.47	0.00	1.00
Tsetse Suitability	7,147	0.91	0.46	−0.78	1.45
		Precolonial and Colonial Controls			
Precolonial Centralization	9,095	1.66	0.78	0.00	3.00
Slave Exports	9,095	150,841.30	206,271.70	0.00	665,966.00
		Instrument and Colonial Imprisonment			
Soil Suitability for Palm Oil x Share of Positive Shock (M) Years	11,025	3.09	7.95	0.00	32.34
Colonial Imprisonment (ST)	11,025	0.75	0.13	0.46	0.92
Colonial Imprisonment (LT)	11,025	0.11	0.08	0.01	0.33

Notes: See text and online appendix for details.

A.6.2 Possible Channels

There are many potential channels through which the use of an, ostensibly, institution of justice like prisons for primarily prison labor or economic/extrajudicial motives may matter for populations' long-term trust in legal institutions. A full exploration of these channels is beyond the scope of this paper, but we discuss two main ones here. One hypothesis is that repressive practices like coercive policing and police violence against populations needed to exert control and imprisonment for prison labor described in Section 2 may have continued in regions today, even after the prison labor motive for incarceration disappeared in the postcolonial period.

A second channel is that colonial imprisonment coupled with the existing economically motivated system of prison labor is highlighted in local memory as unjust and the fear and injustice retained in residents' memories has been passed down over generations and is reflected in lower trust in legal institution outcomes in current times. Exposure to colonial imprisonment then reduces residents' trust in legal institutions with colonial origins such as modern courts, the police, and systems of tax administration, as a result of repeated negative experiences and long local memories as described in previous literature (Nunn and Wantchekon, 2011; Lowes and Montero, 2021*a*,*b*). A key assumption here is that there are relatively low levels of internal migration, with most people residing in their provincial homelands. Although there are no available data on migration, research has documented significant positive correlations (0.7, $p < 0.001$) between historic (c.1850) ethnic/province-level residence and contemporary Afrobarometer respondent locations by ethnicity (Archibong, 2019; Nunn and Wantchekon, 2011); this suggests that the low migration assumption is reasonable here.

One way to potentially assess this hypothesis is test if reported trust in legal institutions is even lower among people who report their ethnicity in the Afrobarometer survey as

being from an ethnic group, historically based in the southern region. The southern region experienced the most intensive use of prison labor in the country, and the results are largely driven by the southern region as discussed in Section A.5.6. We match ethnic groups of respondents in Afrobarometer to their historic ethnic homeland in Murdock's (1967) Ethnographic Atlas. We then examine the relationship between colonial imprisonment and trust by southern ethnicity status. The results in Table A16 show no effects of southern ethnicity status on the trust outcomes. The results suggest that the persistence in policing practices channel may be the primary channel at work here, though we cannot rule out the local memory channel based on the findings in Table A16.

Table A16: OLS Estimates: Relationship between colonial imprisonment and trust in historical legal Institutions versus interpersonal trust by southern ethnicity status

Outcome:	**Panel: Colonial Imprisonment (Short-Term) and Contemporary Trust Outcomes**					
	Trust in Historical Legal Institutions			**Interpersonal Trust**		
	Police	Courts	Tax	Neighbor	Relative	Local Gov.
	(1)	(2)	(3)	(4)	(5)	(6)
Colonial imprisonment (ST)	−0.584***	−0.599***	−0.766**	−0.326	1.106	−0.568**
	(0.161)	(0.212)	(0.367)	(0.545)	(0.735)	(0.287)
	[0.001]	[0.064]	[0.166]	[0.599]	[0.358]	[0.353]
Southern Ethnicity	−0.617	−0.025	0.193	0.207	0.709	−0.632
	(0.427)	(0.632)	(0.864)	(0.437)	(0.729)	(0.601)
	[0.327]	[0.974]	[0.867]	[0.719]	[0.437]	[0.482]
ST x Southern Ethnicity	0.762	0.083	−0.560	−0.417	−1.060	1.060
	(0.533)	(0.877)	(1.182)	(0.605)	(1.054)	(0.783)
	[0.312]	[0.932]	[0.756]	[0.581]	[0.441]	[0.374]
Mean of outcome	0.709	1.274	0.976	1.334	1.913	0.948
Observations	6,163	6,115	2,906	3,192	3,125	4,510
Clusters	21	21	21	21	21	21
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Disease Controls	Yes	Yes	Yes	Yes	Yes	Yes
Precolonial and Colonial Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by colonial province. Wild cluster bootstrap (by district) p-values are in brackets. The unit of observation is an individual. Colonial imprisonment (ST) is the average share of short-term (ST) incarcerated populations in each colonial province over 1920 to 1938 as defined in the text. Southern Ethnicity is an indicator that equals one if the respondent is from an ethnic group historically located in the former southern colonial provinces. Trust variables are from the Afrobarometer samples over 2003 to 2014 and as defined in the main text. Trust outcomes are reported trust levels on a scale of 0-3, where "Not at all"= "0", "Just a little"="1", "Somewhat"="2", "A lot"="3". All regressions use region fixed effects at the geopolitical zone level in Nigeria (for 6 geopolitical zones), year fixed effects and educational attainment fixed effects. Individual controls include age, age squared and gender. Geographic controls include an indicator for whether the respondent lives in an urban location, and, at the sub-district or local government area level, include, ruggedness, indicators for petroleum, seacoast and mean land suitability for agriculture and mean elevation in alternate specifications. Disease controls at the sub-district level include malaria suitability and tse tse fly suitability in alternate specifications with results unchanged. Precolonial and colonial controls at the ethnicity-level include the level of precolonial centralization and total exports of slaves from the region during the Atlantic slave trade. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level.

A.6.3 Instrumental Variable Strategy and Results

While Equation 5 includes a rich set of controls, β does not identify the causal effect of colonial imprisonment on trust in legal institutions. It is possible that there exists an omitted variable, such as lower inherent trust among imprisoned populations, which determines both (short-term) colonial imprisonment exposure and trust in legal institutions. To address this issue, we present results using an instrumental variables approach. We construct an instrument for our colonial imprisonment outcome that is the interaction between two variables: (1) the soil suitability for palm oil and (2) the share of moderate positive rainfall shock years in the colonial province over 1920 to 1938. The instrument is based on the findings of the strong predictive power of palm oil production and prices for (short-term) colonial imprisonment, and the previous results showing that short-term incarceration increased in response to moderate positive rainfall shocks that increased agricultural productivity. For instrument validity and for the exclusion restriction to hold, the interacted soil suitability for palm oil instrument must only affect the trust outcomes through the share of short-term sentenced colonial imprisonment measure.

Table A17 shows that the interacted instrument strongly predicts the (short-term) colonial imprisonment measure. Conversely, there is a weaker negative relationship between the interacted soil suitability for palm oil instrument and the share of long-term sentenced colonial imprisonment (column (3) and column (4)). Panel A of Table A18 presents the first-stage estimates for the instrument using the "soil suitability for palm oil x colonial palm oil production" indicator to predict our colonial imprisonment outcome. The instrument predicts (short-term) colonial imprisonment, with an F-stat greater than 10 across all specifications. Panel B of Table A18 reports the second-stage estimates for the trust outcomes. The IV estimates are largely qualitatively similar to the OLS results. While the estimate is imprecisely measured, the coefficient on trust in police remains negative, with

similar magnitudes as in the OLS results. The coefficients on trust in courts and tax administration are also negative and significant, although the large differences in magnitudes between the OLS and IV estimates suggests measurement error and caution in interpreting the IV estimates. The estimate on trust in neighbors is now negative and significant, although with similarly inflated estimates. There is no significant effect for trust in relatives and the elected local governing council.

Table A17: OLS Estimates: Soil suitability for palm oil interacted with share of moderate positive rainfall shock years in colonial province instrument and colonial imprisonment

Outcome:	Colonial imprisonment (ST)		Colonial imprisonment (LT)	
	(1)	(2)	(3)	(4)
Soil Suitability for Palm Oil				
x Share of Positive Shock (M) Years	0.036***	0.013***	−0.019***	−0.006**
	(0.010)	(0.003)	(0.006)	(0.003)
Mean of outcome	0.750	0.769	0.112	0.104
Observations	11,025	6,745	11,025	6,745
Clusters	21	21	21	21
Individual Controls	No	Yes	No	Yes
Geographic Controls	No	Yes	No	Yes
Disease Controls	No	Yes	No	Yes
Precolonial and Colonial Controls	No	Yes	No	Yes
Region FE	No	Yes	No	Yes
Year FE	No	Yes	No	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by colonial province. The unit of observation is an individual. Colonial imprisonment (ST or LT) is the average share of short-term (ST) or long-term (LT) incarcerated populations in each colonial province over 1920 to 1938 as defined in the text. Where specified, regressions use region fixed effects at the geopolitical zone level in Nigeria (for 6 geopolitical zones), year fixed effects and educational attainment fixed effects. Individual controls include age, age squared and gender. Geographic controls include an indicator for whether the respondent lives in an urban location, and, at the sub-district or local government area level, include, ruggedness, indicators for petroleum, seacoast and mean land suitability for agriculture and mean elevation in alternate specifications. Disease controls at the sub-district level include malaria suitability and tse tse fly suitability in alternate specifications with results unchanged. Precolonial and colonial controls at the ethnicity-level include the level of precolonial centralization and total exports of slaves from the region during the Atlantic slave trade. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level.

Table A18: IV Estimates: Effect of colonial imprisonment on present-day trust in historical legal Institutions versus interpersonal trust

Outcome:	**Panel A: First-Stage Estimates Colonial Imprisonment (ST)**					
	(1)	(2)	(3)	(4)	(5)	(6)
Soil Suitability for Palm Oil						
x Share of Positive Shock (M) Years	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
F-Stat of Excluded Instrument	15.31	15.14	15.30	16.72	11.83	16.25
Mean of outcome	0.769	0.769	0.770	0.769	0.768	0.768
Outcome:	**Panel B: Second-Stage 2SLS Estimates**					
	Trust in Historical Legal Institutions			**Interpersonal Trust**		
	Police	Courts	Tax	Neighbors	Relatives	Local Gov
	(1)	(2)	(3)	(4)	(5)	(6)
Colonial imprisonment (ST)	−0.531	−4.345**	−4.105***	−2.146**	−1.094	−1.357
	(0.565)	(1.730)	(1.525)	(1.012)	(1.354)	(0.978)
Mean of outcome	0.709	1.274	0.976	1.334	1.913	0.948
Observations	6,642	6,590	3,126	3,439	3,317	4,899
Clusters	21	21	21	21	21	21
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Disease Controls	Yes	Yes	Yes	Yes	Yes	Yes
Precolonial and Colonial Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Robust standard errors in parentheses clustered by colonial province. Wild cluster bootstrap (by district) p-values are in brackets. The unit of observation is an individual. Colonial imprisonment (ST or LT) is the average share of short-term (ST) or long-term (LT) incarcerated populations in each colonial province over 1920 to 1938 as defined in the text. Trust variables are from the Afrobarometer samples over 2003 to 2014 and as defined in the main text. Trust outcomes are reported trust levels on a scale of 0-3, where "Not at all"= "0", "Just a little"="1", "Somewhat"="2", "A lot"="3". All regressions use region fixed effects at the geopolitical zone level in Nigeria (for 6 geopolitical zones), year fixed effects and educational attainment fixed effects. Individual controls include age, age squared and gender. Geographic controls include an indicator for whether the respondent lives in an urban location, and, at the sub-district or local government area level, include, ruggedness, indicators for petroleum, seacoast and mean land suitability for agriculture and mean elevation in alternate specifications. Disease controls at the sub-district level include malaria suitability and tse tse fly suitability in alternate specifications with results unchanged. Precolonial and colonial controls at the ethnicity-level include the level of precolonial centralization and total exports of slaves from the region during the Atlantic slave trade. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level.