Supplemental Appendix

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A Data Appendix

We work with two main databases: one of hexagonal cells covering England and Wales, and one of British thresher producers who took part in the Royal Agricultural Society competitions between 1841 and 1872. In this appendix, we first describe the construction of these two databases and then provide details on each variable used.

A.1 Unit of Analysis

Hexagonal cells. We start from a georeferenced map of England and cover it with a grid of identical hexagonal cells of 120 square km each (function "fishnet" on ArcGIS). The cells are our main unit of observation, and we assign all geolocated observations to them. We have two types of variables: geographical and demographic/economic. Geographical variables include distances (e.g. to the coast, to towns publishing newspapers, ...) and land characteristics (area, wheat suitability). We calculate geographical variables using the coordinates of the centroid and borders of each hexagon. For instance: distances are calculated from the centroid of the hexagons, and we compute wheat suitability inside each cell's area. The demographic/economic variables are sourced from various historical documents listed below, originally recorded at the level of the ancient parishes. There are around 10,000 such parishes, and we assign them to hexagons based on where the parish centroid falls.

There are 3,149 hexagonal cells in England and Wales. From these, we exclude cells with zero 1801 population (71) and no information on sectoral employment shares (2). We also drop urban areas: cells with log density greater than -9 (177).

Finally, we deal with issues arising from newspaper-based variables (Beach and Hanlon, 2022) by restricting the sample to only those cells within 50 km from an historical newspaper. We augment this condition by requiring that cells contain parishes that are mentioned in English newspapers at least once between 1790 and 1830. The 50 km condition drops 279 (mostly Welsh) cells and the mention condition drops an additional 17. This leaves us with 2,603 cells: our baseline sample. The IV analysis further restricts the sample to coastal areas: 887 cells satisfy all previous conditions and lie within 15 km from the British coastline.

Producers. In 1841, the Royal Agricultural Society of England began to award prizes for the best steam-powered threshing machine presented during one of its meetings. Between 1841 and 1872, 309 threshers and 67 producers took part in fifteen separate competitions. During these competitions, the producers of these threshers processed a fixed amount of wheat, while inspectors recorded the performance of each machine. The best machine received a prize which could reach £60 but was usually around £20-25. We find the complete results of these competitions and collect measures of machines' productivity. We allocate these machines to the parish where the firm that produced them operated: a piece of information which we find either in the commentaries to the competitions or in historical newspapers. We are able to geolocate 306 out of 309 machines precisely. Because all firms operate in urban areas, we calculate machine adoption in all parishes located within 50 km from the cities where machines were produced: a reasonable indicator of the amount of early adoption these firms were exposed to. Similarly, for this database we calculate covariates based on the characteristics of all parishes within 50 km from where these producers operated.

A.2 Variable Description

Our analysis relies on four newly constructed datasets providing granular information on military recruitment, agricultural technology adoption, wages, and machine productivity in early 19th century England and Wales. Here, we detail the construction of each variable across these datasets.

A.2.1 Main Outcome

Agricultural machines. We measure technology adoption through historical newspaper advertisements, exploiting the practice of listing farm equipment in property sales. Labor-saving and non-labor saving machines extend the dataset in Caprettini and Voth (2020). We assemble a list of agricultural machines in use at the time of the Napoleonic Wars from two sources: farm advertisements in British newspapers and the *General Views of Agriculture*. We collect newspaper advertisements from British Library and Findmypast (2022). Within the universe of all articles of the 60 regional newspapers active between 1750 and 1820 and present in the corpus, we performed two sets of searches: first, for the following exact strings: 'threshing machine,' 'reaping machine,' 'mowing machine,' 'horse rake,' 'horse hoe,' 'chaffing machine,' 'turnip cutter,' 'cake crusher'. Second, we searched for the following exact strings: 'farm auction,' 'farm sale,' 'farm for sale,' 'farm to be let,' 'farm to be sold,' and 'farm to sell.'[29] We restricted our search to articles classified as either 'advertisement' or 'classifieds.' Next, we read in full each article retrieved: humans read all articles mentioning at least one machine. In the summer of 2024, we asked OpenAI GPT 3.5 turbo to read the (many more) articles advertising farm sales/leases. We use all information from any article that advertises the sale or the lease of one of these machines or of a farm that lists them among its assets. We drop all advertisements of producers that only provide information about the location of the machine factory, usually an industrial town. We also only consider ads for a single machine whenever we find the same advertisement printed more than once. Finally, we manually geolocate the machines in each advertisement, based on the map prepared by Southall and Burton (2004).

We complement advertisement data with those in the *General Views of Agriculture* published between 1793 and 1815 (Young, 1817). Each volume of the *Views* devotes one chapter to the "Implements of Agriculture" of a different county and contains detailed reports on farms visited, their owners and the agricultural machines found on the premises. We locate on the map by Southall and Burton (2004)

[29] We collected ads for threshing machines in the spring of 2016 and for other machines and farms for sale/lease in the fall of 2019.

any farm which reports one of the machines we searched in the newspapers. In addition, we collect information on 'rollers,' 'winnowing machines' and 'reaping machines.' We ensure that we do not double count any machine from the newspapers, comparing the names of the owners in the two sources.

Machine classification follows detailed functionality descriptions. Labor-saving machines replaced manual work: threshers, horse rakes, horse hoes, mowing machines, rollers, winnowing machines and reapers. Non-labor saving machines facilitated previously undone work: chaffing machines, turnip cutters, and cake crushers. From the full list of machines, we create two variables. *Labor-saving machines* is the sum of threshers, horse rakes, horse hoes, mowing machines, rollers, winnowing machines and reapers: there are 3,878 of these machines in our database, 2,293 observed before 1820. *Non-labor saving machines* is the sum of chaffing machines, turnip cutters and cake crushers: we observe 997 of them, 430 of them observed before 1820. We classify the machines following the historical literature (Rahm, 1844; Fussell, 1952; Walton, 1973).

A.2.2 Main Explanatory Variables

Recruitment. We trace the impact of military recruitment through enlistment records from Britain's two main branches of the armed forces during the French Revolutionary and Napoleonic Wars. We take recruitment from two sources. British Army recruits come from Floud et al. (1990), who digitized the original muster rolls of 23,749 soldiers who served in the Army between 1790 and 1819. From the original regimental books, he selected at random recruits joining the Army in each of the three decades until he reached a pre-established quota. For each soldier sampled, he digitized demographic and anthropometric information: we use the (standardized) birthplace to locate these men on the map of Southall and Burton (2004). Out of the 23,749 soldiers in Floud et al. (1990), we are able to geolocate 15,187 (64%).

Royal Navy recruits come from the original muster rolls of 263 ships in commission between 1793 and 1815. We construct a novel database from ships' muster rolls—accounting records compiled every two months aboard each vessel. Our data combine digitization of three complementary and non-overlapping sources. First,

the Battle of Trafalgar project digitized records of 18,102 sailors on board the 33 ships that fought at Trafalgar with Nelson.[30] Second, Dancy (2012) collected additional records for 42,205 men sailing on 137 different ships sampled randomly to be representative across the size distribution of Royal Navy vessels.[31] Third, we digitized records from 34,707 sailors serving onboard of 94 additional ships. We draw a random sample of ships from Colledge (1969) ensuring that the new ships did not appear in the other two sources.[32] For each of the selected ships, we collect information on ship characteristics from threedecks.org, the canonical source on ships during the Age of Sail. For each sailor in the muster rolls, compiled every two month by the pursers, we collect biographical information including their home town, skill level, and status (pressed or voluntary). We observe each of our 263 ships at one point in time between 1793 and 1815: for that period we take information of everyone on board. We have data for 95,014 men of whom we can geolocate 30,333 (32%) on the map of Southall and Burton (2004).

From recruitment data we construct nine variables. *Total recruits per 1,000 people* is the sum of British Army soldier and Royal Navy sailors per 1,000 people (as counted in the 1801 Population Census: variable *TOT_POP* in Southall et al., 2020). Similarly, *Royal Navy recruits per 1,000 people* and *British Army recruits per 1,000 people* are Royal Navy sailors and British Army soldiers per 1,000 people. *Royal Navy recruits on shallow ships per 1,000 people* is Royal Navy sailors with fewer than three years of sea experience (landsmen and ordinary seamen) sailing on ships with depth of hold shallower than 5m, divided by 1,000 people. *Royal Navy recruits on deep ships per 1,000 people* is Royal Navy sailors with fewer than three years of sea experience (landsmen and ordinary seamen) sailing on ships with holds deeper than 5m, divided by 1,000 people. *Landsmen Royal Navy recruits per 1,000*

[30] See https://www.nationalarchives.gov.uk/nelson/.

[31] These records were collected for two separate projects. The first 81 ships come from Dancy (2018) and contain musters for a random sample of ships commissioned between 1793 and 1801 across three commissioning dockyards (Chatham, Portsmouth and Plymouth). The other 56 ships are from a subsequent project by prof. Dancy, and are sampled at random in each odd year between 1803 and 1815. We thank prof. Dancy for sharing his data with us.

[32] We generate a random page number and a random month in the period 1800–15. We find the ship listed in Colledge closest to that page which i) has at least 13 guns, ii) is not already sampled (not in Dancy's data nor at Trafalgar), and, iii) has a muster record at the National Archives available close to that date.

people is Royal Navy recruits that are entered in the Muster Rolls as "landsmen." *Non-landsmen ("rest") Royal Navy recruits per 1,000 people* is Royal Navy recruits that are *not* entered in the Muster Rolls as "landsmen" (these are "ordinary" or "able seamen," "boys," as well as petty officers and specialized workers.) *Total recruits per 1,000 men* is the sum of British Army soldier and Royal Navy sailors per 1,000 men (as counted in the 1801 Population Census: variable *MA_1801* in Southall et al. (2020). *Royal Navy recruits per 1,000 men* is Royal Navy sailors per 1,000 men. We transform each of these variables with the natural logarithm, and model the extensive margin explicitly by assigning -2 to all cells with no recruitment (Chen and Roth, 2023): this ensures that cells with no recruitment have the lowest value.

Mechanical skills. We combine information on apprenticeships, patents, and on the use of critical pieces of equipment as documented in newspapers to compile an indicator of mechanical skills.

Apprenticeships provided crucial skills for the use of mechanical implements. We use the Apprenticeship Books or the Board of Stamps to compile a list of apprentices who trained between 1792 and 1811 to become metal workers or watchmakers. During the 18$^{\text{th}}$ century, master craftsmen were allowed to indenture an apprentice for seven years after payment of a duty. We use commercial Optical Character Recognition software (*Transkribus*) to digitize the handwritten records of 82,108 duties paid between 1710 and 1811. We automatically extract the residence and occupation of the master and use it to create a cell-level variable equal to the number of apprentices trained to become metal workers (mostly wheelwrights, millwrights and blacksmiths) and watchmakers. To measure the historical availability of mechanical knowledge during the wars against France, we use the residence of the 1,652 metal workers and 97 watchmakers who apprenticed between 1792 and 1811. The source stops recording apprentices after this date.

Agriculture, metallurgy and metal goods patents were filed by the "tinkerers" and mechanics Mokyr believes were crucial for the Industrial Revolution. We use Woodcroft (1854) to geolocate all patents filed under these three categories between 1792 and 1820.

Finally, British newspapers from the period often include mentions of tools and activities related to the work of mechanics. We identified such articles in the British Newspaper Archive in a multi-step process: first, we curated a list of keywords related to mechanical knowledge from the index of Mokyr's Gifts of Athena, as well as the occupation list in de Pleijt and Weisdorf (2017). We then extended this list by finding the nearest neighbors to each of those initial keywords in vector space by embedding a set of related contemporary works, such as the Cyclopaedia (1728), the "Treatise on the Steam Engine" (1827), and 18 volumes of the Encyclopedia Britannica (3rd edition), using OpenAI's embeddings API. We manually filter out false positives and correct clear OCR errors using GPT-4o.[33] We then scraped all BNA articles published in 1792–1820 that contain such keywords, chunk them into 250 word snippets, and use GPT-4o-mini to filter out irrelevant snippets after benchmarking it against the judgment of human RAs. To extract the location of the event implying mechanical knowledge, we uploaded the snippets to an LLM, and ask it to identify the location that the relevant section refers to. We used two different LLMs in this step, GPT-4o-mini and Claude-3-haiku, and took the intersection of the sets of identified locations: for instance, if GPT identified Liverpool and Manchester, Claude identified Manchester and Sheffield, we only use Manchester as the location a snippet refers to. We then geolocated these places using the GoogleMaps-API. This yields a list of locations with evidence of mechanical expertise.

The five variables (apprenticeships, three patent-based variables, and the newspaper-based variable) are positively and highly significantly ($p < 0.0001$) correlated with each other (ρ=0.15–0.36). Figure A.16 shows binscatters of all components, plotted against each other; all pairs show a positive correlation. This suggests that they capture related facets of an underlying pattern. We combine the five variables by extracting the first principal component.

A.2.3 Instrument

Distance to coast and deep sea; centroid at sea dummy. Distance to the coast is the distance of each hexagonal cell centroid to the closest point on the coastline. It is

[33] List available upon request.

set to zero whenever the centroid of a cell falls in the sea, in which case we also set the centroid at sea dummy equal to one. EMODnet Bathymetry Consortium (2018) provides bathymetric survey data on a grid of 0.0625 × 0.0625 arc minutes. We use the grid to construct barymetric profiles of the seabed in front of Great Britain for depth from -5m to -30m meters deep, in 0.5-meter steps. Distance to deep sea, our instrument, is the distance of each hexagonal cell centroid to the closest point on the -12.5m meter deep profile. The distances to the other depths are constructed similarly.

A.2.4 Other Outcomes

Gender ratios (1801 and 1811). We compute the gender ratio using data from the Population Censuses of England, 1801 and 1811 (Southall et al., 2020). The variable is equal to the total number of women (variable *FE_1801* in 1801, *TOT_FEM* in 1811) divided by the total number of men (variable *MA_1801* in 1801, *TOT_MALE* in 1811). We merge the Census to the historical map of English and Welsh parishes as we do with the population. We take the average of the ratios in the two years and transform the variable with the natural logarithm. We trim observations with absolute log ratio above 0.5, dropping two observations with gender ratios below 0.55 and five with gender ratio above 1.69.

Agricultural Wages: 1761–1811. Regional agricultural wage data for this period is scattered across multiple sources. We extract wage information from more than 20,000 pages in 46 volumes of the "General Views of Agriculture" published between 1795 and 1815 (Young, 1817), the "State of the Poor" (Eden, 1797) and Arthur Young's 1770s *Tours* as summarized by Rogers (1902). The latter helps to establish a pre-war pattern. We used a basic Large Language Model (GPT 3.5 turbo, run in the spring-summer 2025) to read each page of these publications and output as many data entries containing a wage rate in a given year and location. We then manually reviewed each entry and obtained more than 1,500 individual agricultural wage entries spanning fifty years. We record separately summer and winter wages and convert them to shillings per day. Weekly wages are converted into daily wages under a six days week assumption. We impute the value of in-kind payments (board,

lodging, beer, etc.) using information from wages quoting remunerations both with and without in-kind payments. We create two measures of wages: 1761–92 (pre war) and 1793–1811 (wartime). Wartime wages exclude wages recorded during the two years of the Peace of Amiens (1802–3).

RASE Productivity. We calculate the productivity of the machines presented at the RASE competitions from the records published on volumes of the *Journal of Agricultural Society of England*. For each competition, the *Journal* reports detailed information on the outcome of the standardized trials used to judge these machines. We harmonize productivity to measure output in sheaves per hour per man and include in all regressions competition fixed effects to account for differences in judges or trials over the years.

Royal Navy port. We compile a list of all known ports or anchorages of the Royal Navy prior to 1815 from two sources. The first is the *Universal British Directory* of 1791 (Barfoot and Wilkes), which contains topographical information of all British population centers at the start of the Wars against France. The second is *Three Decks*, a website collating naval history research of enthusiasts and scholars.[34] We assign a cell to a Royal Navy port or anchorage if a parish within 8 km from the cell centroid is named in one of the two sources.

Commercial port. We compile a database of all commercial ports from Alvarez-Palau et al. (2019). The raw data contains a list of 479 historic ports and landing areas along the coasts of England and Wales. We assign a cell to a commercial port if there exists a port within 8 km from its centroid, if the cell does not have a Royal Navy port and if it has a population density of at least 30 people per square kilometer. This yields a total of 265 ports.

Distance to the busiest commercial and Royal Navy ports. We digitize Lloyd's "Marine List" for 1799 and 1800. Every week, Lloyd's List published the names of every ship calling at any British port. We geolocate these ports, and classify the ships as commercial or military based on their names: commercial ships are reported with the names of the ship and her captain (e.g. "Eweretta, Patterson"); military ships are reported with their name and type (e.g. the "Audacious MW" was a *man of*

[34]See https://threedecks.org/.

war). Busy "Royal Navy ports" have at least 25% of traffic accounted by military ships; commercial ports are the rest. We calculate the distance to the top 3, 5, 10, and 15 busiest commercial ports as well as the distance to the top seven military ports.

Impress service office. We source the list of Impress Service offices active in 1805 from the work of genealogist Paul Benyon.[35] We geolocate the offices and calculate the distance of every cell to the closest one.

Agricultural families in 1831. We source 1831 agricultural families from the Population Census of 1831 (Southall et al., 2020) (variable FAMAGRI). We merge the Census to the historical map of English and Welsh parishes as we do with the 1801 Census. We transform the variable with the natural logarithm.

A.2.5 Other Controls

Farm ads. We search for articles advertising the sale or lease of a farm on the newspapers digitized by British Library and Findmypast (2022). Within the universe of all articles of the 60 regional newspapers active between 1800 and 1820 and present in the corpus, we search for the following exact strings: "farm auction," "farm sale," "farm for sale," "farm to be let," "farm to be sold," and "farm to sell."[36] We restrict our search to articles classified as either 'advertisement' or 'classifieds.' Next, we asked in the summer 2024 OpenAI GPT 3.5 turbo to identify relevant articles inside the page retrieved (there are often more than one relevant advertisement in any given page) and determine the location of the farm by providing a parish and a county in Britain. We geolocate these places with OpenStreetMap and count the number of advertisement assigned inside every cell. In the regressions, we use the natural logarithm of farm ads, and model the extensive margin explicitly by assigning -1 to all cells with no ads (Chen and Roth, 2023).

Area. The total land area of the cell (in square km) is calculated with ArcGIS based on the grid described in the previous section and the shapefile containing the borders of England and Wales. We transform the variable with the natural logarithm.

[35] Accessible at https://sites.rootsweb.com/~pbtyc/Naval.html.

[36] We performed these searches in the fall of 2019.

1801 population. Parish population comes from the Population Census of 1801 Southall et al. (2020). The original variables is *POP_1801*. We merge the Census to the historical map of English and Welsh parishes with ancient county (*ANC_CNTY*) and parish (*ANC_PAR*), before taking these data to our map of hexagonal cells. We transform the variable with the natural logarithm.

1801 sectoral shares. We construct sectoral shares from the Population Census of 1801 (Southall et al., 2020). We calculate two shares: for agriculture and trade. In 1801 these shares reflect the number of workers employed in the two sectors (variables *OC_AGRIC* and *OC_TRADE*) divided by the total number of workers (which also include people employed in the residual category "other": *OC_OTHER*). We merge the Census to the historical map of English and Welsh parishes as we do with the population.

1801 density. Density is 1801 population divided by the area of the cell (Southall et al., 2020). We transform the variable with the natural logarithm.

Potential yield of wheat. We take the potential yield of wheat from the Food and Agriculture Organization Global Agro-Ecological Zones database (FAO-GAEZ). We use the potential yield for summer wheat with intermediate inputs and rain-fed irrigation. The original data is a raster that covers the entire land mass of the Earth on a grid of about 9.25 × 9.25 km. We first resample the raster on a finer grid of 8 × 8 meters with the "nearest" method. Next, we superimpose the map of hexagonal cells described in the previous section and for every cell of the wheat raster we take its centroid and assign it to the hexagonal cell where the centroid falls. Finally, to calculate potential yield, average over those raster cells whose centroids lie within each hexagon.

Ruggedness. We calculate ruggedness with data from Nunn and Puga (2012). Raw data is defined on a grid of 30-arc seconds: for every cell, it records the change in elevation relative to surrounding cells: $\sqrt{\sum_{i=r-1}^{r+1}\sum_{j=c-1}^{c+1}(e_{ij}-e_{rc})^2}$, with e_{rc} elevation in the cell on row r, column c. We superimpose the ruggedness grid to our hexagonal grid and take the weighted average ruggedness in our hexagons, with weights defined by the size of the ruggedness cells. As suggested by Nunn and Puga (2012) we divide ruggedness by 100,000, so that it is measured in hundreds of meters.

Bounty of the sea index. We calculate the bounty of the sea index with the method of Dalgaard et al. (2020). Their index is intended to capture the largely time-invariant geographical potential of local marine ecosystems, for which modern data on species distributions and dominant commercial species provide a proxy. We use data from Food and Agriculture Organization (2016) and Kaschner et al. (2013) which record country-level information on fish catch and a probability of finding different species of fish on a grid covering the seas. We use the FAO Fisheries Yearbook to identify the top eight fish caught by English boats in 1950-59 (the earliest decade available): these are the Atlantic cod, the Atlantic herring, the Haddock, the Whiting, the Pollock, the European plaice, the European hake and the Picked dogfish and account for 83% of the catch by live weight.[37] Next, we construct 0.1°× 0.1°buffers adound our hexagonal cells: this allows to define area just outside each cell that may be covering fisheries. We then use Aquamaps data to compute the average probability of finding each of the eight species of fish inside the buffer of each hexagonal cell. Our bounty of the sea index is the simple average of the eight probabilities.

Country banks in 1791. The locations of country banks (private banking institutions outside of London) is extracted from Dawes and Ward-Perkins (2000), which contains all country banks over 1688—1953. We only consider banks that were active as of 1791. Since the country banks were limited in size (by restrictions on the number of partners) these were generally unit banks, lending credence to their single-town locations.

Distance to 1791 postal town. A post town is a formal part of the state communication system, those towns at which horses are changed at points spread somewhat equidistantly along straight routes. Robertson (1961) documents the universe of post towns at 1791. We transform the variable with the natural logarithm.

Distance to newspapers. We first determine which of the newspapers in British Newspaper Archive was in print before 1820. Next, we manually geolocate the cities in which these newspapers were printed. Finally, we calculate the straight-line distance of the centroid of every hexagonal cell to each of these towns. We keep only

[37]We drop two acquatic species belonging to the top ten of British fish but not covered by Aquamaps: seaweeds and rays.

the distance to the closest town with a newspaper. We transform the variable with the natural logarithm.

1706-91 steam engine dummy. Kanefsky and Robey (1980) compiled a comprehensive list of all the early steam engines in use in England since 1706 (mostly Newcomen engines): we geolocate the engines installed before 1792 on the map of Southall and Burton (2004). We then take this map to the grid of hexagonal cells and create an indicator equal to one in cells with at least one engine.

1700-90 patent dummy. Woodcroft (1854) collects the population of all British patents granted between 1617 and 1854. We collect the residence of every inventor who filed a patent between 1700 and 1790 and geolocate them on the map of England (Southall and Burton, 2004). We then take this map to the grid of hexagonal cells and create an indicator equal to one in cells home to at least one inventor.

Mechanical apprentice dummy. We use the Apprenticeship Books or the Board of Stamps to compile a list of apprentices who trained between 1710 and 1791 to become metal workers or watchmakers. We can geolocate a total of 5,308 metal workers and 568 watchmakers who apprenticed between 1710 and 1791 and use them to construct a dummy.

Distance to Impress office. We obtain a list of Royal Navy officers serving in the Impress office in 1805 from the genealogy website curated by Paul Benyon.[38] We geolocate the 33 English stations where these officers were serving, and we calculate the distance to the closest Impress office of every cell.

Enclosures. Satchell et al. (2017) produced a map of English Parliamentary enclosure based on data collected by Tate and Turner (1978) and Clark and Clark (2001). We use this source to calculate the share of land enclosed by 1792 and between 1793 and 1815 in every cell.

Coal deposit. We follow Fernihough and O'Rourke (2021) and measure coal deposit with the presence of rock strata from the Carboniferous epoch. We create a dummy equal to one for any cell that is at least partially on carboniferous rock.

Proximity to slave port. We follow Heblich et al. (2022) and consider London, Bristol

[38] Accessed on the 1st of May 2025 here: https://freepages.rootsweb.com/~pbtyc/genealogy/Navy_List_1805/Officers/Impress_Service.html.

and Liverpool as the main ports involved in slave trade. We calculate the distance to the closest of these three ports and classify as "close to a slave port" all cells below median distance to one of these three ports.

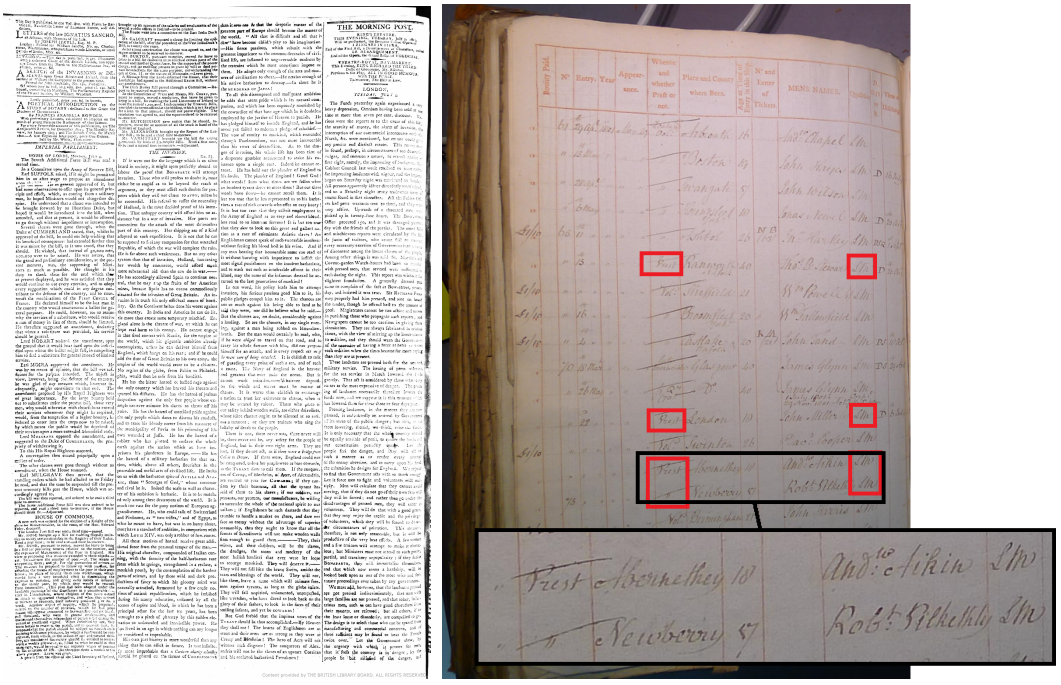
Wheat prices, 1792–1812. Brunt and Cannon (2014) collect weekly county-level wheat prices published by the *London Gazette* between 1770 and 1820. We calculate the difference in average yearly wheat price between 1792 and 1812, the wartime peak (Brunt and Cannon, 2014, Fig. 1). We assign county-level wheat price changes to cells based on what county covers most of the area of a cell.

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B Appendix Figures

Figure A.1: Evidence of pressed landsmen

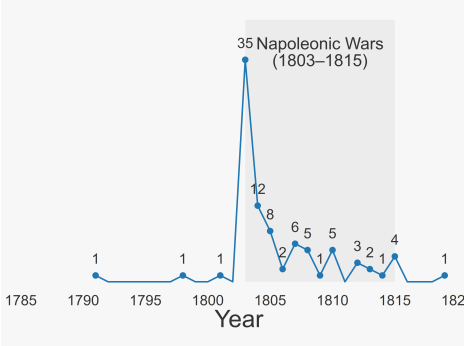
A. Morning Post, 5th July 1803 B. Page from the "Irresistable" Muster Rolls



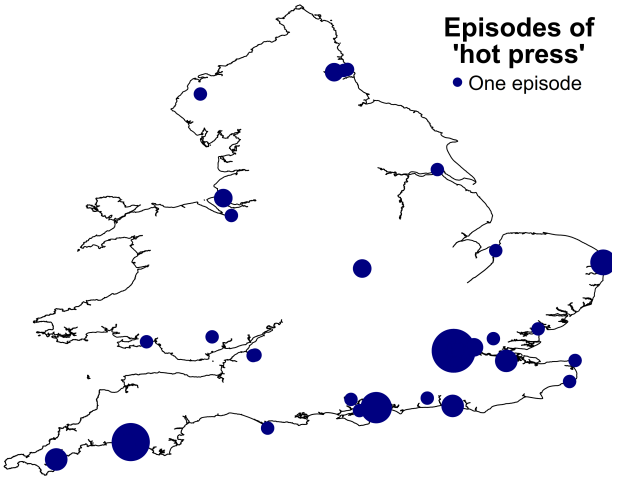
Notes: Evidence of pressed landsmen. Panel A: page 2 of the *Morning Post*, published in London on the 5th July 1803. Newspaper image © The British Library Board. All rights reserved. With thanks to The British Newspaper Archive (www.britishnewspaperarchive.co.uk). Source: British Library and Findmypast (2022). The article on the last column reads: "This reason may be found, perhaps, in circumstances of too domestic, vulgar, and common a nature, to attract notice at first sight, namely, the impressing of landsmen. The Cabinet Council last week resolved to issue orders for impressing landsmen with vigour, and the impress began on Saturday night was continued on Sunday. All persons apparently idle or disorderly were seized, and on a Saturday night many tradesmen were of course found in that character. All the Police Offices had press warrants sent to them, and they were very active. Upwards of a thousand men were picked up in twenty-four hours. [...] These landsmen are pressed both for the sea and military service. [...] Pressing landsmen, in the manner they are now pressed, is undoubtedly an avowal by Government of its sense of the public danger [...] Men will calculate that they cannot avoid serving, that if they do not go of their own free will they will be forced; and rather than go under the disadvantages of pressed men, they will enter as volunteers." Panel B: page from the 1802 muster rolls of the 3rd rate "Irresistable." We highlight in red four landsmen (column "Qualities" reports "LM") that were pressed (column "Whence and whether Presst or not" reports "Prest").

Figure A.2: Episodes of "hot press" mentioned in British newspapers, 1785–1820

A. Frequency overtime

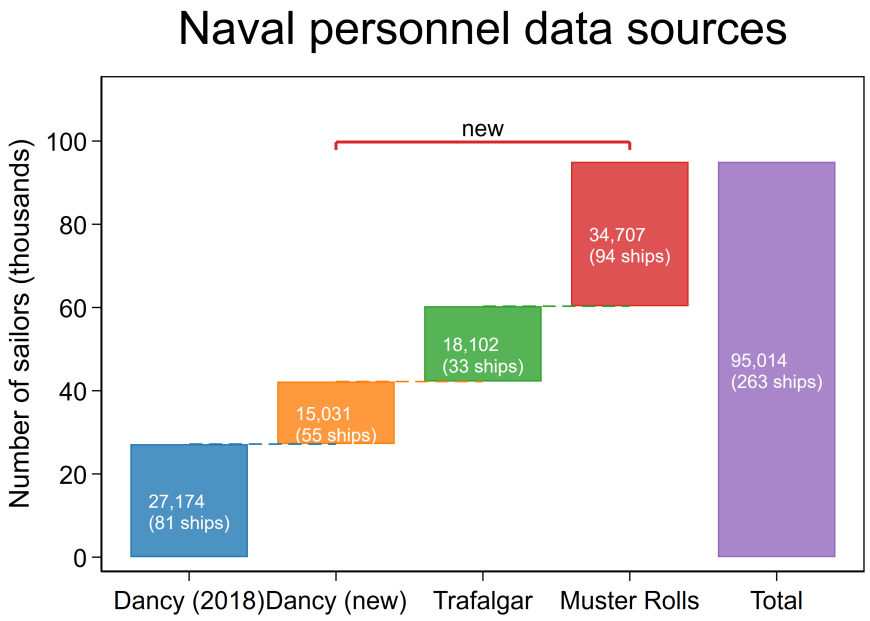


B. Location of "hot press" episodes



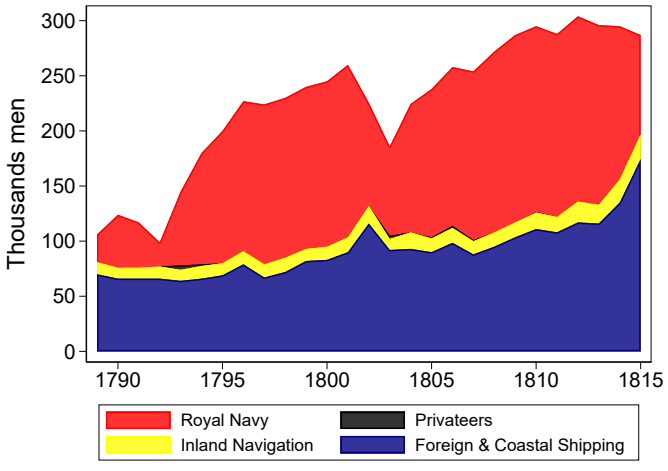
Notes: Number of episodes of "hot press" documented in British newspapers, 1785–1820. During a "hot press" Navy officers disregarded all exemptions, including those that protected landsmen. Panel A: number of episodes overtime. Panel B: location of these episodes. We construct this comprehensive new database as follows: First, we search on British Newspaper Archive all newspapers published between 1790 and 1815 that one of the following keywords: (1) "impressment" (2) "navy press" (3) "landsmen" and "press" (4) "hot press." This step finds 39,920 articles. Second, we remove obvious false positives with a first read of the article, performed with GPT-5-nano: this step narrows the number of articles to 3,978. These 3,978 articles clearly discuss one episode of Navy impressment which we can locate somewhere in Britain. Third, we submit all texts to GPT-5.1 to determine whether the article explicitly discusses the impressment of landsmen, defined as men without seafaring experience. After this classification step, only 235 articles remain. Finally, we deduplicate events using both spatial and temporal criteria, collapsing articles that occur within a 10 km radius and a four-day window into a single episode. To conclusively rule out duplicates, we asked GPT-5.1 to compare every possible pair of texts and judge whether the two items referred to the same "hot impressment" episode. After deduplication, the 235 articles collapse into 88 unique impressment episodes involving landsmen.

Figure A.3: Number of seamen records - by source.



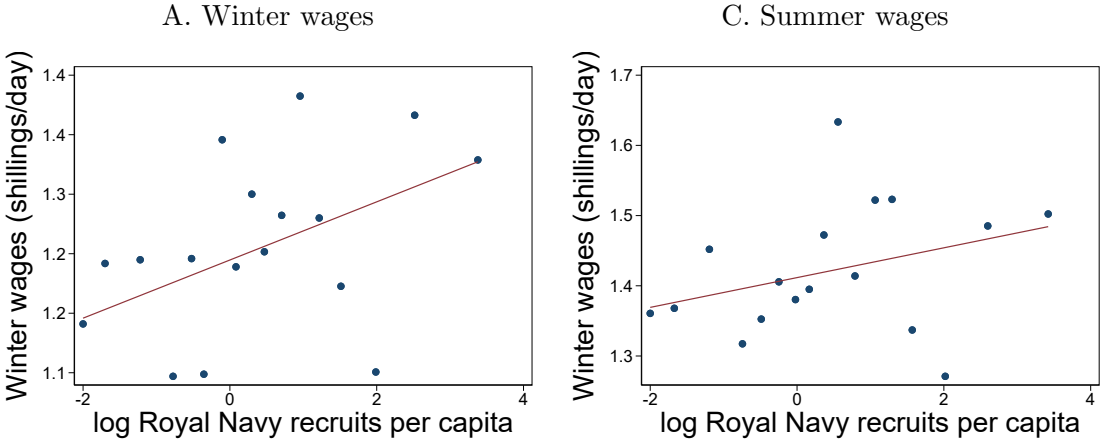
Notes: Source: Dancy (2012), Figure 2.1 and The National Archives. See text.

Figure A.4: British men employed at sea: 1790–1815.



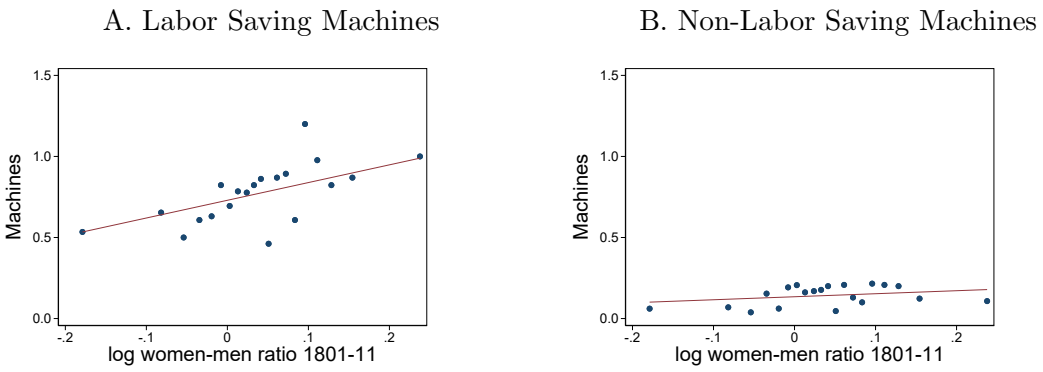
Notes: Source: Dancy (2012), Figure 2.1.

Figure A.5: The impact of naval recruitment on the labor market



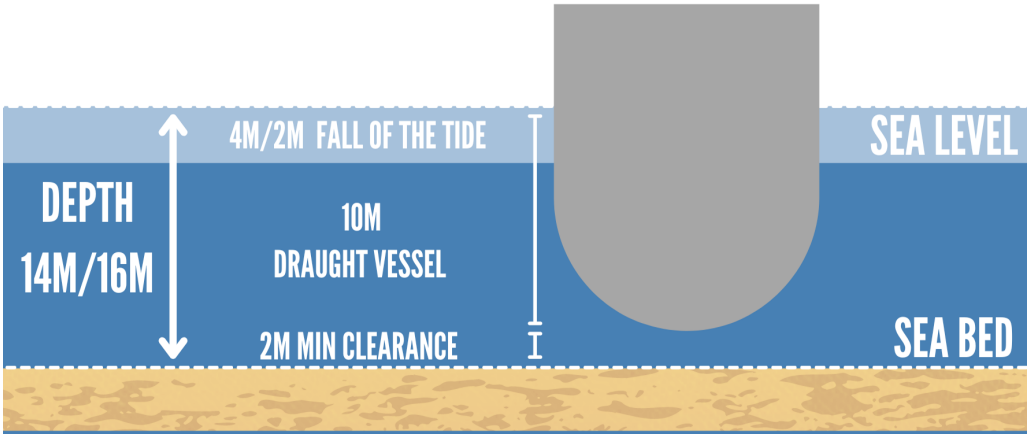
Notes: Binscatter of agricultural wages against log Royal Navy recruitment per capita. Panel A: agricultural wages paid in winter (N=247). Panel B: agricultural wages paid in summer (N=223).

Figure A.6: Gender ratios and machine adoption



Notes: Women to men ratios and machine adoption. Unconditional binscatters with average number of agricultural machines (y-axis) against bins of log average women to men ratios in 1801-11 (x-axes). Panel A: labor-saving agricultural machines. Panel B: non-labor saving agricultural machines.

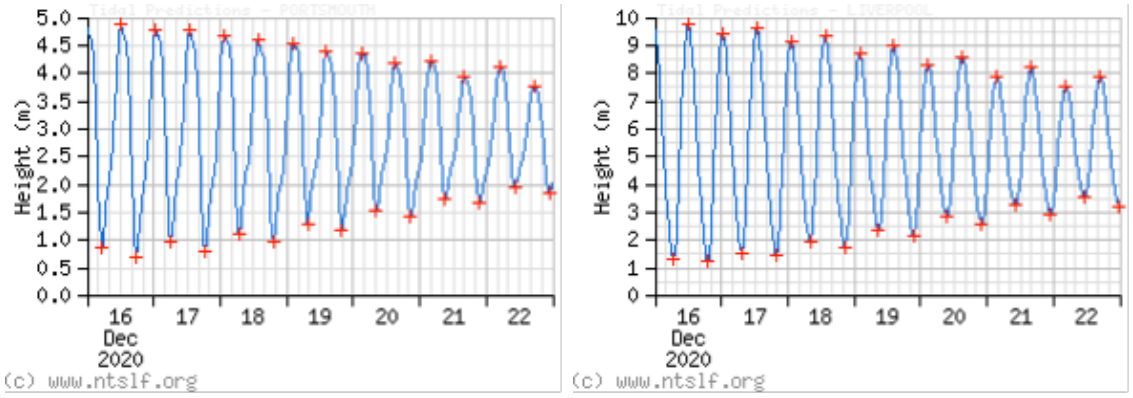
Figure A.7: Depth requirement for safe anchorage.



Notes: Illustration of the FUD rule. Source: http://www.sailtrain.co.uk/navigation/theightanchoring.html

Figure A.8: Tides in Portsmouth and Liverpool

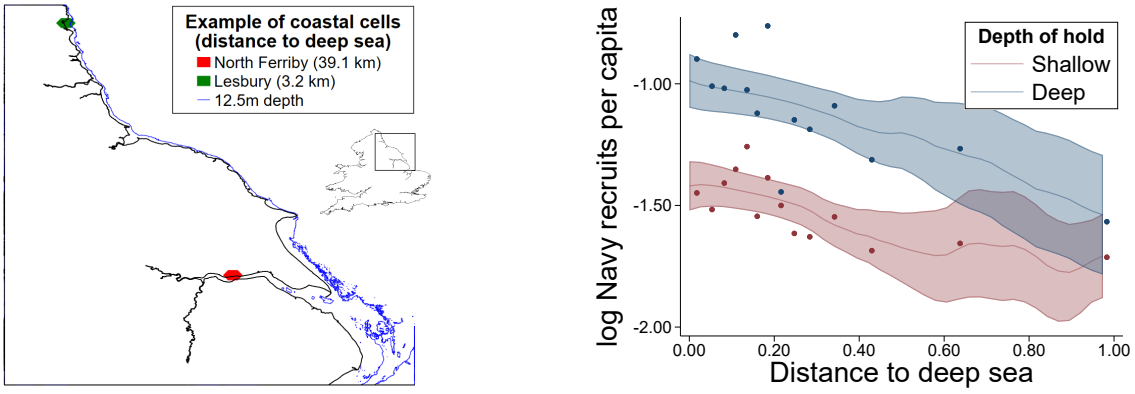
A. Portsmouth B. Liverpool



Notes: Tidal variation in the sea level over the week of 16 December 2020 in two British ports. Panel A: Portsmouth. Panel B: Liverpool.

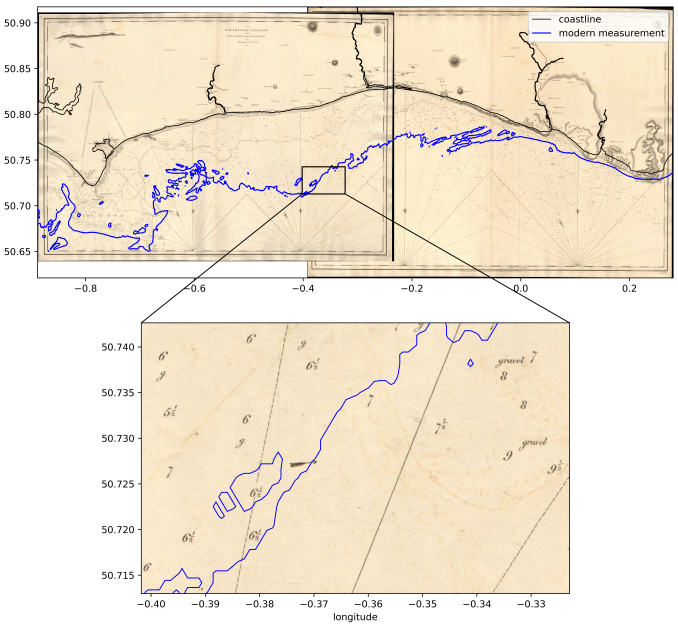
Figure A.9: IV strategy validation

A. Example: cells with different IV exposure B. Depth of hold of recruits' ships



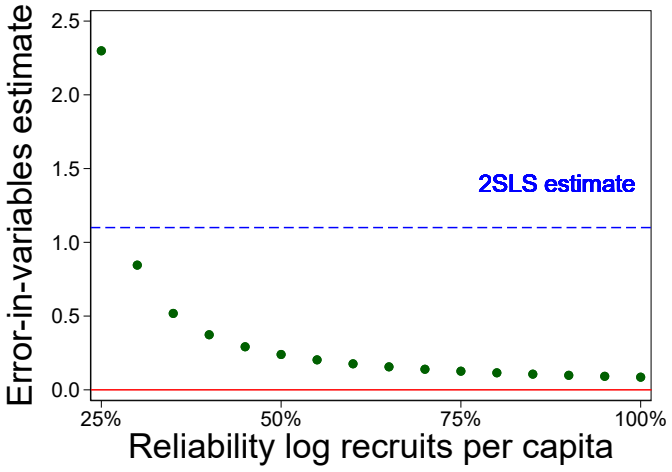
Notes: Panel A: location of two cells used for illustration in the text. Panel B: distance to deep sea and depth of Navy recruits' ships. We use Cattaneo et al. (2024) Stata package `binsreg` to plot unconditional binscatters of distance to the deep sea (x-axis) on log Royal Navy recruits per capita (y-axis). We split recruits into those found on deep (>5m depth of hold) ships (in blue) and those sailing on shallow (<5m) ships (red). We superimpose kernel-weighted local polynomial smoothing lines and their 95% confidence intervals.

Figure A.10: Historical and Modern-Day Depth Measurements



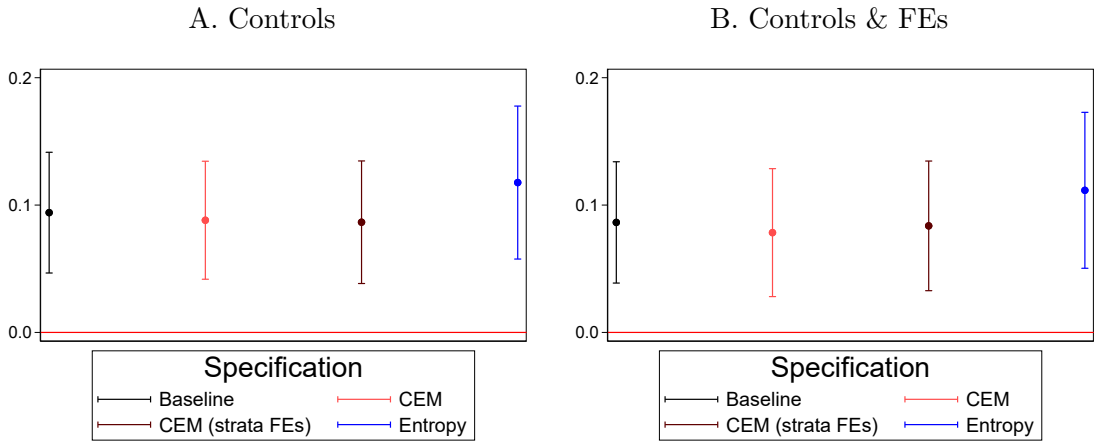
Notes: The top panel shows two hydrographic maps of the English coast (black line) East of Portsmouth, with the modern-day 12.5m bathymetric line superimposed in blue. The bottom panel shows an enlarged part of the upper left map with the modern-day 12.5m measurement overlaid with the depth soundings in fathoms from the historical map (6.835 fathoms are 12.5m).

Figure A.11: Error in variables estimates



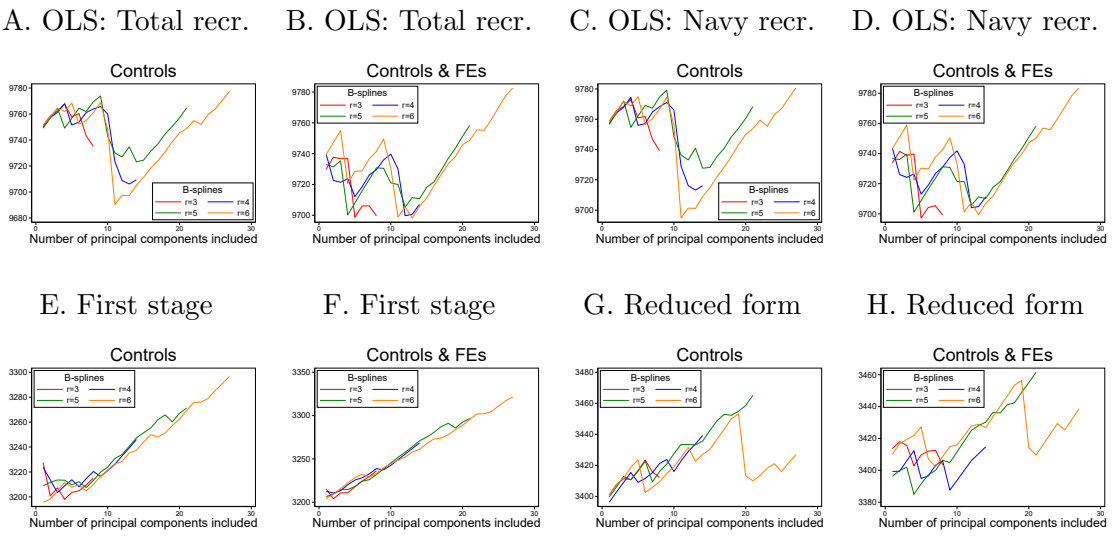
Notes: Error in variable estimates. The figure plots OLS estimates of the impact of naval recruitment on labor saving machine adoption (y-axis) against different levels of assumed reliability of the naval recruitment variable. The point at 100% reliability corresponds to the baseline OLS estimates, which assume no measurement error in recruitment. The dashed, horizontal blue line corresponds to the IV estimates. The sample consists 887 cells within 15 km from the coast.

Figure A.12: Matching exercises



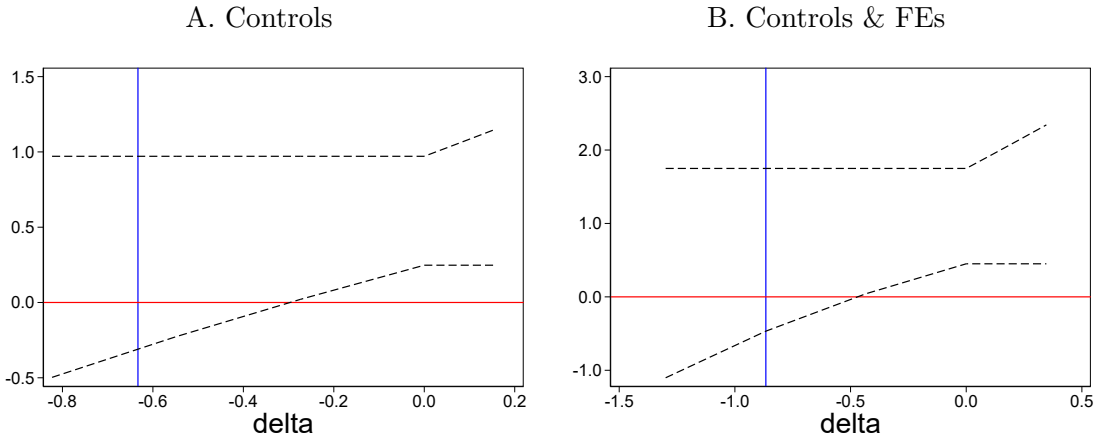
Notes: Coefficients and 95% confidence intervals of the effect of total military recruitment on labor saving machine adoption with different estimation methods. In each panel, from left to right, estimation method is: OLS (baseline); Coarsened Exact Matching (CEM: Iacus et al., 2012); CEM with strata fixed effects; weighted OLS with entropy weights (Hainmueller, 2012). Panel A: specifications with all control. Panel B: specifications with controls and five region fixed effects. See Section 5.2 for details.

Figure A.13: Bayesian Information Criterion for different B-splines included



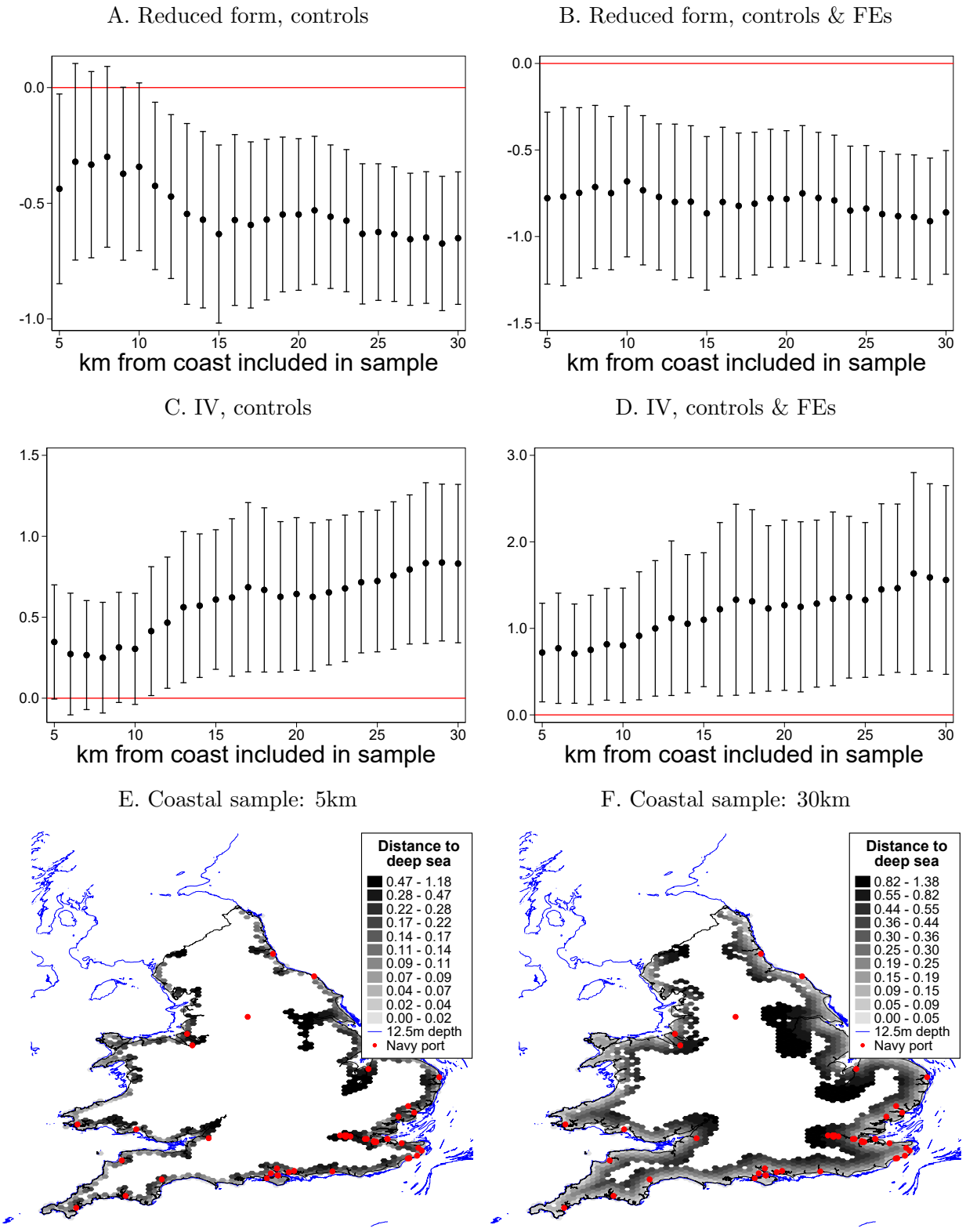
Notes: The y-axis of each panel shows the value of the Bayesian Information Criterion (BIC) statistic for regressions that include the first L_r principal components of r base splines (B-splines) in coordinates, with $r = 3, 4, 5, 6$ and $L_r = 1, 2, \ldots, r-2$. For each r, L_r combination, we plot the BIC statistics of regressions that include the first L_r principal components of r B-splines. Panel A, C, E, G: include the B-splines and all control. Panel B, D, F, H: include the B-splines, all controls and five region fixed effects.

Figure A.14: Plausibly exogenous



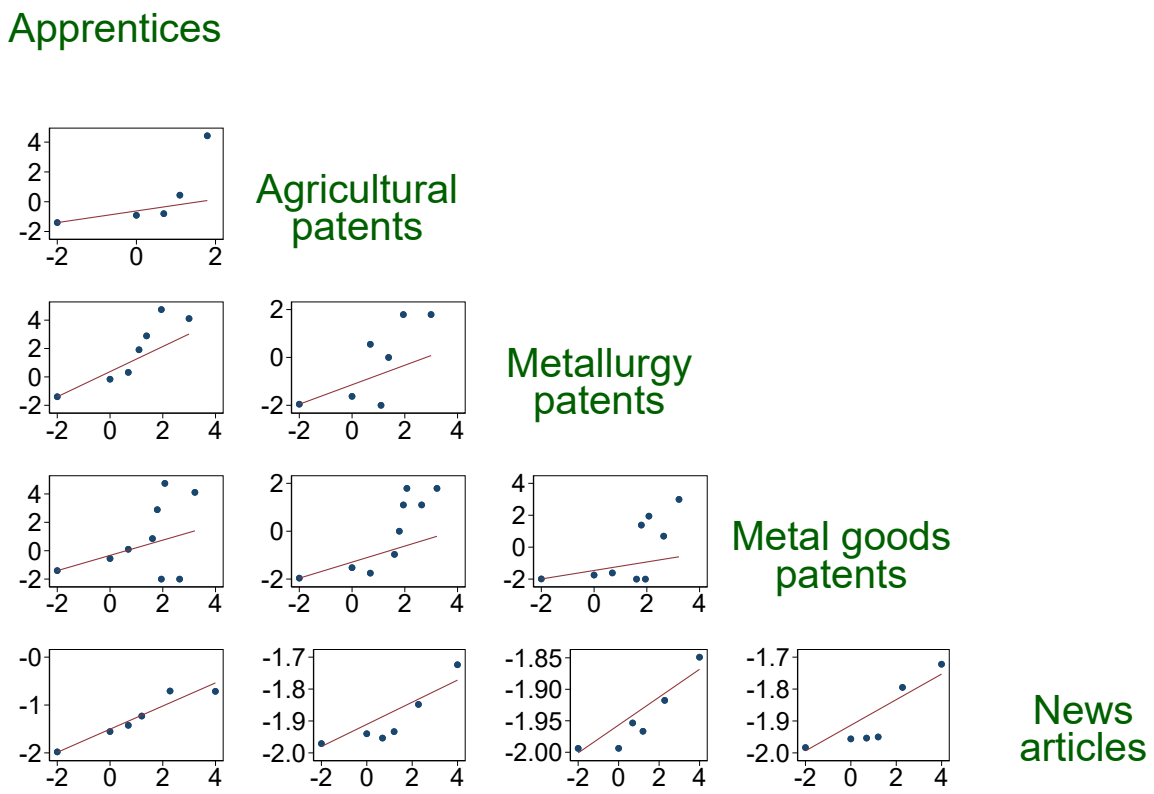
Notes: Effect of violation of exclusion restriction (Conley et al., 2012). Union of 90% confidence intervals of the IV estimates (y-axis) when the exclusion restriction is violated (x-axis). Blue vertical lines: point estimate of the reduced form coefficients. Panel A: specifications with all control. Panel B: specifications with controls and five region fixed effects. See Section 5.4 for details.

Figure A.15: Alternative definitions of coastal sample



Notes: Robustness to the definition of coastal sample. Panels A–B: reduced form: effect of distance to deep sea on labor saving machine adoption in different coastal samples. Panels C–D: IV estimates: effect of naval recruitment on labor saving machine adoption in different coastal samples; instrument is distance to the deep sea. Panels A and C: specifications include distance to the coast and all controls; Panels B and D: specifications include distance to the coast, all controls and five region fixed effects. We use robust standard errors to draw 95% confidence intervals around point estimates. Panels E–F: value of instrument in samples of cells within 5 km and 30 km from the coast.

Figure A.16: Binscatter correlation matrix for the five components of the measure of mechanics



Notes: Matrix of binscatters between the five components used to measure the presence of mechanics and mechanical knowledge. Each panel shows a binscatter and a fitted linear function between each pair of the five variables we use to measure the presence of mechanics and mechanical knowledge during the Napoleonic Wars. "Apprentices" learnt their trade from metal workers or watchmakers masters in 1792–1811 (the last year available). "Patents" are collected by Woodcroft (1854): we use patents filed in 1792–1820 and classified as agricultural, metallurgy or metal goods. "Newspaper" are mention of one of the words referring to mechanical knowledge published by British newspapers between 1792 and 1820.

C Appendix Tables

Table A.1: Main results with log machines

	Dep. var.: log labor saving machines					
Panel A. Recruits are:	Total recruits		Navy recruits		Navy recruits	
	OLS	OLS	OLS	OLS	2SLS	2SLS
log recruits per capita	0.074***	0.065***	0.059***	0.059***	0.523**	0.877**
	[0.000]	[0.000]	[0.002]	[0.002]	[0.013]	[0.012]
Mean log machines	-0.490	-0.490	-0.490	-0.490	-0.465	-0.465
Anderson-Rubin test (p-value)					0.006	0.002
Distance to coast	Yes	Yes	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	No	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887
	Dep. var.: log non-labor saving machines					
Panel B. Recruits are:	Total recruits		Navy recruits		Navy recruits	
	OLS	OLS	OLS	OLS	2SLS	2SLS
log recruits per capita	0.023	0.021	-0.008	-0.008	-0.082	0.235
	[0.254]	[0.298]	[0.715]	[0.715]	[0.695]	[0.450]
Mean log machines	-0.887	-0.887	-0.887	-0.887	-0.905	-0.905
p-value labor saving = non labor saving	0.000	0.001	0.001	0.002	0.006	0.019
Anderson-Rubin test (p-value)					0.698	0.456
Distance to coast	Yes	Yes	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	No	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887
	Dep. var.: log machines			
Panel C. Reduced form	Labor saving		Non labor saving	
Distance to deep sea	-0.087***	-0.110***	0.014	-0.030
	[0.006]	[0.002]	[0.698]	[0.456]
R^2	0.279	0.289	0.073	0.084
p-value labor saving = non labor saving			0.002	0.004
Mean machines	-0.465	-0.465	-0.905	-0.905
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	No	No	No
Observations (grid cells)	887	887	887	887

Notes: Main results with log machine adoption as dependent variable. Sample consists of: 2603 equally sized hexagonal cells (Panel A and B, cols 1–4) and 887 cells within 15 km from the coast (Panel A and B, cols 5–6 and Panel C). Dependent variable: Panel A and Panel C, col 1–2: log labor-saving machines; Panel B and Panel C, col 3–4: log non-labor saving machines. Model is: Panel A and B, col 1–4: OLS; Panel A and B, cols 5–6: IV; Panel C: reduced form. Full controls include: distance to the coast, log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. The p-values at the bottom of Panel B and C test the null that the coefficients of labor-saving and non-labor saving machines are the same. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** p<0.01, ** p<0.05, * p<0.1.

Table A.2: Validation. Distance to deep sea and port presence.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dep. var.: Port presence in grid cell (any size)							
Panel A. Presence of port used by:	Royal Navy ships				Commercial ships			
Distance to deep sea	-0.089***	-0.103***	-0.076***	-0.075***	-0.073**	-0.054	-0.042	-0.027
	[0.000]	[0.000]	[0.001]	[0.002]	[0.029]	[0.126]	[0.256]	[0.496]
R^2	0.038	0.097	0.218	0.228	0.230	0.256	0.272	0.307
Mean dep. var.	0.085	0.085	0.085	0.085	0.460	0.460	0.460	0.460

	Dep var.: Distance to top 15 ports							
Panel B. Distance to ports used by:	Royal Navy ships				Commercial ships			
Distance to deep sea	0.172***	0.375***	0.335***	0.068***	-0.117***	-0.017	-0.057*	0.003
	[0.000]	[0.000]	[0.000]	[0.001]	[0.000]	[0.587]	[0.089]	[0.919]
R^2	0.034	0.446	0.522	0.859	0.012	0.135	0.223	0.354
Mean dep. var.	134.9	134.9	134.9	134.9	75.8	75.8	75.8	75.8
Distance to the coast	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demography, area, soil and farm ads	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Technology, skills, finance and geography	No	No	Yes	Yes	No	No	Yes	Yes
Region FEs (5)	No	No	No	Yes	No	No	No	Yes
Observations (grid cells)	887	887	887	887	887	887	887	887

Notes: β-coefficients from OLS estimates. Panel A: dependent variables are indicators for port presence within 8 km from the cell centroid. Any type of port is considered. Panel B: dependent variables are distance to the closest of the busiest 15 ports in England. Cols 1-4: ports are used by Royal Navy ships. Cols 5–8: ports are used by commercial ships. Full controls include: distance to the coast, log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Units of observation are 887 equally sized hexagonal cells lying within 15 km from the coast. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.3: Validation. Distance to deep sea and recruitment by depth of ship's hold.

	(1)	(2)	(3)	(4)
	log Navy recruits per capita			
The recruit's ship has:	Deep hold		Shallow hold	
Distance to deep sea	-0.114***	-0.089**	-0.076**	-0.075**
	[0.000]	[0.012]	[0.028]	[0.038]
R^2	0.193	0.216	0.163	0.168
Mean dep. var.	-1.117	-1.117	-1.518	-1.518
p-value deep = shallow	0.052	0.324		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887

Notes: OLS estimates. Dependent variable log Royal Navy recruits per capita. Cols 1–2: recruits sailing on ships with deep holds, i.e. deep draught (more than 5m). Cols 3–4: recruits sailing on ships with shallow draught (less than 5m). The p-value at the bottom of the table tests that the coefficient of distance to deep sea in cols 1-3 and 2-4 are the same. Full controls include: distance to the coast, log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Units of observation are 887 equally sized hexagonal cells lying within 15 km from the coast. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.4: The impact of recruitment on gender ratios: identification.

	(1)	(2)	(3)	(4)
	Dep. var.: log gender ratio			
Panel A. OLS and two-stage least squares	OLS		2SLS	
log Royal Navy recruits per capita	0.194***	0.185***	0.299	0.497*
	[0.000]	[0.000]	[0.104]	[0.064]
R^2	0.281	0.318		
Mean dep. var.	0.036	0.036	0.036	0.036
Kleibergen-Paap F-stat first stage			24.6	12.4
Anderson-Rubin test (p-value)			0.116	0.076

	Navy recruits		log gender ratio	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.164***	-0.124***	-0.049	-0.062*
	[0.000]	[0.000]	[0.116]	[0.076]
R^2	0.244	0.276	0.254	0.295
Mean dep. var.	-0.270	-0.270	0.036	0.036
Distance to the coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	884	884	884	884

Notes: The impact of recruitment on the gender ratios. Panel A: Dependent variable is log average 1801-11 women to men ratio. Panel B: Dependent variables are log Royal Navy recruits per capita (cols 1–2); log average 1801-11 women to men ratio (cols 5–6). Panel A: estimation method is OLS (cols 1–2) and two-stages least squares, with recruits instrumented with distance to deep sea (cols 3–4). Panel B: first stages in cols 1–2; reduced form in cols 3–4. The Kleibergen-Paap F-stat in Panel A tests the null that the two instruments do not predict jointly the two endogenous variables. Full controls include: distance to the coast, log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2 and 4 in both panels add five region fixed effects. Panel A, cols 3–4 and Panel B also control for distance to the coast. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. ***p<0.01, **p<0.05, *p<0.1.

Table A.5: Adoption and recruitment of "landsmen" by the Royal Navy

	(1)	(2)	(3)	(4)	(5)	(6)
	Labor saving machines				Landsmen recruits	
Regression:	OLS		2SLS		First stage	
log landsmen Navy recruits per capita	0.045*	0.045*	1.158*	2.139		
	[0.051]	[0.055]	[0.050]	[0.118]		
Distance to deep sea					-0.081**	-0.060
					[0.018]	[0.103]
R^2	0.205	0.219			0.149	0.171
Mean dep. var.	0.769	0.769	0.798	0.798	-1.243	-1.243
Kleibergen-Paap F-stat			5.6	2.7		
Anderson-Rubin test (p-value)			0.001	0.000		
Distance to the coast	No	No	Yes	Yes	Yes	Yes
Full controls	No	Yes	No	Yes	No	Yes
Region FEs (5)	Yes	Yes	Yes	Yes	Yes	Yes
Observations (grid cells)	2603	2603	887	887	887	887

Notes: Adoption and recruitment of inexperienced "landsmen" by the Royal Navy. Dependent variable: Cols 1–4: labor saving machines in grid cell. Cols 5–6: log Royal Navy recruits classified as "landsmen" per capita. Cols 1–2: estimated with OLS. Cols. 3–4: estimated with two-stage least square instrumenting landsmen with distance to the deep sea. Cols 5–6: first stage. Full controls include: distance to the coast, log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Units of observation are: cols 1–2: 2603 equally sized hexagonal cells; cols 3–6: 887 equally sized hexagonal cells lying within 15 km from the coast. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.6: Adoption, recruitment and Royal Navy "impress service" offices in 1805

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Impress office	log recruits per capita				Machines	
Dep. var.:	Distance	Navy: all	Navy: landsmen	Navy: rest	Army	Labor saving	Non labor saving
Distance to deep sea	0.135***						
	[0.000]						
Distance to Impress office		-0.148***	-0.139***	-0.116***	0.046	-0.147***	-0.082**
		[0.000]	[0.000]	[0.004]	[0.278]	[0.001]	[0.042]
R^2	0.364	0.273	0.179	0.272	0.123	0.217	0.071
Mean dep. var.	36.531	-0.275	-1.243	-0.540	-0.941	0.798	0.121
Distance to the coast	Yes	No	No	No	No	No	No
Full controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations (grid cells)	887	887	887	887	887	887	887

Notes: Recruitment and Royal Navy "Impress service" offices in 1805. Dependent variable: Col 1: distance to the closest impress service office active in 1805. Col 2: log Royal Navy recruits per capita. Col 3: log Royal Navy landsmen recruits per capita. Col 4: log Royal Navy non-landsmen recruits per capita. Col 5: log British Army recruits per capita. Col 6: labor saving machines in grid cell. Col 7: non labor saving machines in grid cell. Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Col. 1 also control for distance to the coast. Units of observation are: 887 equally sized hexagonal cells lying within 15 km from the coast. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.7: Never-takers

	(1)	(2)	(3)	(4)	(5)
	Labor saving machines				
Definition of never takers:		Few recruits		Far from *rendezvous*	
	Coastal sample	Never takers	Rest	Never takers	Rest
Distance to deep sea	-0.128***	0.121	-0.125***	0.035	-0.122***
	[0.000]	[0.444]	[0.000]	[0.462]	[0.000]
R^2	0.218	0.351	0.219	0.839	0.227
Mean dep. var.	0.798	0.121	0.883	0.056	0.881
p-value never takers = rest			0.001		0.000
Distance to coast	Yes	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	Yes	Yes	Yes	Yes	Yes
Observations (grid cells)	887	99	788	89	798

Notes: Reduced form estimates for coastal sample (col 1), for cells with fewer than two Royal Navy recruits within 8km (col 2), for cells with two or more recruits within 8km (col 3), for cells farther than 75 km from an Impress Service *rendezvous* (col 4), and for cells within 75 km from an Impress Service *rendezvous* (col 5). Sample in col 1 consists of 887 cells within 15 km from the coast. Full controls include: distance to the coast, log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Units of observation are 887 equally sized hexagonal cells lying within 15 km from the coast. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** p<0.01, ** p<0.05, * p<0.1.

Table A.8: Analysis of compliers

	Average				*p*-value	
	Coastal Sample (1)	Compliers (2)	Always Takers (3)	Never Takers (4)	(2) - (3)	(2) - (4)
Distance to coast	0.040	0.045	0.063	0.015	0.132	0.006
	(0.002)	(0.010)	(0.004)	(0.002)		
log 1801 population	7.185	7.429	7.499	6.752	0.716	0.000
	(0.027)	(0.162)	(0.061)	(0.072)		
log area	4.630	4.772	4.754	4.438	0.796	0.000
	(0.012)	(0.076)	(0.008)	(0.040)		
Wheat suitability	3747.791	3818.406	3825.067	3636.150	0.926	0.058
	(12.906)	(75.299)	(21.399)	(32.323)		
1801 % agri workers	0.353	0.291	0.321	0.414	0.452	0.002
	(0.006)	(0.036)	(0.014)	(0.016)		
1801 % trade workers	0.109	0.117	0.124	0.090	0.784	0.184
	(0.003)	(0.017)	(0.008)	(0.007)		
Distance to 1791 post town	2.227	2.207	2.028	2.436	0.206	0.086
	(0.022)	(0.115)	(0.050)	(0.042)		
Distance to newspaper town	2.992	3.072	2.888	3.058	0.164	0.928
	(0.020)	(0.114)	(0.044)	(0.041)		
1791 country banks	0.335	0.249	0.520	0.190	0.166	0.692
	(0.027)	(0.152)	(0.076)	(0.040)		
1707-90 steam engines (0/1)	0.056	0.047	0.050	0.067	0.890	0.674
	(0.008)	(0.043)	(0.016)	(0.019)		
1700-90 patents (0/1)	0.067	-0.030	0.128	0.050	0.008	0.132
	(0.008)	(0.050)	(0.025)	(0.017)		
1710-92 mechanic apprentice (0/1)	0.396	0.413	0.531	0.251	0.284	0.126
	(0.017)	(0.088)	(0.038)	(0.033)		
log army recruits pc	-0.941	-1.026	-0.459	-1.385	0.078	0.210
	(0.045)	(0.242)	(0.115)	(0.090)		
Proportions	1.00	0.193	0.402	0.405		
		(0.032)	(0.022)	(0.023)		

Notes: Average characteristics in the coastal sample (col 1) and in the sample of compliers (col 2), always takers (col 3) and never takers (col 4). We apply the method of Marbach and Hangartner (2020) to profile compliers and discretize naval recruitment and distance to the deep sea by splitting the sample at the median. The last two columns report *p*-values for the test that the average of compliers are similar to always takers and to never takers.

Table A.9: Synergy between country banks and labor scarcity

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.055***	0.047**	0.030	0.040	0.522***	0.862***
	[0.004]	[0.014]	[0.314]	[0.214]	[0.006]	[0.009]
log recruits per capita × banks	0.071**	0.075**	0.085	0.087	0.252	0.400
	[0.020]	[0.012]	[0.173]	[0.162]	[0.583]	[0.451]
1791 country banks	0.016	0.022	0.019	0.027	0.022	0.053
	[0.389]	[0.222]	[0.627]	[0.495]	[0.681]	[0.510]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.213	0.226	0.203	0.213		
Mean dep. var.	0.769	0.769	0.798	0.798	0.798	0.798
Kleibergen-Paap F-stat first stage					0.6	1.6
Anderson-Rubin test (p-value)					0.005	0.001
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	No	Yes
Observations (grid cells)	2603	2603	887	887	887	887

	Navy recruits		Recruits × banks		Labor saving machines	
Panel B. First stage and reduced form.	First Stage				Reduced form	
Distance to deep sea	-0.178***	-0.139***	-0.004	-0.025	-0.094***	-0.130***
	[0.000]	[0.000]	[0.877]	[0.420]	[0.001]	[0.000]
Distance to deep sea × banks	0.081	0.094*	-0.160	-0.179	0.002	0.010
	[0.121]	[0.078]	[0.327]	[0.266]	[0.970]	[0.876]
1791 country banks	-0.095*	-0.125**	0.153	0.168	0.011	0.012
	[0.082]	[0.021]	[0.224]	[0.181]	[0.870]	[0.868]
R^2	0.245	0.278	0.067	0.075	0.206	0.218
Mean dep. var.	-0.275	-0.275	0.020	0.020	0.798	0.798
F-stat H0: distance to deep sea = 0	27.3	15.1	0.0	0.7		
F-stat H0: distance to deep sea × banks = 0	2.4	3.1	1.0	1.2		
F-stat H0: both instruments = 0	13.7	8.1	1.0	2.1		
Distance to coast	Yes	Yes	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887	887	887

Notes: Heterogeneity in the effect of labor scarcity on machine adoption by presence of country banks. Panel A: Dependent variable is labor-saving machines. Panel B: Dependent variables are log Royal Navy recruits per capita (cols 1–2); log Royal Navy recruits per capita × country banks (cols 3–4); labor saving machines (cols 5–6). Panel A: estimation method is OLS (cols 1–4) and two-stages least squares, with recruits and recruits × country banks instrumented with distance to deep sea and distance to deep sea interacted with country banks (cols 5–6). Panel B: first stages in cols 1–4; reduced form in cols 5–6. The Kleibergen-Paap F-stat in Panel A tests the null that the two instruments do not predict jointly the two endogenous variables. The F-stats in panel B test the null that the instruments do not predict the endogenous variables in separate regressions. Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2 and 4 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. ***p<0.01, **p<0.05, *p<0.1.

Table A.10: Synergy between coal deposits and labor scarcity

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.092***	0.083***	0.057	0.068*	0.503**	0.969**
	[0.000]	[0.001]	[0.112]	[0.074]	[0.021]	[0.013]
log recruits per capita × coal deposits	-0.033*	-0.026	0.007	0.010	0.329	0.312
	[0.065]	[0.144]	[0.785]	[0.686]	[0.415]	[0.518]
Coal deposit	-0.014	-0.008	-0.013	-0.001	0.035	0.043
	[0.405]	[0.624]	[0.638]	[0.972]	[0.671]	[0.667]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.210	0.222	0.197	0.207		
Mean dep. var.	0.769	0.769	0.798	0.798	0.798	0.798
Kleibergen-Paap F-stat first stage					1.3	1.4
Anderson-Rubin test (p-value)					0.002	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	No	Yes
Observations (grid cells)	2603	2603	887	887	887	887

	Navy recruits		Recruits × coal		Labor saving machines	
Panel B. First stage and reduced form.	First Stage				Reduced form	
Distance to deep sea	-0.165***	-0.124***	-0.019	-0.009	-0.089***	-0.123***
	[0.000]	[0.000]	[0.362]	[0.736]	[0.002]	[0.000]
Distance to deep sea × coal deposits	-0.012	-0.022	-0.153	-0.167*	-0.056	-0.073**
	[0.783]	[0.645]	[0.128]	[0.097]	[0.100]	[0.039]
Coal deposit	0.002	0.010	-0.054	-0.038	0.018	0.041
	[0.972]	[0.849]	[0.625]	[0.730]	[0.561]	[0.250]
R^2	0.244	0.276	0.105	0.125	0.207	0.220
Mean dep. var.	-0.275	-0.275	-0.068	-0.068	0.798	0.798
F-stat H0: distance to deep sea = 0	23.9	12.2	0.8	0.1		
F-stat H0: distance to deep sea × coal = 0	0.1	0.2	2.3	2.8		
F-stat H0: both instruments = 0	12.8	6.5	1.7	1.4		
Distance to coast	Yes	Yes	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887	887	887

Notes: Heterogeneity in the effect of labor scarcity on machine adoption by presence of carboniferous deposits. Panel A: Dependent variable is labor-saving machines. Panel B: Dependent variables are log Royal Navy recruits per capita (cols 1–2); log Royal Navy recruits per capita × coal deposits (cols 3–4); labor saving machines (cols 5–6). Panel A: estimation method is OLS (cols 1–4) and two-stages least squares, with recruits and recruits × coal deposits instrumented with distance to deep sea and distance to deep sea interacted with coal deposits (cols 5–6). Panel B: first stages in cols 1–4; reduced form in cols 5–6. The Kleibergen-Paap F-stat in Panel A tests the null that the two instruments do not predict jointly the two endogenous variables. The F-stats in panel B test the null that the instruments do not predict the endogenous variables in separate regressions. Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2 and 4 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. ***p<0.01, **p<0.05, *p<0.1.

Table A.11: Synergy between proximity to slave ports and labor scarcity

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.078***	0.072***	0.096**	0.121**	0.560***	1.136**
	[0.003]	[0.005]	[0.031]	[0.014]	[0.005]	[0.010]
log recruits per capita × close to slave port	-0.002	-0.002	-0.054	-0.064	0.130	-0.145
	[0.940]	[0.943]	[0.161]	[0.101]	[0.860]	[0.855]
Below median distance to slave port	-0.022	-0.058**	-0.062*	-0.098**	-0.054	-0.149**
	[0.251]	[0.014]	[0.065]	[0.014]	[0.457]	[0.026]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.210	0.224	0.201	0.216		
Mean dep. var.	0.769	0.769	0.798	0.798	0.798	0.798
Kleibergen-Paap F-stat first stage					0.4	0.6
Anderson-Rubin test (p-value)					0.002	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	No	Yes
Observations (grid cells)	2603	2603	887	887	887	887

	Navy recruits		Recruits × slave port		Labor saving machines	
Panel B. First stage and reduced form.	First Stage				Reduced form	
Distance to deep sea	-0.191***	-0.137***	-0.019	-0.025	-0.109***	-0.153***
	[0.000]	[0.000]	[0.410]	[0.441]	[0.000]	[0.000]
Distance to deep sea × close to slave port	0.074	0.036	-0.059	-0.068	0.034	0.050
	[0.162]	[0.524]	[0.425]	[0.375]	[0.335]	[0.175]
Below median distance to slave port	-0.060	0.008	-0.048	0.002	-0.094**	-0.140***
	[0.220]	[0.871]	[0.448]	[0.971]	[0.019]	[0.002]
R^2	0.246	0.277	0.086	0.100	0.210	0.227
Mean dep. var.	-0.275	-0.275	-0.090	-0.090	0.798	0.798
F-stat H0: distance to deep sea = 0	33.7	12.8	0.7	0.6		
F-stat H0: distance to deep sea × slave port = 0	2.0	0.4	0.6	0.8		
F-stat H0: both instruments = 0	16.9	6.9	0.6	0.9		
Distance to coast	Yes	Yes	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887	887	887

Notes: Heterogeneity in the effect of labor scarcity on machine adoption by proximity to slave ports. Panel A: Dependent variable is labor-saving machines. Panel B: Dependent variables are log Royal Navy recruits per capita (cols 1–2); log Royal Navy recruits per capita × slave port proximity (cols 3–4); labor saving machines (cols 5–6). Panel A: estimation method is OLS (cols 1–4) and two-stages least squares, with recruits and recruits × slave port proximity instrumented with distance to deep sea and distance to deep sea interacted with slave port proximity (cols 5–6). Panel B: first stages in cols 1–4; reduced form in cols 5–6. The Kleibergen-Paap F-stat in Panel A tests the null that the two instruments do not predict jointly the two endogenous variables. The F-stats in panel B test the null that the instruments do not predict the endogenous variables in separate regressions. Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2 and 4 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. ***p<0.01, **p<0.05, *p<0.1.

Table A.12: Adoption after the Napoleonic Wars.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines (1821-30)					
Panel A. Adoption and recruits. Recruits are:	Total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.027	0.021	0.023	0.025	0.510**	0.921**
	[0.124]	[0.230]	[0.238]	[0.220]	[0.011]	[0.023]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.301	0.318	0.301	0.318		
Mean dep. var.	0.720	0.720	0.720	0.720	0.647	0.647
Anderson-Rubin test (p-value)					0.004	0.003
p-value 1821–30 = 1800–20	0.041	0.008	0.030	0.018	0.668	0.357
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	No	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887

	(1)	(2)	(3)	(4)
	Navy recruits		Lab sav mach (1821-30)	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.167***	-0.116***	-0.085***	-0.107***
	[0.000]	[0.001]	[0.004]	[0.003]
R^2	0.251	0.285	0.320	0.331
Mean. dep. var.	-0.275	-0.275	0.647	0.647
Kleibergen-Paap F-stat first stage	25.6	10.8		
p-value 1821–30 = 1800–20			0.721	0.414
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887

Notes: Adoption after the Napoleonic Wars. Panel A: adoption and recruitment: dependent variable is labor-saving machines observed on newspapers published in 1821–30. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines observed in newspapers published in 1821-30 (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Units of observation are: 2603 equally sized hexagonal cells (Panel A, cols 1–4) and 887 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.13: Adoption during the Wars against France and structural change in 1831.

	(1)	(2)	(3)	(4)
	Dep. var.: log agricultural families in 1831			
Panel A. Adoption and structural change. Estimation:	OLS		Two-stage least squares	
Labor saving machines	-0.022*	-0.027**	-0.503*	-0.589**
	[0.056]	[0.019]	[0.058]	[0.031]
Non labor saving machines	0.009	0.013	0.242*	0.279**
	[0.378]	[0.221]	[0.066]	[0.041]
log agricultural workers, 1801	0.222***	0.223***	0.213***	0.225***
	[0.000]	[0.000]	[0.000]	[0.000]
R^2	0.737	0.741		
Mean dep. var.	5.380	5.380	5.316	5.316
Anderson-Rubin test (p-value)			0.023	0.007
Distance to coast	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	2580	2580	874	874
	First Stage		Reduced form	
Panel B. First stage and reduced form.	Labor saving machines		Agricultural families 1831	
Distance to deep sea	-0.096***	-0.132***	0.046**	0.065***
	[0.001]	[0.000]	[0.023]	[0.007]
log agricultural workers, 1801	-0.018	-0.014	0.216***	0.227***
	[0.644]	[0.721]	[0.000]	[0.000]
R^2	0.206	0.218	0.732	0.735
Mean dep. var.	0.809	0.809	5.316	5.316
Kleibergen-Paap F-stat first stage	12.4	12.4		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	874	874	874	874

Notes: Adoption during the Wars against France and structural change in 1831. Panel A: adoption and structural change: dependent variable is log agricultural families in 1831. Cols 1–2: OLS estimates of Equation (1). Cols 3–4: two-stage least squares estimates of Equation (1); instrument of adoption of labor saving machines is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: labor saving machines in grid cells (cols 1–2) and log agricultural families in 1831 (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, trade employment shares, log 1801 agricultural workers, log farm ads, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2 and 4 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 2–3), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2580 equally sized hexagonal cells (Panel A, cols 1–4) and 873 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.14: The role of commercial ports: IV, reduced form and first stage controlling for distance to commercial port

	(1)	(2)	(3)	(4)	(5)
	Dep. var.: Labor saving machines in grid cell				
Panel A. Two stage least squares					
log Royal Navy recruits per capita	1.023***	1.022***	0.986***	1.026***	1.229**
	[0.005]	[0.007]	[0.005]	[0.006]	[0.010]
Anderson-Rubin test (p-value)	0.000	0.000	0.000	0.000	0.000
	Dep. var.: Labor saving machines in grid cell				
Panel B. Reduced form					
Distance to deep sea	-0.128***	-0.125***	-0.127***	-0.128***	-0.134***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
R^2	0.218	0.218	0.219	0.218	0.220
Mean labor saving machines	0.798	0.798	0.798	0.798	0.798
	Dep. var.: log Royal Navy recruits per capita				
Panel C. First stage					
Distance to deep sea	-0.125***	-0.123***	-0.129***	-0.125***	-0.109***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.002]
R^2	0.276	0.276	0.279	0.282	0.288
Mean log Navy recruits per capita	-0.275	-0.275	-0.275	-0.275	-0.275
Kleibergen-Paap F-stat first stage	12.7	13.3	13.3	12.5	9.5
Distance to commercial ports:	None	top 3	top 5	top 10	top 15
Distance to the coast	Yes	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	Yes	Yes	Yes	Yes	Yes
Observations (grid cells)	887	887	887	887	887

Notes: Robustness to different definition of "commercial port." Panels A and B: Dependent variable is number of labor-saving machines in grid cell. Panel C: Dependent variable is log Royal Navy recruits per capita. Panel A reports two-stage least squares estimates where log Royal Navy recruits are instrumented with distance to the deep sea. Panel B reports reduced form estimates. Panel C reports first stage regressions. Full controls include: distance to the coast, log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Col. 1: baseline with full controls. Cols 2–5 also control for the distance to the closest of the busiest commercial port according to ship traffic in 1799–1800 Lloyd's list. Col 2: busiest 3 ports; col 3: busiest 5 ports; col 4: busiest 10 ports; col 5: busiest 15 ports. Units of observation are 887 equally sized hexagonal cells within 15 km from the coast. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** p<0.01, ** p<0.05, * p<0.1.

Table A.15: The role of land market: Reduced form and IV with farm ads

	(1)	(2)	(3)	(4)
	log farm ads		Farm ads 0/1	
	RF	2SLS	RF	2SLS
log Royal Navy recruits per capita		0.235		-0.242
		[0.401]		[0.450]
Distance to deep sea	-0.030		0.031	
	[0.398]		[0.437]	
R^2	0.362		0.178	
Mean dep. var.	0.951	0.951	0.885	0.885
Kleibergen-Paap F-stat first stage		13.5		13.5
Anderson-Rubin test (p-value)		0.398		0.437
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	Yes	Yes	Yes	Yes
Observations (grid cells)	887	887	887	887

Notes: Dependent variable: log farm ads (cols 1–2) and a dummy equal to one if a cell has at least one farm ad. Full controls include: distance to the coast, log 1801 population, log area, wheat suitability, agricultural and trade employment shares, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2 and 4 in both panels add five region fixed effects. Units of observation are 887 equally sized hexagonal cells within 15 km from the coast. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.16: Extensive margin: Probit models.

	(1)	(2)	(3)	(4)
	Dep. var.: At least one machine			
Panel A. Correlations. Machines are:	Labor saving		Non labor saving	
log total recruits per capita	0.075***	0.062***	0.011	0.003
	[0.001]	[0.005]	[0.722]	[0.919]
Marginal effect at mean recruitment	0.020***	0.017***	0.001	0.000
	(0.006)	(0.006)	(0.004)	(0.004)
	Dep. var.: At least one machine			
Panel B. Correlations. Machines are:	Labor saving		Non labor saving	
log Royal Navy recruits per capita	0.067***	0.061***	-0.050	-0.044
	[0.003]	[0.007]	[0.117]	[0.176]
Marginal effect at mean recruitment	0.018***	0.016***	-0.007	-0.006
	(0.006)	(0.006)	(0.004)	(0.004)
Panel A & B				
Mean dep. var.	0.312	0.312	0.086	0.086
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	2603	2603	2603	2603
	Dep. var.: At least one machine			
Panel C. IV Probit. Machines are:	Labor saving		Non labor saving	
log Royal Navy recruits per capita	0.355**	0.471**	-0.327	0.061
	[0.046]	[0.017]	[0.115]	[0.920]
	Dep. var.: At least one machine			
Panel D. Reduced form. Machines are:	Labor saving		Non labor saving	
Distance to deep sea	-0.383	-0.427	0.373	-0.038
	[0.107]	[0.104]	[0.195]	[0.919]
Marginal effect at mean distance	-0.106	-0.116	0.044	-0.005
	(0.066)	(0.071)	(0.034)	(0.048)
Panel C & D				
Mean dep. var.	0.333	0.333	0.072	0.081
Distance to the coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	790

Notes: Coefficients estimated with Probit (Panels A, B and D) and IV Probit (Panel C). Dependent variable: dummy for at least one machine in grid cell. Cols 1–2: machines are labor saving. Cols 3–4: machines are not labor saving. Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2 and 4 add five region fixed effects. Two-stage Probit IV (Panel C), and reduced form (Panel D) also control for distance to the coast. Units of observation are 2,603 equally sized hexagonal cells (Panel A and B) and 887 equally sized hexagonal cells within 15 km from the coast (Panel C and D). In the last column, 97 Welsh cells are dropped as this region's fixed effect predicts failure perfectly on the coast. We report the Probit coefficients and p-values calculated with robust standard errors in parentheses below . *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.17: Discrete choice model: Poisson regressions.

	(1)	(2)	(3)	(4)
	Dep. var.: Machines			
Panel A. Correlations. Machines are:	Labor saving		Non labor saving	
log total recruits per capita	0.076***	0.062**	0.028	0.021
	[0.007]	[0.025]	[0.666]	[0.730]
Marginal effect at mean recruitment	0.056***	0.046**	0.004	0.003
	(0.020)	(0.020)	(0.009)	(0.008)
	Dep. var.: Machines			
Panel B. Correlations. Machines are:	Labor saving		Non labor saving	
log Royal Navy recruits per capita	0.053**	0.051*	-0.047	-0.032
	[0.049]	[0.053]	[0.457]	[0.592]
Marginal effect at mean recruitment	0.040**	0.038**	-0.007	-0.005
	(0.020)	(0.019)	(0.009)	(0.009)
Panel A & B				
Mean dep. var.	0.769	0.769	0.141	0.141
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	2603	2603	2603	2603
	Dep. var.: Machines			
Panel C. IV Poisson. Machines are:	Labor saving		Non labor saving	
log Royal Navy recruits per capita	0.973**	1.324*	-0.896	
	[0.036]	[0.071]	[0.635]	
	Dep. var.: Machines			
Panel D. Reduced form. Machines are:	Labor saving		Non labor saving	
Distance to deep sea	-0.821***	-1.303***	0.233	-0.777
	[0.006]	[0.001]	[0.715]	[0.346]
Marginal effect at mean distance	-0.663***	-1.079***	0.028	-0.099
	(0.254)	(0.348)	(0.075)	(0.114)
Panel C & D				
Mean dep. var.	0.798	0.798	0.121	0.121
Distance to the coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887

Notes: Coefficients estimated with Poisson regression model (Panels A, B and D) and the *Stata* command `ivpoisson cfunction` which estimates a exponential conditional mean model using a control function to predict Navy recruitment with distance to the deep sea (Panel C). Dependent variable: number of machines in grid cell. Cols 1–2: machines are labor saving. Cols 3–4: machines are not labor saving. Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2 and 4 add five region fixed effects. Two-stage least squares (Panel C), and reduced form (Panel D) also control for distance to the coast. `ivpoisson cfunction` does not converge when the dependent variable is non-labor saving machines and we include all controls and region fixed effects (Panel C, col 4). Units of observation are 2603 equally sized hexagonal cells (Panel A and B) and 887 equally sized hexagonal cells within 15 km from the coast (Panel C and D). We report Poisson coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.18: Discrete choice model: Zero-inflated Poisson regressions.

	(1)	(2)	(3)	(4)
	Dep. var.: Machines			
Panel A. Correlations. Machines are:	Labor saving		Non labor saving	
log total recruits per capita	0.060**	0.048*	0.066	0.036
	[0.034]	[0.087]	[0.369]	[0.587]
Marginal effect at mean recruitment	0.041**	0.033*	0.008	0.005
	(0.019)	(0.019)	(0.009)	(0.008)
	Dep. var.: Machines			
Panel B. Correlations. Machines are:	Labor saving		Non labor saving	
log Royal Navy recruits per capita	0.045*	0.044*	-0.011	-0.016
	[0.082]	[0.079]	[0.876]	[0.803]
Marginal effect at mean recruitment	0.031*	0.031*	-0.001	-0.002
	(0.018)	(0.017)	(0.009)	(0.008)
Panel A & B				
Mean dep. var.	0.769	0.769	0.141	0.141
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	2603	2603	2603	2603
	Dep. var.: Machines			
Panel C. Reduced form. Machines are:	Labor saving		Non labor saving	
Distance to deep sea	-0.961***	-1.421***	0.229	0.051
	[0.001]	[0.000]	[0.714]	[0.939]
Marginal effect at mean distance	-0.741***	-1.148***	0.026	0.007
	(0.238)	(0.318)	(0.071)	(0.090)
Panel C				
Mean dep. var.	0.798	0.798	0.121	0.121
Distance to the coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887

Notes: Coefficients estimated with zero-inflated Poisson model. Inflation is achieved with a logit model that predicts zero machines using no farm ads and distance to closest newspaper greater than 35 km. Dependent variable: number of machines in grid cell. Cols 1–2: machines are labor saving. Cols 3–4: machines are not labor saving. Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, country banks, log distance to post-towns, log distance to newspapers, a dummy for having a commercial port within 8 km, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2 and 4 add five region fixed effects. Reduced form (Panel C) also controls for distance to the coast. Units of observation are 2603 equally sized hexagonal cells (Panel A and B) and 887 equally sized hexagonal cells within 15 km from the coast (Panel C). We report Poisson coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.19: Nearest Neighbor Matching Estimates

	Labor saving machines					
	(1)	(2)	(3)	(4)	(5)	(6)
SATT	0.273***	0.265***	0.250***	0.299***	0.274***	0.282***
	[0.004]	[0.003]	[0.004]	[0.001]	[0.001]	[0.001]
Number of matches	1	3	5	1	3	5
Matched within region (5)?	No	No	No	Yes	Yes	Yes
Observations	2596	2596	2596	2596	2596	2596

Notes: Nearest neighbor matching. Dependent variable is number of labor saving machines. We report the average treatment on the treated: treatment is defined as being in a cell with above median recruitment. Cols 1 and 4 find for each high recruitment cell a similar observation with low recruitment. Cols 2 and 5 find three similar observations. Cols 3 and 6 find five similar observations. Cols 1-3 match on coordinates, population, agricultural share, wheat suitability, country banks, patents, steam engines and apprentices. Cols 4-6 use the same characteristics but require matched cells to be in the same region. p-values calculated with robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.20: Robust spatial inference: Moran's I (p-value)

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits:	Total recruits		Navy recruits		Navy recruits	
Cutoff: 50 km	0.000	0.000	0.000	0.000	0.000	0.000
Cutoff: 100 km	0.000	0.000	0.000	0.000	0.000	0.000
Cutoff: 200 km	0.000	0.015	0.000	0.024	0.000	0.208
Cutoff: 400 km	0.334	0.014	0.271	0.007	0.000	0.158
Cutoff: 600 km	0.137	0.417	0.099	0.457	0.375	0.392
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	No	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887
			Navy Recruits		Lab sav machines	
Panel B. First stage and reduced form.			First stage		Reduced form	
Cutoff: 50 km			0.000	0.000	0.000	0.000
Cutoff: 100 km			0.000	0.002	0.000	0.000
Cutoff: 200 km			0.000	0.003	0.005	0.167
Cutoff: 400 km			0.000	0.068	0.094	0.002
Cutoff: 600 km			0.016	0.408	0.424	0.451
Full controls			Yes	Yes	Yes	Yes
Region FEs (5)			No	Yes	No	Yes
Observations (grid cells)			887	887	887	887

Notes: The table reports p-value of Moran's I statistics at different bandwidths. Null hypothesis is no spatial correlation in the residuals of a regression of labor saving machines on military recruitment or distance to deep sea at the specified bandwidth. Panel A: adoption and recruitment: dependent variable is labor-saving machines. Cols 1–2: main explanatory variable is log total recruits per capita. Cols 3–6: main explanatory variable is log navy recruits per capita. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines (cols 3–4). Cols 5–6: main explanatory variable is distance to the deep sea. All columns include the full set of controls, which include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4, 6 and 8 also include five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are equally sized hexagonal cells: there are 2603 covering the entire country (cols 1–4) and 887 within 15 km from the coast (cols 5–8).

Table A.21: Robust spatial inference: standard errors corrected with the formula of Conley (1999)

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits:	Total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.094	0.086	0.076	0.081	0.609	1.100
Robust s.e.	(0.024)***	(0.024)***	(0.026)***	(0.027)***	(0.220)***	(0.395)***
Conley s.e.: 50 km	(0.026)***	(0.026)***	(0.023)***	(0.027)***	(0.259)**	(0.421)***
Conley s.e.: 100 km	(0.025)***	(0.025)***	(0.021)***	(0.025)***	(0.281)**	(0.442)**
Conley s.e.: 200 km	(0.021)***	(0.019)***	(0.017)***	(0.021)***	(0.331)*	(0.534)**
Conley s.e.: 400 km	(0.016)***	(0.013)***	(0.012)***	(0.015)***	(0.322)*	(0.485)**
Conley s.e.: 600 km	(0.013)***	(0.011)***	(0.009)***	(0.012)***	(0.276)**	(0.392)***
Conley s.e.: 800 km	(0.011)***	(0.009)***	(0.008)***	(0.010)***	(0.239)**	(0.340)***
Conley s.e.: 1000 km	(0.010)***	(0.008)***	(0.007)***	(0.009)***	(0.214)***	(0.304)***
Cluster: county	(0.025)***	(0.023)***	(0.025)***	(0.028)***	(0.280)**	(0.433)**
Specification:	OLS	OLS	OLS	OLS	2SLS	2SLS
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	No	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887

	Navy Recruits		Labor saving machines	
Panel B. First stage and reduced form.	First stage		Reduced form	
	(1)	(2)	(3)	(4)
Distance to deep sea	-1.039	-0.787	-0.633	-0.866
Robust s.e.	(0.206)***	(0.221)***	(0.196)***	(0.226)***
Conley s.e.: 50 km	(0.235)***	(0.240)***	(0.256)**	(0.267)***
Conley s.e.: 100 km	(0.297)***	(0.291)***	(0.254)**	(0.245)***
Conley s.e.: 200 km	(0.414)**	(0.378)**	(0.227)***	(0.192)***
Conley s.e.: 400 km	(0.440)**	(0.348)**	(0.136)***	(0.129)***
Conley s.e.: 600 km	(0.360)***	(0.280)***	(0.120)***	(0.099)***
Conley s.e.: 800 km	(0.312)***	(0.242)***	(0.104)***	(0.086)***
Conley s.e.: 1000 km	(0.279)***	(0.217)***	(0.093)***	(0.077)***
Cluster: county	(0.323)***	(0.297)***	(0.256)**	(0.282)***
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887

Notes: Standard errors corrected for spatial correlation with the formula of Conley (1999). Panel A: Dependent variable is labor saving machines. Reported coefficients unstandardized. Cols 1–2: main explanatory variable is log total recruits per capita. Cols 3–6: main explanatory variable is log navy recruits per capita. Cols 1–4: OLS; cols 5–6: two-stage least squares: naval recruitment is instrumented with distance to deep sea. Panel B: first stage and reduced form: Dependent variable is log Royal Navy recruits per capita (cols 3–4) and labor saving machines (cols 5–6). Main explanatory variable is distance to the deep sea. All columns include the full set of controls, which are: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, log distance to post-towns, log distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 also include five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. In both panels, the first row report point estimates to make comparison with s.e. easier, the following rows report different standard errors corrected in different ways. Row 2: heteroschedastic-robust standard errors. Rows 3–8: standard error corrected with the formula of Conley (1999). Cutoff is 50 (row 3), 100 (row 4), 200 (row 5), 400 (row 6), 600 km (row 7), 800 km (row 8) and 1000 km (row 9). Row 9: standard error clustered at the level of 51 counties. Units of observation are equally sized hexagonal cells: there are 2603 covering the full sample (Panel A, cols 1–4) and 887 within 15 km from the coast (Panel A cols 5–6, Panel B cols 1–4). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.22: Robust spatial inference: t-statistic based correlation (Ibragimov and Müller, 2010)

	(1)	(2)	(3)
	Dep. var.: Labor saving machines in grid cell		
Panel A. Adoption and recruits:	Total recruits	Navy recruits	
Coef. log recruits per capita (average of 4)	0.071	0.064	0.847
t-statistics	2.712	2.833	4.269
$Pr(T > \|t\|)$	0.073	0.066	0.024
Specification:	OLS	OLS	2SLS
Full controls	Yes	Yes	Yes
Underlying observations (grid cells)	2603	2603	887
		Navy Recruits	Lab sav machines
Panel B. First stage and reduced form.		First stage	Reduced form
Coef. distance to deep sea (average of 4)		-0.899	-0.580
t-statistics		-2.466	-6.045
$Pr(T > \|t\|)$		0.090	0.009
Full controls		Yes	Yes
Underlying observations (grid cells)		887	887

Notes: t-statistic based inference (Ibragimov and Müller, 2010). Panel A: Dependent variable is labor saving machines. Cols 1–4: OLS; cols 5–6: two-stage least squares: naval recruitment is instrumented with distance to deep sea. Cols 1–2: main explanatory variable is log total recruits per capita. Cols 3–6: main explanatory variable is log navy recruits per capita. Panel B: first stage and reduced form: Dependent variable is log Royal Navy recruits per capita (cols 3–4) and labor saving machines (cols 5–6). Main explanatory variable is distance to the deep sea. For each specification, we estimate four separate regressions in four regions corresponding roughly to Caird (1852) (Wales is split between the two Western regions). We store the four coefficients and calculate their average, t-statistics and p-value for the null that the average is equal to zero. All regressions include the full set of controls, which are: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Two-stage least squares (Panel A, cols 3), first stage and reduced form (Panel B) also control for distance to the coast.

Table A.23: Robust spatial inference: controlling linearly for latitude and longitude.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.079***	0.076***	0.069***	0.073***	1.439**	1.565**
	[0.000]	[0.000]	[0.002]	[0.001]	[0.031]	[0.026]
Latitude cell centroid (WGS84, degrees)	0.020	0.117***	0.025	0.120***	0.398**	0.733**
	[0.353]	[0.007]	[0.261]	[0.006]	[0.025]	[0.012]
Longitude cell centroid (WGS84, degrees)	0.030	-0.068**	0.033	-0.062**	0.065	-0.120
	[0.206]	[0.023]	[0.158]	[0.039]	[0.478]	[0.416]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.210	0.225	0.208	0.224		
Mean dep. var.	0.769	0.769	0.769	0.769	0.798	0.798
Anderson-Rubin test (p-value)					0.000	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.088***	-0.090**	-0.126***	-0.140***
	[0.010]	[0.010]	[0.000]	[0.000]
Latitude cell centroid (WGS84, degrees)	-0.208***	-0.303***	0.098**	0.259**
	[0.000]	[0.000]	[0.010]	[0.019]
Longitude cell centroid (WGS84, degrees)	-0.077*	-0.062	-0.045	-0.218***
	[0.091]	[0.398]	[0.277]	[0.007]
R^2	0.279	0.295	0.210	0.230
Mean dep. var.	-0.275	-0.275	0.798	0.798
Kleibergen-Paap F-stat first stage	6.7	6.6		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887

Notes: Robustness to controlling for latitude and longitude. Panel A: adoption and recruitment: dependent variable is labor saving machines in grid cell. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2603 equally sized hexagonal cells (Panel A, cols 1–4) and 887 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.24: Robust spatial inference: controlling for a B-spline in coordinates.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.075***	0.071***	0.071***	0.079***	0.583***	0.952**
	[0.025]	[0.024]	[0.028]	[0.028]	[0.211]	[0.414]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.250	0.262	0.249	0.244		
Mean dep. var.	0.769	0.769	0.769	0.769	0.798	0.798
Number of basis functions (r)	6	6	6	3	4	5
Number of principal components	11	13	11	5	1	4
p-value (heterosch. s.e.)	0.000	0.000	0.002	0.001	0.003	0.013
p-value (cluster: county)	0.001	0.001	0.004	0.001	0.018	0.020
p-value (Conley, cutoff 200 km)	0.000	0.000	0.000	0.000	0.055	0.034
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.152***	-0.123***	-0.101***	-0.123***
	[0.206]	[0.220]	[0.196]	[0.256]
R^2	0.272	0.293	0.210	0.260
Mean dep. var.	-0.275	-0.275	0.798	0.798
Number of basis functions (r)	6	3	4	5
Number of principal components	1	2	1	4
p-value (heterosch. s.e.)	0.000	0.000	0.001	0.001
p-value (cluster: county)	0.001	0.004	0.008	0.020
p-value (Conley, cutoff 200 km)	0.000	0.005	0.001	0.000
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887

Notes: Robustness to controlling for a linear B-spline in latitude and longitude. We use the Bayesian Information Criterion to select the number of basis functions and the number of principal components extracted from them to include in the regressions. Panel A: adoption and recruitment: dependent variable is labor-saving machines in grid cell. Columns 1–4: OLS estimates of Equation (1). Columns 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (columns 1–2) and reduced form (columns 3–4). Dependent variables are: log Royal Navy recruits per capita (columns 1–2) and number of labor saving machines in grid cell (columns 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Columns 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, columns 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2603 equally sized hexagonal cells (Panel A, columns 1–4) and 887 equally sized hexagonal cells lying within 15 km from the coast (Panel A, columns 5–6 and Panel B). We report p-values calculated with standard errors robust to heteroskedasticity, clustered at the county level, and calculated with the formula by Conley (1999) with a spatial decay up to 200 km. We report beta coefficients and standard errors calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.25: Robust spatial inference: t-statistic based correlation (Ibragimov and Müller, 2010) after controlling for a B-spline in coordinates.

	(1)	(2)	(3)
	Dep. var.: Labor saving machines in grid cell		
Panel A. Adoption and recruits:	Total recruits	Navy recruits	
Coef. log recruits per capita (average of 4)	0.068	0.067	0.868
t-statistics	2.337	2.580	4.809
$Pr(T > \|t\|)$	0.102	0.082	0.017
Specification:	OLS	OLS	2SLS
Full controls	Yes	Yes	Yes
Number of basis functions (r)	6	6	4
Lr Number of principal components	11	11	1
Underlying observations (grid cells)	2603	2603	887
		Navy Recruits	Lab sav machines
Panel B. First stage and reduced form.		First stage	Reduced form
Coef. distance to deep sea (average of 4)		-1.055	-0.811
t-statistics		-4.490	-4.552
$Pr(T > \|t\|)$		0.021	0.020
Full controls		Yes	Yes
Number of basis functions (r)		6	4
Lr Number of principal components		1	1
Underlying observations (grid cells)		887	887

Notes: t-statistic based inference (Ibragimov and Müller, 2010). Panel A: Dependent variable is labor saving machines. Cols 1-2: OLS; cols 3: two-stage least squares: naval recruitment is instrumented with distance to deep sea. Cols 1: main explanatory variable is log total recruits per capita. Cols 2-3: main explanatory variable is log navy recruits per capita. Panel B: first stage and reduced form: Dependent variable is log Royal Navy recruits per capita (cols 2) and labor saving machines (col 3). Main explanatory variable is distance to the deep sea. For each specification, we estimate four separate regressions in four regions corresponding roughly to Cairds (1852) (Wales is split between the two Western regions). We store the four coefficients and calculate their average, t-statistics and p-value for the null that the average is equal to zero. All regressions include the full set of controls, which are: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Two-stage least squares (Panel A, cols 3), first stage and reduced form (Panel B) also control for distance to the coast.

Table A.26: Robustness to including urban areas.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.077***	0.072***	0.058***	0.063***	0.612***	1.132***
	[0.000]	[0.000]	[0.005]	[0.004]	[0.002]	[0.002]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.206	0.217	0.203	0.216		
Mean dep. var.	0.768	0.768	0.768	0.768	0.800	0.800
Anderson-Rubin test (p-value)					0.000	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2775	2775	2775	2775	961	961

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.165***	-0.126***	-0.101***	-0.143***
	[0.000]	[0.000]	[0.000]	[0.000]
R^2	0.317	0.344	0.200	0.214
Mean dep. var.	-0.126	-0.126	0.800	0.800
Kleibergen-Paap F-stat first stage	28.9	15.2		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	961	961	961	961

Notes: Robustness: sample includes cells with log 1801 density above -9. Panel A: adoption and recruitment: dependent variable is labor saving machines. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2775 equally sized hexagonal cells (Panel A, cols 1–4) and 960 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.27: Robustness to excluding cells with no farm ads.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.080***	0.070***	0.062***	0.065***	0.613***	1.052***
	[0.000]	[0.001]	[0.006]	[0.006]	[0.010]	[0.007]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.213	0.225	0.210	0.224		
Mean dep. var.	0.920	0.920	0.920	0.920	0.949	0.949
Anderson-Rubin test (p-value)					0.002	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2157	2157	2157	2157	742	742

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.166***	-0.134***	-0.102***	-0.141***
	[0.000]	[0.001]	[0.002]	[0.000]
R^2	0.231	0.255	0.202	0.215
Mean dep. var.	-0.152	-0.152	0.949	0.949
Kleibergen-Paap F-stat first stage	19.2	11.3		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	742	742	742	742

Notes: Robustness: sample excludes cells where no farm ads was found on British newspapers. Panel A: adoption and recruitment: dependent variable is labor saving machines. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2299 equally sized hexagonal cells (Panel A, cols 1–4) and 784 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.28: Robustness to including areas with poor newspaper coverage.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.071***	0.063***	0.052**	0.053**	0.533***	0.907**
	[0.000]	[0.001]	[0.010]	[0.013]	[0.008]	[0.010]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.214	0.232	0.211	0.230		
Mean dep. var.	0.742	0.742	0.742	0.742	0.784	0.784
Anderson-Rubin test (p-value)					0.002	0.001
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2899	2899	2899	2899	1056	1056

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.156***	-0.116***	-0.083***	-0.105***
	[0.000]	[0.000]	[0.002]	[0.001]
R^2	0.264	0.296	0.218	0.238
Mean dep. var.	-0.365	-0.365	0.784	0.784
Kleibergen-Paap F-stat first stage	27.6	13.1		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	1056	1056	1056	1056

Notes: Robustness: sample includes cells farther than 50 km from the closest town with local newspaper and cells whose parishes are never mentioned in newspapers of the time. Panel A: adoption and recruitment: dependent variable is labor saving machines. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2899 equally sized hexagonal cells (Panel A, cols 1–4) and 1054 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.29: Robustness to excluding areas close to Royal Navy ports.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.075***	0.068***	0.057***	0.059***	0.615***	0.994**
	[0.000]	[0.001]	[0.007]	[0.008]	[0.004]	[0.011]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.203	0.215	0.200	0.214		
Mean dep. var.	0.740	0.740	0.740	0.740	0.712	0.712
Anderson-Rubin test (p-value)					0.001	0.001
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2527	2527	2527	2527	812	812

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.173***	-0.126***	-0.106***	-0.125***
	[0.000]	[0.001]	[0.001]	[0.001]
R^2	0.227	0.261	0.191	0.204
Mean dep. var.	-0.353	-0.353	0.712	0.712
Kleibergen-Paap F-stat first stage	24.9	11.6		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	812	812	812	812

Notes: Robustness: sample excludes cells within 8 km from a Royal Navy port. Panel A: adoption and recruitment: dependent variable is labor saving machines. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2518 equally sized hexagonal cells (Panel A, cols 1–4) and 802 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.30: Robustness to excluding areas close to victualling centers.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.078***	0.072***	0.064***	0.067***	0.587***	1.042***
	[0.000]	[0.000]	[0.003]	[0.003]	[0.005]	[0.006]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.211	0.224	0.209	0.223		
Mean dep. var.	0.771	0.771	0.771	0.771	0.808	0.808
Anderson-Rubin test (p-value)					0.001	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2572	2572	2572	2572	858	858

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.167***	-0.125***	-0.098***	-0.131***
	[0.000]	[0.000]	[0.001]	[0.000]
R^2	0.243	0.275	0.214	0.227
Mean dep. var.	-0.293	-0.293	0.808	0.808
Kleibergen-Paap F-stat first stage	25.3	12.4		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	858	858	858	858

Notes: Robustness: sample excludes cells within 8 km from a victualling center used by the military to supply troops. Panel A: adoption and recruitment: dependent variable is labor saving machines. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2572 equally sized hexagonal cells (Panel A, cols 1–4) and 857 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.31: Robustness to excluding areas close to Royal Navy ports or victualling centers.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.076***	0.069***	0.058***	0.060***	0.628***	1.008**
	[0.000]	[0.001]	[0.007]	[0.008]	[0.004]	[0.010]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.204	0.217	0.201	0.216		
Mean dep. var.	0.743	0.743	0.743	0.743	0.720	0.720
Anderson-Rubin test (p-value)					0.001	0.001
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2511	2511	2511	2511	797	797

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.173***	-0.127***	-0.109***	-0.128***
	[0.000]	[0.001]	[0.001]	[0.001]
R^2	0.229	0.264	0.196	0.210
Mean dep. var.	-0.360	-0.360	0.720	0.720
Kleibergen-Paap F-stat first stage	24.6	11.6		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	797	797	797	797

Notes: Robustness: sample excludes cells within 8 km from a Royal Navy port and from a victualling center used by the military to supply troops. Panel A: adoption and recruitment: dependent variable is labor saving machines. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2504 equally sized hexagonal cells (Panel A, cols 1–4) and 789 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.32: Robustness to excluding areas close to Royal Navy and commercial ports.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.082***	0.073***	0.062***	0.061**	0.782*	1.699
	[0.000]	[0.001]	[0.009]	[0.015]	[0.058]	[0.237]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.213	0.227	0.209	0.224		
Mean dep. var.	0.758	0.758	0.758	0.758	0.757	0.757
Anderson-Rubin test (p-value)					0.012	0.016
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2097	2097	2097	2097	452	452

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.119**	-0.060	-0.093**	-0.102**
	[0.011]	[0.208]	[0.012]	[0.016]
R^2	0.173	0.221	0.227	0.248
Mean dep. var.	-0.592	-0.592	0.757	0.757
Kleibergen-Paap F-stat first stage	6.5	1.6		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	452	452	452	452

Notes: Robustness: sample excludes cells within 8 km from a Royal Navy or commercial port. Panel A: adoption and recruitment: dependent variable is labor saving machines. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2091 equally sized hexagonal cells (Panel A, cols 1–4) and 445 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.33: Robustness to excluding Wales.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.079***	0.074***	0.065***	0.071***	0.724***	1.497**
	[0.000]	[0.001]	[0.005]	[0.003]	[0.007]	[0.017]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.206	0.219	0.204	0.218		
Mean dep. var.	0.812	0.812	0.812	0.812	0.880	0.880
Anderson-Rubin test (p-value)					0.001	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2346	2346	2346	2346	790	790

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.150***	-0.101***	-0.108***	-0.151***
	[0.000]	[0.008]	[0.001]	[0.000]
R^2	0.255	0.274	0.202	0.214
Mean dep. var.	-0.188	-0.188	0.880	0.880
Kleibergen-Paap F-stat first stage	17.2	7.1		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	790	790	790	790

Notes: Robustness: sample excludes all cells in Wales. Panel A: adoption and recruitment: dependent variable is labor saving machines. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2346 equally sized hexagonal cells (Panel A, cols 1–4) and 789 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). N is lower as we exclude locations without agricultural families in 1831. We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.34: Robustness to controlling for share of land enclosed by Parliament.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.082***	0.077***	0.066***	0.072***	0.816***	1.623**
	[0.000]	[0.000]	[0.003]	[0.002]	[0.005]	[0.014]
Share land enclosed in 1792	-0.042**	-0.012	-0.043**	-0.011	-0.027	-0.034
	[0.012]	[0.514]	[0.011]	[0.542]	[0.439]	[0.536]
Share land enclosed 1792-1815	0.040*	0.041*	0.039*	0.041*	0.074	0.062
	[0.079]	[0.069]	[0.088]	[0.074]	[0.103]	[0.321]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.209	0.220	0.206	0.219		
Mean dep. var.	0.812	0.812	0.812	0.812	0.864	0.864
Anderson-Rubin test (p-value)					0.000	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2423	2423	2423	2423	803	803

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.148***	-0.101***	-0.121***	-0.164***
	[0.000]	[0.007]	[0.000]	[0.000]
Share land enclosed in 1792	-0.013	0.009	-0.038	-0.020
	[0.631]	[0.772]	[0.166]	[0.458]
Share land enclosed 1792-1815	-0.002	0.008	0.072*	0.076*
	[0.937]	[0.788]	[0.055]	[0.050]
R^2	0.252	0.271	0.207	0.221
Mean dep. var.	-0.192	-0.192	0.864	0.864
Kleibergen-Paap F-stat first stage	16.5	7.2		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	803	803	803	803

Notes: Robustness to controlling for the share of land enclosed by a Parliament Act before 1792 and during the Wars against France (1792–1815). Panel A: adoption and recruitment: dependent variable is labor saving machines in grid cell. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2423 equally sized hexagonal cells (Panel A, cols 1–4) and 802 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.35: Robustness to controlling for high wheat price increases.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.083***	0.076***	0.069***	0.072***	0.891***	1.243**
	[0.000]	[0.000]	[0.002]	[0.002]	[0.006]	[0.010]
High wheat price increases	-0.038**	-0.024	-0.042**	-0.027	-0.198***	-0.156**
	[0.045]	[0.329]	[0.026]	[0.272]	[0.002]	[0.049]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.208	0.220	0.206	0.219		
Mean dep. var.	0.800	0.800	0.800	0.800	0.841	0.841
Anderson-Rubin test (p-value)					0.000	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2484	2484	2484	2484	830	830

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.134***	-0.112***	-0.120***	-0.139***
	[0.000]	[0.003]	[0.000]	[0.000]
High wheat price increases	0.124***	0.052	-0.087***	-0.091
	[0.000]	[0.265]	[0.008]	[0.111]
R^2	0.255	0.264	0.208	0.219
Mean dep. var.	-0.198	-0.198	0.841	0.841
Kleibergen-Paap F-stat first stage	15.2	9.1		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	830	830	830	830

Notes: Robustness to controlling for a dummy equal to one if a cell has wartime wheat price increases above the median county. Panel A: adoption and recruitment: dependent variable is labor saving machines in grid cell. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2603 equally sized hexagonal cells (Panel A, cols 1–4) and 887 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.36: Robustness to controlling for a centroid at sea dummy.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita	0.079***	0.073***	0.065***	0.070***	0.563***	1.022***
	[0.000]	[0.000]	[0.002]	[0.002]	[0.006]	[0.006]
Centroid at sea (dummy)	-0.017	-0.030	-0.018	-0.032	0.037	0.014
	[0.538]	[0.283]	[0.515]	[0.240]	[0.465]	[0.831]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.209	0.222	0.207	0.221		
Mean dep. var.	0.769	0.769	0.769	0.769	0.798	0.798
Anderson-Rubin test (p-value)					0.001	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.165***	-0.125***	-0.093***	-0.128***
	[0.000]	[0.000]	[0.001]	[0.000]
Centroid at sea (dummy)	0.038	0.037	0.059	0.051
	[0.425]	[0.428]	[0.195]	[0.256]
R^2	0.244	0.277	0.207	0.219
Mean dep. var.	-0.275	-0.275	0.798	0.798
Kleibergen-Paap F-stat first stage	25.0	12.5		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887

Notes: Robustness to controlling for a dummy equal to one if a cell has the centroid offshore. Panel A: adoption and recruitment: dependent variable is labor saving machines in grid cell. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2603 equally sized hexagonal cells (Panel A, cols 1–4) and 887 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.37: Robustness to an alternative measure of adoption: threshing machines.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Threshers in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Royal Navy recruits			
log recruits per capita	0.067***	0.057***	0.071***	0.060***	0.467**	0.610*
	[0.000]	[0.002]	[0.001]	[0.006]	[0.021]	[0.056]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.127	0.136	0.127	0.136		
Mean dep. var.	0.311	0.311	0.311	0.311	0.386	0.386
Anderson-Rubin test (p-value)					0.014	0.035
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887
			Navy recruits		Threshers	
Panel B. First stage and reduced form.			First Stage		Reduced form	
Distance to deep sea			-0.165***	-0.125***	-0.077**	-0.076**
			[0.000]	[0.000]	[0.014]	[0.035]
R^2			0.244	0.276	0.146	0.147
Mean. dep. var.			-0.275	-0.275	0.386	0.386
Kleibergen-Paap F-stat first stage			25.4	12.7		
Distance to coast			Yes	Yes	Yes	Yes
Full controls			Yes	Yes	Yes	Yes
Region FEs (5)			No	Yes	No	Yes
Observations (grid cells)			887	887	887	887

Notes: Robustness: labor saving machines only include threshers. Panel A: adoption and recruitment: dependent variable is labor saving machines. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2603 equally sized hexagonal cells (Panel A, cols 1–4) and 887 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.38: Robustness to an alternative measure of recruitment: recruits per men.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per men	0.073***	0.067***	0.058***	0.062***	0.562***	1.009***
	[0.000]	[0.001]	[0.005]	[0.004]	[0.006]	[0.005]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.208	0.221	0.206	0.220		
Mean dep. var.	0.769	0.769	0.769	0.769	0.798	0.798
Anderson-Rubin test (p-value)					0.001	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887

	Navy recr. p.m.		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.167***	-0.127***	-0.094***	-0.128***
	[0.000]	[0.000]	[0.001]	[0.000]
R^2	0.256	0.289	0.206	0.218
Mean dep. var.	0.175	0.175	0.175	0.175
Kleibergen-Paap F-stat first stage	25.1	12.5		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887

Notes: Robustness: recruitment intensity is the logarithm of recruits per men. Panel A: adoption and recruitment: dependent variable is labor saving machines in grid cell. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per men (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2603 equally sized hexagonal cells (Panel A, cols 1–4) and 887 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.39: Robustness to an alternative measure of recruitment: assigning -1 to cells with no recruitment.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita (no recruits=-1)	0.084***	0.078***	0.071***	0.075***	0.601***	1.087***
	[0.000]	[0.000]	[0.002]	[0.002]	[0.006]	[0.006]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.211	0.224	0.208	0.222		
Mean dep. var.	0.769	0.769	0.769	0.769	0.798	0.798
Anderson-Rubin test (p-value)					0.001	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.156***	-0.118***	-0.094***	-0.128***
	[0.000]	[0.001]	[0.001]	[0.000]
R^2	0.216	0.248	0.206	0.218
Mean dep. var.	0.095	0.095	0.095	0.095
Kleibergen-Paap F-stat first stage	23.3	12.0		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887

Notes: Robustness: recruitment intensity is the logarithm of recruits per capita; cells with no recruitment are assigned a value of -1. See Chen and Roth (2023) for a discussion of ways to deal with the log of zero. Panel A: adoption and recruitment: dependent variable is labor saving machines in grid cell. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita, with cells with no recruits assigned a value of -1 (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2603 equally sized hexagonal cells (Panel A, cols 1–4) and 887 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.40: Robustness to an alternative measure of recruitment: assigning -3 to cells with no recruitment.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor saving machines in grid cell					
Panel A. Adoption and recruits. Recruits are:	total recruits		Navy recruits		Navy recruits	
log recruits per capita (no recruits=-3)	0.071***	0.064***	0.056***	0.060***	0.561***	1.012***
	[0.000]	[0.001]	[0.006]	[0.005]	[0.006]	[0.006]
Estimation method	OLS	OLS	OLS	OLS	2SLS	2SLS
R^2	0.208	0.221	0.206	0.220		
Mean dep. var.	0.769	0.769	0.769	0.769	0.798	0.798
Anderson-Rubin test (p-value)					0.001	0.000
Distance to coast	No	No	No	No	Yes	Yes
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes	Yes	Yes
Observations (grid cells)	2603	2603	2603	2603	887	887

	Navy recruits		Labor saving machines	
Panel B. First stage and reduced form.	First Stage		Reduced form	
Distance to deep sea	-0.167***	-0.127***	-0.094***	-0.128***
	[0.000]	[0.000]	[0.001]	[0.000]
R^2	0.255	0.287	0.206	0.218
Mean dep. var.	-0.646	-0.646	-0.646	-0.646
Kleibergen-Paap F-stat first stage	24.8	12.2		
Distance to coast	Yes	Yes	Yes	Yes
Full controls	Yes	Yes	Yes	Yes
Region FEs (5)	No	Yes	No	Yes
Observations (grid cells)	887	887	887	887

Notes: Robustness: recruitment intensity is the logarithm of recruits per capita; cells with no recruitment are assigned a value of -3. See Chen and Roth (2023) for a discussion of ways to deal with the log of zero. Panel A: adoption and recruitment: dependent variable is labor saving machines in grid cell. Cols 1–4: OLS estimates of Equation (1). Cols 5–6: two-stage least squares estimates of Equation (1); instrument of naval recruitment is distance to the deep sea. Panel B: first stage (cols 1–2) and reduced form (cols 3–4). Dependent variables are: log Royal Navy recruits per capita, with cells with no recruits assigned a value of -3 (cols 1–2) and number of labor saving machines in grid cell (cols 3–4). Full controls include: log 1801 population, log area, wheat suitability, agricultural and trade employment shares, log farm ads, country banks, proximity to commercial ports, distance to post-towns, distance to newspapers, dummies for steam engines, patents, apprentices, ruggedness and bounty of the sea. Cols 2, 4 and 6 in both panels add five region fixed effects. Two-stage least squares (Panel A, cols 5–6), first stage and reduced form (Panel B) also control for distance to the coast. Units of observation are: 2603 equally sized hexagonal cells (Panel A, cols 1–4) and 887 equally sized hexagonal cells lying within 15 km from the coast (Panel A, cols 5–6 and Panel B). We report beta coefficients and p-values calculated with robust standard errors in parentheses below. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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