The Cash Crop Revolution, Colonialism and Economic Reorganization in Africa

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Abstract.

In the 19th and 20th centuries African economies experienced a significant structural transformation from the slave trades to commercial agriculture. We analyze the long-run impact of this economic transition focusing on the dynamic effects of: shifting geographic fundamentals to favor agro-climatic suitability for cash crops; infrastructural investments to reduce trade costs; and external forward production linkages. Using agro-climatic suitability scores and historical data on the source location of more than 95 percent of all exports across 38 African states, we assess the consequences of these changes on economic reorganization across the continent. We find that colonial cash crop production had positive long-run effects on urbanization, road infrastructure, nighttime luminosity and household wealth. These effects rival or surpass other geographic and historical forces. Exploring causal mechanisms, we show that path dependence due to colonial infrastructure investments is the more important channel than continued advantages in agricultural productivity. However, these agglomerating effects were highly localized; we find limited evidence that commercial agriculture spurred broader regional growth, in contrast to other cash crop regions around the world. If anything, we observe in Africa the economic gains accruing to cash crop zones came at the expense of nearby areas, which are worse off today than expected based on underlying characteristics. Overall, our analysis has important implications for the debate on the long-run effects of colonialism on development in the region. Rather than offsetting negative institutional effects, subnational extractive processes may have reinforced them by sowing economic and social inequalities.

Keywords: cash crops, colonialism, economic reorganization, Africa

JEL Codes: F63, N57, O13, O18, Q17

Introduction

In the 19th and 20th centuries, African economies underwent a significant structural transformation. With the abolition of the slave trades that dominated commerce for the previous three centuries and rising demand from industrializing states for vegetable oils, coffee and cocoa, commercial agriculture took root—first in West Africa where the slave trade was abolished in 1807 and a century later in East Africa. By the 1950s, agricultural commodities accounted for 65 percent of total exports across 38 African states—of which three-quarters were concentrated in coffee, cocoa, groundnuts, cotton and palm products (Hance et al., 1961). In many places across the continent the cash crop revolution, as this economic transition is known, spurred an unprecedented expansion of agricultural production and agricultural-based trade (Austin, 2014a; Hopkins, 1973; Tosh, 1980).[1] In this paper we analyze the enduring impact of the cash crop revolution on economic development across countries in Africa.

Despite a resurgence of research on historical legacies in the study of African political economy,[2] the cash crop revolution has generally been understudied.[3] This represents a major gap not only because of the importance of cash crop agriculture on political, social and economic change across the continent, as noted in a seminal literature in history and geography (Hance, 1964; Hill, 1963; Hogendorn, 1969; Hopkins, 1973; Rodney, 1972), but also because the onset of the economic revolution preceded and was a key driving force of colonialism itself, especially in West Africa (Frankema et al., 2018). While in British East Africa and French Equatorial Africa, the adoption and spread of cash crop agriculture tended to follow colonialism rather than the other way around, colonial economic policies and investments were fundamentally shaped by ecological considerations around commercial agriculture.[4]

In bringing the cash crop revolution into the study of long-run development in Africa, we

[1]In historical perspective, the cash crop revolution represents Africa's third agricultural revolution after the Neolithic transition to sedentary agriculture leading to the cultivation of grains and tubers and the Columbian exchange leading to the spread of maize and cassava.

[2]See Michalopoulos and Papaioannou (2020) for a review.

[3]For an important exception, see the macro-economic analysis by Frankema et al. (2018) on the dynamics of West Africa's transition to commercial agriculture leveraging a comprehensive dataset of the African commodities trade in the 19th century. There have also been a number of articles in economic history on specific crops (such as cotton (De Haas, 2021)) or cases, including Ghana (Austin, 2014b; Jedwab, 2013), Côte d'Ivoire (Jedwab, 2013), Senegambia (Cappelli & Baten, 2017), and Uganda (De Haas, 2017), that offer valuable insights into the effects of cash crops on development processes.

[4]This is perhaps most starkly evident by France's policy to treat Upper Volta (Burkina Faso) as a labor reserve due to the region's high population density in an "inhospitable land." Quote by French doctor, Charles Crozat, who traveled to the Mossi Kingdom in 1890. Cited in Cordell et al. (1996). The Mossi homeland falls in the bottom tercile of cash crop suitability.

set out to make five advances. First, we aim to better understand the endogenous sources of colonialism. A growing literature points to the path dependent effects of colonial investments on development outcomes (Huillery, 2009, 2011; Jedwab et al., 2017; Jedwab & Moradi, 2016; Ricart-Huguet, 2021; Wietzke, 2015), but without systematically accounting for their determinants.[5] Second, we endeavor to account for the relative effects of cash crop agriculture versus other underlying geographic fundamentals that have profoundly shaped African development.[6] Third, we elucidate the mechanisms driving the the persistent effects of commercial agriculture. Fourth, we estimate whether the increasing returns from cash crops spread to neighboring areas. Fifth, we place the impact of the cash crop agriculture in Africa in comparative perspective.

To advance research on these five dimensions, we build a comprehensive dataset of historical African economic geography, including detailed geospatial information on sites of cash crop production and mining. The latter data was extracted from a map published in 1961 depicting the source location of more than 95 percent of all exports across 38 African states, standardized in 1957 U.S. dollars ($). Constructed by a team led by renowned geographer of Africa, William Hance, the map draws on "hundreds of sources...including maps, articles, agricultural yearbooks, reports of commodity boards, and product and regional studies" (Hance et al., 1961). As far as we know, the Hance dataset is the most exhaustive and granular representation of the spatial diffusion of the cash crop revolution across Africa, but has never been systematically analyzed. We aggregate all production points from the Hance map to a rectangular grid of 0.25 lon/lat resolution, along with data on contemporary development outcomes and an extensive set of geographic and historical control variables.

Our baseline regressions suggest that historical cash crop production are significantly better off today on a set of infrastructural and wealth measures than comparable cells within the same African country. Colonial cash crop cells had a 16 percentage points higher probability of having a quality road in 1998; close to a 20 percentage points higher likelihood of emitting nighttime lights in 2015; a 19 percentage points higher likelihood of having a city in 2015; and 14 percent of a standard deviation greater household wealth. Historical cash crop production exhibits a comparable effect on contemporary roads, electrification and cities as colonial mineral

[5] Although see Ricart-Huguet (2021) who attributes coastal trade patterns as shaping investments in West Africa.

[6] A number of studies point to the recurring and path dependent effects of the region's unique biogeographical fundamentals to account for regional variation in development, including: the relative paucity of domesticable plants and animals; the vast continental interior with few inlets or navigable rivers; disease ecologies for malaria and trypanosomiasis; productivity advantage of roots and tubers over cereals; and extensive agriculture and the emergence of trade-based states in zones of ecological diversity (Alsan, 2015; Diamond, 1997; Fenske, 2014; Gallup et al., 1999; Herbst, 2000; Mayshar et al., 2018; Michalopoulos et al., 2019; Sachs et al., 2001).

extraction, despite the more capital-intensive nature of mining.

To better account for the spatial structure of historical cash crop production, we employ a randomization inference-type analysis that uses spatial point process methods to sample 1000 plausible spatial equilibria of colonial resource extraction. These counterfactual production equilibria exhibit highly similar patterns of spatial clustering as the actually observed cash crop locations and ensure balance on geographic and historical baseline variables. The treatment effects derived from comparing development outcomes across historically treated and counterfactual cells remain remarkably close to our baseline regression estimates. Addressing obvious concerns about selection on unobservables, we run reduced form specifications replacing observed cash crop production with the mean agro-climatic potential to grow the nine most important African cash crops. This suitability measure predicts colonial production well and is unrelated to pre-colonial development outcomes, increasing the plausibility of conditional exogeneity assumptions. Confirming our baseline results using actual production, cash crop suitability has positive and significant effects on all four contemporary development outcomes, conditional on geographic and historical control variables as well as country fixed effects. In terms of the relative substantive significance of colonial cash crop agriculture on long-run development, we show that, next to distance to the coast, cash crop suitability surpasses or rivals other factors, such as caloric suitability or disease ecology. Exploring causal mechanisms, we find that the persistence of the cash crop revolution's agglomerating effects operates more through the path dependency induced by colonial infrastructural investments in roads, railways and power generation than continued agricultural production.

However, what were the aggregate effects of these economic changes? Did they spur growth that entailed broader welfare gains or did the reorganization of economic activity around cash crop zones come at the expense of nearby areas (Redding & Turner, 2015)? Our evidence on this is mixed. We find that commercial export agriculture had only moderate positive effects on road infrastructure and household wealth beyond the very local level. Yet, for nighttime luminosity and urbanization spillover effects are negative and significant after only 75 km. This suggests that not only were the long-run effects of colonial cash crop agriculture highly localized but they may have displaced economic potential from neighboring areas, leaving them worse off than would be expected based on their underlying characteristics.

The four maps in Figure 1 visualize our central argument and empirical approach: cash crop suitability (upper-left panel), at least partially shaped the distribution of historical cash crop production (upper-right panel), which in turn structured colonial infrastructure investments in export-oriented cash crop enclaves (lower-left panel) that have wrought severe and persistent subnational variation in economic development (lower-right panel).

Our paper contributes to existing political economy scholarship in several important ways. Building on Hance et al.'s (1961) remarkable data collection and geographic analysis, we contribute new empirical evidence to a large and influential literature on the effects of natural resources and primary commodity exports on economic development. Whereas this literature has predominantly focused on general equilibrium effects via institutions, macroeconomic policy, and industrialization,[7] in line with the broader subnational turn in the study of development growing attention is paid to within-country effects (Allcott & Keniston, 2018; Dell, 2010; Mamo et al., 2019; Michalopoulos & Papaioannou, 2018). Within this latter stream, however, there tends to be a disproportionate focus on minerals relative to commercial agriculture. This is starting to change with a particular focus on historic transitions to cash crop farming and their path dependent effects (Dell & Olken, 2020; Edwards, 2019a; Jedwab & Moradi, 2012, 2016). Our continental analysis of Africa underscores the dual impact that "new geographic" fundamentals had on contemporary spatial equilibria of development via the commercialization of agriculture and colonial infrastructure investments. Our benchmarking analysis shows that these changes have been as consequential for contemporary patterns of economic development, if not more so, than underlying geographic fundamentals regularly cited as the principal determinants of the continent's economic geography, such as caloric suitability, disease prevalence, or distance to navigable rivers.

Theoretically, we build from a classic economics scholarship on the role of agricultural staples versus commodities on regional economic growth (Baldwin, 1956; Engerman & Sokoloff, 1997; Hirschman, 1977; North, 1959; Sokoloff & Engerman, 2000). We find that cash crop agriculture in Africa had limited expansionary effects, even among crops dominated by smallholder producers. This contrasts with the regional benefits arising from food staples historically produced by small family farms in North America (Engerman & Sokoloff, 1997; Hirschman, 1977; North, 1959). Instead, our findings are more closely aligned with North (1959) and Hirschman (1977) that emphasize the mediating effects of production linkages and their structure on the aggregate effects of commercial agriculture.

Finally, our findings inform the debate in the social sciences on the long-run effects of colonialism on development. As is well-known, at the country-level, imperial extractive institutions have been found to be a key source of underdevelopment due to legacies of political and economic inequality, societal fractionalization, and poor property rights (Acemoglu et al., 2001; Engerman & Sokoloff, 1997; Nunn, 2008). Likewise, within countries exploitative and violent

[7] See Van der Ploeg (2011) for a review.

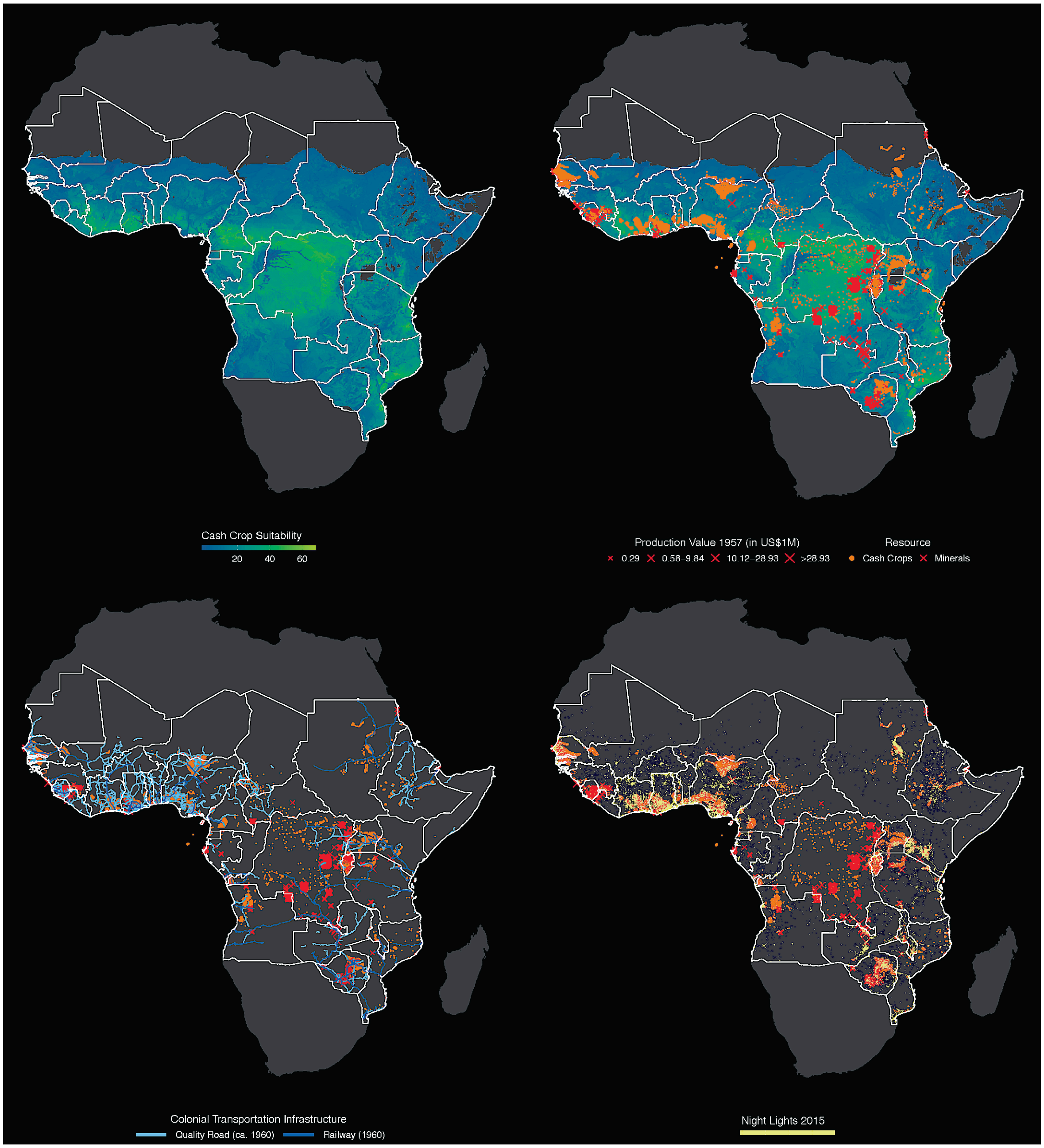

Figure 1: Cash crop suitability, colonial cash crop production, infrastructure and subnational development in Africa.

The blue/green shading in the upper panels shows agro-climatic suitability for cash crops. Each orange point represents US $289,270 export value of cash crop production in 1957. Red crosses represent mining sites producing varying export volumes. The lower-left panel illustrates road and railroad infrastructure around 1960. The lower-right panel overlays the colonial resource data with luminosity at night in 2015 as a proxy for economic activity.

schemes such as the Peruvian mita (Dell, 2010) or rubber plantations in the Belgian Congo (Lowes & Montero, 2017) caused enduring harm on local economies. At the same time, as observed in Java and across Africa, colonial investments in extractive economies, especially in infrastructure and agricultural processing, can produce positive path-dependent effects via economic agglomeration, urbanization and increasing returns to the non-agricultural sector (Dell & Olken, 2020; Jedwab & Moradi, 2016). As noted, however, in Africa, we find that colonial cash crop agriculture led to a reorganization of economic activity such that the gains to cash crop regions, often, came at the expense of nearby areas—a stark empirical example of Redding and Turner's (2015) model on the displacement effects of infrastructural investments and in line with more qualitative assessments on the distributional consequences of colonial export-based economies (Amin, 1972; Hirschman, 1977; Rodney, 1972). Thus, rather than "counterbalancing" negative institutional effects (Dell & Olken, 2020), subnational extractive processes likely reinforced them by forging regional and social inequalities that would spur distributive conflict and increase the barriers to building societal coalitions necessary to bring about institutional reform.[8].

The rest of the paper is as follows. Part I provides a brief overview of the cash crop revolution in Africa and introduces our conceptual framework on the dynamic, interactive effects of geography, infrastructure and production linkages on the reorganization of development. Part II describes our data. Part III summarizes our empirical strategies and results. Part IV concludes.

Historical Context and Conceptual Framework

A Brief Overview of Africa's Cash Crop Revolution

Among the many changes unleashed by the Age of Discovery and the spread of European imperialism, the onset of the global agricultural commodities trade proved one of the most consequential. Starting with the diffusion of sugar to Latin America in the middle of the 15th century and its large-scale cultivation for export, over the following centuries international markets in tobacco, cocoa, coffee, and cotton arose. Africa was integrated into this global economic system, but, at first, not as a source of agricultural commodities, instead as a labor reserve to supply enslaved people to plantations in the Western Hemisphere (Inikori, 2007). For three centuries

[8]See for example Pengl et al. (2021) who find that cash crop agriculture contributed to the development of more exclusionary social boundaries and ethno-political divisions. On the effects of regional and, in particular, ethnic inequality on political instability and country-level development see e.g. Alesina et al. (2016), Cederman et al. (2011), and Østby et al. (2009)

the slave trades largely crowded out cash crop production, despite the region's favorable agro-climatic suitability for agricultural products.

By the end of the 18th century, however, this began to change, starting with the development of export markets for native oil palm in West Africa in response to rising European demand for the commodity for soap-making, candle-making and as an industrial lubricant (Frankema et al., 2018; Hopkins, 1973; Lynn, 1997). The abolition of the slave trade in the early 19th century accelerated West Africa's economic transformation. Beyond oil palm, European demand for other oleaginous crops led to the take-off of the groundnut trade (Brooks, 1975). In contrast to the "plantation complex" that dominated Latin America's cash crop economies (Curtin & Curtin, 1990), in West Africa commercial agriculture was predominantly produced by smallholder farmers (Hogendorn, 1969), which generally proved more efficient under prevailing conditions of land abundance and labor scarcity than more labor- and capital-intensive plantations (Austin, 1996; Hopkins, 1973).[9] Nonetheless, in areas with a high concentration of European settlers, plantations remained an important mode of production. For example, outside of West Africa, one of the first centers of cash crop production was a cluster of coffee plantations established in northwestern Angola in the 1830s by Brazilian expatriates and Portuguese settlers (Van Dongen, 1961); European-owned plantations would dominate Angola's coffee production over the next 140 years (Herrick, 1967).

The cash crop revolution marked a new era of African-European economic integration. As it lifted up smallholder farmers in West Africa and created new economic opportunities for indigenous traders, leading to the rise of the so-called "merchant princes," it pulled European trading houses deeper into the region beyond the coastal ports where they were located during the slave trades (Akyeampong, 2014). The advent of the steamship, which significantly reduced the costs of shipping bulky agricultural products, accelerated the region's commercial transition (Headrick, 2012; Hopkins, 1973; Lynn, 1989). West Africa's terms of trade are estimated to have grown by 1.65% per year between 1808 and 1884, outpacing the growth of other commodity-exporting regions in the global "periphery" (Frankema et al., 2018). This proved a double-edged sword, however, as it laid the economic foundations for European colonization in two important ways.[10] Frankema et al. (2018) convincingly argue that the 19th century agricultural commodity boom likely changed the cost-benefit calculus for imperialists in London and, especially, Paris

[9] For example, see Austin (1996) analysis of the collapse of Cadbury's model cocoa estate due to its high labor inputs vis-à-vis smallholder farms.

[10] The causes of European colonization are complex and multifaceted, but British and, especially, French commercial interests arising from the cash crop trade in West Africa represented an important dimension. For a classic statement, see Hopkins (1973).

(given the share of West African exports in its imperial regime) on the value of colonization. It also increased the influence of the British and French trading houses operating in West Africa, who saw formal colonization as a way to protect and strengthen their commercial interests from European rivals and in the face of the merchant princes' growing political and economic clout (Dike, 1956).[11]

European imperial conquest at the end of the 19th century intensified the spread of cash crops across Africa as colonial governments, under pressure to make their territories pay for themselves, designed their economies around primary commodity production. In colonies with existing or emerging cash crop markets—such as oil palm in Nigeria, groundnuts in Senegal, or cocoa in Ghana—this entailed encouraging the expansion of production, in colonies where commercial agricultural markets were largely absent colonial governments sought to create them. As seen in the case of Uganda in which colonial administrators assessed the viability of a variety of crops from tea, cocoa, sugar, vanilla, coffee, and later cotton (Wrigley et al., 1960), this involved a heavy dose of trial and error, before specializing in those commodities which proved productive.[12] The creation of new cash crop markets also tended to be marked by high degrees of coercion. Beyond the use of direct taxation payable in the colonial currency (Hogendorn, 1969), brute force was not uncommon. While the atrocities meted out in extracting rubber in Leopold's Congo are particularly well-documented (Hochschild, 1999), the corvée system was central to cotton cultivation in French Equatorial Africa and on plantations in Angola and Mozambique.[13] In settler colonies as well, the government banned African cash crop farming to reduce competition[14] and drive indigenous farmers to work on European plantations.

[11] See for example the attendance of British businessman and empire-builder, George Goldie, at the Berlin Conference as a representative of the British. As early as 1877, Goldie, in his words, dreamed "of adding the region of the Niger to the British Empire." Cited in Dike (1956, pp. 208–209). Two years later, Goldie orchestrated the founding of the United African Company which helped to consolidate British trading interests in the Niger Delta and secure the area from French and German competition.

[12] This top-down experimentation did not always go as planned. One of the most prominent examples was the push by the British Cotton Growing Association (BCGA) and the Nigerian colonial government to encourage the cultivation of cotton in Northern Nigeria—which the BCGA identified as the "salvation of Lancashire" to reduce British cotton manufacturers' dependence on American cotton (Hyam, 1968). Despite strong local pressure from colonial authorities and their agents, farmers in Northern Nigeria spurned cotton cultivation for groundnuts, which gave a higher return, required less land and labor, and were consumed locally (Hogendorn, 1969, 1978).

[13] Consistent with the early divergence between Angola and West Africa, European plantations dominated production in settler colonies, whereas elsewhere indigenous smallholder farms represented the modal form of production.

[14] A paradigmatic example of this is Ralph Bunche's documentation of the destruction of the coffee farms of Senior Chief Koinange of Kiambu in Kenya in 1919 (Bunche, 1939).

Geography, Trading Costs and Production Linkages

The upshot of the economic and political changes that swept across Africa between the turn of the 19th century and the 1950s is that a series of new polities emerged that were heavily dependent on, at most, a handful of primary commodity exports. Here we consider the consequences of Africa's cash crop revolution on spatial patterns of economic development. Our conceptual framework revolves around the dynamic effects of geographic change, trading costs, and production linkages.

Geography. As noted, a large literature points to the impact that locational fundamentals have had on long-run development across Africa.[15] The value of different geographic characteristics is not fixed, however; it can change as technology and market forces change (Henderson et al., 2018; Hopkins, 1973). These economic shocks can interact with geography to give rise to new centers of agglomeration (Bleakley & Lin, 2012; Gallup et al., 1999; Henderson et al., 2018; Nunn & Qian, 2011).

Outside of a few large-scale irrigated projects, such as the Gezira cotton scheme in Sudan, commercial agriculture in Africa in the 19th and 20th centuries was heavily dependent on agro-climatic suitability for cash crops. Thus, groundnuts, cotton and tobacco, which require rainfall seasonality, clustered in tropical and subtropical grasslands, savannas, and shrublands, whereas oil palm, cocoa and robusta coffee, which need warmer temperatures, higher levels of rainfall and higher humidity, thrived in tropical and subtropical moist broadleaf forests. (See Figure 1 below).

Trading costs. The commercial value of different ecological zones, in turn, depends on trade costs and their economic geography. Henderson et al. (2018) show that globalization and technological advances in long-distance trade over the last 150 years led to the concentration of economic activity in coastal regions of late-developing countries. With cash crop demand driven by industrializing states in Europe, commercial agricultural zones were integrated with export markets. Thus, in West Africa at least, conditional on suitability, cash crop cultivation tended to concentrate in areas closer to the coast first. (These areas also tended to be the first exposed to the diffusion of cash crops and new agricultural techniques.)[16]

[15] See footnote 5.

[16] The classic example of this is the origin story of cocoa in Ghana in which Tetteh Quarshie, a Ghanaian blacksmith and farmer, travelled to Fernando Po in the 1870s and brought cocoa seeds back with him, leading to the successful introduction of the cash crop (Dickson, 1969).

Trade costs are not fixed either, however. Infrastructural investments can significantly lower them, opening up suitable areas in the hinterland for cash crop production (Jedwab & Moradi, 2016).[17] In the case of colonial Africa, demand for cash crops endogenously increased investments in transportation infrastructure. As one of the leading French traders in West Africa, Georges Borelli, put it in lobbying the French government to build a railway in Dahomey, it would help "syphon [sic] off immense quantities of products, up to the present time not used, towards the coast and towards Europe" (cited in Daumalin (2004)). Likewise the aforementioned British Cotton Growing Association was instrumental in lobbying for a railway line to integrate Northern Nigeria to coastal export markets.[18]

This points to a corollary to Henderson et al.'s (2018) elegant model of spatial development in late developing countries. The rise of commercial export agriculture and connective infrastructure potentially fuelled agglomeration in suitable areas beyond coastal regions (Hance et al., 1961). Catalyzing economic growth in these cash crop zones was perhaps one of the largest waves of rural-rural migration in African history (Amin, 1974; Cordell et al., 1996). While the economic potential of cash crop areas represented a strong pull factor for migrant farmers and laborers (Hill, 1963; Swindell & Jeng, 2006), they were also pushed by repressive colonial labor policies that employed direct taxation, forced labor and deprivation of local economic opportunities to create a cheap supply of labor to service cash crop and mining enclaves and work on colonial infrastructural projects (Amin, 1972, 1974; Asiwaju, 1976; Cordell et al., 1996).[19] In dividing their territories into productive and labor extraction zones, colonial states may have further deepened the displacement of labor and capital that was already occurring due to changing market conditions (Plange, 1979).

Economic linkages. Following from a classical economics literature on the role of staples on regional (i.e., subnational) economic growth (Baldwin, 1956; Hirschman, 1977; North, 1959), another important dynamic shaping the broader economic impact of these new centers of agricultural production was the structure of the resulting production linkages. A core precept of staples theory is that historically export crops tend to generate much weaker domestic production linkages as benefits accrue to external manufacturers, inhibiting the economic differenti-

[17] As Jedwab and Moradi (2016) show in the Gold Coast, relative to headloading, the prevailing primary means of transport, railways reduced transportation costs of cocoa by as much as 90 percent.

[18] While intended to export cotton, this fueled Northern Nigeria's ascendancy as one of the leading groundnut production zones in the world (Hogendorn, 1978).

[19] As Asiwaju (1976) has shown, French colonial authorities' attempts to coerce labor had the unintended consequence of increasing emigration to British colonies. For a useful perspective on the limitations of "colonial control" of labor, see De Haas (2019).

ation and horizontal integration that arose from locally-traded crops, such as grain (Baldwin, 1956; North, 1959). Meier (1969) highlights this in a case study of cocoa production in Ghana; despite the incredible success of the sector, it had "limited integrative" effects on the domestic economy due to "fragmented and compartmentalized" markets made worse by unfavorable colonial policies.

These effects were compounded by the imperial economic systems in which the African cash crop trade was embedded. Designed to supply manufacturers in the metropole with low-cost raw commodities, colonial government policy contributed to the dislocation of forward production to Europe through protective trade policies and vertical infrastructure networks.[20] The development of marketing boards before and during World War II represented the culmination, not the start, of such practices. Some one hundred years before, France restricted groundnut imports to bulk unshelled nuts on French vessels. While this aided French merchants' monopolization of the West African commodity trade, it damaged local oil processing in the region (Brooks, 1975), stymieing the domestic economic differentiation that otherwise might have resulted.

Implications. In sum, the cash crop revolution marked a significant structural transformation in economic production across sub-Saharan Africa, laying the foundation for the integration of cash crop zones, including those further inland, to export markets through new infrastructure, but likely with extremely concentrated benefits. Compounding these spatial disparities were the generally minimalist but hegemonic colonial approach (van de Walle, 2009). Abetted by a peaceful external environment, low settler populations and little encompassing interest of native populations who were viewed as "subjects," colonial governments eschewed state-building and developmental programming (Herbst, 2000; Lange, 2009; Mamdani, 1996) that might have helped to foster more inclusive economies and reduce the spatial inequalities forged out of economic extraction.

Three implications follow from our framework: 1.) we expect agro-climatic suitability for cash crops and historical cash crop production zones to be significant predictors of contemporary patterns of economic development across the continent; 2.) colonial infrastructural investments to reduce trade costs served as a key channel of path dependence; and 3.) the reorganization of economic production around cash crop agriculture combined with weak domestic production linkages likely left a legacy of concentrated economic benefits and perhaps even spatial inequality as it displaced capital and labor from non-cash crop areas.

[20] This is a central line of argument of dependency theory (Cardoso & Faletto, 1979; dos Santos, 1970; Frank, 1966; Rodney, 1972). See also Hirschman (1977) who suggests that imperialism led to underdevelopment via its negative effects on production and fiscal linkages—from which our argument draws inspiration.

Data & Analyses

Historical Cash Crop Locations

To test this argument, we draw on a comprehensive historical map of subnational export production compiled by Hance et al. (1961). In the late 1950s, Hance's team mapped out the source location of more than 95 percent of exports across 38 states in sub-Saharan Africa (excluding the Union of South Africa and most island colonies) and conveyed them as points at the site of cultivation or extraction. Each point represents a value of $289,270, standardized in 1957 U.S. dollars ($). The dataset covers 9 groups of cash crops, 20 minerals and metals, and forest, animal and manufactured products. In total, the Hance map identifies 9,517 geocoded production points, which we digitized for this paper. (See the upper-right panel in Figure 1.). We validated Hance's data against independently collected but somewhat less comprehensive administrative data on subnational export production in the late colonial age, confirming its high accuracy (see Figure A8).

In our analyses, we mainly focus on agricultural exports, which constituted 64.9% of total exports in 1957. The remaining share includes different minerals and metals (27.1%), animal products (2.8%), and manufactured products (0.4%). Among agricultural commodities, the most important were coffee (22.5% of crop exports), cocoa (17.5%), cotton (14.7%), groundnuts (14%), and oil palm (9.9%). Other important agricultural exports were industrial crops like rubber and sisal (7.3%) stimulants such as tea, tobacco, and cloves (7%), food crops including bananas (5%), as well as oil crops (2.2%, e.g. cashew nuts, castor seed, coconut, sesame).

In some analyses below, we rely on the agro-climatic potential to grow cash crops rather than actually observed historical production. More specifically, we use crop-specific suitability rasters for rainfed agriculture from the FAO-GAEZ database and calculate cash crop suitability as the mean suitability score across the nine most important African export crops with available data (coffee, cocoa, cotton, groundnuts, oil palm, tea, tobacco, bananas). We use these suitability scores to address some limitations of the Hance data, in particular the endogenous emergence of historical production and the lack of temporal variation in our data, which complicates the investigation of colonial infrastructure investments, which may be both cause and effect of cash crop production.

Units of Analysis & Outcomes

For our empirical analysis, we aggregate the historical primary commodity data, as well as all outcomes and control variables to 28,166 quarter-degree grid cells (the mean land area of cells in our sample is 237 sq km). For each spatial unit, we code binary measures of whether cash crop or mineral production occurred above the threshold export value of $289,270 in 1957, as measured by Hance. These colonial cash crop and mineral dummies serve as the main predictors in our models and allow a quantitative comparison of the effects of different commodity types.[21]

Consistent with the expectation that the cash crop revolution transformed the long-run spatial distribution of development within African countries, our main outcomes focus on contemporary infrastructure, economic agglomeration, and wealth. First, we use the network of paved (bitumenized) and improved (laterite) in 1998 as mapped on Michelin paper maps and digitized by Jedwab and Moradi (2016). Second, we use data from the Africapolis project, a comprehensive source on urbanization in Africa, to capture the presence and population totals of cities with at least 10'000 inhabitants in 2015.[22] Third, we employ remote-sensed nighttime luminosity data as a proxy for electrification and local economic activity. More specifically, we use the 2015 annual composite of the VIIRS night lights product (Elvidge et al., 2017). The VIIRS data has several advantages over the discontinued DMSP-OLS data, which is frequently used in economics research (e.g. Michalopoulos & Papaioannou, 2013). The higher image resolution and wider detection range of the Suomi-NPP satellite result in more fine-grained spatial variation and less censoring problems than is the case with the DMSP-OLS product. Chen and Nordhaus (2015) demonstrate the superiority of the VIIRS data in predicting local population and economic output across Sub-Saharan Africa, most likely due to detecting lights even in poor and sparsely populated areas. We aggregate all three datasets to our grid data and code both binary and logged continuous outcome variables. For the continuous night lights measure, we use lights per capita to more closely approximate per capita output rather than just population density or electrification. Fourth and finally, we compute the cell mean of asset-based household wealth from all available geocoded Demographic and Health Surveys (DHS) from the years 1990–2017. This measure is based on asset ownership of 747,255 households surveyed in 26 African countries. All analyses of household wealth are restricted to the 24% subsample of our cells that contain DHS enumeration areas.[23]

[21] In alternative specifications, we also use continuous operationalizations of our resource variables and take the log (+1) of cell-level production value in $100 divided by land area in sq km (See Table A4).

[22] In their paper on colonial railways and urbanization, Jedwab and Moradi (2016) use an earlier version of the Africapolis data.

[23] Appendix Tables A1-A3 provide an overview of all variables and data sources and show summary statistics.

Analyses & Results

In this section, we present our empirical strategies and results. We start with our baseline fixed effects models, before describing a randomization inference-type counterfactual exercise based on 1'000 plausible counterfactual distributions of historical cash crop production. Next, we estimate reduced form models based on agro-climatic suitability for cash crops and investigate colonial infrastructure investments as an important channel of persistence. The final empirical sections explore geographic spillovers to better distinguish growth from displacement effects and hetereogeneities by crops, countries, colonial institutions, and post-colonial trajectories.

Baseline Regressions. Our baseline models take the following form:

$$Y_{ic} = \alpha_c + \beta_1 \,\text{Cash Crops}_{ic} + \beta_2 \,\text{Minerals}_{ic} + \lambda \, X_{ic} + \epsilon_{ic}$$

Y_{ic} is outcome Y for cell i nested in country c. The coefficient of interest is β_1 identifying the effect of a colonial cash crop dummy. We also include a colonial mining dummy as a potential confounder and to benchmark any cash crop effects against this more industrial and capital-intensive form of resource extraction. The fixed effects α_c control for all unobserved geographic and historical confounds at the level of colonies and enable the interpretation of coefficients as cell-level deviation from the country mean. X_{ic} is a vector of geographic and historical baseline controls.

To account for the potential confounding effects of biogeographic fundamentals and the legacy of the Neolithic Revolution, we control for calorie-weighted agricultural suitability, elevation and terrain ruggedness, as well as disease prevalence (malaria and tsetse fly). Further geographic controls include distances to coast and navigable rivers to account for natural trading advantages (Henderson et al., 2018; Ricart-Huguet, 2021) as well as absolute latitude, longitude, and their squares. As for potential historical confounds, we control for ethnic group-level exposure to the slave trades (Nunn & Wantchekon, 2011), precolonial reliance on agriculture, and precolonial political centralization (Michalopoulos & Papaioannou, 2013). Reliance on agriculture, and precolonial centralization are taken from Murdock (1967).[24] In addition, we include proximity to historical trade routes, cities in 1900, and the first colonial capital. We estimate all models via OLS and conservatively cluster standard errors at the country level.

[24] Nathan Nunn (2008) provides matches of the ethnic groups in the Ethnographic Atlas to a map of ethnic group polygons published in (Murdock, 1959). We first locate each cell's centroid within a group polygon from Murdock's Tribal Map and then use the match by Nunn (2008) to assign group-level values of agricultural dependence, political centralization, and exposure to the slave trades.

Table 1: Colonial Resources & Contemporary Development

	Outcome						
	Roads		Cities		Lights		Wealth
	(Y/N)	log	(Y/N)	log	(Y/N)	log	cell mean
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cash Crops (Y/N)	0.165***	0.612***	0.184***	0.816***	0.193***	0.874***	0.143***
	(0.019)	(0.069)	(0.022)	(0.111)	(0.030)	(0.170)	(0.032)
Minerals (Y/N)	0.153***	0.650***	0.216***	1.097***	0.180***	1.361***	0.381***
	(0.029)	(0.115)	(0.033)	(0.176)	(0.044)	(0.411)	(0.073)
Colony FE	✓	✓	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓	✓	✓
History Controls	✓	✓	✓	✓	✓	✓	✓
Sample Mean DV	0.334	1.175	0.128	0.509	0.267	1.115	-0.391
Observations	28'166	28'166	28'166	28'166	28'166	28'166	6'775
Adjusted R^2	0.198	0.208	0.203	0.218	0.367	0.305	0.254

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The dependent variables in Columns 1, 3, and 5 are dummies indicating cells that (i) intersect with a paved or improved road in 1998, (iii) host a city with more than 10'000 inhabitants in 2015, (v) emit non-zero night lights in 2015. The dependent variables in Columns 2, 4, and 6 are defined as the natural logarithm of 1 plus (ii) paved or improved road length in km per 1000 sqkm land area in 1998, (iv) the urban population per sqkm land area in 2015, (vi) total night lights per 100'000 capita in 2015. The dependent variable in Column 4 is the asset-based household wealth score as reported in the DHS surveys averaged across all households and survey rounds per cell. Cells without any geocoded DHS surveys are dropped. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Historical controls are logged minimum distances to trade routes in 1900, cities in 1900, and the first colonial capital, as well as ethnic group level proxies for precolonial reliance on agriculture, political centralization, and exposure to the slave trades. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

Table 1 summarizes our findings. Historical cash crop production enters with positive, statistically significant, and substantively large coefficients across all seven specifications. Colonial cash crop cells had a 16.5 percentage points higher probability of having a quality road in 1998 (Column 1); a 18.4 percentage points higher likelihood of having a city in 2015 (Column 3), and a 19.3 percentage points higher chance of emitting nighttime lights in 2015 (Column 5). Using logged continuous outcomes, the estimated coefficients in Columns 2, 4, and 6 indicate that cash crop cells, on average, have 84% more quality roads per sq km, a 126% higher urban population density, and 140% more per capita lights than than comparable cells without cash crop production. In addition, historical cash crop exports are associated 14 percent of a standard deviation greater asset-based wealth among households surveyed by the DHS (Column 7). With the exception of household wealth, these estimates are statistically indistinguishable from the respective minerals coefficient, despite the more capital-intensive nature of mining.[25]

[25] See Appendix Tables A5 and A6 for specifications that restrict comparisons to the intensive margins of our outcomes and treatment variable, respectively.

Randomization inference: counterfactual spatial equilibria. We further proceed with a randomization inference-type analysis inspired by Dell and Olken's (2020) analysis of sugar cultivation in colonial Java. This approach complements our baseline regressions by illuminating the non-random assignment of cash crop production and better accounting for spatial patterns in our historical treatment which are an important issue in persistence studies (Kelly, 2019). The basic intuition is that the observed spatial distribution of colonial cash crop production is just one realization of many possible spatial equilibria. Where exactly cash crops could be profitably produced depended not only on soil characteristics and climatic conditions but also on proximity to trading centers, African producers' local initiative and experimentation, colonial policy, and historical coincidence. According to our data, only 12% of grid cells with above-median agro-climatic suitability for cash crop cultivation saw actual production in 1957.

The intuition of multiple potential spatial equilibria of colonial cash crop extraction enables us to compare cells with actually observed production to cells that would have been treated under a similarly plausible yet unrealized distribution of cash crops. Constructing such plausible counterfactual locations is, however more challenging here than for Javanese sugar factories, where central planning, the need for water power, and land constraints provided a relatively straightforward logic of feasible factory distributions (Dell & Olken, 2020). In our continental sample, the local determinants of colonial resource extraction most likely varied across different crops as well as geographic and institutional contexts, especially in the case of decentralized cash crop production by native farmers. However, soil suitability, proximity to natural and pre-existing trade networks, terrain, the disease environment, and pre-colonial development plausibly mattered across most contexts. We therefore require counterfactual cash crop locations that (i) score similarly on cash crop suitability, as well as all geographic and historical control variables discussed above as real cash crop cells, and that (ii) exhibit comparable patterns of spatial clustering (or, inter-point spacing) as the actually observed production data.

We use point process methods from spatial statistics to construct counterfactual cash crop distributions that fulfill these requirements. A point process is a random allocation mechanism resulting in an observed distribution of points across space. Conventional point process models, which are essentially logistic propensity score models in two-dimensional space, estimate a locations' probability of having a point as loglinear function of covariates and their associated parameters (Baddeley et al., 2015). The standard point process model takes the following form:

$$\lambda_u = \exp(\alpha + \beta X_u)$$

where λ_u denotes the intensity of the point process at location u, e^{α} the baseline intensity, and X_u a vector of covariates measured at location u. Running this model with all 5896 cash crop locations as observed realization of the process and cash crop suitability as well as geographic and historical control variables covariates yields parameter estimates from which we can simulate 1'000 alternative point patterns from the modelled point process.

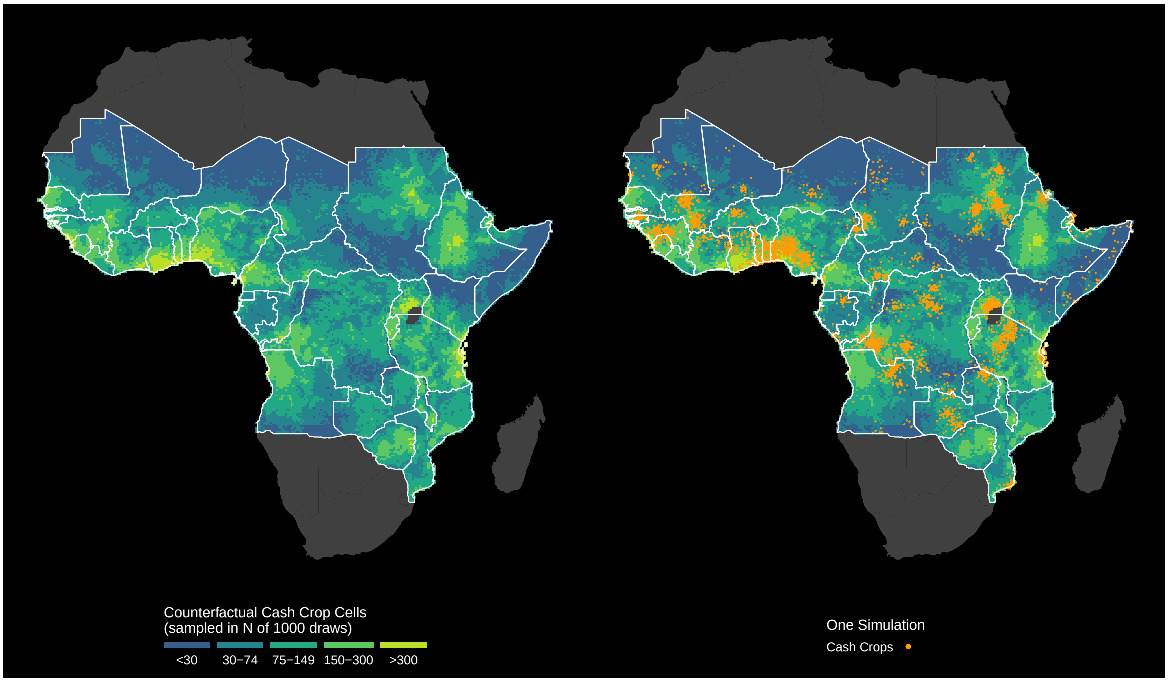

Figure 2: Simulated Cash Crop Counterfactuals. **Left-hand Panel.** Cell-level frequency of containing a counterfactual cash crop point summed across 1'000 simulations of the clustered point process model parameters described in the text. **Right-hand Panel.** A single simulated point pattern from the clustered point process model described in the text.

Visual inspection and formal tests on these counterfactual point patters reveal that they exhibit significantly less spatial clustering than the real cash crop configuration (See Appendix Figure A2). We therefore proceed by estimating a clustered point process model which distributes a limited number of "parent" points according to the covariate function described above, before randomly scattering a number of "offspring" points around each "parent." In expectation, the cluster process yields the same number of points as in our observed cash crop data. As analysts, we have to specify a cluster kernel governing the probability density of offspring around each parent point (Baddeley et al., 2015). After some experimentation, we choose a Variance-gamma kernel, which results in 1'000 counterfactual point patters that, on average, closely approximate the spatial pattern of cash crop points (See Appendix Figure A2). We aggregate each of these counterfactual point patterns to our quarter-degree grid and code, for each resulting dataset, a counterfactual cash crop dummy. Figure 2 shows the distribution of counterfactual cells across all 1'000 simulations (left-hand panel) as well as one point pattern simulated from the cluster model (right-hand panel). We estimate the following bivariate regression across all 1'000 counterfactual datasets and the actually observed one to assess both covariate balance and treatment effects:

$$Y_c = \alpha + \beta \,\text{Cash Crops}_c + \epsilon_c$$

where Y_c is a balance variable or development outcome in cell c and Cash Crops_c the counterfactual or actual cash crop dummy. To test for imbalance in covariates and differences in outcomes, we compare the coefficient β_{real} to the distribution of its 1'000 counterfactual counterparts. We derive point estimates of the treatment effect by subtracting the mean of all counterfactual coefficients from the actual estimate. Empirical p-values are calculated as the share of counterfactual coefficients with greater absolute value than β_{real}.

Figure 3 presents results from our balance checks. It shows the counterfactual coefficient distributions from regressing our 18 geographic and historical balance variables on each of the 1'000 alternative cash crop dummies and also plots the respective coefficient of the actual treatment indicator. Overall, Figure 3 indicates that our simulation exercise succeeded in achieving covariate balance between actual and counterfactual cash crop cells. Across all 18 balance variables, the actual treatment coefficient stays well within the 2.5 and 97.5 percentiles of the respective counterfactual distribution. In addition, the individual panels show that historical cash crop production clustered in relatively favorable locations. Cash crop cells have about 0.6 sd higher cash crop suitability, 0.4 sd higher calorie-weighted suitability, and are located closer to the coast, navigable rivers, historical cities, trade routes, and the capital than the average cell in our data. At the same time, cash crop cells are more suitable for Malaria, more rugged, and were more exposed to the slave trades than the average cell.

Figure 4 summarizes the treatment effect estimation from our counterfactual exercise. Again, each panel shows the distribution of counterfactual coefficients, its 2.5 and 9.5 percentile, as well as the actual treatment coefficient. In addition, the solid blue lines depict the mean of each counterfactual coefficient distribution. All four treatment effects, calculated as the distance between the solid red and blue lines along the x-axis, are substantively very close to our baseline OLS estimates from Table 1 (Columns 2, 4, 6, and 7). The estimated effects on roads, urbanization, and per capita luminosity are somewhat larger than in Table 1, while the effect on wealth is slightly smaller. The empirical p-values remain well below conventional significance levels suggesting that the outcome values observed in actual cash crop cells would have been highly

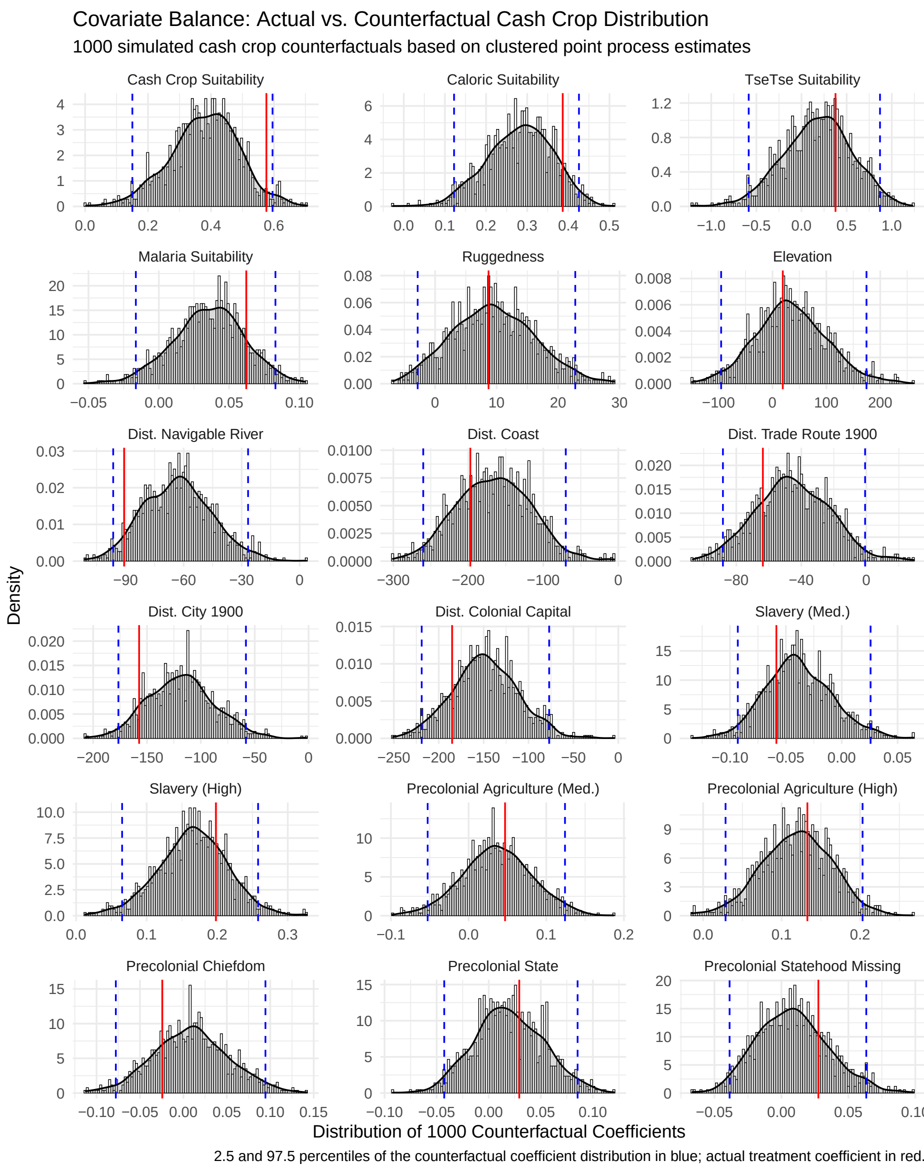

Figure 3: Covariate Balance: Actual vs. Counterfactual Cash Crop Cells. Each panel plots the histogram and smoothed density of counterfactual coefficients derived from 1'000 OLS models regressing the balance variable in the panel title on the counterfactual cash crop dummy based on one of 1'000 simulated point patterns. Dashed blue lines indicate the 2.5 and 97.5 percentiles of each counterfactual coefficient distribution. Solid red lines indicate the coefficient of the real cash crop dummy in a regression with the respective balance variable as outcome.

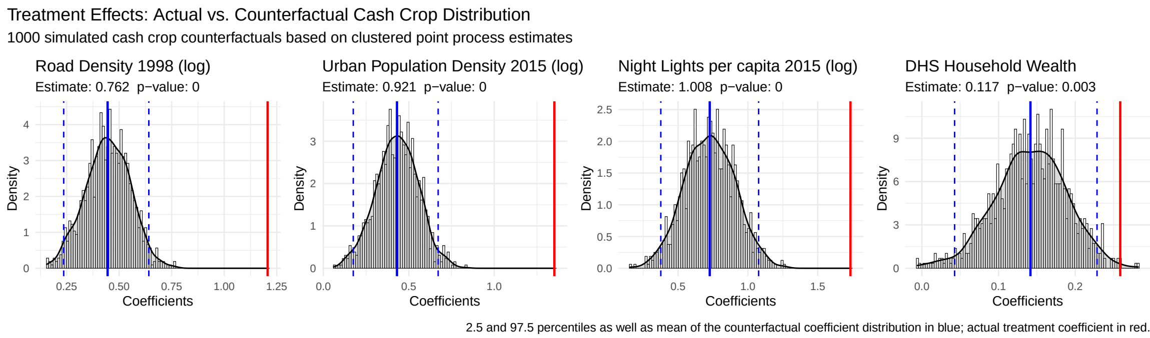

Figure 4: Treatment Effects: Actual vs. Counterfactual Cash Crop Cells. Each panel plots the histogram and smoothed density of counterfactual coefficients derived from 1'000 OLS models regressing the outcome variable in the panel title on a counterfactual cash crop dummy based on one of 1'000 simulated point patterns. Dashed blue lines indicate the 2.5 and 97.5 percentiles of each counterfactual coefficient distribution. The solid blue line is the mean value of the counterfactual coefficient distribution. Solid red lines indicate the coefficient of the real cash crop dummy in a regression with the respective development outcome (β_{real}). Treatment effects are calculated as the difference between the real and mean counterfactual coefficent; empirical p-values calculated as the share of counterfactual coefficients with absolute value greater than β_{real}.

unlikely in the absence of historical production.

In addition to revealing alternative spatial equilibria that remained largely unrealized during colonialism (see Figure 2 above), the counterfactual analysis allows us to benchmark the latent developmental effects of the non-random siting of cash crop production. As illustrated by the counterfactual coefficient means in Figure 4, locational fundamentals and historical processes appear to have predisposed counterfactual cells to higher levels of development than the average cell, but colonial cash crop production substantially amplified this effect by 82 to 214% depending on the outcome.

Suitability Analysis. Both our baseline regressions and the counterfactual analysis are based on observable confounds and may still yield biased estimates if *unobserved* factors varying within countries make an area more likely to produce cash crops and simultaneously lead to more infrastructure investment and economic activity. We address this inferential threat by estimating reduced form specifications of our baseline model replacing the cash crop dummy with the mean agro-climatic suitability score across the nine most important African cash crops (cocoa, coffee, cotton, groundnuts, oil palm, tea, sugarcane, tobacco, and bananas). As the crop suitability rasters provided by the FAO GAEZ database are only based on climatic and soil characteristics, suitability is unaffected by historical economic activity and therefore a clearly more exogenous predictor than our historical production dummy. In this sense, the suitability models can be seen as an intention-to-treat analyses, where suitability acts as nature's treatment assignment, which then only leads to production among a non-random set of complying cells.[26]

One remaining concern is that cash crop suitability picks up general agricultural productivity or other favorable locational fundamentals. We address this concern by, again, including a calorie-weighted crop suitability measure, which is based on all 48 crop-specific suitability scores from FAO-GAEZ weighted by the caloric content per gram of each crop (including the nine cash crop-specific suitability rasters that we use for our main predictor, see Galor & Özak, 2016). In combination with precolonial reliance on agriculture measuered at the ethnic group-level in Murdock's (1967) Ethnographic Atlas and all other geographic covariates, this control makes it unlikely that any effects of cash crop suitability are due to overall agricultural or other locational advantages. Consistent with this notion, we show in Appendix Table A7 that, conditional on geographic controls, cash crop suitability strongly predicts historical production but is unrelated to precolonial factors such as proximity to historical cities, trade routes, political centralization, exposure to the slave trades, and state history. This placebo exercise strongly suggests that, in line with our arguments, locational fundamentals favorable for cash crop production only began to matter with the adoption of export agriculture.

Table 2 summarizes results from regressing the four continuous development outcomes from our baseline analysis on cash crop suitability and the complete set of geographic (odd-numbered columns) or geographic and historical control variables (even-numbered columns). We present both versions since the historical variables may be seen as 'bad controls' in suitability regressions. Across all specifications, cash crop suitability enters with a positive and statistically significant estimate. In the more conservative models with history controls (even-numbered columns), a one standard deviation higher cell value of cash crop suitability is associated with a 25% higher density of quality roads, 16% higher urban population density, 15% more night lights per capita, and 4% higher household wealth. These results make it unlikely that our baseline results are entirely due to selection on unobservables and strongly suggest a causal relationship between the cash crop revolution and contemporary development.

To better grasp the importance of our findings, Table 2 and Figure 5 compare the effects of agro-climatic cash crop potential on patterns of long-run development to other geographic and historical variables regularly cited in the literature as key determinants of development patterns in Africa. All independent variables are standardized to mean 0 and sd 1 to compare effect sizes.

[26]We decided against using suitability as an instrument for actual production, as the exclusion restriction is unlikely to hold. Suitability may have caused cash crop production in other locations than those depicted on our 1957 map and thereby shaped development through earlier or later clusters of agricultural productivity. At the same time, the spatial patterns in the heavily interpolated suitability data most likely lead to exclusion restriction violations by design (Betz et al., 2019).

Table 2: Cash Crop Suitability & Contemporary Development

	Outcome							
	Roads		Cities		Lights		Wealth	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cash Crop Suit.	0.254***	0.221***	0.172**	0.150***	0.176**	0.141**	0.062**	0.040*
	(0.079)	(0.071)	(0.063)	(0.055)	(0.075)	(0.065)	(0.029)	(0.020)
Caloric Suit.	0.163*	0.166	0.058	0.077	0.136*	0.164***	−0.032	−0.051
	(0.089)	(0.100)	(0.053)	(0.054)	(0.078)	(0.057)	(0.054)	(0.046)
TseTse Suit.	−0.016	0.027	−0.061	−0.017	−0.145	−0.091	−0.015	−0.006
	(0.072)	(0.057)	(0.046)	(0.040)	(0.087)	(0.069)	(0.036)	(0.031)
Malaria Suit.	−0.248***	−0.219***	−0.084	−0.082	−0.178**	−0.145*	−0.002	−0.013
	(0.063)	(0.065)	(0.058)	(0.060)	(0.068)	(0.076)	(0.068)	(0.065)
Ruggedness	−0.033	−0.045	−0.044	−0.047	−0.056	−0.060*	−0.023*	−0.021
	(0.051)	(0.049)	(0.031)	(0.030)	(0.038)	(0.035)	(0.013)	(0.013)
Elevation	0.082	0.088*	0.273***	0.267***	0.264***	0.257***	0.138***	0.124**
	(0.064)	(0.048)	(0.077)	(0.063)	(0.082)	(0.078)	(0.046)	(0.049)
Dist. River Nav.	−0.163***	−0.141**	−0.137***	−0.123***	−0.261***	−0.220***	−0.057***	−0.063***
	(0.059)	(0.055)	(0.021)	(0.019)	(0.065)	(0.051)	(0.021)	(0.021)
Dist. Coast	−0.244***	−0.107*	−0.391***	−0.280***	−0.800***	−0.607***	−0.242***	−0.167***
	(0.064)	(0.062)	(0.045)	(0.046)	(0.094)	(0.111)	(0.030)	(0.029)
Dist. City		−0.220***		−0.184***		−0.286***		−0.092***
		(0.042)		(0.062)		(0.060)		(0.016)
Dist. Capital		−0.110**		−0.106**		−0.193***		−0.085***
		(0.046)		(0.039)		(0.055)		(0.023)
Dist. Trade		−0.034*		−0.006		−0.018		−0.026
		(0.018)		(0.021)		(0.029)		(0.017)
Slaves (Med.)		−0.098		−0.068		0.003		0.006
		(0.077)		(0.045)		(0.069)		(0.029)
Slaves (High)		−0.037		−0.074		0.025		0.021
		(0.047)		(0.052)		(0.080)		(0.026)
Agric. (Med.)		0.007		0.097		0.018		0.013
		(0.071)		(0.059)		(0.070)		(0.078)
Agric. (High)		0.142**		0.024		0.081		−0.011
		(0.069)		(0.041)		(0.061)		(0.061)
Precol. State		−0.022		0.045		−0.084		−0.059
		(0.096)		(0.089)		(0.106)		(0.050)
Precol. Chiefdom		−0.010		0.048		−0.003		−0.002
		(0.069)		(0.063)		(0.093)		(0.033)
Precol Centr. NA		0.179*		0.097*		−0.141		−0.064*
		(0.095)		(0.051)		(0.148)		(0.034)
Colony FE	✓	✓	✓	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓	✓	✓	✓
History Controls	✗	✓	✗	✓	✗	✓	✗	✓
Sample Mean DV	1.175	1.175	0.509	0.509	1.115	1.115	-0.391	-0.391
Observations	28'166	28'166	28'166	28'166	28'166	28'166	6'775	6'775
Adjusted R^2	0.189	0.203	0.180	0.194	0.277	0.292	0.197	0.237

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The dependent variables in Columns 1-6 are defined as the natural logarithm of 1 plus (i,ii) paved or improved road length in km per 1000 sqkm land area in 1998, (iii,iv) the urban population per sqkm land area in 2015, (v,vi) total night lights per 100'000 capita in 2015. The dependent variable in Columns 7 and 8 is the asset-based household wealth score as reported in the DHS surveys averaged across all households and survey rounds per cell. Cells without any geocoded DHS surveys are dropped. The main independent variable is the cell mean of agro-climatic suitability scores for nine cash crops from the FAO GAEZ database. Geographic control variables not shown: Longitude, latitude, and their squares. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

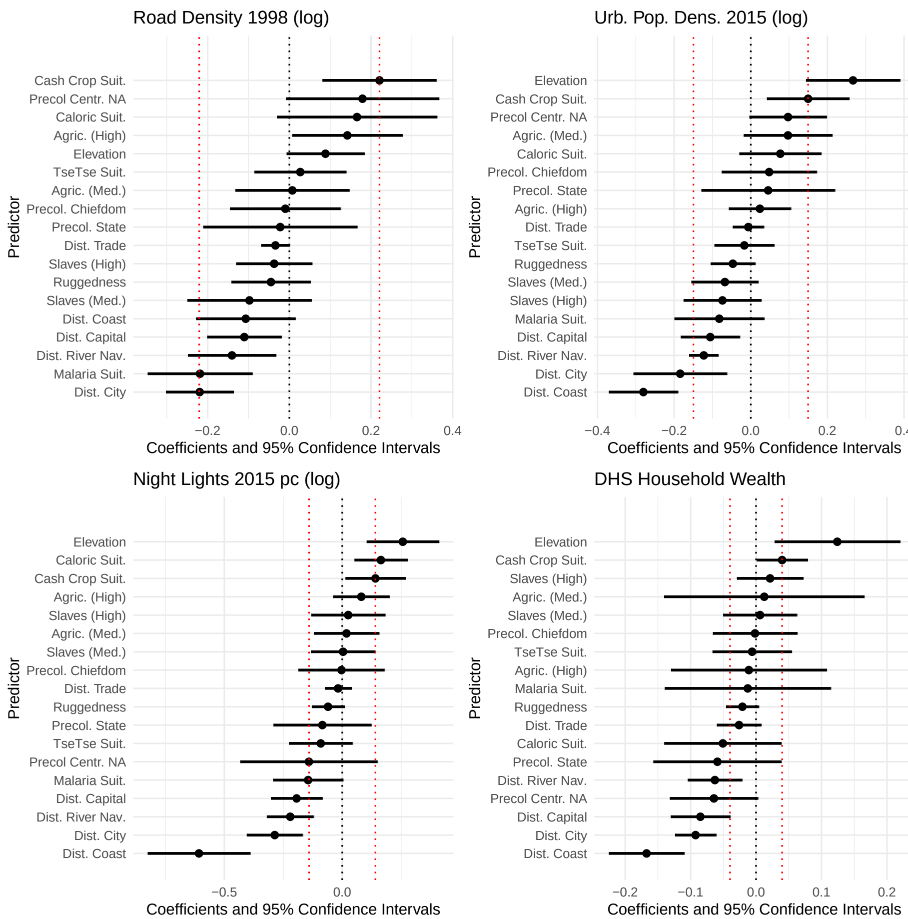

Figure 5: Effect Size: Cash Crop Suitability vs. Other Variables. Compares the effects of a one-standard deviation increase in different geographic variables on contemporary outcomes. Based on Table 2. Dashed red lines indicate the absolute size of the cash crop coefficient, facilitating effect size comparisons.

Overall the results confirm the impact of "the daunting nature of Africa's geography" (Herbst, 2000), in particular the formidable costs to trade for the region's vast interior. Distance to the coast exhibits the largest effects on contemporary development. Next to coastal distance, the effects of cash crop suitability rival, and in many cases, surpass other important geographic and historical factors. One takeaway from this analysis is that the prospective yield from the 19th century onward of agricultural crops of high commercial (and limited nutritional) value was at least as consequential in shaping subnational wealth disparities in Africa as the Neolithic potential to feed dense populations (compare cash crop to caloric suitability in Figure 5).

Mechanisms: serial correlation vs. path dependence. These results raise the question of what accounts for the persistent effects of the cash crop revolution on economic agglomeration across Africa? We test for two potential pathways: serial correlation and path dependence (Bleakley & Lin, 2012; Jedwab et al., 2017). Serial correlation links contemporary patterns of economic development to recurring direct effects of locational fundamentals (i.e., the geographic or environmental conditions that spurred the concentration of economic activities in the past exert a similar influence in the present (Davis & Weinstein, 2002). Accordingly, high levels of contemporary development in cash crop zones would be a function of the continuous agricultural production in these highly suitable areas. In contrast, path dependence points to the increasing returns that arise not necessarily from underlying drivers of initial economic activities but from the clustering of capital and infrastructural investments in a given area (Krugman, 1991). Prior investments not only lower costs going forward but also serve as a coordination mechanism for subsequent distribution of factors of production (Jedwab et al., 2017).

We operationalize the serial correlation mechanism by using an FAO estimate of the market value of total agricultural production across all crops in the year 2000. To test for path dependence, we use data on paved and improved roads around 1960, which we digitized from Michelin paper maps, the railroad data from Jedwab and Moradi (2016), and electricity generation facilities as shown on a comprehensive historical map of African power plants from 1972. We code cell-level proxies of historical road and railroad density, a power plant dummy, and the total crop production value per sq km. As for the railroads, we only use those that were constructed for other than mining or military purposes to make sure that the potential for cash crop exports may have, at least partially, motivated rail construction (Jedwab & Moradi, 2016). Consistent with the pattern visualized in the lower-left panel in Figure 1, we report in Appendix Table A8 that cells with high cash crop suitability received significantly higher colonial investments in road, railroad, and power generation infrastructure. At the same time, suitability strongly

Table 3: Mechanisms: Path Dependence vs. Serial Correlation

	Outcome							
	Roads		Cities		Lights		Wealth	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cash Crop Suitability	0.136**	0.188**	0.078*	0.126**	0.057	0.106*	0.027	0.046*
	(0.062)	(0.075)	(0.044)	(0.055)	(0.070)	(0.061)	(0.022)	(0.024)
Road Dens. 1960 (log)	0.578***		0.404***		0.516***		0.110***	
	(0.028)		(0.038)		(0.037)		(0.010)	
Rail Dens. 1960 (log)	0.250***		0.340***		0.423***		0.045***	
	(0.063)		(0.048)		(0.078)		(0.013)	
Power Plant 1972 (Y/N)	0.434***		0.610***		0.797***		0.179***	
	(0.069)		(0.077)		(0.128)		(0.032)	
Crop Value 2000 (log)		0.126***		0.088***		0.135***		0.034***
		(0.015)		(0.009)		(0.021)		(0.009)
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓	✓	✓	✓
History Controls	✗	✗	✗	✗	✗	✗	✗	✗
Mediated Share	46.3 %	25.8 %	54.6 %	26.6 %	67.7 %	40 %	56.1 %	25.5 %
Observations	28,166	28,166	28,166	28,166	28,166	28,166	6,775	6,775
Adjusted R^2	0.303	0.216	0.284	0.200	0.348	0.297	0.296	0.209

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The dependent variables in Columns 1-6 are defined as the natural logarithm of 1 plus (i,ii) paved or improved road length in km per 1000 sqkm land area in 1998, (iii,iv) the urban population per sqkm land area in 2015, (v,vi) total night lights per 100'000 capita in 2015. The dependent variable in Columns 7 and 8 is the asset-based household wealth score as reported in the DHS surveys averaged across all households and survey rounds per cell. Cells without any geocoded DHS surveys are dropped. The main independent variable is the cell mean of agro-climatic suitability scores for nine cash crops from the FAO GAEZ database. Mediators are (a) the logged paved or improved road length in km per 1000 sqkm land area around 1960, (b) rails built for other than military or mining-related purposes in km per 1000 sqkm land area in 1960, (c) a cell-level dummy for power stations in 1972, and (d) a FAO estimate of total crop production value in 1'000 USD per sqkm as of 2000. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

predicts agricultural output today.

Table 3 investigates the degree to which the suitability effects from Table 2 are mediated by these path dependence and serial correlation proxies. We prefer to run our main mechanism analysis with suitability rather than actual production locations, as the cross-sectional nature of the Hance data does not allow strong conclusions on the temporal and causal sequence between cash crop extraction and infrastructure investments.[27] We focus on models with geographic controls only, as the inclusion of other post-treatment variables than the mediators may lead to bias (Acharya et al., 2016). The coefficients of the mediators across all eight models show that both colonial infrastructure and contemporary agricultural productivity are positively and significantly associated with contemporary roads, urbanization, luminosity, and household wealth. More importantly, the inclusion of colonial investment proxies reduces the effect of suitability on contemporary development by 46-68%, whereas controlling for agricultural output value leads to 26-40% smaller coefficients. These results suggest that path dependence due to colonial infrastructure investments clearly appears as the more important channel accounting for the long-run developmental effects of the cash crop revolution.[28]

Growth or Reorganization? In the final part of our analysis, we move beyond purely local effects of colonial cash crop production. So far, our estimates show large effects on patterns of subnational development: 'treated' cells continue to be significantly better off than comparable cells within the same country. The broader implications of these findings depend on whether and how colonial resource extraction affected development outcomes beyond the immediate neighborhood. The key question is whether historical cash crop production significantly boosted economic growth or merely reshuffled labor, capital, and economic activity in space (Redding & Turner, 2015). Pure local-level analyses like those above risk mistaking the spatial reorganization of economic activity for developmental effects.

To gauge the effects of colonial resource extraction beyond the local level, we run models including variables for proximity to colonial cash crop and mineral production. More specifically, we construct distance band dummy variables coding, for each grid cell, whether it falls within 0-25, 25-50 ...225-250 km of a colonial resource point. We then re-estimate our baseline models

[27] Using actual production instead of suitability does not change our substantive conclusions, as shown in Tables A12 and ??.

[28] We present additional mediation models in the appendix. Table A9 shows effect size reductions when accounting for path dependence and serial correlation simultaneously. Tables A10 and A11 present findings from mediation models that allow for the inclusion of intermediate confounders, i.e. post-treatment variables that may be related to both the mediating and the outcome variables (Acharya et al., 2016). Results remain practically indistinguishable from what we report in Table 3 above.

replacing cell-level resource indicators with 20 distance band dummies capturing proximity to both cash crop and mineral extraction.

$$Y_{ic} = \alpha_c + \sum_{j=0-25}^{225-250} \beta_j \, \text{Dist. Crops}_{ic}^{j} + \sum_{j=0-25}^{225-250} \gamma_j \, \text{Dist. Minerals}_{ic}^{j} + \lambda X_{ic} + \epsilon_{ic}$$

The vectors β_j and γ_j contain the coefficient estimates for all distance band dummies to cash crops and minerals. The key assumption is that any potential reshuffling or spillover effects are contained within these distance bins and that, as a result, cells beyond 250 km of a resource point serve as valid (i.e. entirely unaffected) baseline category (Redding & Turner, 2015).

Figure 6 presents coefficients for distance to cash crops. Across all outcomes, we find positive spillovers up to 50 km. For per capita luminosity and urbanization, we find negative and mostly significant spillovers between 75 and 250 km from colonial cash crop sites. These results suggest that concentrated investments in colonial cash crop enclaves reshuffled population and economic potential from other areas, which appear worse off today than predicted by geographic conditions and precolonial factors. The effects on household wealth are neutral beyond 50 km, while the effects on road infrastructure remain positive and borderline significant up to the second-to-last distance bin. The sum of coefficients across all 10 distance to cash crop bins is positive and significant for road density, negative and significant for urban population, negative but insignificant for per capita nightlights, and positive but insignificant for household wealth. These findings provide suggestive evidence that the cash crop revolution came with broad-based improvements in transportation infrastructure, and, if anything, a positive impact on household wealth. At the same time, it fundamentally reorganized broader patterns of economic agglomeration leading to the concentration of cities and economic activity in relatively narrow production enclaves with unclear net effects on the country's economic development.[29]

Heterogeneous Effects? Thus far we have largely specified the aggregate effects of all cash crops on the main development outcomes across all countries in the sample. In the Appendix, we test whether our estimated effects vary across different institutional or economic conditions during and after the colonial era. Overall the effect sizes are fairly consistent across the major five cash crops, with the exception of household wealth, in which the perennial tree crops coffee, cocoa and oil palm outperform cotton and groundnuts. (See Figure A3). One potential explanation for this difference is labor bottlenecks that Tosh (1980) describes cultivators

[29] Interestingly, the distance to mining coefficients exhibits positive spillovers over a somewhat broader range and only turn negative and borderline significant in the road density model (see Figure A7).

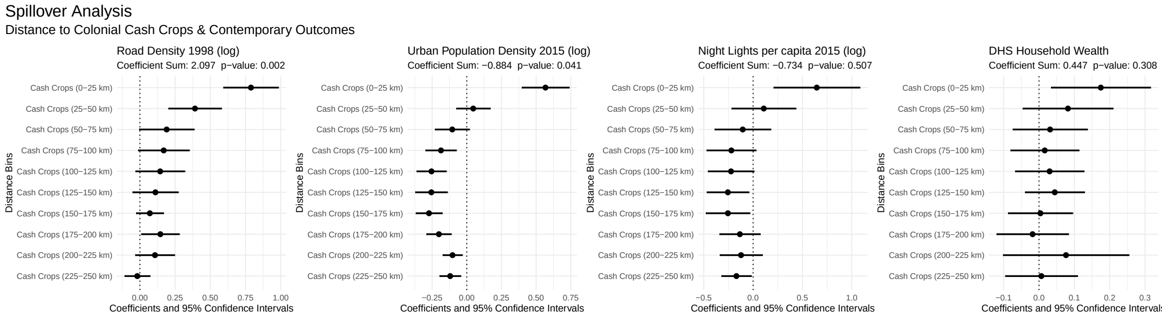

Figure 6: Spillover effects of Colonial Cash Crop Production

in the savanna faced given the labor-intensive nature of cotton and groundnuts and the direct conflict between their farming seasons and that of grain crops. Country-by-country regressions reported in Figure A4 show that results hold for most countries and are not driven by outliers; they also generally persist across different imperial powers but tend to be highest in former British colonies (see Figure A5). Finally, we consider whether path dependent effects have been disrupted by different post-colonial trajectories; results are generally stable across different levels of democracy, conflict-affectedness, and agricultural export dependence as well as among landlocked and coastal countries (See Figure A6).

Beyond Africa. One open question is whether our results of positive but highly localized long-term effects are specific to colonial-era Africa or could also be expected for other historical transitions to commercial export agriculture. A recent empirical literature investigates the short- and long-term effects of cash crop production on economic agglomeration and living standards in Indonesia (Dell & Olken, 2020; Edwards, 2019a, 2019b), Costa Rica (Méndez-Chacon & Patten, 2019), and China (Marden, 2016) and consistently finds positive local effects. These studies clearly highlight local processing, infrastructure investments, and economic linkages as important levers of structural change and historical persistence.

As noted above, African colonial governments rarely invested in and, at times, actively prevented local processing of cash crops. At the same time, European colonialism in Africa occurred late, did not last very long, and was characterized by notoriously low levels of investment as European metropoles required fiscal self-sufficiency (Herbst, 2000; van de Walle, 2009). Based on these features, we expect colonial African cash crop production to produce smaller and more localized effects than cash crop economies entailing higher levels of investment over longer time periods.[30]

[30] As Dell and Olken (2020) demonstrate, even highly extractive colonialism sometimes involves large invest-

We find some evidence for this in an analysis of cash crop suitability and nightlights in a sample of Sub-Saharan African, Latin American, as well as East, South, and Southeast Asian grid cells. More specifically, we regress logged nightlights per land area on standardized mean cash crop suitability and a host of geographic control variables and interact all predictors with an indicator for Sub-Saharan African countries (see Column 1 of Table A14 and Rows 1-2 of Figure 7). We find that the local suitability effect is weaker in Africa than in other world regions with historical cash crop production. To explore broader regional effects on economic agglomeration, we further add maximum cash crop suitability in neighboring cells (using varying distance cutoffs). Proximity to highly suitable cells predicts significantly higher luminosity outside of Africa (see Rows 5, 9, 13, and 17 in Figure 7). Within Sub-Saharan African countries, these spatial suitability spillovers remain essentially zero and are significantly smaller than in the non-African sample see Rows 6, 10, 14, and 18 in Figure 7).

Without global or continental data on cash crop production, processing facilities, and infrastructure investments, these results remain suggestive. That said, they are at least consistent with the notion that Sub-Saharan Africa has not fully realized the economic potential of its cash crop revolution resulting in more spatially concentrated impacts on long-term development than in other world regions.

ments in local processing and infrastructure.

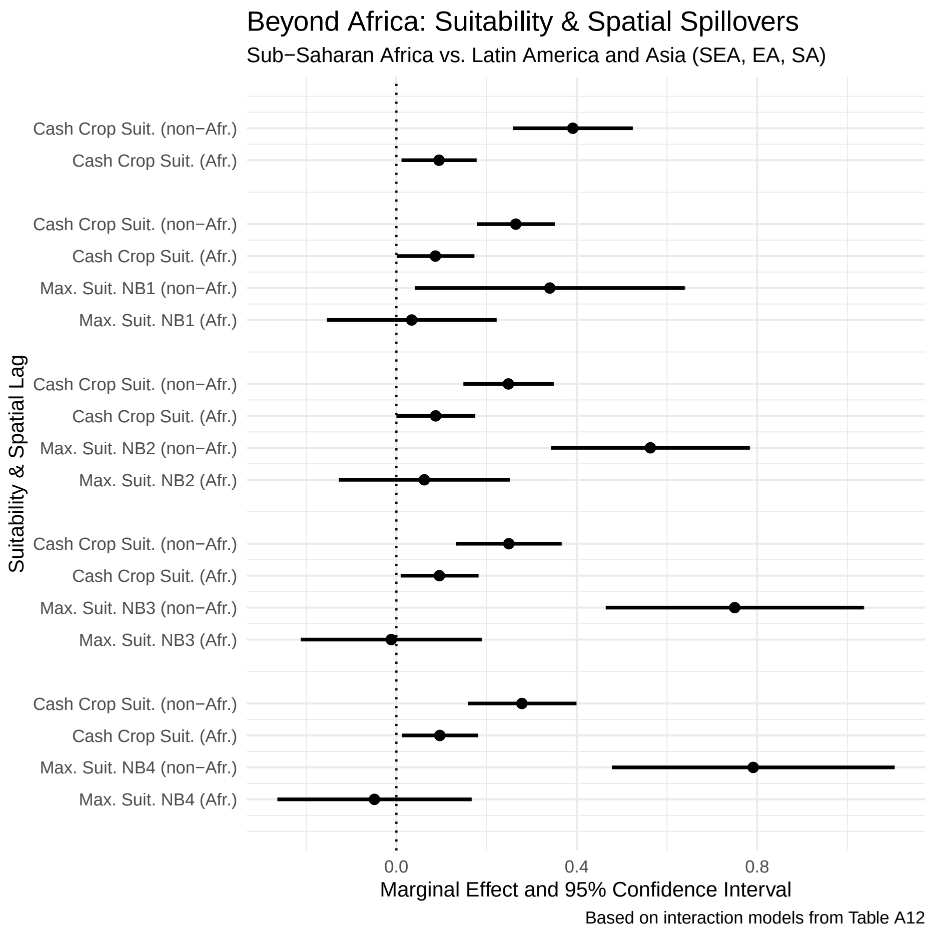

Figure 7: Beyond Africa? Suitability, Nightlights, and Spatial Spillovers. Marginal effects from the five interaction models reported in Table A14. The spatial lags of cash crop suitability included in Models 2-5 ("Max. Suit. NB") take on the maximum value of suitability within neighboring cells based on distance cutoffs ranging from one (Model 2) to four (Model 5) degree lon/lat (about 111 to 444 km at the equator)

Discussion

We argue Africa's contemporary economic geography was shaped by the cash crop revolution that swept the continent from the late 1700s onward. The end of the slave trades and high global demand for agricultural commodities increased the geographical advantages of areas suitable for cash crop cultivation—leading to the emergence of new spatial equilibria centering around highly-suitable regions. However, the takeoff of the cash crop trade with industrializing Europe also contributed to the diffusion of economic imperialism beyond coastal Africa. While external capital fueled the construction of new transportation infrastructure that further intensified the region's agricultural revolution, the vertical integration of cash crop zones with overseas markets combined with protective trade policies (e.g., restricting imports to bulk, raw commodities) dislocated forward production to Europe, limiting domestic economic differentiation and positive spillovers to broader sectors of African economies. The consequence, as we have shown empirically, is a legacy of highly localized agglomerating effects with weak, or even negative effects, on nearby areas.

Despite the heterogeneity of the continent, colonial experiences, and post-colonial trajectories, the path dependent effects of early commercial agriculture are fairly consistent. This points to the significance of this economic transition in shaping modern Africa. Whether recent economic changes (such as, the increase in Chinese development finance, advent of digital financial systems, and emergence of new export markets) are transforming or reinforcing prevailing economic geographies represent an important line of future inquiry.

Another fruitful avenue for research would be to scale up to a global sample to leverage greater variation in the distribution of colonial institutions and commercial export agriculture. Our preliminary analysis suggests the path-dependent effects of cash crop agriculture may be even stronger outside of Africa. Surprisingly, despite cash crop agriculture's importance to the emergence of early modern globalization from the 16th century onward, its impact on spatial patterns of development around the world has largely been understudied.[31] If Africa is any indication, this represents a significant omission in our study of the subnational wealth of nations.

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[31] For notable exceptions, see studies we cite above.

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The Cash Crop Revolution, Colonialism and Economic Reorganization in Africa: Online Appendix

Table of Contents

Data Sources & Summary Statistics

Table A1: Description and Sources of Variables

Variable	Description	Source
Quality Road 1998	Any paved or improved roads within the grid cell	Michelin (1998) from Jedwab and Moradi (2016)
Night Lights 2015	Any detectable night-time lights within the grid cell	Román et al. (2018)
City 2015	Localities with 10,000 inhabitants or more in 2015	Africapolis.org
DHS Household Wealth	Composite asset-based measure of a household's living standard from 93 surveys across 26 countries	DHS (1990-2017)
Road Density 1998 (log)	Natural log of the length of paved or improved roads per square kilometer	Michelin (1998) from Jedwab and Moradi (2016)
Night Lights 2015 pc (log)	cell total of light intensity divided by population	Román et al. (2018)
Urban Population Density 2015 (log)	sum of population residing in cities with more than 10'000 inhabitants divided by land area in sqkm	Africapolis.org
Quality Road 1960	Paved and improved roads recorded by Michelin road maps in the 1960s	Michelin (1965, 1967, 1969)
Railway 1960	Railroads built by 1960	Jedwab and Moradi (2016)
Power Plant 1972	Location of hydropower and thermal plants	Economic Commission for Africa (1972)
Crop Production Value 2000 (log)	grid-level estimate of the market value of all agricultural production	FAO GAEZ
Colonial Cash Crops (Y/N)	Production points greater than $289,270 (1957) across nine different cash crops	Hance et al. (1961)
Colonial Minerals (Y/N)	Mines producing greater than $289,270 (1957) across twenty different minerals	Hance et al. (1961)
Colonial Cash Crop Value (log)	Log of the total value of cash crops produced divided by land area in sqkm	Hance et al. (1961)
Colonial Mineral Value (log)	Log of the total value of cash crops produced divided by land area in sqkm	Hance et al. (1961)
Cash Crop Suitability	Mean agro-climatic suitability across nine cash crops (cocoa, coffee, cotton, groundnuts, oil palm, tobacco, tea, sugarcane, and bananas) in a given area	FAO GAEZ
Caloric Suitability	Potentially attainable caloric yield (post-1500) across all crops suitable for cultivation in a given area	Galor and Özak (2016)
TseTse Suitability	Temperature-based tsetse fly suitability index calculated using the formula in Alsan (2015) and historical temperature data (1901-2017) from the CRU dataset	Alsan (2015); Harris et al. (2014)
Malaria Suitability	Temperature-based suitability index for malaria transmission	Weiss et al. (2014)

Table A2: Description and Sources of Variables (continued from Table A1)

Variable	Description	Source
Terrain Ruggedness	Average terrain ruggedness within quarter-degree cell or polygon	Shaver et al. (2019)
Elevation	Mean elevation in m above sea level within cell or polygon	srtm.csi.cgiar.org
Dist. Navigable River (log)	Minimum geodesic distance to a navigable river	Jedwab and Moradi (2016)
Dist. Coast (log)	Minimum geodesic distance to the coast	ngdc.noaa.gov/mgg/shorelines/
Dist. 1900 City (log)	Minimum geodesic distance to localities with more than 10,000 inhabitants in 1900	Jedwab and Moradi (2016)
Dist. Colonial Capital (log)	Minimum geodesic distance to the colonial capital in 1900	Various
Dist. Precolonial Trade Route (log)	Minimum geodesic distance to precolonial trade routes	Ajayi and Crowder (1985)
Slaves per Area (int.)	Number of slaves taken from a Murdock ethnic group per sqkm (second tercile)	Nunn and Wantchekon (2011)
Slaves per Area (high)	Number of slaves taken from a Murdock ethnic group per sqkm (third tercile)	Nunn and Wantchekon (2011)
Slaves per Area (missing)	Indicates if slave trade data is missing	Nunn and Wantchekon (2011)
Precolonial Agriculture (int.)	Between 46 and 55% reliance on agriculture	Murdock (1967)
Precolonial Agriculture (high)	More than 55% reliance on agriculture	Murdock (1967)
Precolonial Agriculture (missing)	Indicates if precolonial agriculture variable is missing	Murdock (1967)
Precolonial Chiefdoms (Y/N)	Indicates if ethnic group had some political centralization beyond the village level	Murdock (1967)
Precolonial Statehood (Y/N)	Indicates if ethnic group had state-like political centralization	Murdock (1967)

Table A3: Summary Statistics (0.25 Degree Grid Cells)

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Quality Road 1998 (Y/N)	28,166	0.334	0.472	0	0	1	1
Night Lights 2015 (Y/N)	28,166	0.267	0.442	0	0	1	1
City 2015 (Y/N)	28,166	0.128	0.335	0	0	0	1
DHS Household Wealth	6,775	−0.391	0.549	−2.220	−0.721	−0.146	3.068
Road Density 1998 (log)	28,166	−2.676	2.767	−4.605	−4.605	0.940	7.461
Urban Population Density 2015 (log)	28,166	−4.096	1.386	−4.605	−4.605	−4.605	5.556
Night Lights per cap. 2015 (log)	28,166	−3.490	2.149	−4.605	−4.605	−3.461	12.398
Quality Road 1960 (Y/N)	28,166	0.107	0.308	0	0	0	1
Railway 1960 (Y/N)	28,166	0.018	0.134	0	0	0	1
Power Plant 1972 (Y/N)	28,166	0.027	0.163	0	0	0	1
Crop Production Value 2000 (log)	18,636	6.841	2.034	0.112	5.663	8.317	19.851
Colonial Cash Crop Dummy	28,166	0.081	0.273	0	0	0	1
Colonial Mineral Dummy	28,166	0.009	0.093	0	0	0	1
Colonial Cash Crop Value (log)	28,166	0.175	0.623	0	0	0	7
Colonial Mineral Value (log)	28,166	0.022	0.263	0	0	0	9
Cash Crop Suitability	28,166	0.000	1.000	−1.101	−0.871	0.588	4.774
Caloric Suitability	28,166	−0.000	1.000	−1.587	−0.880	0.868	1.767
TseTse Suitability	28,166	9.763	2.694	0.000	7.794	12.183	14.511
Malaria Suitability	28,166	0.562	0.202	0.000	0.395	0.732	0.958
Terrain Ruggedness	28,166	37.836	55.777	0.000	6.505	45.458	765.844
Elevation	28,166	608.049	440.281	−113.633	316.543	817.117	3,654.161
Dist. Navigable River (log)	28,166	5.016	1.214	0.026	4.337	5.913	7.186
Dist. Coast (log)	28,166	6.208	1.192	0.020	5.807	7.028	7.502
Dist. 1900 City (log)	28,166	5.973	0.790	1.245	5.532	6.555	7.370
Dist. Colonial Capital (log)	28,166	6.222	0.733	0.327	5.825	6.776	7.562
Dist. Precolonial Trade Route (log)	28,166	4.803	1.290	0.000	4.086	5.752	7.284
Slaves per Area (int.)	28,166	0.204	0.403	0	0	0	1
Slaves per Area (high)	28,166	0.229	0.421	0	0	0	1
Slaves per Area (missing)	28,166	0.019	0.135	0	0	0	1
Precolonial Agriculture (int.)	28,166	0.462	0.499	0	0	1	1
Precolonial Agriculture(high)	28,166	0.265	0.441	0	0	1	1
Precolonial Agriculture (missing)	28,166	0.040	0.196	0	0	0	1
Precolonial Chiefdoms (Y/N)	28,166	0.619	0.486	0	0	1	1
Precolonial Statehood (Y/N)	28,166	0.126	0.332	0	0	0	1
Precolonial Centralization (missing)	28,166	0.095	0.293	0	0	0	1
Area on Land (sqkm)	28,166	732.293	96.842	0.001	736.064	764.317	769.316

Additional Results

Baseline OLS

In this section we present slight modifications of our baseline analysis. Table A4 uses continuous predictors defined as the total cell value of colonial cash crop or mineral production devided by land area in sq km. All coefficients remain positive, large, and significant.

Table A4: Continuous Predictors

	Outcome			
	Road Dens.	Urban Pop. Dens.	Lights p.c.	HH Wealth
Cash Crops per sqkm (log)	0.268***	0.393***	0.410***	0.066***
	(0.026)	(0.028)	(0.038)	(0.011)
Minerals per sqkm (log)	0.254***	0.496***	0.563***	0.160***
	(0.045)	(0.072)	(0.081)	(0.021)
Colony FE	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓
History Controls	✓	✓	✓	✓
Sample Mean DV	1.175	0.509	1.115	-0.391
Observations	28,166	28,166	28,166	6,775
Adjusted R^2	0.209	0.228	0.310	0.264

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The dependent variables in Columns 1-3 are defined as the natural logarithm of 1 plus (i) paved or improved road length in km per 1000 sqkm land area in 1998, (ii) the urban population per sqkm land area in 2015, (iii) total night lights per 100'000 capita in 2015. The dependent variable in Column 4 is the asset-based household wealth score as reported in the DHS surveys averaged across all households and survey rounds per cell. Cells without any geocoded DHS surveys are dropped. Predictor variables are the logged cell-level production values of cash crops and minerals in 1'000 USD (nominal, as of 1957) per sqkm land area. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Historical controls are logged minimum distances to trade routes in 1900, cities in 1900, and the first colonial capital, as well as ethnic group level proxies for precolonial reliance on agriculture, political centralization, and exposure to the slave trades. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

Table A5 restricts the sample to the intensive margins of our road, urbanization, and luminosity outcomes. This leads to a significant reduction of the cash crop coefficients and insignificant estimates in the road and luminosity models with binary predictors (Columns 1 and 5).

Table A6 restricts the sample to the intensive margin of our cash crop treatment. Results show that among cells with at least some production, higher hitorical production values predict significantly better infrastructure and development outcomes.

Table A5: Intensive Margin: Development Outcomes

	Outcome					
	Road Dens.		Urban Pop. Dens.		Night Lights p.c.	
Cash Crops (Y/N)	0.038		0.141***		0.107	
	(0.029)		(0.053)		(0.084)	
Minerals (Y/N)	0.198***		0.599***		1.091***	
	(0.054)		(0.150)		(0.160)	
Cash Crops per sqkm (log)		0.028**		0.083***		0.068*
		(0.013)		(0.024)		(0.038)
Minerals per sqkm (log)		0.061***		0.226***		0.376***
		(0.017)		(0.041)		(0.040)
Country FE	✓	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓	✓
History Controls	✓	✓	✓	✓	✓	✓
Observations	9,421	9,421	3,615	3,615	7,469	7,469
Adjusted R^2	0.043	0.044	0.172	0.180	0.239	0.240

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. Sample restricted to cells with non-zero values on road length (Columns 1 and 2), cities (Columns 3 and 4), and night lights (Columns 5 and 6). The dependent variables in Columns 1-6 are defined as the natural logarithm of 1 plus (i,ii) paved or improved road length in km per 1000 sqkm land area in 1998, (iii,iv) the urban population per sqkm land area in 2015, (v,vi) total night lights per 100'000 capita in 2015. Predictor variables in odd-numbered columns are binary indicators of colonial cash crop or mineral production. Predictor variables in even-numbered columns are the logged cell-level production values of cash crops and minerals in 1'000 USD (nominal, as of 1957) per sqkm land area. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Historical controls are logged minimum distances to trade routes in 1900, cities in 1900, and the first colonial capital, as well as ethnic group level proxies for precolonial reliance on agriculture, political centralization, and exposure to the slave trades. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

Table A6: Intensive Margin: Cash Crop Value

	Outcome			
	Road Dens.	Urban Pop. Dens.	Lights p.c.	HH Wealth
Cash Crops per sqkm (log)	0.202***	0.351***	0.232**	0.070***
	(0.074)	(0.081)	(0.099)	(0.023)
Colony FE	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓
History Controls	✓	✓	✓	✓
Sample Mean DV	2.344	1.775	2.762	-0.186
Observations	2,276	2,276	2,276	1,370
Adjusted R^2	0.161	0.225	0.450	0.310

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. Sample restricted to cells with at least some cash crop exports in 1957. The dependent variables in Columns 1-3 are defined as the natural logarithm of 1 plus (i) paved or improved road length in km per 1000 sqkm land area in 1998, (ii) the urban population per sqkm land area in 2015, (iii) total night lights per 100'000 capita in 2015. The dependent variable in Column 4 is the asset-based household wealth score as reported in the DHS surveys averaged across all households and survey rounds per cell. Cells without any geocoded DHS surveys are dropped. Predictor variables are the logged cell-level production values of cash crops and minerals in 1'000 USD (nominal, as of 1957) per sqkm land area. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Historical controls are logged minimum distances to trade routes in 1900, cities in 1900, and the first colonial capital, as well as ethnic group level proxies for precolonial reliance on agriculture, political centralization, and exposure to the slave trades. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

Counterfactual Analysis

We base the counterfactual analysis in the main text on estimated coefficients from a clustered point process model that imposes heavier clustering than predicted by covariates alone. Here, we justify this choice by showing counterfactual cell and point distribution resulting from a standard point process model without any imposed clustering. Figure A1 clearly shows that both the distribution of counterfactual cells (left-hand panel), and one random point pattern simulated from the model (right-hand panel) scatter more widely in space than the actual distribution of historical cash crop locations (depicted in the upper-right panel of Figure 1 in the main text)

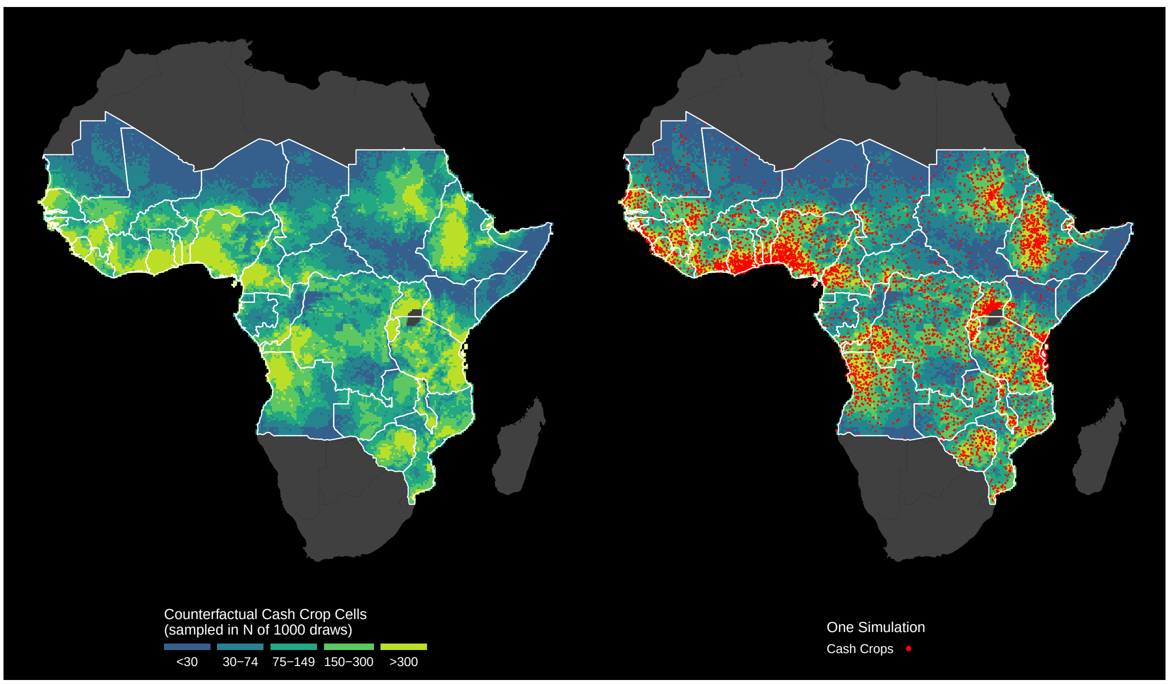

Figure A1: Simulated Cash Crop Counterfactuals. **Left-hand Panel.** Cell-level frequency of containing a counterfactual cash crop point summed across 1'000 simulations of the standard point process model parameters described in the text. **Right-hand Panel.** A single simulated point pattern from the standard point process model described in the main text.

Figure A2 performs a randomization inference-type comparing the actually observed average nearest-point distance among cash crop locations to the 1'000 counterfactual distributions generated by means of the standard (left-hand panel) and clustered point process models (right-hand panel). The left-hand panel indicates that actual cash crop points are on average much closer to the nearest other cash crop point than is the case in the 1'000 simulated point patterns without imposed clustering. Using the cluster point process model solves this issue as the average nearest-neighbor distances across the 1'000 counterfactual point patterns are now well in line with the actually observed value. This insight is confirmed by maximum absolute deviation (MAD) tests that compare the K-function of the actually observed point pattern to the K-functions of simulated patterns based on the estimated model parameters. The K-function captures the number of neighboring points across the entire observation area and is therefore a much more comprehensive measure of clustering/inter-point spacing than nearest-neighbor distances. For the standard point process model, we clearly reject the hypothesis that the K-function of cash crop points is identical with the model (p=0.01). The p-value from the MAD test of the cluster model is 0.5 leading to a clear failure to reject the hypothesis of identical K-functions.

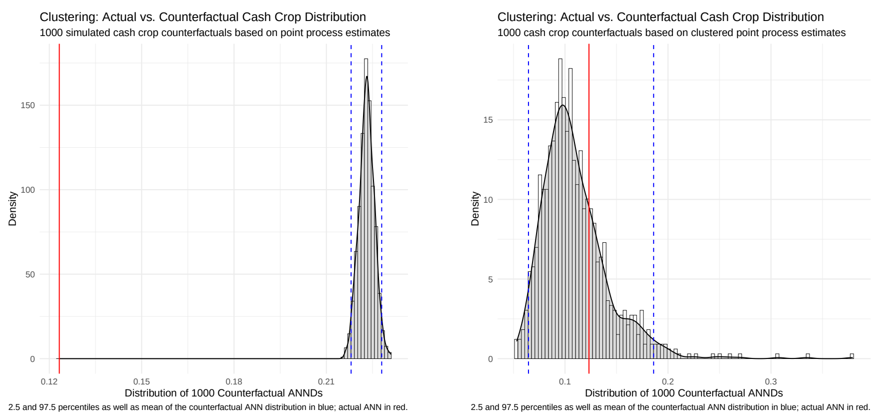

Figure A2: Clustering in counterfactual cash crop distributions. **Left-hand Panel.** The histogram and smoothed density show the distribution of the average nearest-point distance (in degree lat/lon) across 1'000 counterfactual cash crop point patterns derived from the standard log-linear point process model described in the text. Dashed blue lines indicate the 2.5 and 97.5 percentiles of the average nearest-neighbor distribution. The solid red line shows the average nearest-neighbor distance among all actually observed colonial cash crop points. **Right-hand Panel.** Average nearest-neighbor distance across 1'000 counterfactual cash crop point patterns derived from the the clustered point process model described in the text. Dashed blue lines indicate the 2.5 and 97.5 percentiles of the average nearest-neighbor distribution. The solid red line shows the average nearest-neighbor distance among all actually observed colonial cash crop points.

Suitability Models

Table A7 regresses historical cash crop production and a range of pre-colonial development outcomes on cell-level agro-climatic suitability for cash crops and the set of geographic controls. Coefficients indicate that suitability strongly predicts historical production but is unrelated to urbanization, proximity to trade routes, political centralization, exposure to the slave trades, and a country-level measure of years since first state formation (Borcan et al., 2018).

Table A7: Cash Crop Suitability & Precolonial Development

	Outcome					
	Cash Crops 1957	Dist. Cities	Dist. Trade Route	Murdock Centr.	Slaves	State Hsitory
Cash Crop Suitability	0.070***	0.018	0.015	−0.031	0.037	−0.052
	(0.011)	(0.064)	(0.052)	(0.029)	(0.029)	(0.080)
Colony FE	✗	✗	✗	✗	✗	✗
Geographic Controls	✓	✓	✓	✓	✓	✓
History Controls	✗	✗	✗	✗	✗	✗
Sample Mean DV	0.081	5.973	4.803	0.474	0.156	6.217
Observations	28'166	28'166	28'166	25'493	27'641	28'103
Adjusted R^2	0.075	0.318	0.304	0.135	0.195	0.441

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The dependent variables are (i) a dummy for cash crop production in 1957, (ii) logged distance to cities in 1900, (iii) logged distance to trade routes in 1900, (iv) a dummy if the cell falls within a Murdock group polygon with a high level of political centralization (chiefdom or higher), (v) the logged number of slaves per ethnic polygon area as provided by Nunn and Wantchekon (2011), and (vi) the logged number of years since the onset of centralized statehood as measured on the country-level by Borcan, Olsson and Putterman (2018). The main predictor is the cell mean of agroclimatic suitability for cocoa, coffee, cotton, groundnuts, oil palm, tea, tobacco, sugarcane, and bananas. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Standard errors clustered on countries in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

Mechanisms

In this section, we present additional evidence on the causal mechanisms analysis in the main text. First, Table A8 shows that cash crop suitability strongly predicts all four mediators that we use in our mediation analysis.

Table A8: Cash Crop Suitability & Mediators

	Outcome			
	Road Dens. 1960	Rail Dens. 1960	Power Plant 1972	Crop Value 2000
Cash Crop Suitability	0.174***	0.052***	0.009***	0.521***
	(0.059)	(0.016)	(0.003)	(0.164)
Country FE	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓
History Controls	✗	✗	✗	✗
Sample Mean DV	0.356	0.06	0.027	4.526
Observations	28,166	28,166	28,166	28,166
Adjusted R^2	0.221	0.032	0.042	0.625

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The dependent variables in Columns 1, 2, and 4 are defined as the natural logarithm of 1 plus (i) paved or improved road length in km per 1000 sqkm land area around 1960, (ii) rails built for other than military or mining-related purposes in km per 1000 sqkm land area in 1960, and (iii) a cell-level estimate of crop production value in 1'000 USD per sqkm as of 2000. The outcome in column 3 is a cell-level dummy for power stations in 1972. The main independent variable is the cell mean of agro-climatic suitability scores for nine cash crops from the FAO GAEZ database. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

Second, Table A9 suggests that, taken together, our historical infrastructure and contemporary agricultural productivity mediators explain very large shares of the overall suitability effects.

Third, A10 and A11 present results from alternative mediation models that allow for the inclusion of intermediate confounders, i.e. post-treatment variables that may be caused by suitability and plausibly affect both our mediators and outcome variables. In these models, we treat all historical control variables from our baseline analysis as potential intermediate confounders and estimate average controlled direct effects via sequential g-estimation. This mediation method is frequently used in biostatistics and has been popularized in the social sciences by Acharya et al. (2016). For details, we refer interested readers to their excellent article. The findings from this exercise only marginally diverge from what we report in Tables 3 and A11.

Finally, we replicate our mechanism analysis using actually observed historical production rather than suitability. Table A12 shows that cells with colonial export crop production had significantly better infrastructure outcome at the eve of independence and continue to be agriculturally more productive. As our historical cash crop data only provides one snapshot from the late 1950s, it remains unclear whether production was the driver or a result of historical infras-

Table A9: Mechanisms: Path Dependence & Serial Correlation

	Outcome			
	Road Dens. 1998	Urban Pop. Dens. 2015	Lights p.c. 2015	HH Wealth
Cash Crop Suitability	0.094	0.051	0.011	0.018
	(0.060)	(0.040)	(0.061)	(0.018)
Road Dens. 1960 (log)	0.554***	0.388***	0.490***	0.107***
	(0.028)	(0.038)	(0.033)	(0.010)
Rail Dens. 1960 (log)	0.219***	0.320***	0.389***	0.043***
	(0.053)	(0.042)	(0.068)	(0.013)
Power Plant 1972 (Y/N)	0.384***	0.577***	0.742***	0.172***
	(0.069)	(0.077)	(0.121)	(0.032)
Crop Value 2000 (log)	0.093***	0.060***	0.101***	0.021**
	(0.015)	(0.007)	(0.020)	(0.009)
Country FE	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓
History Controls	✗	✗	✗	✗
Mediated Share	62.9 %	70.5 %	93.6 %	70.5 %
Observations	28,166	28,166	28,166	6,775
Adjusted R^2	0.318	0.293	0.358	0.301

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The dependent variables in Columns 1-3 are defined as the natural logarithm of 1 plus (i) paved or improved road length in km per 1000 sqkm land area in 1998, (ii) the urban population per sqkm land area in 2015, (iii) total night lights per 100'000 capita in 2015. The dependent variable in Columns 4 is the asset-based household wealth score as reported in the DHS surveys averaged across all households and survey rounds per cell. Cells without any geocoded DHS surveys are dropped. The main independent variable is the cell mean of agro-climatic suitability scores for nine cash crops from the FAO GAEZ database. Mediators are (a) the logged paved or improved road length in km per 1000 sqkm land area around 1960, (b) rails built for other than military or mining-related purposes in km per 1000 sqkm land area in 1960, (c) a cell-level dummy for power stations in 1972, and (d) a FAO estimate of total crop production value in 1'000 USD per sqkm as of 2000. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

Table A10: Mechanisms: Path Dependence vs. Serial Correlation (ACDE)

	Outcome							
	Roads		Cities		Lights		Wealth	
	PD	SC	PD	SC	PD	SC	PD	SC
Cash Crop Suit.	0.139***	0.194***	0.081***	0.132***	0.063	0.114***	0.031**	0.049***
	(0.038)	(0.040)	(0.024)	(0.029)	(0.043)	(0.044)	(0.014)	(0.016)
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓	✓	✓	✓
History Controls	✓	✓	✓	✓	✓	✓	✓	✓
Mediated Share	45.3 %	23.5 %	52.9 %	23.4 %	64 %	35.2 %	50.1 %	21 %
Observations	28,166	28,166	28,166	28,166	28,166	28,166	6,775	6,775
Adjusted R^2	0.118	0.102	0.118	0.114	0.221	0.216	0.195	0.191

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The dependent variables in Columns 1-6 are defined as the natural logarithm of 1 plus (i,ii) paved or improved road length in km per 1000 sqkm land area in 1998, (iii,iv) the urban population per sqkm land area in 2015, (v,vi) total night lights per 100'000 capita in 2015. The dependent variable in Columns 7 and 8 is the asset-based household wealth score as reported in the DHS surveys averaged across all households and survey rounds per cell. Cells without any geocoded DHS surveys are dropped. The main independent variable is the cell mean of agro-climatic suitability scores for nine cash crops from the FAO GAEZ database. Mediators are (a) the logged paved or improved road length in km per 1000 sqkm land area around 1960, (b) rails built for other than military or mining-related purposes in km per 1000 sqkm land area in 1960, (c) a cell-level dummy for power stations in 1972, and (d) a FAO estimate of total crop production value in 1'000 USD per sqkm as of 2000. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

Table A11: Mechanisms: Path Dependence & Serial Correlation (ACDE)

	Outcome			
	Roads	Cities	Lights	Wealth
Cash Crop Suit. (ACDE)	0.097**	0.055**	0.020	0.023*
	(0.038)	(0.023)	(0.042)	(0.014)
Country FE	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓
History Controls	✓	✓	✓	✓
Mediated Share	61.7 %	68.1 %	88.8 %	62.8 %
Observations	28,166	28,166	28,166	6,775
Adjusted R^2	0.063	0.080	0.179	0.197

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The dependent variables in Columns 1-3 are defined as the natural logarithm of 1 plus (i) paved or improved road length in km per 1000 sqkm land area in 1998, (ii) the urban population per sqkm land area in 2015, (iii) total night lights per 100'000 capita in 2015. The dependent variable in Columns 4 is the asset-based household wealth score as reported in the DHS surveys averaged across all households and survey rounds per cell. Cells without any geocoded DHS surveys are dropped. The main independent variable is the cell mean of agro-climatic suitability scores for nine cash crops from the FAO GAEZ database. Mediators are (a) the logged paved or improved road length in km per 1000 sqkm land area around 1960, (b) rails built for other than military or mining-related purposes in km per 1000 sqkm land area in 1960, (c) a cell-level dummy for power stations in 1972, and (d) a FAO estimate of total crop production value in 1'000 USD per sqkm as of 2000. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

tructure investments. We therefore base our main mechanism results on the plausibly exogenous suitability measure (Table 3) and report the alternative using actual production here. Table A13 shows the results of this exercise and again indicates path dependence via early infrastructural advantages as the clearly more important channel.

Table A12: Cash Crops & Mediators

	Outcome			
	Road Dens. 1960	Rail Dens. 1960	Power Plant 1972	Crop Value 2000
Cash Crops (Y/N)	0.715***	0.233***	0.056***	1.183***
	(0.137)	(0.058)	(0.009)	(0.255)
Country FE	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓
History Controls	✗	✗	✗	✗
Sample Mean DV	0.356	0.06	0.027	4.526
Observations	28,166	28,166	28,166	28,166
Adjusted R^2	0.243	0.046	0.049	0.626

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The dependent variables in Columns 1, 2, and 4 are defined as the natural logarithm of 1 plus (i) paved or improved road length in km per 1000 sqkm land area around 1960, (ii) rails built for other than military or mining-related purposes in km per 1000 sqkm land area in 1960, and (iii) a cell-level estimate of crop production value in 1'000 USD per sqkm as of 2000. The outcome in column 3 is a cell-level dummy for power stations in 1972. The main independent variable is the cell mean of agro-climatic suitability scores for nine cash crops from the FAO GAEZ database. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

Table A13: Mechanisms: Path Dependence vs. Serial Correlation (Historical Production)

	Outcome							
	Roads		Cities		Lights		Wealth	
Cash Crops (Y/N)	0.205***	0.551***	0.516***	0.801***	0.506***	0.845***	0.083**	0.172***
	(0.073)	(0.061)	(0.076)	(0.128)	(0.162)	(0.181)	(0.031)	(0.031)
Road Dens. 1960 (log)	0.575***		0.383***		0.495***		0.107***	
	(0.029)		(0.035)		(0.039)		(0.010)	
Rail Dens. 1960 (log)	0.245***		0.312***		0.395***		0.041***	
	(0.063)		(0.045)		(0.071)		(0.012)	
Power Plant 1972 (Y/N)	0.421***		0.563***		0.750***		0.171***	
	(0.070)		(0.078)		(0.122)		(0.031)	
Crop Value 2000 (log)		0.123***		0.079***		0.125***		0.032***
		(0.015)		(0.007)		(0.019)		(0.010)
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓	✓	✓	✓
History Controls	✗	✗	✗	✗	✗	✗	✗	✗
Mediated Share	70.5 %	20.8 %	42.3 %	10.4 %	49.1 %	14.9 %	57 %	10.1 %
Observations	28,166	28,166	28,166	28,166	28,166	28,166	6,775	6,775
Adjusted R^2	0.303	0.220	0.292	0.219	0.351	0.306	0.299	0.220

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The dependent variables in Columns 1-6 are defined as the natural logarithm of 1 plus (i,ii) paved or improved road length in km per 1000 sqkm land area in 1998, (iii,iv) the urban population per sqkm land area in 2015, (v,vi) total night lights per 100'000 capita in 2015. The dependent variable in Columns 7 and 8 is the asset-based household wealth score as reported in the DHS surveys averaged across all households and survey rounds per cell. Cells without any geocoded DHS surveys are dropped. The main independent variable is the historical cash crop production dummy. Mediators are (a) the logged paved or improved road length in km per 1000 sqkm land area around 1960, (b) rails built for other than military or mining-related purposes in km per 1000 sqkm land area in 1960, (c) a cell-level dummy for power stations in 1972, and (d) a FAO estimate of total crop production value in 1'000 USD per sqkm as of 2000. Geographic control variables include caloric suitability, TseTse fly suitability, malaria suitability, ruggedness, elevation, logged minimum distances to navigable rivers and the coast, as well as absolute longitude, latitude, and their squares. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

Heterogeneous Effects?

In this section, we present potential heterogeneous effects by cash crop type; country-by-country; by European colonizer; by colonial economy type; by the density of the European settlers in a given district; and by duration of formal colonization. First, Figure A3 shows that there are no distinguishable differences between the main cash crops (cocoa, coffee, palm, cotton, and groundnuts) on economic outcomes except on household wealth. Cotton and especially groundnuts have had weaker effects on household wealth compared to cocoa, palm and coffee.

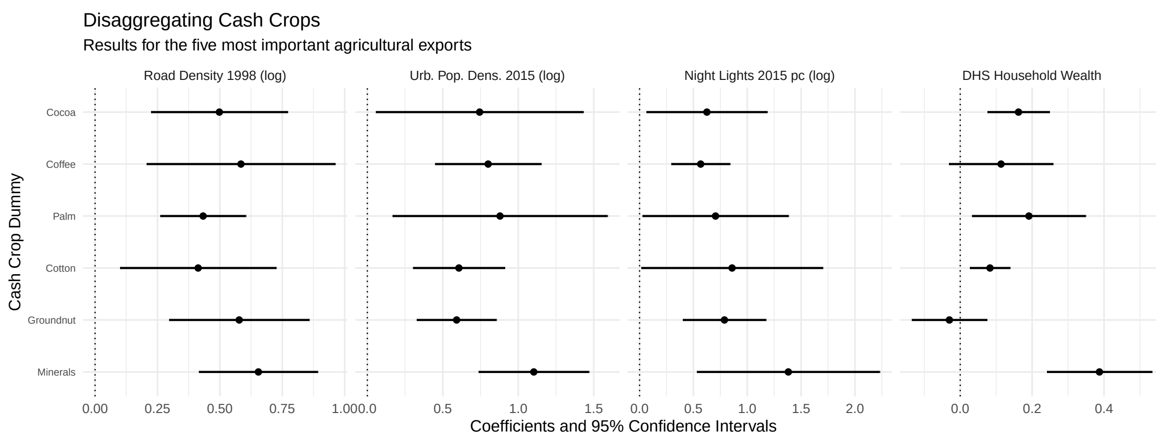

Figure A3: Disaggregating effects by five main cash crops: cocoa, coffee, oil palm, cotton, and groundnuts.

Figure A4 reports regression results of the main outcomes on the cash crop dummy country-by-country. It shows that our findings are not driven by outliers; instead we observe positive correlations across a majority of countries in the sample.

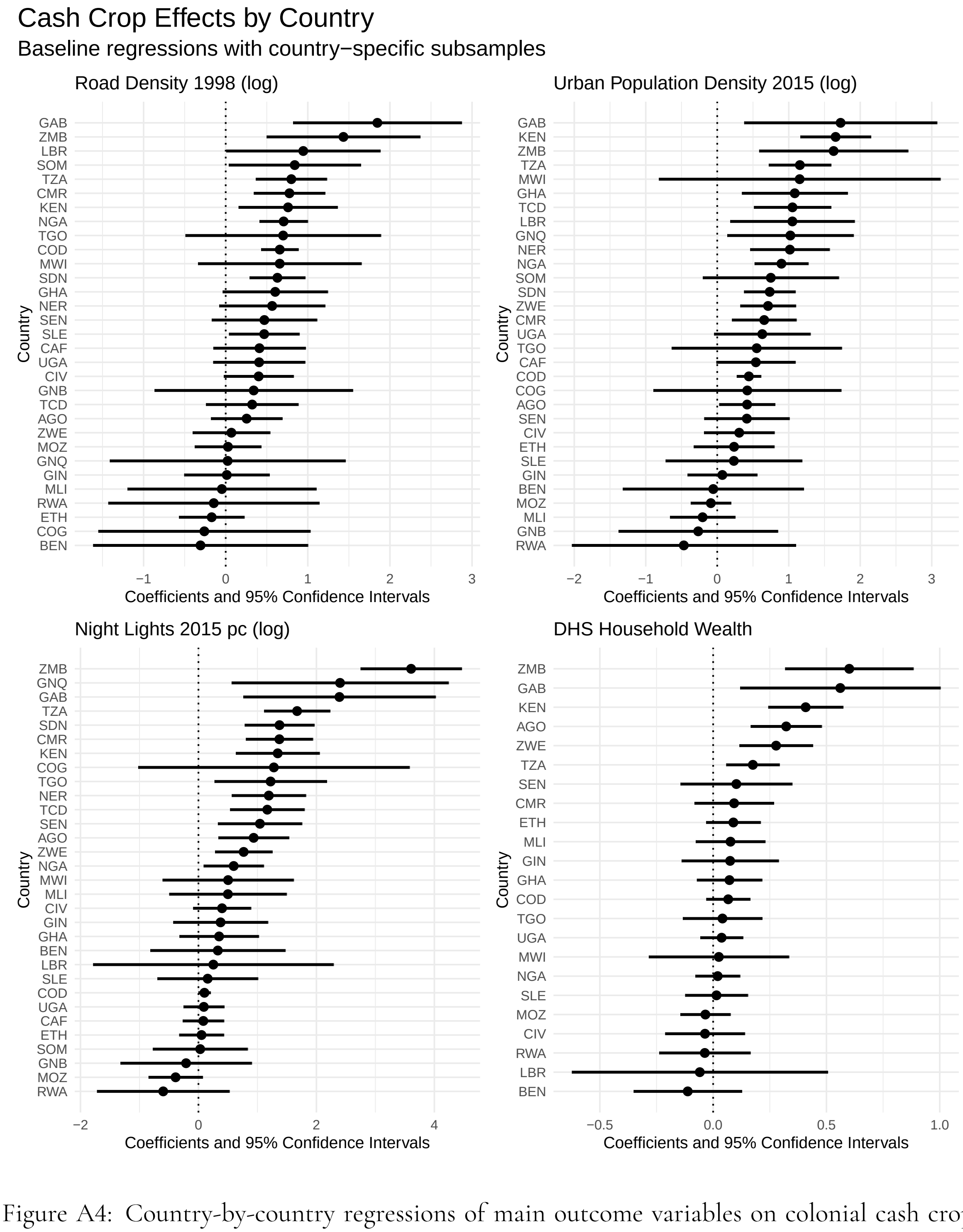

Figure A4: Country-by-country regressions of main outcome variables on colonial cash crop production dummy

Figure A5 reports regression results of the main outcomes on the cash crop dummy by different European colonizer. The path dependent effects of cash crops tend to be strongest in former British colonies.

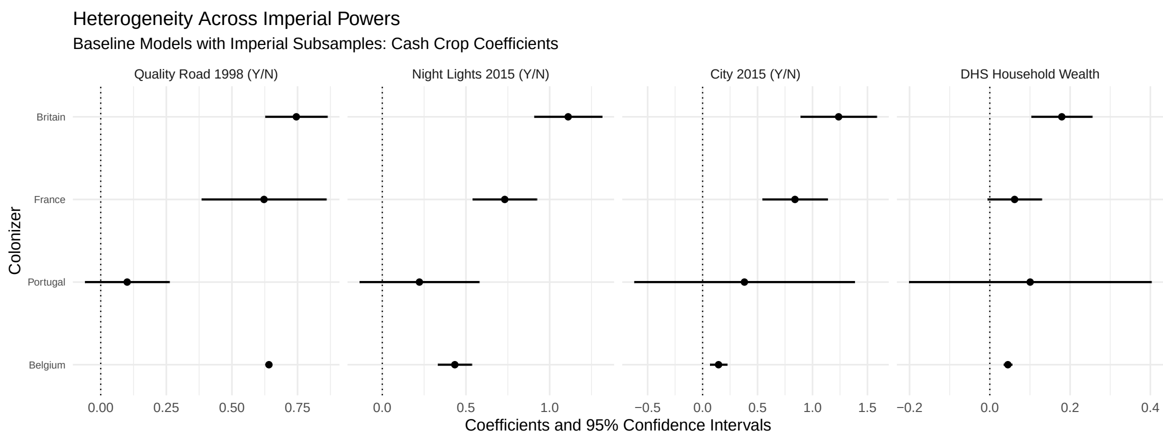

Figure A5: Empire-by-empire regressions of main outcome variables on colonial cash crop production

Figure A6 reports the impact of colonial cash crops (upper panel) on contemporary development outcomes by various country sub-groups: different levels of democracy; conflict-affectedness; agricultural/mineral export dependence; and landlocked vs. coastal. Marginal effect estimates from multiplicative interaction models based on our baseline specifications in Table 1. Continuous moderators are made categorical based on sample terciles.

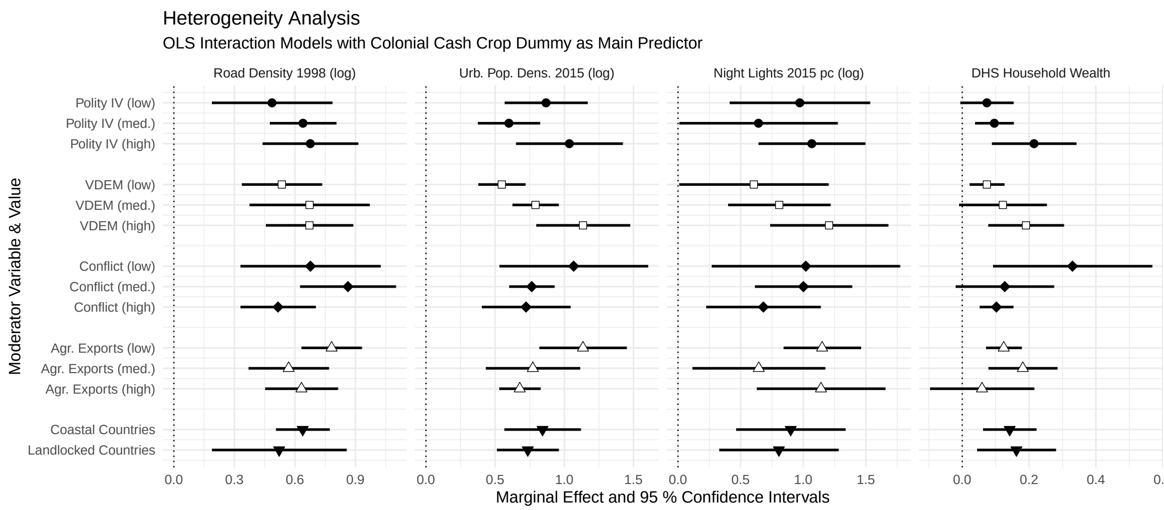

Figure A6: Heterogeneity by post-independence trajectories.

Spillovers

Figure A7 reports the spillover coefficients for minerals as estimated in the same model reported in Figure 6 of the main paper. Agglomerating effects from minerals are similarly concentrated but with less evidence of displacement effects from nearby areas.

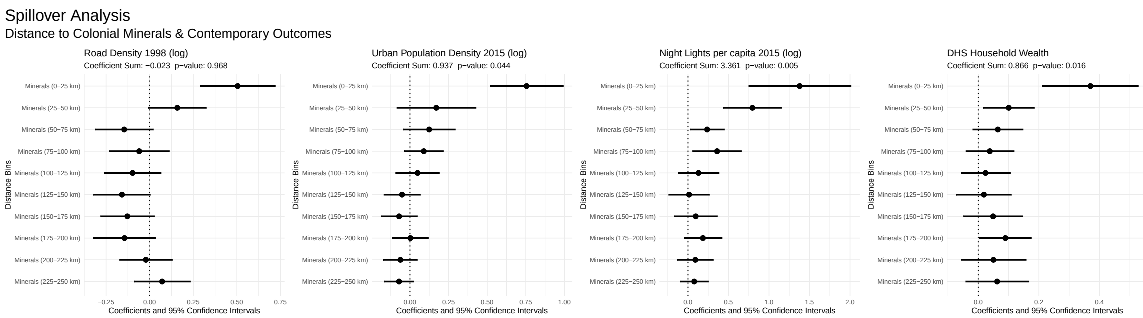

Figure A7: Spillover effects of Colonial Mineral Production

Beyond Africa?

To assess whether our findings of positive local effects and limited or even negative spillovers is specific to Africa, we conduct additional analyses comparing our African sample to other world regions in which export agriculture was or still is economically important (Latin America, Southeast, East, and South Asia). To do so, we use the global grid cell data provided by Henderson et al. (2018) who use the same spatial resolution as we do in our baseline models. We augment their dataset by adding mean cash crop suitability based on the FAO GAEZ data as well as spatial lags of suitability defined as the maximum value in neighboring cells where the neighborhood is defined based on varying distance cutoffs (1, 2, 3, and 4 degree lon/lat). We further add the superior 2015 night light data as a globally available proxy for economic activity and agglomeration.

We then regress night lights per land area on cash crop suitability, its interaction with a Sub-Saharan Africa dummy, country fixed effects, the set of geographic control variables used by Henderson et al. (2018)[32], and their interactions with the Africa dummy. Column 1 of Table A14 indicates that the cell-specific effect of cash crop suitability on nighttime luminosity is significantly weaker in Africa than in other world regions. Columns 2 to 5 add the spatial suitability lags as well as their interactions with the Africa dummy. Outside of Africa, proximity to highly suitable cells predict higher luminosity above and beyond the cell-specific local effects. This seems consistent with broader regional agglomeration effects and positive spatial spillovers. The interaction coefficients in Columns 2 to 5 are always negative, significant and of almost equal size as their respective constitutive term implying the absence of any spatial spillovers in the African subsample. The corresponding marginal effects are graphically summarized in Figure 7 in the main text.

[32]We replace their Malaria stability index with the more exogeneous temperature-based suitability index used in our main specifications. In addition, we include caloric suitability instead of their agricultural suitability index, as caloric suitability is also based on the FAO-GAEZ data and therefore on the same source as cash crop suitability.

Table A14: Africa vs. Latin America and Asia

	Nightlights per sqkm (log)				
	(1)	(2)	(3)	(4)	(5)
Cash Crop Suit. (Std.)	0.391***	0.265***	0.248***	0.249***	0.278***
	(0.067)	(0.044)	(0.051)	(0.060)	(0.061)
Cash Crop Suit. × SSA	−0.297***	−0.178***	−0.161**	−0.154**	−0.182**
	(0.080)	(0.062)	(0.067)	(0.074)	(0.075)
Max. Cash Crop Suit. NB1 (Std.)		0.340**			
		(0.153)			
Max. Suit. NB1 × SSA		−0.306*			
		(0.180)			
Max. Cash Crop Suit. NB2 (Std.)			0.563***		
			(0.112)		
Max. Suit. NB2 × SSA			−0.501***		
			(0.148)		
Max. Cash Crop Suit. NB3 (Std.)				0.750***	
				(0.146)	
Max. Suit. NB3 × SSA				−0.762***	
				(0.178)	
Max. Cash Crop Suit. NB4 (Std.)					0.791***
					(0.160)
Max. Suit. NB4 × SSA					−0.840***
					(0.194)
Country FE	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓
History Controls	✗	✗	✗	✗	✗
Observations	88,118	88,118	88,118	88,118	88,118
Adjusted R^2	0.563	0.565	0.567	0.570	0.570

Notes: OLS regressions with 0.25 degree lat/lon grid cells as units of analysis. The sample includes all cells within the Sub-Saharan African countries covered by our baseline analysis as well as all Latin American, South, East, and Southeast Asian cells. The dependent variable is defined as the natural logarithm of 1 plus total night lights per 1000 sqkm in 2015. Geographic control variables are based on Henderson et al. (2018) and include: ruggedness, elevation, distance to coast, malaria suitability, caloric suitability, absolute latitude, temperature, precipitation, length of the growing season, 14 biome indicators, and four dummies indicating whether a cell is located within 25 km of a coastline, navigable river, big lake, and natural harbor. Standard errors clustered on country in parentheses. Significance codes: *p<0.1; **p<0.05; ***p<0.01

B Validation of the Hance Production Locations

The dataset we compiled to validate Hance et al. (1961) in Figure A8 only includes primary commodities that account for 10% or more of total exports as of 1960. Aggregate primary commodity exports data come from the United Nations, Yearbook of International Statistics for as close to 1960 as available. Country-specific subnational production data comes from unique sets of sources for each colony or sets of colonies (French West Africa, French Equatorial Africa), again as close as possible to the year 1960 (see below for a detailed list of sources). We use these data sources to validate the Hance map at the level of subnational administrative units (districts or regions). Figure A8 shows that overall and resource-specific correlations between Hance and our independently collected data are high, confirming the high accuracy of the more comprehensive Hance map.

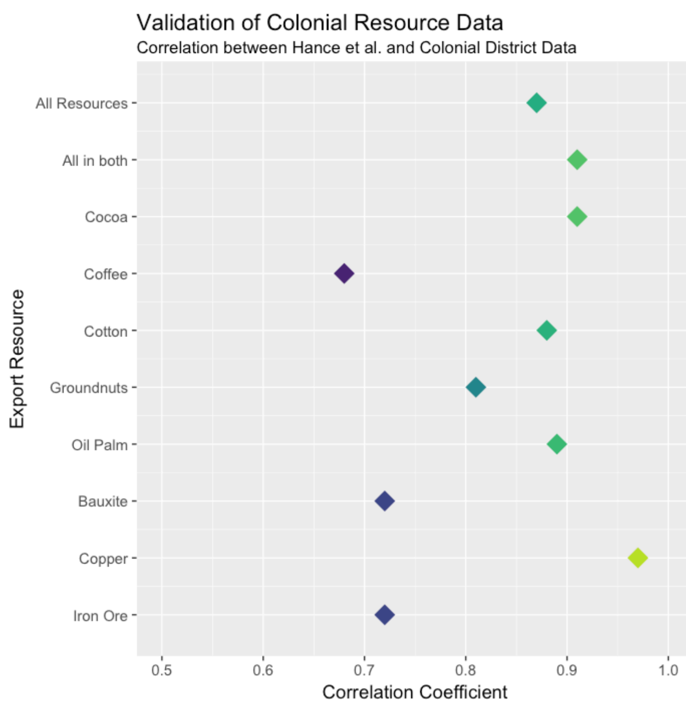

Figure A8: Correlations between Hance's primary commodity data (standardized in 1957 US$) with the primary commodity data data we collected from colonial reports, maps and other records (standardized in 1960 US$; see additional appendix below). Data have been aggregated to second-level (in some cases first-level) administrative districts (regions) at independence (c. 1960).

Sources of Primary Commodity Production and European Settlers by Colony

Angola

- Primary commodity exports as of 1960
    - Coffee (36%)
    - Diamonds (17%)
- Sources of administrative, settler and spatial primary commodity production data
    - Angola. Repartição de Estatística Geral. 1959. Anuário Estatístico – Repartição de Estatística Geral.
    - Angola. Repartição de Estatística Geral. Censo geral da população, 1940. Luanda: Imprensa Nacional, 1941.
    - Simões, J. M. De Pitta, Ligia Marques, and J. Ferreira. 1966. Ocorrências minerais. Luanda: Direção Provincial dos Servicos de Geologia e Minas.
    - Van Dongen, Irene S. 1961. "Coffee Trade, Coffee Regions, and Coffee Ports in Angola." Economic Geography 37(4): 320-346.

Belgian Congo (DRC)

- Primary commodity exports as of 1960
    - Copper (27%)
    - Coffee (14%)
    - Palm (13%)
- Sources of administrative, settler and spatial primary commodity production data
    - Atlas du Congo Belge et du Ruanda-Urundi. 1955. 11. Congo Belge et Ruanda-Urundi: Productions Agricoles.
    - Belgian Congo. Volume II. 1960. Brussels: Belgian Congo and Ruanda-Urundi Information and Public Relations Office.

- Belgique. Ministère du Congo Belge et Ruanda-Urundi. 1959-1960. Bulletin agricole du Congo Belge et Ruanda-Urundi = Landbouwkundig Tijdschrift voor Belgisch-Congo en Ruanda-Urundi.
- United States. 1944. Belgian Congo Copper Mines (including cobalt, iron, lead, zinc, radium, gold and limestone deposits). Washington, D.C.: Foreign Economic Administration.

Cameroon

- Primary commodity exports as of 1960
  - Cocoa (25%)
  - Coffee (20%)
  - Aluminium (20%)
- Sources of administrative, settler and spatial primary commodity production data
  - Service Colonial des Statistiques. Annuaire Statistique Du Cameroun 1947. Paris: Ministère de la France d'Outre-Mer.
  - Service Colonial des Statistiques. Annuaire Statistique Du Cameroun 1938-1945. Paris: Ministère de la France d'Outre-Mer.

Central African Republic

- Primary commodity exports as of 1960
  - Cotton (44.7%)
  - Coffee (24.9%)
  - Diamonds (12.1%)
- Sources of administrative, settler and spatial primary commodity production data
  - French Equatorial Africa. Haut-Commissariat. 1950-1955. Annuaire Statistique de l'Afrique Equatoriale Française.
  - France. Service de statistiques chargé des relations et de la coopération avec les états d'Outre-Mer. Recensement Général De La Population (Décembre 1956). Résultats Définitifs. Service de Statistique.

Chad

- Primary commodity exports as of 1960
    - Cotton (80%)
- Sources of administrative, settler and spatial primary commodity production data
    - French Equatorial Africa. Haut-Commissariat. 1950-1955. Annuaire Statistique de l'Afrique Equatoriale Française.
    - Cabot, Jean. 1957. 'La Culture Du Coton Au Tchad." Annales de Géographie 66(358): 499-508.
    - Cabot, Jean, and Christian Bouquet. 1972. Atlas Pratique Du Tchad. Paris: Institut Geographique National.

Côte d'Ivoire

- Primary commodity exports as of 1960
    - Coffee (45%)
    - Cocoa (20%)
- Sources of administrative, settler and spatial primary commodity production data
    - Côte d'Ivoire. 1958. Inventaire économique de la Côte d'Ivoire (1947 à 1956). Carte no. 6: Le Café en Côte d'Ivoire en 1957.
    - Côte d'Ivoire. 1958. Inventaire économique de la Côte d'Ivoire (1947 à 1956). Carte no. 7: Le Cacao en Côte d'Ivoire en 1957.
    - Côte D'Ivoire. Service de L'Agriculture. Territoire de la Côte D'Ivoire. Rapport Annuel 1957. VI Partie: Statistiques.
    - United Africa Company, ltd. 1956. "Cocoa in West Africa." no. 18: 1-20.
    - France. Afrique Occidentale Française. haut commissariat. (1951). Annuaire statistique de l'Afrique occidentale française: 5. Paris: Impr. nationale.

Dahomey (Benin)

- Primary commodity exports as of 1960
  - Palm products (66%)
- Sources of administrative, settler and spatial primary commodity production data
  - Rossignol, P, H Borius, Suzanne Truitard, and Jean Kerhor. 1944. Les Exportations Agricoles Des Cercles De L'Afrique Occidentale Et Du Togo Français. Paris: Direction des Affaires Economiques.
  - France. Afrique Occidentale Française. haut commissariat. (1951). Annuaire statistique de l'Afrique occidentale française: 5. Paris: Impr. nationale.

Ethiopia

- Primary commodity exports as of 1960
  - Coffee (56.5%)
- Sources of administrative, settler and spatial primary commodity production data
  - Ethiopian Economic Review. 1962. Addis Ababa.

Gambia

- Primary commodity exports as of 1960
  - Groundnuts (88.2%)
- Sources of administrative, settler and spatial primary commodity production data
  - Second Annual Report of the Gambia Oilseeds Marketing Board and the Gambia Oilseeds Marketing Company Ltd. Season 1950/1951. 1952. Bathurst.
  - Gambia. (1946). Report ... on the annual census, 1945. Bathurst: Government Printer.

Guinea

- Primary commodity exports as of 1960
  - Bauxite/Aluminum (47.4%)
  - Diamonds (12.6%)
  - Bananas (10.7%)
  - Coffee (10.5%)
- Sources of administrative, settler and spatial primary commodity production data
  - Lafosse, Georges. 1952. Guinée Française. Carte économique [1 : 2.000.000]. Paris: Institut Géographique National.
  - Rossignol, P, H Borius, Suzanne Truitard, and Jean Kerhor. 1944. Les Exportations Agricoles Des Cercles De L'Afrique Occidentale Et Du Togo Français. Paris: Direction des Affaires Economiques.
  - France. Afrique Occidentale Française. haut commissariat. (1951). Annuaire statistique de l'Afrique occidentale française: 5. Paris: Impr. nationale.

Gold Coast (Ghana)

- Primary commodity exports as of 1960
  - Cocoa (60%)
- Sources of administrative, settler and spatial primary commodity production data
  - Gold Coast Survey Department. 1949. Atlas of the Gold Coast (Map 15. Agricultural Products.).
  - Ghana Cocoa Marketing Board. 1957-1961. Annual report and accounts for the year ended.
  - Gold Coast. Census Office. The Gold Coast Census of Population 1948: Report and Tables.
  - Great Britain Colonial Office. 1952. An Economic Survey of the Colonial Territories, 1951: The Gambia, the Gold Coast, Nigeria, Sierra Leone, and St. Helena. Volume 3. London.

- Urquhart, D. H. 1955. Report on the Cocoa Industry in Sierra Leone and Notes on the Cocoa Industry of the Gold Coast ('Cocoa Production in the Gold Coast". p. 30.). Bournville: Cadbury Bros.
- Gold Coast. (1950). Census of Population 1948. Report and tables: [With a map]. London.

Kenya

- Primary commodity exports as of 1960
  - Coffee (24%)
  - Tea (24%)
  - Sisal (11%)
- Sources of administrative, settler and spatial primary commodity production data
  - East African Statistical Department. 1955. Kenya Agricultural Census (Highland and Asian Settled Area). Nairobi.
  - Matheson, Alastair. 1959. Tea in Kenya: A Short Illustrated Account of an Expanding and Progressive Industry - the Tea Industry of Kenya. Nairobi: Prepared for the Tea Board of Kenya by the Dept. of Information.
  - Colony and Protectorate of Kenya Government Printer. 1953. Report on the Census of the Non-Native Population of Kenya Colony and Protectorate Taken on the Night of the 25th February, 1948.
  - Survey of Kenya. 1962. Atlas of Kenya: A Comprehensive Series of New and Authentic Maps Prepared from the National Survey and Other Governmental Sources, with Gazetteer and Notes on Pronunciation & Spelling. Nairobi.

Liberia

- Primary commodity exports as of 1960
  - Iron Ore (47%)
  - Rubber (42%)
- Sources of administrative, settler and spatial primary commodity production data

- Church, RJ Harrison. 1969. “The Firestone Rubber Plantations in Liberia.” Geography 54(4): 430–437.
- United States. Bureau of Mines. 1961. Geological Survey: Minerals Yearbook. Washington DC.
- United States. Army. 1964. Area Handbook for Liberia. Washington, DC: US Govt. Print. Off
- United States. 1964. Liberia: A Market for U.S. Products. Washington, DC: US Govt. Print. Off.

French Soudan (Mali)

- Primary commodity exports as of 1960
  - Coffee (56.5%)
- Sources of administrative, settler and spatial primary commodity production data
  - Rossignol, P, H Borius, Suzanne Truitard, and Jean Kerhor. 1944. Les Exportations Agricoles Des Cercles De L'Afrique Occidentale Et Du Togo Français. Paris: Direction des Affaires Economiques.
  - France. Afrique Occidentale Française. haut commissariat. (1951). Annuaire statistique de l'Afrique occidentale française: 5. Paris: Impr. nationale.

Madagascar

- Primary commodity exports as of 1960
  - Coffee (40%)
- Sources of administrative, settler and spatial primary commodity production data
  - Humbert, H., and G. Cours Darne. 1964. ”Carte Internationale du Tapis Végétal et des Conditions Écologiques, République Malagache.” Pondichéry: Institut Français de Pondichéry.
  - Association des Géographes de Madagascar and Françoise Le Bourdiec. 1969. Atlas de Madagascar (“Planche 33: Café, Cacao, Bananes.”). Tananarive: Bureau Pour le Développement de la Production Agricole.
  -

Mozambique

- Primary commodity exports as of 1960
    - Cotton (32%)
    - Sugar (13%)
    - Cashew (13%)
- Sources of administrative, settler and spatial primary commodity production data
    - Bravo, N. S. 1963. A Cultura Algodoeira na Economia do Norte de Moçambique. Lisboa.
    - Mozambique. 1962. Atlas de Moçambique (30. Agricultura). Lourenço Marques: Empresa Moderna.
    - Mozambique. 1951. Recenseamento Agricola: Repartição Técnica de Estatística: 259–283. Lourenco Marques: Imprensa Nacional.
    - Mozambique. 1951. Recenseamento Agricola: Repartição Técnica de Estatística: 414–425. Lourenco Marques: Imprensa Nacional.
    - Mozambique. (1947). Recenseamento da população não indigena em 12 de junho de 1945. Lourenço Marques: Imprensa nacional de Mozambique.

Nyasaland (Malawi)

- Primary commodity exports as of 1960
    - Tobacco (45%)
    - Tea (40%)
- Sources of administrative, settler and spatial primary commodity production data
    - Great Britain Colonial Office. 1952. An Economic Survey of the Colonial Territories, 1951:The Central African and High Commission Territories, Northern Rhodesia, Nyasaland, Basutoland, Bechuanaland, and Swaziland. Volume 1. Map of Northern Rhodesia and Nyasaland, Main Cash Products. London.
    - Federation Of Rhodesia And Nyasaland. 1959. Report on an Economic Survey of Nyasaland, 1958–1959. Salisbury: The Government Printer.

- Federation Of Rhodesia And Nyasaland. 1958. Report on the Agricultural and Pastoral Production of Southern Rhodesia, Northern Rhodesia and Nyasaland, 1956–1957. Salisbury: The Government Printer.
- Federation Of Rhodesia And Nyasaland. 1961. Tobacco Production Map of the Federation of Rhodesia and Nyasaland. Salisbury: Federal Department of Trigonometrical Topographical Surveys.
- Rhodesia and Nyasaland. (1960). Census of population, 1956. Salisbury.

Niger

- Primary commodity exports as of 1960
  - Groundnuts (70–80%)
- Sources of administrative, settler and spatial primary commodity production data
  - République du Niger. Cultures Vivrières; Cultures Industrielles (unsourced map from Library of Congress received in 1962).
  - République du Niger. Carte Administrative: Production Agricole, Arachide Coque (unsourced map at Library of Congress, 1964).
  - France. Afrique Occidentale Française. haut commissariat. (1951). Annuaire statistique de l'Afrique occidentale française: 5. Paris: Impr. nationale.

Nigeria

- Primary commodity exports as of 1960
  - Palm products (26%)
  - Cocoa (24%)
  - Groundnuts (15%)
- Sources of administrative, settler and spatial primary commodity production data
  - Buchanan, Keith M., and John Charles Pugh. 1955. Land and People in Nigeria: The Human Geography of Nigeria and Its Environmental Background. London: University of London Press.

- Dorward, D. C. 1978. Annual Departmental Reports Relating to Nigeria and British Cameroons. East Ardsley, UK: EP Microform.
- Great Britain Colonial Office. 1952. An Economic Survey of the Colonial Territories, 1951: The Gambia, the Gold Coast, Nigeria, Sierra Leone, and St. Helena. Volume 3. London.
- Nigeria Cocoa Marketing Board and R. Galletti. 1956. Nigerian Cocoa Farmers: An Economic Survey of Yoruba Cocoa Farming Families ("Cocoa Producing Areas of the Western Region of Nigeria."). London: Oxford University Press.
- Nigeria Groundnut Marketing Board. 1954. Fifth Annual Report of the Nigeria Groundnut Marketing Board. Season 1953-54 (pp. 14–15). Lagos.
- Nigeria Oil Palm Produce Marketing Board. 1950. First Annual Report 1949 (pp. 18–25). Brighton, UK: King, Thorne, and Stace, Ltd.
- Nigeria Department of Statistics. 1955. Population census of Nigeria, 1952–53. Lagos.

Nothern Rhodesia (Zambia)

- Primary commodity exports as of 1960
  - Copper (90%)
- Sources of administrative, settler and spatial primary commodity production data
  - Northern Rhodesia Copper Industry Service Bureau. 1961. Northern Rhodesia Chamber of Mines Yearbook. Kitwe.
  - Northern Rhodesia Department of Geological Survey. 1959. Mineral Map of Northern Rhodesia. Lusaka.
  - Northern Rhodesia Census. 1951. Lusaka: Government Printer.
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  - Rhodesia and Nyasaland. (1960). Census of population, 1956. Salisbury.

Ruanda-Urundi (Rwanda, Burundi)

- Primary commodity exports as of 1960
    - Coffee (75%)
- Sources of administrative, settler and spatial primary commodity production data
    - Belgique. Ministère du Congo Belge et Ruanda-Urundi. 1959-1960. Bulletin Agricole du Congo Belge et Ruanda-Urundi = Landbouwkundig Tijdschrift voor Belgisch-Congo en Ruanda-Urundi.
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    - Belgian Congo. (1952). Résultats du recensement général de la population non-indigène du Congo-Belge et du Ruanda-Urundi du 3 janvier 1952.

Senegal

- Primary commodity exports as of 1960
    - Groundnuts (80%)
- Sources of administrative, settler and spatial primary commodity production data
    - Rossignol, P, H Borius, Suzanne Truitard, and Jean Kerhor. 1944. Les Exportations Agricoles Des Cercles De L'Afrique Occidentale Et Du Togo Français. Paris: Direction des Affaires Economiques.
    - Senegal. 1965. Cartes pour servir a l'aménagement du territoire. Ouvrage réalisé par l'equipe de l'aménagement du territoire: Pierre Metge et al.
    - France. Afrique Occidentale Française. haut commissariat. (1951). Annuaire statistique de l'Afrique occidentale française: 5. Paris: Impr. nationale.

Sierra Leone

- Primary commodity exports as of 1960
  - Diamonds (55%)
  - Iron ore (18%)
- Sources of administrative, settler and spatial primary commodity production data
  - Clarke, John Innes. 1966. Sierra Leone in Maps. London: University of London Press.
  - Hall, P K. 1969. The Diamond Fields of Sierra Leone. Freetown, Sierra Leone: Geological Survey Division.
  - Sierra Leone. 1931. Sierra Leone report of census for the year 1931. Freetown: Government Printer.

Somalia

- Primary commodity exports as of 1960
  - Bananas (70%)
- Sources of administrative, settler and spatial primary commodity production data
  - Committee for the World Atlas of Agriculture. 1976. World Atlas of Agriculture, Vol. 4: Africa: Commercial Farming Areas (Somalia, 1965).
  - World Bank. 1957. The Economy of the Trust Territory of Somaliland. Washington D.C: International Bank for Reconstruction and Development.

Southern Rhodesia (Zimbabwe)

- Primary commodity exports as of 1960
  - Tobacco (30%)
- Sources of administrative, settler and spatial primary commodity production data
  - Federation of Rhodesia and Nyasaland. 1961. Tobacco Production Map of the Federation of Rhodesia and Nyasaland. Salisbury: Director of Federal Surveys.

- Federation Of Rhodesia And Nyasaland. 1958. Report on the Agricultural and Pastoral Production of Southern Rhodesia. Salisbury: The Government Printer
- Rhodesia and Nyasaland. (1960). Census of population, 1956. Salisbury.

Sudan

- Primary commodity exports as of 1960
  - Cotton (55%)
- Sources of administrative, settler and spatial primary commodity production data
  - Republic of the Sudan Ministry of Economics and Finance. 1958. Sudan Cotton Review. Khartoum.
  - Republic of the Sudan Sudan Survey Department. 1957. Sudan Cotton. Khartoum.
  - Sudan. (1961). First population census of Sudan, 1955/56: Final report. Khartom.

Tanganyika (Tanzania)

- Primary commodity exports as of 1960
  - Sisal (27%)
  - Coffee (17%)
  - Cotton (16%)
- Sources of administrative, settler and spatial primary commodity production data
  - Guillebaud, Claude William. 1958. An Economic Survey of the Sisal Industry of Tanganyika. Welwyn, UK: Tanganyika Sisal Growers Association.
  - East African Statistical Department. 1953. Report on the Analysis of the Sample Census of African Agriculture, 1950. Nairobi.
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  - East Africa High Commission. (1958). Report on the census of the non-African population taken on the night of 20th-21st February, 1957. Dar es Salaam: Printed by the Govt. Printer.

Togo

- Primary commodity exports as of 1960
  - Cocoa (28%)
  - Coffee (25%)
- Sources of administrative, settler and spatial primary commodity production data
  - Rossignol, P, H Borius, Suzanne Truitard, and Jean Kerhor. 1944. Les Exportations Agricoles Des Cercles De L'Afrique Occidentale Et Du Togo Français. Paris: Direction des Affaires Economiques.
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  - Premiers résultats du recensement de 1951 dans les territoires d'Outre Mer: (Population non originaire). (1952). Paris: Ministère de la France d'Outre Mer.

Uganda

- Primary commodity exports as of 1960
  - Coffee (40%)
  - Cotton (35%)
- Sources of administrative, settler and spatial primary commodity production data
  - Uganda, Department of Lands and Surveys. 1962. Atlas of Uganda (49. Coffee, Tea, Sugar, Tobacco). Entebbe.
  - Uganda, Department of Lands and Surveys. 1962. Atlas of Uganda (47. Cotton). Entebbe.
  - Uganda. 1953. Report on the census of the non-native population of Uganda protectorate, taken on the night of the 25th February, 1948. Nairobi: W. Boyd.
  - Uganda Protectorate. 1961. Annual Report of the Department of Agriculture, For the Year Ended 31st December, 1960 (Appendix IV: Crop Production).

Zanzibar

- Primary commodity exports as of 1960
  - Cloves (75%)
- Sources of administrative, settler and spatial primary commodity production data
  - Zanzibar Govt. Printer. 1947. Annual Report of the Agricultural Department.
  - Sheriff, A. 1991. Zanzibar under Colonial Rule. Athens, OH: Ohio University Press.
  - Zanzibar Blue Book. 1946.

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