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Abstract

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JEL Classification: J15, F60, N63

Keywords: Slavery, Industrial revolution, Trade, Finance

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Slavery and the British Industrial Revolution*

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1 Introduction

Europeans enslaved millions on the African continent during their colonization of the Americas, consigning the survivors of transatlantic voyages to forced labor on sugar, tobacco, cotton and coffee plantations in the Caribbean and North and South America. In the process, Europeans accumulated wealth, either from the slave trade itself, plantation production, or the wider triangular trade between Europe, Africa, and the Americas. To what extent did this wealth contribute to the growth and economic development of modern Europe?

We provide new theory and evidence on this question for Britain's Industrial Revolution. We use granular data on the location of slaveholders within Britain collected under the terms of the 1833 Abolition of Slavery Act. We combine these data on the spatial distribution of slavery wealth with rich geographic information on economic activity in Britain before and after its entry into transatlantic slavery in the 1560s. To identify causal effects, we develop an instrument for slavery wealth exploiting exogenous variation in slave mortality during the middle passage, from Africa to the Americas: Where poor weather conditions led to longer voyages, there were fewer survivors. By linking slave-traders to the locations of their ancestors, we show that higher mortality on voyages spelled lower slavery wealth in 1833. We show that areas with exogenously more slavery wealth grow faster, experience more structural change, develop more mills and factories, and adopt more steam engines. We rationalize these findings using a dynamic spatial model, in which slavery wealth stimulates domestic capital accumulation, and hence expands production in capital-intensive sectors.

A growing literature has documented slavery's adverse effects on African economic development: African countries exposed to the slave trade are still markedly poorer today, with lower levels of interpersonal trust (Nunn and Wantchekon 2011, Nunn 2008). While statues commemorating slave traders and slaveholders continue to adorn European cities, and endowed hospitals and libraries perpetuate their names, slavery's economic consequences in today's developed countries are not well understood. The idea that slavery and the trade in enslaved human beings jump-started the Industrial Revolution is not new: Eric Williams (1944) famously argued that Britain accumulated vast wealth from the triangular trade – and that it re-invested this wealth in the leading sectors of the Industrial Revolution.[1] Indeed, no country had greater involvement in the transatlantic slave trade than Britain, and it also industrialized first. At the same time, quantitative economic historians have questioned the idea that the slave trade boosted economic development in Europe, and in industrializing Britain in particular. Profits from the slave trade were no higher than in other lines of business, the argument

[1] Relatedly, historians of global capitalism (Wallerstein 2004, Frank 2011) have emphasized that Atlantic slavery was crucial for economic development after 1500.

goes; absolute levels of profit from the slave trade were small relative to the size of the British economy (Engerman 1972, Eltis and Engerman 2000).

We make a number of contributions to this debate. First, we emphasize *slaveholding* in addition to *slave trading*. The purchase and sale of human beings was only one part of the slave economy. Much of the wealth accumulated from slavery was derived from colonial sugar, tobacco, cotton and coffee plantations. Participation in the slave trade often facilitated a transition to plantation ownership. Indeed, Solow (1993) argues that the profits from slaveholding were an order of magnitude greater than direct profits from the slave trade itself.[2] To measure this wealth from slaveholding, we use a distinctive feature of our empirical setting: Britain, through the Abolition of Slavery Act in 1833, provided compensation payments to existing slaveholders. These compensation payments were substantial, equal to £20 million in current prices, which was around 40 percent of the government's budget and 5 percent of gross domestic product (GDP), with the resulting debt not paid off until 2015. We use individual-level data on these compensation payments to more than 25,000 slaveholders, as compiled by historians over more than a decade in the *Legacies of British Slavery* database (Hall et al. 2014). This allows us to directly measure slavery wealth for each slaveholder in terms of the total number of enslaved persons and their assessed value.

Second, much of the existing debate about the Williams hypothesis has occurred at the level of the economy as a whole. Since many factors change over time at the aggregate level, this creates challenges for identification and measurement. In contrast, we exploit geographical variation in slavery participation across locations within Britain, which enables us to control for these other aggregate time-varying factors. We combine our measure of slaveholder wealth from the claims for compensation with detailed information on population, employment structure and property values across locations within Britain.

Third, a key challenge in the existing debate about the Williams hypothesis is that slavery wealth is endogenous. To address this concern, we first use our spatially-disaggregated data on economic activity before the rise of the slave economy, using property values in Britain dating back to 1086. We use these data to check for balancedness and differences in pre-trends between locations that subsequently have high or low slavery wealth. We also develop a new instrumental variables estimation strategy based on the fact that many slave traders eventually became slaveholders, investing their wealth in West Indian plantations. In the age of sail, the idiosyncrasies of wind and weather heavily influenced the duration of transatlantic voyages. Crowded and inhumane conditions on slave voyages led to high rates of mortality

[2] According to conventional estimates, profits from slave *trading* amounted to around 0.5 percent of GDP. In contrast, Solow (1993) estimates that profits from *slaveholding* were around 5 percent of GDP, or roughly 80 percent of total domestic investment.

during the middle passage. A primary determinant of mortality for the enslaved was voyage duration (Eltis 1984). As voyage times increased because of unfavorable winds, water began to run out, and infectious diseases spread, raising mortality among the enslaved. High mortality reduced slave traders' profits, making their continued involvement in the trade less likely. Hence, inclement weather shocks both directly reduced wealth, and also induced exit from the slave trade, thereby reducing slaveholder wealth in 1833 (at the time of abolition). We therefore instrument 1833 slavery wealth using a voyage outcome measure inversely related to middle-passage mortality.

Fourth, we develop a dynamic spatial model to evaluate the aggregate and distributional consequences of slaveholding. The model highlights three mechanisms through which slavery wealth affects economic development. First, for a given capital stock, greater access to colonial slavery investments makes domestic investments less attractive through a standard substitution effect, thereby decreasing the domestic capital stock. Second, greater access to colonial slavery investments raises the productivity of the investment technology, which stimulates capital accumulation and increases the steady-state domestic capital stock. Third, slavery investments are more collateralizeable than other investments, which alleviates collateral constraints, and again stimulates domestic capital accumulation.[3] We show that the net effect of these three forces is that locations with greater access to colonial slavery investments exhibit faster capital accumulation along the transition path to steady-state and a higher steady-state domestic capital stock. In the presence of financial frictions, this increased capital is disproportionately invested locally, which in turn stimulates local economic growth, and structural transformation towards capital-intensive manufacturing.

We use our voyage outcome instrument to identify the effect of exogenous variation in slavery wealth on local economic development. In our first-stage regression, we find that a one standard deviation increase in this voyage outcome instrument (reduction in middle-passage mortality) implies a 0.16 standard deviation increase in slaveholder wealth in 1833. In our second-stage regression, we find that a one standard deviation increase in slaveholder wealth translates into a 0.52 standard deviation increase in property values, a 0.61 standard deviation increase in agricultural employment, a 0.87 standard deviation increase in manufacturing employment, a 0.79 standard deviation increase in the average number of cotton mills in 1839, and a 1.78 standard deviation increase in the number of steam engines.

Combining our model and rich geographic data, we find substantial aggregate and distributional consequences of access to slavery investments. At the aggregate level, we find an

[3] Of the twelve rules governing slavery in the West Indies in (Stephen 1824), rule X states "The slave may be mortgaged, demised, and settled for any particular Estate or estates, in possession, remainder, or reversion." The Legacies of British Slavery Database contains many examples of enslaved persons used as collateral.

increase in national income of 3.5 percent, which is sizeable relative to conventional estimates of the welfare gains from international trade, such as the upper bound of 9 percent for 19th-century Japan in Bernhofen and Brown (2005). Capitalists were the largest beneficiaries with an increase in their aggregate income of 11 percent, both because of the direct income from slavery capital invested in colonial plantations, and because of the induced increase in steady-state domestic manufacturing capital. Landowners experience small aggregate income losses of just under 1 percent, because of the reallocation of labor away from agriculture. Expected worker welfare rises by 3 percent, because of the substantial wage increases in slaveholding locations, and the positive probability of living in those locations. At the disaggregated level, we find that access to slavery investments played an important role in shaping the geography of the industrial revolution, consistent with our causal estimates using variation in middle-passage mortality. The locations with the greatest levels of participation in slavery investment experience increases in total income of more than 40 percent, with population increasing by 6.5 percent, capitalists' income rising by more than 100 percent, and landlords' income declining by just over 7 percent.

The remainder of the paper is structured as follows. Section 2 reviews the related literature. Section 3 discusses the historical background. Section 4 introduces our data. Section 5 provides motivating evidence on patterns of slaveholding and economic activity within Britain over time. Section 6 develops the theoretical model that guides our empirical analysis. Section 7 reports our main empirical results. Section 8 summarizes our conclusions.

2 Related Literature

There is a large literature examining links between slavery and the Industrial Revolution in Britain after 1750. The idea that riches derived from slavery accelerated economic development is almost as old as capitalism itself – and so are the counterarguments. Adam Smith considered slavery and the colonial system economically inefficient. On the other hand, in 1788, when the British parliament debated the possible abolition of slavery, merchants involved in the trade argued that "the effects of this trade to Great Britain are beneficial to an infinite Extent ... [and] ... were this [trade to be] abolished, it would [cause] very great Detriment to our Manufacturers...." (Eltis and Engerman 2000). Karl Marx Marx (1867), in "Das Kapital," famously opined that "the veiled slavery of the wage-workers in Europe needed, for its pedestal, slavery pure and simple in the new world..." In 1944, Eric Williams (1944) argued

> "Britain was accumulating great wealth from the triangular trade. ...that trade inevitably [increased] ... the productive power of the country... the investment of profits from the triangular trade in British industry ... supplied ... the huge

outlay for the construction of vast plants to meet the needs of the new productive process..."

Williams' hypothesis stimulated a large body of academic research on links between the triangular trade and industrial development in Britain. Historians of the 'world system of capitalism' in the vein of Immanuel Wallerstein and Gunder Frank have argued that economic development in the European 'core' cannot be separated from exploitation and political suppression in the periphery (Frank 1967, Wallerstein 2004), emphasizing the importance of capital accumulation. Using data on slave-trading voyages from British and European ports over time, Derenoncourt (2019) estimates the contribution of the slave trade to city population growth.[4] Findlay (1990), for example, argues "slavery was an integral part of a complex ... system of trade in goods and factors within which the Industrial Revolution ... emerged... [but there is] no causal arrow from slavery to British industrialization." Price and Whatley (2020) estimate the financial impact of the South Sea Company's monopoly on the trade of enslaved Africans to Spanish America (the Asiento de Negros), as granted by the British Parliament. While some studies focus on the profits from the slave trade, other historical research emphasizes the contribution of the wealth derived from colonial slavery plantations Darity (1990).[5] Solow (1993) emphasizes that profits from slave trading and slave holding were large compared with domestic investments in Britain.[6]

Critical assessments focus on the limited profitability of the slave trade. Some historians have argued that planters in the West Indies barely covered their cost and that profitability declined from the 1750s onwards (Ragatz 1928), but this notion has been disputed (Drescher 2010). Thomas and Bean calculated that Britain did not profit from slave plantations producing colonial produce (Thomas and Bean 1974). Similarly, Eltis and Engerman (2000) examine aggregate effects of the slave trade and conclude their analysis by saying, "African slavery ... did not ... cause the British Industrial Revolution ... ."

Therefore, with a few exceptions, slavery has mainly been viewed as little more than a sideshow in the transformation of Britain's economy. However, there remains a scarcity of

[4]Related research by Acemoglu and co—authors emphasizes that, in North—Western Europe, Atlantic trade led to better institutions by strengthening the hand of merchants (Acemoglu et al. 2005). However, these authors do not emphasize that much of this trade derived from the trafficking of enslaved Africans.

[5]Using data from Maryland in the United States, González et al. (2017) provide empirical evidence that slavery wealth was an important source of collateral used to finance U.S. entrepreneurship. For the United States as a whole, Francis (2021) emphasizes the role played by the tariff revenue derived by the Federal Government from the imports that were made possible by the export of the cotton produced by slave plantations.

[6]While not all scholars agree, there is substantial evidence that slavery did not accelerate development in the U.S. (Bleakley and Rhode 2021, Wright 2006). A key difference is that slavery occurred domestically in the U.S., which implies that three forces were at work: slavery's effect on capital returns, the local labor market, and institutions and culture. Britain's exposure to slavery was fundamentally different, with nationals investing in overseas slave plantations and the slave trade, but without any substantive domestic slavery.

quantitative, well—identified evidence on the contribution of slavery towards Britain's Industrial Revolution, combining aggregate and cross-sectional evidence.

Our research is also related to the wider literature on structural transformation and economic development, including Matsuyama (1992), Caselli and Coleman (2001), Lucas (2002), Ngai and Pissarides (2007), Uy et al. (2012), Herrendorf et al. (2012), Bustos et al. (2016), Gollin et al. (2016), Caprettini and Voth (2020) and Fajgelbaum and Redding (2022). We contribute to research on the geography of the British Industrial Revolution (Crafts and Wolf 2014), and to work on the role of financial development in economic growth generally, as well as during the British Industrial Revolution in particular, including Gerschenkron (1962), Guiso et al. (2004), Moll (2014), Itskhoki and Moll (2019), and Heblich and Trew (2019). Our main contribution relative to this research is to provide theory and evidence on the role of slavery wealth in influencing structural transformation and regional economic development.

3 Historical Background

Britain's involvement in the slave trade dates back to the 1560s and expanded substantially after 1640. In 1660, the Royal African Company was granted a monopoly over English trade with the West Coast of Africa, including the slave trade. However, following the Glorious Revolution of 1688 and the accession of William III, this monopoly was broken up; subsequent slave voyages were financed and organized by individual ship owners.

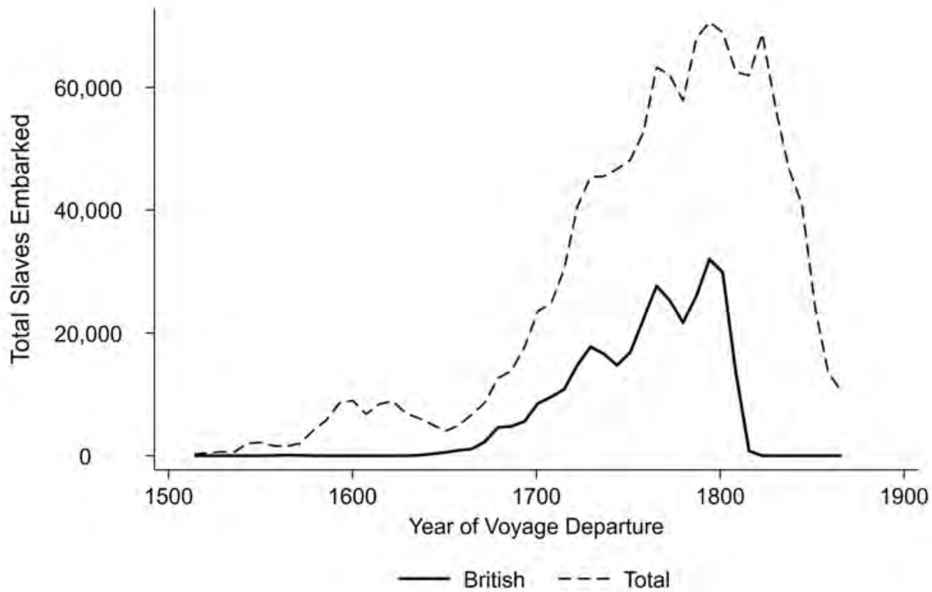
By the 1700s, the 'triangular trade' from Europe-Africa-Americas was the mainstay of the British West Coast ports of Bristol and Liverpool. This trade involved the export of manufacturing goods, including textiles, from Britain to the West Coast of Africa; the transportation of enslaved persons from the West Coast of Africa to the Americas; and the export of plantation products such as sugar, tobacco, coffee and cotton from the Americas to Britain.

Figure 1 shows the annual number of enslaved persons transported across the Atlantic by ships from British ports (solid line) and ships from all nations (dashed line). From 1701-1807, British ships are estimated to have have carried over 2.5 million enslaved persons, more than one third of the over 6 million total transported during this period.[7] The British slave trade was concentrated in three British ports: Liverpool (49 percent); London (29 percent); and Bristol (21 percent); with all other ports accounting for only 1 percent of trade.

The wealth accumulated from the slave trade and slaveholding was far from evenly distributed within Britain. James Penny, who was heavily involved in the slave trade, predicted instant ruin from its abolition for the British towns most involved in it: "[s]hould this trade be abolished, it would not only affect the Commercial Interest . . . of the County of Lancaster, and

[7]The total number of enslaved persons embarked, including years after 1807, was 10.6 million (Eltis 1984).

Figure 1: Slave Trade - Annual Total of Enslaved Persons Shipped, British vs ROW



Note: Annual total number of enslaved persons transported across the Atlantic ocean using ships from British ports and ships from all nations.

more particularly the Town of Liverpool, whose fall, . . . would be as rapid as its Rise has been astounding." (Eltis and Engerman 2000).

At the individual level, the sums involved were large. The Grade I-listed Harewood House is one of England's finest country houses, and is still owned by the Lascelles family, who amassed substantial wealth through slavery. In 1833, the Second Earl of Harewood received $\pounds 26,307$ in slavery compensation payments for 1,277 enslaved persons, which equals $\pounds 19$ million adjusted for inflation, or $\pounds 128$ million when expressed as the same share of GDP.[8]

Over time, reports of barbaric conditions on slave ships led to a campaign for the abolition of the slave trade.[9] In response to this growing campaign, the Abolition of the Slave Trade Act was passed in 1807, which prohibited the slave trade (but not slavery) in the British Empire. Some abolitionists hoped that slavery would be unsustainable without the slave trade, but further legislation was delayed by the Revolutionary Wars. Eventually, the Slavery Abolition Act of 1833 was passed, making the ownership of enslaved persons illegal within the British Empire (Taylor 2020).

Under the terms of the 1833 Act, the British government spent $\pounds 20$ million to compensate slaveholders, equivalent to 40 percent of government revenue or 5 percent of GDP (Barro

[8]The grandfather of the Earl of Harewood was Edwin Lascelles, born in Barbados without a title in 1712. A relative, Alan Lascelles, is The Queen's private secretary in Netflix's series The Crown.

[9]Black African writers played an important role in making these barbaric conditions more widely known, including Equiano (1789). For further discussion of the abolitionist campaigns, see Taylor (2020) .

1987). Additionally, formerly-enslaved persons were forced to work without remuneration for up to six years under an "apprenticeship" system. Slaveholders were required under the 1833 Act to register claims for the number of enslaved persons held, which were systematically collected and processed by a Slave Compensation Committee. Separate schedules were drawn up for each colony that specified a compensation rate per slave that depended on age and occupation.[10] Compensation was paid to slaveholders from 1835 onwards.

4 Data

We construct a new spatially-disaggregated dataset on slaveholding and economic activity in England and Wales.[11] We combine seven main data sources: (i) Individual-level data on slaveholding based on compensation claims paid under the 1833 Abolition of Slavery Act; (ii) Individual slave-trading voyages from British ports; (iii) Population and employment structure; (iv) Property valuations; (v) Location of cotton mills; (vi) Family linkages; (vii) Steam engines.[12]

Slaveholding We use data from the *Legacies of British Slavery Database* to measure the geographical distribution of slavery wealth within Britain at the time of the abolition of slavery in 1833. Starting with the records of the Slave Compensation Committee, this database was constructed over more than a decade by the *Centre for the Study of the Legacies of British Slavery* at University College London. The data include detailed information on compensation claims, the identity of the awardees, the legitimacy of their claims, and the ownership records of awardees. We use a digital version of these data, which includes information on 53,000 individuals connected to slavery, of whom 25,000 were awarded compensation for 425,000 enslaved persons. In Section G.1 of the online appendix, we provide an example of the entry from this database for the Second Earl of Harewood. We observe name, date of birth and death, biographical information including family history, address, the name and location of each colonial plantation, and the compensation awarded and number of enslaved persons for each plantation. We find a tight and approximately log linear relationship across slaveholders between the value of slavery compensation paid and the number of enslaved persons claimed.[13] We use the number of enslaved persons claimed for compensation purposes as our baseline measure of slaveholding in our regression analysis.

[10] See Figure G.3 in Online Appendix G.1 for an example of such a compensation schedule.

[11] We focus on England and Wales, because the population census is reported separately for these two countries; our historical property valuation data is unavailable for Scotland; and the Act of Union with Scotland occurs later in 1707 after the start of slave trading from the British Isles.

[12] See Online Appendix G for further details about the data sources and definitions.

[13] See Figure G.4 in Online Appendix G.1 for a binscatter of this relationship.

Slave voyages We use the slave voyages dataset constructed by Herbert Klein and collaborators.[14] This database contains information on 36,000 slave voyages, with a total of over 10 million enslaved persons shipped across the Atlantic from 1526 onward. Of these, 10,785 voyages were conducted by British owners, involving the transportation of 2.9 million enslaved persons from 1562 to the Abolition of the Slave Trade in 1807. For each voyage, we know the names of (up to) eight owners; the port of origin; the ports visited on the African coast; and the final destination. For a subset of voyages, we also observe the duration of the voyage, and the number of enslaved embarked and disembarked. We use this information to compute a voyage mortality rate, which we use to construct one of our instruments for slaveholding.

Population and Employment Structure We obtain data on parish population from 1801-1831 from the population census (see Wrigley 2011). We supplement these population census data with information from the *History database of the Global Environment* (Hyde) for years before 1801 (see Klein Goldewijk et al. 2017). Data on employment structure by parish in 1831 are provided by Southall et al. (2004). We distinguish employment in agriculture, as well as in manufacturing.

Cotton Mills We construct two sets of data on the location of cotton mills within England and Wales. First, we digitized data on the number of cotton mills in each parish for the year 1839, as reported in House of Commons (1839). This parliamentary report summarizes the results of factory inspections under the Factory Act and contains the most comprehensive data on industrial establishments in Britain before the start of the Census of Production during the 20th century. Second, we digitized data on the location of 212 British cotton mills that were erected in the early decades of the industrial revolution from 1768-88 from Colquhoun, as revised and extended by Chapman (1981).

Property Valuations We use a number of different sources of data on property valuations for each parish. For the year 1086, we construct the value of land, buildings and equipment for each parish from the Domesday Book, using the digitized data for each manor in PASE (2010). For the year 1334, we use the value of personal property (excluding land and buildings) for each parish from the Lay subsidies, as compiled by Glasscock (1974) and Campbell and Bartley (2006). For the year 1798, we digitized the data on the land tax quotas for each parish, as reported in House of Commons (1844). These land tax quotas were originally specified in 1690, and were subject to gradual amendment over time (Ginter 1992). In 1798, these land tax quotas were made unalterable by law; they remained unchanged until abolished in 1963. For the years 1815, 1843 and 1881, we digitized rateable values for each parish, which correspond

[14] Available online at `www.slavevoyages.org`.

to the market value of the annual flow of rent for the use of land and buildings. With a few minor exceptions, these rateable values include all categories of land and property, and were used to raise revenue for local public goods.

Family Linkages We link the location of slaveholders in 1833 to that of slave traders' ancestors. We use the fact that many individuals involved in the slave trade either returned to their ancestral home areas, or continued to have family there (who would inherit, or benefit from their relative's expertise). We begin by using the Slave Voyages database (see above) to identify individuals involved in the slave trade. We next use two different approaches to link these slave traders to the locations of slaveholders in 1833. Our first approach uses genealogical information. For each slave trader, we find the largest family tree containing this person from `Ancestry.com`. From this family tree, we extract the universe of the slave trader's parents, grandparents, and great-grandparents (as far as these are available), and locate them geographically based on birth address (or death address if birth address is unavailable). Our second approach uses the geographical distribution of surnames in Britain (e.g., Cheshire and Longley 2011). We assign slave traders to locations probabilistically, based on the likelihood of observing their surname in a location in the individual-level 1851 population census. We use these two different approaches to construct our two instruments for slavery wealth, as discussed below.

Steam Engines We use the British Newspaper Archive to collect data on the location of steam engines. We search for second-hand sales, advertisements, and job ads that contain references to steam engines from 520 local newspapers in England and Wales. Over the period 1755–1850, we obtain around 20,000 references to steam engines, which we assign geographically based on the location of publication of the newspaper.

Data Structure To overcome changes in the boundaries of administrative units such as parishes over time, we construct a hexagonal spatial grid over England and Wales, consisting of 849 cells ("regions").[15] Each grid cell covers an area of 200 square kilometers and the distance from the centroid to the vertex measures around 9 km. Since the dominant mode of commuting during our sample period was walking, 9 km is a reasonable maximum distance over which it would be possible to walk to work. A further advantage of this grid cell structure is that it is straightforward to examine the robustness of our results to alternative sizes of grid cells, as discussed below. We assign our data to grid cells either based on exact geolocated addresses (e.g., for slaveholder addresses) or the latitude and longitude coordinates of

[15]We choose hexagons (rather than squares or triangles) because of their advantages for partitions of geographical space, as discussed for example in Carr and Pickle (2010).

the centroids of parishes (e.g., for our population census data). With around 10,000 parishes in England Wales, each parish is small relative to the area of our 849 grid cells.

5 Motivating Evidence

We begin by providing some motivating evidence on patterns of slaveholding and economic activity in England and Wales. In Subsection 5.1, we examine cross-section patterns at the time of the Abolition of Slavery in 1833. In Subsection 5.2, we use our historical data on property values to the examine the evolution of this relationship over time.

5.1 Economic Activity and Slaveholding in the 1830s

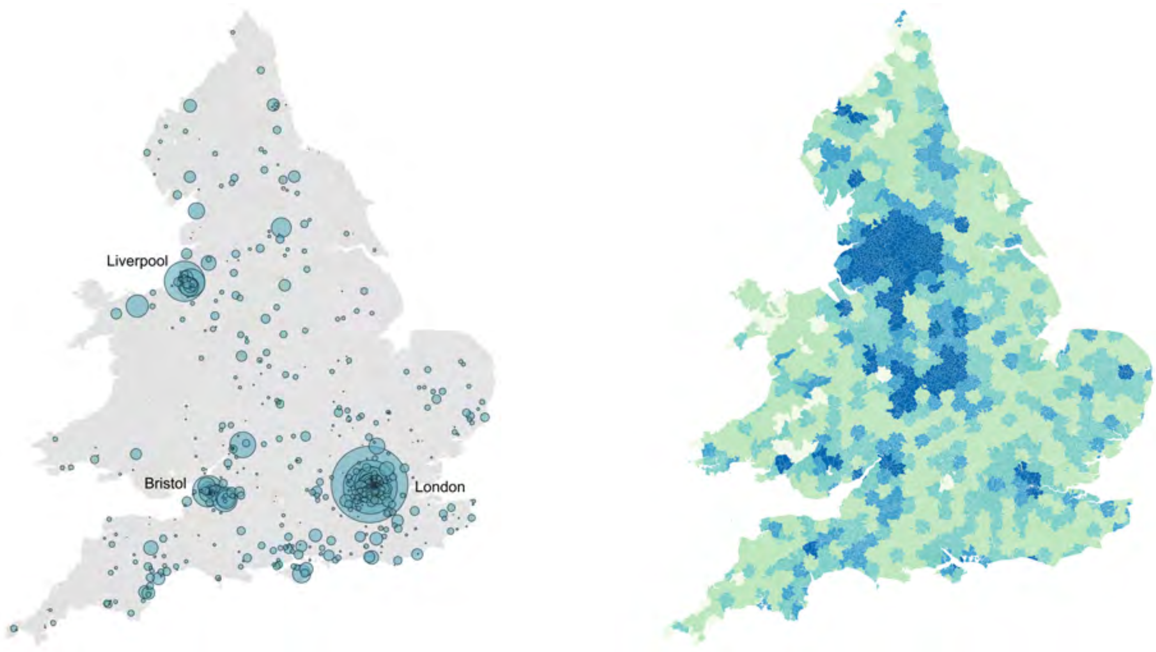
In Figure 2a, we show the spatial distribution of slaveholder compensation in 1833 in England and Wales. To provide as fine a level of spatial resolution as possible, we display slavery wealth in this figure at the parish level. The size of the blue circles is proportional to the amount of slavery compensation awarded in current price 1833 pounds sterling. We find the largest concentrations in the areas surrounding the three ports most heavily involved in the slave trade and the products of the slave economy (in particular, sugar, tobacco, coffee and cotton): Liverpool in the North-West, Bristol in the South-West, and London in the South-East. But slaveholding extends throughout much of England and Wales, particularly in coastal regions, and in the main population centers.

In Figure 2b, we show the manufacturing employment share in each of our hexagonal regions in 1831. By that time, the manufacturing employment share for England and Wales as a whole was approximately 42%, and we see the emergence of industrial agglomerations in the North. However, agriculture still employs approximately 27% of the population and there is substantial heterogeneity in agricultural specialization across regions, with agriculture still accounting for more than 60% percent of employment in some counties.[16] Comparing the two figures, manufacturing employment shares and slaveholder compensation are positively correlated.

In Figure 3, we provide further evidence on the correlation between structural transformation and slaveholding using three different indicators: the agricultural employment share in 1831 (left panel), the number of cotton mills in 1839 (middle panel), and the industry employment share in 1831 (right panel). We show the fitted values and 95 percent confidence intervals from local polynomial regressions of all three measures on the number of enslaved

[16]See Figure B.1 in Online Appendix B for a corresponding map of agricultural employment shares. To derive the 1831 figure, we linearly interpolate the Broadberry et al. (2010) employment shares for 1801 and 1851. Along similar lines, Crafts (1985) reports a share of male employment in industry later, in 1840, of 47.3%.

Figure 2: Slaveholding and Structural Transformation in the 1830s



(a) Slaveholder Compensation in 1833 (b) Manufacturing Employment Share in 1831

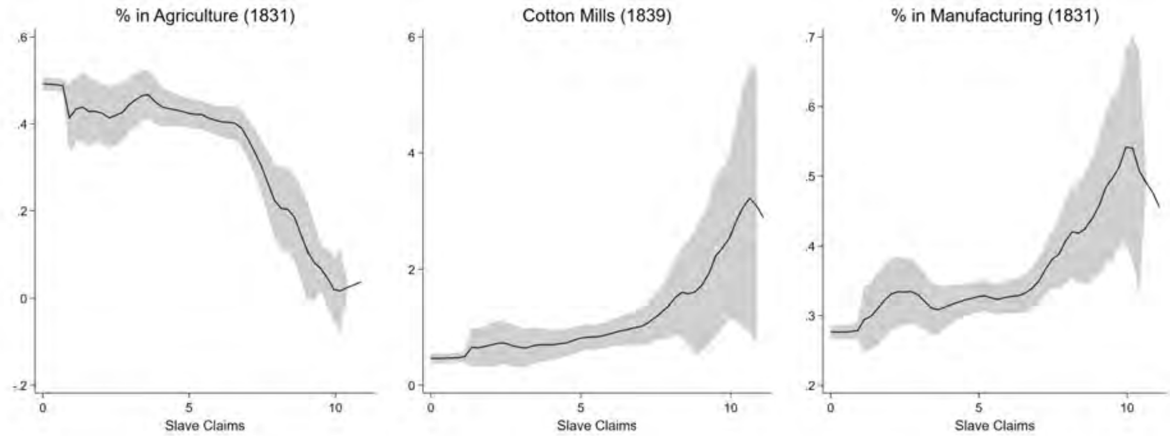
Note: *Left panel*: Slaveholder compensation in each parish in 1833 pounds sterling; size of blue circles proportional to the total value of slaveholder compensation in each region. The largest three slave trading ports by enslaved persons embarked are labelled. *Right panel*: Manufacturing employment share in each region in the 1831 census; darker blue colors correspond to higher values; lighter green colors correspond to lower values.

persons claimed in 1833. We find that areas with greater slaveholding have lower agricultural employment shares, more cotton mills, and higher manufacturing employment shares.

5.2 Economic Activity and Slaveholding over Time

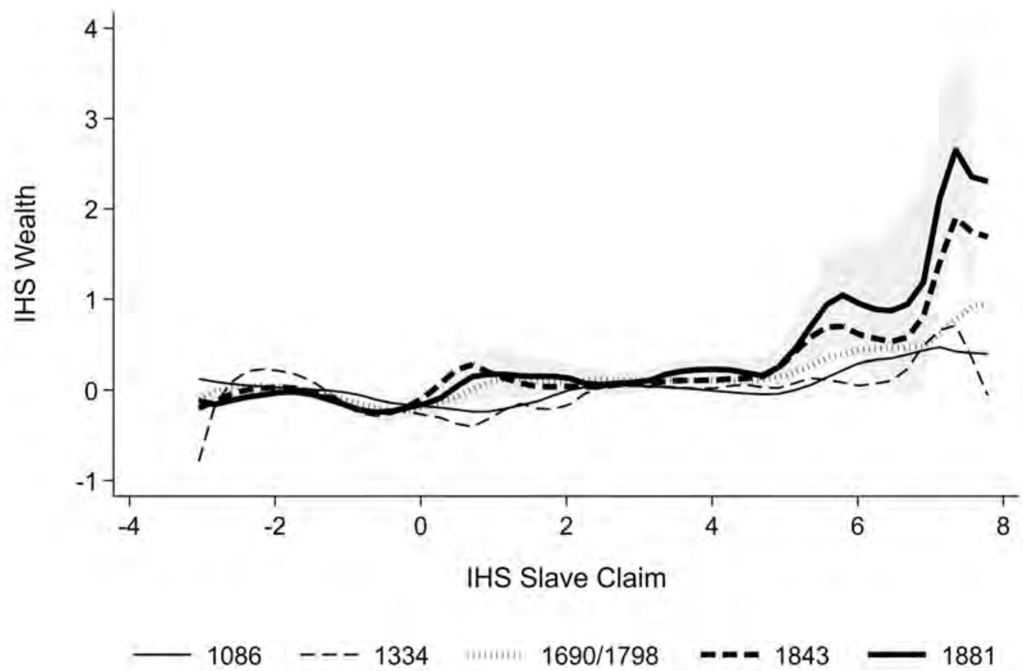
We next use our long historical time-series on property valuations to examine the timing of the emergence of this relationship. We estimate non-parametric regressions of property valuations per land area in each year on the number of enslaved persons claimed in 1833. We control for other potential determinants of property valuations, such as geographical location, using the Frisch-Waugh-Lovell Theorem. In particular, we regress both property valuations and slaveholding on controls for latitude, longitude, and population, generate the residuals, and then estimate our non-parametric regressions using these residuals. We find a similar pattern of results in robustness tests without these controls.

Figure 3: Structural Transformation and Slaveholding in the 1830s



Note: In all three panels, horizontal axis shows total number of enslaved in each hexagon in 1833; vertical axes show agricultural employment share in 1831 (left panel), number of cotton mills in 1839 (middle panel), and manufacturing employment share in 1831 (right panel); dark line shows fitted values from local polynomial regression; gray shading shows 95 percent confidence intervals. Slave claims and the number of cotton mills are inverse hyperbolic sine transformed.

Figure 4: Property Valuations by Year and Number of enslaved persons Claimed in 1833



Note: Local polynomial regressions; vertical axis is residual from regressing the inverse hyperbolic sine (IHS) of property valuation on the parish centroid's latitude, longitude and population in each grid cell; horizontal axis is residual from regressing the inverse hyperbolic sine (IHS) of 1833 slavery compensation on the same control variables; gray shading shows 95 percent confidence intervals for 1881; see Section 4 above and Section G of the Online Appendix for further details about the property valuation data for each year.

In Figure 4, we show the estimated gradient between the inverse hyperbolic sines of each of our measures of property valuation per land area and the number of enslaved persons claimed in 1833. The residual property valuation and slaveholding variables both have mean zero. For 1086 (solid medium black line), we find a relatively flat relationship with only a slight upward slope. For 1334, we again observe a flat relationship, with essentially no gradient. Therefore, we find no evidence of a relationship between levels of economic activity and future slaveholding before Britain's large-scale involvement in slavery from the 1640s onwards.

In contrast, using our 1798 property valuation data, which are based on amended 1690 land tax quotas, we begin to observe a positive upward-sloping relationship. By 1843, this positive slope steepens further, particularly at higher levels of slaveholding. By 1881, there is a further steepening of this positive slope, which is again greater at higher levels of slaveholding. Hence, following Britain's large-scale participation in slave trading and slaveholding from the 1640s onwards, we start to observe a positive relationship between economic activity and our measure of slaveholding.

Taken together, these empirical findings are suggestive of a relationship between slavery wealth and economic development. In the next section, we develop a theoretical model to understand the potential mechanisms for such an empirical relationship. In the following section, we introduce our identification strategy to estimate causal effects, and use our theoretical model to quantify the aggregate and distributional consequences of slavery investments.

6 Theoretical Model

To guide our empirical analysis, we develop a simple theoretical model of economic development and structural transformation.[17] We augment a conventional specific-factors model to incorporate labor mobility, endogenous capital accumulation, and slavery investments in an overseas colony. Slavery and domestic investments are assumed to be imperfect substitutes for one another. Investments are subject to financial frictions, such that most domestic investments occur locally. Access to slavery investments raises the rate of return to capital accumulation, which increases the steady-state capital stock, and hence leads to an expansion in the local capital-intensive manufacturing sector.

6.1 Model Setup

We consider a set of small open economies: many domestic locations indexed by $i, n \in \{1, \ldots, N\}$ and a colonial plantation $\mathbb{N}$. Time is discrete and indexed by t.

[17]For a more detailed exposition of the model and the derivation of all theoretical results in this section of the paper, see Online Appendix C.

The world economy includes four types of agents: workers, capitalists, landlords and enslaved persons. Workers, capitalists and landlords are located in the domestic economy. Enslaved persons work in the colonial plantation. There are three sectors of economic activity: agriculture and manufacturing (produced in the domestic economy) and plantation products (produced in the colony). Agriculture is produced with labor and land. Manufacturing is produced with labor and capital. Workers are mobile between the two domestic sectors. But land and capital are specific factors that can only be used in agriculture and manufacturing respectively. Enslaved persons and capital produce plantation goods.[18]

Workers are endowed with one unit of labor that is supplied inelastically. They are geographically mobile across locations within the domestic economy, but geographically immobile between the domestic economy and the colonial plantation. Landlords in each domestic location are geographically immobile and own local land (m_n).

Capitalists are geographically immobile and own local capital (k_{nt}). Each period, they allocate capital to either local manufacturing or to plantation production. They also make a dynamic consumption-investment decision. They can either invest their assets (a_{nt}) in capital (k_{nt}) or a consumption bond that pays a constant rate of return ρ. Investments in capital are subject to collateral constraints, such that capitalists can only invest a multiple of their current assets: $k_{nt} \leq \lambda_n a_{nt}$. If they invest in capital, they observe idiosyncratic productivity draws for the number of effective units of capital for use in domestic manufacturing and the colonial plantation. These idiosyncratic productivity draws give rise to a downward-sloping Keynesian marginal efficiency of capital schedule for each location. They also imply an asset demand system in which the elasticity of substitution between domestic and colonial investments is determined by the dispersion of these idiosyncratic productivity draws. Capitalists face financial frictions, such that $\phi_{nit} \geq 1$ units of capital must be invested from location n in order for one unit to be available for production in location $i \in \{n, \mathbb{N}\}$.[19]

6.2 Preferences and Endowments

The indirect utility function for a worker ϑ in location n at time t ($u_{nt}(\vartheta)$) depends on the wage (w_{nt}^L), the consumption goods price index (p_{nt}), amenities that are common across workers (B_{nt}), and an idiosyncratic amenity draw ($b_{nt}(\vartheta)$) that captures all the idiosyncratic reasons

[18] For simplicity, we abstract from land use in plantation products and capital use in agriculture, although both can be introduced. What matters is that plantation products and domestic manufacturing both use capital, and domestic manufacturing is more capital-intensive than domestic agriculture.

[19] In our baseline specification, we capture the local nature of investment by assuming for simplicity that capitalists can only invest in their own location or the colonial plantation. In Online Appendix F, we develop an extension, in which capitalists can invest in any domestic location subject to financial frictions that increase with distance, which gives rise to a gravity equation in bilateral investment flows.

why an individual worker can choose to live in a particular location:

$$u_{nt}(\vartheta) = \ln B_{nt} + \ln w_{nt}^{L} - \ln p_{nt} + \kappa \ln b_{nt}(\vartheta), \tag{1}$$

where the parameter κ regulates the heterogeneity in idiosyncratic amenities. The consumption goods price index (p_{nt}) depends on the price of agriculture (p_{nt}^{A}), the price of manufacturing (p_{nt}^{M}) and the price of plantation products (p_{nt}^{S}):

$$p_{nt} = \left[\left(p_{nt}^{A}/\beta_{t}^{A}\right)^{1-\sigma} + \left(p_{nt}^{M}/\beta_{t}^{M}\right)^{1-\sigma} + \left(p_{nt}^{S}/\beta_{t}^{S}\right)^{1-\sigma} \right]^{\frac{1}{1-\sigma}}, \tag{2}$$

where (β_{t}^{A}, β_{t}^{M}, β_{t}^{S}) are taste parameters that control the relative weight of the three goods in utility; we assume inelastic demand between the three sectors ($0 < \sigma < 1$), as in the macroeconomics literature on structural transformation.

Each location is connected to world markets through iceberg trade costs that can differ across sectors ($\tau_{it}^{A} \geq 1$, $\tau_{it}^{M} \geq 1$, $\tau_{it}^{S} \geq 1$) and faces exogenous prices for each good on world markets (p_{t}^{AW}, p_{t}^{MW}, p_{t}^{SW}).[20] Therefore, no-arbitrage implies that the local prices of the three goods (p_{nt}^{A}, p_{nt}^{M}, p_{nt}^{S}), and hence the local consumption price index (p_{nt}), are pinned down by these iceberg trade costs and exogenous world market prices.

6.3 Technology

Each good is produced under conditions of perfect competition using constant returns to scale Cobb-Douglas technologies. Cost minimization and zero profits imply that price equals unit costs if a good is produced:

$$p_{it}^{A} = \frac{1}{z_{it}^{A}} \left(q_{it}\right)^{\alpha^{A}} \left(w_{it}^{L}\right)^{1-\alpha^{A}}, \qquad i \in \{1, \ldots, N\}. \tag{3}$$

$$p_{it}^{M} = \frac{1}{z_{it}^{M}} \left(r_{it}\right)^{\alpha^{M}} \left(w_{it}^{L}\right)^{1-\alpha^{M}}, \qquad i \in \{1, \ldots, N\}. \tag{4}$$

$$p_{\mathbb{N}t}^{S} = \frac{1}{z_{\mathbb{N}t}^{S}} \left(r_{\mathbb{N}t}\right)^{\alpha^{S}} \left(w_{\mathbb{N}t}^{S}\right)^{1-\alpha^{S}}, \tag{5}$$

where z_{it}^{j} denotes productivity for sector $j \in \{A, M, S\}$; q_{it} is the domestic agricultural land rent; r_{it} is the domestic rental rate per effective unit of capital; $r_{\mathbb{N}t}$ is the exogenous rental rate per effective unit of capital in the colonial plantation; $w_{\mathbb{N}t}^{S}$ is the exogenous shadow cost of enslaved labor in the colonial plantation; and $0 < \alpha^{A}, \alpha^{M}, \alpha^{S} < 1$.

The equilibrium wage (w_{it}^{L}) is determined by the equality of labor's value marginal product in agriculture and manufacturing for each domestic location where both these goods are

[20]While our baseline specification assumes for simplicity that locations are small open economies that face exogenous world market prices, we can also allow for an endogenous terms of trade.

produced. Given prices (p_i^A, p_i^M), productivity (z_i^A, z_i^M), land supply (m_i), capital allocated to domestic manufacturing (k_{it}^M) and total employment (ℓ_{it}) for a given location i, the model behaves as in the conventional specific-factors model. In contrast to this conventional framework, both the capital allocated to domestic manufacturing k_{it}^M) and total employment (ℓ_{it}) are endogenous, and the capital stock (k_{it}) is determined by consumption-saving decisions.

6.4 Labor Market Clearing

After observing her idiosyncratic amenity draws ($b_n(\vartheta)$), each worker chooses her preferred domestic location. We make the conventional assumption that idiosyncratic amenities are drawn from an extreme value distribution: $F(b) = \exp(-\exp(-b-\overline{\gamma}))$, where $\overline{\gamma}$ is the Euler-Mascheroni constant. Using this assumption, the share of workers who choose to live in location n depends on relative amenity-adjusted real wages, and takes the logit form:

$$\mu_{nt} = \frac{\ell_{nt}}{\bar{\ell}_t} = \frac{\left(B_{nt} w_{nt}^L / p_{nt}\right)^{1/\kappa}}{\sum_{k=1}^{N} \left(B_{kt} w_{kt}^L / p_{kt}\right)^{1/\kappa}}, \tag{6}$$

where $\bar{\ell}_t$ is total domestic employment, such that labor market clearing implies $\sum_{i \in N} \ell_{it} = \bar{\ell}_t$. Worker expected utility taking into account the idiosyncratic productivity draws is:

$$\mathbb{U}_t = \kappa \log \left[\sum_{k=1}^{N} \left(B_{kt} w_{kt}^L / p_{kt}\right)^{1/\kappa} \right], \tag{7}$$

Intuitively, expected utility increases in amenities (B_{nt}) and wages (w_{nt}^L), and decreases in the consumption price index (p_{nt}).

6.5 Capital Allocation Within Periods

At the beginning of period t, the capitalists in location n inherit an existing stock of capital k_{nt}, and decide where to allocate this existing capital, and how much to consume and invest. Once these decisions have been made, production and consumption occur. At the end of period t, new capital is created from the investment decisions made at the beginning of the period, and the depreciation of existing capital occurs. In the remainder of this subsection, we characterize capital allocation decisions at the beginning of period t. In the next subsection, we characterize optimal consumption-investment decisions.

We assume that capital can be allocated either locally (k_{nnt}) or to the colonial plantation ($k_{n\mathbb{N}t}$).[21] The productivity of capital in each of these uses is subject to idiosyncratic productiv-

[21] In Online Appendix F, we develop our theoretical extension to allow capitalists to invest in all domestic locations, subject to financial frictions that generate a gravity equation for investment. Using data from the Legacies of British Slavery database, we find that capital investments indeed decline sharply with distance, with more than 50 percent of investment occurring within 100 km, as shown in Online Appendix B.5.

ity draws (ϵ_{nnt}, $\epsilon_{n\mathbb{N}t}$) for effective units of capital, as in Liu et al. (2022). These idiosyncratic productivity draws correspond to Keynesian marginal efficiency of capital shocks, and give rise to imperfect substitutability between domestic and colonial investments.[22] The return to a capitalist from location n of investing a unit of capital in destination i (v_{nit}) depends on the rental rate per effective unit (r_{it}), the number of effective units (ϵ_{nit}) and financial frictions (ϕ_{nit}): $v_{nit} = \epsilon_{nit} r_{it}/\phi_{nit}$. We assume that these idiosyncratic productivity shocks (ϵ_{nit}) are drawn independently from a Fréchet distribution: $F(\epsilon) = e^{-\epsilon^{-\theta}}$. The shape parameter $\theta > 1$ controls the dispersion of these shocks. We normalize the scale parameter to one, because it enters the model isomorphically to financial frictions (ϕ_{nit}).

Using the properties of this Fréchet distribution, the shares of capital allocated to each location depend on relative rental rates (r_{it}) and financial frictions (ϕ_{nit}):

$$\xi_{nit} = \frac{k_{nit}}{k_{nt}} = \frac{\left(r_{it}/\phi_{nit}\right)^{\theta}}{\sum_{m\in\{n,\mathbb{N}\}}\left(r_{mt}/\phi_{nmt}\right)^{\theta}}, \qquad i \in \{n, \mathbb{N}\}. \tag{8}$$

Both local domestic manufacturing and the colonial plantation face an upward-sloping supply function for capital, such that each must offer a higher rental rate (r_{it}) in order to attract a larger share of capital (ξ_{nit}). If some domestic locations n have better information about slavery investments, for example through ancestral links to the slave trade, this is reflected in lower financial frictions for colonial investment (lower $\phi_{n\mathbb{N}t}$), and hence a higher share of capital invested in the colony $\mathbb{N}$ (higher $\xi_{n\mathbb{N}t}$).

Capital market clearing implies that the capital employed in local manufacturing (k_{nt}^{M}) equals the capital allocated locally (k_{nnt}). Similarly, the capital employed in the colonial plantation ($k_{\mathbb{N}t}^{S}$) equals the capital allocated there from all domestic locations $n \in N$:

$$k_{nt}^{M} = k_{nnt} = \xi_{nnt} k_{nt}, \qquad\qquad k_{\mathbb{N}t}^{S} = \sum_{n=1}^{N} k_{n\mathbb{N}t} = \sum_{n=1}^{N} \xi_{n\mathbb{N}t} k_{nt}, \tag{9}$$

where $\xi_{nnt} + \xi_{n\mathbb{N}t} = 1$. As an investment location i attracts a larger share of capital from an ownership location n (ξ_{nit}), it attracts units of capital with lower realizations for idiosyncratic productivity, and hence moves further down its marginal efficiency of capital schedule, reducing the average productivity of capital. Therefore, we can write the capital market clearing condition (9) in productivity-adjusted terms as:

$$\widetilde{k}_{nt}^{M} = \gamma \xi_{nnt}^{-\frac{1}{\theta}} k_{nnt} = \gamma \xi_{nnt}^{\frac{\theta-1}{\theta}} k_{nt},$$
$$\widetilde{k}_{\mathbb{N}t}^{S} = \sum_{n\in\mathbb{N}} \gamma \xi_{n\mathbb{N}t}^{-\frac{1}{\theta}} k_{n\mathbb{N}t} = \sum_{n\in\mathbb{N}} \gamma \xi_{n\mathbb{N}t}^{\frac{\theta-1}{\theta}} k_{nt},$$

[22]This imperfect substitutability is consistent with slavery investments being concentrated in cane sugar, tobacco, cotton and coffee, none of which could be efficiently produced domestically at the time. It is also in line with the theoretical and empirical literature on asset demand systems following Koijen and Yogo (2019).

where we use the tilde above the capital stock to denote the productivity-adjustment; $\gamma\xi_{nit}^{-\frac{1}{\theta}}$ is the average productivity of capital; $\gamma \equiv \Gamma\left(\frac{\theta-1}{\theta}\right)$; and $\Gamma(\cdot)$ denotes the Gamma function.

Again using the properties of the Fréchet distribution, the expected return to capital taking into account the idiosyncratic productivity draws is equalized across locations:

$$v_{nt} = v_{nnt} = v_{n\mathbb{N}t} = \gamma \left[\sum_{m \in \{n,\mathbb{N}\}} \left(r_{mt}/\phi_{nmt}\right)^{\theta} \right]^{\frac{1}{\theta}}. \tag{10}$$

Intuitively, if location i has better investment characteristics in the form of a higher rental rate (r_{it}) or lower financial frictions (ϕ_{nit}), it attracts investments with lower idiosyncratic realizations for productivity, which reduces the capital productivity of capital through a composition effect. With a Fréchet distribution for capital productivity, this composition effect exactly offsets the impact of the better investment characteristics, such that the expected return to capital is equalized across locations. Therefore, the rental rate for capital can differ between local manufacturing and the colonial plantation ($r_{nt} \neq r_{\mathbb{N}t}$), but the expected return to capital taking into account the idiosyncratic productivity draws is equalized ($v_{nnt} = v_{n\mathbb{N}t} = v_{nt}$). Total capitalist income is linear in the existing capital stock: $V_{nt} = v_{nt}k_{nt}$.

A key implication of this specification is that capital market integration acts like an improvement in the productivity of the investment technology. To illustrate this point, note that the expected return to capital (v_{nt}) in equation (10) can be re-written in terms of the domestic investment share (ξ_{nnt}) using equation (8):

$$v_{nt} = \frac{\gamma\left(r_{nt}/\phi_{nnt}\right)}{\left(\xi_{nnt}\right)^{\frac{1}{\theta}}}. \tag{11}$$

In steady-state, the expected return to capital (v_{nt}) is pinned down by no-arbitrage with the rate of return on the consumption bond ($v_n^* - \delta p_n = \rho$).[23] Other things equal, a location n with better access to slavery investments (lower colonial financial frictions $\phi_{n\mathbb{N}t}$) has a lower domestic investment share (lower ξ_{nnt}) on the right-hand side of equation (11), which requires a lower rental rate (r_{nt}) for the equation to hold. Intuitively, obtaining access to slavery investments acts like an improvement in investment productivity, because capitalists obtain another set of draws for idiosyncratic productivity for the colonial plantation, which increases the average productivity of the investments that they choose to undertake in equilibrium. This increased average productivity of investment raises the rate of return to capital accumulation, which leads to a higher steady-state capital stock, and hence a lower steady-state rental rate.

[23] A similar result holds in the absence of the consumption bond, in which case the steady-state expected return to capital is exogenously determined by parameters and the consumption price index: $v_n^* = p_n(1-\beta(1-\delta))/\beta$.

6.6 Capital Allocation Across Periods

Capitalists choose consumption and investment to maximize intertemporal utility subject to their budget constraint:

$$\max_{\{c_{nt},a_{nt+1}\}} \left\{ U_{nt}^{k} = \sum_{t=0}^{\infty} \beta^{t} \ln c_{nt}^{k} \right\}, \tag{12}$$

$$\text{subject to } p_{nt} c_{nt}^{k} + p_{nt} \left(a_{nt+1} - a_{nt} \right) = R_{nt} a_{nt},$$

where R_{nt} is the gross return to assets: $R_{nt} = \max\{v_{nt} - \delta p_{nt}, \rho\}$.

Given the linearity of capitalists' income in the existing stock of assets, equilibrium investments are characterized by a corner solution. If the expected return to capital net of depreciation ($v_{nt} - \delta p_{nt}$) exceeds the return from the consumption bond (ρ), capitalists invest all in capital up to the collateral constraint (λ_n): $k_{nt} = \lambda_n a_{nt} \cdot 1_{\{(v_{nt}-\delta p_{nt})>\rho\}}$. We assume that collateral constraints do not bind in steady-state. Therefore, the expected return to capital equals the return from the consumption bond in steady-state: $v_{nt} - \delta p_{nt} = \rho$.

Given our assumption of logarithmic utility, capitalists' optimal consumption-saving decisions are characterized by a constant saving rate, as in Moll (2014):

$$a_{nt+1} = \beta \left(R_{nt}/p_{nt} + 1 \right) a_{nt}. \tag{13}$$

Therefore, although the saving rate is here endogenous, capital accumulation takes a similar form as in the conventional Solow-Swan model. There exists a steady-state capital-labor ratio in each location. If the initial capital stock in a location differs from this steady-state value, consumption smoothing implies that capitalists gradually accumulate or decumulate capital along the transition path towards this steady-state.

6.7 Slavery and Industrialization

Given time-invariant values of the exogenous variables, we show in Proposition C.1 in Online Appendix C.11 that there exists a unique steady-state equilibrium of the model. We now use the model to characterize the aggregate impact and distributional consequences of greater access to slavery investments. In particular, we undertake a comparative static in which we reduce colonial financial frictions ($\phi_{n\mathbb{N}}$) from prohibitive values for all locations (such that $\xi_{nn} = 1$ for all n) to finite values for some locations n (such that $\xi_{nn} < 1$ for some n, as observed in our data). We hold constant world prices (p^{AW}, p^{MW}, p^{SW}) and other exogenous fundamentals. Therefore, this comparative static captures the pure impact of greater access to slavery investments through capital accumulation. We show that the domestic investment share (ξ_{nn}) is a sufficient statistic for the impact of colonial financial frictions ($\phi_{n\mathbb{N}}$) on steady-state economic activity, as summarized in the following proposition.

Proposition 1. ***(Slavery and Industrialization)*** *Other things equal, in steady-state equilibrium, locations with better access to slavery investments (lower $\phi_{n\mathbb{N}}$ and hence lower ξ^*_{nn}) have (i) lower agricultural employment (ℓ_n^{A*}); (ii) higher manufacturing employment (ℓ_n^{M*}); (iii) higher total population (ℓ_n^*); (iv) a lower rental rate for capital (r_n^*); (v) higher wages (w_n^{L*}) and worker real income (w_n^{L*}/p_n); (vi) lower price of agricultural land (q_n^*); (vii) higher productivity-adjusted and unadjusted stocks of capital ($\widetilde{k}_n^*$, k_n^*); (viii) higher productivity-adjusted and unadjusted stocks of capital in domestic manufacturing ($\widetilde{k}_n^{M*}$, k_n^{M*}); (ix) higher capitalist real income ($v_n^* k_n^*/p_n$); (x) lower landlord real income ($q_n^* m_n/p_n$).*

Proof. See Section C.12 of the online appendix. □

The proposition reflects the net effect of counteracting forces. On the one hand, for a given stock of capital (k_n), the fall in colonial financial frictions ($\phi_{n\mathbb{N}}$) reduces the capital allocated to local manufacturing (lower k_{nn}) through a conventional substitution effect. On the other hand, the fall in colonial financial frictions ($\phi_{n\mathbb{N}}$) acts like an improvement in the productivity of the investment technology, which increases the return to capital accumulation, and raises the steady-state capital stock (k_n^*). The proposition establishes that the second effect dominates the first in steady-state, such that the fall in colonial financial frictions ($\phi_{n\mathbb{N}}$) increases the steady-state allocation of capital to local manufacturing (higher k_{nn}^*). In the new steady-state, the expected return to capital (v_n^*) is again equal to the unchanged rate of return on the consumption bond (ρ), but the increase in the steady-state capital stock leads to a fall in the steady-state rental rate (r_n^*).

The remaining parts of the proposition follow from the specific-factors structure of production and population mobility. Given constant prices and zero-profits in manufacturing, a lower steady-state rental rate (r_n^*) raises the steady-state wage (w_n^*). Given constant prices and zero-profits in agriculture, a higher steady-state wage (w_n^*) reduces the steady-state price of land (q_n^*). Additionally, higher wages imply higher worker real income (w_n^*/p_n) for constant goods prices, which increases steady-state population (ℓ_n^*). A higher steady-state allocation of capital to local manufacturing (k_{nn}^*) raises labor's value marginal product in manufacturing, which together with the increase in steady-state population (ℓ_n^*) implies higher manufacturing employment (ℓ_n^{M*}). Finally, given constant prices and a fixed supply of land, the higher steady-state wage (w_n^*) implies lower agricultural employment (ℓ_n^{A*}).

Therefore, we find that improved access to slavery investments both changes the structure of economic activity within locations (stimulating industrialization and structural transformation away from agriculture) and also changes the spatial distribution of economic activity across locations (raising population density in locations with better access to slavery investments and reducing population density elsewhere). Since the reduction in financial frictions with the colonial plantation acts like an improvement in investment productivity, aggregate real income across all locations and factors of production (capitalists, workers and landowners) increases. But there are distributional consequences across the different factors of production. Given an unchanged supply of land (m_n) and constant goods prices (p_n), the fall in the price of agricultural land (q_n) in locations with better access to slavery investments reduces the real income of landowners ($q_n^* m_n / p_n$). Additionally, given an unchanged expected return to capital (v_n^*) and constant goods prices (p_n), the increase in the capital stock (k_n) in locations with better access to slavery investments raises the real income of capitalists ($v_n^* k_n^* / p_n$).

Finally, we focus for brevity here on steady-state impacts, where collateral constraints do not bind. However, if slavery wealth is more collateralizable than other wealth, better access to slavery investments also can relax collateral constraints (higher λ_n), and hence raise capital accumulation along the transition path to steady-state.

7 Main Empirical Results

A key prediction of our theoretical framework is that improved access to slavery investments stimulates local capital accumulation and induces an expansion of the capital-intensive manufacturing sector. We now provide empirical evidence in support of this prediction using exogenous variation in access to slavery investments (and hence slaveholder wealth in 1833) from the middle-passage mortality experienced by slave-trading ancestors. In Section 7.1, we introduce our identification strategy, explain the construction of our instrument, and provide some empirical evidence in support of our causal argument. In Section 7.2, we report our main instrumental variables estimation results for a range of economic outcomes. In Section 7.3, we summarize a range of robustness checks that probe our main findings. Finally, in Section 7.4, we use our theoretical model to quantify the aggregate and distributional consequences of access to slavery investments.

7.1 Identification Strategy

Our identification strategy uses the well-known link between slave trading and slaveholding. Many families started out slave trading, and through the resulting connections to the slave economy, transitioned into slaveholding (as discussed in Hall et al. 2014). Therefore, we develop an instrument for slaveholder wealth in a location in 1833 based on the middle-passage mortality that affected the investment of slave-traders hailing from the same location.

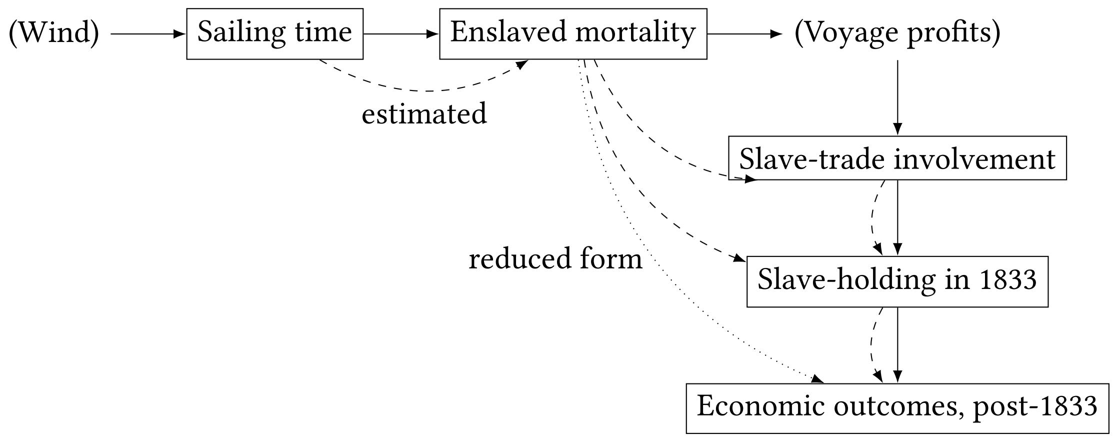
We assign slave traders to the locations of slaveholders in 1833 in two ways. First, we use genealogical information from family trees to link slaveholder locations to slave traders' areas of ancestral origin. Second, we use the geographical concentration of surnames in Britain to probabilistically assign slave traders to locations, and then connect them to slaveholders living in each location in 1833.

In our baseline specification, we use middle-passage mortality to construct our baseline voyage-outcome measure. Since middle-passage mortality is only available for a subset of slave voyages, we also report robustness tests in which we use only variation in the number of ancestors of slave traders (for which we do not require mortality data), or in which we use the number of slave voyages as an alternative indirect measure of voyage outcomes. We now discuss in further the construction of our instrument and the causal logic underlying it.

Middle-Passage Mortality The key ideas underlying our identification strategy are outlined in Figure 5. First, starting from the top-left, idiosyncratic wind conditions had a substantial effect on voyage duration across the Atlantic. Second, voyage duration was an important determinant of slave mortality during the middle-passage under crowded, insanitary and inhumane conditions on slave ships. As sailing times increased, water ran out and infectious diseases spread, leading to sharp increases in middle-passage mortality. Third, moving further to the right, higher middle-passage mortality reduced the profitability of slave-trading voyages. Fourth, moving downwards, this reduction in voyage profitability from adverse wind conditions discouraged (or made impossible) future participation of slave traders in subsequent slave voyages, given the substantial upfront costs involved. Fifth, moving further downwards, lower involvement in the slave trade reduced the likelihood of traders making the transition to slaveholding as plantation owners, and the wealth they could use to do so. In sum, since bad weather shocks both directly lowered trader wealth, and induced exit from the slave trade, they reduced slaveholder wealth in 1833 at the time of abolition.

Causal Mechanism We now provide evidence in support of the steps in this causal chain. Wind speed and direction were the main determinants of ship speed and voyage times in the age of sail (Pascali 2017). Both fluctuated with atmospheric conditions. Around the equator, a lack of surface winds can becalm sailing ships for weeks, which is why sailors refer to them as *dolldrums*. This is reflected in analyses of ship log books, where slave-trading voyages from West Africa to the West Indies took between 25-60 days, as discussed in Haines et al. (2001) and Cohn and Jensen (1982). When voyages took longer than expected, and drinking water ran out, the horrendous conditions aboard for enslaved persons led to sharp increases in mortality, as documented in Kiple and Higgins (1989).

Figure 5: Identification Strategy



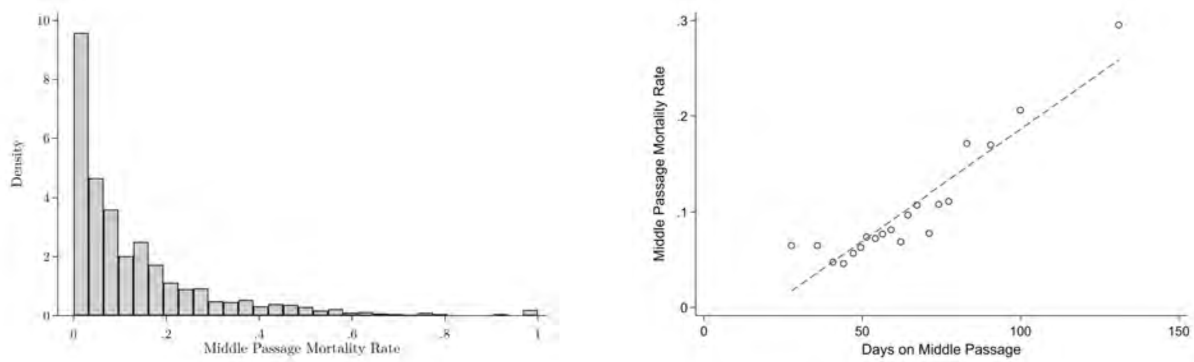
Note: Solid arrows are causal relationships; dashed arrows are estimated relationships; variables in parentheses are unobserved; dotted arrows are reduced-form relationships.

We use data from the Slave Voyages database to corroborate the relationship between sailing time and enslaved mortality. In Figure 6a, we show a histogram of middle-passage mortality across all slave voyages from British ports. We find large differences in middle-passage mortality. While many voyages experienced mortality rates of 5-10 percent, some saw rates of 20 percent or more. These differences in mortality are heavily influenced by sailing time. To illustrate this, Figure 6b presents a binscatter plot of the relationship between middle-passage mortality and the duration in days of the voyage from West Africa to the Americas. Consistent with the historical literature emphasizing voyage duration as the main determinant of middle-passage mortality, we see a strong and positive relationship between sailing time and mortality. Ten extra voyage days increase the mortality rate by 2.3 percentage points. For a ship carrying 350 enslaved persons, this corresponds to 8 additional deaths.

Financing slave-trading voyages required considerable upfront capital investments in ship and crew and to purchase slaves in West Africa. The main source of revenue was the sale of the enslaved in the Americas. Therefore, high mortality rates on slave-trading voyages could result in substantial losses for the slave traders involved. Specifically, we expect voyage duration and middle-passage mortality to be key in enabling continued involvement in the slave trade. To establish this link, Figure 7 displays mean continuation probabilities for slave traders across the number of slave voyages n. We compute these mean continuation probabilities from voyage n to $n+1$ separately for slave traders that experienced above and below-median middle-passage mortality during voyage n.[24] Consistent with the idea that adverse wind conditions and low voyage profits made it less likely that individuals were able

[24] Table B.3 in Online Appendix B.3, we provide further evidence that voyage failure, as recorded by the Slave Voyage Database, became more common the longer the middle passage lasted.

Figure 6: Middle-passage Mortality and Voyage Duration for Slave Voyages



(a) Histogram of middle-passage mortality

(b) Voyage duration and mortality

Note: *Left panel:* The figure shows a histogram of the mortality rates among the enslaved ((enslaved embarked - enslaved disembarked)/enslaved embarked) across slave-trading voyages from British ports. *Right panel:* The figure shows a binscatter of the duration of slave-trading voyages from British ports (horizontal axis) and mortality rates among the enslaved (vertical axis); blue dots correspond to ventiles and the red dashed line shows the linear fit.

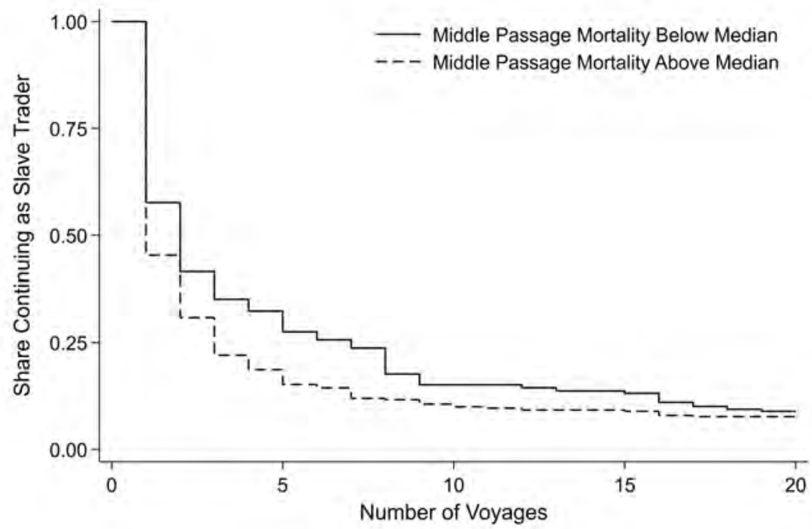
to continue in the slave trade, we find lower continuation probabilities for slave traders who experience above-median middle-passage mortality. For example, after 5 voyages, we find that over one third of the owners who experienced below-median mortality of enslaved stayed involved, whereas less than 20 percent of those exposed to above-median mortality continued to participate.[25]

This pattern of results is consistent with selection on profitability in the slave trade. Those who were lucky with wind conditions and made substantial voyage profits accumulated further wealth and continued to participate in the slave trade. Those who were unlucky with weather conditions and experienced substantial voyage losses dropped out of the slave trade.

Voyage Outcomes To implement our identification strategy, we begin by constructing a voyage outcome measure for slave traders based on middle-passage mortality. We observe a decline in middle-passage mortality over time in the slave voyages data, in part because of improvements in ship technology. To abstract from this secular decline and focus on variation across voyages within the same time period, we remove decadal fixed effects from middle-passage mortality. From the residuals, we construct our outcome measure for slave-trading voyage j and ship owner or "voyager" v as the inverse of the mortality rate among the enslaved: $1/mortality_{vj}$, where mortality equals the number of enslaved embarked, minus the number

[25]In Figure B.4 in Online Appendix B.3, we provide further evidence on this relationship between middle-passage mortality and continuation probabilities in the slave trade.

Figure 7: Continued Involvement in the Slave Trade by Middle-passage Mortality



Note: Horizontal axes is number of slave voyages n; Vertical axis is continuation probability from slave voyage n to slave voyage $n+1$; mean probabilities of continued involvement shown separately for middle-passage voyages with above and below median mortality among the enslaved during voyage n.

of enslaved disembarked, divided by the number of enslaved embarked. This voyage outcome measure has a lower bound of one for voyages where all of the enslaved die, and approaches infinity as the number of deaths among the enslaved approaches zero.[26]

The slave voyages data report up to eight ship owners or "voyagers" for each slave voyage, such that a given voyager can appear multiple times for different slave voyages. We compute the average *voyage outcome* for voyager v as the average across all of their slave voyages j:

$$VO_v = \frac{1}{n_v} \sum_{j=1}^{n_v} \frac{1}{mortality_{vj}}, \tag{14}$$

where n_v is the number of slave voyages for which voyager v is observed.

Family Trees In our baseline specification, we combine data on slave traders' voyage outcomes and the location of their ancestors, using family trees on Ancestry.com. Often, families hailing from a particular place would see one of theirs work and live in a major trading port for a few years – but the majority of the family network, including many individuals who inherit or benefit from the business advice of a relative, remained near the ancestral home. For example, the Lascelles family initially lived in Stank Hall, Yorkshire; three of the family's

[26]For the small number of voyages with zero mortality among the enslaved, we use $0 + \epsilon = 0.005$ to avoid this voyage outcome measure becoming undefined for voyages with no deaths.

male descendants became slave traders, participating in 14 voyages between 1699 and 1736. By 1787, the Lascelles owned 27,000 acres in Barbados, Jamaica, Grenada, and Tobago. All the male lines save one eventually died out, so that only one of them - Henry, second Earl of Harewood (1767-1841) - received slavery compensation under the terms of the Abolition of Slavery Act, as shown in the family tree in Figure B.2 in Online Appendix B.1. By then, the Lascelles had returned to Yorkshire, building their country home.

Using the family trees reported on *Ancestry.com*, we identify 20,000 ancestors of these voyagers, as discussed further in Online Appendix G. We collect birth and death addresses for the parents, grandparents and great grandparents of these voyagers. We also distinguish between two groups among slave-trading ancestors: successful traders (in the sense of more than one slave-trading voyage) and all other traders (with only one slave-trading voyage). For each location i, we compute our first average voyage outcome instrument (VOI_i^{tree}) as an average of the voyager outcomes across all slave-trading ancestors in that location:

$$VOI_i^{tree} = \frac{1}{A} \sum_{a=1}^{A_i} VO_{v(a)}, \tag{15}$$

where A_i is the number of ancestors of slave-traders in location i; A is the total number of ancestors of slave-traders in England and Wales; $VO_{v(a)}$ is the average voyage outcome for voyager v who is the descendant of ancestor a, as defined in equation (14) above, where the notation $v(a)$ makes explicit that voyager v is matched to ancestor a; the scaling by $1/A$ rather than $1/A_i$ outside the summation ensures that the instrument increases with the number of slave-trading ancestors in a location, and implies that it captures a location's share of slave-trading ancestors in England and Wales weighted by their voyage outcomes.

In our first-stage regression, we predict slaveholding in 1833 in a location using this instrument for the average voyage outcome of slave-traders with ancestors in that location. Note that this instrumental variables estimation does not require there to exist direct family connections between individual slaveholders in 1833 in a given location and the ancestors of slave traders in that same location. The presence of ancestors of slave traders in a location could have predictive power for slave holding there in 1833 because of indirect connections: For example, slave traders could pass information about opportunities for slaveholding investments through friends, business and social networks that are correlated with their familial locations.

In Table 1, we report a balance test for three groups of locations – those without ancestors involved in the slave trade, those with successful ancestors in the slave trade, and those with unsuccessful ancestors in the slave trade. For all indicators of economic conditions before the large-scale expansion of Britain's role in the slave trade starting in the 1640s, we find no significant differences in property values for regions that were home to successful and unsuccessful voyagers. But regions that never engaged in the slave trade show lower levels of wealth and industrial activity after the expansion of British involvement in the slave trade from the 1640s onwards. The remaining rows compare geographic location (as measured by latitude and longitude) and geographical distance from ports. Successful slave traders' ancestral regions do not have significantly different latitudes or longitudes but they are located slightly closer to Liverpool. The absence of major differences between columns 2 and 3 suggests that our instrument is as good as randomly assigned across regions.

Table 1: Balance Test – Ancestors and Middle Passage Mortality

Variable	(1) None Mean/SE	(2) Unsuccessful Mean/SE	(3) Successful Mean/SE	T-test Difference (1)-(2)	(1)-(3)	(2)-(3)
Domesday Wealth (1086)	4.67	4.93	4.97	-0.26	-0.30	-0.04
	(0.05)	(0.10)	(0.08)			
Wealth Subsidy (1334)	4.04	4.18	4.20	-0.14	-0.16	-0.02
	(0.05)	(0.10)	(0.10)			
Property Wealth (1690)	7.84	8.29	8.28	-0.45***	-0.44***	0.01
	(0.04)	(0.06)	(0.06)			
Cotton Mills (1788)	0.05	0.30	0.23	-0.26***	-0.18***	0.07
	(0.01)	(0.05)	(0.04)			
Longitude	-1.97	-1.66	-1.58	-0.31	-0.39	-0.07
	(0.08)	(0.10)	(0.11)			
Latitude	52.50	52.46	52.43	0.04	0.07	0.04
	(0.06)	(0.09)	(0.08)			
Dist Historic Port	19.47	22.48	21.46	-3.00*	-1.99	1.02
	(0.65)	(1.20)	(1.31)			
Dist Liverpool	214.46	186.93	192.43	27.53***	22.03***	-5.50
	(3.80)	(7.50)	(7.35)			
N	511	165	175			

Note: The value displayed for t-tests are the differences in the means across the groups. Standard errors are robust. Group 1 is the set of regions without any identified ancestors of slave voyagers. Groups 2 and 3 split those regions with ancestors into above and below voyage outcomes (recall that voyage outcomes are inversely related to middle-passage mortality). Wealth and count variables are inverse hyperbolic sine transformed. The control variable IHS of population in 1780 is included in all estimation regressions. All missing values in balance variables are treated as the group mean. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

In Table B.5 in Online Appendix B.4, we provide evidence on the performance of the instrument in the first-stage when we use only the share of ancestors as an instrument (without taking into account middle-passage mortality) versus including information on middle-passage mortality (as in our baseline specification in equation (15)). We show that the first-stage F-statistic increases when we incorporate mortality information, consistent with our mechanism. The gain is visible both with and without controls; and the final instrument, mortality scaled, is strong for both family trees (here) and surnames (below).

Surnames in the 1851 Fullcount Census Our first IV above exploits direct genealogical connections between slave traders and their ancestors. However, family trees on *Ancestry.com* are not available for all traders, and this selection could be non-random: Successful slave-trading families could be either more or less likely to have detailed family records. To address this potential concern, we also use the national distribution of all *surnames* (from the 1851 population census) to measure regional links with families in the slave trade. This strategy exploits the persistent geographical concentration of surnames in Britain (Cheshire and Longley 2011) and assumes that concentrations of slave voyager surnames in 1851 are informative about their familial locations. While less precise than the family-tree instrument, this strategy is exhaustive. It provides a useful cross-validation of our family-tree instrument.

The 1851 census contains a total of $N = 17,474,083$ individuals with $S = 330,329$ distinct surnames. The surname distribution is heavily skewed (Fox and Lasker 1983, Güell et al. 2014). The two most common surnames, Smith and Jones, account for about 1.4 percent of all individuals, while 37 percent of names occur only once. Of the 2,259 distinct voyager surnames, we can match 90 percent (2,040) to at least one individual in the 1851 census. Comparing the voyager and non-voyager surnames, we find that voyager surnames are a bit more common than non-voyager surnames.

We use the voyager surnames observed in the 1851 census to predict the spatial distribution of voyagers' familial locations. We observe the location of named individuals in the 1851 census by parish. To account for the frequency and spatial dispersion of surnames, we use Monte Carlo simulations, in which we randomly match all slave voyagers (unique in first name and surname) to individuals in the 1851 census using their surname. For example, we observe 21 slave voyagers with the surname *Smith*. We randomly match these 21 observations with 21 of the 240,117 individuals named *Smith* in the 1851 census.[27] For each of these voyager-surname matches m, we use a voyager's average voyage outcome across all of their slave voyages (VO_v), as defined in equation (14) above. For each region i, we compute the sum of voyage outcome measures of all voyagers matched to surnames in that region. Finally, we repeat this procedure for iterations $l = \{1, \ldots, L\}$, where $L = 1,000$. Our second average voyage outcome instrument for each region i is an average across these iterations:

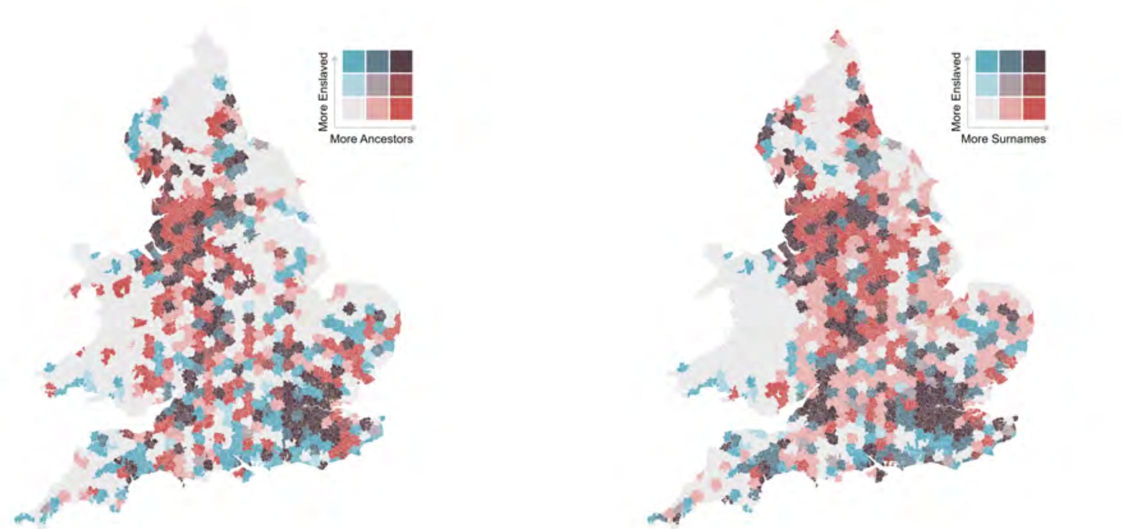
$$VOI_i^{sname} = \frac{1}{L} \sum_{l=1}^{n} \sum_{m=1}^{M_{il}} VO_{v(m)}, \tag{16}$$

[27] We take the number of voyagers directly from the slave voyages dataset. Alternatively, one could make an assumption about their population growth rate, and inflate their number between their slave voyage year and 1851. This procedure would give more weight to earlier voyagers. Since we find that this adjustment does not make a great difference, we refrain from further complicating the measure.

where the outer summation averages across iterations for a given region i; the inner summation counts the voyager-surname matches for that region in a given iteration l; M_{il} is the number of voyager-surname matches in region i for iteration l; the notation $v(m)$ makes explicit that voyager v is assigned to voyager-surname match m.

Figure 8: Bivariate Plots of Slaveholding and Ancestral Connections to the Slave Trade

(a) Family Trees (b) Surnames



Note: The bi-plot displays tertiles of the distribution of familial connections to the slave trade as measured by family trees (left panel) and surnames (right panel) against terciles of slaveholding across English and Welsh parishes. Data are constructed for our 849 hexagonal regions and cross-walked into parishes based on their centroids for the purposes of the visualization.

Figure 8 shows bi-variate plots of our voyage outcome instruments and slaveholders in 1833, with the left panel displaying the family-tree instrument (VOI_i^{tree}), and the right panel displaying the surname instrument (VOI_i^{sname}). Grey areas show neither slaveholding nor familial connections to slave traders; dark brown indicates a strong confluence of both. Where areas of the map are only red, there are many ancestral connections to slave trading but few 1833 slaveholders; where areas of the map are blue, there are many 1833 slaveholders but few ancestral connections to slave trading. The map shows that slaveholding and familial connections to the slave trade were widespread; and in many places, they coincide. Comparing both maps, we see strong overlap in the areas around London, Bristol and Liverpool, but also in numerous other locations in England and Wales.

7.2 Instrumental Variables Estimation

We now use our two instrumental variables to estimate the impact of slavery wealth on economic development. We start with our baseline empirical results for cross-section patterns of economic development in the 1830s. Next, we check the plausibility of our IV strategy using never-takers: regions where ancestors of slave traders lived, but where no slaveholders dwelled in 1833. Finally, we provide evidence on the importance of capital accumulation using repeated cross-sections of steam power adoption over time.

Baseline Estimations Our goal is to estimate the effect of 1833 slaveholding wealth across regions i (S_i) on measures of economic development (Y_i). To establish causality, we instrument 1833 slaveholding (S_i) with our voyage outcome instruments (VOI_i) discussed above:

$$Y_i = C_2 + \beta \widehat{S}_i + \delta X_i' + \epsilon_i \tag{17}$$

$$S_i = C_1 + \alpha VOI_i + \gamma X_i' + \rho_i \tag{18}$$

where C_1 and C_2 are regression constants; X' is a vector of control variables for other determinants of economic activity, including the population in 1780, latitude, longitude, distance to the nearest county bank or post town, the count of cotton mills in 1788, distance to the coast and our measure of property wealth in 1690; and ϵ_i and ρ_i are stochastic errors.

Table 2, Panel A reports results from our IV-estimation, using the family tree instrument. Col. 1 shows a strong relationship with high first-stage F-stats, well above the conventional levels and Anderson-Rubin p-values that are below 0.01 (or at 0.01 in col. 6, Panel A). This underlines the relevance of our instrument. A one standard deviation increase in the voyage outcome measure using ancestors implies a 0.16 standard deviation increase in slaveholder wealth in 1833. Instrumented slave claims strongly and positively predict the number of steam engines in the region (col. 2). It is also associated with higher property taxes in 1815 (col. 3), and negatively predicts employment in agriculture (col. 3). Employment in manufacturing is higher (col. 4), as is the number of cotton mills (col. 5).

We standardize all variables to facilitate the interpretation of the inverse hyperbolic sine transformed measures. Therefore, our estimates imply that a one standard deviation increase in compensation payments translates into a 1.76 standard deviation increase in steam engines, a 0.52 standard deviation increase in rateable values, a 0.61 standard deviation decrease in agricultural employment contrasted by a 0.86 standard deviation increase in manufacturing employment and a 0.77 standard deviation decrease in the average distance to the ten nearest cotton mills in 1839. We also derive elasticities following the approach in Bellemare and Wichman (2020) and report them at the bottom of the table. Doubling slave claims implies a 290 percent increase in steam engines, an 11 percent increase in rateable values, 8 percentage points less agricultural employment, 13 percentage points more manufacturing employment and a 58 percent more mills in the region.[28]

[28]At the extensive margin, a 10 percent increase in slave claims increases the probability to host a mill by 3.48

Table 2: IV: Voyage Outcome Instruments

	(1) SlaveClaims	(2) SteamEng-1830	(3) PropTax1815	(4) %Agric1831	(5) %Manuf1831	(6) CottonMill-1839
A. VO-Scaled Ancestors	0.164***					
	(0.03)					
Slave Claims		1.760***	0.523**	-0.614***	0.861***	0.774***
		(0.42)	(0.22)	(0.17)	(0.25)	(0.29)
N Voyagers	286	286	286	286	286	286
Elasticity	0.14	2.90	0.11	-0.08	0.13	0.58
KPW F-Stat		30.64	30.64	30.64	30.64	30.64
AR p-value		0.00	0.02	0.00	0.00	0.01
B. VO-Scaled Surnames	0.435***					
	(0.05)					
Slave Claims		0.736***	0.561***	-1.360***	1.249***	0.695***
		(0.20)	(0.09)	(0.17)	(0.18)	(0.12)
N Voyagers	2040	2040	2040	2040	2040	2040
Elasticity	1.82	1.21	0.12	-0.19	0.18	0.52
KPW F-Stat		77.18	77.18	77.18	77.18	77.18
AR p-value		0.00	0.00	0.00	0.00	0.00
Observations	849	849	849	849	849	849
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. Standardised coefficients with robust standard errors in parenthesis. Slave claims and the outcomes in columns 1–3 and 6 are IHS-transformed. Instrument is the grid cell share of voyager ancestors, scaled by inverse middle-passage mortality (Panel A) or voyager surnames scaled by inverse middle-passage mortality (Panel B).

This pattern of results is robust across different specifications. In Table B.8 in Online Appendix B.4, we demonstrate that we find similar results using a log-transformation instead of the inverse hyperbolic sine. Our baseline specification controls for 1690 property wealth, which implies that our results capture changes in economic performance since then. But our results are not dependent on controls. In Online Appendix B.4, we show additional results without control variables, and also report the estimated coefficients for all control variables. Our baseline specification uses robust standard errors, because our 849 regions are relatively large, which helps to alleviate potential concerns about spatially correlated errors. In Online Appendix B.4, we report results using Heteroskedasticity Autocorrelation Consistent (HAC) standard errors following Conley (1999). Again, we find a similar pattern of results.

In Panel B of Table 2, we repeat the estimations using the surname instrument. Both instruments are positively correlated (as evident from Figure 8). Since inferring family ties from surnames is more noisy than using a genealogy measure, we think of the surname specification as providing validation of our empirical strategy. Again, the instrument is strong with first-stage F-statistics well above the conventional levels. The first stage suggests that a 1 standard

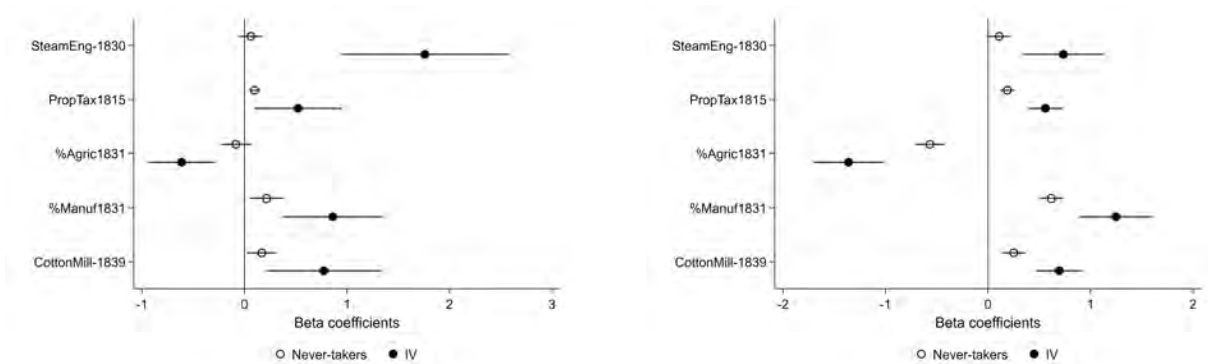
percentage points or 12 percent relative to the mean probability of 27.4 percentage points.

deviation increase in the voyage outcome measure based on surnames implies 0.44 standard deviation higher claims in 1833. Overall, instrumenting slave claims with the alternative surname instrument leads to qualitatively and quantitatively similar results.

To sum up: Regions from which slave traders experiencing beneficial conditions hailed had more slave wealth in 1833. This had effects on economic development: land values increased, consistent with increased urbanization. The share of employment in agriculture declined, the share in manufacturing increased, there were more industrial establishments and more steam engines in the vicinity.

Figure 9: Beta Coefficients for our IV Specification and Never-takers

(a) Family Tree Instrument (b) Surname Instrument



Note: Beta coefficients with 95% confidence intervals from IV estimations using the voyage outcome instrument based on family trees (left panel) or surnames (right panel) and reduced form OLS regressions for nevertaker regions with no slaveholding.

Never-takers A simple plausibility check for our IV-strategy in the spirit of Bound and Jaeger (2000), Angrist and Krueger (1994), and D'Haultfœuille et al. (2022) looks at never-taker regions where ancestors of slave traders lived, but where we find no slave wealth in 1833. If our argument is correct, regions that merely had exposure to the slave trade –without slave-holding later– should *not* show any statistically significant differences in economic performance.

Figure 9 plots the coefficients for our main outcome variables for our baseline IV specification and the never-takers (left: family-tree instrument; right: surnames).[29] We find much larger standardised coefficients for our IV specification, whereas the never-takers show much smaller estimates and in many cases, precisely-estimated zeros.[30]

Taken together, these empirical results provide strong support for the mechanism in our model: Exogenous increases in access to slavery wealth stimulate local capital accumulation,

[29]In this never-takers specification, we estimate reduced-form regressions of our main outcomes on our measures of familial connections to the slave-trade for regions with no slaveholding in 1833.

[30]Table B.15 in Online Appendix B.4 reports the estimated coefficients for the never-taker analysis.

which induces a reallocation of economic activity towards the manufacturing sector.

Steam Power Adoption Steam power was arguably one of the key technologies of the Industrial Revolution, and associated with important improvements in productivity and establishment size (Atack et al. 2008). Adopting its use required a range of technological inventions and innovations, and was costly. Here, we present evidence from the adoption of steam power over time, showing that areas with more slaveholding in 1833 had an increasing edge.

Table 3: IV: Steam Engine Adoption and Slaveholding

	(1) Pre-1792	(2) 1792-1830	(3) 1830-1850	(4) Post-1850
A. VO-Scaled Ancestors	0.280	1.760***	1.427***	1.282***
	(0.26)	(0.42)	(0.35)	(0.31)
KPW F-Stat	30.64	30.64	30.64	30.64
AR p-value	0.28	0.00	0.00	0.00
Elasticity	1.17	2.90	1.87	1.32
B. VO-Scaled Surnames	0.367**	0.736***	0.884***	1.072***
	(0.18)	(0.20)	(0.18)	(0.19)
KPW F-Stat	77.18	77.18	77.18	77.18
AR p-value	0.03	0.00	0.00	0.00
Elasticity	1.53	1.21	1.16	1.11
Observations	849	849	849	849
Controls	Yes	Yes	Yes	Yes

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.10$. Panels A and B give standardised IV coefficients with robust standard errors in parenthesis. Outcome is IHS count of articles mentioning steam engines from the British Newspaper Archive in the indicated time period. The independent variable is IHS of slave claims. The instrument in Panel A is the region share of voyager ancestors, scaled by voyage outcome (inverse middle-passage mortality). The instrument in Panel B is the region share of voyager surname matches, again scaled by voyage outcome (inverse middle-passage mortality). Standard controls are included in all regressions.

In Figure B.3a in Online Appendix B.1, we illustrate the geography of steam engine adoption, by showing the count of articles mentioning steam engines between 1792 and 1830. In Figure B.3b in Online Appendix B.1, we display binscatter plots of steam engine adoption in different time periods against slaveholding in 1833. In the period before 1792, there is hardly any relationship existent, which is consistent with James Watt's key innovations in the efficiency of the steam engine taking place from 1763-75. Starting with the period 1792-1830, we find a strong link between slavery and steam engine adoption. The effect increases over time – and the slave-owning areas' edge grows in magnitude after 1830.

Table 3 reports corresponding instrumental variables specifications, in which we instrument slaveholding in 1833 using our family-tree and surname instruments introduced in the previous section. Corresponding OLS estimates are shown in Appendix Table B.1. Again we find little evidence of a relationship before 1792 and a substantial strengthening of the relationship over time. Both instruments lead to similar results: for the ancestor (surname) instrument a 1 standard deviation increase in compensation claims implies a 0.28 (0.37) standard deviation increase in newspaper articles mentioning steam engines before 1792 and this number increases to 1.76 (0.74) standard deviations 1792-1830; 1.43 (0.88) standard deviations between 1830-50; and 1.28 (1.07) standard deviations after 1850.[31]

7.3 Robustness Tests

This section summarizes a number of robustness tests, focusing on the family-tree instrument (see Appendix B.4 for a detailed discussion).

We first assess the presence of spatial auto-correlation (SAC), using Moran's I. SAC becomes insignificantly different from zero at around 500km for the majority of our regressions, and for all within 750km. To ensure that the presence of SAC below these distances is not unduly biasing our standard errors, we calculate Conley Spatial HAC standard errors (Conley 1999) which correct for cluster correlation in spatial settings. Even at a bandwidth distance of 750 km, our main results remain statistically significant at conventional levels.

Second, we choose a different procedure to assign parish-level observations to hexagons. Our preferred approach assigns parishes to a hexagon if their centroid falls inside. The benefit of not employing area weights to map values into polygons is that we do not mechanically introduce spatial auto-correlation. On the downside, we may assign large rural parishes to a neighboring hexagon even though the majority of its area does not lie within it. To rule out that our results depend on the specific choice how we map parish information to hexagons, we rerun our results using area weights. Our results remain unchanged. In a similar vain, we experiment with hexagons of different size. Our preferred hexagons span an area of around 9km from the center to vertex, which represents a plausible commuting distance at a time when walking was the dominant transport mode. In Table B.13, we present specifications where we consider parishes, the smallest political unit; registration districts; and grid of squares with side length 0.2°, or roughly 20km. We find a similar quantitative and qualitative pattern of results across each of these alternative choices of spatial units.

Third, we report a robustness test, in which we use the number of slave voyages as an alternative measure of voyage outcomes. The logic is similar to our baseline specification.

[31] In Table B.2 in Online Appendix B.2, we show that the same pattern holds if we examine the extensive margin of steam engine adoption.

Slave voyagers who experienced a lower middle-passage mortality are more likely to engage in more than one voyage. Therefore, higher values of the voyage-frequency instrument imply better slave-voyage outcomes and thus a higher probability to remain engaged in the slave trade. Again we find a similar pattern of results as in our baseline specification.

In a last set of checks, we assess how much our results depend on the three major slave ports, i.e. Bristol, Liverpool and London. Specifically, we exclude any region located within 30km of these slave ports and find that the magnitude and significance of the coefficients again remain largely the same. Overall, we conclude that our findings are not driven by the major slave ports alone, consistent with Figure 8, which shows that compliers with the slavery instrument are found across England and Wales.

7.4 Quantitative Analysis of the Model

Our empirical findings so far have provided evidence of causal effects of slaveholding on local economic activity. We now use our theoretical model to assess the aggregate and distributional consequences of access to slavery investments.

We assume standard values for the model's parameters (Online Appendix D). We set the share of land in agricultural costs as $\alpha^A = 0.31$, based on the share of land and buildings in farm income in Feinstein (1972). Given this parameter, we set the share of capital in manufacturing costs as $\alpha^M = 0.36$, which ensures that the model is consistent with both the 20% share of agriculture in national income in 1851 in Deane and Cole (1967), and the 65% share of labor in national income in 1850 in Crafts (2022). We assume a migration elasticity of $1/\kappa = 2$, as a central value in the range of estimates in Bryan and Morten (2019) and Galle et al. (2020). We assume an elasticity of substitution between domestic and slavery investments of $\theta = 4$, towards the high end of the estimates in Koijen and Yogo (2020). In Online Appendix E, we demonstrate the robustness of our quantitative conclusions to the assumption of alternative values for these parameters.

We quantify the model using our rateable values and employment data.[32] Our rateable values data measure flow rental values from domestic capital and land. In contrast, slavery compensation was rationalized as a one-off payment for the net present value of the labor of enslaved persons. To convert this net present value into the corresponding flow value, we assume a rate of return of 10 percent, which reflects the high rates of mortality among enslaved persons and the risk associated with slavery investments (including the risk of slave rebellion). Additionally, compensation values for enslaved persons were set at 40 percent of market values, in part because of the implicit compensation through the "apprenticeship" system. Therefore, we multiply the flow compensation values by 2.5 to obtain flow market values.

[32]See Online Appendix C.13-C.14 for further details on the quantification of the model.

Finally, the total value of slavery plantations (including land and buildings) was typically 3 times the value of enslaved persons, according to the accounting studies in Sheridan (1965), Ward (1978), and Rosenthal (2018). Therefore, we multiply the flow market values of enslaved persons by 3 to obtain the flow market value of slavery investments. For the aggregate economy as a whole, the resulting flow income from these slavery investments equals 3.63 percent of the flow income from all capital and land (including slavery capital, domestic capital and land), which is in line with the estimates in Pebrer (1833).[33]

Our counterfactuals start at the observed equilibrium in the data in 1833 and evaluate the impact of a prohibitive increase in colonial financial frictions ($\phi_{n\mathbb{N}} \rightarrow \infty$ for all n). We hold goods price constant to focus purely on the impact of access to slavery investments through capital accumulation. For ease of interpretation, we report the changes in variables from the counterfactual equilibrium to the observed equilibrium in the data, such that the results correspond to the impact of improved access to slavery investments. We denote the counterfactual equilibrium value of variables with a prime, the observed equilibrium values with no prime, and the relative changes between the two equilibria with a hat (such that $\hat{x}_n = x_n'/x_n$). We assume that the observed equilibrium in the data on 1833 is close to the steady-state in the absence of any further changes in the exogenous variables, and we report counterfactuals for the steady-state impact of the changes in colonial financial frictions.[34]

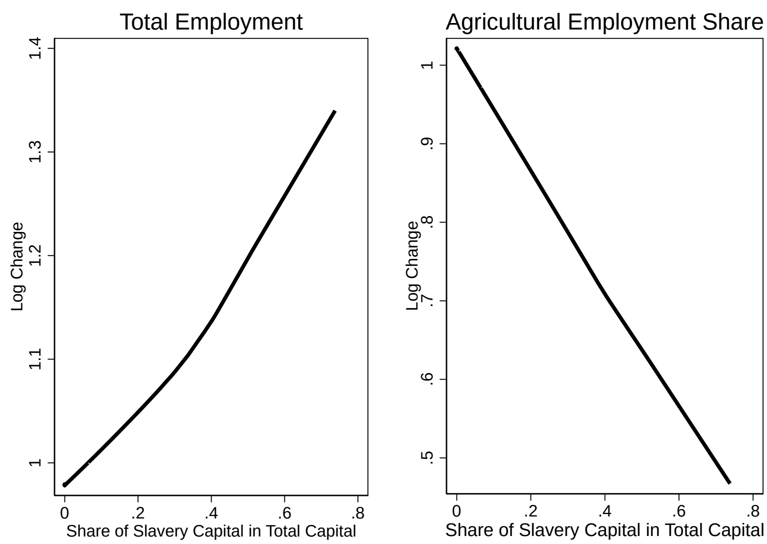
We begin by quantifying the impact of slavery investments on the spatial distribution of economic activity. In the left panel of Figure 10, we display locally-weighted linear least squares regressions across locations of log changes in total employment ($\ln(\ell_n^*/\ell_n^{*\prime})$) on the observed share of slavery capital in total capital in 1833 ($\xi_{n\mathbb{N}}^* = K_{n\mathbb{N}}^*/(K_{n\mathbb{N}}^* + K_{nn}^*)$), where recall $\xi_{n\mathbb{N}} + \xi_{nn} = 1$. Consistent with our analytical results in Proposition 1 and our causal estimates in the previous subsection, we find that greater access to slavery investments increases a location's total employment: The log relative changes in total employment are substantial, ranging from 0.98 (a 2 percent decline) to 1.43 (a 43 percent increase).

In the right panel of Figure 10, we show analogous locally-weighted linear least squares regressions for log changes in agricultural employment shares ($\left(\ell_n^{A*}/\ell_n^*\right) / \left(\ell_n^{A*\prime}/\ell_n^{*\prime}\right)$). Again in line with our earlier theoretical and empirical results, we find that greater access to slavery investments induces greater structural transformation away from agriculture. The magnitudes are substantial: The log change in agricultural employment shares ranges from 1.02 (a 2 percent increase) for those locations with no slavery investments to 0.47 (a 47 percent decline) for those locations with the greatest participation in slavery investments.

[33] According to Pebrer (1833), the value of all capital and land in the West Indies was 3.44 percent of the value of all capital and land in both the United Kingdom and the West Indies in 1833.

[34] To the extent that the full steady-state impact of British participation in slavery had not been realized by the 1830s, our estimates underestimate this full steady-state impact, and hence are likely conservative.

Figure 10: Counterfactual Changes in Total Employment and Agricultural Employment Shares from Access to Slavery Investments



Note: Vertical axis in left panel shows log changes in total employment across locations; vertical axis in right panel shows log changes in agricultural employment shares across locations; horizontal axis in both panels displays the share of slavery investments in total investments in the 1830s; both panels show locally-weighted linear least square regressions of the changes from the counterfactual equilibrium (without slavery investments and $\xi_{nn}^{*\prime} = 1$ for all n) to the observed equilibrium in the 1830s (with slavery investments and $0 < \xi_{nn}^{*} < 1$ for some n).

We next turn to the aggregate and distributional consequences of access to slavery investments. In the first column of Table 4, we report percentage changes in aggregate income, capitalist income, landlord income and worker welfare from the counterfactual equilibrium with prohibitive colonial financial frictions ($\phi_{n\mathbb{N}t} \to \infty$) to the observed equilibrium in 1833. We find an increase in the aggregate income of all factors of production (capital, labor and land) of 3.54 percent. This increase in aggregate income is sizeable relative to conventional estimates of the welfare gains from international trade (an upper bound of 9 percent for 19th-century Japan in Bernhofen and Brown 2005), particularly as this counterfactual focuses solely on the mechanism of capital accumulation, holding goods price constant. During the period 1800-30, British GDP per capita was growing at 0.3% per annum according to Crafts (2022). Therefore, slavery investments increased aggregate income by the equivalent of more than a decade of growth. We find that this change in aggregate income involves substantial changes in the distribution of income across factors of production, with capitalist income rising by 11 percent, and landlord income declining by just under 1 percent. The change in worker welfare is the population-weighted average of the change in the real wage in each location and equals 3.06 percent, implying substantial welfare gains for domestic free workers from the enslavement and exploitation of black Africans in colonial plantations.

In the second to fourth columns of Table 4, we show that these aggregate changes mask

Table 4: Aggregate and Distributional Consequences of Access to Slavery Investments

Variable	Aggregate	<p50	≥p50<p75	≥p75
Population Share 1833	100	68.27	8.68	23.04
Population change	—	-1.97	-0.33	6.47
Aggregate Income change	3.54	-1.58	4.88	40.68
Capitalist Income change	11.11	-2.55	15.52	104.14
Landlord Income change	-0.87	-0.08	-1.96	-7.18
Worker Welfare change	3.06	3.06	3.06	3.06

Note: Slavery income share is the share of the flow income from slavery capital in the flow income from all capital and land; Changes are from the counterfactual equilibrium with prohibitive colonial financial frictions ($\phi_{n\mathbb{N}t} \rightarrow \infty$) to the observed equilibrium in 1833; Population change is the percent change in population; Aggregate income change is the percent change in the aggregate income of all factors of production; Capital income change is the percent change in capitalist income from slavery and domestic investments; Landlord income change is the percent change in landlord income; Worker welfare is the expected utility of the domestic workers, as defined in equation (7); Aggregate column reports values for the aggregate economy; <p50 column reports aggregate values for locations with slavery investment shares ($\xi_{n\mathbb{N}}$) less than the median across those locations with positive shares; ≥p50<p75 column reports aggregate values for locations with slavery investment shares ($\xi_{n\mathbb{N}}$) from the 50-75th percentiles across locations with positive shares; ≥p75 column reports aggregate values for locations with slavery investment shares ($\xi_{n\mathbb{N}}$) above the 75th percentile across locations with positive shares.

substantial distributional consequences across geographical locations, depending on their participation in slavery investments. We divide locations into three groups: those with slavery investment shares ($\xi^*_{n\mathbb{N}}$) less than the median across locations with positive values for slavery investment (68 percent of the 1833 population); locations with slavery investment shares from the 50-75th percentiles of these positive values (just under 9 percent of the 1833 population); and locations with slavery investment shares above the 75th percentile of these positive values (23 percent of the 1833 population).[35] For locations with the least participation in slavery investments, we see a decline in aggregate income of -1.58 percent, a fall of population of 1.97 percent, a drop in capitalist income of 2.55 percent, and little change in landlord income, as economic activity reallocates towards locations with greater participation in slavery investments. In contrast, for locations with the greatest participation in slavery investments, we find an increase in aggregate income of more than 40 percent, a rise in population of 6.47 percent, a growth in capitalist income of more than 100 percent, and a decline in landlord income of 7.18 percent. Since labor is mobile across locations, workers in all three groups of locations experience the same increase in welfare of 3.06 percent.

Therefore, we find sizeable aggregate effects on access to slavery investments on income and welfare and the distribution of income across factors of production. Additionally, our results highlight the uneven impact of slavery investments on the geography of the industrial revolution within Britain, consistent with our causal estimates using quasi-experimental varia-

[35]The median slavery investment share ($\xi^*_{n\mathbb{N}}$) for locations with positive slavery investment is 3.55 percent.

tion above. Locations with better access to slavery investments experience greater expansions in economic activity, structural transformation away from agriculture, and redistributions of income away from landlords and towards capitalists.

8 Conclusion

Before Europe's contact with the Americas, and its heavy involvement in the trafficking of enslaved Africans to the new colonies, the continent was an also-ran in economic terms. Growth accelerated as Atlantic trade increased (Acemoglu et al. 2005), and all the more so in the countries that played a leading role in the trans-Atlantic slave trade. A number of historians have argued that Britain accumulated great wealth from the slave trade, colonial plantations, and the wider triangular trade to which these gave rise (Williams 1944). In contrast, most quantitative assessments of this argument by economic historians have remained sceptical of this view, pointing out that the profits from the slave trade were not particularly high (Eltis and Engerman 2000).

In this paper, we argue that it was not slave-trading as much as *slave-holding* that contributed to Britain's Industrial Revolution. The most optimistic estimates of slave trading profits are in the range of 0.5% of GDP in the late 18th century; for slave-holding, the estimate is closer to 5% (Solow 1993). We develop a spatial general equilibrium model that formalizes the role of slavery wealth in economic development. Greater access to slavery investments raises the productivity of the investment technology, which stimulates capital accumulation and increases the steady-state capital stock. Additionally, slavery investments can readily be collateralized, alleviating financing constraints, and again stimulating domestic capital accumulation. In the presence of financial frictions, the greater capital stock is disproportionately invested locally, which in turn accelerates local economic growth and structural transformation towards capital-intensive manufacturing.

For identification, we use the effect of weather on sailing time, enslaved mortality, and survival in the slave trade. Shipping enslaved Africans to the Americas took time, and conditions on board the ships were horrific. When passages took too long, mortality increased sharply. We show that shocks to enslaved mortality affected participation in the slave trade, and in turn, the slave-holding of slave traders' descendants in 1833. Using this source of exogenous variation, we find that greater slavery wealth promoted local economic growth and led to a reallocation of economic activity away from agriculture, and towards manufacturing, the diffusion of new manufacturing technology (cotton mills), and the adoption of steam power – the key new technology of the Industrial Revolution.

We use our theoretical model to quantify the aggregate and distributional consequences of access to slavery investments. At the aggregate level, we find an increase in national income of 3.5 percent. Capitalists were the largest beneficiaries with an increase in their aggregate income of 11 percent, with landowners experiencing small aggregate income losses of just under 1 percent. Whereas previous research has largely focused on these aggregate effects, our work emphasizes the uneven impact of access to slavery investments on the geography of the industrial revolution. Locations with the greatest levels of participation in slavery investment experience increases in total income of more than 40 percent, with capitalists' income increasing by more than 100 percent, and landlords' income declining by around 7 percent. Domestic workers' welfare increases by around 3 percent from the enslavement and exploitation of black Africans in colonial plantations. In combination, our results strongly suggest that slavery wealth contributed causally to Britain's Industrial Revolution, accelerating growth and facilitating the escape from Malthusian constraints.

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Online Appendix for "Slavery and the British Industrial Revolution" (Not for Publication)

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Table of Contents

A Introduction

This online appendix contains additional supplementary material for the paper. Section B reports additional empirical results. Section C develops the theoretical model from Section 6 of the paper in further details and reports the derivation of all results including the proof of Proposition 1 in the paper. Section D discusses the calibration of the parameters of the theoretical model. Section F develops an extension of our theoretical model to incorporate investments in all locations and a gravity equation for investment flows. Section G provides further details about the data sources and definitions.

B Additional Empirical Results

In this section, we report additional empirical results and robustness tests to supplement the main results reported in the paper. In Subsection B.1, we provide additional figures for our motivating empirical results in Section 5 of the paper and our main empirical results in Section 7 of the paper. In Subsection B.2, we present additional tables for the empirical results reported in these two sections of the paper.

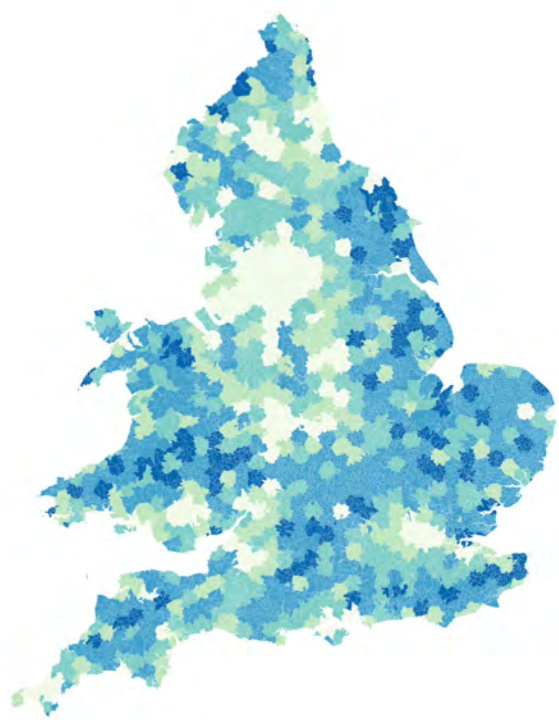
In Subsection B.3, we provide further empirical evidence in support of our causal argument linking middle-passage mortality and continued involvement in the slave trade from Section 7.1 of the paper. In Subsection B.4, we report addition robustness tests for our instrumental variables (IV) estimation in Section 7.2 of the paper. Finally, Subsection B.5, we provide empirical evidence that investments in the Legacies of British Slavery Database decline rapidly with distance and hence are concentrated locally.

B.1 Additional Figures

First, we show the spatial distribution of agricultural employment shares in 1831, as discussed in Subsection 5.1 of the paper. Second, we present the example of the Lascelles family tree, as discussed in Subsection 7.1 of the paper. Third, we provide further results on steam power adoption over time, as discussed in Subsection 7.2 of the paper.

Agricultural Employment Share 1831 In Figure 2b in Subsection 5.1 of the paper, we display the manufacturing employment share across the 849 regions in our data in 1831. By that time, the manufacturing employment share for England and Wales as a whole was 42%, and we see the emergence of industrial agglomerations in the North. However, agriculture still employs 29% of the population and there is substantial heterogeneity in agricultural specialization across regions, with agriculture still accounting for more than 60% percent of employment in some counties. In Figure B.1 we display the agricultural employment share across the 849 regions in our data in 1831. Areas with high manufacturing employment shares tend to have low agricultural employment shares, as structural transformation away from agriculture occurs. Comparing Figure B.1 with Figure 2a in the paper, agricultural employment shares and slaveholder compensation are negatively correlated.

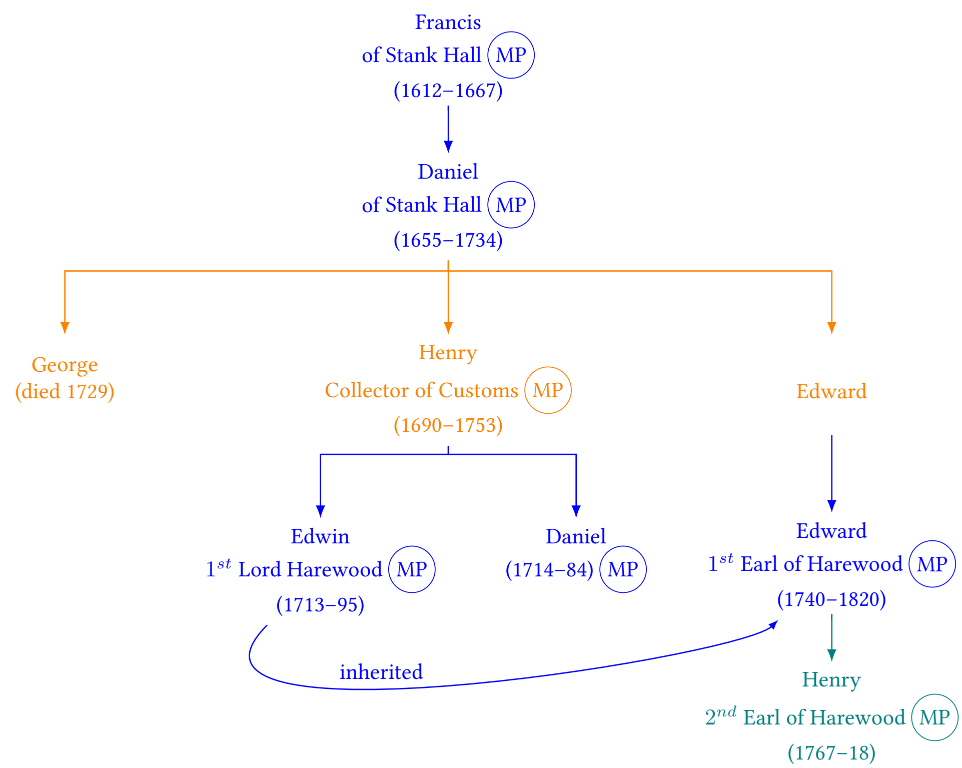
Figure B.1: Agricultural Employment Share in 1831



Note: Agriculture employment share in each region in the 1831 agriculture census; darker blue colors correspond to higher values; lighter green colors correspond to lower values.

Lascelles Family Tree Our first instrumental variable connects voyage outcomes for slave-trading ancestors to slaveholding in 1833 using family trees on Ancestry.com, as discussed in Subsection 7.1 of the paper. The idea of tracing the ancestors of slave traders provides an indirect method of linking locations all across England and Wales to the slave trade. Often, families hailing from a particular place would see one of theirs work and live in a major trading port for a few years – but the majority of the family network, including many individuals who inherit or benefit from the business advice of a relative, remained near the ancestral home. For example, the Lascelles family initially hailed from Stank Hall, in Yorkshire; three of the family's male descendants became slave traders, participating in 14 voyages between 1699 and 1736. By 1787, the Lascelles owned 27,000 acres in Barbados, Jamaica, Grenada, and Tobago. All the male lines save one eventually died out, so that only one of them - Henry, second Earl of Harewood (1767-1841) - received slavery compensation under the terms of the Abolition of Slavery Act, as shown in Figure B.2 below.

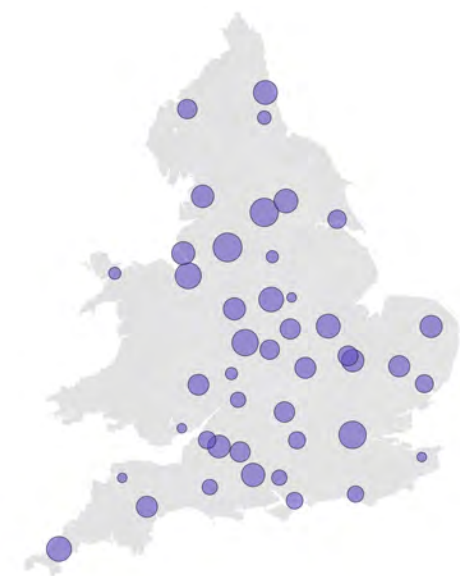
Figure B.2: Lascelles Family Tree



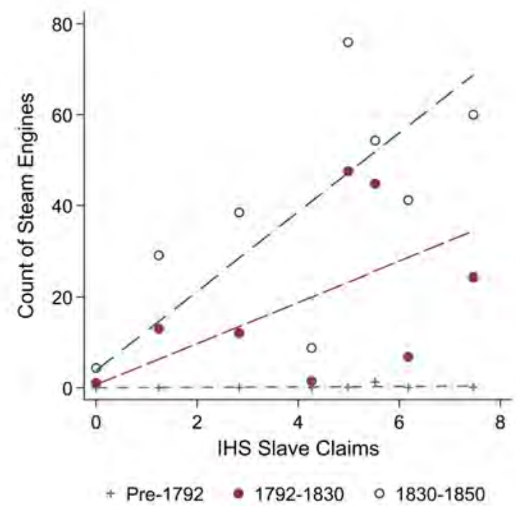
Note: Figure shows a portion of the Lascelles family tree, annotated to highlight the members of the male line who were slaveholders (blue), slave traders and holders (orange) and beneficiaries of the slave compensation act (green) . MP indicates members who were Northallerton MPs.

Steam Power Adoption In Subsection 7.2 in the paper, we present evidence on the relationship between the adoption of steam power over time and slaveholding in 1833. We collect data on steam engine diffusion from the British Newspaper Archive, using information from second-hand sales, advertisements, and job ads. In Figure B.3a, we illustrate the geography of steam engine adoption, by showing the count of articles mentioning steam engines between 1792 and 1830. In Figure B.3b, we display binscatter plots of steam engine adoption in different time periods against slaveholding in 1833. In the period before 1792, there is hardly any relationship existent, which is consistent with James Watt's key innovations in the efficiency of the steam engine taking place from 1763-75. Starting with the period 1792-1830, we find a strong link between slavery and steam engine adoption. The effect increases over time – and the slave-owning areas' edge grows in magnitude after 1830.

Figure B.3: Steam Power Adoption



(a) Geography of Steam Engine Adoption



(b) Steam Engine Adoption and Slaveholding

Note: *Left panel:* Count of articles mentioning steam engines between 1792 and 1830 (from British Newspaper Archives) in each grid cell. Circle size is proportional to the number of articles in each location. *Right panel:* Binscatter of count of articles mentioning steam engines from the British Newspaper Archives in each grid cell against the IHS of slaveholding in 1833.

B.2 Additional Tables

In this subsection of the Online Appendix, we provide additional regression evidence on the adoption of steam power over time.

Steam Power Adoption In Table 3 in Subsection 7.2 in the paper, we report instrumental variables estimation results for the relationship between the adoption of steam power over time and slaveholding in 1833. In Table B.1 below, we report the corresponding OLS estimation results. Again we find little evidence of a relationship before 1792 and a substantial strengthening of the relationship over time. In Table B.2 further below, we report an alternative specification, in which we look at the extensive margin of steam power adoption. We assign a value of one to all regions where newspapers mention steam engines and zero else and estimate a linear probability model. Again we find a comparable pattern, with little evidence of a relationship before 1792, and a substantial strengthening of the relationship over time. Overall, we interpret these findings for steam power adoption as providing support for our postulated mechanism of local capital accumulation.

Table B.1: OLS: Steam Engine Adoption and Slaveholding

	(1) Pre-1792	(2) 1792-1830	(3) 1830-1850	(4) Post-1850
Slave Claims	0.09*	0.10**	0.11**	0.07*
	(0.05)	(0.05)	(0.05)	(0.04)
Population (1780)	0.01	-0.04	-0.01	0.09*
	(0.02)	(0.03)	(0.03)	(0.05)
Latitude	0.02	0.07*	0.05	0.09**
	(0.02)	(0.04)	(0.03)	(0.03)
Longitude	-0.03**	-0.07**	-0.05**	-0.08***
	(0.01)	(0.03)	(0.03)	(0.03)
Dist Country Bank (1780)	-0.18**	-0.28***	-0.32***	-0.28***
	(0.07)	(0.09)	(0.08)	(0.06)
Cotton Mills (1788)	0.41	0.19	0.32**	0.33***
	(0.33)	(0.15)	(0.14)	(0.12)
Dist Post Town (1791)	0.01	-0.20***	-0.21***	-0.26***
	(0.04)	(0.07)	(0.06)	(0.06)
Dist Coast	0.01	0.01	-0.00	-0.02
	(0.01)	(0.02)	(0.02)	(0.02)
Property Wealth (1690)	0.03	0.10**	0.05	0.13**
	(0.02)	(0.05)	(0.05)	(0.05)
Observations	849	849	849	849
F-stat	3.29	4.54	6.13	2.84
Elasticity	0.37	0.17	0.15	0.07

Note: *** p<0.01, ** p<0.05, * p<0.10. OLS coefficients with robust standard errors in parenthesis. Outcome is IHS count of articles mentioning steam engines from the British Newspaper Archive in the indicated time period. The independent variable is IHS of slave claims. The coefficient of the main independent variable is standardised.

Table B.2: IV: Steam Engine Adoption and Slaveholding – Extensive Margin

	(1) Pre-1792	(2) 1792-1830	(3) 1830-1850	(4) Post-1850
A. VO-Scaled Ancestors	0.0334	0.267***	0.258***	0.303***
	(0.03)	(0.06)	(0.07)	(0.11)
KPW F-Stat	30.64	30.64	30.64	30.64
B. VO-Scaled Surnames	0.0477**	0.153***	0.224***	0.384***
	(0.02)	(0.04)	(0.04)	(0.07)
KPW F-Stat	77.2	77.2	77.2	77.2
AR p-value				
Observations	849	849	849	849
Regions > 0	8	44	69	210
Controls	Yes	Yes	Yes	Yes

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.10$. Panels A and B give standardised IV coefficients with robust standard errors in parenthesis. Outcome a dummy indicating a positive count of articles mentioning steam engines from the British Newspaper Archive in the indicated region x time period. The independent variable is IHS of slave claims. The instrument in Panel A is the region share of voyager ancestors, scaled by voyage outcome (inverse middle-passage mortality). The instrument in Panel B is the region share of voyager surname matches, again scaled by voyage outcome (inverse middle-passage mortality). Standard controls are included in all regressions.

B.3 Middle Passage Mortality and Involvement in the Slave Trade

In Subsection 7.1 of the paper, we provide empirical evidence on the role of middle-passage mortality in shaping voyagers' continuing involvement in the slave trade. In Table B.3 we show that – for both UK slave voyages and slave voyages of all other slave trading nations – voyage 'success' was inversely correlated with the duration of the middle passage.

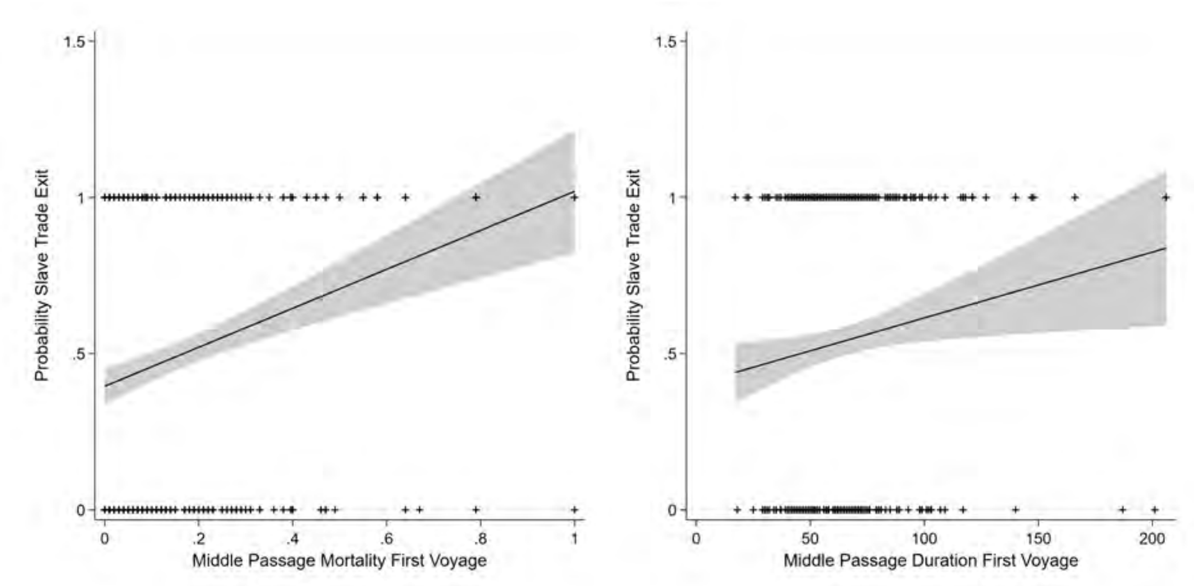
In Figure B.4, we further probe this relationship by showing linear fits of the probability that a slave trader exits after a single voyage against middle-passage mortality (left panel) and voyage duration (right panel). We use the sample of 10,495 slave voyages operating from British ports. We find strong and approximately linear relationships between the probability of exit after a single voyage and both middle-passage mortality and voyage duration.

Table B.3: Voyage Failure and Middle Passage Duration

	UK		all other	
quintile	share of failed voyages (in %)	middle passage duration (in days)	share of failed voyage voyage (in %)	middle passage duration duration (in days)
lowest	0.00	28.19	0.01	27.24
2	0.00	35.46	0.00	36.38
3	0.01	46.31	0.01	45.74
4	0.09	60.14	0.01	59.30
highest	0.11	92.85	0.04	97.98

Note: Success of voyages, by nationality of ship owners. Classification according to the Slave Voyages Database (variable FATE4). We focus on "original goal thwarted (natural causes)" as the indicator of failure.

Figure B.4: Determinants of Exit from the Slave Trade, First Voyage



Note: Horizontal axis shows middle passage mortality during the first slave voyage of a ship owner; vertical axis shows probability of exiting the slave trade after this first slave voyage; grey area represents a 95% confidence interval around the linear fit.

In Table B.4 we show the results of Cox regressions that assess the effect of middle-passage mortality on exit from the slave trade. Experiencing a high mortality during the voyage has a large, positive effect on the likelihood of exiting the slave trade. This result holds even after controlling for the tonnage of the vessel, number of enslaved persons carried and fixed effects for decade and port of departure from Africa. This pattern of results is again consistent with selection on profitability in the slave trade. Many first-time slave traders had relatively small levels of wealth. Those who were unlucky with weather conditions, and experienced high middle-passage mortality, saw their initial wealth levels fall, which could preclude further participation in the slave trade.

Table B.4: Exit from the Slave Trade and Slave Mortality

	(1)	(2)	(3)	(4)	(5)
MP Mortality	2.64***	2.77***	2.55***	3.91***	4.39***
	(5.02)	(4.94)	(3.00)	(4.71)	(4.35)
Tonnage		1.00	1.00	1.00	1.00
		(1.61)	(0.95)	(1.50)	(-0.21)
# Enslaved Embarked				1.00	1.00
				(-0.99)	(-0.11)
Decade FE	No	No	Yes	Yes	Yes
African Port FE	No	No	No	No	Yes
Observations	3,205	3,105	3,103	2,727	2,727
Cluster	Voyage	Voyage	Voyage	Voyage	Voyage

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.10$. Cox regressions - exponentiated coefficients; t statistics in parentheses. We use survival analysis where a trader operating from a British port exiting the slave trading business is coded as "failure". Standard errors are clustered at the level of the individual slave voyage. African port fixed effects controls for the port of departure on the middle passage crossing.

Taken together, this additional evidence corroborates the findings in Subsection 7.1 of the paper and further strengthens the argument that the role of mortality, driven by wind conditions, in the shaping the dynastic fortunes of slave traders was large.

B.4 Robustness of Main IV Results

In this section of the Online Appendix, we report further details for the robustness tests for our main IV specification, as discussed in Section 7.3 of the paper. First, we provide further evidence on the two components underlying our main IV instrument, i.e. familial regional ties and voyage outcomes. Second, we report additional estimation results for our baseline specification and demonstrate the robustness of our findings across different variants of this baseline specification.

Third, we assess the potential relevance of spatial autocorrelation. Fourth, we report a robustness test in which we assign parishes to our hexagonal regions using area weights instead of centroids. Fifth, we report a robustness test, in which we exclude regions close to the main slave-trading ports. Sixth, we demonstrate the robustness of our results to the use of alternative levels of spatial aggregation. Finally, we report further results for the specification check using never-takers discussed in Section 7.2 of the paper.

Table B.5: First Stages: Various Instruments on Slaveholding

	(1) Uncontrolled	(2) Controlled
A. Ancestor Share	0.252***	0.202***
	(0.04)	(0.03)
KPW F-Stat	40.64	37.35
B. Ancestor Share (mort. cells)	0.199***	0.159***
	(0.04)	(0.03)
KPW F-Stat	28.27	25.93
C. VO-Scaled Ancestors	0.207***	0.164***
	(0.03)	(0.03)
KPW F-Stat	36.20	30.64
D. VO-Scaled Surnames	0.415***	0.435***
	(0.03)	(0.05)
KPW F-Stat	144.12	77.18
Observations	849	849

Note: *** p<0.01, ** p<0.05, * p<0.10. The outcome variable is IHS(1833 claims). Robust standard errors in parenthesis. Panel A uses the grid cell share of the ancestors of 1,400 slave traders. Panel B presents the same instrument, but only counting the ancestors of the 300 slave traders with ancestors and mortality data. Panel C presents the our baseline voyage outcome instrument defined in Equation 15. Panel D presents our voyage outcome instrument using surnames from the 1851 census. Column 2 adds the control variables, i.e. population in 1780, latitude, longitude, distance to the nearest county bank or post town, the count of cotton mills in 1788, distance to the coast and our measure of property wealth in 1690. All controls except latitude and longitude are inverse hyperbolic sine transformed.

Familial Regional Ties and Voyage Outcomes Our main family-ties instrument captures two sources of variation: (i) the number of slave-trading ancestors in a location and (ii) the average slave-trade voyage outcomes (middle-passage mortality) of their descendants. We now provide evidence on the additional predictive power of incorporating information on middle-passage mortality in line with our causal argument. Table B.5 compares the performance in the first stage of four different instruments. Panel A uses the share of ancestors of slave traders located in the region. We thus exploit the locations of 10,900 voyager ancestors related to 1,400 unique voyagers. In Panel B, we restrict the pool of voyager ancestors to those linked to a voyager for whom we observe a mortality rate. This reduces our sample down to around 300 unique voyagers. In Panel C, we present our main voyage outcome instrument based on family trees, as defined in equation (15) in the paper. In comparison to Panel B, this specification holds the pool of ancestors and voyagers constant, but uses information on voyage outcomes as measured by middle-passage mortality. In line with our causal argument that high rates of mortality increased exit from trade and reduced the incidence of slaveholding in 1833, we see that the Kleibergen-Paap-Wald F-statistic noticeably improves in Panel C relative to Panel B. We take this as evidence that the causal chain we postulate in Figure Figure 5 in the paper is highly relevant to the spatial distribution of slaveholding. Panel D presents our alternative voyage outcome instrument based on surnames. We see that despite the potential for imprecision in this surnames approach, the predictive power markedly improves as we exploit a more exhaustive spatial distribution of slaving families.

Specification Variants We next report additional estimation results for our baseline specification and demonstrate the robustness of our findings across different variants of this baseline specification. Table B.6 reports the estimated coefficients on all the control variables from our baseline specification, as reported in Table 2 in the paper. Table B.7 reports a robustness test in which we exclude the control variables from our baseline specification. Table B.8 reports a further robustness test, in which we use the log transformation instead of the inverse hyperbolic sine transformation. We find that our baseline estimation results are robust across each of these different specification checks.

Table B.6: Main IV Estimates Showing Full Controls

	(1) SlaveClaims	(2) SteamEng-1830	(3) PropTax1815	(4) %Agric1831	(5) %Manuf1831	(6) CottonMill-1839
A. VO-Scaled Ancestors	0.164***					
	(0.03)					
Slave Claims		1.760***	0.523**	-0.614***	0.861***	0.774***
		(0.42)	(0.22)	(0.17)	(0.25)	(0.29)
Population (1780)	0.135***	-0.292**	0.0259	-0.114***	0.0545	0.00304
	(0.05)	(0.12)	(0.04)	(0.04)	(0.05)	(0.05)
Latitude	-0.0622*	0.138**	0.424***	-0.142***	0.103***	0.138***
	(0.03)	(0.07)	(0.03)	(0.04)	(0.04)	(0.04)
Longitude	0.00503	-0.0502	-0.152***	0.115***	-0.0464	-0.0327
	(0.03)	(0.06)	(0.02)	(0.03)	(0.03)	(0.03)
Dist Country Bank (1780)	-0.0379	-0.185	-0.0757**	0.298***	-0.262***	-0.213***
	(0.05)	(0.12)	(0.04)	(0.05)	(0.06)	(0.06)
Cotton Mills (1788)	0.0273	-0.0135	0.0784	-0.499***	0.824***	1.027***
	(0.08)	(0.17)	(0.06)	(0.08)	(0.13)	(0.11)
Dist Post Town (1791)	-0.221***	0.178	-0.00344	0.165**	-0.0311	0.110
	(0.06)	(0.15)	(0.07)	(0.07)	(0.09)	(0.09)
Dist Coast	-0.0513**	0.104*	-0.00858	0.108***	0.0859***	0.121***
	(0.03)	(0.06)	(0.02)	(0.03)	(0.03)	(0.03)
Property Wealth (1690)	0.136**	-0.176	0.987***	0.102	-0.0923	-0.0558
	(0.05)	(0.12)	(0.06)	(0.07)	(0.07)	(0.07)
N Voyagers	286	286	286	286	286	286
KPW F-Stat		30.64	30.64	30.64	30.64	30.64
AR p-value		0.00	0.02	0.00	0.00	0.01
Success-Scaled Surnames	0.435***					
	(0.05)					
Slave Claims		0.736***	0.561***	-1.360***	1.249***	0.695***
		(0.20)	(0.09)	(0.17)	(0.18)	(0.12)
Population (1780)	0.0110	-0.135**	0.0201	-0.000354	-0.00466	0.0151
	(0.03)	(0.06)	(0.03)	(0.06)	(0.05)	(0.03)
Latitude	-0.145***	0.0940**	0.426***	-0.174***	0.119**	0.135***
	(0.03)	(0.04)	(0.03)	(0.05)	(0.05)	(0.03)
Longitude	0.0170	-0.0609*	-0.152***	0.107**	-0.0423	-0.0335
	(0.03)	(0.03)	(0.02)	(0.04)	(0.04)	(0.03)
Dist Country Bank (1780)	0.0564	-0.242***	-0.0735**	0.256***	-0.240***	-0.218***
	(0.05)	(0.09)	(0.04)	(0.08)	(0.07)	(0.05)
Cotton Mills (1788)	-0.0973	0.110	0.0738	-0.409***	0.778***	1.037***
	(0.08)	(0.15)	(0.05)	(0.13)	(0.15)	(0.10)
Dist Post Town (1791)	-0.110*	-0.0561	0.00530	-0.00552	0.0576	0.0919
	(0.06)	(0.09)	(0.05)	(0.10)	(0.10)	(0.07)
Dist Coast	-0.0480*	0.0440	-0.00635	0.0641	0.108***	0.116***
	(0.02)	(0.03)	(0.02)	(0.04)	(0.04)	(0.02)
Property Wealth (1690)	-0.0185	-0.00327	0.981***	0.227**	-0.158*	-0.0425
	(0.05)	(0.05)	(0.05)	(0.09)	(0.08)	(0.05)
N Voyagers	2040	2040	2040	2040	2040	2040
KPW F-Stat		77.18	77.18	77.18	77.18	77.18
AR p-value		0.00	0.00	0.00	0.00	0.00
Observations	849	849	849	849	849	849
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. Standardised beta coefficients with robust standard errors in parenthesis. Instrument is the grid cell share of voyager ancestors, scaled by voyage outcome (Panel A) or voyager surnames scaled by voyage outcome (Panel B). All control variables except latitude and longitude are inverse hyperbolic sine transformed.

Table B.7: Main IV Estimates Without Controls

	(1) SlaveClaims	(2) SteamEng-1830	(3) PropTax1815	(4) %Agric1831	(5) %Manuf1831	(6) CottonMill-1839
A. VO-Scaled Ancestors	0.207***					
	(0.03)					
Slave Claims		1.631***	1.195***	-1.259***	1.624***	1.588***
		(0.30)	(0.26)	(0.28)	(0.47)	(0.52)
N Voyagers	286	286	286	286	286	286
KPW F-Stat		36.26	36.20	36.20	36.20	36.26
AR p-value		0.00	0.00	0.00	0.00	0.00
B. VO-Scaled Surnames	0.415***					
	(0.03)					
Slave Claims		0.824***	1.518***	-1.361***	1.564***	1.207***
		(0.17)	(0.14)	(0.13)	(0.18)	(0.15)
N Voyagers	2040	2040	2040	2040	2040	2040
KPW F-Stat		144.75	144.12	144.12	144.12	144.75
AR p-value		0.00	0.00	0.00	0.00	0.00
Observations	849	849	849	849	849	849
Controls	No	No	No	No	No	No

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.10$. Standardised beta coefficients with robust standard errors in parenthesis. Instrument is the grid cell share of voyager ancestors, scaled by voyage outcome (Panel A) or voyager surnames scaled by voyage outcome (Panel B).

Table B.8: Main IV Estimates with Log Transformations

	(1) SlaveClaims	(2) SteamEng-1830	(3) PropTax1815	(4) %Agric1831	(5) %Manuf1831	(6) CottonMill-1839
A. VO-Scaled Ancestors	0.164***					
	(0.03)					
Slave Claims		1.814***	0.521**	-0.615***	0.872***	0.780***
		(0.44)	(0.22)	(0.17)	(0.25)	(0.29)
N Voyagers	286	286	286	286	286	286
KPW F-Stat		29.86	29.86	29.86	29.86	29.86
AR p-value		0.00	0.02	0.00	0.00	0.01
B. VO-Scaled Surnames	0.437***					
	(0.05)					
Slave Claims		0.791***	0.548***	-1.336***	1.231***	0.713***
		(0.22)	(0.08)	(0.17)	(0.18)	(0.12)
N Voyagers	2040	2040	2040	2040	2040	2040
KPW F-Stat		83.25	83.25	83.25	83.25	83.25
AR p-value		0.00	0.00	0.00	0.00	0.00
Observations	849	849	849	849	849	849
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. Standardised beta coefficients with robust standard errors in parenthesis. Variables are transformed using $\log(1+x)$ instead of IHS. Instrument is the grid cell share of voyager ancestors, scaled by voyage outcome (Panel A) or voyager surnames scaled by voyage outcome (Panel B).

Spatial Auto-correlation of Regression Residuals Our baseline specification uses robust standard errors, because our 849 regions are relatively large, which helps to alleviate potential concerns about spatially correlated errors. Nonetheless, in principle, there still could be spatial autocorrelation (SAC) across these hexagons. We now provide evidence on the potential relevance of this concern using the procedure in Colella et al. (2019). To assess this, we first seek to understand the extent of SAC in the residuals of our main IV specification (as reported in Table 2). Table Table B.9 reports Moran's I statistics (the spatial analogue to the Durbin—Watson d statistic), measuring SAC at a range of different distance bandwidths. The interpretation of the Moran's I statistics displayed in the Table B.9 is the following. We are testing the null hypothesis that the data is randomly disbursed. A rejection of this null hypothesis implies that the data are more spatially clustered than one would expect under a random distribution. Moran's I lies in the interval $[-1, 1]$ with positive (negative) values indicating positive (negative) spatial auto-correlation. We find some evidence of positive spatial auto-correlation up to about 200 km and after that we observe a negative values. After 400 km, this mostly peters out. Across all the distances reported in Table B.9, the values of Moran's I are small in magnitude and close to zero.

Table B.9: Moran's I

Bandwidth	SteamEng-1830	PropTax1815	%Agric1831	%Manuf1831	CottonMill-1839
50km	.054***	.194***	.063***	.082***	.082***
100km	.020***	.059***	-.00	.021***	.017***
150km	.014***	.013***	.002	.014***	-.00
200km	.004***	.012***	-.00*	.003**	-.00
250km	-.00	.006***	-.00***	-.00	-.00
300km	-.00**	0	-.00	-.00***	0
400km	-.00***	-.00***	0**	-.00*	-.00**
500km	-.00	-.00***	-.00	-.00	-.00
600km	-.00	-.00***	-.00	-.00	-.00
700km	-.00	-.00	-.00	-.00	-.00
750km	-.00	-.00	-.00	-.00	-.00

Table B.10: Main Voyage Outcome IV Estimates with Conley Standard Errors

	(1) SteamEng-1830	(2) PropTax1815	(3) %Agric1831	(4) %Manuf1831	(5) CottonMill-1839
50km	1.760***	0.523**	-0.614***	0.861***	0.774***
	(0.361)	(0.205)	(0.170)	(0.277)	(0.276)
250km	1.760***	0.523***	-0.614***	0.861***	0.774***
	(0.275)	(0.167)	(0.125)	(0.195)	(0.163)
500km	1.760***	0.523***	-0.614***	0.861***	0.774***
	(0.207)	(0.136)	(0.105)	(0.152)	(0.105)
750km	1.760***	0.523***	-0.614***	0.861***	0.774***
	(0.167)	(0.110)	(0.084)	(0.124)	(0.085)
Observations	849	849	849	849	849

Note: *** p<0.01, ** p<0.05, * p<0.10. Standardised beta coefficients with Conley standard errors in parenthesis. Instrument is voyage-outcome-scaled ancestor share. We vary the bandwidth of the estimator from 50 to 300km. Kernel is Bartlett throughout.

To ensure that the presence of SAC within these bandwidths is not unduly biasing our standard errors, we apply the procedure described in Colella et al. (2019) that computes standard errors corrected for cluster correlation in spatial settings. Table B.10 presents these standard errors for the main IV results. At the bandwidth distance of even 750km, we are reassured to find that our main results remain statistically significant at conventional levels.

Area weighting In our baseline specification, we assign parishes to hexagons based on their parish centroids, as discussed further in Section G.2 of this data appendix. The main alternative approach is to use area weights to redistribute parish data across all hexagons that intersect the boundary of the parish, in proportion to the share of the parish area that each intersection represents. We use centroids assignment as our baseline specification to avoid introducing the spatial autocorrelation between neighboring units that apportioning the data with weights necessitates. To show that our results are not sensitive to the choice of one mapping procedure over the other, we present a comparison of the estimates for the share of agriculture and manufacturing in 1831. We would expect these shares to be most sensitive to the assignment choice and it is reassuring to see in Table B.11 that using area weights rather centroid assignment has close to no effect on our results. We also confirmed in unreported regressions that switching to area weights does not materially affect any of our other specifications.

Table B.11: Voyage Outcome IV: Data Generation using Area Weights

	Centroid Mapping		Area Weights	
	%Agric1831	%Manu1831	%Agric1831	%Manu1831
Slave Claims	-0.61***	0.86***	-0.64***	0.85***
	(0.17)	(0.25)	(0.17)	(0.24)
Observations	849	849	849	849
Controls	Yes	Yes	Yes	Yes
N Voyagers	286	286	286	286
KPW F-stat	30.64	30.64	30.64	30.64
AR p-value	0.00	0.00	0.00	0.00

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.10$. Standardised coefficients with robust standard errors in parenthesis. Instrument is the grid cell share of voyager ancestors, scaled by voyage outcome. Outcomes from the 1831 parish census are constructed in two ways. Centroid mapping, our preferred specification, assigns parish data to the grid cell that contains the parish centroid. The first two columns thus repeat the results from Table 2. Area weights distribute data by intersecting parish polygons with our hexagon grid and proportionally assigning values using area weights.

Exclusion of Major Slave-Trading Ports Given the geographic concentration of slave-holding around the three major slave-trading ports of Bristol, Liverpool and London in Figure 2a in the paper, it is reasonable to explore the extent to which our results are driven by these locations. In each panel of Table B.12, we exclude from the estimation sample any regions located within 30km of the noted slave-trading port. We find that the magnitude and significance of the coefficients are relatively stable across each of these specifications. Coefficients also remain in line with our baseline estimation results for the full sample, and even tend to get slightly further from zero when dropping Liverpool. Bristol, the smallest of the three major ports, has indeed the smallest impact on the results. When excluding either London or Liverpool, the significance of the first stage remains above conventional levels. We conclude that our findings are not driven by the major slave-trading ports alone - compliers with the slavery treatment can be found across England and Wales.

Table B.12: Main Voyage Outcome IV Estimates with Slave Port Exclusions

	(1) SteamEng-1830	(2) PropTax1815	(3) %Agric1831	(4) %Manuf1831	(5) CottonMill-1839
Excl. Liverpool	1.93***	0.80***	-0.76***	1.01**	1.25***
	(0.67)	(0.28)	(0.25)	(0.45)	(0.39)
Observations	837	837	837	837	837
KPW F-stat	10.5	10.5	10.5	10.5	10.5
Anderson-Rubin	0.01	0.00	0.00	0.00	0.00
Excl. Bristol	1.75***	0.51**	-0.62***	0.86***	0.78***
	(0.41)	(0.22)	(0.17)	(0.25)	(0.29)
Observations	837	837	837	837	837
KPW F-stat	31.5	31.5	31.5	31.5	31.5
Anderson-Rubin	0.00	0.02	0.00	0.00	0.01
Excl. London	1.61***	0.33	-0.52**	1.13***	0.77*
	(0.47)	(0.20)	(0.22)	(0.44)	(0.45)
Observations	837	837	837	837	837
KPW F-stat	14.8	14.8	14.8	14.8	14.8
Anderson-Rubin	0.00	0.02	0.01	0.00	0.03

Note: *** p<0.01, ** p<0.05, * p<0.10. Standardised beta coefficients with robust standard errors in parenthesis. Instrument is voyage-outcome-scaled ancestor share. We drop grid cells within 30km of the three largest British slave trading ports - Liverpool, Bristol and London - from the estimation sample.

Effect of Spatial Aggregation on Results Our main specification uses spatial units that are regular hexagons of area 200 square kilometres covering England and Wales (see Subsection G.2 of this Online Appendix). It is reasonable to compare the performance of our main IV across alternative choices of spatial units. We show these results in Table B.13. First, using parishes, the smallest unit of local government in England and Wales, we see that our main findings hold. Second, using registration districts, we maintain a compelling first stage, but lose some coefficient significance in the second stage. It is plausible to expect results using this spatial unit to be less strong, since registration districts were not created until the Births and Deaths Registration Act (1836), and hence arguably were not cohesive political and economic units before that time. Finally, we construct a tessellation of England and Wales into a grid of squares with side length 0.2°, or roughly 20km. Here, the performance of the main IV is again highly comparable to that in our baseline specification with hexagonal spatial units.

Table B.13: Main Voyage-Outcome IV Estimates with Various Spatial Units

	(1) SteamEng-1830	(2) PropTax1815	(3) %Agric1831	(4) %Manuf1831	(5) CottonMill-1839
Parishes	1.11*	0.38***	-0.53**	0.53**	0.86***
	(0.63)	(0.09)	(0.22)	(0.26)	(0.28)
Observations	12,655	12,655	12,099	12,099	12,655
KPW F-stat	47.5	47.5	46.8	46.8	47.5
RD	0.66*	0.28*	-0.13	0.41	0.40*
	(0.38)	(0.16)	(0.20)	(0.30)	(0.22)
Observations	624	624	623	623	624
KPW F-stat	31.4	31.4	31.6	31.6	31.4
0.2° grids	0.85*	0.29*	-0.65***	0.83***	0.89***
	(0.47)	(0.17)	(0.20)	(0.19)	(0.25)
Observations	567	567	567	567	567
KPW F-stat	46.7	46.7	46.7	46.7	46.7

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.10$. Standardised beta coefficients with robust standard errors in parenthesis. Instrument is voyage-outcome-scaled ancestor share, as shown in Table 2. Each panel aggregates the data in a different spatial unit. Parishes takes the 1851 definition of English and Welsh parishes from Kain and Oliver (2018). RD are registration districts, a political unit consisting of, on average, 20 parishes. The last panel uses a square tessellation of England and Wales with side length of 0.2°.

Voyage-Frequency Scaled Instruments Information on slave-voyage mortality rates only available for a subset of voyages. Therefore, we consider a second measure of voyage outcomes, the number of shipping ventures that slave traders were involved in, to scale the ancestor and surname instruments. The logic underlying this voyage-frequency measure is similar to our baseline voyage-outcome measure. Slave voyagers who experienced a lower middle-passage mortality are more likely to engage in more than one voyage. Therefore, higher values of the voyage-frequency instrument imply better slave-voyage outcomes and thus a higher probability to remain engaged in the slave trade.

In Table B.14, we report the results of estimations where we repeat our main IV-estimation using voyage-frequency scaled ancestor and surname instruments. We find a similar pattern of results using these alternative instruments.

Table B.14: Voyage IV Estimates

	(1) SlaveClaims	(2) SteamEng-1830	(3) PropTax1815	(4) %Agric1831	(5) %Manuf1831	(6) CottonMill-1839
A. V-Scaled Ancestors	0.127***					
	(0.03)					
Slave Claims		1.783***	0.493*	-0.614***	1.077***	0.753*
		(0.38)	(0.26)	(0.21)	(0.41)	(0.42)
N Voyagers	286	286	286	286	286	286
KPW F-Stat		19.30	19.30	19.30	19.30	19.30
AR p-value		0.00	0.08	0.01	0.00	0.09
B. V-Scaled Surnames	0.390***					
	(0.06)					
Slave Claims		0.696***	0.604***	-1.393***	1.335***	0.726***
		(0.20)	(0.10)	(0.19)	(0.20)	(0.12)
N Voyagers	2040	2040	2040	2040	2040	2040
KPW F-Stat		49.69	49.69	49.69	49.69	49.69
AR p-value		0.00	0.00	0.00	0.00	0.00
Observations	849	849	849	849	849	849
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. Standardised beta coefficients with robust standard errors in parenthesis. Instrument is the grid cell share of voyager ancestors, scaled by voyage numbers (Panel A) or voyager surnames scaled by voyage numbers (Panel B).

Never-takers In Section 7.2 of the paper, we report plausibility check for our IV-strategy in the spirit of Bound and Jaeger (2000) and D'Haultfœuille et al. (2022) that looks at never-takers–regions where ancestors of slave traders lived, but where we find no descendants making claims for slavery compensation in 1833. If our argument is correct, regions that merely had exposure to the slave trade–without slave-holding later– should **not** show any statistically significant differences in economic performance. As a specification check, we therefore estimate reduced-form regressions of our economic outcomes on our instruments for the sample of regions with no slaveholding in 1833. In Figure 9 in the paper, we plot the estimated coefficients on our instruments and the 95 percent confidence intervals. Table B.15 below reports the full estimation results using our family-tree voyage outcome instrument. Table B.16 below reports the full estimation results using our surname voyage outcome instrument. We find much larger standardized coefficients in our baseline IV specifications in the paper than in these never-takers specifications, where we mostly find precisely estimated zeros. Taken together, these empirical results provide strong support for the mechanism in our model, where familial connections to the slave trade affect local economic development through slaveholding and slavery wealth. In locations where we observe no slaveholding and no slavery wealth in 1833, we find little relationship between familial connections to the slave trade and local economic development.

Table B.15: Never-takers Analysis of Voyage Outcome Instrument using Ancestors

	(1) SteamEng-1830	(2) PropTax1815	(3) %Agric1831	(4) %Manuf1831	(5) CottonMill-1839
Success-Scaled Ancestors	0.06	0.10***	-0.08	0.22**	0.17**
	(0.06)	(0.03)	(0.08)	(0.08)	(0.07)
Population (1780)	-0.01	0.05	-0.14***	0.15***	0.04
	(0.02)	(0.04)	(0.03)	(0.04)	(0.02)
Latitude	-0.03	0.42***	-0.16***	0.05	0.07***
	(0.02)	(0.03)	(0.04)	(0.03)	(0.02)
Longitude	-0.01	-0.16***	0.14***	-0.04*	-0.02
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Dist Country Bank (1780)	-0.05	-0.17***	0.35***	-0.27***	-0.22***
	(0.06)	(0.04)	(0.06)	(0.06)	(0.05)
Cotton Mills (1788)	-0.03	0.01	-0.55***	0.88***	1.02***
	(0.05)	(0.06)	(0.10)	(0.14)	(0.13)
Dist Post Town (1791)	-0.10**	-0.17***	0.33***	-0.24***	-0.04
	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
Dist Coast	0.04**	-0.02	0.10***	0.06***	0.06***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Property Wealth (1690)	0.02	1.04***	0.07	-0.01	0.04
	(0.02)	(0.05)	(0.08)	(0.06)	(0.04)
N	567	567	567	567	567
F-stat	1.4	136.9	25.4	23.8	26.5

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.10$. Standardised beta coefficients with robust standard errors in parenthesis. Reduced-form regression of economic outcomes on our voyage outcome instrument based on family trees, only in grid cells where there is no slaveholding.

Table B.16: Never-takers Analysis of Voyage Outcome Instrument using Surnames

	(1) SteamEng-1830	(2) PropTax1815	(3) %Agric1831	(4) %Manuf1831	(5) CottonMill-1839
Success-Scaled Surnames	0.11**	0.19***	-0.57***	0.62***	0.25***
	(0.05)	(0.04)	(0.07)	(0.06)	(0.06)
Population (1780)	-0.03	0.01	-0.02	0.03	-0.01
	(0.02)	(0.03)	(0.04)	(0.03)	(0.02)
Latitude	-0.05**	0.39***	-0.05	-0.07**	0.02
	(0.02)	(0.03)	(0.04)	(0.03)	(0.03)
Longitude	-0.01	-0.16***	0.12***	-0.03	-0.02
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Dist Country Bank (1780)	-0.03	-0.14***	0.21***	-0.14***	-0.17***
	(0.06)	(0.04)	(0.07)	(0.05)	(0.05)
Cotton Mills (1788)	-0.05	-0.03	-0.30***	0.69***	1.00***
	(0.08)	(0.05)	(0.08)	(0.11)	(0.11)
Dist Post Town (1791)	-0.07	-0.12***	0.17***	-0.07	0.03
	(0.05)	(0.05)	(0.07)	(0.05)	(0.06)
Dist Coast	0.04**	-0.03	0.12***	0.05**	0.05***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Property Wealth (1690)	-0.01	0.99***	0.24***	-0.20***	-0.04
	(0.02)	(0.05)	(0.07)	(0.06)	(0.04)
N	567	567	567	567	567
F-stat	1.4	144.3	33.8	39.1	27.9

Note: *** p<0.01, ** p<0.05, * p<0.10. Standardised beta coefficients with robust standard errors in parenthesis. Reduced-form regression of economic outcomes on our voyage outcome instrument based on surnames, only in grid cells where there is no slaveholding.

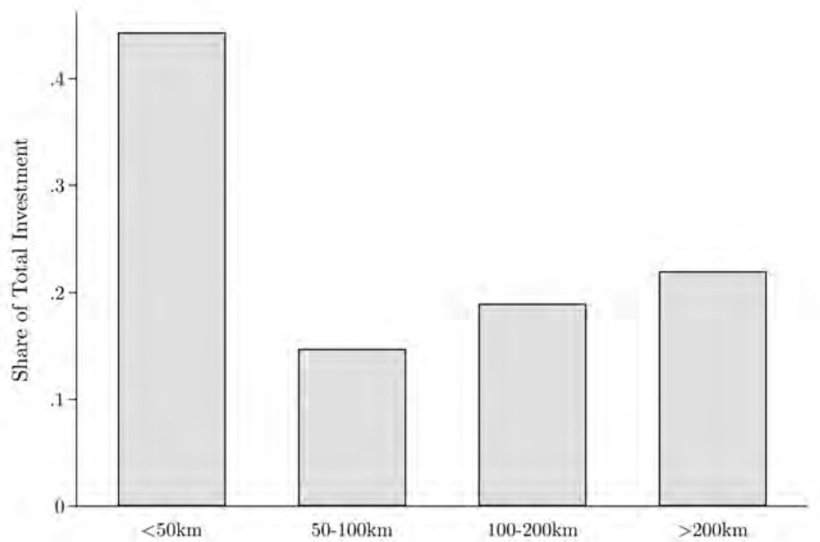
B.5 Evidence on Local Investments

In this section of the Online Appendix, we provide empirical evidence in support of our assumption in the model that investment disproportionately occurs locally. We use data on railway investments by individual slaveholders from the UCL Legacies of Slavery database (436 investments). We measure the distance between a slaveholder's residential address in England and Wales and a railway in which they invested.

We construct these distances as follows. First, we compute the latitude and longitude of the slaveholder's residential address. Second, we compute the latitude and longitude of the railway's terminus. Third, we compute the latitude and longitude of stations in major cities along the railway's route. Fourth, we calculate the minimum of the straight-line (Euclidean) distances from the slaveholder's address to the railway's terminus and major cities. Note that at the time at which most of these investments were made, railway companies were frequently local (e.g., London and Greenwich railway opened in 1836) before the gradual process of mergers that ultimately led to the formation of the main British railway groupings (e.g., Southern Railway formed in 1923).

In Figure B.5, we display the share of the total value of investment across distance grids ranging from 0-50, 50-100, 100-200 and >200 km. Consistent with our assumption that most investment occurs locally, we find that more than one half of all investment takes place within 100km. Although for brevity, we focus on the share of investment value, we find a similar pattern of results for share of the number of investments.

Figure B.5: Gravity of Slaveholder Railway Investments



Note: We measure the distance between a slaveholder's residential address and a railway in which they invested ($N = 436$). Railway investments are from UCL Legacies of Slavery, see https://www.ucl.ac.uk/lbs/commercial/. Railways are located by their terminus cities and/or major stations along the route. The investment values (£) are divided into four distance bins.

C Theoretical Appendix

In this section of the Online Appendix, we provide further details on the theoretical model that we use to guide our empirical analysis. We develop a simple model of economic development and structural transformation between agriculture and manufacturing, which incorporates a role for slavery wealth in influencing domestic industrial development. We consider a dynamic specific-factors model, which features endogenous capital accumulation. Slavery and domestic investments are assumed to be imperfect substitutes for one another. Each type of investment is subject to financial frictions, such that domestic investments disproportionately occur locally.

Slavery wealth affects domestic manufacturing activity through three main channels. First, for a given capital stock, greater access to slavery investments reduces local investments in domestic manufacturing through a conventional substitution effect, which leads to a contraction of the capital-intensive local manufacturing sector. Second, greater access to slavery investments raises the rate of return to capital, which stimulates capital accumulation and increases the capital stock, and hence leads to an expansion of the capital-intensive local manufacturing sector. Third, slavery investments are more collateralizeable than other investments, which alleviates collateral constraints, and again stimulates capital accumulation. We show that the net effect of these three forces is that locations with greater access to slavery investments have a greater rate of capital accumulation along the transition path to steady-state, a higher steady-state capital stock, and higher steady-state employment in the local manufacturing sector.

C.1 Model Setup

We consider a set of small open economies: many domestic locations indexed by $i, n \in \{1, \ldots, N\}$ and a colonial plantation $\mathbb{N}$. Time is discrete and indexed by t.

There are four types of agents: workers, capitalists, landlords and enslaved persons. Workers, capitalists and landlords are located in the domestic economy. The enslaved work in the colonial plantation. There are three goods: agriculture and manufacturing (produced in the domestic economy) and plantation products (produced in the colony). Agriculture is produced with labor and land. Manufacturing is produced with labor and capital. Workers are mobile between the two domestic sectors. But land and capital are specific factors that can only be used in agriculture and manufacturing respectively. Plantation products are produced with enslaved persons and capital.[1]

Workers are endowed with one unit of labor that is supplied inelastically. They are geographically mobile across locations within the domestic economy, but geographically immobile between the domestic economy and the colonial plantation. Landlords in each domestic location are geographically immobile and own local land (m_n).

Capitalists are geographically immobile and own local capital (k_{nt}). Each period, they make a capital allocation decision of how much of the existing stock of capital to allocate to local manufacturing and to plantation production in the colony. Capitalists make a forward-looking consumption-saving decisions. They can either invest their assets (a_{nt}) either in capital (k_{nt})

[1] For simplicity, we abstract from land use in plantation products and capital use in agriculture, although both can be introduced. What matters is that plantation products and domestic manufacturing both use capital, and domestic manufacturing is more capital-intensive than domestic agriculture.

or a consumption bond that pays a constant rate of return ρ. If they invest in capital, they face collateral constraints, such that they can only invest a multiple of their current assets: $k_{nt} \leq \lambda_n a_{nt}$. If they decide to invest their assets in capital, they also observe idiosyncratic productivity draws for the number of effective units of capital for use in domestic manufacturing and the colonial plantation. These idiosyncratic productivity draws give rise to Keynesian marginal efficiency of capital schedules for domestic manufacturing and the colonial plantation. Capitalists face financial frictions, such that $\phi_{nit} \geq 1$ units of capital must be invested from location n in order for one unit to be available for production in location $i \in \{n, \mathbb{N}\}$.[2]

C.2 Preferences

The flow of utility for worker ϑ in location n at time t ($u_{nt}(\vartheta)$) depends on a consumption index (c_{nt}), amenities that are common across workers (B_{nt}), and an idiosyncratic amenity draw ($b_{nt}(\vartheta)$) that is specific to individual workers and captures all the idiosyncratic reasons why an individual worker can choose to locate in a particular region:

$$u_{nt}(\vartheta) = \ln B_{nt} + \ln c_{nt} + \kappa b_{nt}(\vartheta), \tag{C.1}$$

where the parameter κ regulates the heterogeneity in idiosyncratic amenities. The consumption index (c_{nt}) is defined over consumption of the output of the agricultural, manufacturing and plantation sectors and is assumed to take the constant elasticity of substitution (CES) form:

$$c_{nt} = \left[\left(\beta_t^A c_{nt}^A\right)^{\frac{\sigma-1}{\sigma}} + \left(\beta_t^M c_{nt}^M\right)^{\frac{\sigma-1}{\sigma}} + \left(\beta_t^S c_{nt}^S\right)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}, \qquad 0 < \sigma < 1, \tag{C.2}$$

where σ is the elasticity of substitution across sectors and (β_t^A, β_t^M, β_t^S) control the relative weight of the agricultural, manufacturing and plantation sectors in utility. The corresponding indirect utility function takes the following form:

$$u_{nt}(\vartheta) = \ln B_{nt} + \ln w_{nt}^L - \ln p_{nt} + \kappa b_{nt}(\vartheta), \tag{C.3}$$

where w_{nt}^L is wage and p_{nt} is the dual consumption price index. This dual price index is defined over agricultural, manufacturing and plantation prices (p_{nt}^A, p_{nt}^M, p_{nt}^S):

$$p_{nt} = \left[\left(p_{nt}^A/\beta_t^A\right)^{1-\sigma} + \left(p_{nt}^M/\beta_t^M\right)^{1-\sigma} + \left(p_{nt}^S/\beta_t^S\right)^{1-\sigma}\right]^{\frac{1}{1-\sigma}}. \tag{C.4}$$

[2]In our baseline specification, we capture the local nature of investment by assuming for simplicity that capitalists can only invest in their own location or the colonial plantation. In the online appendix, we develop an extension, in which capitalists can invest in any domestic location subject to financial frictions that increase with distance, which gives rise to a gravity equation in bilateral investment flows.

C.3 Production

Agriculture, manufacturing and plantation products are produced under conditions of perfect competition and constant returns to scale. For simplicity, we assume that the production technologies take the following Cobb-Douglas form. Outputs of agriculture (y_{nt}^A), manufacturing (y_{nt}^M) and plantation products (y_{nt}^S) are therefore:

$$y_{nt}^A = z_{nt}^A \left(\frac{m_n}{\alpha^A}\right)^{\alpha^A} \left(\frac{\ell_{nt}^A}{1-\alpha^A}\right)^{1-\alpha^A}, \qquad 0 < \alpha^A < 1, \qquad n \in \{1, \ldots, N\}, \tag{C.5}$$

$$y_{nt}^M = z_{nt}^M \left(\frac{k_{nt}^M}{\alpha^M}\right)^{\alpha^M} \left(\frac{\ell_{nt}^M}{1-\alpha^M}\right)^{1-\alpha^M}, \qquad 0 < \alpha^M < 1, \qquad n \in \{1, \ldots, N\}, \tag{C.6}$$

$$y_{\mathbb{N}t}^S = z_{\mathbb{N}t}^S \left(\frac{k_{\mathbb{N}t}^S}{\alpha^S}\right)^{\alpha^S} \left(\frac{h_{\mathbb{N}t}^S}{1-\alpha^S}\right)^{1-\alpha^S}, \qquad 0 < \alpha^S < 1, \tag{C.7}$$

where (z_{nt}^A, z_{nt}^M, $z_{\mathbb{N}t}^S$) denote productivity in the agriculture, manufacturing and plantation sectors respectively; recall that m_n is the supply of land; ℓ_{nt}^A and ℓ_{nt}^M labor input in agriculture and manufacturing respectively; $h_{\mathbb{N}t}^S$ is the input of enslaved labor for plantation products; and k_{nt}^M and $k_{\mathbb{N}t}^S$ are capital used in manufacturing and plantation products, respectively.

As the production technologies (C.5) and (C.6) satisfy the Inada conditions, it follows that each domestic location will produce both the agricultural and manufacturing goods for positive land endowments (m_n) and positive domestic capital allocations (k_{nt}^M), and the colonial location will produce plantation products for positive inputs of enslaved labor (h_{nt}^S) and capital (k_{nt}^S).

Each location is connected to world markets through iceberg trade costs ($\tau_{it}^A \geq 1$, $\tau_{it}^M \geq 1$, $\tau_{it}^S \geq 1$) and faces exogenous prices for each good on world markets (p_t^{AW}, p_t^{MW}, p_t^{SW}).[3] Therefore, no-arbitrage with international prices determines the domestic price of agricultural and manufacturing goods, depending on whether a location is an exporter or importer of manufacturing:

$$p_{nt}^A = \tau_{nt}^A p_t^{AW}, \qquad p_{nt}^M = p_t^{MW}/\tau_{nt}^M, \qquad \text{if } c_{nt}^A > y_{nt}^A \text{ and } y_{nt}^M > c_{nt}^M, \tag{C.8}$$

$$p_{nt}^A = p_t^{AW}/\tau_{nt}^A, \qquad p_{nt}^M = \tau_{nt}^M p_t^{MW}, \qquad \text{if } y_{nt}^A > c_{nt}^A > \text{ and } c_{nt}^M > y_{nt}^M, \tag{C.9}$$

$$\text{for} \qquad n \in \{1, \ldots, N\}.$$

All domestic locations are importers of plantation products, and hence the domestic price of these products is again determined by no-arbitrage as:

$$p_{nt}^S = \tau_{nt}^S p_t^{SW}, \qquad n \in \{1, \ldots, N\}. \tag{C.10}$$

[3] While our baseline specification assumes for simplicity that locations are small open economies that face exogenous world market prices, we can also allow for an endogenous terms of trade.

Using these domestic prices for agriculture (p_{nt}^A), manufacturing (p_{nt}^M) and services (p_{nt}^S) from price arbitrage, we can solve for the overall domestic consumption price index (p_{nt}) in equation (C.4) above.

C.4 Agricultural Production

Landlords choose inputs of labor (ℓ_{nt}^A) and land (m_{nt}^A) in the agricultural sector to maximize profits. In equilibrium, all land is employed in the agricultural sector ($m_{nt}^A = m_n$), and landlords' profit maximization problem reduces to:

$$\max_{l_{nt}^A} \left\{ p_{nt}^A z_{nt}^A \left(\frac{m_n}{\alpha^A} \right)^{\alpha^A} \left(\frac{\ell_{nt}^A}{1-\alpha^A} \right)^{1-\alpha^A} - w_{nt}^L \ell_{nt}^A - q_{nt} m_{nt} \right\}, \tag{C.11}$$

where q_{nt} is the price of land. From the first-order condition for employment, we have:

$$\left(1-\alpha^A\right) p_{nt}^A z_{nt}^A \left(\frac{m_n}{\alpha^A} \right)^{\alpha^A} \left(\frac{1}{1-\alpha^A} \right)^{1-\alpha^A} \left(\ell_{nt}^A\right)^{-\alpha^A} - w_{nt}^L = 0,$$

$$\left(1-\alpha^A\right) p_{nt}^A z_{nt}^A \left(\frac{m_n}{\alpha^A} \right)^{\alpha^A} \left(\frac{1}{1-\alpha^A} \right)^{1-\alpha^A} \left(\ell_{nt}^A\right)^{-\alpha^A} = w_{nt}^L,$$

$$\frac{p_{nt}^A z_{nt}^A}{w_{nt}^L} \left(\frac{m_n^A}{\alpha^A} \right)^{\alpha^A} \left(\frac{1}{1-\alpha^A} \right)^{-\alpha^A} = \left(\ell_{nt}^A\right)^{\alpha^A},$$

$$\ell_{nt}^A = \left(\frac{p_{nt}^A z_{nt}^A}{w_{nt}^L} \right)^{\frac{1}{\alpha^A}} \left(\frac{1-\alpha^A}{\alpha^A} \right) m_n. \tag{C.12}$$

Profit maximization and zero profits imply that the price of land can be expressed as:

$$q_{nt} = \left(p_{nt}^A z_{nt}^A\right)^{\frac{1}{\alpha^A}} \left(w_{nt}^L\right)^{-\frac{1-\alpha^A}{\alpha^A}}. \tag{C.13}$$

C.5 Manufacturing Production

Each capitalist chooses their inputs of labor (ℓ_{nt}^M) and effective units of capital ($\widetilde{k}_{nt}^M$) in the manufacturing sector to maximize their profits:

$$\max_{l_{nt}^M, k_{nt}^M} \left\{ p_{nt}^M z_{nt}^M \left(\frac{\widetilde{k}_{nt}^M}{\alpha^M} \right)^{\alpha_M} \left(\frac{\ell_{nt}^M}{1-\alpha^M} \right)^{1-\alpha^M} - w_{nt}^L \ell_{nt}^M - r_{nt} \widetilde{k}_{nt}^M \right\}, \tag{C.14}$$

where we use the tilde to distinguish effective units of capital after taking into account idiosyncratic productivity draws ($\widetilde{k}_{nt}^M$) from actual units of capital without taking into account these idiosyncratic productivity draws (k_{nt}^M); and r_{nt} denotes the rental rate per effective unit of capital in domestic manufacturing. From the first-order condition for employment, equilibrium labor input satisfies:

$$\ell_{nt}^M = \left(\frac{p_{nt}^M z_{nt}^M}{w_{nt}^L}\right)^{\frac{1}{\alpha^M}} \left(\frac{1-\alpha^M}{\alpha^M}\right) \widetilde{k}_{nt}^M. \tag{C.15}$$

From the first-order condition for effective units of capital, equilibrium effective units of capital satisfy:

$$\widetilde{k}_{nt}^M = \left(\frac{p_{nt}^M z_{nt}^M}{r_{nt}}\right)^{\frac{1}{1-\alpha^M}} \frac{\alpha^M}{1-\alpha^M} \ell_{nt}^M. \tag{C.16}$$

Combining profit maximization and zero profits, we obtain:

$$p_{nt}^M = \frac{1}{z_{nt}^M} r_{nt}^{\alpha^M} \left(w_{nt}^L\right)^{1-\alpha^M},$$

which highlights that capitalists perceive a constant rate of return to effective capital determined by goods prices, productivity and wages:

$$r_{nt} = \left(p_{nt}^M z_{nt}^M\right)^{\frac{1}{\alpha^M}} \left(w_{nt}^L\right)^{-\frac{1-\alpha^M}{\alpha^M}}. \tag{C.17}$$

C.6 Plantation Production

Each capitalist chooses their inputs of enslaved labor ($h_{\mathbb{N}t}^S$) and effective units of capital ($\widetilde{k}_{\mathbb{N}t}^S$) in plantation production to maximize their profits:

$$\max_{h_{\mathbb{N}t}^S, k_{\mathbb{N}t}^S} \left\{ p_t^{SW} z_{\mathbb{N}t}^S \left(\frac{\widetilde{k}_{\mathbb{N}t}^S}{\alpha^S}\right)^{\alpha_S} \left(\frac{h_{\mathbb{N}t}^S}{1-\alpha^S}\right)^{1-\alpha^S} - w_{\mathbb{N}t}^S h_{\mathbb{N}t}^S - r_{\mathbb{N}t} \widetilde{k}_{\mathbb{N}t}^S \right\}, \tag{C.18}$$

where recall that p_t^{SW} is the price of plantation products on world markets; again we use the tilde to distinguish effective units of slavery capital after taking into account the idiosyncratic productivity draws ($\widetilde{k}_{\mathbb{N}t}^S$) from actual units of slavery capital without taking into account these idiosyncratic productivity draws ($k_{\mathbb{N}t}^S$); $w_{\mathbb{N}t}^S$ is the shadow wage of enslaved labor, which is exogenously determined by the costs of obtaining enslaved labor through the slave trade; and $r_{\mathbb{N}t}$ denotes the rental rate per effective unit of capital in the colonial plantation. From the first-order condition for enslaved labor, equilibrium employment of enslaved labor satisfies:

$$h_{\mathbb{N}t}^S = \left(\frac{p_t^{SW} z_{\mathbb{N}t}^S}{w_{\mathbb{N}t}^S}\right)^{\frac{1}{\alpha^S}} \left(\frac{1-\alpha^S}{\alpha^S}\right) \widetilde{k}_{\mathbb{N}t}^S. \tag{C.19}$$

From the first-order condition for effective units of capital, equilibrium effective units of capital satisfy:

$$\widetilde{k}_{\mathbb{N}t}^S = \left(\frac{p_t^{SW} z_{\mathbb{N}t}^S}{r_{\mathbb{N}t}}\right)^{\frac{1}{1-\alpha^S}} \frac{\alpha^S}{1-\alpha^S} \ell_{\mathbb{N}t}^S. \tag{C.20}$$

Combining profit maximization and zero profits, we obtain:

$$p_t^{SW} = \frac{1}{z_{\mathbb{N}t}^S} r_{\mathbb{N}t}^{\alpha^S} \left(w_{\mathbb{N}t}^S\right)^{1-\alpha^S},$$

which highlights that capitalists perceive a constant rate of return to effective capital determined by goods prices, productivity and wages:

$$r_{\mathbb{N}t} = \left(p_t^{SW} z_{\mathbb{N}t}^S\right)^{\frac{1}{\alpha^S}} \left(w_{\mathbb{N}t}^S\right)^{-\frac{1-\alpha^S}{\alpha^S}}. \tag{C.21}$$

C.7 Labor Market Clearing

After observing her idiosyncratic draws ($b_n(\vartheta)$), each workers chooses her preferred domestic location. We make the conventional assumption that idiosyncratic amenities are drawn from an extreme value distribution: $F(b) = \exp(-\exp(-b - \overline{\gamma}))$, where $\overline{\gamma}$ is the Euler-Mascheroni constant. After observing her idiosyncratic amenity draws for all locations, each worker chooses her preferred location.[4] Under our extreme value functional form assumption, the share of workers that choose to live in location n at time t (μ_{nt}) takes the familiar logit form:

$$\mu_{nt} = \frac{\ell_{nt}}{\overline{\ell}_t} = \frac{\left(B_{nt} w_{nt}^L / p_{nt}\right)^{1/\kappa}}{\sum_{k=1}^N \left(B_{kt} w_{kt}^L / p_{kt}\right)^{1/\kappa}}, \tag{C.22}$$

as shown in Section C.15 of this online appendix, where ℓ_{nt} is the measure of workers that choose to live in location n at time t and $\overline{\ell}_t$ is the total measure of workers in the economy. Worker expected utility across locations also takes the familiar logit form:

$$\mathbb{U}_t = \kappa \log \left[\sum_{k=1}^N \left(B_{kt} w_{kt}^L / p_{kt}\right)^{1/\kappa}\right], \tag{C.23}$$

as shown in Section C.15 of this online appendix.

C.8 Capital Market Clearing

Capital market clearing requires that the stock of capital in each domestic location (k_{nt}) equals the stock of capital used in domestic manufacturing ($k_{nnt} = k_{nt}^M$) plus the stock of capital used in colonial production ($k_{n\mathbb{N}t}$):

$$k_{nt} = k_{nnt} + k_{n\mathbb{N}t}, \tag{C.24}$$

where

$$k_{nt}^M = k_{nnt}, \tag{C.25}$$

[4] Although we use idiosyncratic amenity draws as a dispersion force across locations, it is straightforward to consider alternative dispersion forces, such as an inelastic supply of housing.

$$k^S_{\mathbb{N}t} = \sum_{n \in N} k_{n\mathbb{N}t}. \tag{C.26}$$

Effective units of capital equal actual units of capital multiplied by average productivity: $\widetilde{k}^M_{nt} = \bar{\epsilon}_{nnt} k_{nnt}$ and $\widetilde{k}^S_{\mathbb{N}t} = \sum_{n \in N} \bar{\epsilon}_{n\mathbb{N}t} k_{n\mathbb{N}t}$, where we derive closed-form solutions for the average productivities of capital ($\bar{\epsilon}_{nnt}$, $\bar{\epsilon}_{n\mathbb{N}t}$) below.

C.9 Capital Allocation Within Periods

At the beginning of period t, the capitalists in location n inherit an existing stock of capital k_{nt}, and decide where to allocate this existing capital and how much to invest in accumulating additional capital. Once these decisions have been made, production and consumption occur. At the end of period t, new capital is created from the investment decisions made at the beginning of the period, and the depreciation of existing capital occurs. In the remainder of this subsection, we characterize capitalists' decisions at the beginning of period t of where to allocate the existing stock of capital. In the next subsection, we characterize capitalists' optimal consumption-investment decision.

We assume that the productivity of capital for domestic use (ϵ_{nnt}) and colonial use ($\epsilon_{n\mathbb{N}t}$) is subject to an idiosyncratic productivity draw for the number of effective units of capital, as in Liu et al. (2021). These idiosyncratic productivity draws can be interpreted as a Keynesian marginal efficiency of capital draw and give rise to a form of imperfect substitutability between domestic and slavery investments.[5] Therefore, the return to a capitalist from location n of investing a unit of capital in destination $i \in \{n, \mathbb{N}\}$ (v_{nit}) depends on the rental rate per effective unit (r_{it}), the number of effective units (ϵ_{nit}) and financial frictions (ϕ_{nit}):

$$v_{nit} = \frac{\epsilon_{nit} r_{it}}{\phi_{nit}}, \qquad i \in \{n, \mathbb{N}\}. \tag{C.27}$$

We assume that these idiosyncratic shocks to the productivity of capital are drawn independently from the following Fréchet distribution:

$$F(\epsilon) = e^{-\epsilon^{-\theta}}, \qquad \theta > 1, \tag{C.28}$$

where we have normalized the Fréchet scale parameter to one, because it enters the model isomorphically to financial frictions, and the Fréchet shape parameter (θ) controls the responsiveness of capital investments to economic variables.

Using the properties of this Fréchet distribution, the shares of capital owned in location n that are invested in each domestic location i and in slavery in the colonial plantation $\mathbb{N}$ depend

[5] This imperfect substitutability is consistent with slavery investments being concentrated in cane sugar, tobacco and cotton, none of which were available domestically at the time. It is also in line with the theoretical and empirical literature on asset demand systems following Koijen and Yogo (2019).

on relative returns to capital and financial frictions:

$$\xi_{nnt}=\frac{k_{nnt}}{k_{nt}}=\frac{\left(r_{nt}/\phi_{nnt}\right)^{\theta}}{\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^{\theta}+\left(r_{nt}/\phi_{nnt}\right)^{\theta}}, \tag{C.29}$$

$$\xi_{n\mathbb{N}t}=\frac{k_{n\mathbb{N}t}}{k_{nt}}=\frac{\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^{\theta}}{\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^{\theta}+\left(r_{nt}/\phi_{nnt}\right)^{\theta}}, \tag{C.30}$$

as shown in Section C.16 of this Online Appendix. We thus obtain the capital allocations to each sector and location:

$$k_{nt}^{M}=\xi_{nnt}k_{nt}, \tag{C.31}$$

$$k_{\mathbb{N}t}^{S}=\sum_{n=1}^{N}\xi_{n\mathbb{N}t}k_{nt}, \tag{C.32}$$

where $\xi_{nnt}+\xi_{n\mathbb{N}t}=1$. Using the properties of the Fréchet distribution, the expected return to capital after taking into account the idiosyncratic productivity draws is equalized between the domestic and colonial slavery locations, and is given by:

$$v_{nt}=\overline{v}_{nnt}=\overline{v}_{n\mathbb{N}t}=\gamma\left[\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^{\theta}+\left(r_{nt}/\phi_{nnt}\right)^{\theta}\right]^{\frac{1}{\theta}}, \tag{C.33}$$

$$\gamma=\Gamma\left(\frac{\theta-1}{\theta}\right),$$

as also shown in Section C.16 of this Online Appendix; $\overline{v}_{nnt}$ and $\overline{v}_{n\mathbb{N}t}$ are the expected returns to allocating a unit of capital to the domestic location and colonial plantation, respectively; and $\Gamma\left(\cdot\right)$ is the Gamma function.

The productivity-adjusted stocks of capital allocated to domestic manufacturing ($\widetilde{k}_{nt}^{M}$) and the colonial slavery plantation ($\widetilde{k}_{nt}^{S}$) are:

$$\widetilde{k}_{nt}^{M}=\widetilde{k}_{nnt}=\overline{\epsilon}_{nnt}\xi_{nnt}k_{nt}=\gamma\xi_{nnt}^{\frac{\theta-1}{\theta}}k_{nt}, \tag{C.34}$$

$$\widetilde{k}_{\mathbb{N}t}^{S}=\sum_{n\in\mathbb{N}}\widetilde{k}_{n\mathbb{N}t}=\sum_{n\in\mathbb{N}}\overline{\epsilon}_{n\mathbb{N}t}\xi_{n\mathbb{N}t}k_{nt}=\sum_{n\in\mathbb{N}}\gamma\xi_{n\mathbb{N}t}^{\frac{\theta-1}{\theta}}k_{nt}, \tag{C.35}$$

where we have used $k_{nt}^{M}=\xi_{nnt}k_{nt}$; and recall that $\overline{\epsilon}_{nnt}$ and $\overline{\epsilon}_{nNt}$ denote the average productivity of capital for the domestic location and colonial plantation, respectively. The total gross income of each capitalist before depreciation is linear in the existing stock of capital and given by:

$$V_{nt}=v_{nt}k_{nt}, \tag{C.36}$$

where capitalist income can be expressed equivalently in terms of either actual or effective units of capital: $v_{nt}k_{nt}=v_{nt}\left[k_{nnt}+k_{n\mathbb{N}t}\right]=\left(r_{nt}/\phi_{nnt}\right)\widetilde{k}_{nnt}+\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)\widetilde{k}_{n\mathbb{N}t}$, as again shown in Section C.16 of this Online Appendix.

We assume that capitalists' investment technology uses goods with the same functional form as consumption. In particular, capitalists in each location can produce one unit of capital using one unit of the consumption index in that location. Existing capital depreciates at the constant rate δ. Therefore, expected income net of depreciation from a unit of capital is given by $v_{nt} - \delta p_{nt}$. Given the linearity of capitalists' net income in the existing stock of capital ($(v_{nt} - \delta p_{nt}) k_{nt}$), the capitalists' decision of whether to invest assets in capital or the consumption bond is characterized by a corner equilibrium. If the rate of return on capital net of depreciation ($v_{nt} - \delta p_{nt}$) exceeds the rate of return on the consumption bond (ρ), capitalists invest all of their assets in capital up to the collateral constraint:

$$k_{nt}(a_{nt}) = \lambda_n a_{nt} \cdot 1_{\{(v_{nt} - \delta p_{nt}) > \rho\}}. \tag{C.37}$$

If capitalists invest their assets in capital, they allocate positive shares of capital to domestic manufacturing (ξ_{nnt}) and the colonial plantation ($\xi_{n\mathbb{N}t}$) for non-prohibitive values of financial frictions (ϕ_{nnt}, $\phi_{n\mathbb{N}t}$) for each of these alternative uses.

C.10 Capital Allocation Across Periods

Capitalists in each location choose their consumption and investment to maximize their intertemporal utility subject to the investment technology. Capitalists' intertemporal utility equals the net present discounted value of their flow of utility each period:

$$U_{nt}^k = \sum_{t=0}^{\infty} \beta^t \ln c_{nt}^k, \tag{C.38}$$

where the superscript k denotes the value of a variable for capitalists; β denotes the discount rate; and we omit the term in amenities for capitalists without loss of generality, because they are geographically immobile, and hence this term plays no role for equilibrium allocations.

The intertemporal budget constraint for capitalists in each location requires that total income from the existing stock of assets ($R_{nt} a_{nt}$) equals the value of consumption ($p_{nt} c_{nt}^k$) plus the value of savings ($p_{nt}(a_{nt+1} - a_{nt})$):

$$p_{nt} c_{nt}^k + p_{nt}(a_{nt+1} - a_{nt}) = R_{nt} a_{nt}, \tag{C.39}$$

where R_{nt} is the maximum of the return from investment in capital net of depreciation and the return from the consumption bond:

$$R_{nt} = \max\{v_{nt} - \delta p_{nt}, \rho\}.$$

Combining the intertemporal utility function (C.38) and budget constraint (C.39), capitalists' intertemporal optimization problem is:

$$\max_{\{c_{nt}, a_{nt+1}\}} \sum_{t=0}^{\infty} \beta^t \ln c_{nt}^k, \tag{C.40}$$

$$\text{subject to} \qquad p_{nt}c_{nt}^k + p_{nt}\left(a_{nt+1} - a_{nt}\right) = R_{nt}a_{nt},$$

We can write this problem as the following Lagrangian:

$$\mathcal{L} = \sum_{t=0}^{\infty} \beta^t \ln c_{nt}^k - \mu_t \left[p_{nt}c_{nt}^k + p_{nt}\left(a_{nt+1} - a_{nt}\right) - R_{nt}a_{nt}\right]. \tag{C.41}$$

The first-order conditions are:

$$\left\{c_{nt}^k\right\} \qquad \frac{\beta^t}{c_{nt}^k} - p_{nt}\mu_t = 0, \tag{C.42}$$

$$\left\{k_{nt+1}\right\} \qquad \left(R_{nt+1} + p_{nt+1}\right)\mu_{t+1} - p_{nt}\mu_t = 0, \tag{C.43}$$

Together these first-order conditions imply the following Euler equation:

$$\frac{c_{nt+1}^k}{c_{nt}^k} = \beta \frac{p_{nt}\mu_t}{p_{nt+1}\mu_{t+1}} = \beta\left(R_{nt+1}/p_{nt+1} + 1\right), \tag{C.44}$$

where the transversality condition implies:

$$\lim_{t\to\infty} \beta^t \frac{k_{nt+1}}{c_{nt}^k} = 0. \tag{C.45}$$

Our assumption of logarithmic utility and the property that the intertemporal budget constraint is linear in the stock of existing capital together imply that capitalists' optimal consumption-saving decision involves a constant saving rate, as in Moll (2014). In particular, we conjecture and verify that the following policy functions satisfy the above Euler equation:

$$p_{nt}c_{nt}^k = (1-\beta)\left(R_{nt} + p_{nt}\right)a_{nt}, \tag{C.46}$$

$$a_{nt+1} = \beta\left(R_{nt}/p_{nt} + 1\right)a_{nt}. \tag{C.47}$$

In steady-state equilibrium, we assume that collateral constraints do not bind, such that the steady-state rate of return to capital net of depreciation equals the rate of return on the consumption bond: $v_{nt} - \delta p_{nt} = \rho$ and hence $R_{nt} = \rho$. Therefore, capitalists are indifferent between investing their assets in capital and the consumption bond. In such a steady-state equilibrium, investment in capital exactly offsets depreciation ($\delta p_{nt}k_{nt}$), such that net investment in capital is zero ($p_{nt}\left(k_{nt+1} - k_{nt}\right) = 0$), and the capital stock is constant over time ($k_{nt+1} = k_{nt} = k_n^*$).

If collateral constraints bind along the transition path, capitalists invest all of their assets in capital accumulation ($k_{nt} = \lambda_n a_{nt}$), and receive a rate of return net of depreciation ($v_{nt} - \delta p_{nt}$) that exceeds the rate of return on the consumption bond ($R_{nt} > \rho$).

C.11 Steady-State Equilibrium

In this section of the Online Appendix, we characterize the steady-state equilibrium of the model. We consider a steady-state equilibrium with time-invariant exogenous fundamentals: amenities (B_n), productivities (z_n^A, z_n^M, z_n^S), world prices (p^{AW}, p^{MW}, p^{SW}), trade costs (τ_n^A, τ_n^M, τ_n^S), financial frictions (ϕ_{ni}), endowments ($\bar{\ell}$, m_n), the colonial rental rate ($r_{\mathbb{N}}$), and the shadow cost of enslaved labor ($w_{\mathbb{N}}^S$). We denote the steady-state values of variables with an asterisk. We focus on a steady-state equilibrium in which both the agricultural and manufacturing sectors are active in each location, as observed in our data. The solution to the model has a sequential structure, such that we can solve for steady-state in a sequence of steps.

Proposition C.1. ***(Existence and Uniqueness)*** *Given time-invariant fundamentals* $\{B_n$, z_n^A, z_n^M, z_n^S, p^{AW}, p^{MW}, p^{SW}, τ_n^A, τ_n^M, τ_n^S, ϕ_{ni}, $\bar{\ell}$, m_n, $r_{\mathbb{N}}$, $w_{\mathbb{N}}^{S*}\}$, *there exists a unique steady-state equilibrium of the model* $\{\ell_n^{A*}$, ℓ_n^{M*}, ℓ_n^*, ξ_{ni}^*, k_n^{M*}, k_n^{S*}, w_n^{L*}, r_n^*, $q_n^*\}$.

Proof. **Goods prices:** Good prices are determined by no arbitrage given exogenous prices on world markets and transport costs:

$$\begin{aligned} p_n^A &= \tau_n^A p^{AW}, & p_n^M &= p^{MW}/\tau_n^M, & &\text{if } c_n^{A*} > y_n^{A*} \text{ and } & y_n^{M*} &> c_n^{M*}, \\ p_n^A &= p^{AW}/\tau_n^A, & p_n^M &= \tau_n^M p^{MW}, & &\text{if } y_n^{A*} > c_n^{A*} \text{ and } & c_n^{M*} &> y_n^{M*}, \end{aligned} \tag{C.48}$$

$$n \in \{1, \ldots, N\}.$$

$$p_n^S = \tau_n^S p^{SW}, \qquad n \in \{1, \ldots, N\},$$

$$p_n = \left[\left(p_n^A/\beta^A\right)^{1-\sigma} + \left(p_n^M/\beta^M\right)^{1-\sigma} + \left(p_n^S/\beta^S\right)^{1-\sigma} \right]^{\frac{1}{1-\sigma}},$$

such that we can treat goods prices as if they are exogenous.

Expected Return to Capital: In a steady-state equilibrium, no arbitrage with consumption bonds implies:

$$v_n^* = \rho + \delta p_n = \bar{\rho}_n, \tag{C.49}$$

where (ρ, p_n) and hence $\bar{\rho}_n$ are exogenous.

Domestic Rental Rate: Now note that we can re-write the expected return to capital (C.33) as follows:

$$\frac{v_n^*}{\gamma} = \left[\left(r_{\mathbb{N}}/\phi_{n\mathbb{N}}\right)^{\theta} + \left(r_n^*/\phi_{nn}\right)^{\theta} \right]^{1/\theta},$$

and the capital allocation probabilities (C.29) imply:

$$\left[\left(r_{\mathbb{N}}/\phi_{n\mathbb{N}}\right)^{\theta} + \left(r_n^*/\phi_{nn}\right)^{\theta} \right]^{1/\theta} = \frac{r_n^*/\phi_{nn}}{\left(\xi_{nn}^*\right)^{1/\theta}}.$$

Combining these two equations, we obtain the following relationship between the steady-state expected return to capital (v_n^*) and the steady-state domestic rental rate (r_n^*):

$$v_n^* = \frac{\gamma \left(r_n^* / \phi_{nn}\right)}{\left(\xi_{nn}^*\right)^{1/\theta}}.$$

Assuming no domestic capital frictions ($\phi_{nn} = 1$), we obtain:

$$r_n^* = \frac{1}{\gamma} \left(\xi_{nn}^*\right)^{1/\theta} v_n^* = \frac{\overline{\rho}_n}{\gamma} \left(\xi_{nn}^*\right)^{1/\theta}. \tag{C.50}$$

Capital Allocation: Assuming no domestic capital frictions ($\phi_{nn} = 1$), we also have the following expression for capital allocation:

$$\xi_{nn}^* = \frac{\left(r_n^*\right)^{\theta}}{\left(r_{\mathbb{N}} / \phi_{n\mathbb{N}}\right)^{\theta} + \left(r_n^*\right)^{\theta}}.$$

Combining these two relationships, we can solve for the equilibrium capital allocation from the following implicit function:

$$\xi_{nn}^* = \frac{\left(\frac{\overline{\rho}_n}{\gamma}\right)^{\theta} \xi_{nn}^*}{\left(r_{\mathbb{N}} / \phi_{n\mathbb{N}}\right)^{\theta} + \left(\frac{\overline{\rho}_n}{\gamma}\right)^{\theta} \xi_{nn}^*}. \tag{C.51}$$

Having thus determined the steady-state capital allocation (ξ_{nn}^*) in equation (C.51) as a function of the exogenous fundamentals ($\overline{\rho}_n$, $r_{\mathbb{N}}$, $\phi_{n\mathbb{N}}$), we have determined the steady-state rental rate (r_n^*) in equation (C.50) as a function of these same exogenous fundamentals.

Wage: Given the steady-state rental rate (r_n^*), manufacturing productivity (z_i^M) and manufacturing prices (p_i^M) as determined as a function of exogenous variables by price arbitrage, we can solve for the steady-state wage (w_n^{L*}) from the zero-profit condition in manufacturing:

$$p_n^M z_n^M = \left(r_n^*\right)^{\alpha^M} \left(w_n^{L*}\right)^{1-\alpha^M}.$$

Re-arranging this zero-profit condition, we obtain the following closed-form solution for the wage:

$$w_n^{L*} = \left[\frac{p_n^M z_n^M}{\left(r_n^*\right)^{\alpha^M}}\right]^{\frac{1}{1-\alpha^M}}, \tag{C.52}$$

where p_n^M and z_n^M are exogenous and we determined r_n^* as a function of exogenous variables above.

Land Price: Given the steady-state wage (w_n^{L*}), agricultural productivity (z_i^A) and agricultural prices (p_i^A) as determined as a function of exogenous variables by price arbitrage, we can solve for the steady-state land price (q_n^*) from the zero-profit condition in manufacturing:

$$p_n^A z_n^A = \left(q_n^*\right)^{\alpha^A} \left(w_n^{L*}\right)^{1-\alpha^A}.$$

Substituting for the steady-state wage (w_n^{L*}) using equation (C.52), we obtain the following closed-form solution for the land price:

$$q_n^* = \left[\frac{p_n^A z_n^A}{\left(w_n^{L*}\right)^{1-\alpha^A}}\right]^{\frac{1}{\alpha^A}} = \left[\frac{p_n^A z_n^A \left(r_n^*\right)^{\alpha^M \frac{1-\alpha^A}{1-\alpha^M}}}{\left(p_n^M z_n^M\right)^{\frac{1-\alpha^A}{1-\alpha^M}}}\right]^{\frac{1}{\alpha^A}}, \tag{C.53}$$

where (p_n^A, z_n^A, p_n^M, z_n^M) are exogenous and we determined r_n^* as a function of exogenous variables above.

Total Population: From equation (C.22), steady-state total population (ℓ_n^*) is given by:

$$\ell_n^* = \frac{\left(B_n w_n^{L*}/p_n\right)^{1/\kappa}}{\sum_{k=1}^N \left(B_k w_k^{L*}/p_k\right)^{1/\kappa}} \bar{\ell}.$$

Substituting for the steady-state wage (w_n^{L*}) using equation (C.52), we obtain the following closed-form solution for steady-state total population:

$$\ell_n^* = \frac{\left(B_n/p_n\right)^{1/\kappa} \left(\left(p_n^M z_n^M\right)^{\frac{1}{1-\alpha^M}} \left(r_n^*\right)^{-\frac{\alpha^M}{1-\alpha^M}}\right)^{1/\kappa}}{\sum_{k=1}^N \left(B_k/p_k\right)^{1/\kappa} \left(\left(p_k^M z_k^M\right)^{\frac{1}{1-\alpha^M}} \left(r_k^*\right)^{-\frac{\alpha^M}{1-\alpha^M}}\right)^{1/\kappa}} \bar{\ell}. \tag{C.54}$$

where (p_n^M, z_n^M, B_n, p_n) are exogenous and we determined (r_n^*) as a function of exogenous variables above.

Productivity-Adjusted Manufacturing Capital-Labor Ratio: From equation (C.16), we have the following expression for the steady-state productivity-adjusted capital-labor ratio:

$$\frac{\widetilde{k}_n^{M*}}{\ell_n^{M*}} = \left(\frac{p_n^M z_n^M}{r_n^*}\right)^{\frac{1}{1-\alpha^M}} \frac{\alpha^M}{1-\alpha^M}. \tag{C.55}$$

where (p_n^M, z_n^M) are exogenous and we determined (r_n^*) as a function of exogenous variables above.

Unadjusted Manufacturing Capital-Labor Ratio: Recall the following relationship between the capital stocks with and without the productivity-adjustment: $\widetilde{k}_n^{M*} = \gamma \left(\xi_{nn}^*\right)^{-1/\theta} k_n^{M*}$. Using this relationship in equation (C.55), we obtain:

$$\frac{k_n^{M*}}{\ell_n^{M*}} = \frac{\left(\xi_{nn}^*\right)^{\frac{1}{\theta}}}{\gamma} \left(\frac{p_n^M z_n^M}{r_n^*}\right)^{\frac{1}{1-\alpha^M}} \frac{\alpha^M}{1-\alpha^M}, \tag{C.56}$$

where (p_n^M, z_n^M) are exogenous and we determined (r_n^*, ξ_{nn}^*) as a function of exogenous variables above.

Agricultural Employment: From the equality of marginal products in the two sectors, we have:

$$\left(1-\alpha^{A}\right)p_{n}^{A}z_{n}^{A}\left(\frac{m_{n}}{\alpha^{A}}\right)^{\alpha^{A}}\left(\frac{1}{1-\alpha^{A}}\right)^{1-\alpha^{A}}\left(\ell_{n}^{A*}\right)^{-\alpha^{A}}=\left(1-\alpha^{M}\right)p_{n}^{M}z_{n}^{M}\left(\frac{\widetilde{k}_{n}^{M}}{\alpha^{M}}\right)^{\alpha^{M}}\left(\frac{1}{1-\alpha^{M}}\right)^{1-\alpha^{M}}\left(\ell_{n}^{M*}\right)^{-\alpha^{M}},$$

$$p_{n}^{A}z_{n}^{A}\left(\frac{m_{n}}{\ell_{n}^{A*}}\right)^{\alpha^{A}}\left(\frac{1-\alpha^{A}}{\alpha^{A}}\right)^{\alpha^{A}}=p_{n}^{M}z_{n}^{M}\left(\frac{\widetilde{k}_{n}^{M*}}{\ell_{n}^{M*}}\right)^{\alpha^{M}}\left(\frac{1-\alpha^{M}}{\alpha^{M}}\right)^{\alpha^{M}}.$$

Re-arranging this relationship, we have:

$$\ell_{n}^{A*}=\left[\frac{p_{n}^{A}z_{n}^{A}\left(\frac{1-\alpha^{A}}{\alpha^{A}}\right)^{\alpha^{A}}}{p_{n}^{M}z_{n}^{M}\left(\frac{1-\alpha^{M}}{\alpha^{M}}\right)^{\alpha^{M}}}\right]^{\frac{1}{\alpha^{A}}}\frac{m_{n}}{\left(\widetilde{k}_{n}^{M*}/\ell_{n}^{M*}\right)^{\alpha^{M}/\alpha^{A}}}.$$

Substituting for the steady-state capital-labor ratio using equation (C.55), we have:

$$\ell_{n}^{A*}=\left[\frac{p_{n}^{A}z_{n}^{A}\left(\frac{1-\alpha^{A}}{\alpha^{A}}\right)^{\alpha^{A}}}{p_{n}^{M}z_{n}^{M}\left(\frac{1-\alpha^{M}}{\alpha^{M}}\right)^{\alpha^{M}}}\right]^{\frac{1}{\alpha^{A}}}\frac{m_{n}}{\left(\left(\frac{p_{n}^{M}z_{n}^{M}}{r_{n}^{*}}\right)^{\frac{1}{1-\alpha^{M}}}\frac{\alpha^{M}}{1-\alpha^{M}}\right)^{\alpha^{M}/\alpha^{A}}},\tag{C.57}$$

where $(p_{n}^{A}, z_{n}^{A}, p_{n}^{M}, z_{n}^{M}, m_{n})$ are exogenous and we determined r_{n}^{*} as a function of exogenous variables above.

Manufacturing Employment: We can recover steady-state manufacturing employment (ℓ_{n}^{M*}) from labor market equilibrium within each location:

$$\ell_{n}^{M*}=\ell_{n}^{*}-\ell_{n}^{*A},\tag{C.58}$$

where we determined ℓ_{n}^{*} and ℓ_{n}^{*A} as a function of exogenous variables above.

Productivity-adjusted Manufacturing Capital Stock: We can recover the productivity-adjusted manufacturing capital stock ($\widetilde{k}_{n}^{M*}$) from the productivity-adjusted capital-labor ratio ($\widetilde{k}_{n}^{M*}/\ell_{n}^{*M}$) and manufacturing employment (ℓ_{n}^{*M}):

$$\widetilde{k}_{n}^{M*}=\frac{\widetilde{k}_{n}^{M*}}{\ell_{n}^{*M}}\ell_{n}^{*M},\tag{C.59}$$

where we determined $\widetilde{k}_{n}^{M*}/\ell_{n}^{*M}$ and ℓ_{n}^{*M} as a function of exogenous variables above.

Unadjusted Manufacturing Capital Stock: We can recover the unadjusted manufacturing capital stock (k_{n}^{M*}) from the unadjusted capital-labor ratio (k_{n}^{M*}/ℓ_{n}^{*M}) and manufacturing employment (ℓ_{n}^{*M}):

$$k_{n}^{M*}=\frac{k_{n}^{M*}}{\ell_{n}^{*M}}\ell_{n}^{*M},\tag{C.60}$$

where we determined k_{n}^{M*}/ℓ_{n}^{*M} and ℓ_{n}^{*M} as a function of exogenous variables above.

Unadjusted Capital Stock: The overall capital stock is given by:

$$k_{n}^{*}=\frac{k_{n}^{M*}}{\xi_{nn}^{*}},\tag{C.61}$$

where we determined k_n^{M*} and ξ_{nn}^* as a function of exogenous variables above.
Capital Stock in Colonial Plantation: The capital stock in the colonial plantation is given by:

$$k_n^{S*} = (1 - \xi_{nn}^*)\, k_n^*, \tag{C.62}$$

where we determined k_n^* and ξ_{nn}^* as a function of exogenous variables above.
Productivity-Adjusted Capital Stock in Colonial Plantation: Recall the following relationship between the capital stocks with and without the productivity-adjustment: $\widetilde{k}_n^{S*} = \gamma\,(1 - \xi_{nn}^*)^{-1/\theta}\, k_n^{S*}$. Using this relationship in equation (C.62), we obtain:

$$\widetilde{k}_n^{S*} = \gamma\,(1 - \xi_{nn}^*)^{\frac{\theta-1}{\theta}}\, k_n^*,$$

where we determined k_n^* and ξ_{nn}^* as a function of exogenous variables above. □

C.12 Sufficient Statistic for Slavery Investments

In this section of the Online Appendix, we use the model to evaluate the impact of access to slavery investment on levels and patterns of economic activity, and provide a proof of Proposition 1 in the paper. In particular, we undertake a comparative static in which we reduce colonial financial frictions ($\phi_{n\mathbb{N}}$) from prohibitive values for all locations (such that $\xi_{nn} = 1$ for all n) to finite values for some locations n (such that $\xi_{nn} < 1$ for some n as in our data). We hold constant world prices (p^{AW}, p^{MW}, p^{SW}) and other exogenous fundamentals. Therefore, this comparative static captures the pure impact of greater access to slavery investments through capital accumulation. We show that the domestic investment share (ξ_{nn}) is a sufficient statistic for the impact of colonial financial frictions ($\phi_{n\mathbb{N}}$) on steady-state economic activity, as summarized in the following proposition.

Proposition. ***(Slavery and Industrialization, Proposition 1 in the paper)*** *Other things equal, in steady-state equilibrium, locations with better access to slavery investments (lower $\phi_{n\mathbb{N}}$ and hence lower ξ_{nn}^*) have (i) lower agricultural employment (ℓ_n^{A*}); (ii) higher manufacturing employment (ℓ_n^{M*}); (iii) higher total population (ℓ_n^*); (iv) a lower rental rate for capital (r_n^*); (v) higher wages (w_n^{L*}) and worker real income (w_n^{L*}/p_n); (vi) lower price of agricultural land (q_n^*); (vii) higher productivity-adjusted and unadjusted stocks of capital ($\widetilde{k}_n^*$, k_n^*); (viii) higher productivity-adjusted and unadjusted stocks of capital in domestic manufacturing ($\widetilde{k}_n^{M*}$, k_n^{M*}); (ix) higher capitalist real income ($v_n^* k_n^*/p_n$); (x) lower landlord real income ($q_n^* m_n/p_n$).*

Proof. **Goods prices:** Recall from equation (C.48) that goods prices are determined by no arbitrage given exogenous prices on world markets and transport costs and are invariant with respect to ξ_{nn}^*:

$$\begin{aligned}
&p_n^A = \tau_n^A p^{AW}, \qquad p_n^M = p^{MW}/\tau_n^M, \qquad \text{if } c_n^{A*} > y_n^{A*} \quad \text{and} \quad y_n^{M*} > c_n^{M*}, \\
&p_n^A = p^{AW}/\tau_n^A, \qquad p_n^M = \tau_n^M p^{MW}, \qquad \text{if } y_n^{A*} > c_n^{A*} \quad \text{and} \quad c_n^{M*} > y_n^{M*},
\end{aligned} \tag{C.63}$$

$$n \in \{1, \ldots, N\}.$$

$$p_n^S = \tau_n^S p^{SW}, \qquad n \in \{1, \ldots, N\},$$

$$p_n = \left[\left(p_n^A / \beta^A \right)^{1-\sigma} + \left(p_n^M / \beta^M \right)^{1-\sigma} + \left(p_n^S / \beta^S \right)^{1-\sigma} \right]^{\frac{1}{1-\sigma}},$$

such that we can treat goods prices as if they are exogenous.

Expected Return to Capital: Recall from equation (C.49) that no arbitrage implies that the steady-state expected return to capital (v_n^*) is pinned down by the exogenous value of the return to consumption bonds (ρ) and depreciation (δp_n) and invariant with respect to ξ_{nn}^*:

$$v_n^* = \rho + \delta p_n = \overline{\rho}_n, \tag{C.64}$$

where (ρ, δ) and hence $\overline{\rho}_n$ are exogenous.

Domestic Rental Rate: Recall from equation (C.50) that with no domestic capital frictions ($\phi_{nn} = 1$), the steady-state domestic rental rate (r_n^*) can be expressed as:

$$r_n^* = \frac{\overline{\rho}_n}{\gamma} \left(\xi_{nn}^* \right)^{1/\theta}, \tag{C.65}$$

where $\overline{\rho}_n$ is exogenous and γ is a parameter. Therefore, locations with better access to slavery investments (lower ξ_{nn}^*) have lower domestic rental rates (r_n^*).

Wage: Using equation (C.50) to substitute for the steady-state rental rate (r_n^*) in the steady-state wage equation (C.52), we can write the steady-state wage (w_n^{L*}) as:

$$w_n^{L*} = w_n^{L*} = \left[\frac{p_n^M z_n^M}{\left(\frac{\overline{\rho}_n}{\gamma} \left(\xi_{nn}^* \right)^{1/\theta} \right)^{\alpha^M}} \right]^{\frac{1}{1-\alpha^M}}, \tag{C.66}$$

where (p_n^M, z_n^M, $\overline{\rho}_n$) are exogenous. Therefore, other things equal, locations with better access to slavery investments (lower ξ_{nn}^*) have higher wages (w_n^{L*}), and hence higher real worker income (w_n^{L*}/p_n), since p_n is also exogenous.

Land Price: Using equation (C.50) to substitute for the steady-state rental rate (r_n^*) in the steady-state land price equation (C.53), we can also write the steady-state land price (q_n^*) as:

$$q_n^* = \left[\frac{p_n^A z_n^A \left(\frac{\overline{\rho}_n}{\gamma} \left(\xi_{nn}^* \right)^{1/\theta} \right)^{\alpha^M \frac{1-\alpha^A}{1-\alpha^M}}}{\left(p_n^M z_n^M \right)^{\frac{1-\alpha^A}{1-\alpha^M}}} \right]^{\frac{1}{\alpha^A}}. \tag{C.67}$$

where (p_n^A, p_n^M, z_n^A, z_n^M, $\overline{\rho}_n$) are exogenous. Therefore, other things equal, locations with better access to slavery investments (lower ξ_{nn}^*) have lower land prices (q_n^*), because their higher wages (w_n^{L*}) imply that less revenue is left over per unit of output to pay land.

Total Population: Using equation (C.65) to substitute for the steady-state rental rate (r_n^*) in the steady-state total population equation (C.54), we can also write steady-state total population (ℓ_n^*) as:

$$\ell_n^* = \frac{(B_n/p_n)^{1/\kappa}\left(\left(p_n^M z_n^M\right)^{\frac{1}{1-\alpha^M}}\left(\frac{\overline{\rho}_n}{\gamma}\left(\xi_{nn}^*\right)^{1/\theta}\right)^{-\frac{\alpha^M}{1-\alpha^M}}\right)^{1/\kappa}}{\sum_{k=1}^{N}(B_k/p_k)^{1/\kappa}\left(\left(p_k^M z_k^M\right)^{\frac{1}{1-\alpha^M}}\left(\frac{\overline{\rho}_k}{\gamma}\left(\xi_{kk}^*\right)^{1/\theta}\right)^{-\frac{\alpha^M}{1-\alpha^M}}\right)^{1/\kappa}}\overline{\ell}, \tag{C.68}$$

where $(B_n, p_n, p_n^M, z_n^M, \overline{\rho}_n)$ are exogenous. Therefore, other things equal, locations with better access to slavery investments (lower ξ_{nn}^*) have higher total population (ℓ_n^*).

Productivity-adjusted Manufacturing Capital-labor Ratio: Using equation (C.50) to substitute for the steady-state rental rate (r_n^*) in the equation for the steady-state productivity-adjusted manufacturing capital-labor ratio (C.55), we can also write the steady-state productivity-adjusted manufacturing capital-labor ratio ($\widetilde{k}_n^{M*}/\ell_n^{M*}$) as:

$$\frac{\widetilde{k}_n^{M*}}{\ell_n^{M*}} = \left(\frac{p_n^M z_n^M}{\frac{\overline{\rho}_n}{\gamma}\left(\xi_{nn}^*\right)^{1/\theta}}\right)^{\frac{1}{1-\alpha^M}}\frac{\alpha^M}{1-\alpha^M}. \tag{C.69}$$

where $(p_n^M, z_n^M, \overline{\rho}_n)$ are exogenous. Therefore, other things equal, locations with better access to slavery investments (lower ξ_{nn}^*) have higher steady-state productivity-adjusted capital-labor ratios ($\widetilde{k}_n^{M*}/\ell_n^{M*}$).

Unadjusted Capital-labor Ratio: Using equation (C.50) to substitute for the steady-state rental rate (r_n^*) in the equation for the steady-state unadjusted manufacturing capital-labor ratio (C.56), we can also write the steady-state unadjusted manufacturing capital-labor ratio (k_n^{M*}/ℓ_n^{M*}) as:

$$\frac{k_n^{M*}}{\ell_n^{M*}} = \frac{\left(\xi_{nn}^*\right)^{\frac{1}{\theta}}}{\gamma}\left(\frac{p_n^M z_n^M}{\frac{\overline{\rho}_n}{\gamma}\left(\xi_{nn}^*\right)^{1/\theta}}\right)^{\frac{1}{1-\alpha^M}}\frac{\alpha^M}{1-\alpha^M},$$

which can be re-written as:

$$\frac{k_n^{M*}}{\ell_n^{M*}} = \gamma^{-1+\frac{1}{1-\alpha^M}}\left(\overline{\rho}_n\right)^{-\frac{1}{1-\alpha^M}}\left(\xi_{nn}^*\right)^{\frac{1}{\theta}-\frac{1}{\theta}\frac{1}{1-\alpha^M}}\left(p_n^M z_n^M\right)^{\frac{1}{1-\alpha^M}}\frac{\alpha^M}{1-\alpha^M}$$

$$\frac{k_n^{M*}}{\ell_n^{M*}} = \gamma^{\frac{\alpha^M}{1-\alpha^M}}\left(\overline{\rho}_n\right)^{-\frac{1}{1-\alpha^M}}\left(\xi_{nn}^*\right)^{-\frac{\alpha^M}{\theta(1-\alpha^M)}}\left(p_n^M z_n^M\right)^{\frac{1}{1-\alpha^M}}\frac{\alpha^M}{1-\alpha^M}, \tag{C.70}$$

where $(p_n^M, z_n^M, \overline{\rho}_n)$ are exogenous. Therefore, other things equal, locations with better access to slavery investments (lower ξ_{nn}^*) have higher steady-state capital-labor ratios (k_n^{M*}/ℓ_n^{M*}).

Agricultural Employment: Using equation (C.50) to substitute for the steady-state rental rate (r_n^*) in the equation for steady-state agricultural employment (C.57), we can write steady-state agricultural employment (ℓ_n^{A*}) as:

$$\ell_n^{A*} = \left[\frac{p_n^A z_n^A \left(\frac{1-\alpha^A}{\alpha^A}\right)^{\alpha^A}}{p_n^M z_n^M \left(\frac{1-\alpha^M}{\alpha^M}\right)^{\alpha^M}} \right]^{\frac{1}{\alpha^A}} \frac{m_n \left(\xi_{nn}^*\right)^{\frac{\alpha^M}{\theta\alpha^A(1-\alpha^M)}}}{\left(\left(\frac{p_n^M z_n^M}{\bar{\rho}_n/\gamma} \right)^{\frac{1}{1-\alpha^M}} \frac{\alpha^M}{1-\alpha^M} \right)^{\alpha^M/\alpha^A}}, \tag{C.71}$$

where (p_n^A, z_n^A, p_n^M, z_n^M, m_n, $\bar{\rho}_n$) are exogenous. Therefore, other things equal, locations with better access to slavery investments (lower ξ_{nn}^*) have lower steady-state agricultural employment (ℓ_n^{A*}).

Manufacturing Employment: We can recover steady-state manufacturing employment (ℓ_n^{M*}) from labor market equilibrium within each location:

$$\ell_n^{M*} = \ell_n^* - \ell_n^{*A}. \tag{C.72}$$

We showed above that locations with better access to slavery investments (lower ξ_{nn}^*) have higher total population (ℓ_n^*) and lower agricultural employment (ℓ_n^{*A}), which implies that they have higher manufacturing employment (ℓ_n^{*M}).

Productivity-adjusted Manufacturing Capital Stock: We can recover the productivity-adjusted manufacturing capital stock ($\widetilde{k}_n^{M*}$) from the productivity-adjusted manufacturing capital-labor ratio ($\widetilde{k}_n^{M*}/\ell_n^{*M}$) and manufacturing employment (ℓ_n^{*M}):

$$\widetilde{k}_n^{M*} = \frac{\widetilde{k}_n^{M*}}{\ell_n^{*M}} \ell_n^{*M}. \tag{C.73}$$

We showed above that locations with better access to slavery investments (lower ξ_{nn}^*) have higher productivity-adjusted manufacturing capital-labor ratios ($\widetilde{k}_n^{M*}/\ell_n^{*M}$) and higher manufacturing employment (ℓ_n^{*M}), which implies that they have higher productivity-adjusted capital stocks ($\widetilde{k}_n^{M*}$).

Unadjusted Manufacturing Capital Stock: We can recover the unadjusted manufacturing capital stock (k_n^{M*}) from the unadjusted capital-labor ratio (k_n^{M*}/ℓ_n^{*M}) and manufacturing employment (ℓ_n^{*M}):

$$k_n^{M*} = \frac{k_n^{M*}}{\ell_n^{*M}} \ell_n^{*M}. \tag{C.74}$$

We showed above that locations with better access to slavery investments (lower ξ_{nn}^*) have higher unadjusted manufacturing capital-labor ratios (k_n^{M*}/ℓ_n^{*M}) and higher manufacturing employment (ℓ_n^{*M}), which implies that they have higher unadjusted capital stocks (k_n^{M*}).

Capital Stock: The overall capital stock is given by:

$$k_n^* = \frac{k_n^{M*}}{\xi_{nn}^*} = \gamma^{\frac{\alpha^M}{1-\alpha^M}} \left(\bar{\rho}_n\right)^{-\frac{1}{1-\alpha^M}} \left(\xi_{nn}^*\right)^{-\left(\frac{\alpha^M}{\theta(1-\alpha^M)}+1\right)} \left(p_n^M z_n^M\right)^{\frac{1}{1-\alpha^M}} \frac{\alpha^M}{1-\alpha^M} \ell_n^{M*}. \tag{C.75}$$

where $(p_n^M,\, z_n^M,\, \overline{\rho}_n)$ are exogenous. We showed above that locations with better access to slavery investments (lower ξ_{nn}^*) have higher steady-state manufacturing employment (ℓ_n^{M*}). Therefore, other things equal, locations with better access to slavery investments (lower ξ_{nn}^*) have higher steady-state capital stocks (k_n^*).

Expected Worker Welfare: Using equation (C.52) to substitute for the steady-state wage (w_n^{L*}) in expected worker welfare $(\mathbb{U}^*)$ in equation (7), we obtain the following closed-form solution for steady-state expected worker welfare:

$$\mathbb{U}^* = \kappa \log \left[\sum_{k=1}^{N} \left(B_k \left(p_k^M z_k^M \right)^{1-\alpha^M} / \left(\left(r_k^* \right)^{\frac{\alpha^M}{1-\alpha^M}} p_k \right) \right)^{1/\kappa} \right]$$

where $(p_k^M,\, z_k^M,\, B_k,\, p_k)$ are exogenous and we determined (r_n^*) as a function of exogenous variables above. Using equation (C.50) to substitute for the steady-state rental rate (r_n^*), we can write steady-state expected worker welfare as:

$$\mathbb{U}^* = \kappa \log \left[\sum_{k=1}^{N} \left(B_k / p_k \right)^{1/\kappa} \left(\left(p_k^M z_k^M \right)^{1-\alpha^M} \left(\xi_{kk}^* \right)^{-\frac{\alpha^M}{\theta(1-\alpha^M)}} \left(\overline{\rho}_k / \gamma \right)^{-\frac{\alpha^M}{1-\alpha^M}} \right)^{1/\kappa} \right]. \tag{C.76}$$

where $(p_k^M,\, z_k^M,\, B_k,\, p_k,\, \overline{\rho}_n)$ are exogenous. Therefore, other things equal, greater access locations to slavery investments (lower ξ_{kk}^* across locations k) raises expected worker welfare $(\mathbb{U}^*)$.

Capitalist Real Income: Steady-state capitalist real income is given by:

$$\frac{v_n^* k_n^*}{p_n},$$

where p_n is exogenous. We showed above that the steady-state expected return to capital (v_n^*) is invariant with respect to access to slavery investments (ξ_{nn}^*) and the steady-state capital stock (k_n^*) is increasing in access to slavery investments. Therefore, other things equal, capitalists in locations with better access to slavery investments (lower ξ_{nn}^*) have higher capitalist real income $(v_n^* k_n^* / p_n)$.

Landowner Real Income: Steady-state landowner real income is given by:

$$\frac{q_n^* m_n}{p_n},$$

where $(p_n,\, m_n)$ are exogenous. We showed above that the steady-state price of land (q_n^*) is decreasing in access to slavery investments (ξ_{nn}^*). Therefore, other things equal, landowners in locations with better access to slavery investments (lower ξ_{nn}^*) have lower real income $(q_n^* m_n / p_n)$. □

C.13 Steady-State Model Inversion

In this section of the Online Appendix, we show how the observed data and the equilibrium conditions of the model can be used to solve for unobserved endogenous variables and unobserved location characteristics. We use the values of some of these unobserved endogenous variables in our counterfactuals for the removal of access to slavery investments, as discussed further in the next section of this Online Appendix.

Given the observed data $\{\mathbb{R}_n^*, \mathbb{R}_n^{S*}, \ell_n^{A*}, \ell_n^{M*}, m_n, \overline{\rho}_n\}$, and assuming that these observed data are a steady-state equilibrium of the model, we now show that we can invert the model to recover unobserved endogenous variables $\{w_n^{L*}, \mathbb{R}_n^{A*}, \mathbb{R}_n^{M*}, \xi_{nn}^*, q_n^*, r_n^*, \widetilde{k}_n^{M*}, k_n^{M*}, k_n^*\}$, and solve for unobserved composite fundamentals $\{r_{Nn}^*/\phi_{nN}, p_n^A z_n^A, p_n^M z_n^M, B_n/p_n\}$ that rationalize the observed data as a steady-state equilibrium. The model inversion has a sequential structure, such that we can solve for the unobserved endogenous variables and unobserved composite fundamentals in a sequence of steps.

Proposition C.2. ***(Model Inversion)*** *Suppose that we observe data on rateable values ($\mathbb{R}_n^*$), slavery compensation ($\mathbb{R}_n^{S*}$), agricultural employment (ℓ_n^{A*}), manufacturing employment (ℓ_n^{M*}), land area (m_n) and the rate of return on consumption bonds (ρ). Assuming that the observed data correspond to a steady-state equilibrium, the model can be inverted to recover unique values of other unobserved endogenous variables $\{w_n^{L*}, \mathbb{R}_n^{A*}, \mathbb{R}_n^{M*}, \xi_{nn}^*, q_n^*, r_n^*, \widetilde{k}_n^{M*}, k_n^{M*}, k_n^*\}$ and unique values of unobserved composite fundamentals $\{r_{Nn}^*/\phi_{nN}, p_n^A z_n^A, p_n^M z_n^M, B_n/p_n\}$ that rationalize the observed data as a steady-state equilibrium.*

Proof. **Wages (w_n^{L*}):** The equality between observed rateable values ($\mathbb{R}_n^*$) and payments for the use of land and capital implies:

$$\mathbb{R}_n^* = q_n^* m_n + v_n^* k_n^{M*} = q_n^* m_n + \frac{r_n^*}{\phi_{nn}} \widetilde{k}_n^{M*} = w_n^{L*} \left[\ell_n^{A*} \left(\frac{1-\alpha^A}{\alpha^A} \right) + \ell_n^{M*} \left(\frac{1-\alpha^M}{\alpha^M} \right) \right].$$

Re-arranging this relationship, we can solve for wages (w_n^{L*}) from observed rateable values ($\mathbb{R}_n^*$) and employments (ℓ_n^{A*}, ℓ_n^{M*}):

$$w_n^{L*} = \frac{\mathbb{R}_n^*}{\left[\ell_n^{A*} \left(\frac{1-\alpha^A}{\alpha^A} \right) + \ell_n^{M*} \left(\frac{1-\alpha^M}{\alpha^M} \right) \right]}, \tag{C.77}$$

where ($\mathbb{R}_n^*, \ell_n^{A*}, \ell_n^{M*}$) are observed.

Land Payments ($\mathbb{R}_n^{A*}$): Using the solution for wages (w_n^{L*}) from Step 1, land payments ($\mathbb{R}_n^{A*}$) satisfy:

$$\mathbb{R}_n^{A*} = q_n m_n = w_n^{L*} \ell_n^{A*} \left(\frac{1-\alpha^A}{\alpha^A} \right), \tag{C.78}$$

where ℓ_n^{A*} is observed and we solved for w_n^{L*} above.

Domestic Manufacturing Capital Payments ($\mathbb{R}_n^{M*}$): Using the solution for wages (w_n^*) from Step 1, total payments for manufacturing capital ($\mathbb{R}_n^{M*}$) satisfy:

$$\mathbb{R}_n^{M*} = v_n^* k_n^{M*} = \frac{r_n^*}{\phi_{nn}} \widetilde{k}_n^{M*} = w_n^{L*} \ell_n^{M*} \left(\frac{1-\alpha^M}{\alpha^M} \right). \tag{C.79}$$

where ℓ_n^{M*} is observed and we solved for w_n^{L*} above. Note that equations (C.77), (C.78) and (C.79) ensure $\mathbb{R}_n^* = \mathbb{R}_n^{A*} + \mathbb{R}_n^{M*}$.

Slavery Capital Payments ($\mathbb{R}_n^{S*}$): We directly observe slavery capital payments from the Legacies of British Slavery Database: $\mathbb{R}_n^{S*}$.

Capital Allocation (ξ_{nn}^*, $\xi_{n\mathbb{N}}^*$): Using our solution for manufacturing rateable values ($\mathbb{R}_n^{M*}$) from Step 4 and observed slavery wealth ($\mathbb{R}_n^{S*}$), together with the property that the expected return to capital conditional to allocating it to a given use is the same between domestic manufacturing and colonial production ($v_{ni}^* = v_{n\mathbb{N}}^* = v_n^*$), we can solve for the shares of manufacturing capital (ξ_{nn}^*) and slavery capital ($\xi_{n\mathbb{N}}^*$) in total capital:

$$\xi_{nn}^* = \frac{\mathbb{R}_n^{M*}}{\mathbb{R}_n^{M*} + \mathbb{R}_n^{S*}} = \frac{v_n^* k_n^{M*}}{v_n^* k_n^{M*} + v_n^* k_{n\mathbb{N}}^{S*}} = \frac{k_n^{M*}}{k_n^{M*} + k_{n\mathbb{N}}^{S*}}, \tag{C.80}$$

$$\xi_{n\mathbb{N}}^* = \frac{\mathbb{R}_n^{S*}}{\mathbb{R}_n^{M*} + \mathbb{R}_n^{S*}} = \frac{v_n^* k_{n\mathbb{N}}^{S*}}{v_n^* k_n^{M*} + v_n^* k_{n\mathbb{N}}^{S*}} = \frac{k_{n\mathbb{N}}^{S*}}{k_n^{M*} + k_{n\mathbb{N}}^{S*}}, \tag{C.81}$$

where we observe $\mathbb{R}_n^{S*}$ and solved for $\mathbb{R}_n^{M*}$ above.

Expected Return to Capital (v_n^*): No-arbitrage with consumption bonds implies that the expected return to capital (v_n^*) satisfies:

$$v_n^* = \rho + \delta p_{nt} = \overline{\rho}_n.$$

Rental Rates (r_n^*, $r_{\mathbb{N}}/\phi_{n\mathbb{N}}$): The steady-state rental rate (r_n^*) satisfies:

$$r_n^* = \frac{\overline{\rho}_n}{\gamma} \left(\xi_{nn}^*\right)^{1/\theta},$$

where we solved for ξ_{nn}^* above. Under the assumption of no domestic financial frictions ($\phi_{nn} = 1$), we can recover the steady-state slavery rental rate net of financial frictions ($r_{\mathbb{N}}/\phi_{n\mathbb{N}}$) for those locations with positive slavery investments ($\xi_{nn}^* < 1$):

$$\xi_{nnt} = \frac{\left(r_{nt}^*\right)^\theta}{\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^\theta + \left(r_{nt}^*\right)^\theta} = \frac{\left(\frac{\overline{\rho}_n}{\gamma}\right)^\theta \xi_{nn}^*}{\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^\theta + \left(\frac{\overline{\rho}_n}{\gamma}\right)^\theta \xi_{nn}^*} = \frac{\left(\frac{\overline{\rho}_n}{\gamma}\right)^\theta}{\frac{1}{\xi_{nn}^*}\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^\theta + \left(\frac{\overline{\rho}_n}{\gamma}\right)^\theta},$$

which implies:

$$\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^\theta + \xi_{nn}^* \left(\frac{\overline{\rho}_n}{\gamma}\right)^\theta = \left(\frac{\overline{\rho}_n}{\gamma}\right)^\theta,$$

$$(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}) = (1-\xi^*_{nn})^{\frac{1}{\theta}} \left(\frac{\overline{\rho}_n}{\gamma}\right).$$

Agricultural Land (q^*_n): The steady-state price of agricultural land (q^*_n) satisfies:

$$q^*_{nt} = \frac{\alpha^A}{1-\alpha^A}\frac{w^{L*}_{nt}\ell^{A*}_{nt}}{m_n},$$

where (ℓ^{A*}_{nt}, m_n) are observed and we solved for w^{L*}_n above.

Productivity-adjusted Manufacturing Capital ($\widetilde{k}^{M*}_n$): Productivity-adjusted manufacturing capital ($\widetilde{k}^{M*}_n$) satisfies:

$$\widetilde{k}^{M*}_n = \frac{\alpha^M}{1-\alpha^M}\frac{w^{L*}_n\ell^{M*}_n}{r^*_n} = \frac{\alpha^M}{1-\alpha^M}\frac{w^{L*}_n\ell^{M*}_n}{\frac{\overline{\rho}_n}{\gamma}\left(\xi^*_{nn}\right)^{1/\theta}},$$

where we observe ℓ^{M*}_n and solved for (w^{L*}_n, ξ^*_{nn}) above.

Unadjusted Manufacturing Capital (k^{M*}_n): Using the relationship between productivity-adjusted and unadjusted capital, we have:

$$\widetilde{k}^{M*}_n = \gamma\left(\xi^*_{nn}\right)^{-\frac{1}{\theta}} k^{M*}_n,$$

which implies that unadjusted manufacturing capital (k^M_n) is:

$$k^{M*}_n = \frac{1}{\gamma}\left(\xi^*_{nn}\right)^{\frac{1}{\theta}} \widetilde{k}^{M*}_n = \frac{1}{\gamma}\left(\xi^*_{nnt}\right)^{\frac{1}{\theta}} \frac{\alpha^M}{1-\alpha^M}\frac{w^{L*}_n\ell^{M*}_n}{r^*_n} = \frac{\alpha^M}{1-\alpha^M}\frac{w^{L*}_n\ell^{M*}_n}{\overline{\rho}_n},$$

where we observe ℓ^{M*}_n and solved for w^*_n above.

Unadjusted Capital (k^*_n): Using the capital allocation rule, we have:

$$k^{M*}_n = \xi^*_{nn}k^*_n,$$

which implies that unadjusted total capital (k^*_n) is:

$$k^*_n = \frac{k^{M*}_n}{\xi^*_{nn}} = \frac{1}{\xi^*_{nn}}\frac{\alpha^M}{1-\alpha^M}\frac{w^{L*}_n\ell^{M*}_n}{r^*_n} = \frac{1}{\xi^*_{nn}}\frac{\alpha^M}{1-\alpha^M}\frac{w^{L*}_n\ell^{M*}_n}{\overline{\rho}_n},$$

where we observe ℓ^{M*}_n and solved for (w^{L*}_n, ξ^*_{nn}) above.

Manufacturing Price-adjusted Productivity ($p^M_n z^M_n$): From zero profits, manufacturing price-adjusted productivity ($p^M_n z^M_n$) is:

$$p^M_n z^M_n = \left(r^*_n\right)^{\alpha^M}\left(w^{L*}_n\right)^{1-\alpha^M} = \left(\frac{\overline{\rho}_n}{\gamma}\left(\xi^*_{nn}\right)^{1/\theta}\right)^{\alpha^M}\left(w^{L*}_n\right)^{1-\alpha^M},$$

where we solved for ξ^*_{nn} and w^{L*}_n above.

Agricultural Price-adjusted Productivity ($p^A_n z^A_n$): From zero profits, agricultural price-adjusted productivity ($p^A_n z^A_n$) is:

$$p^A_n z^A_n = \left(q^*_n\right)^{\alpha^A}\left(w^{L*}_n\right)^{1-\alpha^A} = \left(\frac{\alpha^A}{1-\alpha^A}\frac{w^{L*}_n\ell^{A*}_n}{m_n}\right)^{\alpha^A}\left(w^{L*}_n\right)^{1-\alpha^A},$$

where we observe ℓ_n^{A*} and solved for w_n^{L*} above.

Price-adjusted Amenities (B_{nt}/p_{nt}): From population mobility, we can recover price-adjusted amenities (up to a normalization or choice of units) as follows:

$$\frac{\ell_n^*}{\widetilde{\ell}} = \left(\frac{B_n/p_n}{\widetilde{B}/\widetilde{p}}\right)^{1/\kappa} \left(\frac{w_n^{L*}}{\widetilde{w}^{L*}}\right)^{1/\kappa},$$

where a tilde above a variable denotes a geometric mean. We thus obtain:

$$\frac{B_n/p_n}{\widetilde{B}/\widetilde{p}} = \left(\frac{\ell_n^*}{\widetilde{\ell}}\right)^{\kappa} \left(\frac{w_n^{L*}}{\widetilde{w}^{L*}}\right)^{-1},$$

where we observe $(\ell_n^*, \widetilde{\ell})$ and solved for $(w_n^{L*}, \widetilde{w}^{L*})$ above and choose units to measure amenities such that $\widetilde{B}/\widetilde{p} = 1$.

Expected Utility ($\mathbb{U}_t$): From expected utility, we have:

$$\exp\left(\mathbb{U}_t\right) = \left[\sum_{k=1}^{N} \left(B_{kt} w_{kt}^L / p_{kt}\right)^{1/\kappa}\right]^{\kappa},$$

which implies that we can recover expected utility from:

$$\exp\left(\mathbb{U}_t\right) = \left[\sum_{k=1}^{N} \left(\left(\frac{\ell_n^*}{\widetilde{\ell}}\right)^{\kappa} \widetilde{w}^{L*}\right)^{1/\kappa}\right]^{\kappa}.$$

Income from Slavery Investments: Income in each location is given by:

$$x_{nt} = q_{nt} m_n + w_{nt}\left(\ell_{it}^A + \ell_{it}^M\right) + v_{nt}\left(k_{nt}^M + k_{nt}^S\right),$$

$$x_{nt} = w_{nt}\left(\ell_{it}^A + \ell_{it}^M\right) + \left(\mathbb{R}_{nt}^A + \mathbb{R}_{nt}^M + \mathbb{R}_{nt}^S\right).$$

The share of income from slavery is therefore:

$$\frac{\mathbb{R}_{nt}^S}{x_{nt}} = \frac{\mathbb{R}_{nt}^S}{w_{nt}\left(\ell_{it}^A + \ell_{it}^M\right) + \left(\mathbb{R}_{nt}^A + \mathbb{R}_{nt}^M + \mathbb{R}_{nt}^S\right)}.$$

□

C.14 Steady-state Counterfactuals

In this section of the Online Appendix, we show how the model can be used to undertake counterfactuals for the steady-state impact of removing access to slavery investments. We develop a method for computing these counterfactuals to implement the comparative static in Proposition 1 of the paper and Section C.12 of this Online Appendix.

We measure slavery investments at the time of the abolition of slavery using our slave-holder compensation data. We assume standard values for the model's parameters from the existing empirical literature, as discussed further in Section D of this Online Appendix. We start at the observed equilibrium in the data in 1833 and undertake a counterfactual for a prohibitive increase in financial frictions with the colonial plantation ($\phi_{n\mathbb{N}} \to \infty$ for all n). Comparing the resulting counterfactual equilibrium to the observed equilibrium, we evaluate the impact of access to slavery investments on levels and patterns of economic activity.

We use an exact-hat algebra approach, in which we re-write the counterfactual equilibrium conditions in terms of the observed variables in the data in 1833, and the relative changes of the endogenous variables between the counterfactual and observed equilibria. We denote the counterfactual equilibrium variables with a prime, the observed equilibrium values with no prime, and the relative changes of variables between the two equilibrium with a hat (such that $\hat{x}_n = x'_n/x_n$). We assume that the observed equilibrium in 1833 is close to steady-state, in the absence of any further changes in technology or other exogenous variables of the model.[6] We solve for the new counterfactual steady-state equilibrium given prohibitive colonial financial frictions. We hold constant goods prices on world markets (p^{AW}, p^{MW}, p^{SW}) and the other exogenous variables of the model. Therefore, this counterfactual captures the pure impact of the abolition of slavery on economic development through the mechanism of capital accumulation.

We use the property of the model that the domestic investment share (ξ^*_{nn}) is a summary statistic for the impact of access to slavery investments on the spatial distribution of economic activity. As colonial financial frictions become prohibitive ($\phi_{n\mathbb{N}} \to \infty$ for all n), the domestic investment share converges to one ($\xi^{*\prime}_{nn} \to 1$ for all n), such that the relative change in colonial financial frictions is given by $\widehat{\xi}_{nn} = 1/\xi_{nn}$. Given this counterfactual change in the domestic investment share ($\widehat{\xi^*_{nn}}$), we can solve for the counterfactual changes in all other endogenous variables from Proposition 1 in the paper.

Counterfactual Change in Domestic Investment Share ($\widehat{\xi^*_{nn}}$): The counterfactual change in the domestic investment share is:

$$\widehat{\xi^*_{nn}} = \frac{1}{\xi^*_{nn}}.$$

Counterfactual Change in Expected Return to Capital ($\widehat{v^*_n}$): The steady-state expected return to capital (v^*_n) is determined by no-arbitrage with the consumption bond ($\overline{\rho}_n$), and hence

[6] To the extent that the full steady-state impact of British participation in slavery from the 1640s onwards had not been realized by the 1830s, we may underestimate this steady-state impact by starting from the observed equilibrium in the 1830s.

is invariant respect to the removal of access to slavery investments:

$$\widehat{v}_n^* = 1. \tag{C.82}$$

Counterfactual Change in Rental Rate (r_n^*): The counterfactual change in the steady-state rental rate (r_n^*) is given by:

$$\widehat{r}_n^* = \left(\widehat{\xi}_{nn}^*\right)^{\frac{1}{\theta}}. \tag{C.83}$$

Therefore, the removal of access to slavery investments increases the steady-state rental rate in locations that participated in slavery (through a rise in ξ_{nn}^*).

Counterfactual Wage ($\widehat{w}_n^{L*}$): Recall from equation (C.66) that the zero-profit condition in the manufacturing sector implies:

$$p_n^M z_n^M = \left(r_n^*\right)^{\alpha^M} \left(w_n^{L*}\right)^{1-\alpha^M}.$$

Therefore, the counterfactual change in the steady-state wage is:

$$\widehat{w}_n^{L*} = \left(\widehat{r}_n^*\right)^{-\frac{\alpha^M}{1-\alpha^M}}. \tag{C.84}$$

Hence, the removal of access to slavery investments reduces the steady-state wage in locations that participated in slavery (because of the rise in the rental rate r_n^*).

Counterfactual Total Population Share ($\widehat{\mu}_n^*$): From the population choice probabilities, the counterfactual change in the steady-state population share is:

$$\widehat{\mu}_n^* \mu_n^* = \frac{\mu_n^* \left(\widehat{w}_n^*\right)^{1/\kappa}}{\sum_{k=1}^N \mu_k^* \left(\widehat{w}_k^*\right)^{1/\kappa}}. \tag{C.85}$$

Hence, the removal of access to slavery investments reduces the steady-state population share in locations that participated in slavery (because of the fall in the wage w_n^*).

Counterfactual Land Price ($\widehat{q}_n^*$): Recall from equation (C.67) that the zero-profit condition in agriculture implies:

$$p_n^A z_n^A = \left(q_n^*\right)^{\alpha^A} \left(w_n^{L*}\right)^{1-\alpha^A}.$$

Therefore, the counterfactual change in the steady-state land price is:

$$\widehat{q}_n^* = \left(\widehat{w}_n^{L*}\right)^{-\frac{\left(1-\alpha^A\right)}{\alpha^A}}. \tag{C.86}$$

Hence, the removal of access to slavery investments increases the steady-state land price in locations that participated in slavery (because of the fall in the wage w_n^*).

Counterfactual Productivity-Adjusted Manufacturing Capital-Labor Ratio ($\widehat{\frac{\widetilde{k}_n^{M*}}{\ell_n^{M*}}}$): Recall from equation (C.69) that the steady-state productivity-adjusted manufacturing capital-labor ratio can be written as:

$$\frac{\widetilde{k}_n^{M*}}{\ell_n^{M*}} = \frac{\alpha^M}{1-\alpha^M} \frac{w_n^{L*}}{r_n^*}.$$

Therefore, the counterfactual change in the steady-state productivity-adjusted manufacturing capital-labor ratio is:

$$\frac{\widehat{\widetilde{k}_n^{M*}}}{\ell_n^{M*}} = \frac{\widehat{w}_n^{L*}}{\widehat{r}_n^*}. \tag{C.87}$$

Hence, the removal of access to slavery investments reduces the steady-state productivity-adjusted manufacturing capital-labor ratio in locations that participated in slavery (through the fall in the wage (w_n^{L*}) and the rise in the rental rate r_n^*).

Counterfactual Unadjusted Manufacturing Capital-Labor Ratio ($\frac{\widehat{k_n^{M*}}}{\ell_n^{M*}}$): Recall from equilibrium capital portfolio allocations, productivity and un-adjusted capital are related according to:

$$\widetilde{k}_{nt}^M = \gamma \xi_{nnt}^{\frac{\theta-1}{\theta}} k_{nt}.$$

Therefore the counterfactual change in the unadjusted manufacturing capital-labor ratio is given by:

$$\frac{\widehat{k_n^{M*}}}{\ell_n^{M*}} = \widehat{\xi}_{nnt}^{-\frac{\theta-1}{\theta}} \frac{\widehat{w}_n^{L*}}{\widehat{r}_n^*}. \tag{C.88}$$

Hence, the removal of access to slavery investments reduces the steady-state unadjusted manufacturing capital-labor ratio in locations that participated in slavery (through the rise in ξ_{nn}^*, the fall in the wage w_n^* and the rise in the rental rate r_n^*).

Counterfactual Agricultural Employment ($\widehat{\ell}_{nt}^A$): Recall from equation (C.71) that steady-state agricultural employment can be written as:

$$\ell_{nt}^A = \left(\frac{p_{nt}^A z_{nt}^A}{w_{nt}^L}\right)^{\frac{1}{\alpha^A}} \left(\frac{1-\alpha^A}{\alpha^A}\right) m_n.$$

Therefore the counterfactual change in agricultural employment is:

$$\widehat{\ell}_{nt}^A = \left(\widehat{w}_{nt}^L\right)^{-\frac{1}{\alpha^A}}$$

Hence, the removal of access to slavery investments increases steady-state agricultural employment in locations that participated in slavery (through the lower wage w_n^*). **Counterfactual Manufacturing Employment ($\widehat{\ell}_n^{M*} \ell_n^{M*}$):** Recall from equation (C.58) that steady-state manufacturing employment can be written as:

$$\ell_n^{M*} = \ell_n^* - \ell_n^{*A}.$$

Therefore, the counterfactual change in steady-state manufacturing employment from the abolition of slavery can be recovered from:

$$\widehat{\ell}_n^{M*} \ell_n^{M*} = \widehat{\ell}_n^* \ell_n^* - \widehat{\ell}_n^{*A} \ell_n^{*A}, \tag{C.89}$$

where we determined $\widehat{\ell_n^*}$ and $\widehat{\ell_n^{*A}}$ above. Since the removal of access to slavery investments reduces total population and increases agricultural employment in the locations that participated in slavery the most, it also reduces manufacturing employment in the locations that participated in slavery the most.

Counterfactual Productivity-Adjusted Manufacturing Capital Stock ($\widehat{\widetilde{k}_n^{M*}}$): Recall from equation (C.59) that the steady-state productivity-adjusted manufacturing capital stock can be written as:

$$\widetilde{k}_n^{M*} = \frac{\widetilde{k}_n^{M*}}{\ell_n^{*M}} \ell_n^{*M}.$$

Therefore, the counterfactual change in the steady-state productivity-adjusted manufacturing capital stock can be recovered from:

$$\widehat{\widetilde{k}_n^{M*}} = \widehat{\frac{\widetilde{k}_n^{M*}}{\ell_n^{*M}}} \widehat{\ell_n^{*M}}, \tag{C.90}$$

where we determined $\widehat{\frac{\widetilde{k}_n^{M*}}{\ell_n^{*M}}}$ and $\widehat{\ell_n^{*M}}$ above. Since the removal of access to slavery investments reduces the steady-state productivity-adjusted manufacturing capital-labor ratio and reduces steady-state manufacturing employment, it also reduces the steady-state productivity-adjusted manufacturing capital stock.

Counterfactual Unadjusted Manufacturing Capital Stock ($\widehat{k_n^{M*}}$): Recall from equation (C.60) that the steady-state manufacturing capital stock can be written as:

$$k_n^{M*} = \frac{k_n^{M*}}{\ell_n^{*M}} \ell_n^{*M},$$

Therefore, the counterfactual change in the steady-state manufacturing capital stock can be recovered from:

$$\widehat{k_n^{M*}} = \widehat{\frac{k_n^{M*}}{\ell_n^{*M}}} \widehat{\ell_n^{*M}},$$

where we determined $\widehat{\frac{k_n^{M*}}{\ell_n^{*M}}}$ and $\widehat{\ell_n^{*M}}$ above. Since the removal of access to slavery investments reduces the steady-state unadjusted manufacturing capital-labor ratio and reduces steady-state manufacturing employment, it also reduces the steady-state unadjusted manufacturing capital stock.

Counterfactual Capital Stock ($\widehat{k_n^*}$): Recall from equation (C.61) that the steady-state capital stock can be written as:

$$k_n^* = \frac{k_n^{M*}}{\xi_{nn}^*}.$$

Therefore, the counterfactual change in the steady-state capital stock can be recovered from:

$$\widehat{k_n^*} = \frac{k_n^{M*}}{\widehat{\xi_{nn}^*}} = \frac{\widehat{k_n^{M*}}}{1/\xi_{nn}^*}. \tag{C.91}$$

where we determined $\widehat{k_n^{M*}}$ and $\widehat{\xi_{nn}^{*}}$ above. Since the removal of access to slavery investments reduces the steady-state unadjusted manufacturing capital stock, it also reduces the steady-state capital stock.

Counterfactual Expected Worker Welfare ($\widehat{\exp(\mathbb{U}^*)}$): Recall from equation (C.76) that steady-state expected worker welfare can be written as:

$$\exp(\mathbb{U}^*) = \left[\sum_{k=1}^{N} \left(B_k w_k^{L*}/p_k\right)^{1/\kappa}\right]^{\kappa}.$$

Therefore, the counterfactual change in steady-state expected worker welfare can be written as:

$$\widehat{\exp(\mathbb{U}^*)} = \left[\sum_{k=1}^{N} \mu_{kt} \left(\widehat{w_k^{L*}}\right)^{1/\kappa}\right]^{\kappa}. \tag{C.92}$$

Hence, the removal of access to slavery investments reduces steady-state expected worker welfare (through lower w_n^*).

Counterfactual Capitalist Real Income: Recall that capitalist real income is:

$$\frac{v_n^* k_n^*}{p_n}.$$

We show above that v_n^* is invariant to ξ_{nn}^* and p_n is exogenous. Therefore, the counterfactual change in capitalist real income is given by:

$$\widehat{k_n^*}.$$

We showed above that the removal of access to slavery investments reduces the steady-state capital stock ($\widehat{k_n^*} < 1$). Hence, it also reduces steady-state capitalist real income.

Counterfactual Landowner Real Income: Recall that landowner real income is:

$$\frac{q_n^* m_n}{p_n}.$$

Both m_n and p_n are exogenous. Therefore, the counterfactual change in landowner real income is given by:

$$\widehat{q_n^*}.$$

We showed above that the removal of access to slavery investments increases steady-state agricultural land prices ($\widehat{q_n^*} > 1$). Hence, it also increases landowner real income.

Counterfactual Income: Note that income in each location is given by:

$$x_{nt} = q_{nt} m_n + w_{nt}\left(\ell_{it}^{A} + \ell_{it}^{M}\right) + v_{nt}\left(k_{nt}^{M} + k_{nt}^{S}\right),$$

$$x_{nt} = w_{nt}\left(\ell_{it}^{A} + \ell_{it}^{M}\right) + \left(\mathbb{R}_{nt}^{A} + \mathbb{R}_{nt}^{M} + \mathbb{R}_{nt}^{S}\right).$$

$$x_{nt} = w_{nt}\ell_{it} + \left(\mathbb{R}^A_{nt} + \mathbb{R}^M_{nt} + \mathbb{R}^S_{nt}\right).$$

Therefore, the counterfactual change in income is given by:

$$\widehat{x}_{nt}x_{nt} = \widehat{w}_{nt}\widehat{\ell}_{it}w_{nt}\ell_{it} + \left(\widehat{\mathbb{R}}^A_{nt}\mathbb{R}^A_{nt} + \widehat{\mathbb{R}}^M_{nt}\mathbb{R}^M_{nt} + \widehat{\mathbb{R}}^S_{nt}\mathbb{R}^S_{nt}\right).$$

$$\widehat{x}_{nt} = \frac{w_{nt}\ell_{it}}{x_{nt}}\widehat{w}_{nt}\widehat{\ell}_{it} + \frac{\mathbb{R}^A_n}{x_{nt}}\widehat{\mathbb{R}}^A_n + \frac{\mathbb{R}^M_n}{x_{nt}}\widehat{\mathbb{R}}^M_n,$$

where we have used $\widehat{\mathbb{R}}^S_{nt} = 0$. We can re-write this counterfactual change in income as:

$$\widehat{x}_{nt} = \frac{w_{nt}\ell_{it}}{x_{nt}}\widehat{w}_{nt}\widehat{\ell}_{it} + \frac{\mathbb{R}^A_n}{x_{nt}}\widehat{q}^A_n + \frac{\mathbb{R}^M_n}{x_{nt}}\widehat{v}_n\widehat{k}_n.$$

We thus have a direct loss in income from the removal of access to slavery investments (as captured by the compensation payments $\mathbb{R}^S_{nt}$) and an indirect loss through changes in incomes in the agricultural and manufacturing sectors.

C.15 Worker Location Decisions

In this section of the Online Appendix, we provide the detailed derivations for workers' location decisions. In Subsection C.15.1, we characterize worker expected utility. In Subsection C.15.2, we derive workers' location choice probabilities.

C.15.1 Expected Utility

We now derive expected utility in equation (C.23) of this online appendix. Recall that idiosyncratic amenities are drawn from an extreme value distribution with the following cumulative distribution function:

$$F(b) = e^{-e^{(-b-\bar{\gamma})}},$$

and corresponding probability density function:

$$f(b) = e^{(-b-\bar{\gamma})}e^{-e^{(-b-\bar{\gamma})}}.$$

Using this extreme value distribution, note that:

$$\text{Prob}\left[u_{nt} + \kappa b_{nt} \geq u_{mt} + \kappa b_{mt}\right], \qquad \forall\, m \neq n,$$

$$\text{Prob}\left[u_{nt} - u_{mt} + \kappa b_{nt} \geq \kappa b_{mt}\right],$$

$$\text{Prob}\left[\kappa b_{mt} \leq u_{nt} - u_{mt} + \kappa b_{nt}\right],$$

$$\text{Prob}\left[\kappa b_{mt} \leq \kappa \bar{b}_{nmt} + \kappa b_{nt}\right],$$

$$\bar{b}_{nmt} \equiv \frac{u_{nt} - u_{mt}}{\kappa},$$

$$\text{Prob}\left[b_{mt} \leq \bar{b}_{nmt} + b_{nt}\right].$$

Now define expected utility as:

$$\mathbb{U}_t = \max_{\{n\}_1^N} \left\{\mathbb{E}_b\left[u_{nt}\right] + \kappa b_{nt}\right\}$$

$$\mathbb{U}_t = \sum_{n=1}^{N} \int_{-\infty}^{\infty} \left(u_{nt} + \kappa b_{nt}\right) f\left(b_{nt}\right) \prod_{m \neq n} F\left(\bar{b}_{nmt} + b_{nt}\right) \mathrm{d}b_{nt}.$$

Using our assumed functional form, we have:

$$\mathbb{U}_t = \sum_{n=1}^{N} \int_{-\infty}^{\infty} \left(u_{nt} + \kappa b_{nt}\right) e^{\left(-b_{nt}-\bar{\gamma}\right)} e^{-e^{\left(-b_{nt}-\bar{\gamma}\right)}} e^{-\sum_{m \neq n} e^{\left(-\bar{b}_{nmt}-b_{nt}-\bar{\gamma}\right)}} \mathrm{d}b_{nt},$$

$$\mathbb{U}_t = \sum_{n=1}^{N} \int_{-\infty}^{\infty} \left(u_{nt} + \kappa b_{nt}\right) e^{\left(-b_{nt}-\bar{\gamma}\right)} e^{-\sum_{m=1}^{N} e^{\left(-\bar{b}_{nmt}-b_{nt}-\bar{\gamma}\right)}} \mathrm{d}b_{nt},$$

since $\bar{b}_{nnt} = 0$.

$$\mathbb{U}_t = \sum_{n=1}^{N} \int_{-\infty}^{\infty} \left(u_{nt} + \kappa b_{nt}\right) e^{\left(-b_{nt}-\bar{\gamma}\right)} e^{-e^{\left(-b_{nt}-\bar{\gamma}\right)} \sum_{m=1}^{N} e^{\left(-\bar{b}_{nmt}\right)}} \mathrm{d}b_{nt}.$$

Define:

$$\eta_{nt} \equiv \log \sum_{m=1}^{N} e^{-\bar{b}_{nmt}},$$

$$e^{\eta_{nt}} = \sum_{m=1}^{N} e^{-\bar{b}_{nmt}},$$

$$\zeta_{nt} \equiv b_{nt} + \bar{\gamma},$$

Using these definitions:

$$\mathbb{U}_t = \sum_{n=1}^{N} \int_{-\infty}^{\infty} \left(u_{nt} + \kappa\left(\zeta_{nt} - \bar{\gamma}\right)\right) e^{\left(-\zeta_{nt}\right)} e^{-e^{\left(-\zeta_{nt}\right)} \sum_{m=1}^{N} e^{\left(-\bar{b}_{nmt}\right)}} \mathrm{d}\zeta_{nt},$$

$$\mathbb{U}_t = \sum_{n=1}^{N} \int_{-\infty}^{\infty} \left(u_{nt} + \kappa\left(\zeta_{nt} - \bar{\gamma}\right)\right) e^{\left(-\zeta_{nt}\right)} e^{-e^{\left(-\zeta_{nt}\right)} e^{\eta_{nt}}} \mathrm{d}\zeta_{nt},$$

$$\mathbb{U}_t = \sum_{n=1}^{N} \int_{-\infty}^{\infty} \left(u_{nt} + \kappa\left(\zeta_{nt} - \bar{\gamma}\right)\right) e^{\left(-\zeta_{nt}\right)} e^{-e^{\left(-\left(\zeta_{nt}-\eta_{nt}\right)\right)}} \mathrm{d}\zeta_{nt}.$$

Now define another change of variables:

$$\tilde{y}_{nt} \equiv \zeta_{nt} - \eta_{nt}.$$

Using this definition:

$$\mathbb{U}_t = \sum_{n=1}^{N} \int_{-\infty}^{\infty} \left(u_{nt} + \kappa \left(\tilde{y}_{nt} + \eta_{nt} - \bar{\gamma}\right)\right) e^{\left(-(\tilde{y}_{nt}+\eta_{nt})-e^{(-\tilde{y}_{nt})}\right)} \mathrm{d}\tilde{y}_{nt}.$$

$$\mathbb{U}_t = \sum_{n=1}^{N} \left(\begin{array}{c} \int_{-\infty}^{\infty} \left(u_{nt} + \kappa \left(\eta_{nt} - \bar{\gamma}\right)\right) e^{\left(-(\tilde{y}_{nt}+\eta_{nt})-e^{(-\tilde{y}_{nt})}\right)} \mathrm{d}\tilde{y}_{nt} \\ +\kappa \int_{-\infty}^{\infty} \tilde{y}_{nt} e^{\left(-(\tilde{y}_{nt}+\eta_{nt})-e^{(-\tilde{y}_{nt})}\right)} \mathrm{d}\tilde{y}_{nt} \end{array} \right).$$

$$\mathbb{U}_t = \sum_{n=1}^{N} e^{-\eta_{nt}} \left(\begin{array}{c} \left(u_{nt} + \kappa \left(\eta_{nt} - \bar{\gamma}\right)\right) \int_{-\infty}^{\infty} e^{\left(-\tilde{y}_{nt}-e^{(-\tilde{y}_{nt})}\right)} \mathrm{d}\tilde{y}_{nt} \\ +\kappa \int_{-\infty}^{\infty} \tilde{y}_{nt} e^{\left(-(\tilde{y}_{nt}+\eta_{nt})-e^{(-\tilde{y}_{nt})}\right)} \mathrm{d}\tilde{y}_{nt} \end{array} \right).$$

Now note that:

$$\frac{\mathrm{d}}{\mathrm{d}y} \left[e^{-e^{-y}} \right] = e^{-y-e^{-y}},$$

$$\int_{-\infty}^{\infty} e^{\left(-\tilde{y}_{nt}-e^{(-\tilde{y}_{nt})}\right)} \mathrm{d}\tilde{y}_{nt} = \left[e^{-e^{-\tilde{y}_{nt}}} \right]_{-\infty}^{\infty} = [1 - 0],$$

which implies:

$$\mathbb{U}_{it} = \sum_{n=1}^{N} e^{-\eta_{nt}} \left(\begin{array}{c} \left(u_{nt} + \kappa \left(\eta_{nt} - \bar{\gamma}\right)\right) \\ +\kappa \int_{-\infty}^{\infty} \tilde{y}_{nt} e^{\left(-(\tilde{y}_{nt}+\eta_{nt})-e^{(-\tilde{y}_{nt})}\right)} \mathrm{d}\tilde{y}_{nt} \end{array} \right).$$

Now note also that:

$$\kappa\bar{\gamma} = \kappa \int_{-\infty}^{\infty} \tilde{y}_{nt} e^{\left(-(\tilde{y}_{nt}+\eta_{nt})-e^{(-\tilde{y}_{nt})}\right)} \mathrm{d}\tilde{y}_{nt},$$

Therefore:

$$\mathbb{U}_t = \sum_{n=1}^{N} e^{-\eta_{nt}} \left(u_{nt} + \kappa\eta_{nt}\right).$$

Using the definition of η_{nt}, we have:

$$\mathbb{U}_t = \sum_{n=1}^{N} e^{-\log \sum_{m=1}^{N} e^{-\bar{b}_{nmt}}} \left(u_{nt} + \kappa \log \sum_{m=1}^{N} e^{-\bar{b}_{nmt}} \right).$$

Recall that

$$\bar{b}_{nmt} \equiv \frac{u_{nt} - u_{mt}}{\kappa}.$$

Therefore

$$\begin{aligned} \left(u_{nt} + \kappa \log \sum_{m=1}^{N} e^{-\bar{b}_{nmt}} \right) &= \left(u_{nt} + \kappa \log \sum_{m=1}^{N} e^{-\frac{(u_{nt}-u_{mt})}{\kappa}} \right) \\ &= \kappa \log \left(\sum_{m=1}^{N} e^{\frac{u_{mt}}{\kappa}} \right) \\ &= \kappa \log \left(\sum_{m=1}^{N} e^{u_{mt}^{1/\kappa}} \right), \end{aligned}$$

and

$$\begin{aligned}\sum_{n=1}^{N} e^{-\log \sum_{m=1}^{N} e^{-\bar{b}_{nmt}}} &= \sum_{n=1}^{N} e^{-\log \sum_{m=1}^{N} e^{-\frac{u_{nt}-u_{mt}}{\kappa}}}, \\ &= \sum_{n=1}^{N} e^{-\log\left[e^{-u_{nt}^{1/\kappa}} \sum_{m=1}^{N} e^{u_{mt}^{1/\kappa}}\right]} \\ &= \sum_{n=1}^{N} e^{u_{nt}^{1/\kappa}} \sum_{m=1}^{N} e^{-u_{mt}^{1/\kappa}} \\ &= 1.\end{aligned}$$

Thus we obtain the expression for expected utility in equation (C.23):

$$\mathbb{U}_t = \max_{\{n\}_1^N} \left\{\mathbb{E}_b\left[u_{nt}\right] + \kappa b_{nt}\right\} = \kappa \log\left(\sum_{n=1}^{N} e^{u_{nt}^{1/\kappa}}\right).$$

C.15.2 Location Choice Probabilities

We now derive the location choice probabilities (μ_{nt}) in equation (C.22) in this Online Appendix. The probability that a worker chooses location n is given by:

$$\mu_{nt} = \text{Prob}\left[\frac{\bar{u}_{nt}}{\kappa} + b_{nt} \geq \max_{m \neq n}\left\{\frac{\bar{u}_{mt}}{\kappa} + b_{mt}\right\}\right],$$

$$\mu_{nt} = \text{Prob}\left[\frac{\bar{u}_{nt} - \bar{u}_{mt}}{\kappa} + b_{nt} \geq \max_{m \neq n}\left\{b_{mt}\right\}\right],$$

where we use $\bar{u}_{nt}$ to denote the common component of utlity. Therefore this location choice probability can be written as:

$$\mu_{nt} = \int_{-\infty}^{\infty} f\left(b_{nt}\right) \prod_{m \neq n} F\left(\frac{\bar{u}_{nt} - \bar{u}_{mt}}{\kappa} + b_{nt}\right) \mathrm{d}b_{nt}.$$

Using our extreme value distributional assumption and the definition of $\bar{b}_{nmt}$ in the previous subsection, we can write this as:

$$\mu_{nt} = \int_{-\infty}^{\infty} e^{(-b_{nt}-\bar{\gamma})} e^{-e^{(-b_{nt}-\bar{\gamma})} \sum_{m=1}^{N} e^{-\bar{b}_{nmt}}} \mathrm{d}b_{nt},$$

Recall from the previous subsection the following definitions:

$$\eta_{nt} \equiv \log \sum_{m=1}^{N} e^{-\bar{b}_{nmt}},$$

$$e^{\eta_{nt}} = \sum_{m=1}^{N} e^{-\bar{b}_{nmt}},$$

$$\zeta_{nt} \equiv b_{nt} + \bar{\gamma}.$$

Using these definitions, our location choice probability can be written as follows:

$$\mu_{nt} = \int_{-\infty}^{\infty} e^{-\zeta_{nt}} e^{-e^{-\zeta_{nt}} e^{\eta_{nt}}} \mathrm{d}\zeta_{nt},$$

Now recall the following additional definition from the previous subsection:

$$\tilde{y}_{nt} \equiv \zeta_{nt} - \eta_{nt}.$$

$$\mu_{nt} = \int_{-\infty}^{\infty} e^{-(\tilde{y}_{nt}+\eta_{nt})} e^{-e^{-(\tilde{y}_{nt}+\eta_{nt})} e^{\eta_{nt}}} \mathrm{d}\tilde{y}_{nt},$$

$$\mu_{nt} = e^{-\eta_{nt}} \int_{-\infty}^{\infty} e^{-\tilde{y}_{nt}} e^{-e^{-(\tilde{y}_{nt})}} \mathrm{d}\tilde{y}_{nt},$$

$$\mu_{nt} = e^{-\eta_{nt}} \int_{-\infty}^{\infty} e^{-\tilde{y}_{nt} - e^{-(\tilde{y}_{nt})}} \mathrm{d}\tilde{y}_{nt},$$

Recall that:

$$\int_{-\infty}^{\infty} e^{\left(-\tilde{y}_{nt} - e^{(-\tilde{y}_{nt})}\right)} \mathrm{d}\tilde{y}_{nt} = \left[e^{-e^{-\tilde{y}_{nt}}} \right]_{-\infty}^{\infty} = [1 - 0].$$

Therefore we have

$$\mu_{nt} = e^{-\eta_{nt}}.$$

Recall

$$\eta_{nt} \equiv \log \sum_{m=1}^{N} e^{-\bar{b}_{nmt}},$$

Therefore

$$\mu_{nt} = e^{-\left[\log \sum_{m=1}^{N} e^{-\bar{b}_{nmt}}\right]},$$

Recall

$$\bar{b}_{nmt} \equiv \frac{(\bar{u}_{nt} - \bar{u}_{mt})}{\kappa}.$$

Therefore

$$\mu_{nt} = e^{-\log\left[\sum_{m=1}^{N} e^{-\frac{(\bar{u}_{nt} - \bar{u}_{mt})}{\kappa}}\right]},$$

$$\mu_{nt} = e^{-\log\left[e^{-\bar{u}_{nt}^{1/\kappa}} \sum_{m=1}^{N} e^{\bar{u}_{mt}^{1/\kappa}}\right]},$$

$$\mu_{nt} = e^{\log\left[e^{\bar{u}_{nt}^{1/\kappa}} \sum_{m=1}^{N} e^{-\bar{u}_{mt}^{1/\kappa}}\right]},$$

$$\mu_{nt} = e^{\log\left[\frac{e^{\bar{u}_{nt}^{1/\kappa}}}{\sum_{m=1}^{N} e^{\bar{u}_{mt}^{1/\kappa}}}\right]},$$

$$\mu_{nt} = \frac{e^{\bar{u}_{nt}^{1/\kappa}}}{\sum_{m=1}^{N} e^{\bar{u}_{mt}^{1/\kappa}}},$$

which yields equation (C.22) in this online appendix:

$$\mu_{nt} = \frac{\exp\left(\bar{u}_{nt}\right)^{1/\kappa}}{\sum_{m=1}^{N} \exp\left(\bar{u}_{mt}\right)^{1/\kappa}}.$$

C.16 Capital Allocation Decisions Within Periods

In this section of the Online Appendix, we provide the detailed derivations for capitalists capital allocation decisions within periods. In Subsection C.16.1, we characterize the bilateral distribution of capital returns. In Subsection C.16.2, we derive the capital allocation probabilities. In Subsection C.16.3, we analyze the multilateral distribution of capital returns. In Subsection C.16.4, we derive the expected return to capital. In Subsection C.17, we characterize the average productivity of capital for each bilateral investment allocation.

C.16.1 Bilateral Distribution of Capital Returns

The returns to a unit of capital allocated from location n to location $i \in \{n, \mathbb{N}\}$ are:

$$v_{nit} = \frac{\epsilon_{nit} r_{it}}{\phi_{nit}}.$$

Effective units of capital are drawn from the following distribution:

$$F(\epsilon) = e^{-\epsilon^{-\theta}}, \qquad \theta > 1.$$

Using the monotonic relationship between income and effective units of capital, we have:

$$\epsilon_{nit} = \frac{v_{nit}}{r_{it}/\phi_{nit}}.$$

The distribution of capital returns from location n to location $i \in \{n, \mathbb{N}\}$ is therefore:

$$F_{ni}(v) = e^{-(r_{it}/\phi_{nit})^{\theta} v^{-\theta}}, \qquad \theta > 1.$$

C.16.2 Derivation of Capital Allocation Probabilities

The probability that capital is allocated to location $i \in \{n, \mathbb{N}\}$ is:

$$\begin{aligned}
\xi_{nit} &= \text{Prob}\left[v_{nit} \geq \max\{v_{not}\}; o \in \{n, \mathbb{N}\}\right], \\
&= \int_0^\infty \prod_{o \neq i} F_{no}(v) f_{ni}(v) \, dv, \\
&= \int_0^\infty \left[\prod_{o \neq i} e^{-(r_{ot}/\phi_{not})^{\theta} v^{-\theta}}\right] \theta (r_{it}/\phi_{nit})^{\theta} v^{-(\theta+1)} e^{-(r_{it}/\phi_{nit})^{\theta} v^{-\theta}} dv, \\
&= \int_0^\infty \left[\prod_{o \in \{n, \mathbb{N}\}} e^{-(r_{ot}/\phi_{not})^{\theta} v^{-\theta}}\right] \theta (r_{it}/\phi_{nit})^{\theta} v^{-(\theta+1)} dv, \\
&= \int_0^\infty \left[e^{-\Psi_{nt} v^{-\theta}}\right] \theta \Psi_{nit} v^{-(\theta+1)} dv,
\end{aligned}$$

where:

$$\Psi_{nit} \equiv \left(r_{it}/\phi_{nit}\right)^{\theta}, \qquad \Psi_{nt} \equiv \sum_{o\in\{n,\mathbb{N}\}} \left(r_{ot}/\phi_{not}\right)^{\theta}.$$

Note that:

$$\frac{d}{dv}\left[\frac{1}{\Psi_{nt}}e^{-\Psi_{nt}v^{-\theta}}\right] = \theta v^{-(\theta+1)}e^{-\Psi_{nt}v^{-\theta}}.$$

Using this result:

$$\xi_{nit} = \frac{\Psi_{nit}}{\Psi_{nt}} = \frac{\left(r_{it}/\phi_{nit}\right)^{\theta}}{\sum_{o\in\{n,\mathbb{N}\}}\left(r_{ot}/\phi_{not}\right)^{\theta}}.$$

C.16.3 Multilateral Distribution of Capital Returns

The distribution of capital returns in location n from all destinations $i \in \{n, \mathbb{N}\}$ is:

$$F_n\left(v\right) = \prod_{i\in\{n,\mathbb{N}\}} e^{-\left(r_{it}/\phi_{nit}\right)^{\theta}v^{-\theta}} = e^{-\Psi_{nt}v^{-\theta}}.$$

Note that the distribution of capital returns in location n across all destinations $i \in \{n, \mathbb{N}\}$ is equal to the distribution of capital returns in location n from a given destination i conditional on allocating capital to that destination:

$$\begin{aligned}
&= \frac{1}{\xi_{nit}}\int_o^v \prod_{o\neq i} F_{no}\left(v\right) f_{ni}\left(v\right)dv,\\
&= \frac{1}{\xi_{nit}}\int_o^v \left[\prod_{o\neq i} e^{-\left(r_{ot}/\phi_{not}\right)^{\theta}v^{-\theta}}\right]\theta\left(r_{it}/\phi_{nit}\right)^{\theta}v^{-(\theta+1)}e^{-\left(r_{it}/\phi_{nit}\right)^{\theta}v^{-\theta}}dv,\\
&= \frac{1}{\xi_{nit}}\int_o^v \left[\prod_{o\in\{n,\mathbb{N}\}} e^{-\left(r_{ot}/\phi_{not}\right)^{\theta}v^{-\theta}}\right]\theta\left(r_{it}/\phi_{nit}\right)^{\theta}v^{-(\theta+1)}dv,\\
&= \frac{\Psi_{nt}}{\Psi_{nit}}\int_o^v \left[e^{-\Psi_{nt}v^{-\theta}}\right]\theta\Psi_{nit}v^{-(\theta+1)}dv,\\
&= e^{-\Psi_{nt}v^{-\theta}}.
\end{aligned}$$

C.16.4 Derivation of Expected Return to Capital

The expected return to capital in location n across all destinations $i \in \{n, \mathbb{N}\}$ at time t is:

$$\begin{aligned}
\mathbb{E}_{nt}\left[v\right] &= \int_0^{\infty} vf_n\left(v\right)dv,\\
&= \int_0^{\infty} \theta\Psi_{nt}v^{-\theta}e^{-\Psi_{nt}v^{-\theta}}dv.
\end{aligned}$$

Now define the following change of variables:

$$y_{nt} = \Psi_{nt}v^{-\theta}, \qquad dy_t = -\theta\Psi_{nt}v^{-(\theta+1)}dv,$$

$$v = \left(\frac{y_{nt}}{\Psi_{nt}}\right)^{-\frac{1}{\theta}}, \qquad dv = -\frac{dy_{nt}}{\theta\Psi_{nt} v^{-(\theta+1)}} = -\frac{dy_{nt}}{\theta\Psi_{nt}\left(\frac{y_{nt}}{\Psi_{nt}}\right)^{\frac{\theta+1}{\theta}}},$$

Using this change of variables, the expected return to capital in location n from all destinations $i \in \{n, \mathbb{N}\}$ at time t can be written as:

$$\begin{aligned}
\mathbb{E}_{nt}[v] &= \int_0^\infty \theta\Psi_{nt} v^{-\theta} e^{-\Psi_{nt} v^{-\theta}} dv, \\
&= \int_0^\infty \theta y_{nt} e^{-y_{nt}} \frac{dy_{nt}}{\theta\Psi_{nt}\left(\frac{y_{nt}}{\Psi_{nt}}\right)^{\frac{\theta+1}{\theta}}}, \\
&= \int_0^\infty y_{nt} e^{-y_{nt}} \frac{(y_{nt})^{-\frac{\theta+1}{\theta}} dy_{nt}}{\Psi_{nt}(\Psi_{nt})^{-\frac{\theta+1}{\theta}}}, \\
&= \int_0^\infty \Psi_{nt}^{1/\theta} y_{nt}^{-1/\theta} e^{-y_{tn}} dy_{nt},
\end{aligned}$$

which can be in turn written as:

$$\mathbb{E}_{nt}[v] = \gamma\Psi_{nt}^{1/\theta} = \gamma\left[\sum_{o\in\{n,\mathbb{N}\}} (r_{ot}/\phi_{not})^{\theta}\right]^{1/\theta},$$

$$\gamma \equiv \Gamma\left(\frac{\theta-1}{\theta}\right).$$

C.17 Derivation of Average Capital Productivity

Recall that the distribution of capital returns in location n across all destinations $i \in \{n, \mathbb{N}\}$ is equal to the distribution of capital returns in location n from a given destination i conditional on allocating capital to that destination:

$$F_n(v) = e^{-\Psi_{nt} v^{-\theta}}.$$

Now recall the monotonic relationship between income and ability:

$$v_{nit} = \frac{\epsilon_{nit} r_{it}}{\phi_{nit}}.$$

Therefore the distribution of capital productivity for location n in a given destination i conditional on allocating capital to that destination:

$$\begin{aligned}
F_n(\epsilon) &= e^{-\Psi_{nt}(r_{it}/\phi_{nit})^{-\theta}\epsilon^{-\theta}}, \\
&= e^{-(\Psi_{nt}/\Psi_{nit})\epsilon^{-\theta}}.
\end{aligned}$$

Expected capital productivity for location n in a given destination i conditional on allocating capital to that destination at time t is:

$$\begin{aligned}
\mathbb{E}_n\left[\epsilon\right] &= \int_0^\infty \epsilon f_n\left(\epsilon\right) d\epsilon, \\
&= \int_0^\infty \theta\left(\Psi_{nt}/\Psi_{nit}\right)\epsilon^{-\theta} e^{-\left(\Psi_{nt}/\Psi_{nit}\right)\epsilon^{-\theta}} d\epsilon.
\end{aligned}$$

Now define the following change of variables:

$$y_{nt} = \left(\Psi_{nt}/\Psi_{nit}\right)\epsilon^{-\theta}, \qquad dy_{nt} = -\theta\left(\Psi_{nt}/\Psi_{nit}\right)\epsilon^{-(\theta+1)} d\epsilon,$$

$$\epsilon = \left(\frac{y_{nt}}{\Psi_{nt}/\Psi_{nit}}\right)^{-\frac{1}{\theta}}, \qquad d\epsilon = -\frac{dy_{nt}}{\theta\left(\Psi_{nt}/\Psi_{nit}\right)\left(\frac{y_{nt}}{\Psi_{nt}/\Psi_{nit}}\right)^{\frac{\theta+1}{\theta}}}.$$

Using this change of variables, capital productivity for location n in a given destination i conditional on allocating capital to that destination can be written as:

$$\begin{aligned}
\bar{\epsilon}_{nit} = \mathbb{E}_{nt}\left[\epsilon\right] &= \int_0^\infty \theta\left(\Psi_{nt}/\Psi_{nit}\right)\epsilon^{-\theta} e^{-\left(\Psi_{nt}/\Psi_{nit}\right)\epsilon^{-\theta}} d\epsilon, \\
&= \int_0^\infty \theta y_{nt} e^{-y_{nt}} \frac{dy_{nt}}{\theta\left(\Psi_{nt}/\Psi_{nit}\right)\left(\frac{y_{nt}}{\Psi_{nt}/\Psi_{nit}}\right)^{\frac{\theta+1}{\theta}}}, \\
&= \int_0^\infty y_{nt} e^{-y_{nt}} \frac{\left(y_{nt}\right)^{-\frac{\theta+1}{\theta}} dy_{nt}}{\left(\Psi_{nt}/\Psi_{nit}\right)\left(\Psi_{nt}/\Psi_{nit}\right)^{-\frac{\theta+1}{\theta}}}, \\
&= \int_0^\infty y_{nt}^{-1/\theta} e^{-y_{nt}}\left(\Psi_{nt}/\Psi_{nit}\right)^{1/\theta} dy_{nt}, \\
&= \gamma\left(\Psi_{nt}/\Psi_{nit}\right)^{1/\theta}, \\
&= \gamma \xi_{nit}^{-1/\theta}.
\end{aligned}$$

Productivity-adjusted capital from location n in destination i at time t therefore:

$$\widetilde{k}_{nit} = \bar{\epsilon}_{nit} k_{nit} = \bar{\epsilon}_{nit}\xi_{nit} k_{nt}.$$

We thus have:

$$\widetilde{k}_{nt}^{M} = \bar{\epsilon}_{nnt}\xi_{nnt} k_{nt} = \gamma \xi_{nnt}^{\frac{\theta-1}{\theta}} k_{nt}.$$

Note that total capital income in location n from destination i can be written in the following two equivalent ways:

$$\begin{aligned}
v_{nt}\xi_{nit} k_{nt} &= \left(r_{it}/\phi_{nit}\right)\bar{\epsilon}_{nit}\xi_{nit} k_{nt}, \\
\gamma\left(r_{it}/\phi_{nit}\right)\xi_{nit}^{\frac{\theta-1}{\theta}} k_{nt} &= \gamma\left(r_{it}/\phi_{nit}\right)\xi_{nit}^{\frac{\theta-1}{\theta}} k_{nt}.
\end{aligned}$$

We thus have the following expressions for productivity-adjusted capital for each domestic location and the colonial slavery plantation:

$$\widetilde{k}_{nt}^{M} = \bar{\epsilon}_{nnt} k_{nnt} = \bar{\epsilon}_{nnt} \xi_{nnt} k_{nt} = \gamma \xi_{nnt}^{\frac{\theta-1}{\theta}} k_{nt},$$

$$\widetilde{k}_{\mathbb{N}t}^{S} = \sum_{n \in \mathbb{N}} \bar{\epsilon}_{n\mathbb{N}t} k_{n\mathbb{N}t} = \sum_{n \in \mathbb{N}} \bar{\epsilon}_{n\mathbb{N}t} \xi_{n\mathbb{N}t} k_{nt} = \sum_{n \in \mathbb{N}} \gamma \xi_{n\mathbb{N}t}^{\frac{\theta-1}{\theta}} k_{nt}.$$

D Calibration Appendix

In this section of the Online Appendix, we discuss the calibration of the model's parameters. We use standard values for the model's parameters from the existing empirical literature. We calibrate the share of land in agricultural production costs (α^A) using data on farm incomes. From Table 23 of Feinstein (1972), the share of rent for farm land and buildings in total farm incomes in the United Kingdom in 1855 (the first year for which data are reported) was 31 percent. We therefore set $\alpha^A = 0.31$.

Given this assumed value of α^A, we calibrate the share of capital in manufacturing production costs (α^M) to ensure that the model's predictions are consistent with observed data on the aggregate share of labor in national income and the share of agriculture in national income. In our model, there are two domestic production sectors: agriculture and manufacturing. Agriculture uses labor and land. Manufacturing uses labor and capital. The aggregate share of labor in national income $(1-\alpha)$ is:

$$(1-\alpha) = \frac{wL}{Y} = \frac{wL^A}{Y} + \frac{wL^M}{Y} = \frac{Y^A}{Y}\frac{wL^A}{Y^A} + \frac{Y^M}{Y}\frac{wL^M}{Y^M},$$

which can be written as:

$$(1-\alpha) = \frac{Y^A}{Y}\left(1-\alpha^A\right) + \left(1 - \frac{Y^A}{Y}\right)\left(1-\alpha^M\right).$$

Rearranging this relationship, we have:

$$\left(1-\alpha^M\right) = \frac{(1-\alpha) - \frac{Y^A}{Y}\left(1-\alpha^A\right)}{\left(1-\frac{Y^A}{Y}\right)}. \tag{D.1}$$

Recall that we set the share of land in agriculture production costs as $\alpha^A = 0.31$. From Table 3 in Crafts (2022), the share of labor in national income for the nearby year of 1850 is $(1-\alpha) = 0.65$. From Table 37 in Deane and Cole (1967), the share of agriculture, forestry and fishery in national income for the nearby year of 1851 is $Y^A/Y = 0.20$. Substituting these values into equation (D.1) above, the implied value for the share of labor in manufacturing production costs is $\left(1-\alpha^{M}\right) = 0.64$, which implies a value for the share of capital in manufacturing production costs of $\alpha^{M} = 0.36$.

We calibrate the migration elasticity ($1/\kappa$) using structural estimates from the spatial economics literature. Using data for U.S. states and Indonesia regions, Bryan and Morten (2019) estimate migration elasticities from $1/\kappa = 2.7 - 3.2$. Using data for U.S. commuting zones, Galle et al. (2020) estimate migration elasticities from $1/\kappa = 1.42 - 2.79$. Surveying existing estimates, Fajgelbaum et al. (2019) report migration elasticities ranging from $1/\kappa = 1.16 - 2.49$ in Appendix Table A.17. Based on these findings, we choose a central value for the migration elasticity of $1/\kappa = 2$.

We calibrate the elasticity of substitution between slavery and domestic investments (θ) using estimates from the recent literature on asset demand systems following Koijen and Yogo (2019). The smaller this elasticity, the greater the improvement in the productivity of the investment technology from access to slavery investments. Using data on international stocks and bonds, Koijen and Yogo (2020) estimates elasticities of substitution of 1.9 and 4.2, respectively. Based on these estimates, we assume a conservative (i.e., relatively high) value of $\theta = 4$ in our baseline specification.

We assume a value for the rate of return for consumption bonds of $\rho = 0.0399$, which is the average of the values reported for 3 percent British Consols from 1750-1799 in Table 2 from Antràs and Voth (2003), based on data from Mitchell (1971).

E Robustness to Alternative Parameter Values

In our baseline specification in Section 7.4 of the paper, we assume standard values for the model's parameters from the existing empirical literature. In this section of the Online Appendix, we demonstrate the robustness of our quantitative conclusions to the assumption of alternative parameter values.

In particular, we demonstrate robustness to the use of alternative values for the migration elasticity ($1/\kappa$) and the elasticity of substitution between domestic and slavery investments (θ). We hold all other parameters constant at their values in our baseline specification. Therefore, we set the share of land in agricultural costs as $\alpha^{A} = 0.31$, based on the share of land and buildings in farm income in Feinstein (1972). Given this parameter, we set the share of capital in manufacturing costs as $\alpha^{M} = 0.36$, which ensures that the model is consistent with both the 20% share of agriculture in national income in 1851 in Deane and Cole (1967), and the 65% share of labor in national income in 1850 in Crafts (2022).

Given these values for the other model parameters, we consider a grid of seven alternative values of the migration elasticity ($1/\kappa$) and the elasticity of substitution between domestic and slavery investments (θ), which yields $7 \times 7 = 49$ parameter combinations. We vary the migration elasticity ($1/\kappa$) from 1.25 to 5, which compares with a central value of $1/\kappa = 2$ in existing empirical studies ((Bryan and Morten 2019, Galle et al. 2020). We vary the elasticity of substitution between domestic and slavery investments (θ) from 2 to 8, which compares with the empirical estimates of 1.9 and 4.2 in Koijen and Yogo (2020).

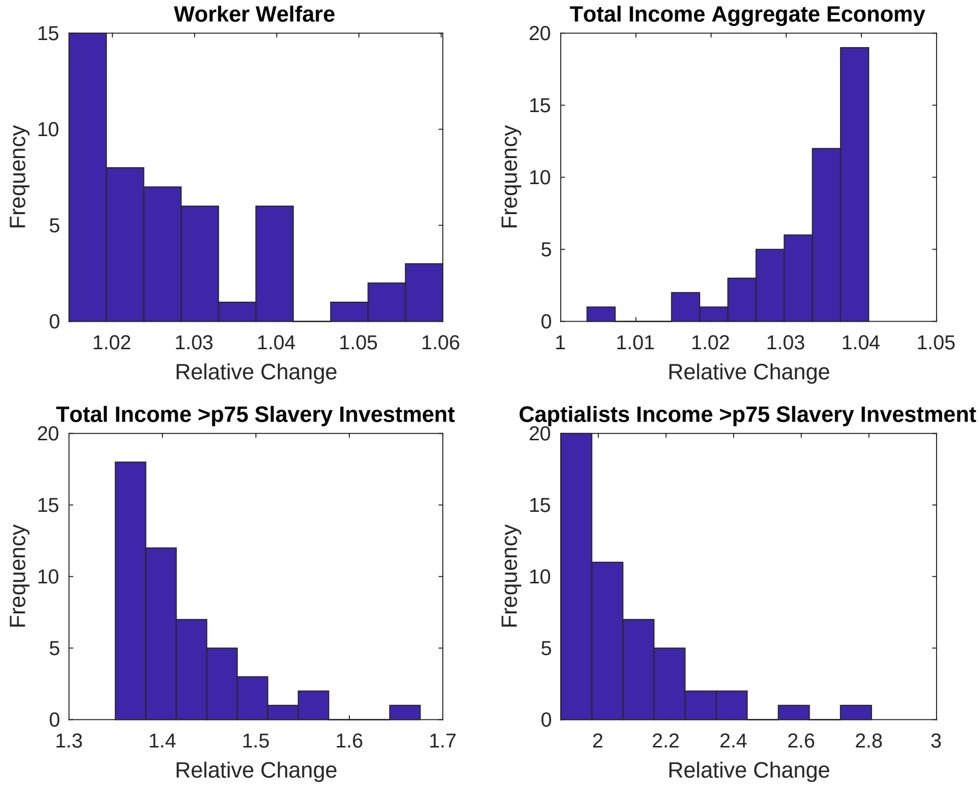
For each parameter combination on this grid, we undertake our counterfactual for prohibitive colonial financial frictions ($\phi_{n\mathbb{N}} \to \infty$). The lower the migration elasticity ($1/\kappa$), the more difficult it is to reallocate labor away from slaveholding locations in the counterfactual for prohibitive colonial financial frictions ($\phi_{n\mathbb{N}} \to \infty$). The lower the elasticity of substitution between domestic and slavery investments (θ), the more difficult it is to reallocate capital domestically in this counterfactual for prohibitive colonial financial frictions ($\phi_{n\mathbb{N}} \to \infty$).

We compute relative changes from the counterfactual equilibrium with prohibitive colonial financial frictions to the observed equilibrium in 1833 for (i) Worker welfare as measured by expected utility; (i) Total income for the aggregate economy as a whole; (iii) Total income for locations with slavery investment shares above the 75th percentile for locations with positive slavery investment shares; (iv) Total capitalist income for locations with slavery investment shares above the 75th percentile for locations with positive slavery investment shares. The relative change in worker welfare is a weighted average of the relative change in worker real income in each location, where the weights are population shares. Total income is the sum of the income of capitalists (from both slavery and domestic manufacturing capital), landowners and workers.

In Figure E.1, we display histograms of the relative changes in each variable across the entire parameter grid. As shown in the top-left panel, the welfare gains from access to slavery investments range from around 2 to 6 percent. As shown in the top-right panel, the increase in total income for the aggregate economy as a whole varies from around 1-4 percent. As shown in the bottom-left panel, the increase in total income for locations with the greatest participation in slavery investments ranges from 35-65 percent. Finally, as shown in the bottom-right panel, the increase in capitalists income for these locations with the greatest participation in slavery investments varies from 100-180 percent.

Therefore, across this entire grid of parameter values, we find that access to slavery investments has sizeable aggregate economic effects and a substantial impact on the geography of the industrial revolution.

Figure E.1: Proportional Changes in Worker Welfare, Total Income for the Aggregate Economy, and both Total Income and Capitalist Income for Locations With Slavery Investment Shares Above the 75th Percentile



Note: Histograms of relative changes (x/x') from the counterfactual equilibrium with prohibitive financial frictions ($\phi_{n\mathbb{N}} \to \infty$) to the observed equilibrium in 1833 across a grid of parameter values for the migration elasticity ($1/\kappa$) from 1.25-5 and the elasticity of substitution between domestic and slavery investments (θ) from 2 to 8. Total income equals the sum of the income of capitalists (from both slavery and domestic manufacturing capital), landowners and workers. Bottom two panels show aggregate values for locations with slavery investment shares above the 75th percentile for locations with positive slavery investment shares.

F Theoretical Extensions

In this section of the Online Appendix, we present an extension of our baseline model to allow capitalists to invest in any domestic location subject to financial frictions that increase with distance. We show that this specification implies a gravity equation in bilateral investment flows, such that investment continues to be concentrated locally.

The specification of consumption, production and labor mobility remains the same as in our baseline specification in Section 6 of the paper and Section C of this Online Appendix. The only change is to the specification of capital allocation decisions within periods from Section 6.5 of the paper and Section C.9 of this Online Appendix, as summarized in the next subsection. The characterization of capitalists optimal consumption-investment decisions remains the same as in Subsection 6.6 of the paper and Subsection C.10 of this Online Appendix, given the expected return to capital (v_{nt}) determined below.

F.1 Capital Allocation With Domestic Gravity

At the beginning of period t, the capitalists in location n inherit an existing stock of capital k_{nt}, and decide where to allocate this existing capital and how much to invest in accumulating additional capital. Once these decisions have been made, production and consumption occur. At the end of period t, new capital is created from the investment decisions made at the beginning of the period, and the depreciation of existing capital occurs. For this remainder of this subsection, we focus on capitalists' capital allocation decisions at the beginning of period t.

We assume that the productivity of capital for domestic use (ϵ_{nnt}) and colonial use ($\epsilon_{n\mathbb{N}t}$) is subject to an idiosyncratic productivity draw for the number of effective units of capital, as in Liu et al. (2022). These idiosyncratic productivity draws can be interpreted as a Keynesian marginal efficiency of capital draw and give rise to a form of imperfect substitutability between domestic and slavery investments.[7] The key difference from our baseline specification in the paper is that the capitalist in each domestic location n can invest in any domestic location $i \in N$ and in the colonial plantation $\mathbb{N}$. The return to a capitalist from location n of investing a unit of capital in destination $i \in \{N \cup \mathbb{N}\}$ (v_{nit}) depends on the rental rate per effective unit (r_{it}), the number of effective units (ϵ_{nit}) and financial frictions (ϕ_{nit}):

$$v_{nit} = \frac{\epsilon_{nit} r_{it}}{\phi_{nit}}, \qquad i \in \{N \cup \mathbb{N}\}. \tag{F.1}$$

We assume that these idiosyncratic shocks to the productivity of capital are drawn independently from the following Fréchet distribution:

$$F(\epsilon) = e^{-\epsilon^{-\theta}}, \qquad \theta > 1, \tag{F.2}$$

where we have normalized the Fréchet scale parameter to one, because it enters the model isomorphically to financial frictions, and the Fréchet shape parameter (θ) controls the responsiveness of capital investments to economic variables.

Using the properties of this Fréchet distribution, the shares of capital owned in location n that are invested in each domestic location i and in slavery in the colonial plantation $\mathbb{N}$ depend on relative returns to capital and financial frictions:

$$\xi_{nit} = \frac{k_{nit}}{k_{nt}} = \frac{\left(r_{it}/\phi_{nit}\right)^{\theta}}{\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^{\theta} + \sum_{k \in N} \left(r_{kt}/\phi_{nkt}\right)^{\theta}}, \qquad i \in N, \tag{F.3}$$

[7] This imperfect substitutability is consistent with slavery investments being concentrated in cane sugar, tobacco and cotton, none of which were available domestically at the time. It is also in line with the theoretical and empirical literature on asset demand systems following Kiojen and Yogo (2019).

$$\xi_{n\mathbb{N}t} = \frac{k_{n\mathbb{N}t}}{k_{nt}} = \frac{\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^{\theta}}{\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^{\theta} + \sum_{k\in N}\left(r_{kt}/\phi_{nkt}\right)^{\theta}}. \tag{F.4}$$

A key prediction of this specification is that investment flows between locations are characterized by a gravity equation. The probability of investing from origin n in destination i depends on the characteristics of the origin n, the attributes of the destination i, and bilateral financial frictions (ϕ_{nit}), namely "bilateral resistance." Furthermore, this probability also depends on the characteristics of all destinations i and all bilateral financial frictions, namely "multilateral resistance." Therefore, if financial frictions are increasing in geographical distance, this specification provides microfoundations for a gravity equation, in which bilateral investment flows are declining in distance, and hence are concentrated locally, as observed empirically.

Capital market clearing implies that the capital used in domestic manufacturing in each destination i is the sum of the capital allocated there from all domestic origins n:

$$k_{it}^{M} = \sum_{n\in N}\xi_{nit}k_{nt}. \tag{F.5}$$

Similarly, the capital used in the colonial plantation equals the sum of the capital allocated there from all domestic origins n:

$$k_{\mathbb{N}t}^{S} = \sum_{n\in\mathbb{N}}\xi_{n\mathbb{N}t}k_{nt}, \tag{F.6}$$

where $\xi_{n\mathbb{N}t} + \sum_{i\in N}\xi_{nit} = 1$. The average productivity of capital allocated to each location depends on the share of capital allocated to that location (ξ_{nit}), such that the capital market clearing condition can be written in productivity-adjusted terms as:

$$\widetilde{k}_{nt}^{M} = \sum_{i\in N}\gamma\xi_{nit}^{-\frac{1}{\theta}}k_{nit} = \sum_{i\in N}\gamma\xi_{nit}^{\frac{\theta-1}{\theta}}k_{nt},$$

$$\widetilde{k}_{\mathbb{N}t}^{S} = \sum_{n\in\mathbb{N}}\gamma\xi_{n\mathbb{N}t}^{-\frac{1}{\theta}}k_{n\mathbb{N}t} = \sum_{n\in\mathbb{N}}\gamma\xi_{n\mathbb{N}t}^{\frac{\theta-1}{\theta}}k_{nt},$$

where we use the tilde above the capital stock to denote the productivity-adjustment. Intuitively, as location n allocates a larger share of capital to location i (higher ξ_{nit}), it moves further down the marginal efficiency of capital to investments of lower productivity, which reduces the average productivity of these investments (by $\xi_{nit}^{-\frac{1}{\theta}}$).

Again using the properties of the Fréchet distribution, the expected return to capital taking into account the idiosyncratic capital productivity draws is equalized between local manufacturing and the colonial plantation:

$$v_{nt} = \gamma\left[\left(r_{\mathbb{N}t}/\phi_{n\mathbb{N}t}\right)^{\theta} + \sum_{k\in N}\left(r_{kt}/\phi_{nkt}\right)^{\theta}\right]^{\frac{1}{\theta}}, \qquad \gamma\equiv\Gamma\left(\frac{\theta-1}{\theta}\right), \tag{F.7}$$

where $\Gamma(\cdot)$ is the Gamma function.

Intuitively, if location i has a better investment characteristics in the form of a higher rental rate (r_{it}) or lower financial frictions (ϕ_{nit}), it attracts investments with lower idiosyncratic realizations for capital productivity, which reduces average capital productivity through a composition (batting average) effect. With a Fréchet distribution for capital productivity, this composition effect exactly offsets the impact of the better investment characteristics, such that the expected return to capital is equalized across locations. Therefore, the rental rate for capital can differ across domestic destinations and between domestic destinations and the colonial plantation, but the expected return to capital taking into account the idiosyncratic productivity draws is equalized. Total capitalist income is linear in the existing stock of capital and given by $V_{nt} = v_{nt} k_{nt}$.

The expected return to capital (v_{nt}) in equation (F.7) can be re-written in terms of the domestic investment share (ξ_{nnt}) using equation (F.3):

$$v_{nt} = \frac{\gamma \left(r_{nt} / \phi_{nnt} \right)}{\left(\xi_{nnt} \right)^{\frac{1}{\theta}}}. \tag{F.8}$$

Given domestic rental rates (r_{nt}) and financial frictions (ϕ_{nnt}), locations n with greater access to investments in other (lower ϕ_{nit}) for $i \neq n$ have lower domestic investment shares (lower ξ_{nnt}), which implies higher expected returns to capital accumulation (higher v_{nt}) from equation (F.8). Intuitively, there is a downward-sloping marginal efficiency of capital schedule for each destination, as determined by the distribution of idiosyncratic productivity draws. As in our baseline specification in the main paper, obtaining access to slavery investments acts like an improvement in the productivity of the investment technology, because capitalists obtain another set of draws for idiosyncratic productivity for the colonial plantation, which increases the average productivity of the investments that they undertake in equilibrium.

G Data Appendix

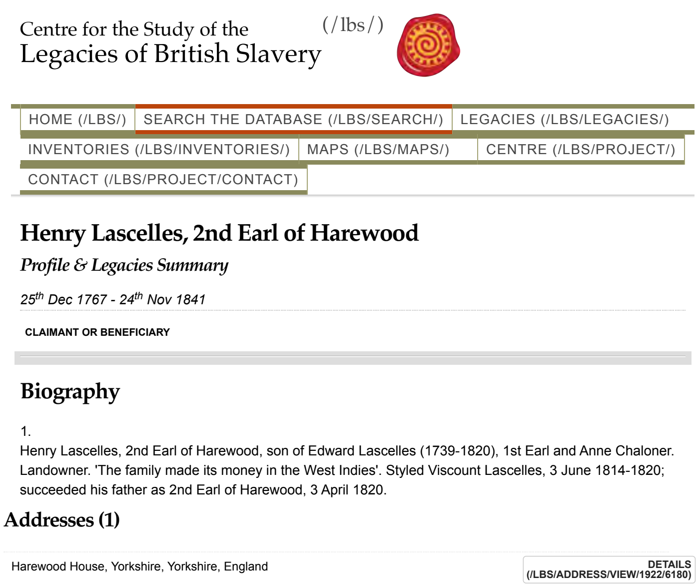
In this section of the Online Appendix, we provide further information on the data sources and definitions.

G.1 Slavery Compensation

As discussed in Section 4 of the paper, we use data from the *Legacies of British Slavery Database* to measure the geographical distribution of slavery wealth within Britain at the time of the abolition of slavery in 1833. Starting with the records of the Slave Compensation Committee, this database was constructed over more than a decade by the *Centre for the Study of the*

Legacies of British Slavery at University College London. The data include detailed information on compensation claims, the identity of the awardees, the legitimacy of their claims, and the ownership records of awardees. We use a digital version of these data, which includes information on 53,000 individuals connected to slavery, of whom 25,000 were awarded compensation for 425,000 enslaved persons. In Figures G.1-G.2 below, we provide an example of the entry from this database for the Second Earl of Harewood. We observe name, date of birth and death, biographical information including family history, address, the name and location of each colonial plantation, and the compensation awarded and number of enslaved persons for each plantation.

Figure G.1: Example Compensation Claim for Henry Lascelles from the Legacies of British Slavery Database



Note: Example compensation claim for Henry Lascelles from the Legacies of British Slavery Database, showing name, birth and death date, family history and address.

Figure G.2: Example Claim from the Legacies of British Slavery Database

Associated Claims (6)

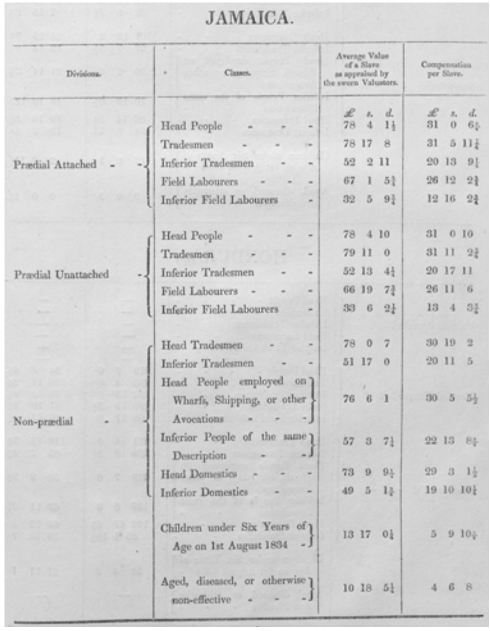
Barbados 211 (Belle) (/lbs/claim/view/5922)	£6,486 1s 6d	Awardee	DETAILS (/LBS/CLAIM/VIEW/5922)
Barbados 2769 (Fortescues) (/lbs/claim/view/3115)	£3,291 11s 4d	Awardee	DETAILS (/LBS/CLAIM/VIEW/3115)
Barbados 2770 (Thicket) (/lbs/claim/view/3116)	£5,810 5s 6d	Awardee	DETAILS (/LBS/CLAIM/VIEW/3116)
Barbados 3817 (Mount St George) (/lbs/claim/view/6143)	£3,835 6s 5d	Awardee	DETAILS (/LBS/CLAIM/VIEW/6143)
Jamaica St Dorothy 23 (Nightingale Grove Estate) (/lbs/claim/view/20581)	£2,599 0s 4d	Awardee	DETAILS (/LBS/CLAIM/VIEW/20581)
Jamaica St Thomas-in-the-Vale 147 (Williamsfield Estate) (/lbs/claim/view/19790)	£4,286 19s 3d	Awardee	DETAILS (/LBS/CLAIM/VIEW/19790)

Note: Further details for the compensation claim for Henry Lascelles from the Legacies of British Slavery Database, showing amounts awarded for individual estates.

As discussed in Section 3 of the paper, slavery compensation payments under the Abolition of Slavery Act of 1833 were divided up across the different colonies. Separate schedules were drawn up for each colony that specified a compensation rate per slave that depended on occupation and age. In Figure G.3, we provide an example of such a schedule for Jamaica. Compensation rates are higher for enslaved people working in more skilled occupations and lower for children and enslaved people whose ability to work was reduced by either age or illness. Despite this limited variation in compensation rates per slave, we find that the total compensation paid to each slaveholder has a strong, positive, statistically significant and approximately log linear relationship with the number of enslaved, as shown in Figure G.4 below. Therefore, we use the number of enslaved as our baseline measure of slaveholding in our regression specifications in Section 7 of the paper.

In our quantitative analysis of the model in Section 7.4 of the paper, we measure wealth from slavery investments using the slavery compensation payments. In particular, these payments were rationalized under the Abolition of Slavery Act of 1833 as compensation for the value of enslaved persons. However, the total value of slavery plantations (including land and buildings) was typically 2-3 times the value of enslaved persons, according to the detailed accounting studies in Sheridan (1965), Ward (1978) and Rosenthal (2018). Therefore, in our quantitative analysis of the model, we assume a value of wealth from slavery investments equal to 2.5 times the value of compensation payments. Since slaveholders were also partly compensated through the six-year "apprenticeships" of forced labor, this assumption that slavery investments were 2.5 times compensation payments is likely conservative.

Figure G.3: Slave Compensation Schedule for Jamaica from the 1833 Abolition of Slavery Act

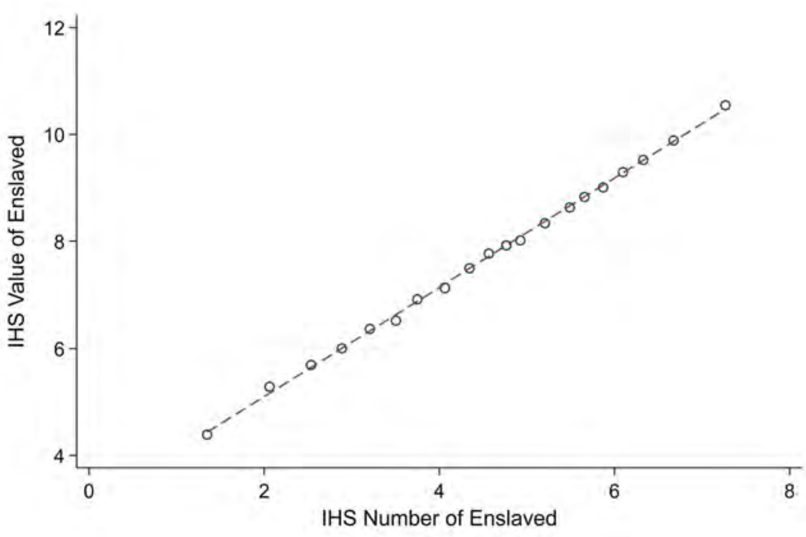


JAMAICA.

Divisions.	Classes.	Average Value of a Slave as appraised by the sworn Valuators. £ s. d.	Compensation per Slave. £ s. d.
Prædial Attached	Head People	78 4 1½	31 0 6¾
	Tradesmen	78 17 8	31 5 11¼
	Inferior Tradesmen	52 2 11	20 13 9¼
	Field Labourers	67 1 5¼	26 12 2¾
	Inferior Field Labourers	32 5 9¼	12 16 2¾
Prædial Unattached	Head People	78 4 10	31 0 10
	Tradesmen	79 11 0	31 11 2¾
	Inferior Tradesmen	52 13 4¼	20 17 11
	Field Labourers	66 19 7¾	26 11 6
	Inferior Field Labourers	33 6 2¼	13 4 3¾
Non-prædial	Head Tradesmen	78 0 7	30 19 2
	Inferior Tradesmen	51 17 0	20 11 5
	Head People employed on Wharfs, Shipping, or other Avocations	76 6 1	30 5 5½
	Inferior People of the same Description	57 3 7¼	22 13 8¼
	Head Domestics	73 9 9¼	29 3 1½
	Inferior Domestics	49 5 1¼	19 10 10¼
	Children under Six Years of Age on 1st August 1834	13 17 0¼	5 9 10¼
	Aged, diseased, or otherwise non-effective	10 18 5¼	4 6 8

Note: Predial refers to enslaved people employed in agricultural occupations; Non-predial refers to enslaved people working in non-agricultural occupations (e.g., domestic service); Attached refers to enslaved people held on the estates of their enslavers; Unattached refers to enslaved people rented by their enslavers to other estates.

Figure G.4: Binscatter Across Slaveholders of Value of Slavery Compensation Paid Against Number of Enslaved Claimed Under the 1833 Abolition of Slavery Act



Note: Vertical axis shows inverse hyperbolic sine (IHS) of the value of slavery compensation; horizontal axis shows the inverse hyperbolic sine (IHS) of the number of enslaved; each dot corresponds to a ventile of the distribution across slaveholders in our data; red dotted line shows the linear fit between the two variables.

G.2 Hexagonal Regions

To overcome changes in the boundaries of administrative units such as parishes in England and Wales over time, we construct a hexagonal spatial grid consisting of 849 cells ("regions"). We choose hexagons (rather than squares or triangles) because of their advantages for partitions of geographical space, as discussed for example in Carr and Pickle (2010). Each grid cell covers an area of 200 square kilometers and the distance from the centroid to the vertex measures around 9 km. Since the dominant mode of commuting during our sample period was walking, 9 km is a reasonable distance over which it would be possible to walk to work. The average hexagon contains 15 parishes and the average historic county contains 15 hexagons. This section discusses the creation of the hexagons and the mapping of data into them.

Hexagon Construction We employ a GIS tessellation procedure to create a grid of regular hexagonal polygons, each at a fixed size of 200 square kilometres, that covers the full extent of England and Wales. We construct this hexagon grid starting from the intersection of the most northern and western coordinates of England and Wales. We then select the subset of hexagons that contain at least one of the $N = 12,659$ parish centroids. We drop the Isles of Scilly, as few of our data sources cover this remote archipelago. This leaves us with 849 units of observation.

Point-level Data To assign point-specific locations to the hexagonal grid, we use a simple spatial join of the latitude-longitude of the address to the hexagonal grid it falls inside. This procedure applies to all data where we translate an address to a point-specific location (e.g, slavery compensation recipients, cotton mills).

Distance Data We calculate distances from the latitude-longitude of a location (e.g, country banks, historic ports) to the centroid of the hexagonal region. For distance to the coast, we calculate the minimum distance to the coastline to the hexagon centroid.

Parish-level Data Census data is available to us at the level of parishes, which presents a choice as to how we aggregate the data into our hexagonal units. There are two main alternatives for mapping parishes to hexagons. First, one can aggregate using *centroid mapping*, in which parishes are assigned to hexagons based on the parish centroid. Second, one can use *area weights* to redistribute parish data across all hexagons that intersect the boundary of the parish, in proportion to the share of the total parish area that each intersection represents. We use centroid mapping in our baseline specification to avoid introducing the spatial autocorrelation between neighboring units that apportioning the data with weights necessitates. We also report a robustness test using area weights and show that in practice we find a similar pattern of results using both approaches.

G.3 Population Data

Population data from the population censuses of England and Wales from 1801-1891 was provided by the *Cambridge Group for the History of Population and Social Structure* (Cambridge Group), as documented in Wrigley (2011). The original sources for the population data are:

- 1801 Census Report, Abstract of answers and returns, PP 1801, VI
- 1811 Census Report, Abstract of answers and returns, PP 1812, XI
- 1821 Census Report, Abstract of answers and returns, PP 1822, XV
- 1831 Census Report, Abstract of the Population Returns of Great Britain, PP 1833, XXXVI to XXXVII
- 1841 Census Report, Enumeration Abstract, PP 1843, XXII
- 1851 Census Report: Population Tables, part II, vols. I to II, PP 1852-3, LXXXVIII, parts I to II
- 1861 Census Report: Population tables, vol. II, PP 1863, LIII, parts I to II
- 1871 Census Report: vol. III, Population abstracts: ages, civil condition, occupations and birthplaces of people, PP 1873, LXXI, part I
- 1891 Census Report: vol. II, Area, Houses and Population: registration areas and sanitary districts, PP 1893-4, CV [which also includes the 1881 data, as used in our analysis]

G.4 Property Valuation Data

Domesday Data Our property valuation data for 1086 are from *The Domesday Book* assessment of land holdings undertaken by William the Conqueror shortly after the Norman conquest of England and Wales in 1066.

The survey process and compilation of Domesday Book took about 20 months (January 1086 to September 1087), being facilitated by the availability of Anglo-Saxon hidage (or tax) lists. The counties of England were grouped into circuits. Each circuit was visited by a team of commissioners, bishops, lawyers and lay barons, who had no material interests in the area. The commissioners were responsible for circulating a list of questions to land holders, for subjecting the responses to a review in the county court by the hundred juries, and for supervising the compilation of county and circuit returns. The circuit returns were then sent to the Exchequer in Winchester where they were summarised, edited and compiled into Domesday Book, as discussed further in McDonald and Snooks (1986).

We use the digital edition of the *The Domesday Book* from the Prosopography of Anglo-Saxon England (PASE 2010). For each manor, the data report (i) the holder of the manor in 1066 prior to the Norman Conquest; (ii) the holder of the manor in 1086; (iii) the valuation of the manor in 1066 and 1086 (including land, buildings, equipment and people); (iii) the number of different categories of people: freemen and sokeman, villans, bordars, and slaves; (iv) location information, including county, hundred, vill and latitude and longitude coordinates. We assign manors to the parishes in which their latitude and longitude coordinates fall. We aggregate valuations across manors within parishes to obtain a property valuation for each parish in 1086.

Lay Subsidy Data Our property valuation data for 1344 are from the *Lay Subsidy* of that year, which corresponded to a tax on the personal property (excluding land and buildings) of the laity (the church and religious orders were exempt).

The origins of the lay subsidies of the early-14th century were the continuing conflict with France and Scotland, which placed extra demands upon the revenue of the Crown. With increasing frequency, these special needs were met by subsidies granted by Parliament to the Crown in the form of taxes on the personal property of the laity. Taxes were paid based on the value of movable goods, principally on crops and livestock, rather than on land and buildings. For the Lay Subsidy of 19th September 1334, the tax rate was a fifteenth from rural areas and a tenth from boroughs and ancient demesnes.[8] Based on these tax rates, a tax quota was specified for each community, which in rural areas correspond closely to the manors reported in *The Domesday Book*.

We use a digital version of the 1334 Lay Subsidy compiled by Campbell and Bartley (2006) based on the tax quotas for each community reported in Glasscock (1975). For each community, we observe the value of tax quota and latitude and longitude coordinates. We assign communities to the parishes in which their latitude and longitude coordinates fall. We aggregate valuations across communities within parishes to obtain a property valuation for each parish in 1344.

[8]Ancient demesnes were, in general, rural manors, which had been listed under the heading *Terra Regis* in *The Domesday Book*, as discussed in Hoyt (1950).

Land Tax Data Our property valuation data for 1798 are from the Land Tax quotas for that year. The land tax was first imposed in 1693 in the form of a national poundage rate on both personal property and land and buildings. In the face of declining revenues from under-reporting, this direct poundage rate was replaced with a system of county land tax quotas. These county quotas were further subdivided into hundred and parish quotas by the local commissioners of the tax. These land tax quotas were amended over time, although increases in land tax faced resistance, as discussed in Ginter (1992). In 1798, the Land Tax Perpetuation Act of Parliament made these land tax quotas unalterable by law, and they remained unchanged until the land tax was abolished in 1963. We use reported land tax quotas for each parish from the parliamentary return published under the 1798 Land Tax Perpetuation Act.

Rateable Values Our property valuation data for 1815, 1843, 1852, 1865, 1881 and 1896 are rateable values, which correspond to the annual flow of rent for the use of land and buildings, and equal the price times the quantity of floor space in the model. In particular, these rateable values correspond to "The annual rent which a tenant might reasonably be expected, taking one year with one another, to pay for a hereditament, if the tenant undertook to pay all usual tenant's rates and taxes ... after deducting the probable annual average cost of the repairs, insurance and other expenses" (see London County Council 1907).

These rateable values cover all categories of property, including public services (such as tramways, electricity works etc), government property (such as courts, parliaments etc), private property (including factories, warehouses, wharves, offices, shops, theaters, music halls, clubs, and all residential dwellings), and other property (including colleges and halls in universities, hospitals and other charity properties, public schools, and almshouses). As discussed in Stamp (1922), there are three categories of exemptions: (1) Crown property occupied by the Crown (Crown properties leased to other tenants are included); (2) Places for divine worship (church properties leased to other tenants are included); (3) Concerns listed under No. III Schedule A, namely: (i) Mines of coal, tin, lead, copper, mundic, iron, and other mines; (ii) Quarries of stone, slate, limestone, or chalk; ironworks, gasworks, salt springs or works, alum mines or works, waterworks, streams of water, canals, inland navigations, docks, drains and levels, fishings, rights of markets and fairs, tolls, railways and other ways, bridges, ferries, and cemeteries. Rateable values were assessed at the parish level approximately every five years during our sample period. All of the above categories of properties are included, regardless of whether or not their owners are liable for income tax.

These rateable values have a long history in England and Wales, dating back to the 1601 Poor Relief Act, and were originally used to raise revenue for local public goods. Different types of rateable values can be distinguished, depending on the use of the revenue raised:

Schedule A Income Taxation, Local Authority Rates, and Poor Law Rates. Where available, we use the Schedule A rateable values, since Schedule A is the section of the national income tax concerned with income from property and land, and these rateable values are widely regarded as corresponding most closely to market valuations. For example, Stamp (1922) argues that "It is generally acknowledged that the income tax, Schedule A, assessments are the best approach to the true values" (page 25). Where these Schedule A rateable values are not available, we use the Local Authority rateable values, Poor Law rateable values, or property valuations for income tax. For years for which more than one of these measures is available, we find that they are highly correlated with one another across parishes.

- **1815**: Property valuations for income tax. Return to an address of the Honourable the House of Commons, dated 21 February 1854; House of Commons Papers, vol. LVI.1, paper no: 509.
- **1843**: Property valuations for income tax. Return to an address of the Honourable the House of Commons, dated 21 February 1854; House of Commons Papers, vol. LVI.1, paper no: 509.
- **1847**: Poor Law Rateable Values. Return to an order of the Honourable the House of Commons, dated 31 August 1848; House of Commons Papers, vol. LIII.11, paper no: 735.
- **1852**: Property valuations for income tax. Return to an address of the Honourable the House of Commons, dated 21 February 1854; House of Commons Papers, vol. LVI.1, paper no: 509.
- **1865**: Parishes. Return (Pursuant to an Address of the House of Lords, dated 24th March 1868) of the Parishes of England and Wales, dated 24 March 1868; House of Lords Papers, vol. XVIII, paper no: 54.
- **1881**: Poor Law Rateable Values. A Statement of the Names of the Several Unions And Poor Law Parishes In England And Wales; And of the Population, Area, And Rateable Value Thereof in 1881. London: Her Majesty's Stationery Office, 1887.

Rateable values are reported at the parish level. However, parish geographies change over time which means that the raw data cannot be readily linked to our preferred hexagon geography. To accommodate this, we introduce the following procedure.[9]

1. We manually match the rateable value information at the parish level with the *CGKO* (Cambridge Group Kain Oliver) shapefile using both, parish and place names, as well

[9] For more details, we refer the reader to Heblich et al. (2022).

as the corresponding poor law union and county the parish (or place) is nested in. The CGKO shapefile was developed by the *Cambridge Group for the History of Population and Social Structure* and consists of roughly 23,000 spatial units and it is derived from Kain and Oliver's digital maps of parish and township boundaries. It can map data at the level of parishes, townships, or places from censuses collected between 1801–1891.

2. In some cases, the parish units used to report rateable values do not match census parishes, for instance because evaluators chose to aggregate information. In these cases, we look up the location manually and geolocate it. This leaves us with coordinates for the specific rateable value payment.

3. Since parish boundaries change over time, we cannot be sure that the rateable value reported for a given parish applies to the matched census parish. Therefore, we refrain from using the rateable value per parish and focus instead on the *rateable value per acre* assigned to the parish centroid or the coordinates of a manually located entry, respectively. Conveniently, rateable values were reported along with the corresponding acreage of the parish they apply to. This procedure leaves us with 10,238 observation points for the years 1815, 1843 and 1852 and 18,575 points in 1881 across England and Wales. Note that CGKO units are very accurate and in some cases, a rateable value reported for one parish my be linked to one census parish which is, however, subdivided into multiple places and thus spatial units. In this case, we would assign the same rateable value per acre to each subdivision.

4. In a last step, we log-transform the data to ensure that they are approximately normally distributed and use *kriging*, a spatial interpolation method, to estimate a smooth surface using the rateable value per acre information from all matched locations in England and Wales. From this estimated surface, we can calculate every hexagon's rateable value by multiplying the average rateable value per acre with the hexagon's acreage.

G.5 Family Trees Instrument

Our baseline instrument exploits the spatial distribution of the ancestors of slave traders to predict the regions which transitioned into slave holding by 1833. We identify these ancestors by collecting data on the family trees of slave traders as reported on `Ancestry.com`. This section outlines how we use this data to construct the mapping of slave trader ancestors.

Ancestors We start with the sample of slave traders identified as the owners of British-flagged slave voyages in the Slave Voyages database. For each of these 3,995 individuals, we attempt to collect the most detailed family tree on Ancestry.com. We identify ancestors as members of the family tree born before the slave trader. We geolocate the birth and death locations of each ancestor, and prefer the birth location if both are available. Next, we choose to exclude ancestors that we locate within 10km of their slave trader's location. This helps us to identify the ancestral homeland of the family, rather than the current or recent location of the family, which is unsurprisingly skewed towards slave ports. This procedure yields 20,840 ancestors a of 1,474 slave traders v that cover around 40% of our regions i. We consider only the subset of these trees which connect to a slave trader with available mortality data (around 25% of those in the Slave Voyages database). This leaves a sample of 2,485 ancestors from 286 slave traders. One potential concern is that the family trees available on Ancestry.com could be a selected sample, which motivates our use of the surname instrument as a robustness test. Balance tests for family tree availability do not unambiguously suggest selection. The 286 traders whose ancestors form our instrument have, on average, completed more voyages than the rest of the slave traders. They also slightly over-represent Liverpool-based traders. However, the groups are statistically indistinguishable in terms of the years when they operated and the average duration of their middle-passage crossings.

Instrument Construction We assign to each ancestor their associated slave traders' voyage outcomes. In particular, we construct our voyage outcome measure as follows. First, we regression-adjust the mortality rate of slave voyage j in year t for decade fixed effects to account for the fact that overall mortality rates were decreasing over time, and then normalize the rates between zero and one. Second, we invert the voyage-specific mortality rate: $1/mortality_j$. Note that this voyage outcome measure ranges from a lower bound of one for voyages where all of the enslaved die, and approaches infinity as the number of deaths among the enslaved approaches zero. Therefore a higher value of our voyage outcome measures corresponds to fewer deaths among the enslaved and a more profitable voyage for the slave trader. Note that we treat $mortality_j = 0$ as $0 + \epsilon = 0.005$ to avoid an undefined measure for the small number of voyages with zero mortality among the enslaved. Third, we calculate voyager v's average *voyage outcome* as $VS_v = \frac{1}{n_v} \sum_{j=1}^{n_v} 1/mortality_{vj}$, where n_v is the number of slave trading voyages for voyager v. Finally, we assign equally this average voyage outcome for each slave-trading descendent to their ancestors from their family trees, as defined above. For each location i, we compute our first average voyage outcome instrument (VSI_i^{tree}) as an average of the voyager outcomes across all slave-trading ancestors in that location:

$$VSI_i^{tree} = \frac{1}{A} \sum_{a=1}^{A_i} VS_{v(a)},$$

where A_i is the number of ancestors of slave-traders in location i; A is the total number of ancestors of slave-traders in England and Wales; the scaling by $1/A$ rather than $1/A_i$ before the summation ensures that locations with more slave-trading ancestors have higher values of the instrument; $VS_{v(a)}$ is the average voyage outcome for voyager v who is the descendant of ancestor a, as defined above and in equation (14) in the paper, where the notation $v(a)$ makes explicit that voyager v is matched to ancestor a.

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