The Cotton Boom and Slavery in Nineteenth-Century Rural Egypt*

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Abstract

The "staples thesis" argues that institutions in a given region could be explained by the nature of production of its prevailing staples, whereby slavery is likely to emerge in "slave-conducive" crops, such as cotton, rice, and sugarcane. This paper evaluates the thesis using a unique natural experiment from nineteenth-century rural Egypt, the cotton boom that occurred because of the American Civil War in 1861-1865. Historical evidence suggests that the cotton boom marked the emergence of the short-lived institution of large-scale agricultural slavery in Egypt's Nile Delta, where all slaves were imported from East Africa, before the abolition of slavery in 1877. Employing the newly digitized Egyptian individual-level population census samples from 1848 and 1868, I find that cotton-favorable districts witnessed greater increases in household's slaveholdings and the share of slave-owning households between 1848 and 1868 than less favorable districts. Those districts also witnessed greater increase in the population share of free local immigrants. I examine several potential mechanisms of these effects, namely, cross-district differences in the relative scarcity of free local labor and inter-crop differences in economies of scale and skill-intensity (results on mechanisms are not complete).

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1. Introduction

> *The barbarism of the* [U.S.] *South, while destroying itself,* [appeared] *in the providence of God to be working out the regeneration of Egypt.*
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> *North American Review* 98, no. 203 (1864), p. 483 (Cited in Earle, 1926)

Why does slavery, which characterized labor organization throughout most of human history, exist? Influenced by the Canadian experience and introduced by a few Canadian scholars, the so-called "staples thesis" argues that institutions could be explained by the nature of production of the prevailing crops in a region and are thus attributable to the region's geographic favorability to certain crops. The thesis was then extended to explain the economic divergence of U.S. North and South by Douglass North (1966 [1961]). Mechanisms of the "geographic determinism" that is inherent in this thesis range from differences in skill intensity between "slave-conducive" crops and "free labor" crops (Fenoaltea, 1984; Goldin and Sokoloff, 1984), inter-crop differences in economies of scale where "gang labor" is required in certain crops (Fogel, 1989), and differences between economic activities in costs of labor turnover (Hanes, 1996). Nevertheless, despite the large literature on slavery in the Americas, there is still little econometric evidence on the underlying factors behind the emergence of slavery, presumably because of the difficulty of observing a natural experiment in history where slavery is the outcome. To the best of my knowledge, only Nilsson (1994) provides evidence on the impact of the abolition of slavery on the pattern of production in the post-bellum U.S. South, where he suggests that the U.S. South switched away from cotton after slavery was abolished, hence suggesting that slavery was an indispensable labor institution for cotton cultivation.

This paper provides novel econometric evidence to test the various versions of the "staples thesis" on the origins of slavery, using a unique natural experiment from nineteenth-century rural Egypt, the boom in cotton prices that occurred because of the American Civil War in 1861-1865, which is known as the "Lancashire Cotton Famine" (Figure I.A). Egypt, a major producer of long-staple cotton at the time, benefited from the boom along with India, and its cotton production and exports witnessed sharp increases (Figure I.B). Strikingly, however, the boom was correlated with a surge in Egypt's slave imports from East Africa presumably to work on Egyptian farmers' cotton plantations in the Nile Delta although slave prices remained stable (Figures II.A and II.B). Perhaps intrigued by nineteenth-century European writers' remarks, historians of modern Egypt long documented that the cotton boom marked the "emergence" of agricultural slavery in the Nile Delta, ironically a short-lived institution as slavery was abolished in Egypt several years later in 1877 (Earle, 1926; Baer, 1967; Helal, 1999; Cuno, 2009 and 2010). Prior to the boom, slavery in Egypt (an autonomous Ottoman province at the time), and in the Ottoman Empire at large, was mostly confined to domestic and sexual services, with the majority of slaves, 75 percent of whom were females, residing in cities. On the other hand, agricultural slavery was, as Cuno (2009) puts it, "a rarity in Islamic history," and before the cotton boom, only existed in sugarcane plantations and certain public works in the Nile Valley (Helal, 1999).

This paper builds on the aforementioned literature in order to rigorously examine the impact of the cotton boom of 1861-1865, an exogenous price shock in international markets, on *imported* slavery and free local labor in nineteenth-century rural Egypt. In order to do so, I employ a new and unique date source, the Egyptian individual-level

population census samples from 1848 and 1868 that I recently digitized from the original census manuscripts at the National Archives of Egypt and that are described in detail in Saleh (2013). These are two of the earliest population censuses from any non-Western country to include information on every household member (not only household heads) including females, children, and slaves. Two features of the Egyptian 1848 and 1868 population censuses make them suitable to examine the impact of the cotton boom on nineteenth-century rural Egypt. First, the censuses are, to the best of my knowledge, the only surviving comprehensive data source on slavery in Egypt, and perhaps in the entire Middle East, before its abolition in 1877. Second, since the cotton boom occurred in 1861-1865, i.e. between 1848 and 1868, the two census samples allow me to employ a straightforward difference-in-differences strategy where I compare the *change* between 1848 and 1868 in shares and outcomes of slave and free populations in "cotton-favorable" (treatment group) and "cotton-unfavorable" (control group) districts in rural Egypt. The observed changes are hence plausibly attributable to the cotton boom.

I employ three alternative measures for cotton favorability, (a) a dummy variable for the Nile Delta, to capture the availability of perennial irrigation which was essential for long-staple cotton plantation, (b) a dummy variable for districts on the Damietta Nile Branch, to capture soil quality that was most favorable to long-staple cotton, and (c) temperature, where cotton cultivation required more moderate climates. I find that cotton-favorable districts witnessed between 1848 and 1868 *differentially* greater increases in household's slaveholdings, population share of slave-owning households, and population share of free local migrants, than cotton-unfavorable districts. However, the cotton boom had no effect on the share of local free landholding farmers. Interestingly, slave

population in cotton-favorable districts was negligible in 1848 hence suggesting that the cotton boom indeed marked the "emergence" of agricultural slavery in the Nile Delta.

There is a large body of literature, both theoretical and empirical, on the reasons behind the emergence of slavery, or more generally, the coercion of labor, which go beyond the standard "staples thesis." Wright (1978, 2003, and 2006) argued that political factors, and not geographic favorability to crops, explain the differential institutional path of the U.S. North and South. The well-known Nieboer-Domar model explained slavery by the scarcity of labor relative to land (Nieboer, 2011 [1900]; Domar, 1970), and, more recently, Acemoglu and Wolitzky (2011) extended this hypothesis within a principal-agent framework where coercion affects the participation constraint of workers. Perhaps relatedly, in a series of seminal papers, Engerman and Sokoloff (1997, 2000, and 2002) argued that divergence in economic and political institutions (including slavery) between North and South America was dictated by differences in their initial factor endowments. Several papers attempted to empirically test both the reasons and long-term effects of coercion of labor (Nunn, 2008; Dell, 2010; Nunn and Wantchekon 2011; Acemoglu et al., 2012; Fenske, 2013), including the impact of international price shocks on coercion of labor, which is the most relevant to this paper (Dippel, Greif, and Trefler, 2015).

There are two distinguishing features of my paper compared to the aforementioned literature though. First, the Egyptian case study is unique because it is, to the best of my knowledge, the *first* natural historical experiment in the literature on slavery where slavery is itself an outcome of an exogenous historical event, in this case a price shock on cotton's international market. Interestingly, rural Egypt with its small-scale landowners is a totally different context from the usually studied transatlantic slave

trade with its European large-scale landowners, and hence slavery is probably a less expected outcome in Egypt's case. Second, because enslavement of fellow Muslims is prohibited under Islamic law, slavery in the Middle East, and nineteenth-century Egypt was no exception, consisted solely of non-Muslim slaves that were *imported* from outside the region (mainly, Caucasia and East Africa) who were then normally converted to Islam. Therefore, unlike the aforementioned literature, Egypt's slavery was not an endogenously formed institution of *coercion* of local labor. To be even more specific, I do *not* claim that Egypt's institution of imported slavery was itself *formed* as a consequence of the cotton boom, since in fact domestic service and sexual slavery existed in Egypt for centuries and even agricultural slavery existed in the Nile Valley prior to the boom. What I *do* claim though is that the cotton boom caused a differential increase in the demand for agricultural slaves in cotton-favorable districts in Egypt, and, strikingly, agricultural slavery did *not* exist in those districts prior to the boom.

Inspired by the various theories on the emergence of slavery, I attempt to test different mechanisms that may account for the observed effects, namely, the cross-district differences in relative scarcity of local free labor and inter-crop differences in economies of scale and skill intensity. I use district's population shares of emigrants (both legal and "fugitives") and of military conscripts as measures of the district's relative scarcity of labor, as suggested by the historical literature, and I use district's share of hamlets, one type of large agricultural estates, as a measure of economies of scale. Results on mechanisms are not yet complete in this preliminary version of the paper.

Finally, the paper contributes to Egyptian history. As I mentioned above, I build on the historical literature on Egypt's slavery by providing the first econometric evidence

on the effect of the cotton boom on agricultural slavery in rural Egypt. This is possible because of the newly digitized census samples of 1848 and 1868. In fact, prior to the discovery of the 1848 and 1868 population censuses, the conventional belief among historians and demographers was that there was no information on nineteenth-century Egypt's slave population. The paper also contributes to the literature on the agricultural history of nineteenth-century Egypt (Al-Hitta, 1950; Owen, 1969), which was, in the words of Roger Owen, one of the most renowned historians of modern Egypt, "almost wholly shaped by cotton" (Owen, 1969, p. xxiv).

The rest of this paper is organized as follows. Section 2 provides a historical background on rural Egypt's major export crop plantations and the free and slave labor markets in the nineteenth century. I describe the data in section 3. Section 4 discusses the empirical strategy, while section 5 reports the findings. I examine the mechanisms of the impact of the cotton boom in section 6 (incomplete). Section 7 outlines the next steps.

2. Historical Background

2.1. Egypt's Major Export Crops

Up to 1800, Egypt's agriculture was mostly confined to winter crops, such as wheat, barley, beans, and Egyptian clover, due to its reliance on the Nile inundation in August. Summer crops, such as short-staple cotton, sugarcane, and rice, were limited to farms that were close to the Nile River and could thus have water throughout the whole year. As part of his ambitious state-led modernization program, Muhammad Ali Pasha, the autonomous Ottoman viceroy of Egypt in 1805-1848, introduced perennial irrigation in the Nile Delta, but not in the Nile Valley due to technological constraints, in order to expand on summer "cash" crops. Those consisted mainly of three crops, the high-quality

long-staple cotton, sugarcane, and rice. Following the discovery of long-staple cotton by a French industrialist named Louis Alexis Jumel in 1821, Ali largely expanded on its cultivation in the Nile Delta, which was suitable because of both its perennial irrigation and mild temperature. By contrast, sugarcane plantations increased in the Middle and Southern Nile Valley, because of its high temperature, whereas rice plantations increased in the Northern Delta because of its soil. Wheat, a winter crop, was in fact planted in all Egypt. Ali monopolized internal and international trade of all major cash crops (cotton, wheat, rice, and sugarcane) in 1808-1842. After 1842, farmers became connected to the world markets, as exporters were allowed to purchase crops directly from farmers.

Figure I.A and Figure III show prices of Egypt's major export crops, mostly in England, which was Egypt's major trade partner having about 70 percent of Egypt's trade. Only cotton, and less so wheat, witnessed price booms between 1848 and 1868, cotton because of the American Civil War and wheat because of the abolition of the Corn Laws in England and the Crimean War.

2.2. Egypt's Free and Slave Labor Markets

Throughout the agricultural history of Egypt, local farmers were technically "free," although they were tied to their villages since antiquity and could not emigrate in principle without state permits. Local farmers were allocated plots of land to cultivate on which they paid land tax (*kharaj*). Technically though, all land was state-owned since antiquity, and farmers were only "landholders" who enjoyed usufruct rights on land that were transferable and inheritable only upon state approval, but did not enjoy full private property rights until 1899. Besides landholding farmers, there were landless farmers who worked on farms of others for a wage or a share of the crop yield.

Prior to the cotton boom, slavery in Egypt, and the Ottoman Empire at large, was mostly confined to domestic and sexual services. The majority of slaves, mostly females, resided in cities, whereas agricultural slavery was very limited and only existed in sugarcane plantations and certain public works in the Nile Valley (Helal, 1999). All slaves were imported from outside Egypt. The vast majority of slaves in 1848 were blacks or "Sudanese," who came from places South of Nubia, mainly Darfur, Kurdufan, Sennar, and Chad. There were also brown slaves or Abyssinians, who were imported from Ethiopia, and white slaves who were brought from Circassia and Georgia.

Panel (A) of Figure II shows estimates of slave prices in Cairo slave market in 1800-1877, based on Mowafi (1981). Prices varied by gender, color, and age. Females were generally more expensive than males, because they were purchased as concubines, and white and Abyssinian slaves were more expensive than blacks (I do not show prices of white slaves in the figure because they were very rare and way more expensive than Abyssinians and blacks). Also, slaves who aged between 14 and 29 years of age were usually the most expensive. The figure shows relative stability in prices of black slaves throughout the whole period despite changes in slave imports in panel (B), hence suggesting that the supply of black slaves was perfectly elastic.

Panel (B) of Figure II shows Egypt's flow of slave imports during the same period, along with the major events that may have affected the supply or demand of slaves. There are two major spikes in slave imports, which were generally around 5,000 slaves annually. The first is around 1822, right after Egypt's invasion of Sudan, where slaves were captured and employed as officers and soldiers in Ali's new army, and the second is in 1861-1869, which presumably occurred because of the cotton boom. Another

event that perhaps contributed to the decline in demand for black slaves in the 1830s is the end of Russia's occupation of Circassia and Georgia around 1828, which may have resumed importing white slaves from these regions, and hence could have reduced the demand for black slaves. Starting from 1869, the state anti-slave trade measures became strictly enforced thus reducing slave imports drastically, before the final abolition of slavery and the emancipation of all existing slaves in 1877.

3. Data

Examining the effects of the cotton boom on slavery and on the geographic and occupational distributions of free local labor in rural Egypt requires collecting comprehensive information on the characteristics of rural Egypt's free and slave populations both before and after the cotton boom. Until recently, the conventional belief among historians and demographers was that Egypt's first population census was conducted in 1882, and so it was presumed that there was no information on Egypt's nineteenth-century slave population given that slavery was abolished in 1877. That proved to be wrong, however, after the discovery of the population censuses of 1848 and 1868 at the Egyptian Archives in the 1990s. In this paper, I employ this new and unique date source, the individual-level census *samples* from 1848 and 1868 that I recently digitized from the original census manuscripts at the National Archives of Egypt and that are described in detail in Saleh (2013). I restrict the census samples to individuals in rural Egypt, where the sampling rate is 1 percent of rural Egypt's population in 1848 and 1868. I aggregated the sample to the household level, which is probably more meaningful for examining the extent of slaveholdings. In order to control for geographic fixed effects within the difference-in-differences strategy, I matched rural districts across 1848 and

1868, which resulted in 25 matched districts (out of 71 rural districts in 1848), 8 in the Nile Delta and 17 in the Nile Valley, and I restricted the sample to households in these 25 districts.[1] [2]

There are three outcomes of interest. The first outcome is slavery, which I measure by (a) household's slaveholdings (broken down by sex and age), and (b) a dummy variable for slave-owning households. An individual's legal status (free, slave, or emancipated slave) is usually recorded in the census manuscripts in both 1848 and 1868, along with an individual's ethnicity. All slaves were imported from abroad and were of three ethnicities: whites (Circassians and Georgians), Abyssinians (Ethiopians), and blacks (mainly from Sudan and Chad). In many households, however, and especially in 1868, there are household members who are recorded as blacks but with no information on their legal status. It is almost certain though that those individuals were in fact slaves, because (a) they are mentioned after all household members including free servants, which was the conventional order of recording slaves in the 1848 and 1868 census manuscripts, and (b) they had no recorded relationship to household head, unlike family members and free servants. For these reasons, both Helal (1999) and Cuno (2009 and 2010) regard those observations as slaves, and I follow them in this paper. It appears that the most likely explanation for not recording the slave status explicitly for those individuals is that census takers in both 1848 and 1868 often omitted certain information

[1] There are three administrative levels in Egypt, which are, from smallest to largest, village, district, and province. Because the 1848 and 1868 census samples are random individual-level samples that are not representative at the village-level, I had to do the matching at the higher level, the district.

[2] Unlike the almost complete 1848 census, the 1868 population census was apparently incomplete, where I found census registers for only two provinces in the Nile Delta (out of six provinces) and four provinces in the Nile Valley (out of eight provinces) (Saleh 2013). This explains the relatively low matching rate.

if it is understood from the context, which is likely the case for black household members who are unrelated to the household head.

The two other outcomes of interest are the geographic and occupational outcomes of free local population. These are immigration of free local labor, which I measure by a dummy variable that takes the value of one if the household head is born outside the province, and occupational specialization of free local labor, which I measure by a dummy variable that takes the value of one if the household head is a landholding farmer.

Two variables define a household's exposure to the cotton boom, first, the census year, where households in 1868, but not in 1848, were exposed to the boom, and second, district's geographic favorability to cotton cultivation. I use three district-level measures of cotton favorability, (i) a dummy variable that takes the value of one for districts in the Nile Delta, as a measure of the availability of perennial irrigation, (ii) a dummy variable that takes the value of one for Eastern Delta districts that lie on the Damietta Nile branch, as a measure of soil quality that was most favorable to long-staple cotton based on contemporary experts' accounts (Gliddon, 1841, pp. 15-18), and (iii) district's average temperature in 1900-1930 in March and April, where long-staple cotton is sowed (Gliddon 1841), with milder temperatures being more favorable to the plantation of long-staple cotton. Based on Cuno (1992), I measure district's favorability to rice cultivation by a dummy variable for districts in the Northern Nile Delta and to sugarcane cultivation by a dummy variable for districts in the Middle and Southern Nile Valley.[3] Figure IV shows the spatial distribution of the crop favorability variables on Egypt's map.

[3] Another alternative is to use the FAO-GAEZ database, which measures crop-specific potential yield under "traditional" agriculture at a detailed geographic level. I am currently exploring this data source.

Do crop favorability measures predict the actual shares of cultivated area of each major export crop at the time? Unfortunately, there is no subnational information on crops' land acreage in Egypt before 1894-1895. I thus employ the province-level statistics from 1894-1895 and the district-level 1929 agricultural census, which are the earliest data sources on land acreage of each crop in Egypt at the subnational level and I regress these shares on the crop favorability measures. The results are shown in Table I. Overall, it seems that the measures indeed predict the actual crop cultivation pattern in Egypt with two caveats, (a) the limited statistical power because of the small sample size especially in 1894-1895, and (b) the cultivation of cotton became widespread in all Egypt by the end of the nineteenth century, thus limiting the predictive power of the cotton-favorability variable in both 1894-1895 and 1929.

I control for several household-level characteristics that might affect slaveholdings and geographic and occupational outcomes of free local labor. These include: (i) a dummy variable that takes the value of one if household head is non-Muslim, (ii) a dummy variable for household head belonging to an Arab tribe (Bedouin), (iii) a dummy variable for household head being a village headman, and (iv) sex and age composition of free members in the household.

Table II shows the summary statistics in 1848 and 1868 for all the variables that are included in the empirical analysis at both the household and district levels, where the sample is restricted to the matched 25 rural districts. Average household's slave holdings and the share of slave-owning households both tripled between 1848 and 1868. Surprisingly, the share of landholding farmers dropped between the two years. Other variables are quite stable between 1848 and 1868.

4. Empirical Strategy

I employ a simple difference-in-differences strategy that exploits the cross-district variation in geographic favorability to Egypt's major export crops along with the fact that the cotton boom took place between the two census samples of 1848 and 1868. In particular, I estimate the following OLS regression:

$$(1)\ y_{ijt} = \alpha_{1j} + \alpha_2 Postboom_t + \alpha_3\left(Cotton_j \times Postboom_t\right) + \alpha_4\left(Sugar_j \times Postboom_t\right) + \alpha_5\left(Rice_j \times Postboom_t\right) + \boldsymbol{X}'_{ijt}\alpha_6 + \varepsilon_{ijt}$$

Where y_{ijt} is the outcome of household i residing in rural district j in year t (= 1848 or 1868); α_{1j} are district fixed effects; $Postboom_t$ is a dummy variable that takes the value of one in the post-boom period, i.e. for the 1868 census; $Cotton_j$, $Sugar_j$, and $Rice_j$ are district-level time-invariant variables that measure district's geographic favorability to the plantation of long-staple cotton, sugarcane, and rice respectively; $\boldsymbol{X}'_{ijt}$ is a vector of household-level time-varying controls; and ε_{ijt} is an error term. All standard errors are clustered at the district level, which is the level at which I measure crop favorability. In this specification, α_2 captures the change in outcome of interest between 1848 and 1868 in the base group, i.e. districts that are favorable to wheat (among other crops), but not primarily to long-staple cotton, sugarcane, or rice, whereas α_3 measures the impact of the cotton boom on the outcome of interest, which captures the differential change in outcome of interest between 1848 and 1868 in cotton-favorable districts compared to less favorable ones.

The identification in this regression comes from the cross-district differences in *changes* between 1848 and 1868 in outcome of interest. The identifying assumption here is that there are no other district-specific time-variant characteristics that changed

between 1848 and 1868 and that might be correlated with both favorability to cotton plantation and the outcome of interest. It is violated, for example, if there were other policies or events that took place between 1848 and 1868 and differed between cotton-favorable and cotton-unfavorable districts and that could be driving the observed differential changes in outcome of interest. It is important here to mention that changes in landownership laws between 1848 and 1868, and most importantly, the 1858 land code, do not seem to have differed across districts.

5. Results

5.1. Impact on Slavery

In order to build an intuition for the results, I start by showing in Table III a simple difference-in-differences summary statistics table that compares average slave population shares across districts in the Nile Delta and the Nile Valley in both 1848 and 1868. The Nile Delta was favorable to cotton cultivation, but the Nile Valley was not, until at least the beginning of the twentieth century. Interestingly, while the Valley had higher slave population share, on average, than the Delta in 1848, perhaps to work on sugarcane plantations or public works, the Delta witnessed greater increase in slave population share between 1848 and 1868. Strikingly, the slave population share in the Delta was almost negligible in 1848 but rose to about 5 percent of the population in 1868. By contrast, the slave population in the Valley was almost unchanged between the two years at around 1.5 percent. This suggests that the Nile Delta experienced the "emergence" of agricultural slavery between 1848 and 1868, presumably as a consequence of the cotton boom.

These findings are further confirmed in Table IV, which provides the central findings of the paper. Panel (A) shows that the cotton boom had a positive and statistically significant impact on the number of slaves in household. Between 1848 and 1868, households in cotton-favorable districts witnessed a differentially greater increase in their slaveholdings by around 0.17 - 0.30 slaves, on average, compared to those in cotton-unfavorable districts. The effect is robust to the usage of the three alternative measures of cotton-favorability and to the inclusion of controls for district's favorability to the cultivation of sugarcane and rice and for age and sex composition of free members in household. The impact of the cotton boom on households' slaveholding is large given that the average household's slaveholdings in 1868 are 0.16 slaves. As expected, sugarcane-favorable and rice-favorable districts witnessed no change in their household's slaveholdings between 1848 and 1868.

The increase in average household's slaveholdings between 1848 and 1868 may reflect either an increase in slave ownership base among households (extensive margin) or an increase in slaveholdings among households who already owned slaves in 1848 (intensive margin). Panel (B), which shows the results on district's share of slave-owning households, addresses this question. I find that between 1848 and 1868, households in cotton-favorable districts were differentially more likely to own a slave by 9-11 percentage points compared to those in less favorable districts, thus suggesting a differentially greater increase in the slave ownership base among households.

If the increase in slaveholdings was indeed intended to recruit slaves in cotton plantation, it is important to examine the sex and age composition of slaves. Table V addresses this question via re-estimating equation (1) with household's slaveholdings of

each sex and age group as outcomes. The differential increase in household's slaveholdings in cotton-favorable districts is three times stronger for male slaves than for female slaves, and within male slaves, the impact of the cotton boom is strongest for those between 15 and 29 years of age. This supports the hypothesis that the new slaves were employed in agriculture, and in fact contrasts with the traditional employment of slaves in sexual and domestic services as was the case in Egyptian urban provinces in both 1848 and 1868, where 75 percent of slaves were females.

5.2. Impact on Free Local Labor

Having examined the impact of the cotton boom on slavery, a natural question arises: Did the cotton boom have similar effects on the free local labor in cotton-favorable districts? To be specific, did it differentially attract free local immigrants to work on cotton plantations? Did it differentially increase the share of free local landholding farmers in those districts via inducing non-farmers to work on the now-profitable cotton plantations?

In order to better understand the changes in free local labor markets that resulted from the cotton boom, I re-estimated equation (1) for two outcomes, (i) a dummy variable that takes the value of one if the household head is immigrant (born outside province) and (ii) a dummy variable that takes the value of one if household head is a landholding farmer, where I estimated the latter regression separately among non-immigrant and immigrant free local household heads. Both outcomes are defined among local free household heads only.

The results are shown in Tables VI and VII respectively. First, in Table VI, I find that cotton-favorable districts witnessed differentially greater increase in the share of

local free immigrants between 1848 and 1868 than cotton-unfavorable districts. Interestingly, the effect stems from a statistically significant drop in the share of local free immigrants in cotton-unfavorable districts, specifically, in sugarcane- and rice-favorable districts, and simultaneous increase in the share of local free immigrants in cotton-favorable districts (the latter increase is statistically significant except if I use the "Delta" dummy variable as a measure of cotton-favorability). These results suggest that cotton-favorable districts differentially attracted local free immigrants after the boom away from sugarcane and rice plantations, presumably to work on cotton plantations.

Second, the results on the share of landholding farmers within free local labor, both immigrants and non-immigrants, are in Table VII. Panel (A) shows that while there is a statistically significant and large decrease between 1848 and 1868 in the share of landholding free local farmers in cotton-unfavorable districts, including sugarcane and rice districts, the share remains unchanged in cotton-favorable districts. The observed decrease is hence likely attributable to other reasons apart from the cotton boom. One partial explanation is that the government used a large number of free local workers from the Nile Valley on corvée contracts for the construction of the Suez Canal in 1859-1869, hence perhaps reducing the share of landholding farmers in this region.

Taking a closer look at non-immigrating and immigrating local free household heads in panels (B) and (C), I find, unsurprisingly, that the results hold among non-immigrants who constituted the vast majority of local free labor. Among immigrants, however, it appears that those in cotton-favorable districts were differentially more likely to be landholding farmers between 1848 and 1868 compared to immigrants in cotton-

unfavorable districts. The results on immigrants should be interpreted with caution though because of the small sample size of immigrants.

6. Mechanisms (Incomplete)

Several mechanisms may account for the observed effects of the cotton boom on slave and free local labor. I am currently working on a simple conceptual framework to organize this discussion. The main idea of the framework is that there are two factors of production, land and labor. Capital could also be added to the model since there is evidence that Egypt imported machines and other capital from England during the cotton boom presumably to operate on the cotton plantations. Crops differ in technology of production, specifically, economies of scale and labor intensity, with cotton, sugarcane, and rice being labor intensive, whereas wheat is land intensive. Two groups provide labor, local free workers and imported slave workers, which I think of as imperfect substitutes. The key difference between the two types of labor is there is a fixed cost of importing slaves (perhaps, there is a difference in skill too). Because it was not possible to complete the framework for inclusion in this preliminary version of the paper, the discussion below is less formal and consists of ideas for empirical tests for the various potential mechanisms that might explain the findings. Results are incomplete.

6.1. Cross-District Differences in Slave Prices or Quantities

Perhaps, the first mechanism that could drive the impact of the cotton boom on the differential growth in slavery in 1848-1868 between cotton-favorable and cotton-unfavorable districts is the existence of cross-district differential changes in the supply-side factors of the slaves market during that period that could themselves be attributable to the cotton boom, yet *holding the demand for slaves constant*. For example, it could be

that slaves became differentially cheaper in cotton-favorable districts between 1848 and 1868 due to a differential increase in their supply in those districts, whereas the demand remained unchanged. One reason for this possible differential abundance of slaves is the abolition of the Trans-Atlantic slave trade during the American Civil War, which might have diverted slaves from the United States to the Ottoman Empire. Historical evidence suggests, however, that one can safely exclude this mechanism. First, the Trans-Atlantic slaves market was in West Africa and was totally separate from Egypt's slaves market that drew slaves from East Africa (Sudan, Ethiopia, and Chad), and hence the supply of slaves was likely unaltered by the cotton boom. Second, black and Abyssinian slaves, who were transported to Egypt by land or via the Nile River, were in fact less abundant and most expensive in the Delta, including cotton-favorable districts, than in the Valley, because of both transportation costs and import duties that were imposed at several points along the slave trade route, and this pattern likely persisted between 1848 and 1868.

6.2. Cross-District Differences in Relative Scarcity of Local Free Labor

The second candidate mechanism is that differential changes in the relative supply of local free labor in 1848-1868 between cotton-favorable and cotton-unfavorable districts might have driven the impact of the cotton boom on the differential growth in slavery. This mechanism is inspired by two observations. On the one hand, it is probably in line with the Nieboer-Domar model and the theoretical literature on the coercion of labor, with the fundamental difference that slavery in Egypt was imported rather than being enforced on the local free population. It contrasts though with the "staples thesis," because the low labor-to-land ratio could induce slavery regardless of the nature of production of the prevailing crop. On the other hand, the relative scarcity of local free

labor in nineteenth-century rural Egypt is, as Cuno (2010) describes, the conventional explanation for the emergence of agricultural slavery in Egypt in the historical literature, where shortage of local free labor was itself a consequence of military conscription and widespread peasants' flight from their villages presumably to avoid high taxation, conscription, and corvée work.

In order to test this mechanism, I include a set of time-varying district-level control variables in equation (1) with household's slaveholdings as the dependent variable. I first include the district's (logarithm of) number of free local individuals, which is the sample estimate of district's free population (I only have samples of individuals in each district and not the full population count). Second, I control for the share of district's emigrants, including both legal emigrants (who obtained governmental permits to emigrate) and fugitives (who fled their villages illegally). Third, I include the share of district's conscripts, which captures the intensity of military conscription.

The results are shown in Panel (A) of Table VIII. It appears that cross-district differences in scarcity of free local labor, as far as it may be captured by the three aforementioned measures, do not account for the impact of the cotton boom on household's slaveholding. In fact, all three measures are statistically insignificant with the exception of the share of emigrants in the district in column (6). The latter, however, has the opposite sign; districts which had higher shares of their local free population emigrating to other provinces had lower household's slaveholdings.

6.3. Cross-District Differences in Economies of Scale of Prevailing Crop

The third possible mechanism is that slaves were more likely to be employed as "gang labor" on large plantations. If there were differences between crops in their returns

to scale with the production of cotton favoring larger plots, and if the cotton boom provided incentives for increasing cotton production, this might explain why cotton-favorable districts witnessed differentially greater growth in slavery between 1848 and 1868. This is in fact inspired by one version of the "staples thesis," where the technology of production of the prevailing crop(s) is responsible for the type of labor contract that emerges. Specifically, it is in line with Fogel's (1989) explanation of slavery as providing "gang labor" in cotton and tobacco plantations in the U.S. South. Also, this mechanism has some support from the historical literature. According to Owen (2002, p. 146-48), the growth of hamlets, which were one form of large agricultural estates in nineteenth-century rural Egypt, was largely attributable to the cotton boom and marked the rise of "agricultural capitalism" in the Egyptian countryside.

Yet, there is a fundamental difference between the implications of Egypt's natural experiment and the "staples thesis," in general, and the "economies of scale" version of the theory, in particular. While the thesis suggests that there are inherent characteristics of the nature of production of certain crops, in this case, the increasing returns to scale, which are conducive to slavery, the cotton boom suggests, to the contrary, that there is a threshold level of profitability of crop cultivation, above which slaves are profitable to employ, but below which they are not. This threshold perhaps stems from the fixed cost of purchasing slaves (unlike free local labor). It is important here to emphasize that cotton was planted in cotton-favorable districts, perhaps in large plots, between 1821 and 1861, with virtually no demand for slaves. It was only the increase in profitability of cotton plantation as a result of the cotton boom that caused the emergence of the demand for slaves, hence suggesting an important qualification to the "staples thesis."

Testing this mechanism is difficult though because there is no published information on the size of landholdings in each district before the 1929 agricultural census.[4] I thus use a more crude measure of the share of large agricultural estates or land concentration, the share of hamlets in the district out of the total number of its geographic units that were enumerated in 1848 and 1868. I add this measure as a control variable in equation (1) with household's slaveholdings as the dependent variable. The results are shown in Panel (B) of Table VIII. While the share and the absolute number of hamlets is each positively correlated with household's slaveholdings, they each lose their statistical significance if the cotton-favorability measure is added to the regression. This suggests that using agricultural slavery was indeed correlated with larger plantations, yet, this mechanism does not account for the impact of the cotton boom on slavery.

6.4. Cross-District Differences in Relative Labor Intensity of Prevailing Crop

The fourth mechanism is that there were inter-crop technological differences in relative labor (or skill) intensity that might drive the observed differential growth in slavery in 1848-1868. For example, if cotton is more labor-intensive or unskilled-intensive than other crops, the increase in cotton prices might have induced the differentially higher demand for slaves in cotton-favorable districts. This is another version of the "staples thesis," which is in line with Fenoaltea's (1984) theory of the emergence of slavery in "effort-intensive" crops, yet again subject to the aforementioned difference, that there should be a threshold level of profitability of cotton above which it

[4] I am initiating a new data collection project at Egypt's Ministry of Finance's Archives, to digitize representative samples of the unpublished individual-level cadastral surveys in 1813-1988. These surveys are the only surviving data source on landholdings and taxation in nineteenth-century rural Egypt. The completion of this large-scale project is not likely to happen in the short term.

is profitable to recruit more (unskilled) labor. One way to test this mechanism is to examine the share of unskilled agricultural workers in each district.

7. Next Steps

This paper introduces a unique natural historical experiment from nineteenth-century rural Egypt in order to examine the underlying reasons behind the emergence of agricultural slavery, the "Lancashire Cotton Famine" that resulted from the American Civil War, and that caused a sharp increase in cotton prices worldwide. Historical evidence suggests that the cotton boom marked the emergence of agricultural slavery in Egypt's Nile Delta, using imported slaves from East Africa presumably to work on the increased cotton plantations. Using the newly digitized Egyptian individual-level census samples from 1848 and 1868, I find that cotton-favorable districts witnessed differentially greater increases in household's slave holdings and the share of slave-owning households in 1848-1868 than less favorable districts. Those districts also witnessed differentially greater increase in the share of local free immigrants, who were mostly landholding farmers, although the share of local free landholding farmers among non-immigrants remained stable.

Inspired by the literature on the emergence of slavery, or more generally, the coercion of labor, including the "staples thesis," I examine various mechanisms that might account for the impact of an exogenous price shock in international markets on slavery. There is an important difference, however, between Egypt's case study and this literature, namely that slaves in Egypt were imported from abroad, whereas the theoretical literature is concerned with the "enslavement" or "coercion" of local free population, a measure that was banned in Islamic law. I attempt to test for four

mechanisms, inter-district differences in slaves' supply and the relative scarcity of local free labor and inter-crop differences in economies of scale and labor intensity. The results of this exercise are not included in this preliminary version of the paper.

The next step on this paper is to include a theoretical framework to streamline the discussion of the mechanisms, which I explained briefly in section 6, and to complete the empirical analysis of the mechanisms. Another direction is to use an alternative measure for the geographic favorability to crops, namely, the FAO-GAEZ database.

Finally, it is unlikely that slavery had a long-lasting effect on cotton-favorable districts. At its peak, slavery did not exceed 5 percent of the population, and was a very short-lived institution. Although I am unable to follow slaves after their emancipation in the subsequent village-level population censuses in 1882-2006 (color or ethnicity is not recorded in all Egyptian censuses except in 1848 and 1868), historical evidence suggests that many slaves returned back to their countries of origin after emancipation, and others were married to free women and were hence assimilated to the local population.

Nevertheless, the cotton boom led to the long-term persistence of cotton plantation for over a century, and the hierarchical organization of labor and land concentration in cotton-favorable had likely persisted. I am currently exploring the long-term effects of the cotton boom on the assimilation of Arab tribes (Bedouins), gender inequality in educational and occupational outcomes, and the hierarchical organization of labor, but these ideas are suitable for a different project.

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TABLE I
Do Crop Favorability Measures Predict Crops' Actual Plantations?

A. Province-Level Regression: All Rural Provinces
Dependent Variable: Actual Crop's Share of Province's Planted Area in 1894-1895

	(1) % Cotton	(2) % Sugar	(3) % Rice	(4) % Wheat	(5) % Corn	(6) % Egyptian Clover
Damietta	0.019	-0.006	-0.010	0.099	0.131***	-0.021
	(0.051)	(0.003)	(0.008)	(0.080)	(0.037)	(0.040)
Sugarcane	-0.076**	0.024	-0.014	0.097	-0.057	-0.018
	(0.034)	(0.018)	(0.010)	(0.055)	(0.077)	(0.060)
Rice	0.173***	-0.005	0.047***	0.047	-0.162***	0.067**
	(0.040)	(0.003)	(0.007)	(0.118)	(0.030)	(0.028)
Constant	0.082**	0.009**	0.014	0.162***	0.225***	0.167***
	(0.034)	(0.004)	(0.010)	(0.044)	(0.042)	(0.049)
Observations	15	15	15	15	15	15
Adjusted R^2	0.712	0.105	0.632	-0.019	0.219	-0.108

B. Province-Level Regression: Matched Rural Provinces Only
Dependent Variable: Actual Crop's Share of Province's Planted Area in 1894-1895

	(1) % Cotton	(2) % Sugar	(3) % Rice	(4) % Wheat	(5) % Corn	(6) % Egyptian Clover
Damietta	0.173**	-0.008	0.040*	0.367***	-0.029	0.004
	(0.046)	(0.006)	(0.016)	(0.043)	(0.067)	(0.047)
Sugarcane	-0.093	0.015*	-0.019	0.149**	-0.156	-0.027
	(0.046)	(0.006)	(0.016)	(0.043)	(0.067)	(0.047)
Rice						
Constant	0.098	0.009	0.019	0.210**	0.241**	0.212**
	(0.046)	(0.006)	(0.016)	(0.043)	(0.067)	(0.047)
Observations	6	6	6	6	6	6
Adjusted R^2	0.482	0.242	0.129	0.805	-0.084	-0.606

C. District-Level Regression: All Rural Districts
Dependent Variable: Actual Crop's Share of District's Total Planted Area in 1929

	(1) % Cotton	(2) % Sugar	(3) % Rice	(4) % Wheat	(5) % Corn	(6) % Egyptian Clover
Damietta	0.017	-0.000	0.025	0.013	0.013	0.030
	(0.015)	(0.000)	(0.018)	(0.012)	(0.024)	(0.028)
Sugarcane	-0.051**	0.015**	-0.012*	0.006	-0.202***	0.004
	(0.023)	(0.006)	(0.006)	(0.011)	(0.028)	(0.019)
Rice	0.003	-0.001**	0.124***	-0.080***	-0.166***	0.083**
	(0.028)	(0.000)	(0.029)	(0.015)	(0.030)	(0.032)
Constant	0.201***	0.002***	0.012*	0.177***	0.303***	0.127***
	(0.008)	(0.000)	(0.006)	(0.007)	(0.013)	(0.013)
Observations	62	62	62	62	62	62
Adjusted R^2	0.092	0.148	0.592	0.343	0.553	0.139

D. District-Level Regression: Matched Rural Districts Only
Dependent Variable: Actual Crop's Share of District's Total Planted Area in 1929

	(1) % Cotton	(2) % Sugar	(3) % Rice	(4) % Wheat	(5) % Corn	(6) % Egyptian Clover
Damietta	0.029	-0.001	0.012	0.007	0.020	0.053
	(0.025)	(0.001)	(0.037)	(0.020)	(0.042)	(0.032)
Sugarcane	0.033	0.010	-0.023**	0.016	-0.210***	0.002
	(0.025)	(0.007)	(0.009)	(0.012)	(0.042)	(0.023)
Rice	0.015	-0.000	0.183***	-0.048**	-0.165***	0.077**
	(0.039)	(0.001)	(0.047)	(0.017)	(0.042)	(0.035)
Constant	0.193***	0.002***	0.023**	0.165***	0.273***	0.153***
	(0.012)	(0.001)	(0.009)	(0.008)	(0.015)	(0.013)
Observations	24	24	24	24	24	24
Adjusted R^2	0.001	0.089	0.737	0.230	0.623	0.344

* P < 0.10, ** P < 0.05, *** P < 0.01. Robust standard errors are in parentheses. Province-level data in panels A and B are from Egypt's General Statistical Yearbook of 1910, pp. 256-271. District-level data in panels C and D are from the General Agricultural Census of 1929, pp. 20-25.

TABLE II
Summary Statistics: The 1848 and 1868 Individual-Level Population Census Samples in Rural Egypt - Matched Rural Districts Only

(A) Household-Level Means

	1848	1868
Number of slaves and blacks in HH	0.058	0.159
	(0.640)	(1.047)
=1 if Slaves or blacks in HH	0.017	0.053
	(0.129)	(0.225)
=1 if HH Head Migrant	0.061	0.040
	(0.240)	(0.196)
=1 if HH Head Farmer	0.641	0.521
	(0.480)	(0.500)
Delta (=1 if District in Nile Delta)	0.360	0.303
	(0.480)	(0.460)
Damietta (=1 if District on Damietta Nile branch)	0.249	0.205
	(0.433)	(0.404)
Sugarcane (=1 if District in Middle or Southern Nile Valley)	0.303	0.294
	(0.460)	(0.455)
Rice (=1 if District in Northern Nile Delta)	0.107	0.018
	(0.310)	(0.132)
District's average temperature in Celsius in March and April 1900-1930	18.472	18.709
	(0.952)	(0.681)
=1 if HH Head Non-Muslim	0.084	0.079
	(0.277)	(0.269)
=1 if HH Head from an Arab tribe	0.006	0.018
	(0.078)	(0.132)
=1 if HH Head headman of village	0.019	0.023
	(0.138)	(0.151)
Number of free males 0-4 in HH	0.546	0.544
	(0.903)	(0.802)
Number of free males 5-14 in HH	0.578	0.652
	(0.878)	(0.868)
Number of free males 15-29 in HH	0.426	0.528
	(0.736)	(0.762)
Number of free males 30-59 in HH	0.757	0.637
	(0.860)	(0.641)
Number of free males 60+ in HH	0.299	0.251
	(0.493)	(0.452)
Number of free females 0-4 in HH	0.535	0.568
	(0.837)	(0.846)
Number of free females 5-14 in HH	0.444	0.587
	(0.730)	(0.834)
Number of free females 15-29 in HH	0.476	0.568
	(0.708)	(0.781)
Number of free females 30-59 in HH	0.838	0.773
	(0.800)	(0.693)
Number of free females 60+ in HH	0.313	0.256
	(0.531)	(0.465)
Observations	2469	3321

Means computed across households are reported. Standard deviations are in parentheses.

(B) District-Level Statistics

	1848	1868
Log (Population)	6.173	6.291
	(0.454)	(0.926)
Log (Free population)	6.162	6.266
	(0.454)	(0.921)
Delta (=1 if District in Nile Delta)	0.320	0.320
	(0.476)	(0.476)
Damietta (=1 if District on Damietta Nile branch)	0.160	0.160
	(0.374)	(0.374)
Sugarcane (=1 if District in Middle or Southern Nile Valley)	0.320	0.320
	(0.476)	(0.476)
Rice (=1 if District in Northern Nile Delta)	0.080	0.080
	(0.277)	(0.277)
District's average temperature in Celsius in March and April 1900-1930	18.599	18.599
	(0.839)	(0.839)
Observations	25	25

Means computed across districts are reported. Standard deviations are in parentheses.

TABLE III
Slavery in Rural Egypt in 1848 and 1868

A. Slave Population Share (Cross-District Average)

	1848	1868	Difference (1868-1848)
Valley	.016	.014	-.001
	(.004)	(.004)	(.005)
Delta	.001	.045	.043***
	(.001)	(.006)	(.006)
Difference	-.014**	.031***	.045***
(Delta-Valley)	(.006)	(.007)	(.009)

B. Average Household's Slaveholdings (Cross-District Average)

	1848	1868	Difference (1868-1848)
Valley	.089	.079	-.009
	(.022)	(.023)	(.032)
Delta	.007	.275	.267***
	(.006)	(.041)	(.041)
Difference	-.082**	.195***	.276***
(Delta-Valley)	(.032)	(.043)	(.054)

TABLE IV
The Cotton Boom and Slavery in Nineteenth-Century Rural Egypt

A. Dependent Variable: Number of Slaves in Household

	(1)	(2)	(3)	(4)	(5)	(6)
1868 Dummy	0.009	0.034	2.607***	0.038**	0.037*	1.821***
	(0.023)	(0.023)	(0.718)	(0.018)	(0.019)	(0.621)
Delta * 1868 Dummy	0.291***			0.172***		
	(0.052)			(0.055)		
Damietta * 1868 Dummy		0.309***			0.226***	
		(0.044)			(0.039)	
Temperature * 1868 Dummy			-0.134***			-0.092***
			(0.038)			(0.033)
Sugarcane * 1868 Dummy				-0.063	-0.063	-0.080*
				(0.038)	(0.040)	(0.047)
Rice * 1868 Dummy				-0.094	0.008	-0.148
				(0.083)	(0.125)	(0.121)
District FE?	Yes	Yes	Yes	Yes	Yes	Yes
Household-Level Controls?	No	No	No	Yes	Yes	Yes
P-Value ($H_0: \beta_{1868} + \beta_{cotton} = 0$)	0.000	0.000	0.001	0.000	0.000	0.007
P-Value ($H_0: \beta_{1868} + \beta_{sugar} = 0$)				0.505	0.508	0.009
P-Value ($H_0: \beta_{1868} + \beta_{rice} = 0$)				0.511	0.717	0.008
Number of Clusters	25	25	25	25	25	25
Observations	5790	5790	5790	5736	5736	5736
Adjusted R^2	0.013	0.012	0.010	0.173	0.174	0.173

B. Dependent Variable: =1 if At Least One Slave in Household

	(1)	(2)	(3)	(4)	(5)	(6)
1868 Dummy	0.001	0.013*	1.154***	0.009	0.018**	0.952***
	(0.004)	(0.007)	(0.227)	(0.007)	(0.008)	(0.156)
Delta * 1868 Dummy	0.115***			0.087***		
	(0.013)			(0.015)		
Damietta * 1868 Dummy		0.110***			0.087***	
		(0.010)			(0.012)	
Temperature * 1868 Dummy			-0.060***			-0.049***
			(0.012)			(0.008)
Sugarcane * 1868 Dummy				-0.016	-0.025**	-0.023*
				(0.010)	(0.010)	(0.011)
Rice * 1868 Dummy				0.007	0.058	-0.024
				(0.039)	(0.064)	(0.060)
District FE?	Yes	Yes	Yes	Yes	Yes	Yes
Household-Level Controls?	No	No	No	Yes	Yes	Yes
P-Value ($H_0: \beta_{1868} + \beta_{cotton} = 0$)	0.000	0.000	0.000	0.000	0.000	0.000
P-Value ($H_0: \beta_{1868} + \beta_{sugar} = 0$)				0.319	0.302	0.000
P-Value ($H_0: \beta_{1868} + \beta_{rice} = 0$)				0.687	0.237	0.000
Number of Clusters	25	25	25	25	25	25
Observations	5790	5790	5790	5736	5736	5736
Adjusted R^2	0.041	0.037	0.035	0.155	0.155	0.153

* P < 0.10, ** P < 0.05, *** P < 0.01. Robust standard errors clustered at the district-level are in parentheses.

TABLE V
Sex and Age Composition of Slaves in Rural Egypt

Dependent Variable: Number of Slaves in Indicated Sex and Age Group in Household

A. Male Slaves

	(1) Total	(2) 0-4	(3) 5-14	(4) 15-29	(5) 30-59	(6) 60+
1868 Dummy	0.025**	-0.003	0.015**	0.017*	-0.002	-0.001
	(0.011)	(0.002)	(0.006)	(0.009)	(0.004)	(0.001)
Damietta * 1868 Dummy	0.175***	0.013**	0.029*	0.095***	0.037***	0.002
	(0.023)	(0.005)	(0.014)	(0.018)	(0.013)	(0.002)
Sugarcane * 1868 Dummy	-0.039	0.004	-0.015	-0.029**	-0.003	0.004**
	(0.025)	(0.007)	(0.010)	(0.014)	(0.010)	(0.002)
Rice * 1868 Dummy	0.044	-0.014*	0.009	0.068	-0.020	-0.000
	(0.103)	(0.008)	(0.027)	(0.097)	(0.024)	(0.002)
District FE?	Yes	Yes	Yes	Yes	Yes	Yes
Household-Level Controls?	Yes	Yes	Yes	Yes	Yes	Yes
P-Value (H_0: $\beta_{1868} + \beta_{cotton} = 0$)	0.000	0.081	0.004	0.000	0.008	0.408
P-Value (H_0: $\beta_{1868} + \beta_{sugar} = 0$)	0.526	0.900	0.953	0.385	0.643	0.045
P-Value (H_0: $\beta_{1868} + \beta_{rice} = 0$)	0.502	0.035	0.355	0.387	0.374	0.206
Number of Clusters	25	25	25	25	25	25
Observations	5736	5736	5736	5736	5736	5736
Adjusted R^2	0.187	0.054	0.093	0.142	0.110	0.007

B. Female Slaves

	(1) Total	(2) 0-4	(3) 5-14	(4) 15-29	(5) 30-59	(6) 60+
1868 Dummy	0.012	0.003	0.003	0.006	-0.000	0.000
	(0.010)	(0.002)	(0.002)	(0.006)	(0.004)	(0.000)
Damietta * 1868 Dummy	0.051***	0.004	-0.000	0.027**	0.021***	-0.001
	(0.018)	(0.003)	(0.003)	(0.010)	(0.007)	(0.001)
Sugarcane * 1868 Dummy	-0.023	-0.005	-0.001	-0.004	-0.007	-0.003
	(0.019)	(0.004)	(0.010)	(0.011)	(0.008)	(0.003)
Rice * 1868 Dummy	-0.036	-0.012**	-0.011**	-0.003	-0.006	-0.001
	(0.024)	(0.005)	(0.004)	(0.024)	(0.009)	(0.001)
District FE?	Yes	Yes	Yes	Yes	Yes	Yes
Household-Level Controls?	Yes	Yes	Yes	Yes	Yes	Yes
P-Value (H_0: $\beta_{1868} + \beta_{cotton} = 0$)	0.001	0.001	0.425	0.002	0.003	0.562
P-Value (H_0: $\beta_{1868} + \beta_{sugar} = 0$)	0.548	0.697	0.852	0.838	0.378	0.300
P-Value (H_0: $\beta_{1868} + \beta_{rice} = 0$)	0.333	0.072	0.054	0.889	0.475	0.338
Number of Clusters	25	25	25	25	25	25
Observations	5736	5736	5736	5736	5736	5736
Adjusted R^2	0.119	0.029	0.045	0.101	0.058	0.017

* P < 0.10, ** P < 0.05, *** P < 0.01. Robust standard errors clustered at the district-level are in parentheses.

TABLE VI
The Cotton Boom and Migration of Free Local Labor in Rural Egypt

Dependent Variable: =1 if Household Head is Born Outside Province

	(1)	(2)	(3)	(4)	(5)	(6)
1868 Dummy	-0.045**	-0.046**	0.694**	-0.039	-0.040	0.812*
	(0.019)	(0.019)	(0.309)	(0.029)	(0.030)	(0.413)
Delta * 1868 Dummy	0.070*			0.076		
	(0.038)			(0.048)		
Damietta * 1868 Dummy		0.105***			0.102***	
		(0.022)			(0.030)	
Temperature * 1868 Dummy			-0.038**			-0.044*
			(0.017)			(0.023)
Sugarcane * 1868 Dummy				-0.015	-0.014	-0.021
				(0.037)	(0.037)	(0.042)
Rice * 1868 Dummy				-0.060	-0.015	-0.090**
				(0.038)	(0.029)	(0.037)
District FE?	Yes	Yes	Yes	Yes	Yes	Yes
Household-Level Controls?	No	No	No	Yes	Yes	Yes
P-Value ($H_0: \beta_{1868} + \beta_{cotton} = 0$)	0.463	0.000	0.034	0.343	0.000	0.061
P-Value ($H_0: \beta_{1868} + \beta_{sugar} = 0$)				0.030	0.031	0.084
P-Value ($H_0: \beta_{1868} + \beta_{rice} = 0$)				0.052	0.022	0.072
Number of Clusters	25	25	25	25	25	25
Observations	5646	5646	5646	5613	5613	5613
Adjusted R^2	0.046	0.050	0.045	0.051	0.054	0.050

* P < 0.10, ** P < 0.05, *** P < 0.01. Robust standard errors clustered at the district-level are in parentheses. Migration status is defined in this regression for Egyptian free individuals with a recorded place of origin only.

TABLE VII
The Cotton Boom and Occupation of Free Local Labor in Rural Egypt

Dependent Variable: =1 if Household Head is Landholding Farmer

A. All Egyptian Free Household Heads

	(1)	(2)	(3)	(4)	(5)	(6)
1868 Dummy	-0.210***	-0.194***	2.065*	-0.240***	-0.219***	2.846*
	(0.037)	(0.036)	(1.169)	(0.047)	(0.046)	(1.571)
Delta * 1868 Dummy	0.258**			0.309**		
	(0.097)			(0.117)		
Damietta * 1868 Dummy		0.287**			0.329**	
		(0.128)			(0.131)	
Temperature * 1868 Dummy			-0.118*			-0.160*
			(0.062)			(0.083)
Sugarcane * 1868 Dummy				0.060	0.040	0.037
				(0.075)	(0.073)	(0.080)
Rice * 1868 Dummy				-0.035	0.165	-0.101
				(0.116)	(0.145)	(0.198)
District FE?	Yes	Yes	Yes	Yes	Yes	Yes
Household-Level Controls?	No	No	No	Yes	Yes	Yes
P-Value (H_0: $\beta_{1868} + \beta_{cotton} = 0$)	0.596	0.456	0.091	0.524	0.390	0.083
P-Value (H_0: $\beta_{1868} + \beta_{sugar} = 0$)				0.006	0.006	0.080
P-Value (H_0: $\beta_{1868} + \beta_{rice} = 0$)				0.038	0.702	0.066
Number of Clusters	25	25	25	25	25	25
Observations	4000	4000	4000	3988	3988	3988
Adjusted R^2	0.058	0.058	0.053	0.125	0.125	0.120

B. Non-Immigrant Household Heads

	(1)	(2)	(3)	(4)	(5)	(6)
1868 Dummy	-0.233***	-0.227***	1.960*	-0.263***	-0.257***	2.785*
	(0.036)	(0.034)	(1.134)	(0.049)	(0.044)	(1.551)
Delta * 1868 Dummy	0.247**			0.305**		
	(0.103)			(0.125)		
Damietta * 1868 Dummy		0.309**			0.356**	
		(0.129)			(0.132)	
Temperature * 1868 Dummy			-0.114*			-0.158*
			(0.060)			(0.082)
Sugarcane * 1868 Dummy				0.058	0.053	0.039
				(0.072)	(0.069)	(0.081)
Rice * 1868 Dummy				-0.036	0.164	-0.101
				(0.121)	(0.144)	(0.194)
District FE?	Yes	Yes	Yes	Yes	Yes	Yes
Household-Level Controls?	No	No	No	Yes	Yes	Yes
P-Value (H_0: $\beta_{1868} + \beta_{cotton} = 0$)	0.885	0.516	0.098	0.719	0.444	0.086
P-Value (H_0: $\beta_{1868} + \beta_{sugar} = 0$)				0.001	0.001	0.083
P-Value (H_0: $\beta_{1868} + \beta_{rice} = 0$)				0.030	0.509	0.067
Number of Clusters	25	25	25	25	25	25
Observations	3764	3764	3764	3753	3753	3753
Adjusted R^2	0.065	0.067	0.061	0.136	0.140	0.132

C. Immigrant Household Heads

	(1)	(2)	(3)	(4)	(5)	(6)
1868 Dummy	-0.099*	-0.050	7.429***	-0.102	-0.057	6.722***
	(0.049)	(0.056)	(1.481)	(0.089)	(0.084)	(1.736)
Delta * 1868 Dummy	0.416**			0.382*		
	(0.191)			(0.191)		
Damietta * 1868 Dummy		0.675***			0.638***	
		(0.056)			(0.083)	
Temperature * 1868 Dummy			-0.396***			-0.358***
			(0.081)			(0.095)
Sugarcane * 1868 Dummy				-0.074	-0.130	-0.161
				(0.124)	(0.134)	(0.118)
Rice * 1868 Dummy						
District FE?	Yes	Yes	Yes	Yes	Yes	Yes
Household-Level Controls?	No	No	No	Yes	Yes	Yes
P-Value (H_0: $\beta_{1868} + \beta_{cotton} = 0$)	0.102	.	0.000	0.136	0.000	0.001
P-Value (H_0: $\beta_{1868} + \beta_{sugar} = 0$)				0.047	0.042	0.002
P-Value (H_0: $\beta_{1868} + \beta_{rice} = 0$)				0.266	0.505	0.001
Number of Clusters	20	20	20	20	20	20
Observations	203	203	203	203	203	203
Adjusted R^2	0.239	0.243	0.242	0.226	0.231	0.230

* P < 0.10, ** P < 0.05, *** P < 0.01. Robust standard errors clustered at the district-level are in parentheses. Economic activity is defined in this regression for Egyptian free individuals with a recorded occupational title only.

TABLE VIII
Mechanisms of the Effect of the Cotton Boom on Slavery

Dependent Variable: Number of Slaves in Household

A. Mechanism: Cross-District Differences in Scarcity of Local Free Labor

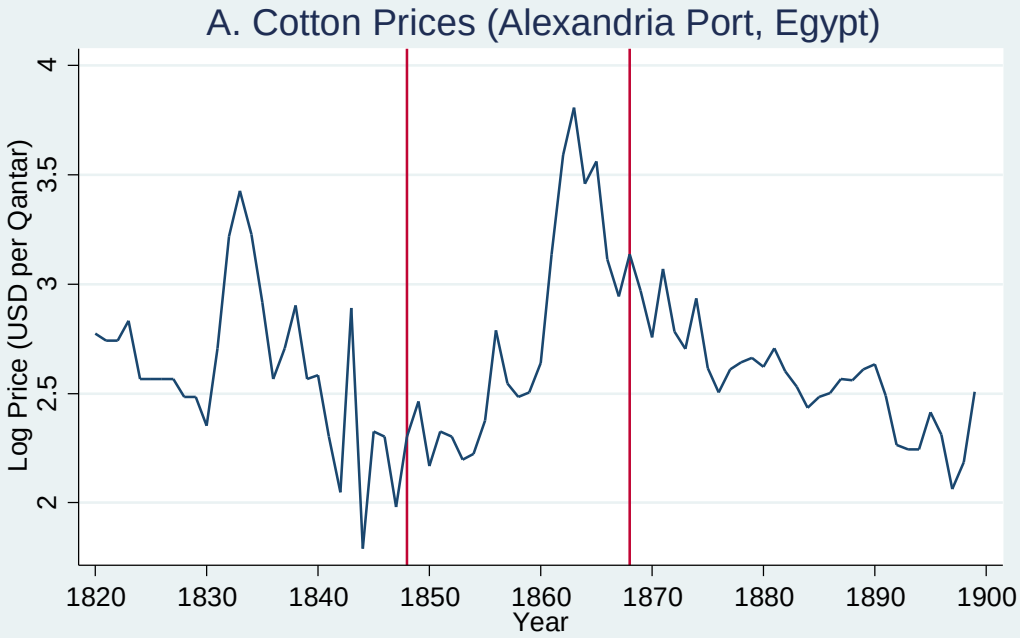
	(1)	(2)	(3)	(4)	(5)	(6)
1868 Dummy	0.034	0.073**	0.093*	0.098**	0.021	0.043
	(0.023)	(0.034)	(0.054)	(0.039)	(0.050)	(0.061)
Damietta * 1868 Dummy	0.309***				0.297***	0.200***
	(0.044)				(0.040)	(0.052)
Percent Emigrant from District		-0.442			-0.212	-0.304**
		(0.262)			(0.185)	(0.146)
Percent Conscripts in District			1.123		0.175	-2.204
			(4.107)		(4.429)	(3.873)
Log (Free Population)				0.021	-0.004	-0.009
				(0.041)	(0.045)	(0.040)
Percent Immigrant into District						0.246
						(0.294)
District FE?	Yes	Yes	Yes	Yes	Yes	Yes
Household-Level Controls?	No	No	No	No	No	Yes
P-Value (H_0: $\beta_{1868} + \beta_{cotton} = 0$)	0.000				0.000	0.000
Number of Clusters	25	25	25	25	25	25
Observations	5790	5790	5790	5790	5790	5736
Adjusted R^2	0.012	0.008	0.007	0.008	0.012	0.171

B. Mechanism: Cross-Crop Differences in Economies of Scale

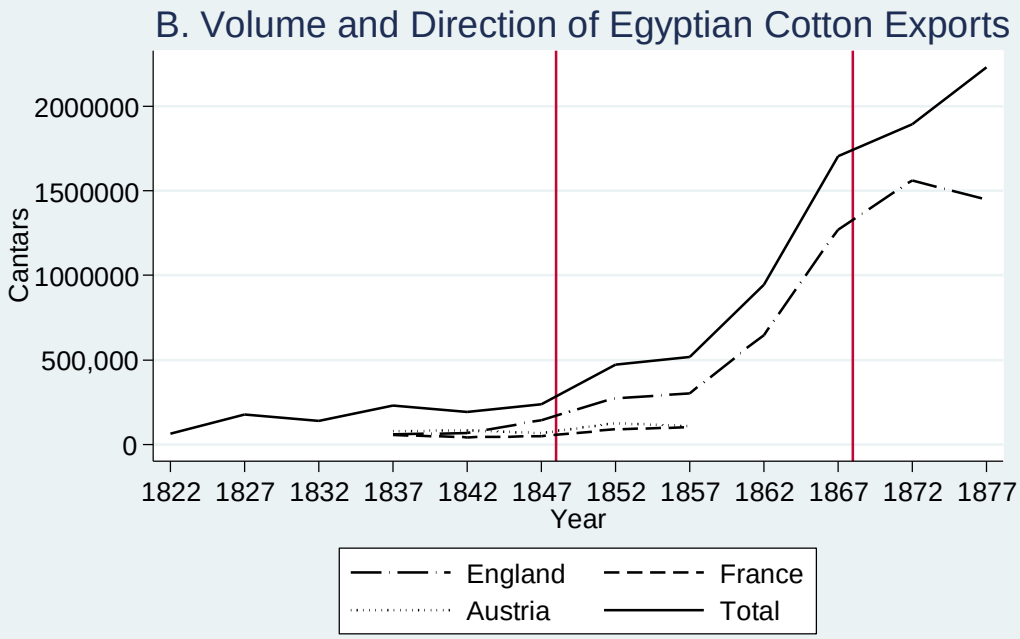
	(1)	(2)	(3)	(4)	(5)	(6)
1868 Dummy	0.086**	0.104***	0.033	0.041*	0.023	0.031
	(0.031)	(0.032)	(0.023)	(0.024)	(0.021)	(0.022)
Share of Hamlets in District	0.638*		0.156		0.187	
	(0.359)		(0.197)		(0.128)	
Number of Hamlets in District		0.019**		0.007		0.007**
		(0.008)		(0.004)		(0.003)
Damietta * 1868 Dummy			0.292***	0.278***	0.219***	0.207***
			(0.044)	(0.038)	(0.038)	(0.039)
District FE?	Yes	Yes	Yes	Yes	Yes	Yes
Household-Level Controls?	No	No	No	No	Yes	Yes
P-Value (H_0: $\beta_{1868} + \beta_{cotton} = 0$)			0.000	0.000	0.000	0.000
Number of Clusters	25	25	25	25	25	25
Observations	5790	5790	5790	5790	5736	5736
Adjusted R^2	0.009	0.009	0.012	0.012	0.171	0.171

* P < 0.10, ** P < 0.05, *** P < 0.01. Robust standard errors clustered at the district-level are in parentheses.

FIGURE I
Prices and Volumes of Egypt's Cotton Exports, 1820-1900

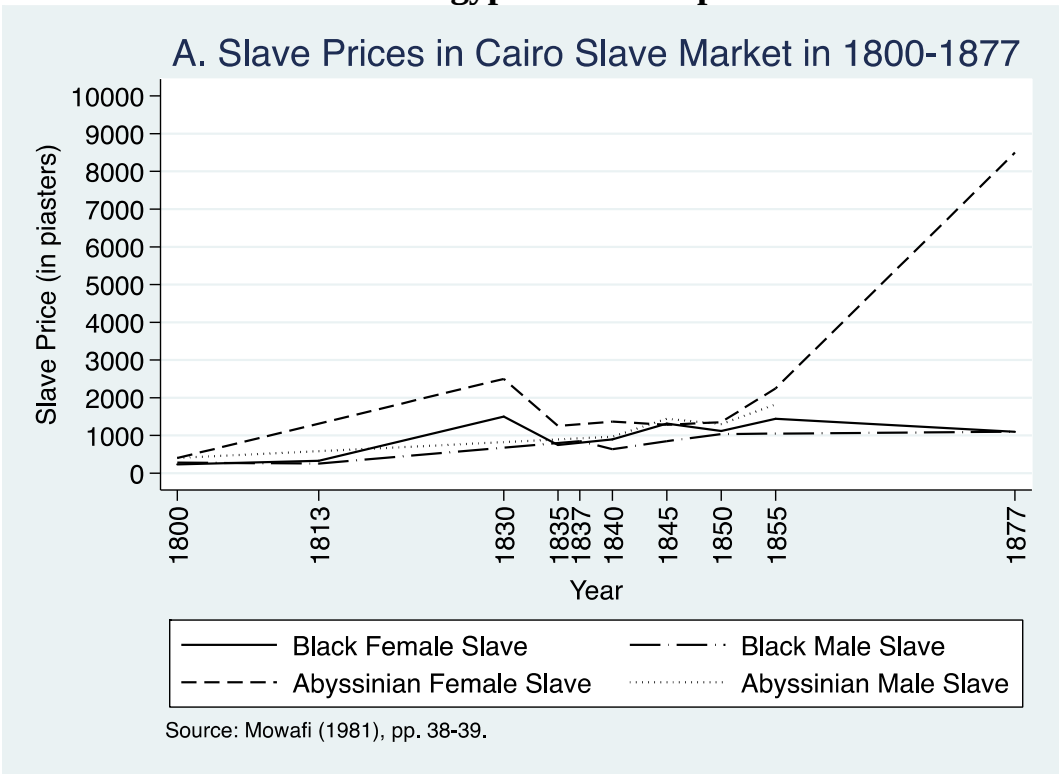


Source: Issawi, Charles (1982). 'The Movement of Cotton Prices, 1820-1899.'
In An Economic History of the Middle East and North Africa, pp. 446-447.
New York: Columbia University Press, 1982.



Source: Owen, E. Roger J. (1969).
Cotton and the Egyptian Economy 1820-1914, A Study in Trade and Development.
Values are measured as averages for each five years.

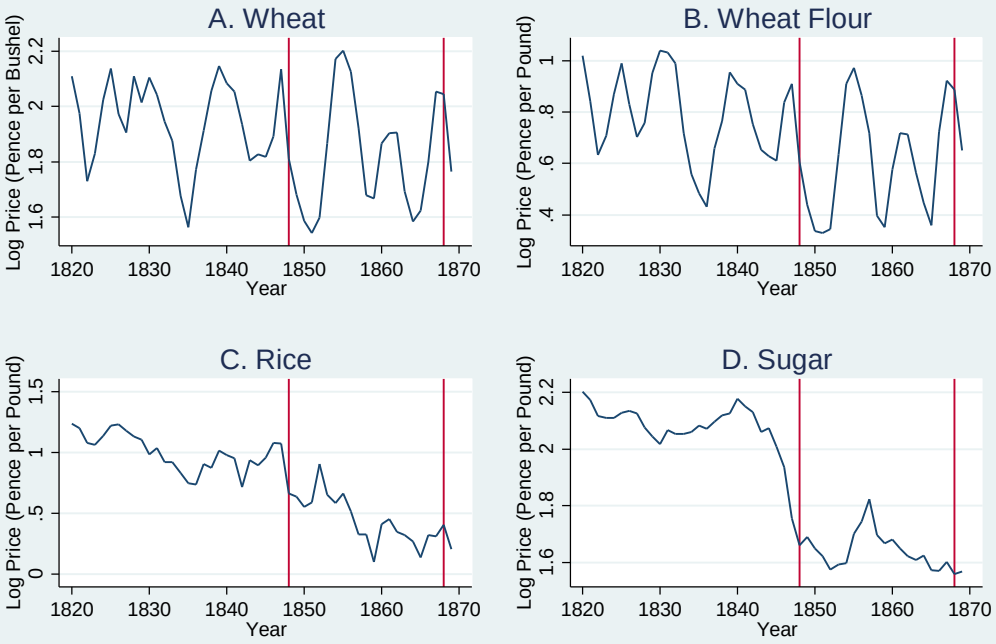
FIGURE II
Prices and Volumes of Egypt's Slave Imports in 1800-1877



Source: Mowafi (1981), pp. 38-39.

Source: Mowafi (1981), pp. 7-8, 32-34, 64-68.

FIGURE III
Prices of Selected Crops in England, 1820-1870



Source: Clark, Gregory (2005). 'The Condition of the Working-Class in England, 1209-2004.' Journal of Political Economy 113(6), pp. 1307-1340.

FIGURE IV
District's Favorability to Egypt's Major Export Crops

A. All Rural Districts

B. Matched Rural Districts