Trade, Slavery, and State Coercion of Labor:

Egypt During the First Globalization Era

Mohamed Saleh

London School of Economics

Mailing address: Houghton Street, London WC2A 2AE, United Kingdom

E-mail: m.saleh@lse.ac.uk

Acknowledgements: This paper was previously circulated under various titles: "The Cotton Boom and Slavery: Evidence from Nineteenth Century Egypt," "Export Booms and Labor Coercion: Evidence from the Lancashire Cotton Famine," and "Globalization and Labor Coercion: Evidence from Egypt During the First Globalization Era." I acknowledge funding from the French National Research Agency (ANR) under the Investments for the Future (Investissements d'Avenir) program, ANR-17-EURE-0010. I am grateful to Daron Acemoglu, Samuel Bowles, Christian Dippel, James Fenske, Victor Gay, Avner Greif, Timothy Guinnane, Naomi Lamoreaux, Yassine Lefouili, Joel Mokyr, Suresh Naidu, Nathan Nunn, Emil Nurutdinov, Thomas Piketty, Jean Tirole, Gavin Wright, and three anonymous referees for very helpful comments. I thank the participants of my presentations at Caltech/All-UC Economic History Group, EHA, Yale, Carlos III Madrid, PSE, Bonn, AEA, CEPR-CAGE-NYUAD, Arizona, UCLA, AALIMS, CEPR-EBRD-EoT, CIFAR, Warwick Economic History Workshop, Harvard (CMES and CES), AMSE, LSE Economic History, European Macro Economic History Webinar, SIOE, and Paris Nanterre. I thank Sarah Wahby, Norhan Muhab, Dalia Elsabbagh, and Xinyan Lao, for their excellent research assistance.

Trade, Slavery, and State Coercion of Labor: Egypt During the First Globalization Era

Abstract

I investigate the effects of trade on labor coercion under the dual-coercive institutions of slavery and state coercion. Employing novel data from Egypt, I document that the cotton boom in 1861–1865 increased both imported slaveholdings of the rural middle class, and state coercion of local workers by the elite. As state coercion reduced wage employment, it reinforced the demand for slaves among the rural middle class. While the abolition of slavery in 1877 increased wages, it did not affect state coercion or wage employment. I discuss the political effects of the abolition as a potential explanation for these findings.

Keywords: slavery, state coercion, trade, abolition, cotton

JEL Classification: F16, J47, N35

"The barbarism of the [U.S.] South, while destroying itself, [appeared] in the providence of God to be working out the regeneration of Egypt."

North American Review 98, no. 203 (1864), p. 483, quoted in Earle (1926)

Ample empirical evidence indicates that trade booms can increase labor coercion. Rising grain exports have long been used to explain the Second Serfdom in Eastern Europe (Małowist 1958, Guzowski 2011). The rising demand for coercion during trade booms has also been documented during the nineteenth century for Britain (Naidu and Yuchtman 2013), Puerto Rico (Bobonis and Morrow 2014), and the British West Indies (Dippel et al. 2020). However, this literature largely focused on a single system of coercion: slavery in the Americas or serfdom in Europe. Yet, multiple coercive systems often coexisted. Slavery and serfdom coexisted in Russia until the eighteenth century (Hellie 2011), and indentured servitude of European immigrants long coexisted with black slavery in the Americas (Galenson 1984). The implications of trade booms under such *dual-coercive* environments are the focus of this article.

Specifically, this article investigates the effects of trade booms on labor coercion under the dual-coercion environment of slavery and state coercion. It focuses on the environment where slaves were imported from abroad, whereas local workers, who were recruited freely on the market, could not be enslaved but may have been subject to state coercion. Conceptually, trade booms may have different implications under dual-coercive systems. Within single-coercion environments, employers face a common labor supply, and have access to a common coercive technology. However, under dual-coercive systems, labor supply and access to coercive systems may differ across employers. While all employers have access to foreign slaves sold in local slave markets, state coercion—like serfdom—is limited to the political elite who can use state violence to coerce local workers taking them out of the free labor market. This implies that slavery and state coercion are interdependent. The trade boom-induced rise in state coercion by the elite reduces the free local labor supply that faces non-elite landholders, inducing them to purchase more foreign slaves than under the slavery-only environment. In a similar vein, the abolition of slavery can exacerbate state coercion, as the elite coerce more

workers to compensate for their freed slaves.

This article draws on the case of Egypt during the First Globalization Era, from its trade liberalization in 1842 until World War I.[1] According to population census data digitized by Mohamed Saleh, while the majority of Egypt's rural labor force in 1848 were self-employed peasants (51 percent) and wage agricultural laborers (10 percent), 8 percent were subject to coercion.[2] First, under the medieval slavery institution, foreign black slaves (1 percent in 1848), captured in the Nilotic Sudan and imported to Egypt, were sold competitively to all landholders, even though their use in agriculture had been exceedingly rare (Cuno 2009). Second, the Ottoman-Egyptian political elite—owners of large estates—could exclusively use state violence to coerce local workers (7 percent in 1848).

To investigate the effects of trade booms on labor coercion under Egypt's dual-coercive system, I focus on two key events. The first event is the cotton boom during the U.S. Civil War in 1861–1865. Egypt, a global producer of high-quality long-staple cotton, quadrupled its cotton production and exports by 1865 (Figure 1). Unlike the US, Egypt did not have international market power on the eve of the cotton boom, and hence cotton prices were largely exogenous. The second event is the abolition of slavery via the Anglo-Egyptian Slave Trade Convention in 1877. Because the abolition was an outcome of British pressure, it was exogenous to landholders. Cotton exports continued to grow after 1877 despite the drop in prices.

I examine the effects of these two shocks using a wide range of novel fine-grained data sources. These include, most importantly, two nationally representative individual-level samples of the Egyptian population censuses of 1848 and 1868 that I digitized from the original Arabic manuscripts at the National Archives of Egypt (Saleh 2013). These are among the earliest precolonial censuses from any non-Western country to include information on every household member, including females, children, and slaves. They are also the only surviving individual-level source on the slave population in Egypt,

[1] Throughout this period, Egypt was first an autonomous Ottoman vassal state until 1882, a de facto British colony under nominal Ottoman sovereignty in 1882–1914, and a British protectorate in 1914–1922.

[2] The remaining rural labor force in 1848 (31 percent) worked outside agriculture, as white-collar workers, artisans, and unskilled non-agricultural laborers.

and probably in the Middle East.

I employ a simple conceptual framework to guide the empirical analysis. Under the dual-coercive environment, the cotton boom increases both slaveholdings of non-elite landholders, and state coercion of local workers by the elite. Wage employment *declines* though, as the rise in state coercion takes more local workers out of the market. The cotton boom-induced rise in state coercion induces non-elite landholders to purchase more slaves than under the slavery-only environment. The subsequent abolition of slavery increases state coercion, to compensate for the elite's emancipated slaves, leading to a further decline in wage employment and a rise in wages.

The findings are mostly consistent with the implications of the conceptual framework. First, the cotton boom caused a substantial rise in agricultural slavery. The rural slave population tripled from 39,762 slaves (1 percent of the population) in 1848 to 144,592 slaves (3 percent) in 1868. The surging demand for slaves came from non-elite landholders—the rural middle class—and not the elite. Second, the cotton boom also caused a rise in state coercion of local workers by the elite, and a decline in wage employment by non-elite landholders. Third, state coercion reinforced the demand for slaves among the rural middle class during the cotton boom. Finally, while the abolition increased wages in the free sector, I fail to find evidence that it affected state coercion or wage employment. I explain this finding by the rising political resistance to state coercion by rural middle-class Members of Parliament (MPs) after the abolition. The evidence on this mechanism remains suggestive, however, as I do not have evidence that the rise in MPs' anti-state coercion attitudes in parliament during the post-abolition period is what mitigated state coercion.

This article mainly contributes to the literature on the causes of labor coercion. Besides being the first to examine the impact of trade booms on coercion under dual-coercive systems, this article also reveals that globalization can have far-reaching consequences. The U.S. Civil War, whose central conflict was about the abolition of slavery, led unintentionally to increased coercion in Egypt. In the absence of international trade, labor coercion could also emerge due to the (exogenous) scarcity of labor relative to land (Domar 1970, Ogilvie and Klein 2017). Alternatively, labor scarcity may increase workers' outside wages, thus reducing coercion, which can explain the decline of coercion in Western Europe after the Black Death (North and Thomas 1973, Brenner 1976). Acemoglu and

Wolitzky (2011) reconciled these countervailing effects. This article argues that the labor supply facing non-elite landholders is endogenous, as it can be reduced due to state coercion by the elite.

This article also speaks to the vast literature on the abolition of coercion (Fogel and Engerman 1974, Fogel 1989, Markevich and Zhuravskaya 2018, Ager et al. 2021). While I do not examine the effects of the abolition on productivity, which has been the focus of this literature, I argue that the selective abolition of one coercive system may exacerbate the other system.

The affinity between cotton and slavery has been long documented (Marx 1861). This association was traced to specific features of cotton production, including effort intensity (Fenoaltea 1984), returns to scale (Fogel 1989), and the relative productivity of women and children (Goldin and Sokoloff 1984). More recently, the new history of capitalism literature emphasized the intertwined role of cotton and slavery in the historical development of global capitalism (Beckert 2015). In contrast to this thesis, I argue that neither slavery nor state coercion was necessary for cotton cultivation.

A recent body of literature examined the long-term effects of labor coercion on economic development (Engerman and Sokoloff 1997, Nunn 2008, Dell 2010, Nunn and Wantchekon 2011, Acemoglu et al. 2012, Dell and Olken 2020). This article focuses instead on the causes of coercion. It also goes beyond the focus of this literature on colonial environments, by studying coercion during the precolonial period. My finding that the ex-slave population disappeared gradually after the abolition implies that agricultural slavery had little long-term effects. To the contrary, state coercion persisted through at least WWI.

This article contributes to Egyptian history. Owen (1969)—a seminal contribution on the history of cotton in Egypt—did not mention the rise of slavery during the cotton boom. Other historians noted the surge in slavery during the cotton boom qualitatively, based on European narratives (Earle 1926, Baer 1967, Fredriksen 1977, Mowafi 1981). Helal (1999) and Cuno (2009) used the 1848 and 1868 censuses to document the rise of slavery within a handful of cotton-growing villages. State coercion occupied another group of scholars (Baer 1962, Barakat 1977), although they did not examine how it was impacted by the cotton boom. This article provides the first comprehensive evidence—based on nationally representative samples of the 1848 and 1868 censuses—that the cotton boom increased both coercive systems, and that the abolition did not affect state coercion. Beyond Egypt, historians

documented the rise of indigenous slavery in sub-Saharan Africa, and of the trans-Saharan slave trade, during the nineteenth century (Austen 1992, Wright 2007, Lovejoy 2012). This article is the first to quantitatively document the rise of the trans-Saharan slave trade due to the cotton boom, as Egypt became the largest slave importer in North Africa.

Cotton, Land, and Labor in Nineteenth-Century Rural Egypt

Egyptian Cotton Cultivation on the Eve of the Cotton Boom

In 1821, a French industrialist discovered the superior quality of a long-staple cotton seed in Egypt. Realizing its potential as an export crop, Muhammad Ali Pasha, the autonomous Ottoman viceroy of Egypt in 1805–1848, expanded its cultivation via the state monopoly system that lasted until 1842, and via the expansion of large estates thereafter. Two factors determined the suitability of a given area to cotton cultivation: mild temperature and the availability of perennial irrigation that provided the Nile water during the spring, the cotton planting season (Owen 1969, pp. 28-57). Consequently, Muhammad Ali invested in perennial irrigation. New deep summer (*sayfi*) canals were constructed, traditional *nili* canals deepened, and water-lifting tools increased (Rivlin 1961, pp. 213-249).

Land and Labor on the Eve of the Cotton Boom

As Muhammad Ali granted land to his family members and top state officials—the Ottoman-Egyptian elite—large estates gradually expanded to occupy 53 percent of land in 1844. This elite were mostly absentee owners who lived in Cairo. Having monopoly over state violence, they were able to confiscate both barren and peasants' land. Large estates were formed on barren, deserted, or tax-arrears land, and only exceptionally on tax-paying land. The 1844 cadaster enumerates three legal forms of large estates. First, *ib'adiyas* (17 percent of land) were formed on barren land for reclamation purposes. Second, *'uhdas* (28 percent) were formed on deserted and tax-arrears land. Third, *jifliks* (8 percent) were formed on tax-paying land and granted exclusively to the viceroy (Barakat 1977).

The remaining 47 percent of land in 1844 was usufruct land that belonged to village headmen

(medium landholders), and the peasantry (small landholders).[3] Since village headmen were the largest landholders outside large estates, they constituted a rural middle class that first emerged in 1813 after the abolition of tax farming, as they acted as intermediaries between the peasantry and the state.

There were two labor coercive institutions: imported slavery and state coercion of local workers. Slavery was a long-standing medieval institution since enslavement of foreign non-Muslims in *ghazwas* (holy raids) was permitted by Islamic law. Slavery was self-perpetuating by law; a slave's conversion to Islam did not result in emancipation, and the offspring of a male slave were automatically slaves. In practice though, the slave population was not sustainable by natural growth due to low fertility and low life expectancy among slaves, and annual slave imports were necessary to meet the demand for slaves.

Slaves constituted 1 percent of the population in 1848.[4] About 94 percent of slaves were blacks (*aswad*, *sudani*) from the Nilotic Sudan (Darfur, Kurdufan, and Sennar), while the remaining 6 percent were Abyssinians (*habashi*) from Ethiopia, and whites (*abyad*) from Circassia and Georgia. Black slaves were transported to Egypt in caravans via trans-Saharan land routes (Fredriksen 1977, pp. 29-42). This eastern trans-Saharan slave trade between Egypt (and the Ottoman Empire) and the Nilotic Sudan and Ethiopia, was largely segregated from the western trans-Saharan slave trade between North Africa, west of Egypt, and sub-Saharan Africa, west of present-day Sudan.

Employing slaves in agriculture was rare before the cotton boom. After the Abbasids' attempt to introduce agricultural slavery in ninth-century Iraq ended with a slave rebellion, agricultural slavery mostly disappeared from the region.[5] In 1848, slaves were over-represented in cities as domestic servants, where they constituted 3 percent of the population, 75 percent of whom were females.

Appendix Figure A.1 provides rough estimates of slave prices and imports in Egypt, based on remarks by contemporaneous European consuls and travelers. Panel (A) shows estimates of slave prices in

[3] Large estates were at least 50 *feddans*, village headmen were typically medium landholders (6-50 *feddans*) (Richards 1978, p. 504), and the peasantry were typically small landholders (0-5 *feddans*) (Cuno 2009).

[4] The urban slave population in 1848 was larger at 15,741 slaves (3 percent) and remained at 3 percent in 1868.

[5] Military slavery, a long-standing institution that emerged in the ninth century, declined in the nineteenth century. In 1848, former Mamluks constituted only 4 percent of the urban slave population.

1800–1877. Whites (not shown) were the most expensive, followed by Abyssinians and blacks. Within each color, females were more expensive. Panel (B) shows estimates of the annual slave imports. Imports increased to 10,000 slaves annually between 1820, when Egypt invaded Sudan, and 1845, when the state stopped its slave raids in Sudan. However, the 1848 census reveals that these numbers are exaggerated. There were around 55,072 slaves in 1848, which is lower than what one would expect under an annual inflow of 10,000 slaves in 1820–1845. After 1845, imports dropped to about 5,000 slaves annually. The cotton boom period witnessed an unprecedented influx of slaves, about 27,500 per year. This is supported by the 1868 census, which shows that the slave population tripled between 1848 and 1868, going up from 55,072 to 173,654 (3 percent of the population).

The second coercive system was state coercion of local workers. Large estates constituted 7 percent of the rural population in 1848.[6] Labor organization varied by the legal form of the large estate. In *ib'adiyas*, labor was supplied by agricultural laborers from neighboring villages (Cuno 1992, pp. 162-3). In *'uhdas*, peasants had to work for the landlord without pay, until they paid back their tax arrears. In *jifliks*, peasants remained as tenants, cash wage workers, or sharecroppers (Cuno 1992, pp. 161-2). Unlike slaves, coerced workers in large estates were not traded.

The Cotton Boom in 1861–1865

After the end of the state monopoly system in 1842, peasants were allowed to sell their output directly to exporters, and hence became exposed to international price shocks. The U.S. Civil War cotton boom was unexpected, and cotton expansion was not state planned, but rather due to individual decisions.[7] India and Brazil increased their cotton production too, with India replacing the US as the world's top cotton producer. But Egyptian cotton was of higher quality than Indian cotton, and thus

[6] There were two other forms of state coercion: military conscription and corvée labor to work in public works.

[7] Faced by demands for state intervention issued by Manchester cotton spinners, Sa'id (viceroy in 1854–1863) replied that, "prices alone will prove a sufficient stimulus without any effort on my part" (Owen 1969, p. 96). Appendix Figure A.7 shows the consequent expansion of the share of cotton in Egypt's total cultivated area and its total value of exports. Egypt's cotton seed exports surged as well (Appendix Figure A.3).

had a secure market share.

Abolition of Slavery in 1877

European abolitionists prioritized the transatlantic slave trade. Only later, they turned their efforts to abolishing the older, yet smaller and less known, trans-Saharan slave trade. Starting from 1837, British abolitionists pressured Egypt to abolish slavery. The Egyptian state was reluctant to comply because it profited from the slave trade. Furthermore, slavery was endorsed by Muslim jurists, and the abolition was thus against Islamic law (Baer 1967).

The real push for abolition occurred in 1869–1876, when Khedive Ismail (1863–1879) ordered several British-led campaigns against Sudanese slave raiders, aiming to restore Egypt's control over the Nilotic Sudan. The abolition was eventually achieved by the signing of the Anglo-Egyptian Slave Trade Convention in 1877 (Fredriksen 1977, pp. 157–180). This was probably facilitated by Ismail's waning power vis-à-vis Britain, due to Egypt's default on its international debt in 1876.

Conceptual Framework

To guide the empirical analysis, I employ a simple conceptual framework that captures the main features of the historical context that I described in the previous section. I assume that land is fixed in each district and exogenously allocated to three classes of landholders, ranked by the size of their landholdings: the elite, the rural middle class, and the peasantry. There is a competitive market for local wage labor. The supply of wage labor is fixed and provided by landless agricultural workers. The demand for labor comes from the elite and the rural middle class. Peasants, on the other hand, recruit their own (unpaid) household labor.[8] All districts are equally suitable to wheat cultivation. Some districts are also suitable to cotton. Cotton is more labor intensive than wheat. Wheat and cotton prices are determined internationally.

There are three environments. Under environment A (slavery only), there is a competitive market for

[8] I account for unpaid household labor in the empirical analysis, by controlling for the number of free household members broken down by sex and age.

imported foreign slaves, who are purchased for an upfront price.[9] The supply of foreign slaves is imperfectly elastic: Slave raiders can capture new slaves in response to higher slave prices. Under environment B (state coercion only), there is no foreign slave market, but the elite—the first movers in the market for local wage labor—can use state violence to coerce local workers to work on their large estates. State coercion takes agricultural laborers out of the wage labor market, reducing the local labor supply. The level of state coercion—the number of workers who are coerced by the elite—is determined by comparing the expected return from coercion (the productivity of coerced workers) to the cost of coercion (mobilizing the army, political resistance). Under environment C (dual coercive institutions), the observed environment in our context, the two coercive systems of slavery and state coercion co-exist.

Below, I analyze the effects of the cotton boom and of the abolition of slavery under each environment. Before the cotton boom (1848–1861), cotton price is lower than wheat. During the cotton boom (1861–1877), cotton price rises substantially above wheat. During the abolition (post-1877), cotton price decreases, but remains higher than wheat, and slavery is abolished. I assume that emancipated slaves emigrate back to the Nilotic Sudan.[10]

Impact of the Cotton Boom. In all three environments, the cotton boom induces landholders in cotton districts to cultivate cotton. Because cotton is labor intensive, the demand for labor rises. Under environment A, the cotton boom increases slavery in cotton districts, as the demand for imported slaves shifts outwards. The positive effect on slaveholdings is largest among the elite—the richest landholders—followed by the rural middle class. The demand for local wage labor shifts outwards

[9] I assume that there are no capital markets, which is a historically realistic assumption in nineteenth-century rural Egypt. Small amounts of agricultural credit were provided by small-scale money changers—mainly, Jews and Levantines. Agricultural banks started to emerge only during the late nineteenth century.

[10] This is equivalent to emancipated slaves disappearing in the long run, as they are mostly single males who die without offspring. An alternative scenario is that ex-slaves become landless agricultural workers, which will suppress the rise in wages, and may increase wage employment, after the abolition. The empirical evidence does not support this latter scenario (see the discussion of Table 5).

too, although wage employment remains constant, as the local labor supply is fixed by assumption.[11] Both slave prices and wages go up.

Under environment B, the cotton boom increases state coercion of local workers by the elite. This implies an inward shift in wage labor supply, a fall in wage employment, and a rise in wages, as coerced workers are taken out of the wage labor market. The demand for wage labor also shifts outwards, due to the rising demand among the rural middle class, causing wages to rise.

Under environment C, the cotton boom increases both slavery and state coercion. Slave employment and prices both go up, as the demand for slaves shifts outwards, where the positive effect on slaveholdings is largest among the rural middle class, not the elite (unlike in environment A). State coercion rises too, as the elite coerce more local workers. The rise in state coercion causes an inward shift in the supply of wage labor, leading wage employment to decline and wages to rise. The demand for wage labor also shifts outwards, and wages rise. State coercion reinforces slavery: The cotton boom-induced rise in state coercion may induce the rural middle class to purchase more slaves than under environment A, because it reduces the local labor supply facing the rural middle class.

Impact of the Abolition. In all three environments, landholders in cotton districts continue to grow cotton, because it remains more profitable than wheat. Under environment A, the abolition induces a further outward shift in the demand for wage labor, to substitute for the emancipated slaves. Because all freed slaves emigrate, wage employment remains constant, however, whereas wages rise.[12]

Under environment C, the abolition of slavery causes state coercion to rise, as the elite substitute for their emancipated slaves by coercing more local workers. This leads to a further inward shift in the supply of wage labor, and hence a further decline in wage employment and a rise in wages. The demand for wage labor also shifts outwards to substitute for the freed slaves who were held by the rural middle class, leading wages to rise.

[11] Alternatively, wage employment may rise if labor supply is elastic. This could be because workers shift from the non-agricultural sector to agriculture, or because self-employed peasants become agricultural laborers, in response to higher agricultural wages. I examine these potential responses in Appendix Table A.4.

[12] The impact of the abolition of slavery is irrelevant under environment B, as there is no slavery to begin with.

Testable Implications. To summarize, this framework produces the following testable implications (hypotheses) under the dual-coercive environment:[13]

H1: *Effects of the Cotton Boom*:

(a) The cotton boom causes an increase in slavery.

(b) The effect of the cotton boom on slavery is largest among the rural middle class.

(c) The cotton boom increases state coercion of local workers by the elite.

(d) The cotton boom reduces wage employment by the rural middle class.

(e) The cotton boom-induced rise in state coercion induces the rural middle class to purchase more slaves than in the absence of state coercion.

H2: *Effects of the Abolition of Slavery*:

(a) The abolition of slavery further increases state coercion of local workers by the elite.

(b) The abolition of slavery reduces wage employment by the rural middle class.

(c) The abolition of slavery causes wages to rise.

Three notes are in order. First, the implications H1(a), H1(c), and H1(d), regarding the effects of the cotton boom on slavery, state coercion, and wage employment, and the implication H2(c), regarding the effect of the abolition of slavery on wages, are shared with single- coercion environments.[14] Second, the implications H1(b), H1(e), H2(a), and H2(b) are unique to the dual-coercive environment. The implication H1(b) demonstrates the heterogeneous slave demand response to the cotton boom across landholder classes, due to differences in political power, rather than income, whereas H1(e), H2(a), and H2(b) reflect the *interdependence* of slavery and state coercion. Second, this conceptual framework focuses on the *economic* response to the cotton boom and the abolition, and not the *political* response. This is because it treats the (co)existence and abolition of the coercive

[13] I do not list the implications of the cotton boom for wages and slave prices, which I do not observe empirically. We only have sporadic national-level wage data in 1840–1841, before the cotton boom. Data on slave prices are only rough estimates at the national level (see Appendix Figure A.1).

[14] Specifically, H1(a) and H2(c) are shared with the slavery-only environment, whereas H1(c) and H1(d) are shared with the state coercion-only environment.

institutions—the political environment—as exogenous. However, the elite or the rural middle class can (attempt to) alter the coercive institution(s) themselves; a political response that is not captured by the current framework. I come back to this point in the Discussion Section.

The Cotton Boom and Labor Coercion

This section introduces the empirical analysis of the effects of the cotton boom. I first describe the data. I then discuss the empirical strategy and the findings.

Data

The empirical investigation of the effects of the cotton boom is based on the 1848 and 1868 population censuses. These censuses include a wide range of variables, such as sex, age, relationship to household head, slave/free status, nationality, religion, ethnicity (e.g., black), occupation, place of residence, and place of origin. Households are clearly delineated. A household record starts with a list of its free members, followed by its (free) servants and slaves. Within each category, males are always recorded before females.[15]

The census samples are two cross-sections of around 80,000 individuals in each of 1848 and 1868. For the purpose of this article, I aggregated the samples to the household (head) level, which is a suitable level to measure slaveholdings, state coercion, and wage employment. I restrict the analysis to households residing in rural Egypt.[16] Out of the universe of 14 rural provinces (70 districts) in 1848, 8 provinces (45 districts) are missing in 1868. We do not know the reason behind this. It could be because the 1868 census was not conducted in these provinces, or because their registers did not survive. I use stratified sampling by province in each year, where I apply systematic sampling by page

[15] An example of the census return of a male slave in 1868 is: Farag al-'Abd, male, slave, able-bodied, 25 years, under the government's control (i.e., Egyptian), brown (Abyssinian), medium height, with non-connected eyebrows and no facial scars, house of Ibrahim Selim, tribe of Selim Selim (which is a sub-tribe of *Awlad Mousa*), village of *Awlad Mousa*, district of *al-'Arin*, province of *al-Sharqiya*.

[16] This means excluding urban provinces: Cairo, Alexandria, Rosetta, *Qusayr*, *'Arish*, and Damietta.

on the entire registers of each (surviving) province.[17] Because of the random sampling procedure, I observe neither the same households nor the same set of villages in each of 1848 and 1868.

I restrict the sample to households residing in the (panel of) 25 rural districts that are observed in both 1848 and 1868, in order to control for district fixed effects. This restriction results in two final cross-sectional samples of 2,469 households in 1848, and 3,321 households in 1868, residing in 504 villages in 25 "matched" districts, located within 6 provinces. Two remarks bolster my confidence in the representativeness of this restricted sample for the whole of rural Egypt. First, Appendix Table A.1 shows that households in matched districts are not statistically different from those in non-matched districts with respect to most characteristics in 1848. The exceptions are that matched districts have a higher proportion of households whose head is a slave (where all household members, including the head, are slaves), lower cotton and cereals productivity in 1877, a higher proportion of non-Muslim households, a lower proportion of Bedouin households, and a lower number of male free members per household who are 50+ years of age. I control for these characteristics (except the proportion of slave-headed households which is an outcome) in the empirical analysis. Second, throughout the analysis, I weight the observations so that the restricted sample is representative of rural Egypt.[18]

There are three outcomes of the cotton boom: slavery, wage employment, and state coercion (see H1 in the Conceptual Framework). I measure slavery at the household level by the number of slaves residing in the household, which captures the overall size of slavery, and by a dummy variable—defined among free household heads only—that equals one if the household head owns at least one slave, which captures the proportion of slave owners.[19] An individual's slave/free status is recorded in

[17] For details about the sampling, see Saleh (2013).

[18] Weights are computed as follows: Personal weights are equal to the province's population divided by its sample size. Out of the six rural provinces that are observed in both 1848 and 1868, four are in the Nile Valley and two in the Nile Delta. Individuals in the four (resp. two) matched provinces in the Valley (resp. Delta) are thus over-weighted to represent the population of the Valley (resp. Delta). Household weights are further adjusted by the province's sample average household size.

[19] Unlike in the Americas where slaves formed their own households, 90 percent of slaves in Egypt lived in their free owner's household. Table 2 and Appendix Table A.2 show that the positive effect of the cotton boom on

both 1848 and 1868, although census takers in 1868 often omitted the "slave" label (*'abd*), using other labels instead, such as "black" (*aswad*), "Sudanese" (*sudani*), and "follower" (*tabi'*). Yet, since individuals with these alternative labels are listed at the end of the household return, and do not have any blood or marriage relationships to the head, they are almost certainly slaves (Cuno 2009).

The censuses further enable me to measure the heterogeneity in slaveholdings across landholders by identifying four major social classes: the elite, the rural middle class, the peasantry, and non-landholders. First, I observe the legal form of each household's area of residence within a village. I use this information to identify areas designated as large estates that belonged to the elite, and areas outside large estates—mostly, village subsections (*hissa*)—that belonged to village headmen and the peasantry.[20] Second, for households in areas outside large estates, I use occupational titles to determine whether the household head is a village headman (i.e., rural middle class), peasant, or non-landholder. Non-landholders include landless agricultural laborers, white-collar workers, artisans, and unskilled non-agricultural workers.

I then examine the heterogeneity in slaveholdings across landholders using two datasets. Both datasets treat large estates as single area-level observations, but they differ on the level of measurement of households outside large estates: village headmen, peasants, and non-landholders. The first, landholder-level, dataset computes their slaveholdings at the household level, whereas the second, area-level, dataset aggregates their slaveholdings to the area level, and compares slavery in large estate areas to that in non-large estate areas. In both datasets, I measure slavery in large estates by the total number of slaves who resided in the estate.[21]

---

slavery is driven by the rise in the proportion of slave owners and in the number of slaves in slave-owning free-headed households. I fail to detect any effect on the proportion of "slave-headed" households where the household head and members are all slaves.

[20] The area of residence is the fourth administrative level below province, district, and village. I observe 669 areas in 504 villages in the 25 matched districts in 1848 and 1868, out of which there are 29 areas designated as large estates: 20 large estates in 1848 (16 *'uhdas* and 4 *jifliks*), and 9 in 1868 (4 *jifliks* and 5 *ib'adiyas*).

[21] Alternatively, I define slaveholdings of the large estate owner as the number of slaves in households in the estate that are headed by slaves only, obtaining very similar results.

The second outcome is the wage employment of local labor, which I measure at the household level by a dummy variable that equals one if the household head is a landless agricultural laborer. This includes both cash wage agricultural workers (*shaghal*, *tammali*) and sharecroppers (*muzari'*).

The third outcome is the state coercion of local labor, which I measure at the area level by the total local population—or, alternatively, the number of agricultural laborers—in large estates. Specifically, I examine the heterogeneity in employment of local workers across large estates (i.e., state coercion) and non-large estate areas (i.e., wage employment).[22]

The main explanatory variable is the suitability to cotton cultivation, which I measure at the district level by the cotton yield per unit of land in 1877, based on the 1877 Statistical Yearbook—the earliest official statistics on crop productivity at the district level.[23] Although cotton suitability may have evolved in response to the expansion of perennial irrigation through 1877, it was constrained by temperature and the technological feasibility of construction of summer canals. As a robustness check, I employ alternative measures of cotton suitability, including the Global Agro-Ecological Zones produced by the Food and Agriculture Organization of the United Nations (FAO-GAEZ) (see Appendix D). Figure 2 maps the cotton and cereals productivity in 1877 for the matched districts.[24]

Table 1 shows the baseline differences in 1848 across high-cotton districts, those above the median cotton productivity, and low-cotton districts. The table reveals that slavery was much larger in low-cotton districts, which is consistent with the historical evidence on employing slaves in state-owned plantations and public works in the non-cotton-growing Nile Valley, before the cotton boom (Helal 1999, pp. 110-22). High-cotton districts had a higher proportion of landless agricultural laborers, a lower proportion of self-employed peasants, a lower proportion of non-Muslims, and more free female members per household aged 41–50 years, than low-cotton districts.

---

[22] I am only able to conduct this heterogeneity analysis at the area level, because I do not observe the number of (non-household) local workers who are employed by landholders in areas outside large estates.

[23] The earliest crop productivity statistics are from Barnett (1844). *Report Transmitting Several Statistical Returns*. British Archives: F.O. 78/583, which is based on unpublished official government statistics. However, these are at the province level, and hence do not provide sufficient variation for the empirical analysis.

[24] Appendix Figure A.8 shows the cotton and cereals productivity in 1877 for all rural districts.

Empirical Specification

To test the implications of the cotton boom for slavery and wage employment (H1(a) and H1(d)), I employ a difference-in-differences strategy, where I exploit the time variation of the cotton boom and the cross-district variation in cotton productivity:

$$y_{hvdt} = \delta(cotton_d \times 1868_t) + X_{hvdt}\gamma_1 + M_{vdt}\gamma_2 + \alpha_d + \beta_t + \varepsilon_{hvdt} \quad (1)$$

where y_{hvdt} is the outcome of household h residing in village v located within district d in census year t, $cotton_d$ is the cotton productivity in district d, 1868_t is a dummy variable that equals one for the 1868 census (i.e., post the cotton boom), α_d is district fixed effects to control for district time-invariant heterogeneity, β_t is census year fixed effects to control for aggregate employment shocks in 1868, and ε_{hvdt} is an error term. Standard errors are clustered at the district level, the level of aggregation of cotton suitability. To account for the small number of clusters (25 districts), I also report randomization inference (RI) *p*-values, which do not rely on the asymptotic properties of estimators (Heß 2017). This procedure replicates the assignment process of households to districts with different levels of cotton suitability. It then re-estimates the regression under this new assignment and repeats this process 1,000 times. Finally, it constructs empirical *p*-values that represent the proportion of simulated *t*-statistics that are larger than the observed *t*-statistic in the data.[25]

The vector X_{hvdt} includes a host of household characteristics. I included two dummy variables indicating non-Muslim and Bedouin households, respectively. Non-Muslims were richer than Muslims on average, and Bedouins were granted land to settle in rural Egypt. Therefore, each group probably had more slaves, and held a different occupational distribution. I also controlled for the number of non-slave household members broken down by sex and age, which captures a household's capacity to employ unpaid household labor in agriculture—an alternative option to purchasing slaves and recruiting non-household wage labor on the market. The vector M_{vdt} includes the district-level cereals productivity in 1877 interacted with the 1868 indicator, which controls for the confounding effect of the Crimean War cereals boom in 1853–1856 (Appendix Figures A.2 and A.6), and the

[25] I employ the *t*-statistic, rather than the regression coefficient itself, because it generally performs better in simulations (MacKinnon and Webb 2020). Using the coefficient yields similar results.

village-level distance to Suez and its interaction with 1868, which capture the exposure to drafting local labor by coercion to work in the construction of the Suez Canal in 1859–1864.

The coefficient δ captures the differential growth of slavery and wage employment, in 1848–1868, across districts with different levels of cotton productivity. According to H1(a) in the Conceptual Framework, $\delta > 0$ for slavery, and according to H1(d), $\delta < 0$ for wage employment.

The validity of equation (1) rests on the parallel-trends assumption: In the absence of the cotton boom, slavery and wage employment would have evolved equally in 1848–1868 across districts with different cotton suitability levels, conditional on controls. There is no additional pre-cotton boom population census (besides the 1848 census), and hence I cannot readily test for the existence of pre-boom differential trends of outcomes by cotton suitability. Instead, I provide three pieces of evidence in support of the parallel-trends assumption. First, Table 1 shows that high-cotton districts were not statistically different from low-cotton districts in 1848, with respect to most household characteristics, which I controlled for in equation (1). Second, there were two other main shocks that occurred between 1848 and 1868, that I controlled for in equation (1): the Crimean War cereals boom in 1853–1856, that I accounted for by controlling for cereals productivity, and the construction of the Suez Canal in 1859–1864.[26] Third, Appendix C provides suggestive evidence on the parallel trends of slavery by cotton productivity before the cotton boom, where I exploit the age profiles of slaves to trace the growth of household slaveholdings over time, under the assumption that a slave is purchased at age 6 and lives up to age 50.

I then employ an augmented empirical specification that studies the heterogeneous effects of the cotton boom on slavery and local employment by landholder class (H1(b), H1(c), and H1(d)). I first use the landholder-level dataset to estimate the following model for slavery:

[26] Appendix Figures A.4 and A.5 reveal that there were no price booms between 1848 and 1868 for the other export crops: linseed, flax, sesame, sugar, and rice.

$$slaves_{lsvdt} = \sum_{s=2}^{4} \delta_s \, (landholderclass_s \times cotton_d \times 1868_t) + \delta \, (cotton_d \times 1868_t)$$

$$+ \sum_{s=2}^{4} \alpha_s \, (landholderclass_s \times cotton_d)$$

$$+ \sum_{s=2}^{4} \beta_s \, (landholderclass_s \times 1868_t) + M_{vdt}\gamma + \theta_s + \alpha_d + \beta_t + \varepsilon_{lsvdt} \quad (2)$$

where $slaves_{lsvdt}$ is the number of slaves owned by landholder l of class $s \in \{2,3,4\}$; the variable $landholderclass_s$ consists of three dummy variables that indicate peasants in areas outside large estates (s = 2), village headmen in areas outside large estates (s = 3), and large estates (s = 4), respectively; the omitted group consists of non-landholders in areas outside large estates, θ_s is landholder class fixed effects.

Next, I use the area-level dataset to estimate the following model for both slavery and the employment of local labor:

$$outcome_{avdt} = \delta_1(largeestate_a \times cotton_d \times 1868_t) + \delta(cotton_d \times 1868_t) +$$

$$\alpha_1(largeestate_a \times cotton_d) + \beta_1(largeestate_a \times 1868_t) + M_{vdt}\gamma + \theta largeestate_a +$$

$$\alpha_d + \beta_t + \varepsilon_{avdt} \quad (3)$$

where $outcome_{avdt}$ is the outcome of area a in village v in district d in census year t, and $largeestate_a$ equals 1 if area a is a large estate and equals 0 otherwise.

The coefficients δ_s in equation (2) capture the heterogeneous effect of the cotton boom on slavery by landholder class in comparison to non-landholders. The implication H1(b) predicts that this effect is largest among the rural middle class ($\delta_3 > \delta_2$; $\delta_3 > \delta_4$). The coefficients δ and δ_1 in equation (3) capture the heterogeneous effect of the cotton boom on the employment of local labor by landholder class. The implication H1(d) predicts that $\delta < 0$ for the number of agricultural laborers in areas outside large estates (i.e., lower wage employment), while H1(c) predicts that $\delta_1 > 0$ for local employment in large estates (i.e., higher state coercion).

Finally, I empirically investigate the implication H1(e) on the interdependence of slavery and state coercion during the cotton boom. I am not able to test this prediction directly, because both slavery

and state coercion are outcomes that were affected by the cotton boom, and because I do not observe the counterfactual of the slavery-only environment. Instead, I provide empirical support for this implication by examining, in a triple difference-in-differences strategy, whether rural middle-class landholders (village headmen) in cotton districts with higher state coercion, purchased more slaves during the cotton boom than their counterparts in cotton districts with lower state coercion. To mitigate the endogeneity of state coercion, I measure it in 1848, prior to the cotton boom. I now turn to the findings in the next subsection.

Findings

The findings are shown in Tables 2-4, and graphically in Appendix Figures A.9-A.13. The effect of the cotton boom on slavery is shown in Table 2. Slavery was rare in rural Egypt in 1848, with 0.05 slave per household, on average. Almost all slaves resided in households headed by freemen, only 1 percent of these households owned any slaves, and slave owners had 4.5 slaves on average. However, as predicted in H1(a), the cotton boom caused rural slavery to rise. Column 1 indicates that the boom had a positive and statistically significant effect on the number of slaves per household, and the effect is greater when adding the control variables in column 2. Districts at the third quartile of cotton yield per unit of land in 1877 (Q_3 = 1.5) (henceforth, high-cotton districts) witnessed a greater rise in the number of slaves per household in 1848–1868 by 0.19 slave, relative to districts at the first quartile (Q_1 = 0) (henceforth, low- cotton districts), which is about four times the 1848 average. Column 4 further shows that the proportion of slave owners among free-headed households in high-cotton districts increased by 7 percentage points, relative to low-cotton districts, which is seven times the proportion in 1848. Taken together, columns 2 and 4 imply that slave owners in high-cotton districts increased their slaveholdings by 2.7 slaves, on average.

According to the Conceptual Framework, this positive impact on slavery is driven by the rising demand for labor, due to the higher labor intensity of cotton.[27] A first alternative interpretation of this finding is that slavery increased because of the cotton boom-induced positive income effect. The

[27] Data from the 1939 Agricultural Census show that cotton had higher labor intensity (Appendix B).

censuses do not report the tasks of slaves, and hence I do not observe whether slaves were indeed employed as agricultural laborers. However, following Cuno (2009), Appendix Table A.3 shows that the positive effect on slavery is mostly driven by purchasing male, not female, slaves in working age, 6–20 and 21–40 years. This suggests that slaves worked in agriculture, because if the rise of slavery in cotton areas were an (pure) income effect, one would expect most slaves to be females, as in cities, where 75 percent were women presumably working as domestic servants. This male bias also comes in contrast to the balanced sex ratio of slaves in rural provinces in 1848.[28] [29]

A second alternative interpretation of the positive effect of the cotton boom on slavery is that slaves were transferred from low-cotton districts to high-cotton districts, via migration of slave owners or slave sales on secondary markets. However, the cotton boom caused an increase in Egypt's slave imports as predicted by H1(a), and not (merely) a movement of slaves within Egypt. First, household slaveholdings in low-cotton districts did not decrease in 1848–1868. Second, the black slave population tripled between 1848 and 1868.

Having established that slavery surged in cotton areas during the cotton boom, I then investigate which landholder class(es) purchased slaves. Consistent with H1(b), column 5 shows that the positive impact of the cotton boom on slaveholdings is largest among the rural middle class—village headmen in areas outside large estates. Village headmen's slaveholdings in high-cotton districts surged in 1848–1868 by 3 slaves per household, compared to their counterparts in low-cotton districts. By contrast, the impact on slaveholdings among owners of large estates is negative, suggesting that the rise in slaveholdings is indeed driven by the rural middle class. The negative effect on slaveholdings in large estates can be probably explained by the rise in coercion of local workers, which I discuss

[28] There was no supply shortage of female slaves during this period. In fact, the female slave population in cities doubled between 1848 and 1868, suggesting that new female slaves were imported.

[29] The employment of male slaves in agriculture, and particularly cotton cultivation, may be surprising, given that women had a comparative advantage in cotton picking in both the U.S. South (Goldin and Sokoloff 1984) and Egypt (Owen 1969, pp. 30-31). It is plausible, however, that free female household members were employed in cotton picking, whereas male slaves were employed in land preparation, sowing, and the construction and maintenance of summer canals, waterwheels, and steam engines for summer irrigation.

below. Furthermore, I obtain similar results, when I estimate the regression at the area level in column 6, where I find that the positive impact on slaveholdings is driven by landholders in non-large estate areas, i.e., non-elite landholders who include the rural middle class.

Table 3 shows the effect of the cotton boom on wage employment and state coercion of local labor. Consistent with H1(d), columns 1 and 2 demonstrate that the cotton boom had a negative and statistically significant impact on wage employment. High-cotton districts witnessed a 13-percentage point decrease in the proportion of agricultural laborers in 1848–1868, relative to low-cotton districts.[30] Columns 3 and 4 show the heterogeneous effects on the employment of local labor across large estates and non-large estate areas. Consistent with H1(c), column 3 shows that the cotton boom had a positive and statistically significant effect on the employment of local labor in large estates.[31] Large estates in high-cotton districts increased their local labor force in 1848–1868 by 61 individuals, on average, relative to large estates in low-cotton districts. As the proportion of the population of large estates declined from 7 percent in 1848 to 3 percent in 1868, this finding implies that large estates became fewer, but larger in size.[32] Furthermore, column 4 shows a negative effect on the number of agricultural laborers in non-large estate areas, as predicted by H1(d), and a positive, yet statistically insignificant, effect on the number of agricultural laborers in large estates.

According to the Conceptual Framework, the increased employment of local labor in large estates during the cotton boom was via state coercion, and not wage recruitment on the market. Two pieces of evidence support this interpretation. First, the legal form distribution of large estates shifted to more coercive forms between 1848 and 1868, from *'uhdas*, where 86 percent of the population of large estates resided in 1848, to *jifliks*, which had 73 percent of the population of large estates in 1868.

[30] Appendix Table A.4 further shows a negative impact on the employment share of the non-agricultural sector. However, this shift is mirrored in a positive effect on the proportion of self-employed peasants, not agricultural laborers, which is probably attributable to the land expansion during the cotton boom (see Appendix E).

[31] Randomization inference *p*-value shows that this coefficient is not statistically significant, though, probably because of the small number of large estates in the sample.

[32] Appendix Table A.5 further demonstrates that large estates in high-cotton districts did not gain population by attracting immigrants from other villages, but rather by having larger local labor force of village natives.

Whereas *'uhdas* were temporary confiscations of tax-arrears land that were eventually dissolved and returned back to the peasantry in the 1860s as they paid back their taxes (Cuno 1992, pp. 157-160), *jifliks* were permanent confiscations of tax-paying land. Second, because of their more coercive nature, *jifliks* probably necessitated a higher use of state violence. Indeed, all *jifliks* in 1868 belonged to Khedive Ismail himself, which must have made it harder for local workers to flee. Furthermore, *jifliks* recruited more soldiers and guards, probably to subdue local workers. Column 5 reveals a positive and statistically significant impact of the cotton boom on the number of soldiers and guards in large estates. These soldiers likely implemented the confiscation of the tax-paying land and maintained continuous presence on the ground to suppress any emerging dissent.

Taken together, the decline in wage employment, despite the rising demand for local labor, can be explained by the decline in labor supply due to state coercion. Consequently, the national-level average daily cash wages of agricultural laborers increased from 0.72 piasters in 1840–1841 (Al-Hitta 1950, pp. 91-5) to 1.85 piasters in 1873 according to the 1873 Statistical Yearbook (p. 269).

The results on the interdependence of slavery and state coercion (H1(e)) are shown in Table 4. Consistent with H1(e), the findings reveal that rural middle-class landholders (village headmen) in cotton districts that were exposed to higher state coercion in 1848 purchased more slaves during the cotton boom than those in cotton districts with lower state coercion. This indicates that state coercion reinforced slavery during the cotton boom.

I conduct several robustness checks for the effects on slavery and wage employment, which I describe in Appendix D. I also demonstrate in Appendix E that the effects of the cotton boom on slavery and wage employment are driven by the expansion in cotton cultivation. However, this is not to say that labor coercion was necessary for cotton cultivation (see Appendix E).

Having described the effects of the cotton boom on slavery, state coercion, and wage employment, I examine in the next section the effects of the abolition of slavery.

The Abolition of Slavery

In the previous section, I showed that the cotton boom caused an increase in slavery and state

coercion, and a decline in wage employment. About a decade later, Egypt abolished slavery and emancipated its slave population. In this section, I examine the effects of this selective abolition of slavery on state coercion, wage employment, and wages.

Data

To investigate the impact of the abolition, I complement the 1848 and 1868 censuses with the subsequent published censuses of 1882, 1897, 1907, and 1917. These censuses enable me to measure state coercion and wage employment at the district level. In particular, the proportion of the population in large estates is observed in 1848, 1868, 1882, and 1897.[33] The proportion of agricultural laborers—including, cash wage agricultural laborers, tenants, and sharecroppers—is observed in 1848, 1868, 1907, and 1917. The censuses also record the ex-slave population, which enables me to test the assumption that ex-slaves emigrated back to the Nilotic Sudan, or gradually disappeared over time as they died without children. The proportion of (ex-)slaves is observed in 1848 and 1868 and is proxied by the proportion of the Sudanese population in 1882, 1907, and 1917.[34] I also provide suggestive province-level evidence on wages, as laborers' average nominal daily wages in Egyptian piasters are observed for agricultural laborers in 1873 from the 1873 Statistical Yearbook, and for unskilled construction laborers in 1903, 1908, and 1913 from the 1914 Statistical Yearbook. However, the evidence on wages must be interpreted with caution, due to the small number of provinces.

Empirical Specification

I exploit the variation across districts in the extent of slavery in 1868, on the eve of the abolition, and the time variation of the abolition, where I estimate the following model:

$$y_{dt} = \delta\left(Slavery_{d,1868} \times Post1877_t\right) + \gamma(X_d \times Post1877_t) + \alpha_d + \beta_t + \varepsilon_{dt} \quad (4)$$

where y_{dt} is the outcome of district d in census year t, $Slavery_{d,1868}$ is the proportion of slaves

[33] All proportions are measured out of the district's total population including (ex-)slaves.

[34] While there was a sizable free Sudanese population in cities, almost all Sudanese people in rural Egypt were brought in as slaves.

in district d in 1868, $Post1877_t$ is a dummy variable that equals one for the post-1877 period, α_d and β_t are district and census year fixed effects, respectively. Standard errors are clustered at the district level. I also report randomization inference *p*-values.

The vector X_d consists of time-invariant characteristics of districts: the initial value of the dependent variable in 1848, the proportion of slaves in 1848, the district's cereals productivity, and the district's distance to Suez. To account for the potential endogeneity of slavery in 1868, I employ the interaction of the district's cotton productivity with the post-1877 indicator, as an instrumental variable for $Slavery_{d,1868} \times Post1877_t$.

The coefficient δ compares the evolution of outcomes before and after the abolition across districts with different levels of reliance on slavery in 1868. H2(a) predicts that $\delta > 0$ for the proportion of the population in large estates: The abolition of slavery has a positive effect on state coercion of local workers. H2(b) predicts that $\delta < 0$ for the proportion of agricultural laborers, because the rise in state coercion will further reduce wage employment. The Conceptual Framework also predicts (by assumption) that $\delta < 0$ for the ex-slave population. Finally, H2(c) predicts that $\delta > 0$ for wages.

Findings

The results are shown in Table 5, and graphically in Appendix Figures A.14-A.16. Columns 1 and 2 show the effect of the abolition on state coercion of local workers. While the OLS and IV estimates are both positive, which is consistent with H2(a), they are not statistically significant. Similarly, columns 3 and 4 reveal that the abolition had a negative effect on wage employment, which is consistent with H2(b), but the effect is not statistically significant. This suggests that while the positive effect of the abolition on state coercion, and its negative effect on wage employment, may have been at play, these effects were muted and not statistically significant. I interpret these findings in the Discussion Section.

I investigate the effect of the abolition on the proportion of emancipated slaves in columns 5 and 6, finding a negative and statistically significant impact, which is consistent with the assumption of the

Conceptual Framework that emancipated slaves did not become agricultural laborers. At the aggregate level, the Sudanese population in rural Egypt first increased between 1848 and 1868, remained constant through 1882, and then witnessed a secular decline from 149,312 in 1882 to 24,766 in 1917.[35] The results in columns 5 and 6 further indicate that this post-1877 decline in the ex-slave population was greater in high-cotton districts. This negative effect can be explained by three mechanisms: (1) emigration: ex-slaves may have returned to the Nilotic Sudan, (2) gradual disappearance: first-generation slaves, who were mostly males, may have died without offspring, and (3) assimilation: descendants of slaves may have increasingly self-identified as Egyptians in the population censuses. Because assimilation of ex-slaves is unlikely to vary across districts by cotton suitability, and because the ex-slave population did not decline in 1868–1882 and decreased only gradually thereafter, suggesting that there was no sudden large emigration wave after the abolition, the negative effect on the ex-slave population is probably explained by the gradual disappearance of slaves that was larger in high-cotton districts. Since the sex ratio of slaves in these districts was more male-biased than in low-cotton districts (Appendix Table A.3), slaves probably died without children, which was exacerbated by the low life expectancy of slaves (Lovejoy 2012, pp. 7-8). This phenomenon—the disappearance of slaves in the long run—has been noted before for the whole Middle East by various scholars including Wright (2007, p. 22) who noted that "most of these people [enslaved blacks] seem to have disappeared without trace," and attributed the phenomenon to the low marriage rate of slaves and their low life expectancy. That said, I am not able to rule out both emigration to Sudan and assimilation as potential mechanisms at play.

Finally, columns 7 and 8 show that the abolition had a positive effect on wages, which is consistent with H2(c). The evidence is only suggestive, though, because of the small number of provinces.

[35] The numbers and percentages of Sudanese in rural Egypt are as follows: 1848: 40,453 (1 percent), 1868: 144,592 (2.9 percent), 1882: 149,312 (2.5 percent), 1907: 39,603 (0.4 percent), 1917: 24,766 (0.3 percent). The decline in the Sudanese population between 1882 and 1917 suggests that there was a real decline in illegal slavery. Both Baer (1967) and Fredriksen (1977) suggest that the enforcement of the abolition was neither perfect nor immediate. However, the post-1877 census data on the Sudanese population probably provide an upper bound on the size of slavery.

To summarize, the abolition of slavery did not have a statistically significant effect on state coercion and wage employment. However, it did have a negative effect on the ex-slave population, which can be due to gradual disappearance, emigration, or assimilation, and a positive effect on wages (subject to the caveat of the small number of provinces). I turn in the next section to a discussion of the empirical findings for both the cotton boom and the abolition.

Discussion

The empirical results are mostly consistent with the implications of the Conceptual Framework under the dual-coercion environment. The empirical evidence supports the implications H1(a)– H1(e) of the cotton boom. The cotton boom in 1861–1865 caused a surge in slavery, that was driven by the rising demand for slaves among rural middle-class landholders, not the elite. It also increased state coercion in large estates, and reduced wage employment. Furthermore, among cotton districts, rural middle-class landholders in districts with higher levels of state coercion in 1848 purchased more slaves during the cotton boom, relative to their counterparts in cotton districts with lower levels of state coercion, suggesting that state coercion reinforced slavery during the cotton boom. However, the empirical evidence on the abolition of slavery is mixed. On the one hand, the abolition caused wages to rise, as predicted by H2(c). On the other hand, however, I fail to find supportive evidence of H2(a) and H2(b) that predict the abolition of slavery increased state coercion, and reduced wage employment. In this section, I discuss the political response by the rural middle class to the abolition, as a potential reason behind these two latter findings.

Specifically, I argue that these two findings can be explained by the *political* effects of the abolition of slavery. Because the rural middle class lost access to slavery following the abolition, they politically pushed for lower state coercion, as they had to compete with the elite over the same scarce local labor. This political effect of the abolition probably countervailed its economic effects, namely the abolition-induced rise of state coercion and the decline of wage employment. By contrast, during the cotton boom, the argument goes, the economic and political effects likely operated in the same direction: Economically, the cotton boom caused a rise in state coercion by the elite and a decline in wage

employment. Politically, the presence of slavery mitigated the political resistance of the rural middle class to state coercion, inducing the elite to coerce more local workers than under the state coercion-only environment.

The Egyptian parliamentary minutes during the precolonial period in 1866–1882 provide suggestive evidence in support of this explanation. The parliament during this period was almost entirely dominated by rural middle-class (village headmen) MPs. These parliamentary minutes thus provide a rare data source to observe the political attitudes of the rural middle class.[36] I used this source to investigate whether rural middle-class MPs from cotton districts became more likely to push for lower state coercion after the abolition of slavery in 1877, relative to their counterparts from non-cotton districts. To do so, I first limited the analysis to rural middle-class MPs. I then identified MP speeches on labor-related topics, and I manually classified these speeches into (1) anti-state coercion speeches, (2) pro-state coercion or neutral speeches, and (3) other labor-related speeches. Finally, I measured the political resistance to state coercion of local labor, at the MP and parliamentary cycle level, by the total length (word count) of anti-state coercion speeches. The results are in Appendix Table F.1, which shows that rural middle-class MPs from high-cotton districts made longer anti-state coercion speeches *after* the abolition, relative to their counterparts from low-cotton districts, and the effect is statistically significant at the 10-percent level (column 2). This suggests that the abolition of slavery increased the political pressure by rural middle-class MPs against state coercion, which may have countervailed the positive economic effect of the abolition of slavery on state coercion.

However, this evidence remains suggestive. First, it is based on the manual classification of attitudes of MP labor-related speeches which may be subject to bias. Second, the effect, if any, is weak being significant at 10 percent only. Third, even if there were an effect on MP speeches, this does not prove that it was MP pressure that mitigated state coercion post 1877. Specifically, the period 1876–1882 witnessed major political events including Egypt's default in 1876, the Urabi uprising against the Khedive in 1879–1882, the parliamentary demand for oversight in 1879–1882, and the British occupation in 1882 that defeated the uprising and established colonial rule that lasted until 1922.

[36] I refer the reader to Appendix F for details about the data source.

These major events may have affected state coercion beyond MP resistance.

Conclusion

This article analyzed the effect of international trade on labor coercion in nineteenth-century rural Egypt, when there were dual coercive institutions—slavery and state coercion—and after slavery was abolished. Using a wide range of novel data sources, I documented that both systems of labor coercion grew in the 1860s due to the cotton boom. The elite increased their coercion of local workers using state violence, wage employment went down, and the rural middle class, facing an increasingly scarce local labor supply due to the rise in state coercion, purchased more slaves. While the abolition of slavery increased wages and reduced the ex-slave population, it did not affect state coercion or wage employment, potentially because of the rising political pressure by rural middle-class MPs against state coercion.

This article opens new areas of future research. First, while this article studied slavery and state coercion as outcomes of the cotton boom and the abolition of slavery, examining the reverse causal relationship—the effect of labor coercion or its abolition on cotton production—is an exciting area for future research. The role of labor coercion in agricultural production has been strongly debated in the scholarship on American slavery and European serfdom. Examining differences in productivity per worker across slaves, local workers in large estates, and wage workers outside large estates, and how productivity was impacted by the abolition of slavery, will shed new light on this question.

Second, the rural intra-elite conflict over factors of production, and its effect on democratization, is commonplace in the Global South. For example, the rural middle class played an important role in the democratization of Latin America during the nineteenth century, because of their conflict over labor and land with the incumbent elite. This agrarian conflict fundamentally differs from the historical experience of Western democracies, where democratization emerged because an economically rising, yet politically disenfranchised, industrialist bourgeoisie demanded power-sharing with the incumbent aristocracy. Understanding this rural intra-elite conflict in nineteenth-century Egypt will broaden our knowledge of this phenomenon, and I examine this question in other work.

Finally, this article raises the question of when international trade can transmit welfare enhancing institutions (e.g., abolition) or welfare reducing institutions (e.g., labor coercion). Investigating this broader question from both theoretical and empirical perspectives is another exciting area for future research.

References

Acemoglu, Daron, Camilo Garcia-Jimeno, and James A. Robinson. "Finding Eldorado: Slavery and Long-run Development in Colombia." *Journal of Comparative Economics* 40, no. 4 (2012): 534–64.

Acemoglu, Daron, and Alexander Wolitzky. "The Economics of Labor Coercion." Econometrica 79, no. 2 (2011): 555–600.

Ager, Philipp, Leah Boustan, and Katherine Eriksson. "The Intergenerational Effects of a Large Wealth Shock: White Southerners after the Civil War." *American Economic Review* 111, no. 11 (2021): 3767– 94.

Al-Hitta, A. Ahmed. *Tarikh al-zira'a al-misriya fi 'ahd Muhammad Ali al-Kabir (History of Egyptian Agriculture under Muhammad Ali)*. Cairo: Dar Al-Ma'arif, 1950.

Austen, Ralph A. "The Mediterranean Islamic Slave Trade out of Africa: A Tentative Census." *Slavery and Abolition* 13, no. 1 (1992): 214–48.

Baer, Gabriel. *A History of Landownership in Modern Egypt, 1800-1950*. Oxford: Oxford University Press, 1962.

_____. "Slavery in Nineteenth Century Egypt." *Journal of African History* 8, no. 3 (1967): 417– 41.

Barakat, Ali. *Tatawur al-milkiya al-zira'iya fi misr wa atharuhu 'ala al-haraka al- siasiya, 1813-1914 (Evolution of Agricultural Landownership in Egypt and Its Effect on Political Movements, 1813-1914)*. Cairo: Dar al-Thaqafa al-Jadida, 1977.

Beckert, Sven. *Empire of Cotton: A Global History*. New York: Alfred A. Knopf, 2015.

Bobonis, Gustavo J., and Peter M. Morrow. "Labor Coercion and the Accumulation of Human Capital." *Journal of Development Economics* 108 (2014): 32–53.

Brenner, Robert. "Agrarian Class Structure and Economic Development in Pre-Industrial Europe." *Past & Present* 70, no. 1 (1976): 30–75.

Cuno, Kenneth M. *The Pasha's Peasants: Land, Society, and Economy in Lower Egypt 1740-1858*. Cambridge: Cambridge University Press, 1992.

_____. "African Slaves in 19th-Century Rural Egypt." *International Journal of Middle East Studies* 41, no. 2 (2009): 186–88.

Dell, Melissa. "The Persistent Effects of Peru's Mining Mita." *Econometrica* 78, no. 6 (2010): 1863–1903.

Dell, Melissa, and Benjamin A. Olken. "The Development Effects of the Extractive Colonial Economy: The Dutch Cultivation System in Java." *The Review of Economic Studies* 87, no. 1 (2020): 164– 203.

Dippel, Chirstian, Avner Greif, and Daniel Trefler (2020). "Outside Options, Coercion, and Wages: Removing the Sugar Coating." *The Economic Journal*, 130, no. 630: 1678–1714.

Domar, Evsey D. "The Causes of Slavery or Serfdom: A Hypothesis." *Journal of Economic History* 30, no. 1 (1970): 18–32.

Earle, Edward Mead. "Egyptian Cotton and the American Civil War." *Political Science Quarterly* 41, no. 4 (1926): 520–45.

Engerman, Stanley L., and Kenneth L. Sokoloff. "Factor Endowments, Institutions, and Differential Paths of Growth Among New World Economies." In *How Latin America Fell Behind: Essays on the Economic Histories of Brazil and Mexico, 1800-1914*, edited by Stephen H. Haber, 260–304. Stanford: Stanford University Press, 1997.

Fenoaltea, Stefano. "Slavery and Supervision in Comparative Perspective: A Model." *Journal of Economic History* 44, no. 3 (1984): 635–68.

Fogel, Robert. *Without Consent or Contract: The Rise and Fall of American Slavery*. New York: W. W. Norton, 1989.

Fogel, Robert, and Stanley L. Engerman. *Time on the Cross: The Economics of American Negro Slavery*. Boston: Little, Brown and Co, 1974.

Fredriksen, Borge. *Slavery and Its Abolition in Nineteenth-Century Egypt*. Bergen, Norway: Historisk Institutt Universitetet I Bergen, 1977.

Galenson, David W. "The Rise and Fall of Indentured Servitude in the Americas: An Economic

Analysis." *Journal of Economic History* 44, no. 1 (1984): 1–26.

Goldin, Claudia, and Kenneth L. Sokoloff. "The Relative Productivity Hypothesis of Industrialization." *Quarterly Journal of Economics* 99, no. 3 (1984): 461–87.

Guzowski, Piotr. "The Influence of Exports on Grain Production on Polish Royal Demesne Farms in the Second Half of the Sixteenth Century." *Agricultural History Review* 59, no. 2 (2011): 312–27.

Helal, Emad A. *Al-raqiq fi misr fil qarn al-tasi' ashar (Slavery in Egypt in the Nineteenth Century)*. Cairo: Dar al-Arabi Publishing House, 1999.

Hellie, Richard. "Russian Slavery and Serfdom, 1450–1804." In *The Cambridge World History of Slavery Volume 3*, edited by David Eltis and Stanley L. Engerman, 275–96. Cambridge: Cambridge University Press, 2011.

Heß, Simon. "Randomization Inference with Stata: A Guide and Software." *The Stata Journal* 17, no. 3 (2017): 630–51.

Lovejoy, Paul E. *Transformations in Slavery: A History of Slavery in Africa*. New York: Cambridge University Press, 2012.

MacKinnon, James G., and Matthew D. Webb. "Randomization Inference for Difference-in-Differences with Few Treated Clusters." *Journal of Econometrics* 218, no. 2 (2020): 435–50.

Małowist, Marian. "Poland, Russia and Western Trade in the 15th and 16th Centuries." *Past & Present* 13 (1958): 26–41.

Markevich, Andrei, and Ekaterina Zhuravskaya. "The Economic Effects of the Abolition of Serfdom: Evidence from the Russian Empire." *American Economic Review* 108, no. 4-5 (2018): 1074–1117.

Marx, Karl. "The North American Civil War." In *Marx/Engels Collected Works, Volume 19*. Moscow: Progress Publishers, 1964. First published in Die Presse, no. 293, October 25, 1861.

Mowafi, Reda. *Slavery, Slave Trade and Abolition Attempts in Egypt and the Sudan 1820- 1882*. Stockholm: Esselte Studium, 1981.

Naidu, Suresh, and Noam Yuchtman. "Coercive Contract Enforcement: Law and the Labor Market in Nineteenth Century Industrial Britain." *American Economic Review* 103, no. 1 (2013): 107–44.

North, Douglass C., and Robert Paul Thomas. *The Rise of the Western World: A New Economic History*. Cambridge: Cambridge University Press, 1973.

Nunn, Nathan. “The Long-Term Effects of Africa’s Slave Trades.” *Quarterly Journal of Economics* 123, no. 1 (2008): 139–176.

Nunn, Nathan, and Leonard Wantchekon. “The Slave Trade and the Origins of Mistrust in Africa.” *American Economic Review* 101, no. 7 (2011): 3221–52.

Ogilvie, Sheilagh, and Alexander Klein. “Was Domar Right? Serfdom and Factor Endowments in Bohemia.” CEPR Discussion Paper No. 12388, CEPR Press, Paris & London, 2017.

Owen, Robert. *Cotton and the Egyptian Economy 1820-1914: A Study in Trade and Development*. Oxford: The Clarendon Press, 1969.

Richards, Alan R. “Land and Labor on Egyptian Cotton Farms, 1882-1940.” *Agricultural History* 52, no. 4 (1978): 503–18.

_____. “Agricultural Mechanization in Egypt: Hopes and Fears.” *International Journal of Middle East Studies* 13, no. 4 (1981): 409–25.

Rivlin, Helen Anne B. *The Agricultural Policy of Muhammad ’Ali in Egypt*. Cambridge, MA: Harvard University Press, 1961.

Saleh, Mohamed. “A Pre-Colonial Population Brought to Light: Digitization of the Nineteenth-Century Egyptian Censuses.” *Historical Methods: A Journal of Quantitative and Interdisciplinary History* 46, no. 1 (2013): 5–18.

Wright, John. *The Trans-Saharan Slave Trade*. New York: Routledge, 2007.

Table 1: Baseline Differences in 1848 by Cotton Productivity in 1877

	Low Cotton			High Cotton			
	N	Mean	SD	N	Mean	SD	Diff
Number of slaves and blacks in HH	1129	0.09	0.89	929	0.02	0.28	–0.071***
=1 if slave-owning free-headed HH	1126	0.02	0.14	925	0.00	0.07	–0.015**
Number of slaves and blacks in free-headed HH	1126	0.09	0.88	925	0.01	0.18	–0.076***
=1 if slave-headed HH	1129	0.00	0.05	929	0.00	0.07	0.002
=1 if HH head peasant	830	0.59	0.49	544	0.48	0.5	–0.157**
=1 if HH head landless agr. laborer	830	0.04	0.2	544	0.16	0.37	0.117
=1 if HH head village headman	830	0.03	0.18	544	0.02	0.15	–0.012
=1 if HH head white-collar worker	830	0.07	0.26	544	0.08	0.27	0.016
=1 if HH head artisan	830	0.09	0.29	544	0.07	0.26	–0.015
=1 if HH head unskilled non-agr. laborer	830	0.17	0.37	544	0.19	0.39	0.051
Cotton yield (*qintars*) per *feddan* in 1877	1129	0.42	0.53	929	1.82	0.39	1.388***
Cereals and beans yield (*ardabbs*) per *feddan* in 1877	1129	2.39	0.46	929	2.20	0.55	–0.091
=1 if HH head non-Muslim	1125	0.14	0.35	922	0.02	0.13	–0.118***
=1 if HH head Bedouin	1129	0.01	0.1	929	0.00	0.06	–0.008
Number of free males 0-5 in HH	1129	0.65	0.99	929	0.64	0.99	–0.024
Number of free males 6-10 in HH	1129	0.36	0.66	929	0.37	0.64	0.001
Number of free males 11-20 in HH	1129	0.31	0.62	929	0.36	0.63	0.047
Number of free males 21-30 in HH	1129	0.35	0.79	929	0.37	0.57	0.025
Number of free males 31-40 in HH	1129	0.32	0.62	929	0.29	0.5	–0.025
Number of free males 41-50 in HH	1129	0.21	0.43	929	0.24	0.44	0.024
Number of free males 50+ in HH	1129	0.32	0.51	929	0.32	0.51	0.002
Number of free females 0-5 in HH	1129	0.66	1.00	929	0.63	0.89	–0.034
Number of free females 6-10 in HH	1129	0.27	0.55	929	0.25	0.52	–0.023
Number of free females 11-20 in HH	1129	0.34	0.65	929	0.32	0.57	–0.021
Number of free females 21-30 in HH	1129	0.50	0.68	929	0.47	0.65	–0.013
Number of free females 31-40 in HH	1129	0.34	0.55	929	0.30	0.53	–0.04
Number of free females 41-50 in HH	1129	0.18	0.41	929	0.22	0.43	0.041**
Number of free females 50+ in HH	1129	0.31	0.53	929	0.35	0.57	0.053

Notes: The sample is restricted to households residing in matched rural districts in 1848. The "Diff" column reports the coefficient of the following household-level regression in 1848: $y_{hd} = \alpha_1 + \alpha_2 HighCotton_d + \varepsilon_{hd}$, where y_{hd} is the outcome of household h residing in district d, and $HighCotton_d$ =1 if the household's district of residence is above the median cotton productivity in 1877. Regressions are weighted by household weights. Standard errors are clustered at the district level. $* \ p < 0.10$, $** \ p < 0.05$, $*** \ p < 0.01$.
Sources: The 1848 census sample. Data on crop productivity in 1877 are from the 1877 Statistical Yearbook.

Table 2: The Cotton Boom and Slavery

	Household-Level				Landholder-Level	Area-Level
	(1)	(2)	(3)	(4)	(5)	(6)
	N. Slaves	N. Slaves	=1 if Slaveowner	=1 if Slaveowner	N. Slaves	N. Slaves
Cotton × 1868	0.11***	0.13***	0.04***	0.05***	0.07*	1.28***
	(0.04)	(0.02)	(0.01)	(0.01)	(0.04)	(0.40)
Large Estate × Cotton × 1868					–2.19***	–3.27***
					(0.27)	(0.42)
Village Headman × Cotton × 1868					2.22***	
					(0.63)	
Peasant × Cotton × 1868					0.01	
					(0.05)	
Household Controls	No	Yes	No	Yes	No	No
District Controls	No	Yes	No	Yes	Yes	Yes
Landholder Class Fixed Effects	No	No	No	No	Yes	Yes
Landholder Class FEs × Cotton	No	No	No	No	Yes	Yes
Landholder Class FEs × 1868	No	No	No	No	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Census Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clusters (Districts)	25	25	25	25	25	25
Observations	5790	5736	5760	5723	3900	669
R^2	0.02	0.09	0.05	0.13	0.35	0.18
Av. Dep. Var. in 1848	0.05	0.05	0.01	0.01	0.07	0.36
$\Pr(\lvert t^{RI:\ \text{Cotton}\times 1868}\rvert > \lvert t^{Study}\rvert)$	0.06	0.00	0.02	0.00	0.42	0.00
$\Pr(\lvert t^{RI:\ \text{L. Estate}\times\text{Cotton}\times 1868}\rvert > \lvert t^{Study}\rvert)$					0.03	0.01
$\Pr(\lvert t^{RI:\ \text{V. Headman}\times\text{Cotton}\times 1868}\rvert > \lvert t^{Study}\rvert)$					0.02	
$\Pr(\lvert t^{RI:\ \text{Peasant}\times\text{Cotton}\times 1868}\rvert > \lvert t^{Study}\rvert)$					0.53	

Notes: The sample is restricted to 25 rural districts that are observed in both 1848 and 1868. The sample in columns 3–4 is further restricted to households with a free head. The omitted group is non-landholders in non-large estate areas in column 5, and non-large estate areas in column 6. Household controls are: =1 if household head is non-Muslim, =1 if household head is Bedouin, the number of household free members broken down by sex and age. District controls are the interaction of the district-level cereals productivity in 1877 with the 1868 indicator, the village's distance to Suez, and its interaction with 1868. Regressions are weighted by household weights in columns 1–5 (in column 5, the weight of large estates is equal to the sum of household weights in the area), and by the sum of household weights in the area in column 6. Standard errors clustered at the district level are in parentheses. $*\ p < 0.10$, $**\ p < 0.05$, $***\ p < 0.01$. The probabilities (Pr) refer to the randomization inference p-values.
Sources: The 1848 and 1868 population census samples. Data on cotton and cereals suitability are from the 1877 Statistical Yearbook.

Table 3: The Cotton Boom, Wage Employment, and State Coercion of Local Labor

	Household-Level		Area-Level		
	(1) =1 if HH Head Ag. Laborer	(2) =1 if HH Head Ag. Laborer	(3) Local Population	(4) N. Agr. Laborers	(5) N. Soldiers & Guards
Cotton × 1868	-0.11***	-0.11***	3.99	-7.14*	-0.15
	(0.04)	(0.04)	(10.56)	(3.68)	(0.36)
Large Estate × Cotton × 1868			41.56***	3.71	1.33***
			(11.88)	(3.72)	(0.37)
Household Controls	No	Yes	No	No	No
District Controls	No	Yes	Yes	Yes	Yes
Large Estate Fixed Effect	No	No	Yes	Yes	Yes
Large Estate × Cotton	No	No	Yes	Yes	Yes
Large Estate × 1868	No	No	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes
Census Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Clusters (Districts)	25	25	25	25	25
Observations	3997	3985	669	669	669
R^2	0.18	0.19	0.34	0.20	0.32
Av. Dep. Var. in 1848	0.10	0.10	63.16	4.84	0.25
$\Pr(\lvert t^{RI:\ \text{Cotton}\times 1868}\rvert > \lvert t^{Study}\rvert)$	0.00	0.00	0.89	0.00	0.81
$\Pr(\lvert t^{RI:\ \text{L. Estate}\times\text{Cotton}\times 1868}\rvert > \lvert t^{Study}\rvert)$			0.37	0.87	0.11

Notes: The sample in columns 1–2 is restricted to households with a free head. Household and district controls are the same as in Table 2. Regressions in columns 1–2 are weighted by household weights. Regressions in columns 3–5 are weighted by the sum of household weights in the area. Standard errors clustered at the district level are in parentheses. $*\ p < 0.10$, $**\ p < 0.05$, $***\ p < 0.01$. The probabilities (Pr) refer to the randomization inference p-values. Sources: See the sources of Table 2.

Table 4: State Coercion Reinforced Slavery During the Cotton Boom

	State Coercion in District in 1848 Measured by:		
	(1) =1 if At Least One Large Estate	(2) Population of Large Estates	(3) N. Agr. Laborers in Large Estates
State Coercion in 1848 × Cotton × 1868	3.17***	0.05***	0.60***
	(0.98)	(0.02)	(0.04)
Cotton × 1868	2.82***	2.36***	2.49***
	(0.62)	(0.67)	(0.68)
State Coercion in 1848 × 1868	-6.16***	-0.09*	-1.13***
	(1.44)	(0.05)	(0.10)
Controls	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes
Census Year Fixed Effects	Yes	Yes	Yes
Clusters (Districts)	22	22	22
Observations (Households)	123	123	123
R^2	0.34	0.33	0.33
Baseline Av. Dep. Var.	1.13	1.13	1.13
$\Pr(\lvert t^{RI:\ \text{Cotton}\times 1868}\rvert > \lvert t^{Study}\rvert)$	0.05	0.08	0.03
$\Pr(\lvert t^{RI:\ \text{State Coercion}\times\text{Cotton}\times 1868}\rvert > \lvert t^{Study}\rvert)$	0.11	0.02	0.17

Notes: The dependent variable is the number of slaves in the (rural middle-class) household. The sample is restricted to village headmen. State coercion in district in 1848 is measured by a dummy variable =1 if there was at least one large estate (column 1), the population of large estates (column 2), and the number of agricultural laborers in large estates (column 3). Regressions are weighted by household weights. Controls are the cereals suitability interacted with the 1868 dummy variable. Standard errors clustered at the district level are in parentheses. $*\ p < 0.10$, $**\ p < 0.05$, $***\ p < 0.01$. The probabilities (Pr) refer to the randomization inference p-values. Sources: See the sources of Table 2.

Table 5: Impact of the Abolition of Slavery on State Coercion, Wage Employment, and Wages

	Prop. Population Large Estates		Prop. Agr. Laborers		Prop. (Ex-)slaves		Av. Daily Wage	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Prop. Slaves 1868 × Post-1877	0.56	1.22	-0.25	-2.11	-0.48***	-0.53***	13.51***	13.51***
	(0.97)	(4.34)	(0.42)	(3.07)	(0.02)	(0.12)	(0.00)	(0.00)
Prop. Slaves 1848 × Post-1877	-0.55	-0.28	1.76***	0.84	-0.52***	-0.54***		
	(1.20)	(1.99)	(0.52)	(1.35)	(0.02)	(0.06)		
District Controls × Post-1877	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Outcome in 1848 × Post-1877	Yes	Yes	Yes	Yes	No	No	No	No
District/Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Census Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters (Districts/Provinces)	25	25	25	25	25	25	6	6
Observations (District/Province-Year)	98	98	93	93	118	118	21	21
KP Wald *F*-stat		1.27		1.05		2.02		.
Av. Dep. Var. in 1848	0.13	0.13	0.09	0.09	0.01	0.01	1.58	1.58
Pr($\lvert t^{RI:\ \text{Slavery1868} \times \text{Post-1877}} \rvert > \lvert t^{Study} \rvert$)	0.60	0.60	0.60	0.23	0.00	0.28	0.14	0.64

Notes: Regressions are at the district-year level in columns 1–6, and at the province-year level in columns 7–8. Standard errors are in parentheses, clustered at the district level in columns 1–6, and at the province level in columns 7–8. The IV regressions employ the interaction of the post-1877 dummy variable with the district's (province's) cotton productivity as an IV. $*\ p < 0.10$, $**\ p < 0.05$, $***\ p < 0.01$. The probabilities (Pr) refer to the randomization inference *p*-values.
Sources: The 1848 and 1868 population census samples, and the 1882, 1897, 1907, and 1917 population censuses. Wages are from the 1873 and 1914 Statistical Yearbooks.

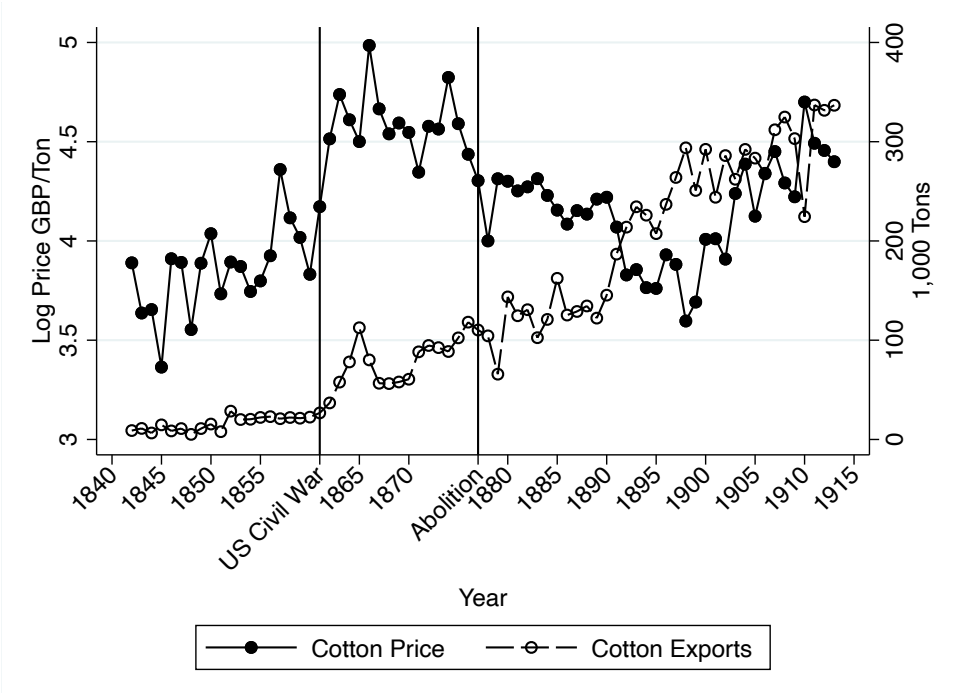

Figure 1: Prices and Exports of Egyptian Cotton in 1842–1913

Notes: Quantities were originally in *qintars*, which I converted into tons according to the rate in Owen (1969, pp. 381-385). Prices were originally in Austrian *thalers* or Egyptian piasters, which I converted into British sterling pounds according to the rates in Owen (1969, pp. 381-385) and https://www.measuringworth.com. Cotton total output (not shown) is virtually equal to cotton exports.
Sources: Owen (1969, pp. 34, 73, 90-91, 123, 126), the 1873 Statistical Yearbook (pp. 172-173), and the 1914 Statistical Yearbook (p. 356).

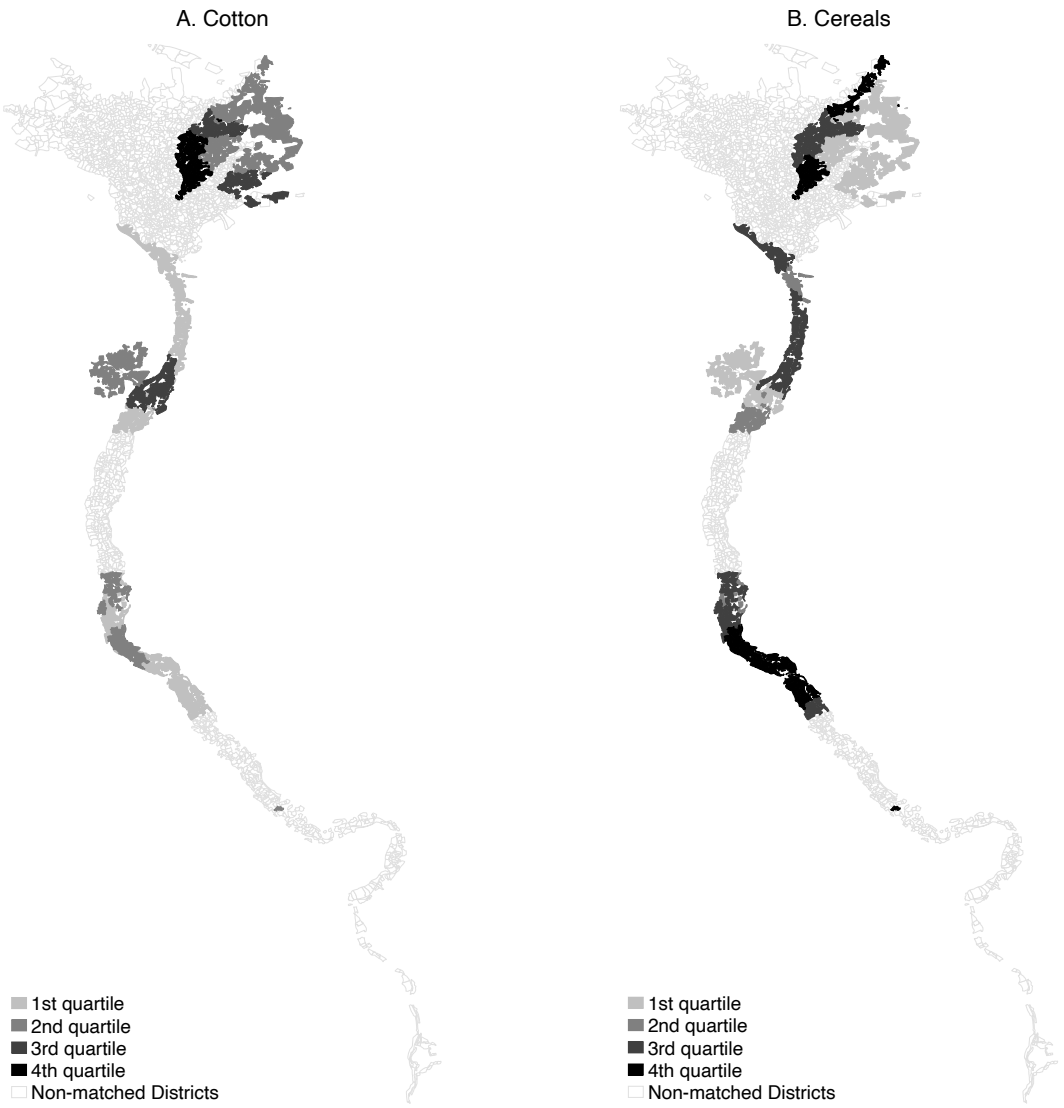

Figure 2: Cotton and Cereals Productivity in 1877 in Matched Districts

Notes: Cotton productivity is the cotton yield in *qintars* per feddan, and cereals productivity is the yield of wheat, barley, and beans in *ardabbs* per feddan, where 1 feddan = 6,368 square meters, 1 *qintar* = 44.5 kilograms, and 1 *ardabb* = 135 kilograms. The maps show the spatial distribution at the district level for the 25 matched districts.
Sources: The 1877 Statistical Yearbook.

Trade, Slavery, and State Coercion of Labor

Egypt During the First Globalization Era

Mohamed Saleh[1]

Online Appendix

A Additional Figures and Tables

This section presents additional figures and tables.

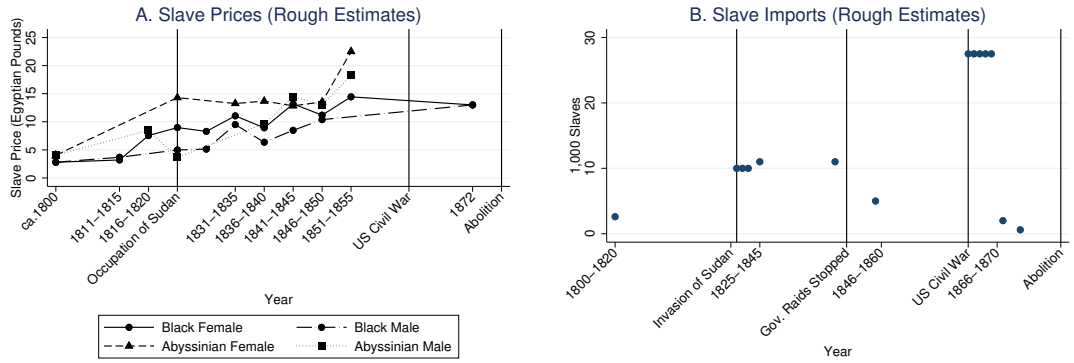

Figure A.1: Slave Prices and Imports in Egypt in 1800–1877

Sources: Prices: Fredriksen (1977, pp. 70-71). Imports: 1800–1820: Mowafi (1981, pp. 32-34); 1821–1860: Fredriksen (1977, pp. 50-57); 1861–1877: Baer (1967).

[1]London School of Economics and Political Science, Houghton Street, London WC2A 2AE, United Kingdom, m.saleh@lse.ac.uk.

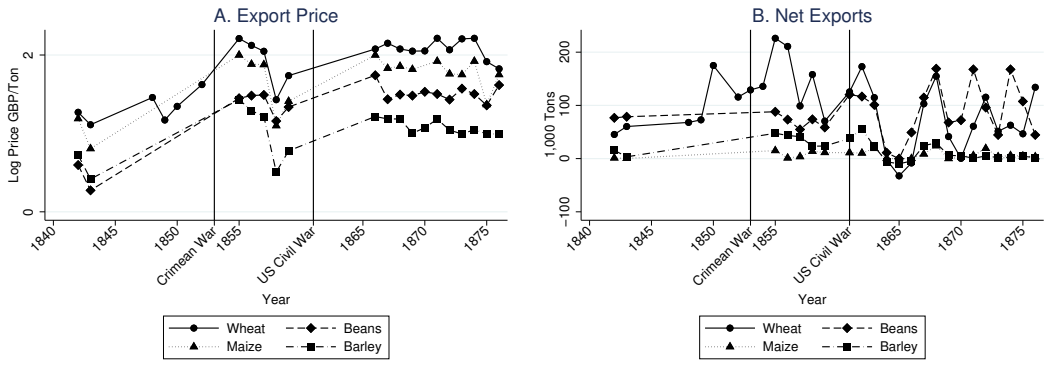

Figure A.2: Prices and Exports of Egyptian Cereals in 1842–1876

Notes: Original quantities are reported in *ardabbs*. I converted *ardabbs* of wheat in Owen (1969) into tons according to the rate: 1 *ardabb* = 133.6 kilograms, in the 1873 Statistical Yearbook (p. 2). *Ardabbs* of wheat and maize in the other sources were first converted into bushels according to the rate: 1 *ardabb* = 5 bushels = 135 kilograms, in U.K. Parliamentary Papers, Vol. 53 (1849) (p. 359), Fowler, T. K. (1861). *Report on the Cultivation of Cotton in Egypt*. J. J. Sale, Printer, Manchester (p. 12), and U.S. House of Representatives Papers (1877) (p. 905). Bushels were then converted into tons using Iowa State University's conversion rate: https://www.extension.iastate.edu/agdm/. *Ardabbs* of beans and barley were converted into tons according to the rate: 1 *ardabb* = 197.7 kilograms, in the 1873 Statistical Yearbook (p. 2). Original prices are reported in Egyptian piasters, which I converted into British pounds (GBP) according to the conversion rate in Owen (1969, pp. 381-385) and https://www.measuringworth.com.
Sources: 1842–1843: U.K. Parliamentary Papers, Vol. 53 (1849) (pp. 359-367); 1848–1850 and 1852–1854 (wheat only), 1861–1865: Owen (1969, pp. 80, 103); 1855–1858 (no information on imports): U.S. House of Representatives Papers (1860) (p. 358); 1859: Fowler, T. K. (1861). *Report on the Cultivation of Cotton in Egypt*. J. J. Sale, Printer, Manchester (p. 12); 1866–1876: U.S. House of Representatives Papers (1877) (pp. 918-933).

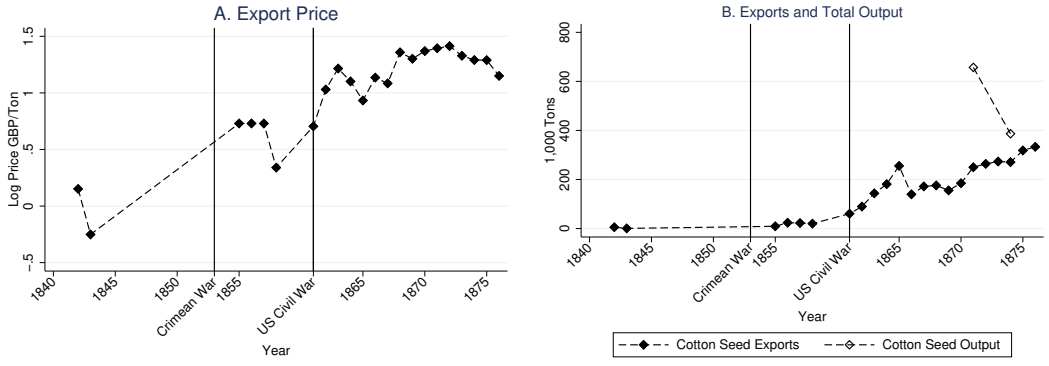

Figure A.3: Prices, Exports, and Production of Egyptian Cotton Seed in 1842–1876

Notes: Original quantities are reported in *ardabbs*. I converted *ardabbs* into tons according to the conversion rate: 1 *ardabb* = 197.7 kilograms, in the 1873 Statistical Yearbook (p. 2). Original prices are reported in Egyptian piasters, which I converted into British pounds (GBP) according to the conversion rate in Owen (1969, pp. 381-385) and https://www.measuringworth.com.
Sources: Owen (1969, pp. 34, 73, 90-91, 123, 126). Price in 1860: the 1873 Statistical Yearbook (pp. 172-173).

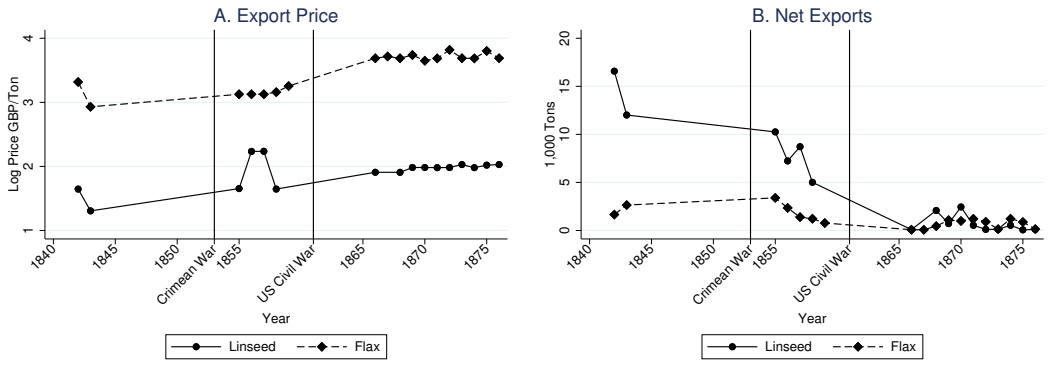

Figure A.4: Prices and Exports of Egyptian Linseed and Flax in 1842–1876

Notes: Original quantities are reported in *ardabbs* for linseed and in *cantars*/*quintals* for flax. I converted *ardabbs* into tons according to the conversion rate: 1 *ardabb* = 197.7 kilograms, in the 1873 Statistical Yearbook (p. 2). I converted *cantars*/*quintals* into tons according to the conversion rate in Owen (1969, pp. 381-385). Original prices are reported in Egyptian piasters, which I converted into British pounds (GBP) according to the conversion rate in Owen (1969, pp. 381-385) and https://www.measuringworth.com.
Sources: 1842–1843: U.K. Parliamentary Papers, Vol. 53 (1849) (pp. 359-367); 1855–1858 (no information on imports): U.S. House of Representatives Papers (1860) (p. 358); 1859 (flax only): Fowler, T. K. (1861). *Report on the Cultivation of Cotton in Egypt*. J. J. Sale, Printer, Manchester (p. 12); 1866–1876: U.S. House of Representatives Papers (1877) (pp. 918-933).

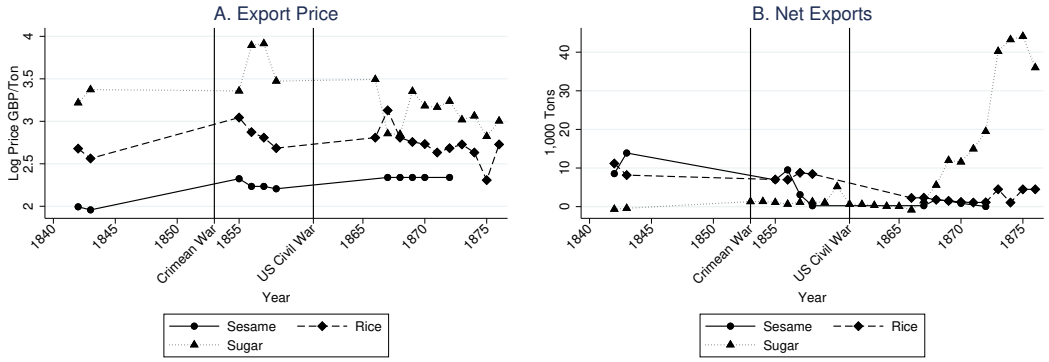

Figure A.5: Prices and Exports of Egyptian Sesame, Rice, and Sugar in 1842–1876

Notes: Original quantities are reported in *ardabbs*, which I converted into tons according to the conversion rate: 1 *ardabb* = 197.7 kilograms for sesame and sugar, and 1 *ardabb* = 185.6 kilograms for rice, in the 1873 Statistical Yearbook (p. 2). Original prices are reported in Egyptian piasters, which I converted into British pounds (GBP) according to the conversion rate in Owen (1969, pp. 381-385) and https://www.measuringworth.com.
Sources: 1842–1843: U.K. Parliamentary Papers, Vol. 53 (1849) (pp. 359-367); 1855–1858 (no information on imports): U.S. House of Representatives Papers (1860) (p. 358); 1859–1865 (sugar exports only): the 1873 Statistical Yearbook (pp. LXXV-LXXVI); 1866–1876: U.S. House of Representatives Papers (1877) (pp. 918-933).

Figure A.6: Production of Egyptian Major Export Crops (Ex. Cotton and Cotton Seed) in 1844 and 1874

Sources: 1844: Rivlin (1961, pp. 258-260); 1874: U.S. House of Representatives Papers (1877) (pp. 918-933).

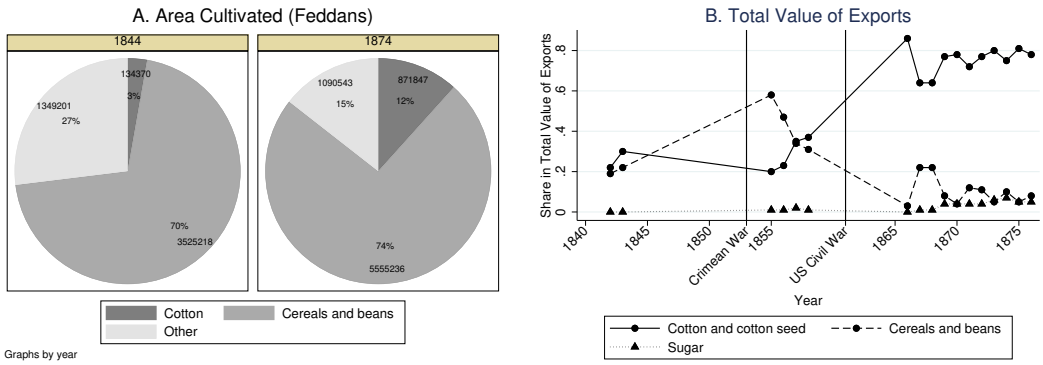

Figure A.7: Relative Land and Exports Shares of Egyptian Major Export Crops in 1842–1876

Notes: 1 *feddan* = 6,368 square meters.
Sources: Cropped area: 1844: Rivlin (1961, pp. 258-260); 1874: U.S. House of Representatives Papers (1877) (p. 905). Total value of exports: 1842–1843: U.K. Parliamentary Papers, Vol. 53 (1849) (pp. 359-367); 1855–1858 (no information on imports): U.S. House of Representatives Papers (1860) (p. 358); 1866–1876: U.S. House of Representatives Papers (1877) (pp. 918-933).

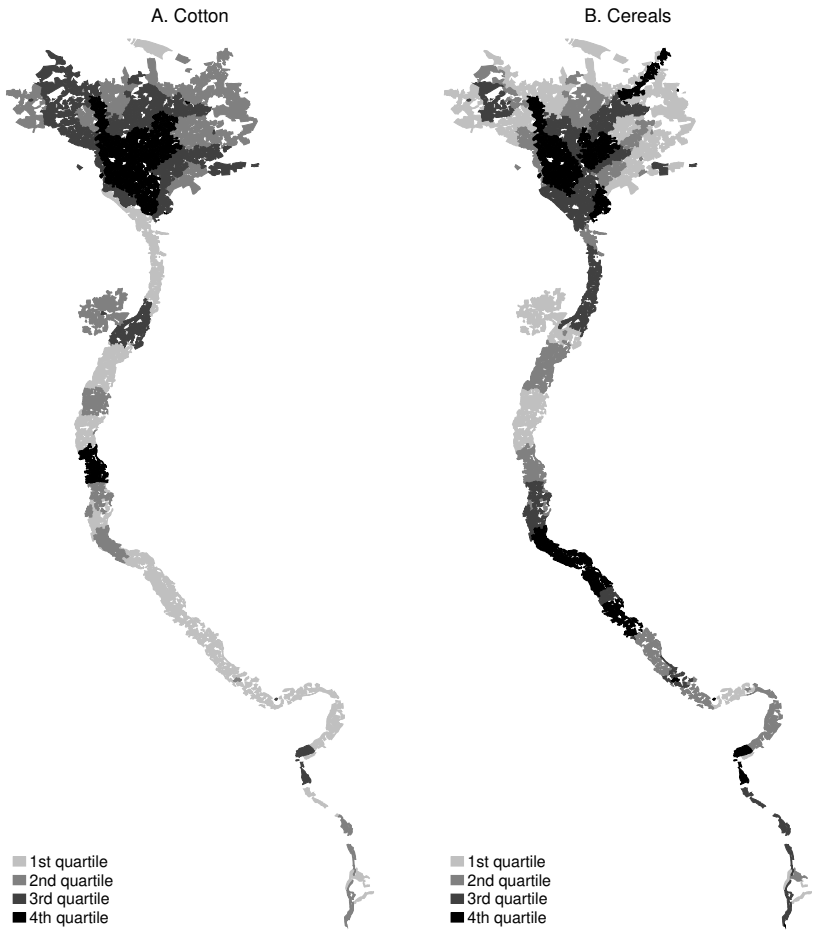

Figure A.8: Cotton and Cereals Productivity in 1877 in All Rural Districts

Notes: Cotton productivity is the cotton yield in *qintars* per *feddan*, and cereals productivity is the yield of wheat, barley, and beans in *ardabbs* per *feddan*, where 1 *feddan* = 6,368 square meters, 1 *qintar* = 44.5 kilograms, and 1 *ardabb* = 135 kilograms. The maps show the spatial distribution at the district level for all rural districts.
Sources: The 1877 Statistical Yearbook.

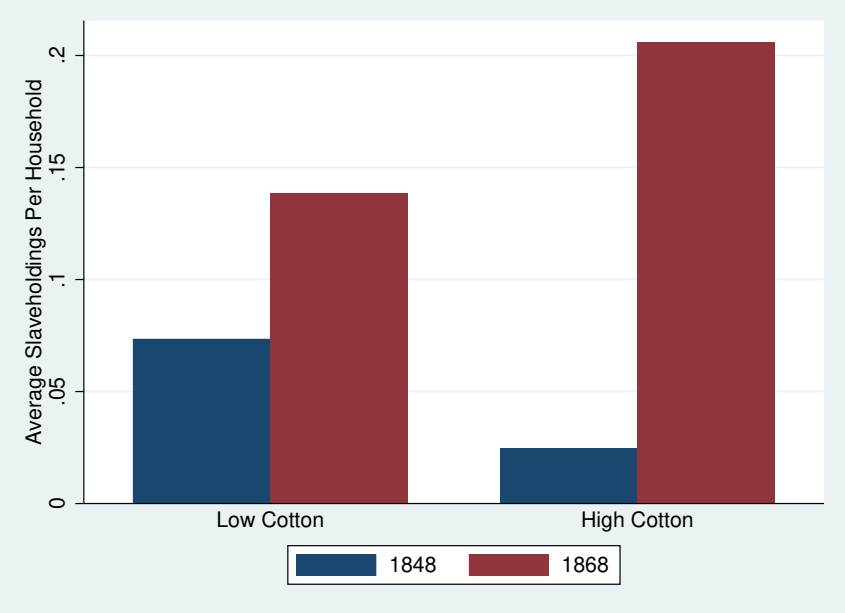

Figure A.9: The Cotton Boom and Slavery

Notes: High cotton-suitability districts are those at the 75th percentile or above (≥ 1.473201) in the cross-district distribution of the cotton yield in *qintars* per *feddan* in 1877.
Sources: See the sources of Table 2.

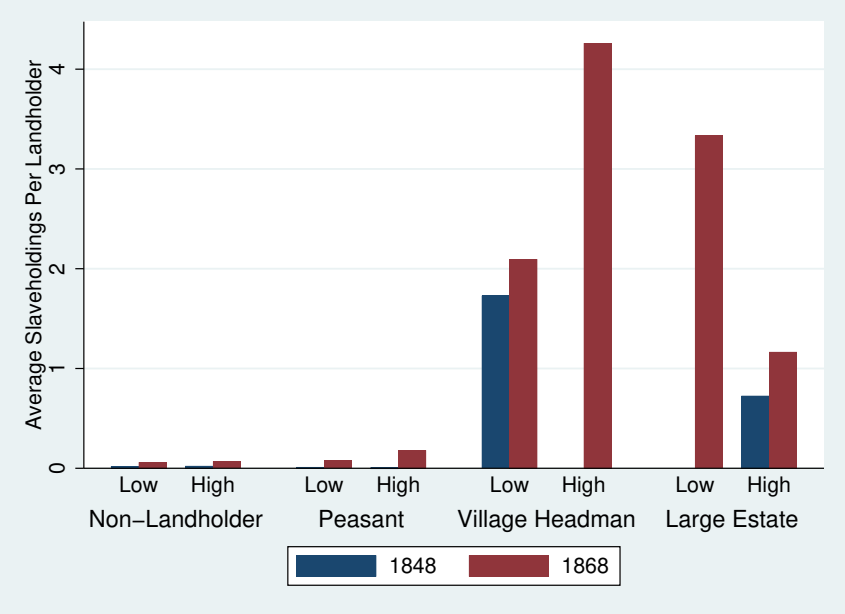

Figure A.10: The Cotton Boom and Slavery by Landholder Class

Notes: High cotton-suitability districts are those at the 75th percentile or above (≥ 1.473201) in the cross-district distribution of the cotton yield in *qintars* per *feddan* in 1877.
Sources: See the sources of Table 2.

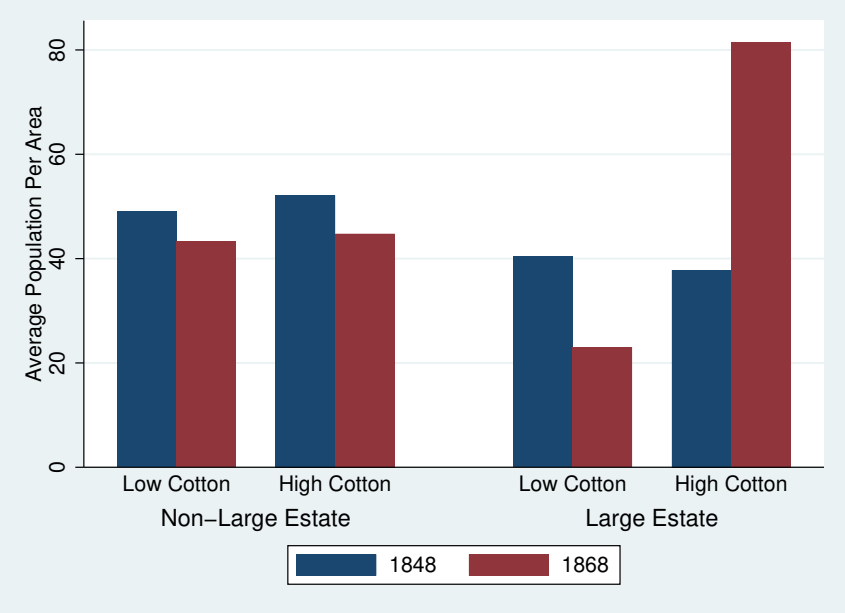

Figure A.11: The Cotton Boom and State Coercion of Labor

Notes: High cotton-suitability districts are those at the 75th percentile or above (≥ 1.473201) in the cross-district distribution of the cotton yield in *qintars* per *feddan* in 1877.
Sources: See the sources of Table 3.

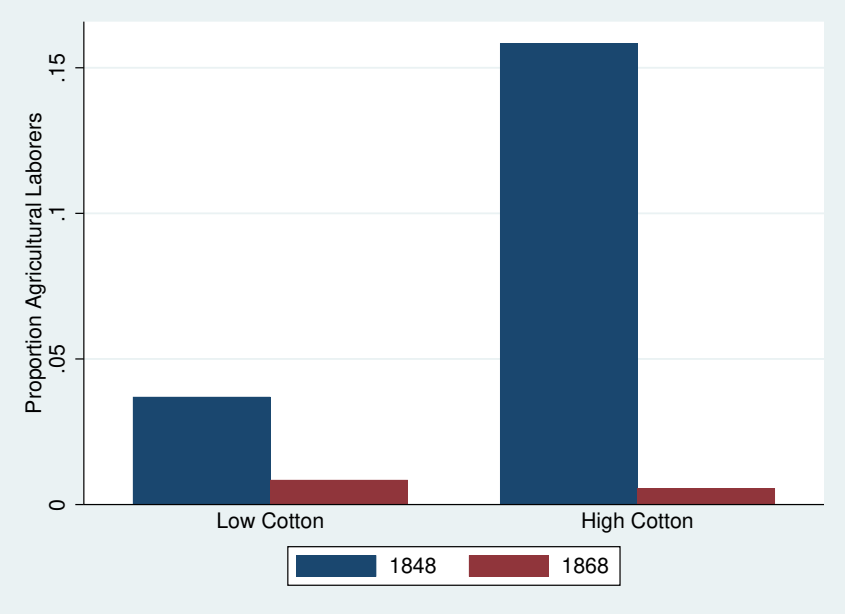

Figure A.12: The Cotton Boom and Wage Employment

Notes: High cotton-suitability districts are those at the 75th percentile or above (≥ 1.473201) in the cross-district distribution of the cotton yield in *qintars* per *feddan* in 1877.
Sources: See the sources of Table 3.

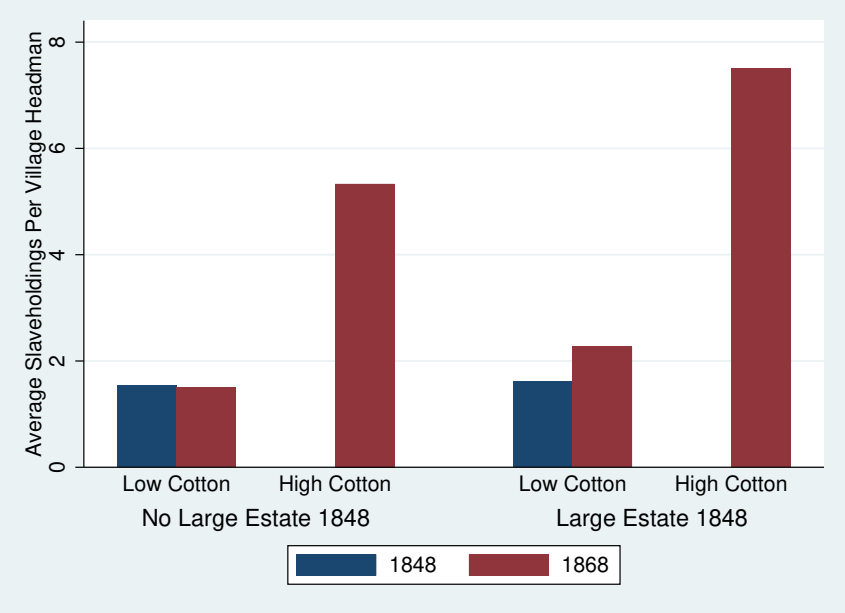

Figure A.13: State Coercion Reinforced Slavery During the Cotton Boom

Notes: High cotton-suitability districts are those at the 90th percentile or above ($\geq$ 1.7737) in the cross-district distribution of the cotton yield in *qintars* per *feddan* in 1877.
Sources: See the sources of Table 4.

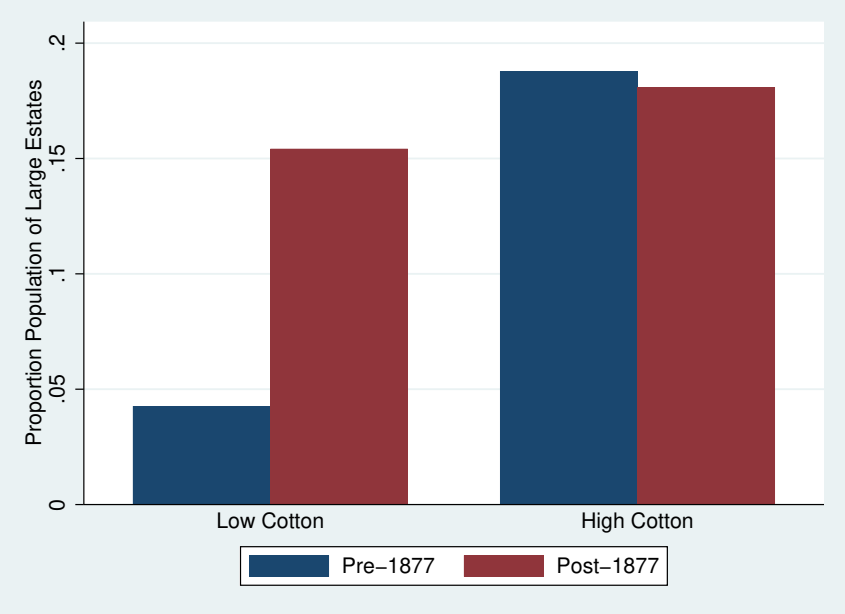

Figure A.14: Impact of the Abolition of Slavery on State Coercion

Notes: High cotton-suitability districts are those at the 75th percentile or above ($\geq$ 1.473201) in the cross-district distribution of the cotton yield in *qintars* per *feddan* in 1877.
Sources: See the sources of Table 5.

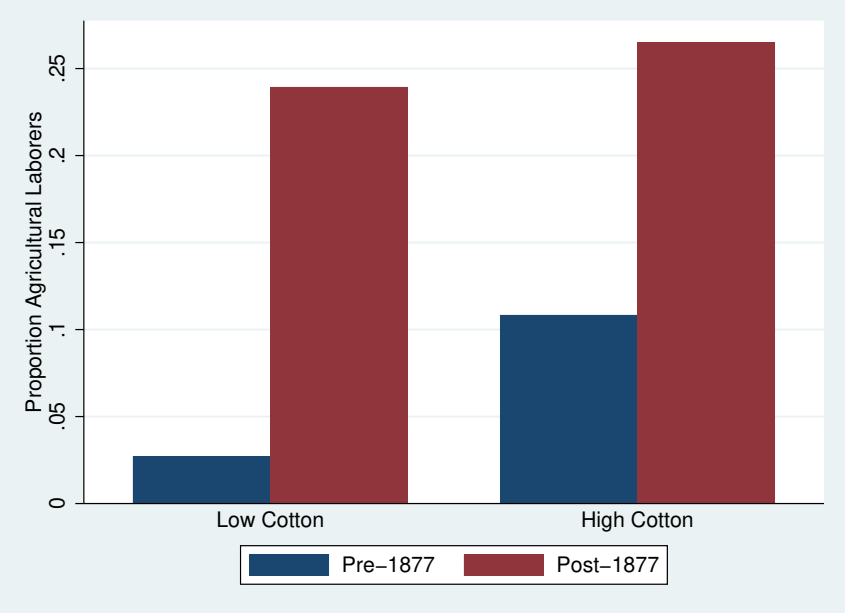

Figure A.15: Impact of the Abolition of Slavery on Wage Employment

Notes: High cotton-suitability districts are those at the 75th percentile or above ($\geq$ 1.473201) in the cross-district distribution of the cotton yield in *qintars* per *feddan* in 1877.
Sources: See the sources of Table 5.

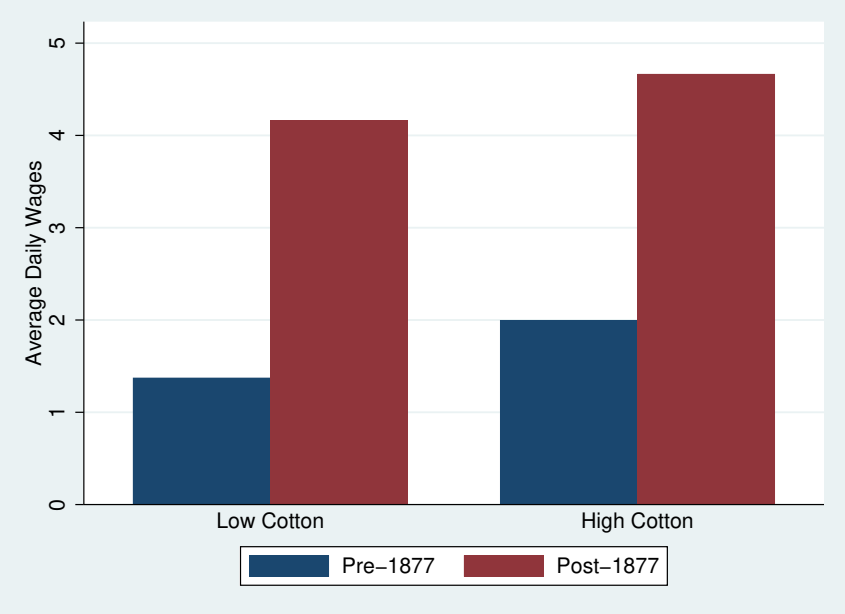

Figure A.16: Impact of the Abolition of Slavery on Wages

Notes: High cotton-suitability provinces are those at the 50th percentile or above ($\geq$ 1.151582) in the cross-province distribution of the cotton yield in *qintars* per *feddan* in 1877.
Sources: See the sources of Table 5.

Table A.1: Baseline Differences across Matched and Non-matched Districts in 1848

	Non-matched			Matched			
	N	Mean	SD	N	Mean	SD	Diff
Number of slaves and blacks in HH	4860	0.04	0.42	2469	0.06	0.64	0.019
=1 if slave-owning free-headed HH	4853	0.01	0.12	2459	0.01	0.11	-0.001
Number of slaves and blacks in free-headed HH	4853	0.03	0.40	2459	0.05	0.62	0.015
=1 if slave-headed HH	4860	0.00	0.04	2469	0.00	0.06	0.003**
=1 if HH head peasant	3700	0.57	0.50	1661	0.57	0.50	0.002
=1 if HH head landless agr. laborer	3700	0.12	0.32	1661	0.08	0.26	-0.044
=1 if HH head village headman	3700	0.03	0.18	1661	0.03	0.17	-0.005
=1 if HH head white-collar worker	3700	0.07	0.25	1661	0.07	0.26	0.006
=1 if HH head artisan	3700	0.07	0.26	1661	0.09	0.28	0.016
=1 if HH head unskilled non-agr. laborer	3700	0.14	0.35	1661	0.17	0.38	0.032
Cotton yield (qintars) per feddan in 1877	4860	1.80	1.20	2469	0.88	0.86	-0.869***
Cereals and beans yield (ardabbs) per feddan in 1877	4860	2.44	0.74	2469	1.92	0.98	-0.479*
=1 if HH head non-Muslim	4803	0.04	0.20	2454	0.08	0.28	0.044**
=1 if HH head Bedouin	4860	0.05	0.22	2469	0.01	0.08	-0.052***
Number of free males 0-5 in HH	4860	0.73	1.04	2469	0.68	1.04	-0.055
Number of free males 6-10 in HH	4860	0.38	0.67	2469	0.38	0.66	-0.006
Number of free males 11-20 in HH	4860	0.34	0.62	2469	0.34	0.62	0.001
Number of free males 21-30 in HH	4860	0.36	0.60	2469	0.36	0.67	-0.006
Number of free males 31-40 in HH	4860	0.31	0.53	2469	0.31	0.57	0.003
Number of free males 41-50 in HH	4860	0.24	0.46	2469	0.22	0.43	-0.015
Number of free males 50+ in HH	4860	0.36	0.54	2469	0.32	0.51	-0.044**
Number of free females 0-5 in HH	4860	0.71	1.01	2469	0.67	0.97	-0.040
Number of free females 6-10 in HH	4860	0.29	0.59	2469	0.26	0.53	-0.025
Number of free females 11-20 in HH	4860	0.34	0.65	2469	0.33	0.62	-0.013
Number of free females 21-30 in HH	4860	0.49	0.73	2469	0.49	0.66	0.005
Number of free females 31-40 in HH	4860	0.36	0.57	2469	0.33	0.54	-0.026
Number of free females 41-50 in HH	4860	0.22	0.45	2469	0.20	0.42	-0.023
Number of free females 50+ in HH	4860	0.34	0.54	2469	0.33	0.55	-0.012

Notes: The sample is restricted to households residing in 70 rural districts in 1848. The "Diff" column reports the coefficient of the following household-level regression in 1848: $y_{hd} = \alpha_1 + \alpha_2 DistMatched_d + \varepsilon_{hd}$, where y_{hd} is the outcome of household h residing in district d in 1848, and $DistMatched_d$ is a dummy variable =1 if the household's district of residence is observed in both 1848 and 1868, and =0 if the district of residence is observed in 1848 only. Each regression is weighted by the household inverse sampling probability. Standard errors are clustered at the district level. $*p < 0.10, **p < 0.05, ***p < 0.01$.
Sources: The 1848 population census sample. Data on crop productivity in 1877 are from the 1877 Statistical Yearbook.

Table A.2: The Cotton Boom and Slavery: Other Outcomes

	N. Slaves in Free-headed HH	=1 if HH Head Slave
	(1)	(2)
Cotton × 1868	0.13***	0.00
	(0.03)	(0.00)
Cereals × 1868	-0.06*	-0.00
	(0.04)	(0.00)
Controls	Yes	Yes
District FE	Yes	Yes
Census Year FE	Yes	Yes
Clusters (Districts)	25	25
Obs (Households)	5723	5736
R^2	0.10	0.01
Av. Dep. Var. in 1848	0.04	0.00

Notes: The sample is restricted to households residing in 25 rural districts that are observed in both 1848 and 1868. The sample is further restricted to free-headed households in column 1. Regressions are weighted by the inverse sampling probability of households. Standard errors clustered at the district level are in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$. Controls are: =1 if household head is non-Muslim, =1 if household head is Bedouin, the number of household free members broken down by sex and age, the village's distance to Suez, and its interaction with 1868.
Sources: See the sources of Table 2.

Table A.3: The Cotton Boom and the Sex and Age Composition of Slaves

(a) Male Slaves by Age Bracket

	(1) Total	(2) 0-5	(3) 6-20	(4) 21-40	(5) 41-50	(6) 50+
Cotton × 1868	0.10***	0.01***	0.05***	0.04***	0.00	-0.00
	(0.02)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
Cereals × 1868	-0.05*	0.00	-0.04**	-0.02	-0.00	0.00
	(0.03)	(0.00)	(0.02)	(0.01)	(0.00)	(0.00)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Census Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clusters (Districts)	25	25	25	25	25	25
Obs (Households)	5645	5645	5645	5645	5645	5645
R^2	0.11	0.03	0.11	0.07	0.03	0.01
Av. Dep. Var. in 1848	0.02	0.01	0.01	0.01	0.00	0.00

(b) Female Slaves by Age Bracket

	(1) Total	(2) 0-5	(3) 6-20	(4) 21-40	(5) 41-50	(6) 50+
Cotton × 1868	0.03***	0.00	0.01***	0.01**	-0.00	0.00
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Cereals × 1868	-0.01	0.00	-0.00	-0.01*	0.00	-0.00
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Census Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clusters (Districts)	25	25	25	25	25	25
Obs (Households)	5645	5645	5645	5645	5645	5645
R^2	0.07	0.03	0.05	0.05	0.02	0.02
Av. Dep. Var. in 1848	0.02	0.00	0.01	0.01	0.00	0.00

Notes: The sample is restricted to free household heads residing in 25 rural districts that are observed in both 1848 and 1868. Regressions are weighted by the inverse sampling probability of households. Controls are the same as in Table A.2. Robust standard errors clustered at the district level are in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$.
Sources: See the sources of Table 2.

Table A.4: The Cotton Boom and the Occupational Distribution of Local Labor

	=1 if HH Head is					
	(1) Agricultural Laborer	(2) Peasant	(3) Village Headman	(4) Artisan	(5) White-collar	(6) Non-agr. Unskilled
Cotton × 1868	-0.13***	0.21***	0.01	0.00	-0.06*	-0.03
	(0.04)	(0.05)	(0.01)	(0.01)	(0.03)	(0.03)
Cereals × 1868	0.02	-0.10	-0.01**	0.02	0.05*	0.03
	(0.02)	(0.07)	(0.01)	(0.02)	(0.03)	(0.04)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Census Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clusters (Districts)	25	25	25	25	25	25
Obs (Households)	3985	3985	3985	3985	3985	3985
R^2	0.19	0.07	0.12	0.08	0.05	0.06
Av. Dep. Var. in 1848	0.10	0.54	0.03	0.09	0.07	0.18

Notes: The sample is restricted to free household heads residing in 25 rural districts that are observed in both 1848 and 1868, with a non-missing occupational title. Regressions are weighted by the inverse sampling probability of households. Controls are the same as in Table A.2. Standard errors clustered at the district level are in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$.
Sources: See the sources of Table 2.

Table A.5: The Cotton Boom and Migration of Local Labor

	Number of Local Workers at the Area Level		
	(1) Total	(2) Natives	(3) Immigrants
Large Estate × Cotton × 1868	41.56***	53.72***	-12.16***
	(11.88)	(12.68)	(2.51)
Cotton × 1868	3.99	-0.17	4.16*
	(10.56)	(9.53)	(2.05)
Large Estate × 1868	-14.03	-45.90***	31.88***
	(12.93)	(15.23)	(4.57)
Controls	Yes	Yes	Yes
Large Estate	Yes	Yes	Yes
Large Estate × Cotton	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Census Year FE	Yes	Yes	Yes
Clusters (Districts)	25	25	25
Obs (Areas)	669	669	669
R^2	0.34	0.23	0.26
Av. Dep. Var. in 1848	63.16	58.47	4.69

Notes: Controls are the interaction of the district-level cereals productivity in 1877 with the 1868 indicator, the village's distance to Suez, and its interaction with 1868. Regressions are weighted by the sum of household weights in the area. Robust standard errors clustered at the district level are in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$.
Sources: See the sources of Table 2.

B Labor Intensity of Cotton

Cotton was labor intensive, relative to other crops, in Egypt. It required a considerable amount of labor in land preparation, sowing, soil tending, picking, ginning, and trees uprooting (Owen 1969, pp. 30-33). I observe the number of cultivators per *feddan* for each crop in the 1939 Agricultural Census (pp. 60-69), which is the earliest data source that records this type of information. However, I do not observe the number of working hours, or the seasonality of employment (e.g., during the harvest season), which may vary across crops. I estimate the following model separately for each landholding size:

$$laborperland_{cp}^{f} = \alpha_c + \beta_p + \varepsilon_{cp}, \quad f \in \{0-1, 1-2, 2-3, 3-4, 4-5, 5-10, 10-20, 20-50, 50-100, 100-200, 200-500, 500^{+}\, feddans\} \tag{B.1}$$

where $laborperland_{cp}^{f}$ is the number of cultivators per *feddan* of crop c in province p on landholding size f, α_c is a full set of crop fixed effects, where cotton is the omitted category, and β_p is a full set of province fixed effects to control for inter-province heterogeneity in labor-to-land ratio. I estimate a separate regression for each landholding size, because crops may vary with respect to the landholding distribution.[2] The results are shown in Appendix Table B.1. Although differences between cotton and wheat are not statistically significant, cotton has systematically higher labor-to-land ratio at any landholding size.

Although the results come from 1939, they likely apply to the 19th century. First, the harvesting of wheat, barley, and beans in 1830 required 4–8 workers per *feddan*, according to Majlis al-Mashoura (1830). *La'ihat zira'at al-fallah wa tadbir ahkam al-siyasa bi qasd al-najah (Farmer's Guide to Agriculture)*. Amiria Press, Cairo, which is similar to the number of cultivators per *feddan* for these crops in 0–1 *feddan* landholdings in 1939. This suggests that the technology of production changed little between 1830 and 1939, especially on small landholdings. Second, mechanization of Egyptian agriculture started only in the 1970s (Richards 1981).

C Parallel Trends of Household's Slave Acquisition

I provide suggestive evidence on the parallel trends assumption for household slave purchases prior to the cotton boom using the age distribution of slaves. Recall that I only observe the household's stock of slaves in 1848 or 1868, but not the flow of slave purchases. However, age profiles of slaves enable me to reconstruct the yearly number (flow) of slaves that were purchased by each household, under the assumption that a slave is purchased at age 6 and lives up to age 50, which is supported by historical evidence.[3] I thus pool the 1848 and 1868

[2] My objective is to measure inter-crop differences in labor intensity, holding landholding size constant. For example, a crop may have a higher labor-to-land ratio, because it is more likely to be produced in small landholdings, and not because it is more labor-intensive.

[3] I focus on slaves aged 6–50 (with non-missing age) who live in free-headed households. I exclude slaves who are born into slavery, i.e. those who have at least one slave parent in the household, and those below 6 who are less

Table B.1: Labor-to-Land Ratio by Crop in 1939

	(1) 0-1	(2) 1-2	(3) 2-3	(4) 3-4	(5) 4-5	(6) 5-10	(7) 10-20	(8) 20-50	(9) 50-100	(10) 100-200	(11) 200-500	(12) 500+
Wheat	-0.620	-0.350	-0.226	-0.131	-0.115	-0.115	-0.026	-0.011	-0.005	-0.002	-0.016	-0.000
	(1.338)	(0.255)	(0.174)	(0.170)	(0.142)	(0.142)	(0.096)	(0.045)	(0.044)	(0.039)	(0.020)	(0.028)
Beans	9.384	0.354	0.528***	0.569***	0.527***	0.527***	0.323***	0.182***	0.090**	0.051	0.012	0.012
	(9.471)	(0.265)	(0.188)	(0.152)	(0.123)	(0.123)	(0.086)	(0.042)	(0.039)	(0.035)	(0.020)	(0.028)
Barley	0.583	0.527*	0.671***	0.756***	0.660***	0.660***	0.399***	0.248***	0.134***	0.077*	0.027	0.017
	(1.302)	(0.302)	(0.179)	(0.148)	(0.127)	(0.127)	(0.099)	(0.045)	(0.046)	(0.040)	(0.022)	(0.028)
Lentils	1.240	1.493*	1.528*	1.010***	0.862**	0.862**	1.378**	0.699***	0.477***	0.624***	0.065**	0.017
	(1.705)	(0.824)	(0.824)	(0.359)	(0.356)	(0.356)	(0.591)	(0.163)	(0.123)	(0.218)	(0.028)	(0.042)
Onions	3.054**	3.286***	3.369***	3.076***	2.700***	2.700***	1.419***	0.795***	0.521***	0.382***	0.191***	0.133***
	(1.528)	(1.042)	(0.919)	(0.916)	(0.577)	(0.577)	(0.318)	(0.170)	(0.127)	(0.125)	(0.054)	(0.044)
Rice	-1.508	-0.493	-0.038	-0.089	-0.068	-0.068	-0.035	-0.006	-0.011	-0.024	-0.010	0.008
	(1.669)	(0.344)	(0.270)	(0.208)	(0.170)	(0.170)	(0.117)	(0.054)	(0.053)	(0.044)	(0.024)	(0.044)
Sugar	0.356	0.357	0.603***	0.591***	0.559***	0.559***	0.426***	0.293***	0.214***	0.192***	0.128***	0.337*
	(1.301)	(0.348)	(0.205)	(0.183)	(0.161)	(0.161)	(0.097)	(0.052)	(0.064)	(0.056)	(0.042)	(0.188)
Peanuts	0.443	0.650	0.262	0.411*	0.330	0.330	0.201	0.233*	0.342	0.112	0.064	0.222*
	(1.273)	(0.973)	(0.317)	(0.247)	(0.239)	(0.239)	(0.139)	(0.123)	(0.226)	(0.085)	(0.053)	(0.131)
Maize	-0.779	1.314	-0.264	-0.157	-0.110	-0.110	-0.004	0.010	0.012	0.007	-0.007	0.001
	(1.379)	(1.751)	(0.208)	(0.201)	(0.170)	(0.170)	(0.111)	(0.054)	(0.050)	(0.042)	(0.021)	(0.028)
S. Sorghum	-0.191	0.035	-0.074	0.253	0.238	0.238	0.169*	0.091**	0.034	0.109	0.001	0.012
	(1.389)	(0.251)	(0.177)	(0.206)	(0.153)	(0.153)	(0.099)	(0.045)	(0.046)	(0.078)	(0.021)	(0.031)
N. Sorghum	-0.527	-0.009	-0.018	0.132	0.121	0.121	0.071	0.108*	0.066	0.062	0.034	0.027
	(1.410)	(0.305)	(0.192)	(0.178)	(0.157)	(0.157)	(0.108)	(0.057)	(0.044)	(0.045)	(0.021)	(0.043)
Fenugreek	0.484	0.933**	1.061***	0.977***	0.911***	0.911***	0.527***	0.332***	0.181***	0.116***	0.054**	0.045
	(1.420)	(0.367)	(0.245)	(0.252)	(0.189)	(0.189)	(0.108)	(0.056)	(0.052)	(0.040)	(0.022)	(0.030)
Province FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Obs (Crop-Province)	164	167	165	169	165	165	170	171	166	163	157	147
R^2	0.156	0.211	0.473	0.447	0.572	0.572	0.437	0.523	0.405	0.375	0.437	0.263
Mean Dep. Var.	4.410	2.457	1.772	1.470	1.240	1.240	0.619	0.347	0.205	0.156	0.070	0.068

Notes: The dependent variable is the labor-to-land ratio, which is the number of cultivators divided by the area cultivated. Each column shows the results of an OLS regression of the labor-to-land ratio on a full set of crop and province fixed effects, at each landholding size, where cotton is the omitted category. White-Huber heteroskedasticity robust standard errors are in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$. Rice refers to both summer and Nolitic rice. S. Sorghum is summer sorghum, N. Sorghum is Nolitic sorghum.
Sources: The 1939 Agricultural Census (pp. 60-69).

households in matched districts, and create a "pseudo-panel" that traces yearly slave purchases of each household in 1848 (1868) from 1804 (1824) to 1848 (1868),[4] in order to estimate the following regression:

$$slavespurchased_{hdt} = \alpha_h + \delta_t + \sum_{j=1809}^{1868} \beta_{1j} cotton_d + \sum_{j=1808}^{1868} \beta_{2j} cereals_d + \varepsilon_{hdt} \qquad \text{(C.1)}$$

where $slavespurchased_{hdt}$ is the number of slaves purchased by household h in district d in period $t \in \{1809-1818, 1819-1828, ..., 1859-1868\}$ with $1804-1808$ being the omitted period,[5] α_h are household fixed effects, δ_t are period fixed effects. Standard errors are clustered at the district level. If the parallel trends assumption holds, I would expect β_1 to be not statistically different from 0 for all periods up to 1858, and to be positive in 1859–1868.

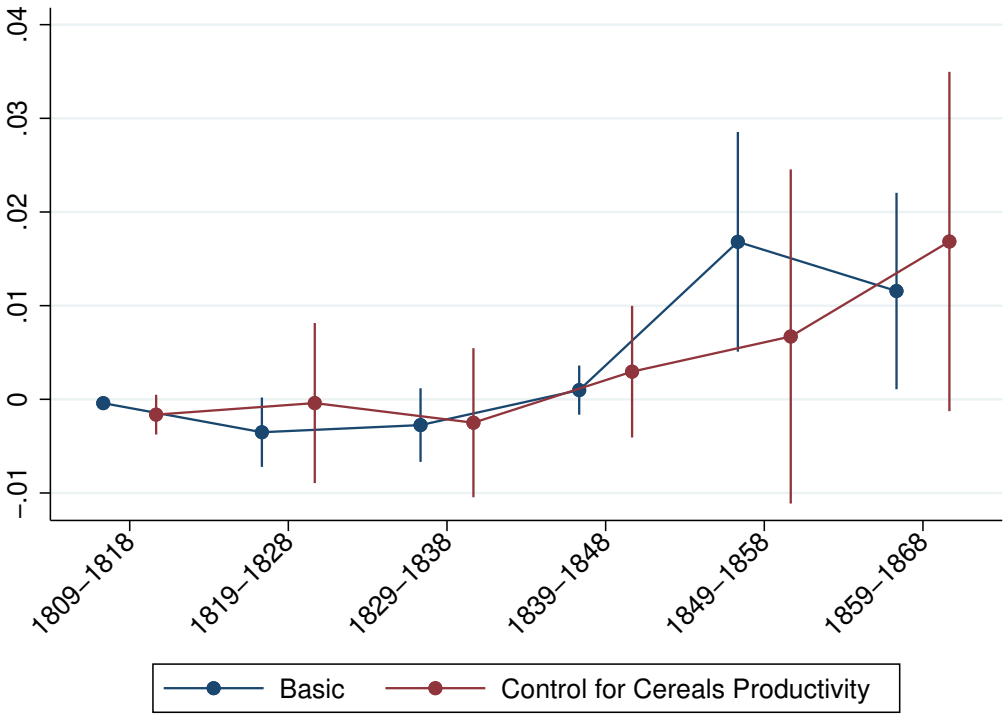

Figure C.1: The Evolution of Household Slave Acquisition in 1804–1868

Notes: The figure plots the estimated coefficients for equation (C.1). The 95% confidence intervals are shown.
Sources: See the sources of Table 2.

The coefficients $\hat{\beta}_1$ are plotted in Appendix Figure C.1. The growth of household slaveholdings in more cotton-suitable villages is not statistically different from that in less cotton-suitable villages up to 1858, but the difference becomes positive in 1859–1868, which is arguably attributable to the cotton boom. This finding is consistent with Figure 2, which suggests that

likely to have been purchased. According to Fredriksen (1977, pp. 44-5), slaves were mostly purchased below the age of 15. I exclude slaves above 50, because I observe extremely few of them, which suggests that most slaves died before that age.

[4]These are the earliest and latest possible dates of purchasing a slave aged 6–50 in each of 1848 and 1868. For example, the oldest slaves in 1848 are 50, i.e. born in 1798, and purchased at age 6 in 1804.

[5]I estimate the flow of slaves by decade, rather than by year, because of age heaping. I also tried 5-year and 15-year intervals, and the results (available upon request) are similar.

Egypt's slave imports remained stable between the invasion of Sudan in 1820 and the abolition of state slave raids in 1845.

D Robustness Checks

I conducted several robustness checks. First, I employed two alternative measures of cotton suitability. As a second measure, I used the village's distance to the (eastern) Damietta Nile branch, which is based on the irrigation network in the 1840s. According to Gliddon, G. R. (1841). *A Memoir on the Cotton of Egypt*. James Madden & Co., London (p. 15), areas closer to the Damietta branch were more suitable to cotton, because it was technically easier to dig summer canals from the Damietta branch, which was much deeper than the (western) Rosetta branch (Rivlin 1961, p. 224). Consequently, 61 percent of the total length of summer canals in 1840 originated from the Damietta branch (Rivlin 1961, p. 281).[6] The results, shown in Appendix Table D.1, are similar to the main findings.

I also employed a third measure, the Global Agro-Ecological Zoning crop suitability indices produced by the Food and Agriculture Organization (FAO-GAEZ), which are widely used in the literature. Because Egyptian agriculture is irrigation-fed, I used the FAO-GAEZ indices under irrigation and intermediate input level for the baseline period (1961–1990).[7] In comparison to the actual crop productivity in 1877, the FAO-GAEZ indices have the advantages of being measured at the more fine-grained village level, and of capturing the potential—not the actual—crop suitability. However, they are subject to a major caveat, because they assume that water resources are available and that the irrigation infrastructure is in place, based on the period from 1961 to 1990. This implies the FAO-GAEZ indices are endogenous to the evolution of the (perennial) irrigation infrastructure in Egypt up to 1990, making them less precise estimates of the crop suitability during the 19th century, than the 1877 crop productivity measures. The results, shown in Appendix Table D.2, are mostly similar to the main findings.

The second robustness check is to control for the more fine-grained village fixed effects, which account for time-invariant characteristics of villages that may be correlated with cotton suitability. I exploit the fact that among the 504 villages that are observed in either 1848 or 1868, there are 105 villages that appear by random chance in both samples. I thus restricted the analysis to households residing in this panel of villages, which allows me to control for village fixed effects. The results are mostly similar to the main findings (Appendix Table D.3).

[6] In 1840, 86 percent of the total length of summer canals was in the Delta: 61 percent originated from the Damietta branch, which consisted of canals in eastern and central Delta, and 25 percent from the Rosetta branch, which consisted of canals in western Delta (Rivlin 1961, pp. 213-249). Rivlin (1961, p. 224) mentions that "This higher elevation of water [of the Damietta branch] was due to the fact that the Damietta branch followed a more sinuous and consequently a longer course and had less of an incline than that of the Rosetta branch."

[7] I used FAO-GAEZ Data Portal Version 3.0.1. The crop suitability indices under irrigation are not available at the *low* input level, presumably because the irrigation infrastructure requires a sufficiently high level of input. The crop suitability indices under irrigation assume that water resources are available and that the irrigation infrastructure is in place. They take into account the type of soil and the terrain slope. The crop suitability indices under rain-fed agriculture show no variation within Egypt, which receives little rainfall.

Third, there may be spillover effects and spatial correlation across villages, which could bias the OLS estimates. To account for this possibility, I use the FAO-GAEZ crop suitability indices that are available at the village level. I then aggregate the data to the village level and restrict the analysis to the balanced panel of villages that appear in both 1848 and 1868. I estimate a Fixed Effects Spatial Autoregressive Model (SAR) at the village-year level. The results are mostly similar to the main findings (Table D.4).

Table D.1: The Cotton Boom, Slavery, and Wage Employment of Local Labor: Using Distance to Damietta Branch

	Slavery		Local Labor
	(1) N. Slaves in HH	(2) =1 if Slave-Owning Free-Headed HH	(3) =1 if HH Head Agr. Laborer
Dist. Damietta × 1868	-1.43***	-0.67***	1.16**
	(0.21)	(0.08)	(0.45)
Cereals × 1868	0.02	0.00	-0.06*
	(0.02)	(0.01)	(0.03)
Dist. Damietta	1.34	0.59	0.72
	(2.01)	(0.53)	(1.57)
Controls?	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Census Year FE	Yes	Yes	Yes
Clusters (District)	25	25	25
Obs (Households)	5736	5723	4020
R^2	0.09	0.14	0.18
Av. Dep. Var. in 1848	0.05	0.01	0.10

Notes: The sample is restricted to households residing in 25 rural districts that are observed in both 1848 and 1868. Columns 2 is further restricted to free household heads. Column 3 is further restricted to free household heads with a non-missing occupational title. Standard errors clustered at the village level are in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$. Distance to the Damietta branch is in 1,000 kilometres. Controls are: =1 if household head is non-Muslim, =1 if household head is Bedouin, the number of household free members broken down by sex and age, the village's distance to Suez, and its interaction with the 1868 dummy variable. Each regression is weighted by household inverse sampling probability.
Sources: See the sources of Table 2.

Table D.2: The Cotton Boom, Slavery, and Wage Employment of Local Labor: Using the FAO-GAEZ Crop Suitability Indices

	Slavery		Local Labor
	(1) N. Slaves in HH	(2) =1 if Slave-Owning Free-Headed HH	(3) =1 if HH Head Agr. Laborer
Cotton × 1868	0.53*	0.23**	0.57**
	(0.31)	(0.10)	(0.22)
Cereals × 1868	-0.23	-0.09	-0.69***
	(0.31)	(0.08)	(0.25)
Cotton	0.10	-0.08	-0.64***
	(0.26)	(0.07)	(0.24)
Cereals	-0.13	0.06	0.52***
	(0.26)	(0.06)	(0.20)
Controls?	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Census Year FE	Yes	Yes	Yes
Clusters (Villages)	504	504	482
Obs (Households)	5736	5723	4020
R^2	0.09	0.13	0.16
Av. Dep. Var. in 1848	0.05	0.01	0.10

Notes: The sample is restricted to households residing in 25 rural districts that are observed in both 1848 and 1868. Columns 2 is further restricted to free household heads. Column 3 is further restricted to free household heads with a non-missing occupational title. The crop suitability indices are continuous. I transformed each crop measure into an index varying between 0 and 1, with 1 being the highest value in the sample, and 0 the lowest. The cereals suitability index is equal to the maximum of the suitability indices of wheat, barley, beans, and maize. Standard errors clustered at the district level are in parentheses. Controls are: =1 if household head is non-Muslim, =1 if household head is Bedouin, the number of household free members broken down by sex and age group, distance to Suez, and its interaction with the 1868 dummy variable. $*p < 0.10, **p < 0.05, ***p < 0.01$.
Sources: The 1848 and 1868 population census samples. Data on crop suitability are from FAO-GAEZ under irrigation and intermediate input in the baseline period 1961–1990.

Table D.3: The Cotton Boom, Slavery, and Wage Employment: Controlling for Village Fixed Effects

	Slavery		Local Labor
	(1) N. Slaves in HH	(2) =1 if Slave-Owning Free-Headed HH	(3) =1 if HH Head Agr. Laborer
Cotton × 1868	0.16**	0.05***	0.01*
	(0.07)	(0.02)	(0.01)
Cereals × 1868	-0.09*	-0.04**	-0.03
	(0.05)	(0.02)	(0.02)
Controls?	Yes	Yes	Yes
Village FE	Yes	Yes	Yes
Census Year FE	Yes	Yes	Yes
Clusters (Villages)	105	105	104
Obs (Households)	2102	2097	1460
R^2	0.13	0.15	0.29
Av. dep. var. in 1848	0.05	0.01	0.01

Notes: The sample is restricted to households residing in 105 villages that are observed in both 1848 and 1868. Columns 2 is further restricted to free household heads. Column 3 is further restricted to free household heads with a non-missing occupational title. Standard errors clustered at the village level are in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$. Controls are: =1 if household head is non-Muslim, =1 if household head is Bedouin, the number of household free members broken down by sex, distance to Suez, and its interaction with the 1868 dummy variable. Each regression is weighted by household inverse sampling probability.
Sources: See the sources of Table 2.

Table D.4: The Cotton Boom, Slavery, and Wage Employment: Fixed Effects Spatial Autoregressive Model (SAR)

	Slavery		Local Labor
	(1) N. Slaves in HH	(2) =1 if Slaveowning Free-Headed HH	(3) =1 if HH Head Agr. Laborer
main			
Cotton × 1868	1.66*	0.67***	0.26*
	(0.89)	(0.26)	(0.14)
Cereals × 1868	-1.33	-0.49**	-0.20
	(0.84)	(0.25)	(0.13)
1868	0.20	0.04	0.01
	(0.27)	(0.08)	(0.04)
W			
Spatial lag of dep. var.	-0.08	0.45**	
	(0.26)	(0.21)	
L			
Spatial lag of dep. var.			-0.28
			(0.31)
Controls?	Yes	Yes	Yes
Location FE?	Yes	Yes	Yes
Locations	103	103	90
Obs (Location-Year)	206	206	180
Pseudo-R^2	0.35	0.35	0.02
Av. Dep. Var. in 1848	0.13	0.03	0.01

Notes: Regressions are based on the 1848 and 1868 population census samples, aggregated to the location level, where a location is defined as the latitude and longitude of the village's centroid. The location-level sample is further restricted to a balanced panel of locations that appear in both years. Specifically, out of 105 villages that appear in both 1848 and 1868 (Table D.3), there are 103 *unique* locations. While outcomes 1–2 are non-missing for all the 103 locations in both 1848 and 1868, outcome 3 is non-missing in both 1848 and 1868 for only 90 locations. W is the spatial weight matrix for the sample of locations used for outcomes 1–2, L is the spatial weight matrix for the sample of locations used for outcome 3, where the spatial weight in both W and L is defined as the inverse distance. The spatial lag of the dependent variable measures the spatial correlation in the dependent variable weighted by the spatial weight matrix. Standard errors are in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$. Controls are measured at the village level and consist of: (1) proportion of non-Muslims, (2) proportion of Bedouins, (3) average number of male free household members, (4) average number of female free household members, and (5) the interaction of distance to Suez with the 1868 dummy variable.
Sources: The 1848 and 1868 population census samples. Data on crop suitability are from FAO-GAEZ under irrigation and intermediate input in the baseline period 1961–1990.

E Expansion of Cotton Cultivation

I hypothesize that the positive effects of the cotton boom on slavery and state coercion, and its negative effect on wage employment, are driven by cotton expansion. At the aggregate level, the cropped area increased by 50 percent between 1844 and 1874, reaching 7.5 million *feddans* in 1874, although the real area increased by only 11 percent during the same period.[8]

I first explore the impact of the cotton boom on the cultivation of cotton, cereals, and other crops, at the district level, using a first-differences model:

$$\Delta cropoutcome_d = \beta_1 cotton_d + \beta_2 cereals_d + \varepsilon_d \tag{E.1}$$

where $\Delta cropoutcome_d$ is the change between 1844 and 1877 in district d in the outcome of three crop groups: cotton, cereals (wheat, barley, and beans), and other crops. For cotton and cereals, I study both area and yield, while for the other crops, I only observe the area. I employ several data sources to construct these outcomes.[9]

Next, I examine the correlation between cotton cultivation and each of slavery and the agricultural employment of local labor:

$$\begin{aligned} y_{hvdt} = \; & \delta_1 cottonoutcome_{dt} + \delta_2 cerealsoutcome_{dt} \\ & + \delta_3 othercropoutcome_{dt} + X_{hvdt}\gamma + \alpha_d + \beta_t + \varepsilon_{hvdt} \end{aligned} \tag{E.2}$$

where y_{hvdt} is either slaveholdings or the agricultural employment of household h in village v in district d in census year t, $cottonoutcome_{dt}$, $cerealsoutcome_{dt}$, and $othercropoutcome_{dt}$ are the area or yield of cotton, cereals, and other crops, respectively, in each of 1844 and 1877, where I assign the 1844 values to the 1848 census, and the 1877 values to the 1868 census.

The results are shown in Table E.1. High-cotton districts increased their real area in 1844–1877 by 33,500 *feddans*, relative to low-cotton districts, which amounts to 42 percent of the average in 1844 (column 1). Furthermore, compared to low-cotton districts, the cotton area in high-cotton districts increased by an additional 4,800 *feddans*, which is more than the average cotton area in 1844 (column 3), whereas the cotton yield rose by an additional 15,700 *qintars*, which is 3.5 times the average in 1844 (column 6). This cotton expansion in high-cotton districts was partially at the expense of other crops (column 5). However, the area and yield

[8] There are inconsistencies across data sources, though. The cropped area in 1874 (7.52 million *feddans*) (U.S. House of Representatives Papers (1877), p. 905) is higher than in 1877 (4.37 million) (the 1873 Statistical Yearbook, Vol. 2, pp. 54-77, 84-99, 118-166), and in 1893–1894 (6.3 million) (the 1909 Statistical Yearbook, p. 270). By contrast, the real area in 1874 (4.81 million *feddans*) (U.S. House of Representatives Papers (1877), p. 905) is lower than in 1877 (5.74 million) (the 1873 Statistical Yearbook, Vol. 1, pp. 123-129), and in 1893–1894 (5.39 million) (the 1909 Statistical Yearbook, p. 270), although it is close to the real area in 1873 (4.62 million) (the 1873 Statistical Yearbook, p. 300). I prefer to use the Egypt-level data for 1874 in U.S. House of Representatives Papers (1877) instead of the other sources, because (1) the cropped area in the 1873 Statistical Yearbook is lower than the real area in the same source (which is definitely an error), (2) the 1873 Statistical Yearbook does not report the cropped area, and (3) the 1909 Statistical Yearbook is after the period of study. However, I use the district-level data in U.S. House of Representatives Papers (1877) on the area and yield of each crop in Table E.1a, due to its finer geographic detail.

[9] Data are at the province level in 1844 from Rivlin (1961, pp. 258-260), and at the district level in 1877 from the 1877 Statistical Yearbook (Vol. 2, pp. 54-77, 84-99, 118-166). Because the 1844 data are at the province level, I impute the outcomes at the district level in 1844, by multiplying the province's outcome in 1844 with the district's share in the province's outcome in 1877.

of cereals did not change differentially across high- and low-cotton districts (columns 4 and 7). Historical evidence suggests that this cotton expansion was achieved via irreversible investments in perennial irrigation (Owen 1969).[10] These irreversible capital investments in perennial irrigation and slavery may explain why cotton production remained high through 1877 (Figure 1) despite the decline in cotton prices after the end of the U.S. Civil War.

Furthermore, panel (E.1b) shows that the growth of slavery in 1848–1868 is positively correlated with cotton area and yield, but not with the area and yield of cereals or the area of other crops. The growth of wage employment in 1848–1868 is negatively correlated with cotton area and yield, but the correlation is not statistically significant. This suggests that the positive impact of the cotton boom on slavery, and its negative impact on wage employment of local labor, that were documented in Tables 2 and 3, can be traced to cotton expansion.

Do these results imply that slavery and state coercion were necessary conditions for cotton cultivation? Answering this question in the Egyptian context requires comparing the cotton yield per slave and local worker across non-large estate areas and large estates, which we do not observe. Yet, various observations suggest that coercion was *not* necessary for cotton production. First, cotton was produced outside large estates by a majority of local workers, both before and during the cotton boom. In 1848 (resp. 1868), non-large estates areas in cotton-growing districts had 1,659,977 (2,139,335) non-slaves versus 4,897 (81,043) slaves, whereas large estates had 142,668 (152,381) non-slaves and 2,449 (2,290) slaves. Second, cotton production increased after the abolition (Figure 2), although state coercion did not rise (see Section), suggesting that this cotton expansion was mostly due to local workers outside large estates. Third, the 1877 Statistical Yearbook provides area-level data on crop yield per unit of land. It thus allows me to compare cotton productivity in large estates and non-large estate areas, although it does not distinguish between slave and free labor. Appendix Table E.2 shows that state coercion was not correlated with higher cotton productivity: Large estates did not have higher cotton productivity than non-large estate areas in 1877, although they were more productive in wheat, barley, and beans.

[10] Province-level data ($N = 5$) on the number of waterwheels per *feddan* and the number of irrigation steam engines per *feddan* in each of 1844 (Rivlin 1961, p. 281) and the 1873 Statistical Yearbook (pp. 270-272) show a positive correlation between the district's cotton productivity and these irrigation investments between 1844 and 1877. However, I fail to detect any correlation between the district's cotton productivity and the growth of summer canals between 1844 and 1873.

Table E.1: The Cotton Boom and Cotton Expansion

(a) Δ Area and Yield of Cotton, Cereals, and Other Crops between 1844 and 1877

	Δ Area (1,000 *feddans*)					Δ Yield (1,000 *qintars* or *ardabbs*)	
	(1) Total Real	(2) Total Cropped	(3) Cotton	(4) Cereals	(5) Other Crops	(6) Cotton	(7) Cereals
Cotton	22.81***	5.30	3.28***	5.53	-3.52*	10.71**	-3.73
	(3.80)	(3.75)	(1.09)	(3.29)	(1.77)	(3.94)	(11.66)
Cereals	-10.07**	-17.85**	0.72	-13.61**	-4.96	5.33	-33.06**
	(4.65)	(7.44)	(1.73)	(5.03)	(4.59)	(4.95)	(13.91)
Obs (Districts)	24	21	21	21	21	21	21
R^2	0.45	0.14	0.34	0.18	0.08	0.41	0.06
Mean Dep. Var. in 1844	80.05	100.24	4.06	57.42	38.77	4.60	166.29

(b) Slavery and the Agricultural Employment of Local Labor

	N. Slaves in HH		=1 if Slaveowning Free-headed HH		=1 if HH Head Agr. Laborer	
	(1)	(2)	(3)	(4)	(5)	(6)
Cotton area (1,000 *feddans*)	0.03***		0.01***		-0.01	
	(0.00)		(0.00)		(0.01)	
Cereals area (1,000 *feddans*)	-0.00		0.00		-0.00*	
	(0.00)		(0.00)		(0.00)	
Other crops area (1,000 *feddans*)	0.00		-0.00		0.01	
	(0.00)		(0.00)		(0.00)	
Cotton yield (1,000 *qintars*)		0.01***		0.00***		-0.00
		(0.00)		(0.00)		(0.00)
Cereals yield (1,000 *ardabbs*)		0.00		0.00		-0.00
		(0.00)		(0.00)		(0.00)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Census Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clusters (Districts)	21	21	21	21	21	21
Obs (Households)	4758	4758	4746	4746	3275	3275
R^2	0.09	0.09	0.14	0.14	0.21	0.20

Notes: White-Huber robust standard errors are in parentheses in panel (a). Standard errors clustered at the district level are in parentheses in panel (b). $*p < 0.10, **p < 0.05, ***p < 0.01$. In panel (a), area is measured in 1,000 *feddans*, yield is measured in 1,000 *qintars* for cotton, and in 1,000 *ardabbs* for wheat, barley, and beans. In panel (b), controls are defined as in Table 2. Regressions in panel (b) are weighted by the inverse sampling probability of households. 1 *feddan* = 6,368 square meters, 1 *qintar* = 44.5 kilograms , 1 *ardabb* = 135 kilograms.
Sources: The 1848 and 1868 population census samples. Data on crop area and yield are from Rivlin (1961, pp. 258-260) for 1844, and the 1877 Statistical Yearbook, Vol. 2, pp. 54-77, 84-99, 118-166, for 1877.

Table E.2: Difference in Cotton and Cereals Productivity Across Large Estates and Non-Large Estate Areas in 1877

	(1) Large Estate 1	(2) Large Estate 2
Cotton × Large Estate	-0.076	-0.369
	(0.215)	(0.236)
Wheat × Large Estate	0.566	0.617**
	(0.429)	(0.297)
Beans × Large Estate	0.552**	1.074***
	(0.252)	(0.301)
Barley × Large Estate	0.218	0.767**
	(0.315)	(0.364)
District FE?	Yes	Yes
Crop FE?	Yes	Yes
Clusters (Districts)	67	61
Obs (Area-Crop)	366	329
R^2	0.514	0.579
Mean Dep. Var.	0.839	0.755

Notes: The dependent variable is the standardized revenue per *feddan* for each crop at the area level. White-Huber heteroskedasticity robust standard errors are in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$. Large estate 1 is a dummy variable that equals 1 if an area is designated as a large estate or if an area includes both a large estate and a non-large estate, and equals 0 if an area does not include any large estates. Large estate 2 is a dummy variable that equals 1 if an area is designated as a large estate, and equals 0 if an area does not include any large estates. It thus treats as missing areas that include both a large estate and a non-large estate.
Sources: Area-level data on the area and revenue of each crop are from the 1877 Statistical Yearbook.

F The Egyptian Parliamentary Minutes in 1866–1882

The analysis of the political attitudes of rural middle class MPs is based on two datasets. The first is the Egyptian parliamentary minutes in 1866–1882 that were published in Arabic by the National Archives of Egypt (Dar al-Watha'iq al-Qawmiya (2001–2017). *The Minutes of Majlis Shura al-Nuwwab*. Cairo: Dar al-Watha'iq al-Qawmiya. 4 volumes). It provides the detailed minutes, including all speeches, during each parliamentary meeting. Hartnett and Saleh (2022) OCR digitized these minutes. The second dataset covers the universe of MPs during this period, and was constructed by Mohamed Saleh based on Subhi, M. K. (1947). *History of Parliamentary Life in Egypt since the Era of Muhammad Ali Pasha*, Vol. 6 and Addendum. Cairo: Dar al-Kutub. It provides information on MP's name, title, occupation, constituency (according to the 1882 population census administrative division), among other variables. I identify rural middle class MPs during this period as those whose occupational title is village headman. The information on MP's constituency enables me to assign the cotton and cereals productivity in 1877 to each MP. For the purpose of this article, I restrict the analysis to rural middle class MPs in 1866–1882, with non-missing constituency and occupation information.

We classified texts in the parliamentary minutes into:

1. General statement: This is a descriptive statement that is not attributed to any person, or an organizational speech made by the House Speaker.

2. MP debate: This is a speech made by an MP.

3. Report: This is a report written by a parliamentary committee, or a group of MPs.

4. Ministerial statement: This is a report, correspondence, or a speech made by a government official, such as a minister, or a director of government agency.

5. Opinion / Decision: This is a resolution made by MPs at the end of a debate. It is not attributed to any particular person.

6. Petition: This is a petition presented by an MP, a group of MPs, or citizens, regarding a personal demand.

I restrict the analysis to texts identified as "MP debate," which are the vast majority of texts. I identified the MP speaker for each text, and linked this dataset with the MPs' dataset, in order to obtain information on MP's characteristics. To identify labor-related speeches, I first manually inferred the "Matter of Discussion" for each group of MP speeches, from the content of the speeches, and from the matter of discussion that is often explicitly mentioned in the source minutes. I then classified matters of discussion into the following "General Topics:" (1) Parliament Organization, (2) Agriculture and Irrigation, (3) Land (Incl. Land Tax), (4) Labor, (5) Budget and Finances (Excl. Land Tax), (6) Judiciary and Bureaucracy, (7) Other,

and (8) Cabinet-Parliament Relationship. In this article, I restrict the analysis to General Topic (4): Labor. I then further classified labor-related matters of discussion into two sub-categories: "State Coercion" and "Other." I list below the labor-related matters of discussion and their sub-category:

1. State Coercion This includes the following matters of discussion sorted by parliamentary cycle:

- 1866–1869: Abolishing Corvée Requirement during Cotton Sowing and Harvest Seasons
- 1870–1873: Corvée Labor Needed for the Beheira Canal Drilling
- 1870–1873: Number of Corvée Workers Required for Public Works
- 1876–1879: Controlling Labor Migration to Large Estates
- 1876–1879: Exempting Landless Farmers from Corvée Labor
- 1876–1879: Monetary Payment for Exemption from Corvée Labor
- 1881–1882: Allocation of Corvée Labor Needed for Cleanup of Beheira Canal across Provinces
- 1881–1882: Draft Law on Corvée Labor
- 1881–1882: Inquiry about Monetary Payments by Populations of Jifliks, Izbas, Ib'adiyas, and Kufur, to Avoid Corvée Labor
- 1881–1882: Reducing Corvée Requirement for Villages, Ib'adiyas, and Jifliks
- 1881–1882: Replacing Corvée Workers with Machinery for Cleaning Irrigation Canals
- 1881–1882: Using Corvée Labor for Certain Canals in Upper Egypt that Are Used Exclusively for Summer Irrigation by Khedival Land

2. Other Labor-Related This includes the following matters of discussion sorted by parliamentary cycle:

- 1866–1869: Enumeration of Bedouins and Populations of Hamlets
- 1866–1869: Making Exemption from Military Conscription by Cash Payment to Government and Removing Social Class Eligibility Conditions
- 1866–1869: Population Census
- 1870–1873: Revising Population Census

- 1881–1882: Draft Decree on Abolition of Privileges of Arab Tribes
- 1881–1882: Draft Decree on Preservation of Exemption for Arab Tribes from Military Conscription and of Monetary Payment to Avoid Corvée Requirement
- 1881–1882: Stricter Identification of Arab Tribes for Census Operation and Military Conscription Privileges

I classify the political attitude in each MP's speech into (1) "Progressive", if the speech calls for an improvement over the status quo, (2) "Conservative," if the speech calls for maintaining the status quo, and (3) "Procedural," if the speech makes a procedural, as opposed to substantive, remark.

In this article, I focus on the following outcomes measured at the MP and parliamentary cycle level: (1) MP's total length of speeches (total word count) that fall under State Coercion, regardless of the attitude, (2) MP's total length of speeches that are "Anti" State Coercion, defined as "Progressive" speeches under State Coercion, (3) MP's total length of speeches that are "Pro or Neutral" towards State Coercion, defined as "Conservative" and "Procedural" speeches under State Coercion, (4) MP's total length of speeches that fall under Other Labor-Related, regardless of the attitude.

Table F.1: The Political Effects of the Abolition of Slavery

	Total Word Count of MP Speeches by Attitude			
	(1) Total Labor	(2) Anti-State Coercion	(3) Pro or Neutral w.r.t. State Coercion	(4) Other Labor
Cotton × Post-1877	4.70	6.26*	1.32	-2.87
	(5.56)	(3.41)	(1.88)	(2.22)
Controls	Yes	Yes	Yes	Yes
District FEs	Yes	Yes	Yes	Yes
Parl. Cycle FEs	Yes	Yes	Yes	Yes
Clusters (Districts)	57	57	57	57
Obs (MP-Cycle)	294	294	294	294
R^2	0.22	0.20	0.23	0.32
Baseline Av. Dep. Var.	30.52	4.06	7.10	19.36

Notes: The analysis is at the MP and parliamentary cycle level. The sample is restricted to rural middle class MPs. The dependent variable is the MP's total word count of parliamentary speeches that are labor-related, classified into (1) all labor, (2) anti-state coercion, (3) pro- or neutral with respect to state coercion, and (4) other labor. Controls are the cereals suitability interacted with the post-1877 dummy variable. There are four parliamentary cycles in 1866–69, 1870–73, 1876–79, and 1881–82. The latter two cycles are coded as post 1877. Standard errors clustered at the district level are in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$.
Sources: The Egyptian parliamentary minutes in 1866–1882.

References

Baer, G. (1967). Slavery in Nineteenth Century Egypt. *Journal of African History*, 8(3):417–441.

Fredriksen, B. (1977). *Slavery and Its Abolition in Nineteenth-Century Egypt*. Historisk Institutt Universitetet I Bergen, Bergen, Norway.

Hartnett, A. S. and Saleh, M. (2022). Rural Intra-Elite Conflict, Colonialism, and the Demand for Power-Sharing: Evidence from Khedival Egypt. Mimeo.

Mowafi, R. (1981). *Slavery, Slave Trade and Abolition Attempts in Egypt and the Sudan 1820-1882*. Esselte Studium, Stockholm.

Owen, R. (1969). *Cotton and the Egyptian Economy 1820-1914: A Study in Trade and Development*. The Clarendon Press, Oxford.

Richards, A. R. (1981). Agricultural Mechanization in Egypt: Hopes and Fears. *International Journal of Middle East Studies*, 13(4):409–425.

Rivlin, H. A. B. (1961). *The Agricultural Policy of Muhammad 'Ali in Egypt*. Harvard University Press, Cambridge, MA.