THE RISE OF THE KNOWLEDGE ECONOMY

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Abstract

Sustained growth emerged in England in the period from the Scientific Revolution to the Enlightenment. Increases in productivity have been argumentatively related to the development of communication infrastructures. We isolate the empirical impact of the evolution of the postal system in England and Wales over the period 1570-1769 on interpersonal communications in the context of the "Republic of Letters." We exploit a quasi-natural experiment due to a postal system reform leading to the opening of the pre-existing network to the public in 1635. We build a novel georeferenced database involving about 60,000 letters by roughly 9,000 correspondents. The reform lead to a substantial increase in interpersonal communications. The results of DiD/IV and event studies confirm the baseline findings bolstering confidence in a causal interpretation of the findings. Looking at the patterns of interactions among knowledge elites, we detect a sizable intensification of communications between scholars and professionals. We collect the content of around 30,000 letters and classify their topics exploiting LDA unsupervised text analysis to assess the impact of the reform on the evolution of communications related to useful knowledge. Finally, drawing on biographical data, we explore the effects on innovation activities and detect an impact on technical innovators and longer-term socio-economic outcomes. Taken together, the findings provide a first systematic evidence of the role of communication infrastructure for the rise of Knowledge Economies.

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The short answer as to why the West is so much richer today than it was two centuries ago is that collectively, these societies "Know" more. (Mokyr, 2005, p.287)

(...) production can draw on accumulated useful knowledge, there has to be social contact between "knowers" and "doers." There is too much tacit and uncodifiable knowledge in technology for the written word and the graphical representation to do it all. (Mokyr, 2002, p.63)

1 Introduction

The emergence of sustained economic growth in England was driven by unprecedented rises in productivity that gained momentum from the early modern period. During this age of the Enlightenment, knowledge produced after the scientific revolution was increasingly transferred into productive know-how and technical, organizational, and institutional innovations that paved the way to the Industrial Revolution (Landes, 1969; Pomeranz, 2000; Jones, 2003). Besides the spread of codified knowledge which was favored by innovations like the printing press, intensified cooperation between upper tail human capital individuals, in particular between "knowers" and "doers", have been considered key for the creation of "useful knowledge" and its spread throughout the economy (Mokyr, 2010). Historians also underscore the potential role of a peculiar European social institution, known as *Republic of Letters*, a network of individuals sharing the goal of exchanging information for the advancement of knowledge (Mokyr, 2016).[1] During this period, person-to-person information flows largely rested on epistolary exchanges. England was a forerunner in the development of a functioning national postal system in the first part of the seventeenth century which might have bolster the subsequent emergence of its *Knowledge Economy* (Merton, 1938; Mokyr, 2002).

In spite of eminent accounts and extensive narratives, we lack systematic formal empirical investigations. Key, but still largely empirically unexplored questions stand out. Did the early access to communication infrastructures in England impact the subsequent intensity of information exchange across different locations during the Enlightenment? Did it affect the patterns of personal interactions within knowledge elites? How, and when, did it affect the interactions between scholars and thinkers and "doers" (i.e. professionals in a broad sense)? What was the content of these direct communications and can it be traced to the production and diffusion of useful knowledge? Finally, did it affect longer term innovation activities and relevant socio-economic outcomes across the affected locations? In this paper, we contribute addressing these questions by tracking the evolution of postal system network in England and Wales and by isolating its impacts on person-to-person epistolary exchanges over the two centuries covering the period 1570-1770.

This context provides several advantages for both the general relevance of the analysis and the empirical identification strategies. First, the role of the Enlightenment in the early modern period for the rise of England is a crucial, long-lasting, question in the social sciences. More generally, the emergence of modern

[1] Coined in 1417 by humanist Francesco Barbaro and popularized by Erasmus, the term ROL refers to a pan-European epistolary network with the goal of exchanging information and advancing knowledge. Accounts portray a growing intensification of communication exchanges after the scientific revolution and peaking during the Age of the Enlightenment in the seventeenth century (prior to the creation of academic journals). According to historians, epistolary communications involved not only knowledge elites (academics, scholars and thinkers) but also upper tail human capital individuals in apical positions like statesmen, and segments of the rising manufacturing elites including practitioners, entrepreneurs, and innovators.

knowledge economies at the onset of the industrial revolution is key in the context of the ongoing debate on the rise of Europe and the big divergence. Second, data availability traditionally confined formal investigations of long-term development on the (post)industrial period (with relevant recent exceptions mentioned below). Nonetheless, given the importance of the topic, information from primary and secondary sources is increasingly made available in digital humanities. We leverage newly available historical data and, through an intensive process of collection, digitization, geo-time enrichment and treatment, we build a highly disaggregated geo-referenced panel database that is suitable for formal empirical analysis. Third, England was a forerunner in the construction of a national postal system and the peculiar evolution of the Royal Posts implies a quasi-natural experiment that can also be leveraged for empirical identification. In particular, we exploit a reform that lead to the opening to the public in 1635 of a pre-existing military infrastructure built at times of wars for strategic purposes and whose use was hitherto limited to the Crown.

1.1 Analysis and Main Data

The empirical impacts are isolated by exploiting a quasi-natural experiment. A system of epistolary communication at the service of the Crown was created in England at times of war for military reasons to connect London with various battlefronts during the sixteenth century (Robinson, 1948). Based on a stable, but costly, network of horse posts, the infrastructure faced serious shortage of resources after the death of Queen Elizabeth I in 1603 and by the 1620's it was in disuse. Mr. Thomas Witherings, a reputed merchant, proposed a reform of the system involving the re-activation of the pre-existing postal stages and making it a sustainable self-financing state monopoly. In 1635 the Royal Posts was born and opened its service also to the general public at pre-determined prices and scheduled days of delivery. See the discussion of the historical background in Section 2. The reform implied that in the subset of (treated) locations that opened to the public, after 1635 the population could send and receive letters at low and predictable costs. Using difference-in-differences approaches, we isolate the impact in locations with access to the (pre-existing) postal network. Event studies allow to track the impact of the reform across time.

The analysis is based on data from multiple sources (see Section 3). Concerning the evolution of the postal system, we recover information from primary and secondary historical sources that describe the spatial evolution of postal stages. We produce a set of geo-referenced maps tracking the evolution of access to the system across the locations in England and Wales over the period 1570-1690. Concerning epistolary communications, we leverage a large investment made in digital humanities over the last decade. We extract information from the repositories of Early Modern Letters Online (EMLO) and Electronic Enlightenment (EE). To make it suitable for empirical (spatial) analysis, the raw information has been treated with a process of data cleaning and enrichment. Each letter, for sender and recipient, was geo-time referenced on the historical locations of the seventeenth century. Identification (and disambiguation across different databases) of the identity of all senders and receivers has been performed by exploiting names, dates of birth/death and other relevant biographic information (from multiple sources). A far from trivial effort involves the classification of around 9,000 correspondents in terms of occupations (or societal roles). The result is a novel database with geo-time referenced information for around 56,000 letters sent from/to England and Wales with verified identity and classification of sender and recipient. Finally, we have collected and cleaned

information on the content of each letter (exploiting abstracts or parts of the text from multiple sources when available) for around 30,000 of the letters. In order to perform the text analysis, the content of the letters (written in multiple languages including archaic English, French, German, and Latin) have been translated into English.

1.2 Main Results

The analysis proceeds in four main steps.

We start by isolating the impact of a postal stage in a location for the intensity of communications over the time. Results show that the reform led to a substantial increase in the volume of letters sent or received in the treated locations across the territories of England and Wales. The patterns are robust to a variety of robustness and sensitivity checks. Information on the location of battlefronts before 1600 also allows to construct an instrumental variable for our treatment based on distance from a network of least-cost paths connecting London to the main battlefronts. A large set of checks, and the results of DID/IV empirical strategies, confirm the findings bolstering confidence on a causal interpretation of the findings. The use of event studies allow to track the effect over the time and shows that opening the postal system significantly, and increasingly, impacts the volume of epistolary exchanges particularly after the end of the Civil War and the restoration of the monarchy in 1660. See the analysis in Section 4.

To address the question on the interactions between knowers and doers, we need a taxonomy of correspondents, which for the early modern period is not a trivial task. We track individuals involved in the production and dissemination of codified knowledge across different academic disciplines (e.g. natural scientists, humanists, thinkers). Beside these individuals, that are labelled as "Scholars", we are interested in tracking the interactions with individuals with upper tail human capital that conceptually contributed to the application and spread of useful knowledge. Following historical research we focus on three main categories. First, we look at manufacturers, businessmen and technical experts (e.g. builders, craftsmen, engineers) as well as practitioners (e.g. physicians, people involved in the production of drugs. etc). Historians also suggest a relevant role of statesmen (e.g. MPs, personnel of government administration, diplomats, colonial agents, etc) which were increasingly involved in the regulation of economic activities. Finally, given the focus on transfer of knowledge, we also track individuals involved in the information industry. These include, e.g., editors, librarians, typographers, as well as non academic scholars involved in the production catalogues, encyclopedias, etc. We label individuals belonging to these join categories as "Professionals".[2] The analysis documents that, on top of an increase in correspondence intensity, the opening of the postal system involved changing patterns of communication across different categories in the treated locations. In particular, communications between scholars become particularly significant after the end of the civil war and the restoration. Interestingly, communications between scholars and professionals also increasingly tend to intensify. See Section 5 for data description and results.

Next, we study the impacts on the contents of communications. Building on works on modern social networks, we apply unsupervised text analysis (using the LDA algorithm) and classify the topics of the

[2] Out of the residual individuals outside scholars and professional, we also explicitly classify clergymen (members of the church, Jesuits, missionaries, etc).

letters. Given our main interest, we focus a macro-topic labeled *knowledge*. Following the conceptualization of useful knowledge provided by historians, we classify in this broad topic letters that discuss: scientific advances and the systematization of knowledge, but also cataloging and publishing, as well as mentoring and education, among others. The unsupervised analysis also clearly isolates further topics and in particular communications related to *ordinary life* (e.g. greetings, scheduling of visits, running the household and family estates).[3] The main results document a sizable intensification of communications related to knowledge. Compared to letters referring to ordinary life matters, the impact of the posts on exchanges mainly focused on knowledge is more progressive (and it peaks in the second half of the seventeenth century). The analysis than further discriminates the changing content of communications by types of correspondents. We find that communications related to useful knowledge increase not only among scholars, but also between scholars and professionals. In fact, these epistolary exchanges are the ones that tend to intensify more and become significant and more visible earlier on. See Section 6 for analysis and results.

Finally, we consider innovation activities, broadly defined, and longer-term outcomes. We assemble a dataset of innovators active in England and Wales between 1570 and 1769. Information is extracted from the Oxford Dictionary of National Biography (ODNB, more than 30,000 biographies of notable people born between 1100 and 1800). The classification is performed by reading full biographies and classifying. The analysis isolates around 600 technical innovators and soft-innovators (e.g. art and humanities). Geo-time referencing the place and decade of the main innovation events during their life (e.g., visits, apprenticeships) allows us to obtain proxies of innovations activities over time and space. The results deliver several insights. Early access to the postal system increase the innovation activities in the subsequent decades for technical innovators (but not for soft innovators). Validation shows that the results go hand-in-hand with the (lack) of intensified epistolary communications. As a last, and more speculatively, step we build on the literature and look at longer term outcomes across locations. We find that places more intensively exposed to the early opening of postal stages display more industrial local economies in the nineteenth century (measured by patents, share of industry, and others). Data construction and results are reported in Section 7.

1.3 Literature

This paper contributes to several strands of the literature in long-term development and economic history. The background is the tradition in the social sciences aiming at understanding why sustained growth first occurred in Europe—the so-called "Great Divergence"—and more specifically why in England—the so-called "Little Divergence". Initially portrayed as a sudden leap into industrial production out of hitherto stagnation, the process of long-term development is increasingly interpreted as resulting from economic, technological, social, and institutional changes that progressively gained momentum in pre-industrial times.

In this paper, we explore the empirical validity of arguments tracing the roots of industrial development to the rise of knowledge Economies during the age of the Enlightenment. Recent empirical estimates indirectly support this perspective by documenting significant increases in living conditions in England

[3]Further topics that clearly emerge relate to *politics* e.g. (royal/court affairs, management of colonies and wars, local politics) and to *religion* (e.g. teleological discussion, organization, Christian traditions). Finally, the analysis detects a topic which we label *academic gossip* that refers to discussions of academic career, power and generally gossip about scholars.

earlier than initially thought already starting from the second half of the seventeenth century (see, e.g., Humphries and Weisdorf, 2019; Broadberry, 2021; Bouscasse et al., 2025, for a structural approach). Our analysis focuses on the intensification of the social interactions related to the production and diffusion of useful knowledge (Mokyr, 2016). The analysis and results broadly contribute to the research on the legacy of history for social interactions, cultural values, and long-run economic development (e.g., Spolaore and Wacziarg, 2013; Giuliano and Nunn, 2021). The results add, more specifically, to the recent works that have pushed the understanding of the role of science and the diffusion of knowledge by performing econometric analysis for the pre-industrial period.

Important advancements in the understanding of the role of the diffusion of knowledge have been recently achieved looking at information codified in books and manuals. Squicciarini and Voigtländer (2015) track the diffusion of the *Encyclopédie* in mid-eighteenth century and isolate a key role of upper tail human capital for the onset of industrial development in France. Important works have tracked the impact of technologies that facilitate diffusion of information. Most notably, Dittmar (2011) looks at the adoption of the printing press on city growth 1400-1600, while Dittmar and Seabold (2019) find that the printing of business manuals and books with a protestant content impact city growth and institutional change, respectively. Almelhem et al. (2026) look at the content of books in England and show that the language of science became more independent from religion and more progress-oriented from the early eighteen century.

Another important stream of the literature has investigated the role of universities and academic scholars. Cantoni and Yuchtman (2014) show that the foundation of universities in Germany in the middle ages favored commerce and economic activities. Building a large original database of scholars, de la Croix et al. (2024) track the evolution of the academic market and its economic determinants across time and space in Europe in pre-industrial times 1000-1800. Further studying interpersonal connections by means of academic affiliations, De la Croix et al. (2025) study the effects of affiliations on the diffusion of main scientific ideas.

Our findings also contribute to the growing body of formal investigations of the determinants of long-term development during pre-industrial times in England. Recent works have pushed the analysis by exploiting disaggregated (spatial) data. Most notably, Heldring et al. (2021) document the role of the dissolution of English monasteries in the sixteenth century in shaping the process of commercialization and paving the way to the industrial development at the onset of the industrial revolution. Angelucci et al. (2022) isolate the impact of trade across towns for the patterns of political representation in the middle ages, participation to the civil war in the seventeenth century, and longer term outcomes.

We contribute to these streams of the literature with a first systematic evidence on the impact of communication infrastructure in shaping person-to-person interactions for the rise of knowledge economies in seventeenth century England and Wales. Complementing existing evidence based on codified knowledge published in books and academic scholars, the results uncover spatial patterns of intensified interactions between knowledge elites and professionals in the context of the diffusion of useful knowledge. The results also complement the evidence on the role of local trade and market history by adding evidence on the role of local exposure to communication infrastructure for innovation activities and long-term outcomes.

2 Historical Background

2.1 Postal Communications and the 1635 Reform

The so-called *King's Posts* was an unrefined postal system lacking a structured network of postal routes (Brayshay, 1991, p. 378), whose aim was to "provide beleaguered English monarchs as quickly as possible with news from distant places" (Campbell-Smith, 2011, p. 7). The system, in place since the days of King John (Hemmeon, 1912, p. 3), was based on royal messengers, called *cursores*, who were paid according to the length of their travels. During the Wars of the Roses (1455-1485) and the English invasion of Scotland of 1482, Edward IV, in need of keeping a close track of the events on the battlefields, mandated to place temporary stables with fresh horses at intervals of roughly a dozen miles along the main roads of his kingdom. The idea of 'laying the posts', or more simply arranging 'post stations' to use during war times, outlived Edward IV's regime and became the cornerstone of future developments of the postal system, especially after the appointment of Brian Tuke, a court official, as the first 'Master of the Posts' by King Henry VIII in 1517. Tuke arranged permanent stables run by *deputy postmasters*. The cities having a stable for such a purpose became known as *post towns* (Campbell-Smith, 2011, p. 9). The first two main post roads to be equipped with permanent staging posts were the North Road, connecting London with the Scottish border, and the Dover Road, linking London with the port of Dover on the English Channel. In the last decades of the sixteenth century, three new post roads with staging posts were set up in response to a rebellion against the Crown happening in Southern Ireland: the West Road, linking London to the Cornwall county, in the far southwest of England; the Bristol Road, stretching from London to Bristol; and the Irish Road, extending from London to the city of Holyhead, in northwestern Wales.

Despite this expansion of the postal network, "little was done to improve the general administration of the Posts" in that period (Campbell-Smith, 2011, p. 19). As the deputy postmasters were remunerated with a basic state salary, their financial conditions critically deteriorated in the second half of the sixteenth century, when a combination of high inflation rates and a sizable wage cut ordered by Queen Elizabeth I pushed them close to their financial limits. The general postmaster Tuke and his successors could not be of much help, as they were not allowed to decree any increase of the deputy postmasters' wages without the royal consent (Hemmeon, 1912, p. 6). In 1583 Elizabeth I made a few concessions to 'uncommissioned' private users of the royal postal service to help supporting the running of the system, but she also enjoined post-riders to always prioritize the delivery of papers and letters for Her Majesty's affairs over the consignment of private letters. For this reason, by 1600 posting was still a "service of the court [...]. The real beginning of a public service only come in the next century" (Robinson, 1948, p. 21). Queen Elizabeth's death in 1603 did not bring about a general improvement in the national postal system either. As James I took power, the Crown's concerns over the financial stability of the King Posts became recurring and the lack of resources became so severe that the government ended up falling into arrears with the payment of deputy postmasters' state wages (Robinson, 1948, p. 35). By the early 1630s the system was thus in need of a deep overhaul, as also demonstrated by the poor quality of most post roads and the slow conveyance of messages.

In 1632 the King's Principal Secretary of State, John Coke, appointed Thomas Witherings, a respected merchant from London, as general postmaster of England for the Foreign Posts, the official and private postal

business along the Dover Road. Before the end of that year, Witherings handed to Coke a detailed plan to reorganize the branch of the postal network under his supervision, through the use of mounted couriers (*staffeti*) who were to travel day and night from stage to stage. Witherings' plan was an evident success, as it soon reduced the journey time between London and the port of Antwerp in the Flanders region from eight to four days (Sharpe, 1984, p. 160). More importantly, the plan kick-started a much more ambitious reform that Witherings himself carefully crafted in that period, whose final goal was to make the Posts a self-supporting business and "no longer a charge to the state" (Hemmeon, 1912, p. 13).

In his "Proposition for settling staffets or packet posts betwixt London and all parts of His Majesty's dominions" dated June 1635, Witherings set up a fixed scale of charges for the carriage of private letters on all the main post roads (now amounting to six, after the addition of a new postal route from London to Norwich via Colchester).[4] Deputy postmasters would then be not only forbidden from pocketing the fees paid for private mail, but would also be required to remit the money to a newly-established 'Letter Office' in London, which was responsible for paying out their salaries. The "Proposition" also prohibited the deputies from hiring out their horses on the days on which the post was due for delivery.[5] Finally, the day and hour of the arrival and departure of *staffeti* to and from London had to be "always certain" (Robinson, 1948, p. 30) and "mail brought along one road to London and addressed to a town on another road" was to be "transferred at the London office" (Beale, 1998, p. 227). On July 31 of that year, Coke approved Witherings' reform proposal and issued a royal proclamation that authorized "the settling of the Letter Office of England and Scotland". On that day the Royal Mail was born.

The reform of 1635 marked the beginning of a radically new period of English communication history. Crucially for our purposes, the change to a revenue-paying basis was made possible both by making the postal system openly available to the public (for the first time ever) and by establishing a statutory monopoly over the carriage of official and unofficial letters.[6] According to Hemmeon (1912), Witherings' work was so effective that "by 1636 his reform was in full and profitable operation" (cf. p. 15). As a result, the whole kingdom experienced a remarkable improvement in postal arrangements: the postal service became much more rapid, reliable, and financially sustainable, and the volume of letters passing along the kingdom's post roads gradually rose (Campbell-Smith, 2011, p. 27). In the following decades, the postal network expanded to serve the population off the six main routes.[7] Still, the administration of the Letter Office kept following

[4]Details on the payment can be found in Beale (1998): "[The proposition] gave postage rates of 2 pence per single letter [i.e. a letter taking only one sheet of paper] for journeys of under 80 miles, of 4 pence for 80 to 140 miles and of 6 pence for journeys above that. Letters to or from Scotland were 8 pence. The same payments were to be applied to the road to Ireland" (cf. p. 227). Also, "the postmasters in the country were not to take any charge for a letter, except one penny for carriage to the next market town. [...] Letters for any of the towns off the great roads [...] were to be left at the post-towns nearest the country towns to which they were directed. They were then to be carried to their destination by foot-posts to a distance of six or eight miles and for each letter these foot-posts were to charge 2 pence, the same price that was charged by the country carriers" (Hemmeon, 1912, pp. 13-14).

[5]The reform of the royal post introduced by Witherings set off a radical shift in the function of the King Posts. Thanks to his master plan, in 1635 the British postal system moved from being a 'royal necessity' constantly drawing on the Crown's resources, to representing a source of revenues to the state.

[6]Private carriers kept operating in competition with the Letter Office after 1635, but were increasingly overloaded with legal constraints slowing down their activity and therefore lost relevance within a few decades (Campbell-Smith, 2011, pp. 27-28).

[7]During the 1660s and 1670s, deputy postmasters on the main routes were allowed to establish new branches, called *by-posts*, between the main post roads and the kingdom's largest towns. In the 1690s the number of by-posts increased significantly and some postmasters were granted the permission to establish *cross-posts*, i.e. links between the six main postal routes.

closely the practices laid down in the "Proposition" of 1635 for almost two centuries (Robinson, 1948).[8]

2.2 Epistolary Communications and the Diffusion of Useful Knowledge

Between the XVI and XVIII century and before the advent of scientific journals, letters were by far the most direct and important means of communication between intellectuals, noblemen, bureaucrats and merchants over short to long distances. A mentioned above, in the context of the Enlightenment historians highlight the peculiar pan-European epistolary network—labeled the *Respublica Literaria* or *Republic of Letters*—allowed people from all over Europe to be in touch with persons they had never physically met to exchange information, discuss new theories and critique ideas to advance knowledge and technological progress (Mokyr, 2005, 2016).[9]

Crucial to interactions across different locations was possibility to communicate at moderate costs. "Cultural innovation post-1500, from the Reformation to Copernican astronomy to calculus depended on the printing press, better postal services, and the improved capability of ships and land-based modes of transport to spread information around the world" (Mokyr, 2016, p. 42). Specifically, in the context of England, Merton (1938, p. 580) emphasizes the relevance of the 1635 postal reform for the development of science: "*Although a postal service for the conveyance of state letters had been extant since the beginning of the sixteenth century, it was not until the middle of the next century, that one general post office of England for private mail was established. And what was perhaps even more important, international postal relations were continually improved so that by the end of the century, communication with the Continent was constant and regular. These extensive developments in communication and transport [...] also promoted intercourse in the domain of thought. This increase of social interaction facilitated the development of science in no small measure.*" In this sense, the postal infrastructure formed part of the broader innovation ecosystem that made Britain "a society that provided both the incentives and the opportunities to apply existing useful knowledge to technology" (Mokyr, 2002, p. 55).

Along similar lines, Mokyr (2002, p. 58) points out that, although postal rates remained high and their structure complex prior to Rowland Hill's postal reform of 1840—most notably introducing the Uniform Penny Post—"postal services in England long before [1840] were providing easy and reliable access to knowledge generated elsewhere." An excerpt from a correspondence between the London-based botanist and physician Nehemiah Grew and the Italian scholar and physician Marcello Malpighi, today referred as the founders of (plant and) microscopical anatomy, a prerequisite for advances in the fields of physiology, embryology, and practical medicine (Riva and Toffoletto, 2025), illustrates this point: "*Most illustrious man, since you have indeed given me many occasions to write to you, and the most illustrious Lord Oldenburg has shown me the way to send letters, I could not (without prejudice to the decorum of my manners) hold my pen any longer. I see that almost all of your observations agree with mine; however, I have chosen to pass over some of them concerning the flower, fruit, and seed. [...] These anatomical observations on*

[8] According to Robinson (1948), "the 2-pence charge for a single letter was to remain the basic rate for two centuries. The increasing cost, according to the distance a letter traveled, was also to a be a long-lived device of the Post Office. The use of the footpost was to remain an important part of the system both in town and country" (cf. p. 31).

[9] The terminology *Respublica Literaria* was first coined in 1417 in a letter between Francesco Barbaro, a Venetian humanist, to Poggio Bracciolini, a Tuscan colleague, and became popular in the XVI century with the work of Erasmus of Rotterdam.

roots, which I have collected in the last year, together with figures, both corresponding to the size of the roots and microscopic ones, I am going to give in a short printer [...] I have also decided to preface the idea of Phytological Science, as outlined in our mind [...] Continue, most learned man, in your excellent undertakings, and strive to bind us and posterity more and more daily to your glorious memory." (see Grew to Malpighi, March 5, 1673; in Adelmann, 1975, pp. 646-47).[10]

According to scholars, the rise of an intense correspondence-based network made possible by the postal system, facilitated the creation, circulation, evaluation, and refinement of what Mokyr (2002) terms "useful knowledge": knowledge with practical applications, encompassing scientific principles, technical skills, artisanal expertise, and the institutional arrangements that support innovation. Furthermore, technical advances rest on incremental improvements to existing instruments and not only entirely new inventions. Development of techniques that work, were often the result of sustained interactions among scholars and skilled practitioners, including physicians, instrument makers, and engineers, and artisans, as well as individuals involved in crafting norms and regulations of socio-economic activities.

The correspondence between the English educational, social, and agricultural reformer Samuel Hartlib and the English natural philosopher Robert Boyle illustrate the importance of extensive discussions about new knowledge, experiments, and technical innovations but also about the individuals with useful knowledge and skills: "*I thank you for your new discoveries in anatomy, and enquiries of other useful and ingenious knowledges. I shewed Mr. Hobbes your letter, who liked it so well, that he desired me to lend it him, which I did. Your worthy friend and mine Mr. Gassend is reasonable well, and hath printed a book of the life and manners of Epicurus [...] in which I believe we shall have much of his own philosophy, which doubtless will be an excellent work. There is an experiment how to shew, as they suppose, that there is or may be vacuum. It were too long to write all the particulars, but in brief thus. They prepare a long tube like a weather-glass [... description of experiment and instruments used continued...].*" (see Hartlib to Boyle, May 19, 1648; Hunter et al., 2001, pp. 65-67).[11] The letter also illustrates the intensity of intellectual exchange sustained through correspondence: it references experimental findings, recently published works, philosophical debates, and technical descriptions of instruments. Such exchanges were not merely informational; they facilitated the replication, adaptation, and improvement of instruments in England, where skilled mechanics were available to implement and refine new designs (see Hartlib to Boyle, July 10, 1657; Hunter et al., 2001, p. 220-22).[12]

The cumulative, and, longer-term effects of these interactions were tangible. In 1659, Boyle and Robert Hooke—an exceptionally versatile natural philosopher active in physics, astronomy, geology, and meteorology—constructed the air pump that would later bear Boyle's name. In fact, Hooke had earlier been recommended to Boyle by Hartlib, following a letter from the mathematician John Pell (see Pell to Hartlib, February 14, 1658; British Library, Manuscript Collections).[13] The resulting Boleyan air pump became a crucial instrument in the experimental study of pneumatics. Together with related work by Otto von Guericke in Germany and Denis Papin in France, it contributed to advances in the understanding of air

[10] An abstract summarizing the content of the letter is available at the following link: `https://emlo.bodleian.ox.ac.uk/profile/work/f41e567d-6def-4af0-8fe8-0f6df88ea0cb`.

[11] Letter available at the following link: `https://www.e-enlightenment.com/item/boylroPC0010065e1c`.

[12] Letter available at the following link: `https://www.e-enlightenment.com/item/boylroPC0010220a1c`.

[13] An abstract of the content of the letter is available at the following link: `https://emlo.bodleian.ox.ac.uk/profile/work/ad164c11-9815-4e1b-b1eb-06e4bf8f7a97`.

pressure and vacuum, developments that ultimately fed into the theory of steam power and the later design of Newcomen's steam engine, subsequently improved by James Watt.

Besides these relevant and highly suggestive examples, whether and how the development of the postal system favored an intensification of communications in the context of the British Enlightenment, significantly boosted the connections and the interactions between savants and fabricants across the affected locations, facilitated the production and spread of useful knowledge and ultimately had a detectable impact on innovation activities and socio-economic outcomes in the longer term, are all open empirical questions, to which we turn next.

3 Data and Empirical Strategy

We build a novel geo-referenced panel dataset drawing on multiple primary and secondary sources. This section briefly presents the main data sources, the construction and treatment of the baseline data and the main empirical specifications. The collection and treatment of further data is presented in the corresponding sections below.

3.1 Data

We exploit spatial variation across grid cells measuring 0.09° in latitude by 0.09° in longitude (approximately 10×10 km at the equator), covering England and Wales. All the data are aggregated into a decadal panel at the grid cell level spanning the period 1570-1769.[14] The resulting dataset is a balanced panel of 2,764 grid cells observed over 20 decades, yielding a total of 55,280 grid cell-decade observations.[15] Data Appendix A provides additional details on the construction of all variables.

The Postal System. We conducted a systematic search for historical sources describing the evolution of the English postal system, focusing on maps of the network. Maps are available for the years 1570, 1580, 1595, 1603, and 1628 for the period prior to the 1635 postal reform, and for the years 1668, 1677, and 1690 for the period after the reform (Carr, 1668; Greene, 1690; Edwards, 1987; Brayshay, 1991, 2011; Campbell-Smith, 2011). For each map, we geo-reference the location of every postal stage and build a digitized version of the network. The final grid cell-level panel dataset is obtained after first mapping all geolocated postal stages onto our 0.09° × 0.09° grid map and then allocating digitized postal maps to each decade from 1570 to 1760.[16] We then define the indicator variable *Stage Dummy*$_{it}$, equal to one if the grid cell i hosts at least one postal stage in decade t, and zero otherwise. In addition, we construct the time-invariant indicator *Stage Dummy 1620*$_i$, which equals one for all decades if the grid cell i hosts at least one postal stage in 1628—the last observed network configuration in the pre-reform period—and zero otherwise.

[14] Each decade begins in a year ending in zero: for example, the period 1620-1629 corresponds to the decade 1620.

[15] The smallest administrative unit in early modern England and Wales was the parish. By 1850, there were 17,898 parishes (see Kain and Oliver, 2001, for detailed information). This implies that, on average, each grid cell in our dataset encompasses approximately six parishes.

[16] More information on the postal dataset construction are available in Data Appendix A.1.

Epistolary Communications. To obtain information on early modern correspondence in England and Wales, we draw on a major investment in the digital humanities made over the past decade (and still ongoing), aimed at collecting information on epistolary exchanges within the Republic of Letters. These collection efforts have produced two online platforms: Early Modern Letters Online (EMLO) and Electronic Enlightenment (EE). EMLO is a union of catalogues that collect person-to-person correspondence for the sixteenth-, seventeenth-, and eighteenth-century. The project, developed starting in 2009 by the Cultures of Knowledge Project at the University of Oxford, aims at tracking the epistolary exchanges in the context of the Enlightment in the period 1550-1750.[17] Similarly, EE is a large scale digital collection of edited correspondence written by thousands of individuals across Europe, the Americas and Asia, from the early seventeenth to the mid-nineteenth century. Conceived in 1995 by the Bodleian Libraries at the University of Oxford, the EE project has assembled a wide-ranging digital collection of interlinked correspondence of both central actors and 'marginal' figures, with the aim of representing a cross-section of early modern and Enlightenment society.[18]

For each letter in EMLO and EE, we extract information on the date, place of origin, destination, sender (including bibliographical details), recipient (including bibliographical details), and either an abstract or the full text. We retrieve all letters sent from or received in England and Wales between 1570 and 1769. We retain only letters for which at least one location (origin or destination) is identified.[19] The data is then enriched with geo-time information to make it suitable for spatial panel analysis. First we geocode the origin and destination of each letter. When geographic coordinates are not provided by the source databases, we manually geocode locations using the platform OpenCage.[20] Next, we remove EE letters that also appear in EMLO, as well as duplicate entries in EE corresponding to original and translated versions of the same letter. This procedure yields 55,539 unique letters. For letters involving multiple senders and/or recipients, we treat each sender-recipient pair as a separate observation. This approach results in 55,778 letter-sender-recipient combinations (hereafter "letters" for simplicity). After excluding observations with either an unidentified sender or recipient (182 letters, corresponding to 185 sender-recipient combinations), the final dataset comprises 55,593 unique letter-sender-recipient combinations.

To construct the final panel dataset, we map the origin and destination of each letter to the $0.09^\circ \times 0.09^\circ$ grid map, which is defined for each different decade. We then aggregate letters at the grid cell-decade level. For each grid cell-decade, we compute the number of outgoing letters (sent from the cell) and incoming letters (received in the cell). We sum these two quantities to obtain a measure of epistolary intensity for each grid cell-decade.[21]

[17] For further details, see the Cultures of Knowledge Project website: `https://www.culturesofknowledge.org/`.

[18] More details on EE are available at `https://www.e-enlightenment.com/index.html` and `https://digital.humanities.ox.ac.uk/project/electronic-enlightenment-project`.

[19] Data from EMLO were extracted via web-scraping procedures in Python, for which we obtained permission from the platform manager. The full EE dataset was obtained under a license agreement between the University of Bologna and the University of Oxford. We use the EMLO version updated in 2020 and the EE version updated in 2018.

[20] Link: `https://opencagedata.com/`.

[21] Double counting problems do not arise as long as origin and destination grid cells differ. However, 924 letters originate and are delivered within the same grid cell, with approximately 86% of them being associated with the grid cell containing the City of London. Results are robust to excluding these letters.

Other Variables. To account for pre-existing communication infrastructure other than the King's posts, we control for historical transport networks. Specifically, we use data on Roman roads from McCormick et al. (2013) and major medieval routes from Edwards (1987). Using these sources, we compute the variable *Distance to Historical Routes*, defined as the distance from each grid cell's centroid to the nearest segment of either network.[22] Proximity to medieval urban centers is tracked using data from Angelucci et al. (2022). For each grid cell we compute the variable *Distance to Medieval Boroughs*, measuring the distance from the cell centroid to the nearest medieval mesne or royal borough.

3.2 Empirical Strategies

Presence of a Postal Stage: Correlational Analysis. As a first step we examine the effect of the presence of a postal stage estimating OLS panel regressions of the form:

$$Y_{it} = \beta StageDummy_{it} + \phi_1'(\mathbf{X}_i \times \eta_t) + \phi_2(StageDummy_{it} \times CivilWar_t) + \theta_i + \eta_t + \varepsilon_{it} \quad (1)$$

where Y_{it} represents an outcome of interest (e.g. intensity of communications, their contents, the level of innovation activity, etc) for grid cell i in decade t, such as the log number of letters sent from and received in a grid cell-decade (plus one). The main coefficient of interest is β, which is the coefficient associated with $StageDummy_{it}$, an indicator taking the value one if grid cell i hosted at least one postal stage in decade t, and zero otherwise. The specification includes grid cell fixed effects θ_i and decade fixed effects η_t. Grid cell fixed effects absorb time-invariant local characteristics, including historical, socio-economic, and political factors that may affect both the presence of a postal stage and our outcomes of interest. Decade fixed effects control for common shocks and aggregate trends that affect all locations simultaneously. The vector $\mathbf{X}_i$ includes a set of time-invariant geographic and historical controls (expressed in logarithms): minimum distance to major rivers, Roman roads, and medieval roads; distance to London, and distance to royal and mesne boroughs. These variables proxy for long-run connectivity and economic importance since the medieval period. Because these covariates do not vary over time, they are interacted with decade fixed effects, allowing for their influence on the outcomes to vary flexibly across decades. Finally, to account for potential disruptions to the postal infrastructure during the English Civil War, we additionally include an interaction between the indicator variable $StageDummy_{it}$ and a dummy equal to one only for the decades 1640 and 1650 ($CivilWar_t$). This term captures specific shocks to our outcomes during periods of conflict, given the postal network available in those decades.

Standard errors are clustered at the grid cell level to account for serial correlation within locations. Given the fine spatial resolution of the data, we also report standard errors corrected for spatial correlation, following Conley (1999). Our baseline specification assumes a spatial correlation radius of 50 km, corresponding to approximately 100 neighboring cells (roughly half the area of the historical county of Yorkshire). We use a Bartlett kernel with linear distance decay, thereby allowing correlation to decline smoothly with geographic distance even among observations within the same cluster.

[22] More details on how we generate this variable can be found in Data Appendix A.3.

The Impact of the 1635 Reform: Difference-in-Differences Analysis. Estimates of specification (1) rely on a time-varying coding of exposure to postal stages. Depending on the outcomes of main interest, these estimates cannot necessarily be interpreted as causal. For instance, concerning the estimates on the intensity of correspondence, one cannot rule out that the establishment of a postal stage in a given location after the opening of the postal system to the public is endogenous. This selection can be associated, for instance to an increasing demand for epistolary communications driven by latent time-varying confounders. Possibly, this problem is less likely for estimates of other outcomes of interests such as the types of correspondents and the content of the letters. Similarly, the sample of the letters and their contents appears unlikely to be systematically selected on specific locations. Ultimately, however, using time-varying information on the presence of a postal stage in each location and period is a correlational strategy that is prone to the possibility of such biases.

In this respect, the 1635 reform of the postal system provides a useful natural experiment. Prior to the 1635 reform, the network of posts was developed for military purposes during the previous century, as a service of the Crown with the goal of connecting London to the battlefronts in the quickest possible way. As a matter of facts, these horse posts created before the subsequent expansion of the network are not systematically located in bigger, commercial, or rising cities. The details of the implementation of the reform imply that the opening of the pre-existing stages to the public is conceptually exogenous to local trends in epistolary intensity, so that pre-existing stages are not affected, by construction, by possible problems of selection of the letters written after the reform in terms of types of correspondents and content of the letters.

As baseline implementation of the difference-in-differences framework we therefore follow a conservative approach. We restrict the treated group to locations where a postal stage was already in place prior to the reform. Specifically, a location is considered treated if it hosted at least one postal stage according to the 1628 postal map (the latest map prior to the reform). Locations without a pre-existing stage act as untreated units. Following narratives on the rapid implementation of the reform (see, e.g., Hemmeon, 1912), we interpret the decade 1630 as treated (although, strictly speaking the reform affected outcomes only for the second half of that period). This amounts at estimating OLS specifications of a D-i-D regression of the form,

$$Y_{it} = \delta(Stage\,Dummy\,1620_i \times Post_t) + \phi_1'(\mathbf{X}_i \times \eta_t) + \phi_2(Stage\,Dummy\,1620_i \times CivilWar_t) + \theta_i + \eta_t + \varepsilon_{it} \quad (2)$$

where the time-invariant indicator $Stage\,Dummy\,1620_i$ equals one if grid cell i hosted at least one postal stage in the decade 1620 (based on the postal map of 1628), and zero otherwise. $Post_t$ represents instead a dummy variable equal to one for all decades from 1630 onward, and zero otherwise. The baseline coefficient of interest is δ, which captures the difference-in-differences estimate of the impact of the postal reform. It measures the differential change in a given outcome after 1630 between locations that hosted a postal stage prior to the reform and those that did not. All other terms in Equation (2) are defined as above.

As further discussed below in the presentation of the results, a large sensitivity analysis is performed to further explore the validity of the estimates. This includes, among others, also running D-i-D/IV regressions where the presence of postal stages prior to the opening of the system is predicted using information on the optimal routes from London to the battlefronts that in the sixteenth century led to their opening for military

purposes.

Dynamic Impacts: Event Study. To assess the validity of the parallel trends assumption and to study the dynamic effects of the postal reform, we also estimate event-study specifications. Specifically, this is done by interaction the pre-reform postal stage dummy with a the full set of decade indicators. The decade 1620 is omitted and serves as the reference period. This specification allows us both to test whether treated and control locations followed similar trends prior to the reform and to trace the evolution of treatment effects over time. Specifically, we estimate by OLS the following equation:

$$Y_{it} = \sum_{\tau \neq 1620} \delta_\tau (Stage\,Dummy\,1620_i \times \mathbb{1}\{t = \tau\}) + \phi_1'(\mathbf{X}_i \times \eta_t) + \phi_2(Stage\,Dummy\,1620_i \times CivilWar_t) + \theta_i + \eta_t + \varepsilon_{it} \quad (3)$$

Under the parallel trends assumption, the coefficients δ_τ corresponding to pre-reform decades ($\tau < 1630$) should be statistically indistinguishable from zero. Post-reform coefficients trace the dynamic response of correspondence and innovation outcomes to the opening of the postal system.

4 The Postal System and Intensity of Personal Interactions

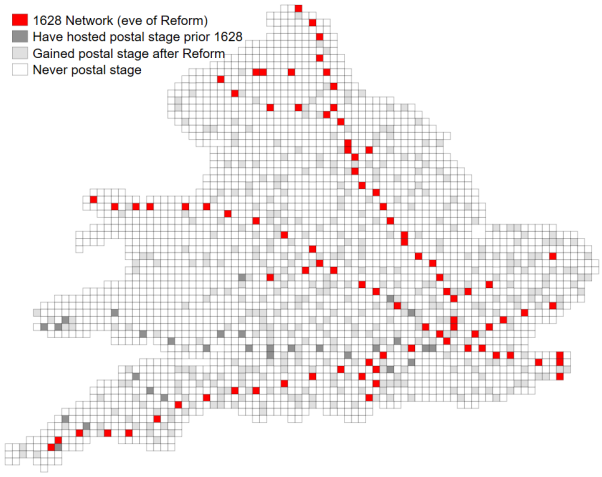
We start by investigating whether the availability of a postal stage affected the intensity of personal interactions through private correspondence.

4.1 Descriptive Evidence

Figure 1 and 2 present preliminary evidence on the association between the presence of a postal stage and correspondence intensity. Prior to the 1635 reform, the postal system was "largely a service of the Court" (Robinson, 1948, p. 21). As a result, correspondence was relatively rare (see Figure 2, Panel a) and concentrated in locations along the main postal routes (dark gray and red cells in Figure 1).

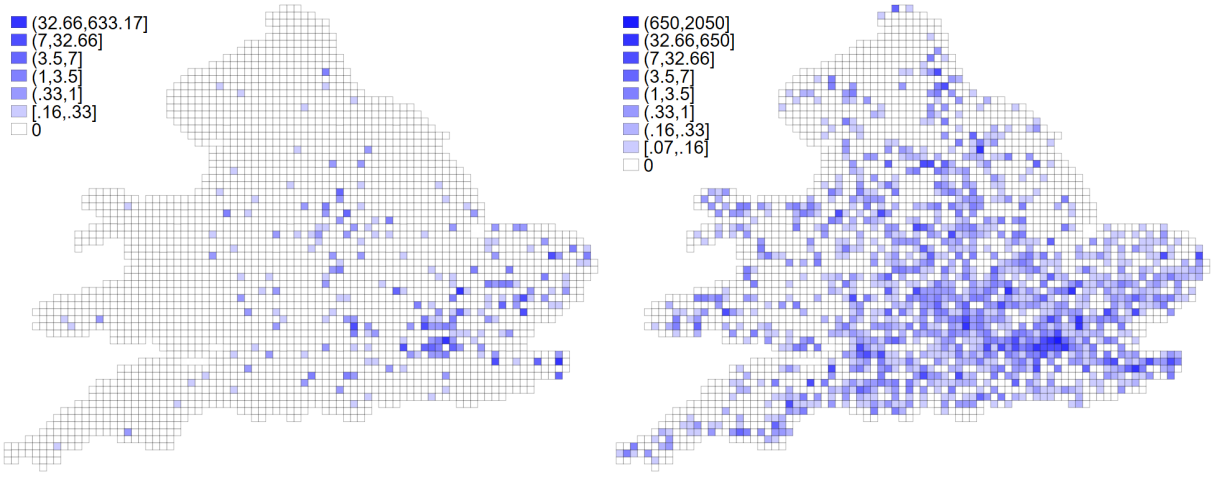
Following the 1635 royal decree that allowed everyone to use the postal system for personal correspondence, the volume of interactions increased substantially (see Figure 2, Panel b). Additional postal stages were established to serve areas previously outside the network (light gray cells in Figure 1), contributing to the intensification of epistolary exchanges. Nevertheless, the spatial distribution of letters in the post-reform period closely reflects the pre-reform network, suggesting that areas connected to the postal system before 1635 experienced a disproportionate expansion in correspondence by mail.

Figure 1: Postal System in England and Wales, Decades 1570-1760



Notes: Grid cells in red are those that hosted at least one postal stage in 1628, the year of the latest map of the postal network in the pre-reform period. Grid cells that hosted at least one postal stage before 1628 or after the 1635 reform are shown, respectively, in dark gray and light gray. Grid cells that never had a postal stage over the whole period are in white. Sources: own elaborations based on Carr (1668), Greene (1690), Edwards (1987), Brayshay (1991), Brayshay (2011) and Campbell-Smith (2011).

Figure 2: Average Decadal Number of Letters by Grid Cell Before and After the 1635 Reform



(a) Letters in decades 1570-1620

(b) Letters in decades 1630-1760

Notes: The figure shows the average number of letters in each grid cell over the pre-reform period (Panel a) and the post-reform period (Panel b). *Sources*: Early Modern Letters Online and Electronic Enlightenment.

4.2 Panel Regressions

As a preliminary step, we first study the intensification of correspondence in grid cells hosting a postal stage focusing on the variable *Stage Dummy*$_{it}$, as presented in Equation (1). The dependent variable is the log number of incoming and outgoing letters in grid cell i during decade t (plus one). Table 1 shows the

OLS results. Column 1 includes grid cell and decade fixed effects only. Column 2 additionally controls for distance to London. Column 3 further incorporates distance to historical transportation routes, while Column 4 adds distance to medieval boroughs. All distance measures are expressed in logarithms and interacted with decade fixed effects. Finally, Column 5 augments the specification with an interaction term between *Stage Dummy*$_{it}$ and a dummy equal to one only for the decades affected by the English Civil War. Standard errors clustered at the grid cell level are reported in parentheses, while Conley (1999)'s spatially corrected standard errors are reported in squared brackets. Across all specifications, the coefficient on the postal stage indicator is positive and significant at conventional levels. Focusing on Column 5, the estimated coefficient of 0.075 implies that the presence of a postal stage is associated with approximately a 7.8 percent increase in correspondence intensity. Column 5 of Table 1 represents our preferred specification in all the subsequent exercises focusing on presence of a postal stage.

Table 1: Presence of a Postal Stage and Intensity of Correspondence – Correlational Evidence

Dependent Variable	Log All Letters				
	(1)	(2)	(3)	(4)	(5)
Stage Dummy	0.091	0.082	0.078	0.080	0.075
	(0.020)***	(0.019)***	(0.019)***	(0.020)***	(0.020)***
	[0.012]***	[0.012]***	[0.012]***	[0.012]***	[0.012]***
Decade FE	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE		✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE			✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE				✓	✓
Stage Dummy × Civil War Dummy					✓
N. Clusters	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.415	0.419	0.421	0.423	0.423
Mean of DV	0.095	0.095	0.095	0.095	0.095

Notes: OLS estimates. Observations are grid cells observed in each decade from 1570 to 1769. In each specification the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one). The explanatory variable *Stage Dummy*$_{it}$ equals one if the grid cell i includes at least one postal stage in decade t, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<10\%$, ** = p-value $<5\%$, *** = p-value $<1\%$.

Robustness. Several robustness checks corroborate the presence of a positive association between the presence of a postal stage and correspondence intensity.

First, we discuss alternative transformations of the dependent variable. Our baseline outcome variable is $ln(N_{it}+1)$, where N_{it} denotes the total number of incoming and outgoing letters in grid cell i during decade t. Because the distribution of N_{it} contains many zeros and is highly right-skewed, this transformation allows us to retain the full sample, mitigate the influence of outliers, and stabilize variance. However, recent works show that log-transformations with added constants may render coefficient magnitudes sensitive to scale choices (Chen and Roth, 2024). To assess the robustness of our findings to alternative transformations, we

perform two sets of exercises. In the first set, we vary the constant term added to zero-valued observations. Increasing the constant reduces the relative contribution of the extensive margin (cells moving from zero to positive correspondence), thereby shifting weight toward variation in higher levels of correspondence. On the contrary, reducing the constant yields the opposite effect. In the second set of exercises, we replace the log transformation with the inverse hyperbolic sine (IHS) transformation of N_{it}, using alternative scaling parameters. Appendix Figure B1 displays the results of all these exercises alongside our baseline specification. Reassuringly, the estimated coefficient on *Stage Dummy*$_{it}$ remains positive and statistically significant across all these checks.

Second, because relatively few grid cells hosted a postal stage (particularly in the earlier decades), one possible concern is that they may systematically differ from grid cells with no postal stages. We address this point in three ways. We start by restricting the sample to grid cells that record at least one letter. This procedure eliminates structurally inactive cells and narrows the analysis on locations participating in correspondence networks. Then, we apply entropy balancing (Hainmueller and Xu, 2013) to balance the mean and variance of key geographic covariates (distance to London, distance to medieval boroughs, and distance to historical routes). Finally, we progressively restrict the sample to grid cells in higher quintiles of the entropy weight distribution, thereby focusing on increasingly comparable subsets of observations. Across all exercises, the results are quantitatively similar (see Appendix Figure B2).

Third, given London's central role in both the postal system and national correspondence networks, one may worry that our results may be entirely driven by activity in London. Therefore, we replicate our analysis (i) excluding the cell hosting the General Post Office, and (ii) computing our dependent variable excluding all letters sent to or received from London. In both cases, The estimated effect of a postal stage is virtually unchanged (Columns 1–2 of Appendix Table B1).

Fourth, to rule out the threat that our results are driven by a small number of very prolific correspondents, we replicate our preferred specification after excluding the top-15 correspondents in the dataset. The estimated coefficient remains positive and statistically significant, although smaller in magnitude (Column 3 of Appendix Table B1).

Lastly, while Oxford and Cambridge were not initially connected to the royal postal network, they were nonetheless integrated into correspondence networks through private messengers (Sigee, 2012). To account for this, we reclassify the grid cells containing Oxford and Cambridge as hosting a postal stage in all decades. The estimated effects are slightly lower in magnitude (Column 4 of Appendix Table B1).

Taken together, the evidence presented so far supports the hypothesis that the presence of postal stages facilitated epistolary exchanges. To go beyond this association and provide a causal interpretation, we exploit plausibly exogenous variation in access to the postal network triggered by the 1635 reform. The results of this analysis are discussed next.

4.3 Difference-in-Differences Results

To estimate the causal effect of the 1635 postal reform on correspondence intensity, we use the difference-in-differences strategy described in Equation (2). Table 2 presents the OLS results. We focus on the coefficient of the interaction between the pre-reform postal stage indicator (*Stage Dummy 1620*$_i$)

and the post-reform dummy (*Post-1635$_t$*). As before, the outcome variable is the log number of incoming and outgoing letters in each grid cell-decade (plus one). We begin with a specification including only grid cell and decade fixed effects (Column 1) and then we progressively add controls, following the same sequence as in Table 1. Across all specifications, our coefficient of interest remains positive and significant at conventional levels. In our preferred specification (Column 5), the coefficient estimate implies that the opening of the postal system in 1635 increased correspondence intensity by approximately 19.8 percent in locations that hosted a postal stage before that year, relative to locations that were not connected to the postal network. Given a pre-reform mean of 0.031 letters per grid cell and decade across the whole sample, this effect corresponds to an increase of approximately 0.2 letters per grid cell-decade in treated locations.[23]

We interpret this estimate as a lower bound of the true effect of the reform. By construction, the control group includes locations that did not host any postal stage prior to 1635, but may have acquired one following the opening of the postal system. To the extent that the establishment of new postal stages after the reform increased correspondence activity in these locations, this contamination of the control group biases the estimated treatment effect toward zero.

Table 2: Effect of 1635 Postal Reform on Intensity of Correspondence – DID Evidence

Dependent Variable	Log All Letters				
	(1)	(2)	(3)	(4)	(5)
Stage Dummy 1620 × Post-1635	0.246	0.225	0.207	0.202	0.181
	(0.064)***	(0.065)***	(0.064)***	(0.063)***	(0.066)***
	[0.032]***	[0.033]***	[0.033]***	[0.033]***	[0.034]***
Decade FE	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE		✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE			✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE				✓	✓
Stage Dummy 1620 × Civil War Dummy					✓
N. Clusters	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.415	0.420	0.421	0.423	0.423
Pre-1630 Mean of DV	0.031	0.031	0.031	0.031	0.031

Notes: OLS estimates. Observations are grid cells observed in each decade from 1570 to 1769. In each specification the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one). The interaction variable *Stage Dummy 1620 × Post-1635* equals one in all grid cells containing at least one postal stage in the decade 1620 for all decades from 1630 onwards, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<10\%$, ** = p-value $<5\%$, *** = p-value $<1\%$.

Robustness. To assess the robustness of our result on the effect of the 1635 reform, we first replicate the same set of sensitivity analyses performed above. In particular, we: (i) use alternative definitions of the

[23] Since the pre-treatment average of $ln(1+N_{it})$ equals 0.031, the baseline mean of $1+N_{it}$ is approximately 1.0315. Given that the treatment increases $1+N_{it}$ by about $(\exp(0.181)-1) \approx 19.8\%$ relative to the counterfactual trend (using the coefficient from Column 5 in Table 2), the absolute increase of N_{it} relative to the baseline mean is equal to $0.198 \times 1.0315 \approx 0.204$.

dependent variable (see Appendix Figure B3); (ii) replicate estimates using entropy weights and focusing on different subsamples to increase comparability of observations in the treatment and control groups (see Appendix Figure B4); (iii) check that our results are not driven by correspondence activity in London and involving the 15 most active correspondents (Columns 1–3 of Appendix Table B2); (iv) recode Oxford and Cambridge as connected to the postal network before 1635 (Column 4 of Appendix Table B2); and (v) consider all grid cells within ten miles from the 1628 postal network as treated units (Column 5 of Appendix Table B2). The results of our difference-in-differences analysis hold across all these robustness exercises.

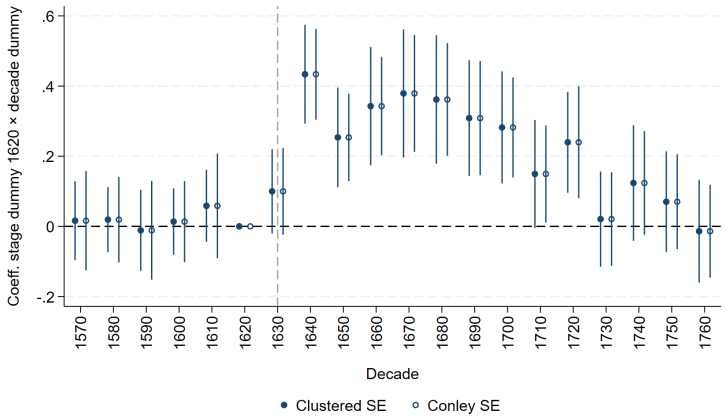
In addition, we find that: (i) changing the variable *Post-1635*$_t$ variable backward by one decade delivers comparable results (see Appendix Table B3); (ii) all results stand if we expand the treatment group by considering all postal stages prior to the reform (i.e., all the locations hosting a postal stage according to all the postal maps predating 1635) instead of only those active on the eve of the reform (see Appendix Table B4); and (iii) our findings are consistent if we instrument the 1628 postal network with a predicted network to further address a potential endogeneity in the location of postal stages prior to the reform.[24]

4.4 Tracking Dynamic Impacts: Event Study

To shed light on the dynamic effect of the opening of the postal system to the public over time, we perform an event study analysis. Specifically, we use a more flexible estimating equation that employs the interaction between the treatment variable (*Stage Dummy 1620*$_i$) and each decade dummy, using 1620 as baseline period. Figure 3 presents the OLS results of this exercise, based on Equation (3). We observe a remarkable increase in the intensity of epistolary exchanges right after 1635, with all the coefficients up to 1720 being positive and statistically significant and reaching a peak during the decade 1640. The estimated difference across treated and untreated locations then gradually decreases over time, for two plausible reasons: the gradual establishment of new postal stages in places that belong to the control group (mechanically producing an attenuation bias in our estimates), and the birth of alternative communication forms, such as scientific journals (i.e., *Philosophical Transactions*). Reassuringly, there were no differential trends in correspondence intensity before 1635, when the postal system was not available for public use.

[24]For more details on how we constructed the predicted network, we refer the interested reader to Data Appendix A.1. The related results are reported in Section B.3 in the appendix.

Figure 3: Time-varying Effect of 1635 Postal Reform on Intensity of Correspondence – Event Study



Notes: Each dot represents the OLS-estimated coefficient of the interaction *Stage Dummy 1620*$_i$ $\times$ decade fixed effect from Equation (3), using the specification in Table 2, Column 5. The dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one). The omitted interaction term is *Stage Dummy 1620*$_i$ $\times$ decade 1620 fixed effect. 90% confidence intervals based on standard errors clustered by grid cell (filled marker) or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space, empty marker) are reported. The dashed vertical line indicates the decade of the postal reform.

Taken together, the findings provide robust evidence on the sizable impact of the opening of the postal system on the intensity of epistolary communications in the affected locations of England and Wales.

5 Interactions between Scholars and Professionals

As discussed in Section 2, Mokyr (2005, 2016) argue that the exchange of knowledge across knowers and doers was central to the production of knowledge with practical applications. In this Section, we specifically investigate whether the post-reform increase in correspondence reflects greater personal exchanges between the knowers—scholars engaged in advancing the theoretical understanding of a particular subject, disseminating results, and educating society—and the doers—professionals, as define below in more details. To this end, we systematize information on the correspondents' occupations. We first describe the data and then discuss the results of the related empirical analysis.

5.1 Classification of Correspondents' Occupations

We classify letters according to the occupations of their senders and recipients, using biographical information from EMLO and EE. We group correspondents in five macro-categories: (i) *scholars* (e.g., natural scientists, humanists, academics); (ii) *practitioners*, encompassing occupations that apply theoretical knowledge to practical problems, including medicine and law (e.g., physicians, lawyers), business (e.g., managers), and technical fields (e.g., engineers, craftsmen); (iii) *statesmen* (e.g., members of Parliament, public administrators, diplomats, judges, military officers); (iv) *information industry* (e.g., editors, publishers, booksellers, translators); and (v) *clergy* (e.g., churchmen, Jesuits, missionaries). This classification is not mutually exclusive, as an individual may belong to more than one category. For example,

Francis Bacon is classified as both a scholar and a statesman, as reflected from his recorded biography "lord chancellor and politician; philosopher; first baron verulam of verulam; viscount st alban". Individuals who cannot be assigned to any of the five categories are placed in a residual category labeled *other*.[25]

Moreover, to operationalize Mokyr's distinction between "knowers" and "doers", we group practitioners, statesmen, and the information industry into a broader *professionals* category representing the "doers", while we associate the scholars with the "knowers." The classification procedure differs across sources. Biographies in EE consist of structured lists of single-word occupational descriptors (e.g., "merchant," "poet," "publisher"). We first compile the full list of distinct keywords appearing in EE biographies and group them into 15 occupation-specific subcategories (e.g., "management," "state bureaucracy," "manufacturing").[26] Each correspondent is assigned to one or more subcategories based on the keywords listed in his or her biography. These subcategories are then aggregated into the five macro-categories described previously, plus the residual *other* category.

For EMLO correspondents, whose biographies are written in narrative form, we segment each biography into short text fragments and extract multi-word phrases capturing occupational information. These phrases are then submitted to the generative AI model Google Gemini for a preliminary classification, which we subsequently review manually to ensure accuracy. For each correspondent in both catalogues, we then construct a set of macro-category-specific indicator variables. The dummy corresponding to macro-category s equals one if at least one extracted phrase in EMLO or the single-word occupational descriptor in EE is associated with category s, and zero otherwise. For the 691 correspondents appearing in both EMLO and EE, we cross-check classifications to ensure consistency.[27]

The dataset contains 9,765 distinct correspondents, of whom 8,205 are drawn from EMLO and 1,560 from EE.[28] Next, for each letter, we construct a vector of dummy variables $d_{s_1 s_2}$ where s_1 and s_2 denote the occupational macro-categories of the sender and the recipient, respectively.[29] Appendix Table A2 reports the distribution of correspondents across macro-categories, overall and by source, as well as the share of letters involving at least a correspondent in a given macro-category. Approximately 39.6% of correspondents fall into the residual *other* category, with EMLO correspondents somewhat less likely to be classified into one of the five main categories than EE correspondents. Moreover, roughly three-quarters of all letters involve at least one scholar.

Occupation-pair indicators are aggregated at the grid cell-decade level following the same procedure used to aggregate letters. After assigning each letter to a given grid cell-decade, we compute, for each cell-decade, the natural logarithm of one plus the total number of letters exchanged between each unordered

[25] For example, the "natural philosopher and mathematician" Isaac Newton (classified as a scholar) used to correspond with John Newton, whose biography reads: "distant relative of Isaac Newton; third baronet; had a house in Soho Square, London; of Barrs Court, Gloucestershire, and later of Thorpe, Lincolnshire". Since no clear occupation appears in this biography, we classify John Newton in the *other* category.

[26] Data Appendix A.2.1 reports the full list of keywords and their corresponding subcategories.

[27] We identify duplicate correspondents by matching first name, surname, year of birth, year of death, and honorific titles (e.g., "Sir," "Lord," "Reverend"), when available.

[28] Appendix Table A1 lists the 30 most active correspondents in our dataset and their occupational classification.

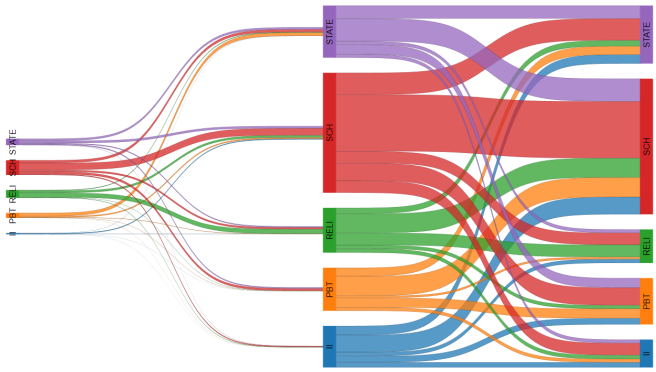
[29] These indicators allow us to distinguish among three types of letter flows: (i) letters involving at least one correspondent belonging to macro-category s (i.e., $s_1 = s$ or $s_2 = s$) ; (ii) letters exchanged between correspondents belonging to the same macro-category (i.e., $s_1 = s_2$), and (iii) letters exchanged between correspondents belonging to different macro-categories (i.e., $s_1 \neq s_2$).

occupation pair. That is, letters sent from occupation s_1 to s_2 and letters sent from occupation s_2 to s_1 are combined into a single measure of interaction between occupations s_1 and s_2. These variables provide occupation-specific measures of local cross-occupational epistolary interactions.[30]

5.2 Descriptive Evidence

Figure 4 illustrates the evolution of average letter flows by occupational macro-category of correspondents in the decades before and after the 1635 reform, highlighting the average increase in epistolary exchanges in the post-period. To further explore the cross-occupational flows before and after the reform, Figure 5 below separately zooms over the two periods.

Figure 4: Average Decadal Number of Letters by Occupation of Correspondents 1570-1769



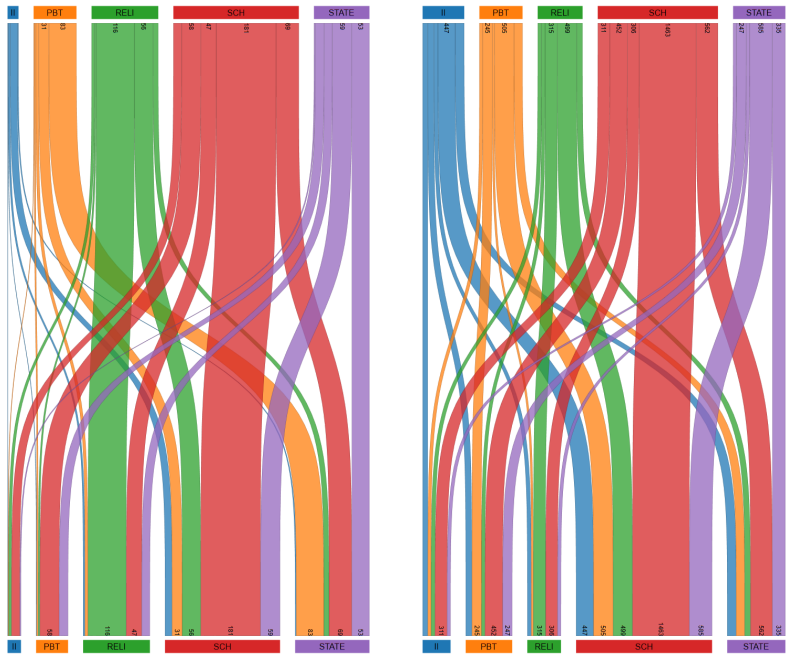
Notes: Average number of letters by occupational macro-category of correspondents per decade, before the 1635 postal reform (left), after the reform (right). The width of bands in each panel indicates the average size of letter flows. The macro-categories of letter senders are reported on the left vertical axis, while those of letter recipients are reported on the right vertical axis. SCH stands for scholars, PBT defines practitioners, STATE represents statesmen, II stand for information industry, and RELI represents clergymen. Figure made with Stata command `sankey`, version 1.81 (Naqvi, 2022).

Panel (a) of Figure 5 shows that before the 1635 reform, epistolary communications in England and Wales were concentrated among three groups: scholars, members of the clergy, and statesmen. In addition, the most active correspondents—scholars and clergy—primarily interacted with their own occupational group, suggesting limited cross-occupational interaction.

Different patterns appear when focusing on the decades after the reform in Panel (b). First, scholars strengthened their central role within the postal network, not only by exchanging a substantially larger number of letters than before (as displayed in 4), but also by interacting with a more diverse set of correspondents. In fact, they became the main recipients of letters from all other occupational categories, and particularly so for practitioners, statesmen, and the information industry. This preliminary evidence supports the view that the 1635 reform acted as a catalyst for a radical transformation in the composition of epistolary exchanges.

[30] When a correspondent holds multiple occupational classifications, the corresponding letter is included in all occupation-pair counts associated with those classifications.

Figure 5: Average Decadal No. of Letters by Occupation of Correspondents Before and After the Reform



(a) Letters in decades 1570-1620 (b) Letters in decades 1630-1760

Notes: Average number of letters by occupational macro-category of correspondents, before the 1635 postal reform (Panel a) and after (Panel b). The width of bands in each panel indicates the average size of letter flows. The macro-categories of letter senders are reported on the top horizontal axis, while those of letter recipients are reported on the bottom horizontal axis. SCH stands for scholars, PBT defines practitioners, STATE represents statesmen, II stand for information industry, and RELI represents clergymen. Figure made with Stata command `sankey`, version 1.81 (Naqvi, 2022).

5.3 Correlational and Difference-in-Differences Results

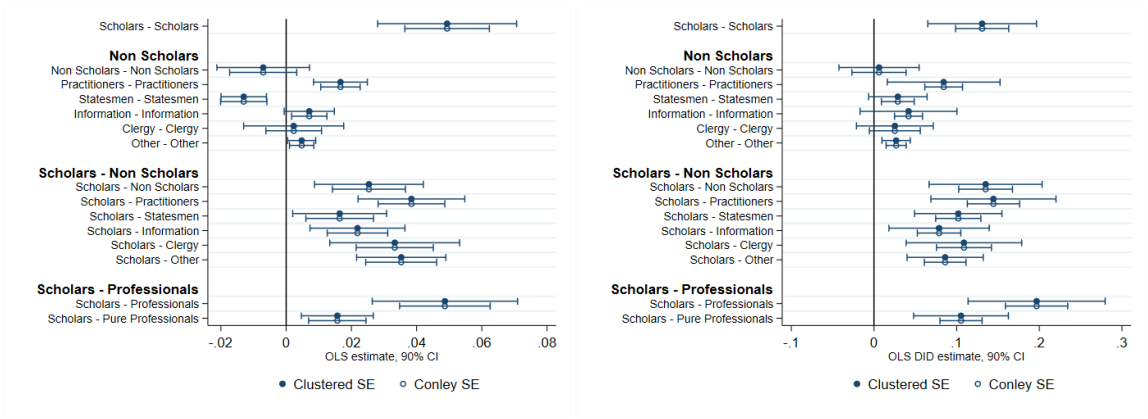
We now investigate the effect of postal connectivity across distinct groups of correspondents. Figure 6 reports the results. Panel (a) reports OLS estimates of Equation (1), whereas Panel (b) presents difference-in-difference estimates based on Equation (2).[31] In both panels, each coefficient is estimated based on our preferred specification in a separate regression. The dependent variable is the log number of incoming and outgoing letters between the unordered occupation-pairs described above and reported on the y-axis. Across panels, two main results emerge.

First, comparing epistolary interactions involving scholars with those exclusively among non-scholars suggests that the postal system benefited scholars the most, both in terms of its availability and the liberalized access to it. Second, focusing on correspondence involving scholars, we find the largest effects for communications between scholars, as well as for communications between scholars and professionals. This last result is consistent with the descriptive evidence presented in Figure 5 and highlights the post-reform intensification of interactions between what Mokyr (2002) calls the knowers and the doers. These findings are generally robust to alternative transformations of the dependent variable (Table B8) and the exclusion of letters associated with the 15 most prolific correspondents in our dataset (Table B9). Moreover, we find similar results when instrumenting the postal network of the decade 1620 with distance to the least cost path

[31] The full set of estimates are also available in Appendix Tables B6 and B7, respectively.

network (Table B10).

Figure 6: Presence of Postal Stage and Effects of the 1635 Reform on Intensity of Correspondence by Occupation of Correspondents – Correlational and DID Evidence



(a) Presence of a postal stage

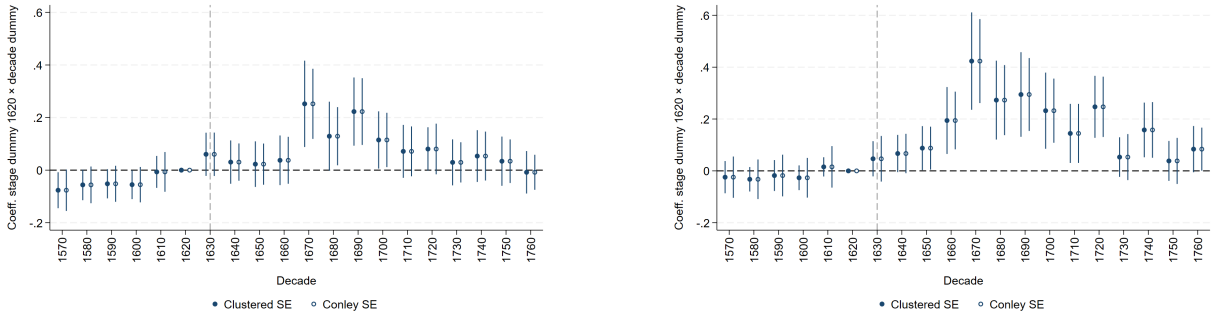
(b) Effect of the 1635 reform

Notes: Panel (a) shows the OLS-estimated coefficient of the indicator variable *Stage Dummy* from Equation (1), using the specification in Table 1, Column 5. Panel (b) shows instead the OLS-estimated coefficient of the interaction *Stage Dummy 1620* $\times$ *Post-1635* from Equation (2), using the specification in Table 2, Column 5. In both equations the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one). The labels on the y-axis indicate the specific subset of letters being considered to define the dependent variable, according to their senders and recipients. The term PSI indicates a single group of people including practitioners, statesmen, and people employed in the information industry. 90% confidence intervals based on standard errors clustered by grid cell (filled marker) or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space, empty marker) are reported.

5.4 Event Study

To examine whether locations with a pre-existing postal stage had experienced a higher exchange of letters between specific correspondent categories before the 1635 reform, we turn to the event-study framework outlined in Equation (3). Figure 7 plots the dynamic treatment effect of the postal reform on the intensity of letter flows involving only scholars (Panel a) and scholars and the PSI group defined above (Panel b). We do not find significant differences in pre-trends of correspondence intensity across places with and without pre-existing postal stages, regardless of the specific type of interlocutor with whom scholars interacted. More interestingly, we document a positive impact of the open access to the postal system for treated locations that materializes already during the reform decade, although the estimates fall short of statistical significance in the case of both letter flows. Concerning the epistolary communications between scholars and the PSI group (Panel b), the reform effect steadily grows until the 1670s before starting to decrease, and it still remains positive and significant until the decade 1740. A similar decreasing trend from the 1670s onwards can be observed also for the specific correspondence between scholars (Panel a), with the reform effect vanishing by the decade 1710.

Figure 7: Time-varying Effect of 1635 Postal Reform on Intensity of Correspondence between knowers and between knowers and doers – Event Study



(a) Scholar → scholar

(b) Scholar ↔ professionals

Notes: Each dot in a given subfigure represents the OLS-estimated coefficient of the interaction *Stage Dummy 1620*$_i$ × decade fixed effect from Equation (3), using the specification in Table 2, Column 5. The dependent variable, constructed using letters from and to different categories of correspondents, is the log number of number of letters sent from and received in each grid cell in a given decade (plus one). The omitted interaction term is *Stage Dummy 1620*$_i$ × decade 1620 fixed effect. 90% confidence intervals based on standard errors clustered by grid cell (filled marker) or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space, empty marker) are reported. The dashed vertical line indicates the decade of the postal reform.

To conclude, the overall findings in this section further suggest that the opening of the postal system to the public helped promote the exchange of ideas and knowledge across England (and Europe as well, since letters were exchanged also internationally), thus encouraging to experiment with new projects and technologies, and to share findings with others.

6 Content of Epistolary Communications and Diffusion of Useful Knowledge

In this Section we study whether the postal system favored exchanges regarding topics that were central for the creation and diffusion of useful knowledge—cooperation aimed at applying the scientific knowledge obtained with the experimental method (e.g. to apply the principles of thermo-dynamics to build working vacuum pumps), the recording and diffusion of information on the "facts that works" (e.g., catalogues of plants more suitable for agriculture and drugs, but also practices to improve business, or organize armies), and education of future generations to these principles (Mokyr, 2010). To do this, we analyze the text of the letters in our dataset and present estimates of the effects of the 1635 reform on the macro-topics discussed, on average and across occupational groups, particularly focusing on exchanges between knowers and doers.

6.1 Content of Epistolary Communications

For 31,090 letters in our dataset, we are able to retrieve either an abstract or the full text. In particular, all letters in EE include either an abstract or the full text, while EMLO reports abstracts for 18,462 letters. For an additional 2,514 EMLO letters without textual information, we complement the dataset using the

Hartlib Papers project, a digital archive of correspondence involving Samuel Hartlib curated by the Digital Humanities Institute at the University of Sheffield.[32]

We preprocessed and standardize the textual data following common practices in the text-analysis literature. Letters are written in multiple languages (English, Latin, Italian, French, German, Dutch, and Spanish); we translate all text into English using Google Translate to ensure comparability across observations.[33]

To characterize the content of the correspondence, we implement a Latent Dirichlet Allocation (LDA) model (Blei et al., 2003). The algorithm identifies 25 latent topics based on word co-occurrence patterns. For each letter, the model returns the parameter γ_j, representing the share of topic j in the document.[34]

To reduce dimensionality and facilitate interpretation, we aggregate the 25 topics into five broader macro-topics: (i) *Ordinary Life* (e.g., family issues, health, finances); (ii) *Knowledge* (e.g., research, systematization of knowledge, publishing, mentoring); (iii) *Politics* (e.g., royal/court affairs, management of colonies, wars); (iv) *Religion* (e.g., theological debates, confessional disputes); and (v) *Academic Gossip*. To guide this aggregation, we examine the 30 letters with the highest γ_j for each topic and use a Large Language Model (ChatGPT 5.1) to generate summaries of their content and assess their relevance to the five macro-topics. Appendix Figures A4, A5, A6, A7, A8 report the wordclouds and short descriptions associated with each topic within the five macro-topics.

For the empirical analysis, for each letter we construct five macro-topic scores equal to the sum of γ_j across topics belonging to the same macro-topic.[35] Each letter is then assigned to the macro-topic with the highest aggregate score. We subsequently aggregate these classifications at the grid cell-decade level. Specifically, for each grid cell-decade, we compute the natural logarithm of one plus the total number of letters assigned to each macro-topic. We also construct occupation-pair-specific counts of letters by macro-topic, based on the occupational classifications of senders and recipients explained above.

6.2 Descriptive Evidence

For each macro-topic and decade, Figure 8 reports the log number of incoming and outgoing letters per active grid cell. The gray vertical line indicates the decade of the postal reform, while the shaded gray area highlights the decades of the English Civil War. Four main patterns emerge. First, correspondence related to ordinary life matters increases steadily over time. Second, knowledge-related correspondence sharply increases in the 1630s (when the reform was enacted) and remains stable in size afterwards, with only a temporary decrease when the Civil War was at its height. The knowledge macro-topic in the post-period particularly discusses how to catalog knowledge in a systematic way, the importance of advancing practical knowledge, the need to enhance the human understanding of nature through independent thought and using experimental methods, and the importance of discussing, publishing, and disseminating scientific advances

[32] Link: `https://www.dhi.ac.uk/hartlib/`.

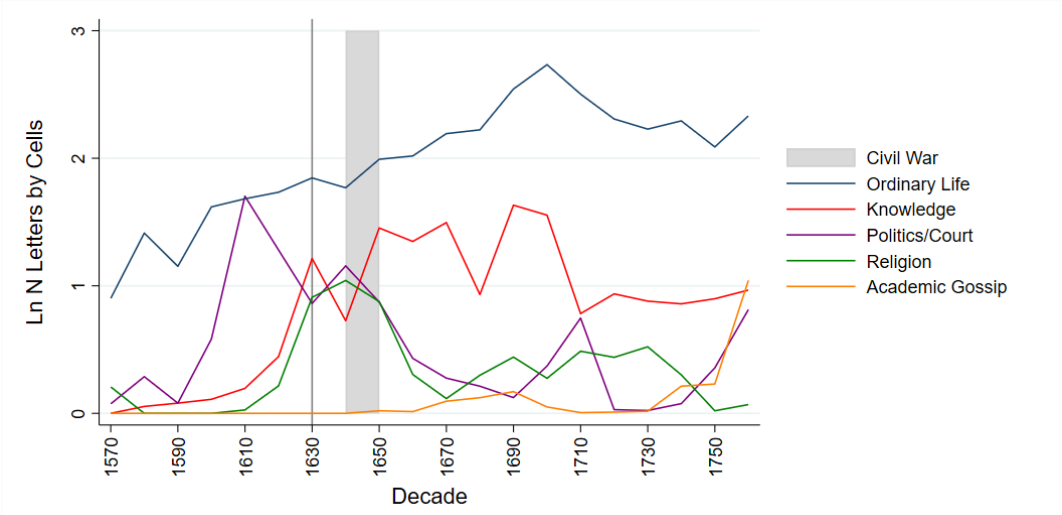
[33] Appendix A.2.3 provides details on translation and text cleaning procedures.

[34] Appendix Figure A3 reports the top ten words associated with each topic.

[35] Because we are particularly interested in interactions involving useful knowledge, our sum of γ_j for the macro-topic *Knowledge* discards Topic 6 since it focuses on literature and arts. However, results (available upon request) are robust and even stronger in magnitude if we include Topic 6 in the *Knowledge* macro-topic.

also through a universal system of knowledge sharing. Third, the remaining macro-topics tend to present spikes associated with relevant historical events. Political correspondence peaks around the death of the Queen in 1603, the Civil War of the 1640s and 1650s, and major conflicts in the eighteenth century. Similarly, religion-related correspondence spikes during the decades surrounding the Civil War, consistent with the confessional disputes of this period. Finally, academic gossip reaches its maximum in the decade marked by the personal dispute between Rousseau and Hume. We next proceed with a formal empirical analysis of the effects of postal connectivity on the letters' content.

Figure 8: Correspondence Intensity by Macro-Topic



Notes: Each line represent the evolution of the log number of incoming and outgoing letters per active grid cell in each decade from 1570 to 1760 for the following 5 macro-topics: ordinary life (blue), knowledge (red), politics/court (purple), Religion (green), and academic gossip (orange). The gray vertical line indicates the decade of the postal reform whereas the gray shaded area highlights the decades of the English Civil War.

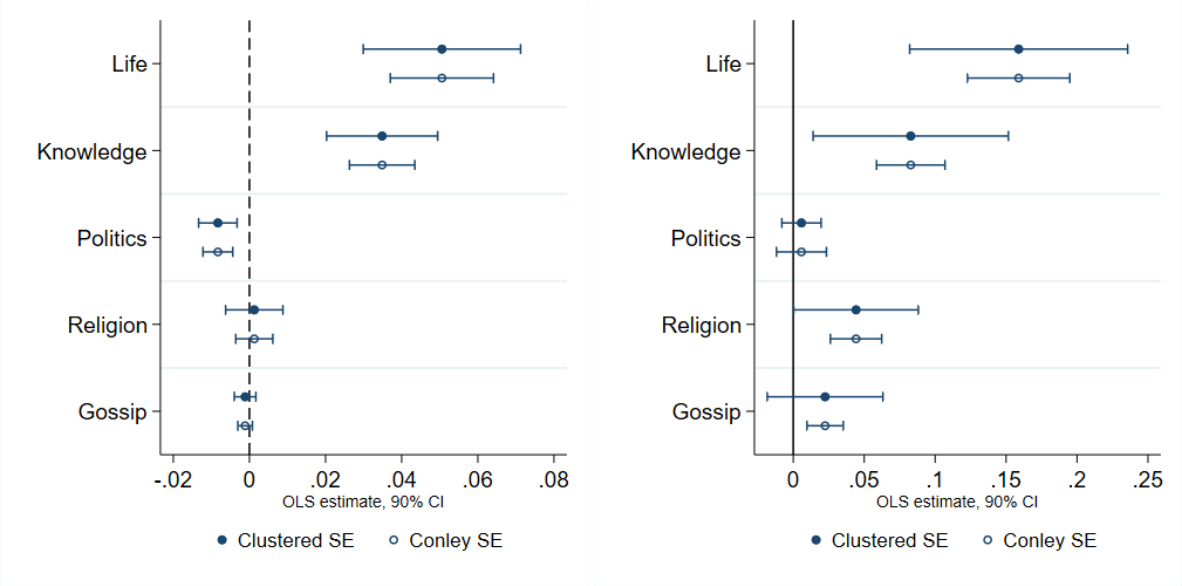
6.3 Impact on Topics

Figure 9 presents the OLS-estimated effects of postal connectivity on the content of correspondence. Panel (a) reports estimates based on Equation (1), focusing on the presence of a postal stage. Panel (b) shows the difference-in-differences estimates from Equation (2), capturing the impact of the 1635 reform. In both panels, we display coefficients from our preferred specification including the full set of control variables. The dependent variable is the log number of incoming and outgoing letters in each grid cell-decade (plus one) assigned to macro-topic m (reported on the y-axis).

Four patterns stand out from Figure 9. First, the results are consistent across empirical strategies. To ease the discussion below, we focus on the difference-in-differences result in Panel (b). Second, consistent with a general expansion in epistolary communications (our first result in Section 4), ordinary life correspondence displays the largest increase following the 1635 reform. Third, knowledge-related exchanges experience the stronger response among the remaining macro-topics. The estimated coefficient implies an increase of approximately 9 percent in knowledge-related correspondence in locations that hosted a postal stage prior

to 1635, relative to locations not connected to the network.[36] Fourth, we find no economically meaningful effects for the remaining macro-topics.

Figure 9: Presence of Postal Stage and Effect of the 1635 Reform on Intensity of Correspondence by Macro-topic – Correlational and DID Evidence



(a) Presence of a postal stage

(b) Effect of the 1635 reform

Notes: Panel (a) shows the OLS-estimated coefficient of the indicator variable *Stage Dummy* from Equation (1), using the specification in Table 1, Column 5. Panel (b) shows instead the OLS-estimated coefficient of the interaction *Stage Dummy 1620* $\times$ *Post-1635* from Equation (2), using the specification in Table 2, Column 5. In both equations the dependent variable is the log number of letters assigned to a given macro-topic, sent from and received in each grid cell in a given decade (plus one). The labels on the y-axis indicate the specific macro-topics being considered to define the dependent variable. 90% confidence intervals are reported based on standard errors clustered by grid cell (filled marker) or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space, empty marker).

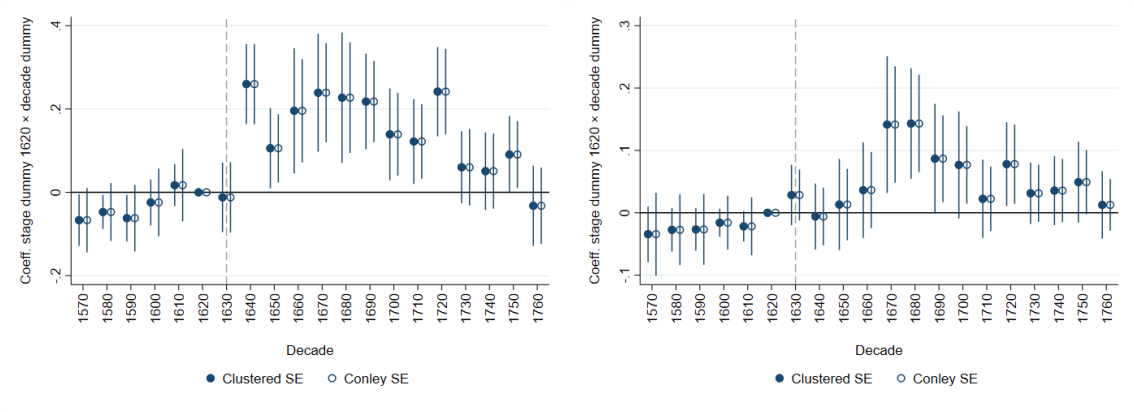
Figure 10 reports event-study estimates from Equation (3), examining the dynamic effects of the reform across macro-topics. Correspondence related to ordinary life matters increases beginning in the 1640s (Panel a). In contrast, knowledge-oriented correspondence displays a more gradual response, with statistically significant increases emerging in the 1670s (Panel b). Two mechanisms may account for this delay. First, the 1640s and 1650s were marked by the English Civil War, during which political and religious tensions intensified. Therefore, it is plausible that correspondence during this period was disproportionately directed to conflict-related matters. Consistent with this interpretation, political and religious correspondence peaks in the decades surrounding the conflict (see Appendix Figure B5).[37] Second, sustained exchanges of useful knowledge may require pre-existing or gradually formed interpersonal connections across domains. Unlike ordinary life correspondence, which often relies on established social ties (i.e., family relationships), cross-occupational knowledge exchange may take time to develop. The

[36] Appendix Table B12 reports the full set of estimates underlying Panel (b).

[37] In fact, as discussed above, a distinct topic capturing confessional disputes appears within the religion macro-topic.

delayed increase in knowledge-related correspondence is consistent with a gradual formation of such inter-domain connections following the reform. We focus on bilateral occupational flows in the next section.

Figure 10: Event Study: Dynamic Effect of 1635 Postal Reform on Intensity of Correspondence by Macro-topic



(a) Ordinary Life

(b) Knowledge

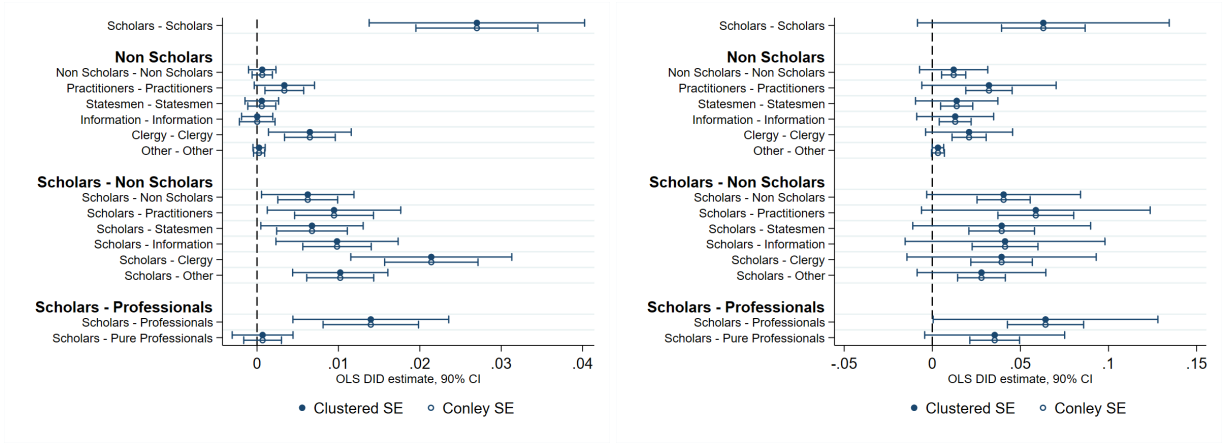
Notes: Each dot in a given subfigure represents the OLS-estimated coefficient of the interaction *Stage Dummy 1620* $\times$ decade fixed effect from Equation (3), using the specification in Table 2, Column 5. The dependent variable is the log number of letters assigned to a given macro-topic, sent from and received in each grid cell in a given decade (plus one). The omitted interaction term is *Stage Dummy 1620* $\times$ decade 1620 fixed effect. 90% confidence intervals based on standard errors clustered by grid cell or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space) are reported. The dashed vertical line indicates the decade of the postal reform.

6.4 Intensity of Knowledge-related Communications between knowers and doers

We now examine whether knowledge-oriented exchanges particularly involved the occupational categories central to the production and dissemination of useful knowledge—scholars, practitioners, statesmen, and the information industry. Figure 11 displays the estimated effects of postal connectivity on the intensity of correspondence between occupational groups. Mimicking the structure of Figure 6 and 9, Panel (a) presents estimates focusing on the presence of a postal stage (Equation 1), while Panel (b) reports the difference-in-differences estimates of the effect of the 1635 reform (Equation 2), using our preferred specifications. The dependent variable is the log number of incoming and outgoing knowledge-related letters in each grid cell-decade (plus one) by the unordered occupation pairs reported on the y-axis.

Focusing on Panel (b) of Figure 11, the estimated effect for knowledge-related exchanges involving scholars and professionals is positive, statistically significant, and statistically indistinguishable from the effect for scholar–scholar correspondence. By contrast, the intensity of knowledge-related correspondence increases less when we consider exchanges between individuals of the same non-scholar categories (e.g., non-scholars to non-scholars, or statesmen to statesmen).

Figure 11: Presence of Postal Stage and Effect of the 1635 Reform on Knowledge-Related Correspondence by Occupation of Correspondents



(a) Presence of a postal stage

(b) Effect of the 1635 reform

Notes: Panel (a) shows the OLS-estimated coefficient of the indicator variable *Stage Dummy* from Equation (1), using the specification in Table 1, Column 5. Panel (b) shows the OLS-estimated coefficient of the interaction *Stage Dummy 1620* $\times$ *Post-1635* from Equation (2), using the specification in Table 2, Column 5. In both equations the dependent variable is the log number of letters assigned to the topic *Knowledge*, sent from and received in each grid cell in a given decade (plus one). The labels on the y-axis indicate the specific subset of letters being considered to define the dependent variable, according to their senders and recipients. 90% confidence intervals based on standard errors clustered by grid cell or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space) are reported.

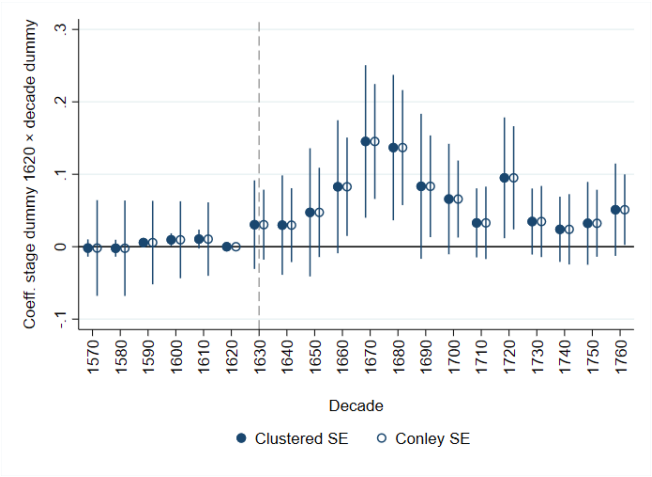
To further study the dynamic patterns underlying higher knowledge-related interactions between scholars and professionals, Figure 12 presents event-study estimates. Besides displaying no pre-trends prior to the reform, starting from the 1630s the figure shows a gradual increase in the intensity of knowledge-related interactions among scholars and professionals, which becomes statistically significant from the 1660s.[38]

In addition, in line with the importance of establishing personal connections in order to engage in a sustained correspondence, Figure 13 reports a gradual increase in correspondence related to ordinary life matters between scholars and professionals.

Consistent with the historical narratives put forward by Merton (1938) and Mokyr (2002, 2016), the evidence assembled in this Section supports the hypothesis that allowing private access to the postal network disproportionately increased exchanges among the knowers—the scholars in our dataset—and the doers—the professionals in our dataset—towards discussions regarding the creation and diffusion of useful knowledge, particularly in locations hosting a postal stage prior to the 1635 reform. In the following Section we turn to the investigation of the effects of postal connectivity for innovation activity.

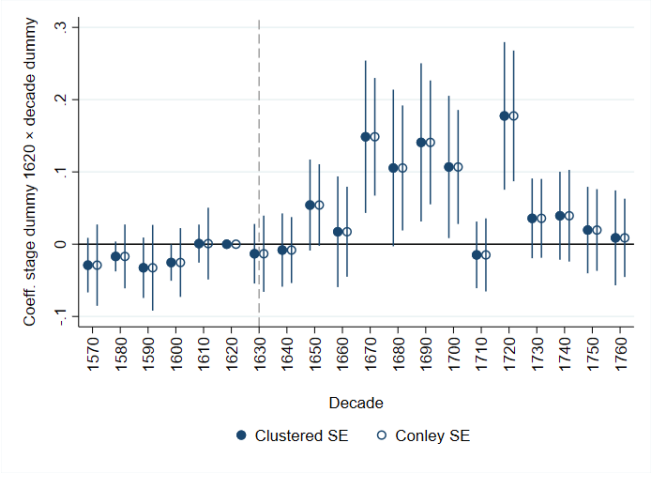
[38]For completeness, Figure B6 reports the same event study focusing on scholar-scholar interactions.

Figure 12: Event Study: Dynamic Effect of 1635 Postal Reform on Intensity of Knowledge-related Correspondence between Scholars and Professionals



Notes: Each dot in a given subfigure represents the OLS-estimated coefficient of the interaction *Stage Dummy 1620* × decade fixed effect from Equation (3), using the specification in Table 2, Column 5, where the dependent variable is constructed using letters from and to different categories of correspondents. The dependent variable is the log number of incoming and outgoing letters assigned to the topic *Knowledge* in each grid cell-decade (plus one). The omitted interaction term is *Stage Dummy 1620* × decade 1620 fixed effect. 90% confidence intervals based on standard errors clustered by grid cell or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space) are reported. The dashed vertical line indicates the decade of the postal reform.

Figure 13: Event Study: Dynamic Effect of 1635 Postal Reform on Intensity of Ordinary-life-related Correspondence between Scholars and Professionals



Notes: Each dot in a given subfigure represents the OLS-estimated coefficient of the interaction *Stage Dummy 1620* × decade fixed effect from Equation (3), using the specification in Table 2, Column 5, where the dependent variable is constructed using letters from and to different categories of correspondents. The dependent variable is the log number of incoming and outgoing letters assigned to the topic *Ordinary Life* in each grid cell-decade (plus one). The omitted interaction term is *Stage Dummy 1620* × decade 1620 fixed effect. 90% confidence intervals based on standard errors clustered by grid cell or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space) are reported. The dashed vertical line indicates the decade of the postal reform.

7 Innovation Activity and Long-Term Outcomes

In this Section, we examine whether postal connectivity, in addition to increasing personal exchanges and boosting knowledge-oriented interactions, had also a tangible impact on innovation activity 1570-1769 and long-term socio-economic outcomes measured in the first half of the nineteenth century.

7.1 Data on Innovation Activity and Long-Term Socio-Economic Outcomes

To study innovation activity over time and space between 1570 and 1769, we construct a georeferenced dataset of innovators active in England and Wales during our period of interest. The primary source is the *Oxford Dictionary of National Biography* (henceforth ODNB), the most comprehensive biographical compendium of individuals who have shaped British history. To build this dataset we proceed in four steps.

First, we perform a full-text search of all biographies of individuals born between 1520 and 1799 using the keywords "create", "construct", invent", "innov", "improv", "patent", and "devise". These terms serve as markers of narratives potentially describing innovative activity. This initial screening yields 6,441 biographies. Second, for each selected biography, we extract short text excerpts surrounding the keywords and manually review them to determine whether the individual can reasonably be classified as an innovator.[39] We distinguish between two categories: (i) *technical innovators*, defined as individuals engaged in innovative activities in science, technology, engineering, or mathematics; and (ii) *soft innovators*, defined as individuals contributing to innovations in the art and humanities. Third, for individuals in both categories, we collect information on key life events and activities, including dates and locations of birth and death, residence, education, temporary visits, inventions, collaborations, memberships in societies and associations, apprenticeships, publications, and honors (e.g., knighthood). Fourth, we geocode each recorded location and map it onto our grid at decadal frequency, thereby linking information on innovation activity to our dataset on letters and postal stages.[40]

The above procedure allows us to identify 363 technical innovators. Examples include Sir Thomas Aylesbury (1576–1657), who participated in trials of new machinery designed to improve coinage production through stamping rather than hammering, and Robert Boyle (1627–1691), one of the founders of modern chemistry, best known for formulating Boyle's Law, which describes the inverse relationship between pressure and volume in a gas at constant temperature within a closed system.

In addition, our methodology identifies 216 soft innovators. Examples include Sir Nathaniel Bacon (1585–1627), an English painter who experimented with varnishes and pigments and developed the yellow pigment known as 'Pinke', widely adopted by contemporaries such as Peter Oliver and John Hoskins; and Richard Bentley (1662–1742), a classical scholar, critic, philologist, and theologian, credited with laying the foundations of the English school of Hellenism.

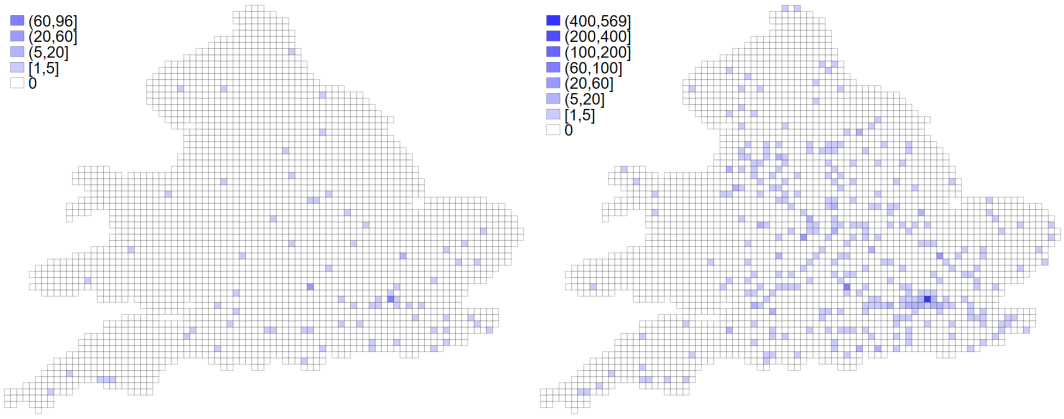
Leveraging the above information on innovators, we construct the following outcomes of interest at the grid cell-decade level: (i) the log number of innovators (not considering if they were born in that grid cell-decade); (ii) the log number of events involving innovators (not considering their birth in that grid

[39] Excerpts consist of the 40 characters preceding and following each keyword occurrence.

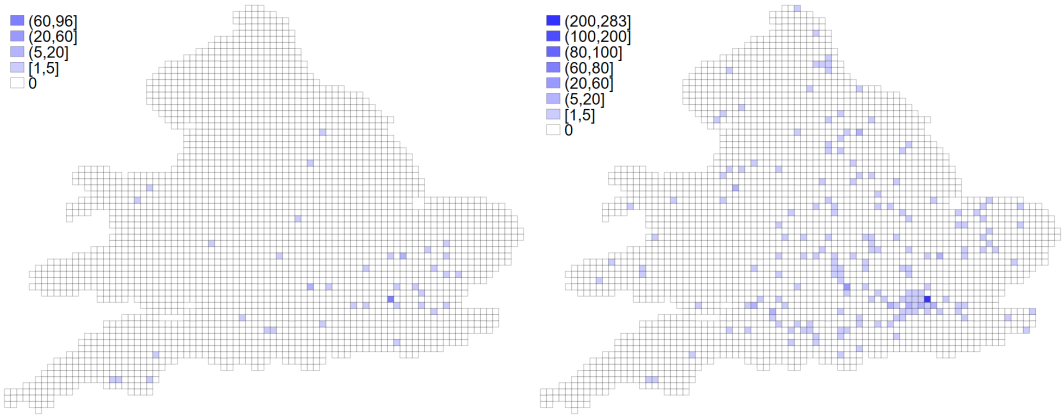
[40] Geolocation is conducted using the website Geonames (https://www.geonames.org/). For locations not available through Geonames, we manually identify coordinates using additional historical and online sources.

cell-decade); and (iii) the log number of inventions. While the first variable simply tracks the presence of an innovator in a given grid cell-decade and can take values greater than one if more than one innovator appear in the same grid cell-decade, the second variable accounts for the number of different activities performed by each innovator located in a given grid cell-decade. We compute these three outcomes for the full set of innovators, for technical innovators only, and for soft innovators only. Figure 14 shows the total number of technical and soft innovators in each grid cell before and after the 1635 postal reform.

Figure 14: Total Number of Technical and Soft Innovators by Grid Cell-Decade, Before and After the 1635 Reform



(a) Technical innovators in decades 1570-1620 (b) Technical innovators in decades 1630-1760



(c) Soft innovators in decades 1570-1620 (d) Soft innovators in decades 1630-1760

Notes: Number of technical innovators in each grid cell before the 1635 reform (Panel a) and after the reform (Panel b). Number of soft innovators in each grid cell before the 1635 reform (Panel c) and after the reform (Panel d). Sources: own elaborations based on Oxford Dictionary of National Biography.

Moreover, we match innovators and letter correspondents by full name, and for each type of innovator (any, technical, and soft innovator) we compute: (i) the log number of letters involving at least an innovator; (ii) the log number of letters between a scholar and an innovator, a scholar and an innovator that is also a professional, a scholar and an innovator that is either a professional, a statesman, or an individual working in the information industry.

Finally, to investigate whether postal connectivity influenced long-term outcomes, we use a set of

socio-economic variables from Heldring et al. (2021). These include the number of gentry, industrial mills, patents, and threshing machines; the share of adult males (older than 20) employed in agriculture and in trade/handicraft; and wheat yields (measured in bushels per acre). All these variables are measured in the first half of the nineteenth century, except for the number of gentry (measured in 1700) and the number of patents (measured over 1672-1852). From the same source, we also retrieve the average tax revenue per taxpayer and an indicator for whether a monastery owned a manor. Because these variables are defined at the parish level in the original dataset, we assign them to our $0.09° \times 0.09°$ grid by mapping the parish centroids to the corresponding grid cells.

7.2 Results

We start by estimating whether postal connectivity affected innovation activity in a panel framework. Table 3 reports the results using the usual difference-in-difference strategy (Equation 2). In each column, the dependent variables is a different proxy for innovation activity, as indicated in the column label. The estimated coefficients provide evidence that the 1635 reform resulted in a differential increase of innovation activity for grid cells already hosting a postal stage at the time of the reform. In particular, the open access to the postal network led to a boost in both the presence of innovators (Column 1) and the number of activities associated with them (Column 2) in treated locations. This effect is stronger for technical innovators (Columns 4 and 5), those mostly involved in the narrative of the British Industrial Revolution.[41] These findings are also robust when instrumenting our treatment variable with the distance to the least cost path network (see Appendix Table B14).

Turning to the matched correspondence and innovators data, the DID estimates in Figure 15 suggest that the 1635 reform helped increasing personal exchanges between scholars and innovators (mostly technical and working as professionals).

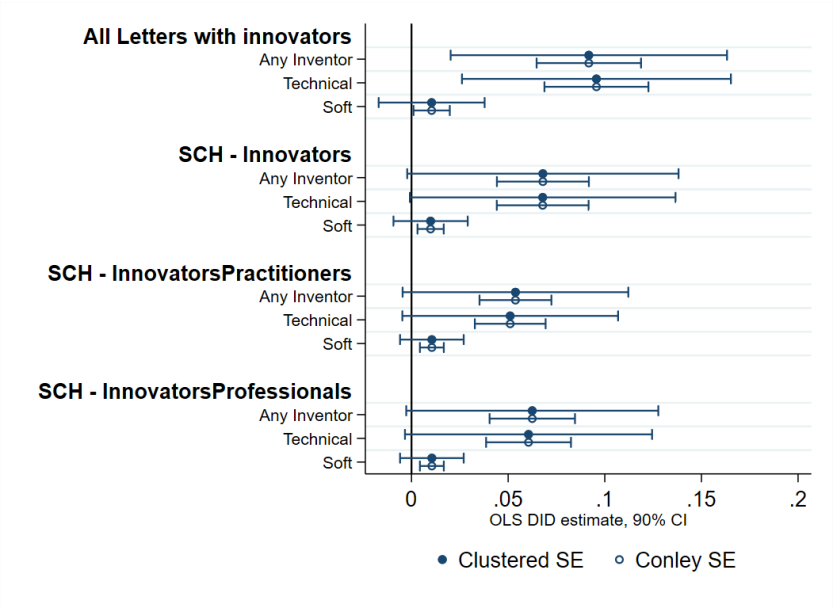
[41] We observe very similar correlational patterns when we look at OLS estimates of Equation (1) involving these innovation proxies and the time-varying postal stage dummy (see Appendix Table B13).

Table 3: Effect of the 1635 Reform on Innovation Activity – DID Evidence

Dependent Variable	Log All Innovators			Log Tech Innovators			Log Soft Innovators		
	Innovators	Events	Inventions	Innovators	Events	Inventions	Innovators	Events	Inventions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stage Dummy 1620 × Post-1635	0.034	0.035	0.011	0.038	0.047	0.013	0.004	-0.007	0.006
	(0.017)**	(0.020)*	(0.010)	(0.015)**	(0.016)***	(0.011)	(0.009)	(0.011)	(0.006)
	[0.010]***	[0.013]***	[0.004]**	[0.008]***	[0.011]***	[0.005]***	[0.006]	[0.007]	[0.004]
Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stage Dummy 1620 × Civil War Dummy	✓	✓	✓	✓	✓	✓	✓	✓	✓
N. Clusters	2,764	2,764	2,764	2,764	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.539	0.504	0.580	0.544	0.495	0.540	0.551	0.599	0.535
Pre-1630 Mean of DV	0.008	0.013	0.001	0.006	0.010	0.001	0.004	0.005	0.001

Notes: OLS estimates. Observations are grid cells in each decade from 1570 to 1769. The dependent variables are: the log of (one plus) the number of innovators (not considering if they were born in that grid cell-decade); the log of (one plus) the number of events involving innovators (not considering their birth in that grid cell-decade); the log of (one plus) the number of inventions made by innovators. In Columns 4 to 6 and Columns 7 to 9 the above variables are measured using, respectively, only the subset of "technical" innovators and only the subset of "soft" innovators. In Columns 1 to 3 the above variables do not distinguish between different types of innovators. The interaction variable *Stage dummy 1620 × Post-1635* equals one in all grid cells containing at least one postal stage in the decade 1620 for all decades from 1630 onwards, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value <10%, ** = p-value <5%, *** = p-value <1%.

Figure 15: Effect of the 1635 Reform on Intensity of Correspondence involving Innovators – DID Evidence



Notes: OLS estimates of the coefficient of the interaction variable *Stage dummy 1620 × Post-1635* from Equation (2), using the specification in Table 2, Column 5. The dependent variable is the log number of incoming and outgoing letters in each grid cell-decade (plus one). The labels on the y-axis indicate the specific subset of letters being considered to define the dependent variable, according to their senders and recipients. Solid horizontal bars indicate 90% confidence intervals constructed using, alternatively, standard errors clustered by grid cell and Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space).

Finally, focusing on socio-economic outcomes over the long-term, we estimate cross-sectional regressions using the innovation and socio-economic proxies described above as dependent variables. Because these outcomes are observed at a single point in time, we collapse our time-varying postal variables to the grid cell level.

Figure 16 shows OLS estimates from these cross-sectional regressions. In line with Heldring et al. (2021), we augment the baseline geographic controls with an indicator for whether a monastery ever owned a manor within the grid cell and with the grid cell-level average tax revenues per taxpayer. We consider two key explanatory variables. Panel (a) focuses on a dummy equal to one if the grid cell ever hosted a postal stage between 1570 and 1769. Panel (b) uses the 1628 postal stage indicator—our pre-reform treatment variable from the difference-in-differences analysis.

In both panels, we find that grid cells directly connected to the postal network are associated with a higher number of gentry, lower employment in agriculture (with higher wheat yields in Panel a), and more employed in industry later in time. Focusing on more specific long-term innovation and industrialization proxies, estimates shows that postal connectivity is associated with a higher number of patents, a higher likelihood to have a textile mill, and a higher number of threshing machines. Overall, these results suggest that postal connectivity fostered elite formation and structural change in the long run.

Figure 16: Presence of Postal Stage and Long-Run Outcomes – Correlational Evidence



(a) Dummy "ever had a postal stage"

(b) Stage dummy 1620

Notes: OLS estimates of cross-sectional regressions of long-term socio-economic variables on dummy variables capturing the availability of postal stages in England and Wales. The unit of observation is the grid cell. The dependent variables, listed on the y-axis of each subfigure, are all standardized to have a mean of zero and a standard deviation of one. Each panel shows only the estimated coefficient of the main explanatory variable in the regression. In Panel (a) the main explanatory variable is an indicator equal to one if the grid cell ever hosted a postal stage between 1570 and 1769, and zero otherwise. In Panel (b) the main explanatory variable is an indicator equal to one if the grid cell hosted at least one postal stage in the decade 1620, and zero otherwise. In both panels, estimates are computed accounting for distances to London, historical routes, and medieval boroughs, an indicator that equals one if a monastery owned a manor, the average tax revenues per tax payer, and county fixed effects. 90% confidence intervals based on standard errors clustered by grid cell (filled marker) or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space, empty marker) are reported.

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A Data Appendix

A.1 Evolution of the Postal System

In this section we illustrate the procedure used to reconstruct the evolution of the postal network across England and Wales. We also explain how we build an artificial network to predict the actual postal network of 1628.

Tracking postal stages in time. To reconstruct the evolution of the postal system during the period 1570-1769 we follow four steps.

The first step consists of conducting a systematic search for historical maps documenting the development of the postal system over time. We collect a set of maps depicting the historical postal system in place in the following years: 1570, 1580, 1595, 1603, 1628, 1668, 1677, and 1690. As an example, Panel (a) of Figure A1 presents the 1668 map digitized from Carr (1668).

Figure A1: Tracking the Postal Stages in 1668



(a) (b)

Notes: Panel (a) displays the map of the postal system in England and Wales in 1668. Panel (b) shows a magnified view of the region enclosed by blue box in Panel (a), with the existing postal stages marked in red.

In the second step, each map is digitized, subdivided into manageable sections, and georeferenced using ArcGIS 10.8. This procedure facilitates the identification of towns and villages by enabling a direct comparison between the historical map and contemporary geographic coordinates (whenever information on the locations name is hard to extract from a given map).

In the third step, we examine the map legend to determine which symbols denote postal stages. For example, the legend shown in Panel (b) of Figure A1 — which zooms in on the area highlighted in blue in Panel (a) — indicates that asterisks represent postal stages. In Panel (b), we mark each asterisk with a red circle for clarity. Because each asterisk is accompanied by a place name, we can identify the corresponding locality and record its geographic coordinates.

In the fourth step, we match the geographic coordinates of localities identified as postal stages to the corresponding grid cells in a fishnet layer covering England and Wales (using a spatial join GIS operation) and repeat this process for all our maps.

The resulting dataset is a grid cell-level panel covering the entire study area, allowing us to observe both the presence and absence of postal stages across cells in each map year. Because historical maps are available for a limited number of years, we use the decade as unit of temporal aggregation. This choice is motivated by the fact that changes in the postal network were gradual rather than abrupt, making it unlikely that substantial reconfigurations occurred within a few years. To construct a balanced panel covering all decades from 1570 to 1760, we assign to each decade the postal stage configuration depicted in the map produced within that decade. For decades without a corresponding map, we assume that the postal network remained unchanged, and so we carry forward the most recently observed configuration. This implies that the 1603 map is assigned in the final dataset to the decades 1600 and 1610, the 1628 map to all decades from 1620 to 1650, and so on.

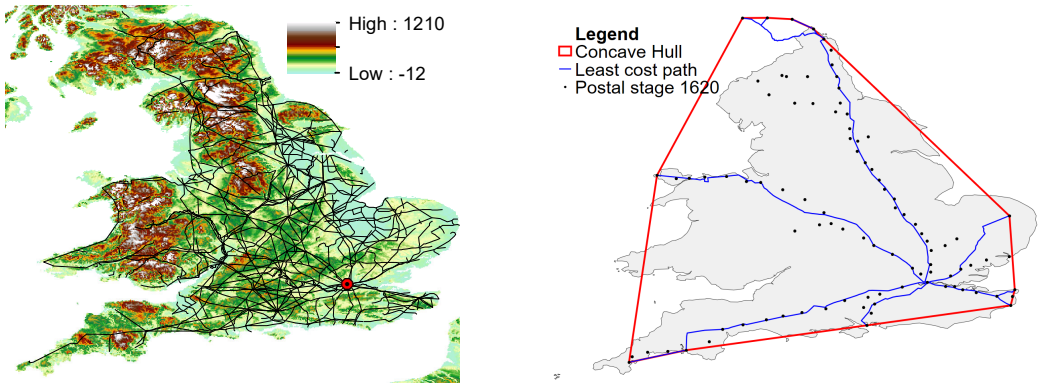
Constructing the predicted network. Estimating the effect of having a postal stage using the actual postal network over time would imply the assumption that postal stages randomly appeared within England and Wales throughout the decades. To mitigate the concern of non-random allocation of the postal stages after the reform, we focus on the network of postal stages of 1628, that is, the latest year in the pre-reform period in which we observe the full postal network configuration. To further address the threats to identification coming from potential non-random allocation of postal stages in 1628, we construct a hypothetical least cost path network and use it as instrumental variable for the actual route placement in that year (see Appendix Figure A2). We refer to this as the predicted network. Given that the purpose of the postal system prior to the reform was to connect the Queen/King with distant locations (due to local turmoil or territorial control) or to continental Europe (see Section 2.1), the proposed instrument addresses the question of which route the royal messengers would have taken to reach the extremes of the English reign, subject to cost minimization.

The least cost path network displayed in Panel (b) of Appendix Figure A2 (blue line) is built following five steps. First, we geolocate all postal stages included in the map of the 1628 postal network (the black dots in the panel). Second, we construct the concave hull containing the 1628 network (the red polygon in the panel) to have a measure of the extent of the reign that the King's messengers were originally able to reach. Third, we identify unique least cost paths from London to each vertex of the concave hull, based on the Dijkstra's optimal route algorithm. To compute transportation costs, we rely on a simple construction cost function from the transport engineering literature and assigned higher transportation costs to land parcels without transportation routes and with steeper slope of the terrain. We build historical routes by assembling the shapefiles of historical Roman roads (McCormick et al., 2013), medieval transport routes (Edwards, 1987), and rivers (Pape, 2004), while slope of the terrain was computed based on the European Digital Elevation Model (DEM).[42] Fourth, we assemble all the separate least cost paths to form a unique predicted network connecting London to the extremes of the 1628 postal network. Finally, for each grid cell we calculate the natural logarithm of the geodesic distance (in kilometers) from the centroid of the cell to the

[42]Link: https://land.copernicus.eu/imagery-in-situ/eu-dem/eu-dem-v1.1?tab=metadata. Last access: 30th December 2018.

full predicted least cost path network. As this distance is time-invariant, we interact it with the post-reform indicator to define our instrumental variable in the final panel dataset.

Figure A2: Pre-Reform Postal Stages and Predicted Network



(a) Historical Routes and Terrain

(b) 1628 Postal Stages and Least Cost Path

Notes: Panel (a) displays the historical routes of England and Wales (black lines), altitude of the terrain in meters, and the location of London (red circle). Panel (b) presents the postal stages in 1628 (black dots), the concave hull including all the vertices of the 1628 network (red polygon), and the least cost path network joining London with each vertex of the concave hull (blue line). *Sources*: Historical routes of England and Wales combine Roman roads from McCormick et al. (2013), medieval routes from Edwards (1987), and rivers from Pape (2004), and own elaborations.

A.2 Details on Data about the Republic of Letters

A.2.1 Classification of Correspondents in Electronic Enlightenment

Below we provide formal definitions of the occupation macro-categories (in bold) used to classify correspondents, as specified in the Merriam-Webster dictionary. We also list the sub-categories (in italics) included in each macro-category, as well as the keywords associated with each sub-category. Importantly, the classification of correspondents' occupations is not mutually exclusive across macro-categories, meaning that, for instance, a given correspondent can be classified both as scholar and as statesman if his or her biography includes keywords from both macro-categories.

Scholar. A learned person who has done advanced study in a special field. This macro-category includes the following sub-categories:

- *Science.* Keywords: arithmetician; experiment; mathematic; mathematician; mathematicians; mathematics; natural; natural histor; natural historian; natural philosopher; natural philosophers; natural scientist; naturalist; naturalists; science; science-writer; scientific writer; scientist; scientists.
- *Life Sciences.* Keywords: anatomist; anatomists; anatomy; astrobiology; bacteriologist; biochemistry; bioinformatics; biolinguistics; biological anthropology; biologist; biologists; biology; biomechanics; biophysics; blood-transfusion; botan; botanical; botanist; botanists; botany; cell biology;

conchologist; developmental biology; ecology; entomologist; ethology; evolutionary biology; evolutionary developmental biology; genetics; helminthologist; histologist; histology; ichthyologist; immunology; latrochemist; micoscopist; microbiology; microscopist; microscopists; microscopy; molecular biology; neuroscience; ornithologist; pharmacology; physiology; physiologist; population biology; quantum biology; quinologist; specimen collector; structural biology; synthetic biology; systems biology; theoretical biology; toxicologist; toxicology; zoological collector; zoologist; zoology.

- *Earth Sciences.* Keywords: atmospheric chemistry; atmospheric physics; atmospheric sciences; biological oceanography; chemical oceanography; climatology; ecologist; economic geology; edaphology; engineering geology; environmental chemistry; environmental geology; environmental soil science; gemology; geochemistry; geochronology; geodesy; geograph; geographer; geographers; geography; geolog; geologist; geologists; geology; geomagnetics; geomicrobiology; geomorphology; geophysics; geostatistics; glaciology; historical geology; human geography; hydrogeology; hydrographe; hydrographer; hydrology; limnology; marine geology; meteorologist; meteorology; micropaleontology; mineral physics; mineralogist; mineralogists; mineralogy; oceanographer; oceanography; palaeontologist; paleoceanography; paleoclimatology; paleontology; paleoseismology; paleotempestology; palynology; pedology; petroleum geology; petrology; physical geodesy; physical oceanography; planetary geology; planetary science; quaternary geology; sedimentology; seismology; selenography; stratigraphy; structural geology; theoretical planetology; topographer; topographers; volcanologist; volcanology.

- *Physical Sciences.* Keywords: aerodynamics; alchemist; alchemists; analytical chemistry; astrobiology; astrodynamics; astrologer; astrometry; astronom; astronomer; astronomers; astronomical observer; astronomy; astrophysics; atmospheric physics; atmospheric science; atomic, molecular, and optical physics; biochemistry; bioinorganic chemistry; biomechanics; bioorganic chemistry; biophysical chemistry; biophysics; calorimetry; celestial mechanics; chemical kinetics; chemical physics; chemist; chemistry; chemists; chief cosmographer; chymico; classical mechanics; click chemistry; cluster chemistry; compact objects; computational astrophysics; computational physics; condensed matter physics; continuum mechanics; cosmographer; cosmographers; dynamics; electrochemistry; electromagnetism; exoplanetology; extragalactic astronomy; femtochemistry; fluid dynamics; fluid kinematics; fluid mechanics; fluid statics; galactic astronomy; geochemistry; geophysics; high energy astrophysics; homeokinetics; inorganic chemistry; interstellar astrophysics; kinematics; magnetospheres; materials chemistry; mathematical physics; mechanics; medicinal chemistry; molecular biochemistry; neurochemistry; neurophysics; nuclear chemistry; nuclear physics; observed sunspots; optics; organic chemistry; organometallic chemistry; particle physics; perpetual motion and a pendulum; photochemistry; physic; physical; physical chemistry; physical cosmology; physical organic chemistry; physicist; physicists; physics; planetary formation; planetary interiors; planetary rings; planetary science; planetary surfaces; plasma astrophysics; plasma physics; polymer chemistry; polymer physics; professor of astronomy; professor of chemistry;

professor of mathematics; professor of physics; psychophysics; quantum biology; quantum chemistry; relativistic astrophysics; small solar system bodies; solar physics; solid-state chemistry; spectroscopy; statics; statistical mechanics; stellar astronomy; stereochemistry; surface science; thermochemistry; thermodynamics; thunder and lightning.

- *Other Scholars.* Keywords: cartograph; cartographer; cartographers; mapmakers; remote sensing; satellite navigation; calculator; curator; school trustee; squire beadle; esquire bedell.

- *Human Sciences.* Keywords: antiquarian; antiquarians; antiquaries; antiquary; anthologist; archaeologist; archaeologists; biblical scholar; cabalist; classical scholar; classicist; classicists; egyptologist; grammar; grammarian; grammarians; greek; hebraist; hebraists; hebrew studies; hellenist; hispanist; historian; historians; hisoriographer; historiographer; history; humanist; humanists; interpreter; kabalist; kabbalist; latinist; linguist; linguists; logician; man of letters; martyrologist; medievalist; memoirist; metaphysician; moral philosopher; moralist; musicologist; numismatist; numismatists; oriental scholar; orientalist; orientalists; orthoepist; papyrologist; philologian; philologist; philologists; philology; philosopher; philosophers; philosophical water; philosophy; preserver of the cornish language; professor of hebrew; professor of law; professor of jurisprudence; professor of philosophy; professor of poetry; professor of theology; religious author; religious authors; religious writer; rhetorician; scholastic; sinologist; spelling reformer; theologian; theologians; theological writer; theologist; theology; writer on theology.

- *Social Sciences.* Keywords: anthropologist; constitutional writer; demographer; economist; economists; ethnographer; ethnologist; genealogist; genealogists; political author; political economist; political historian; political philosopher; political scientist; political scientists; political theorist; political writer; psychologist; psychology; sociologist; statistician; statisticians.

- *Education.* Keywords: academia; academic; academician; accademia; chief schoolmaster; college; college governing body; college head; colleges; collegiant; commoner; connoisseur; conrector; diplomas; educational founder; educational institution; educationalist; educationist; educator; erudit; erudite; fellow commoner; fellow of queens' college; fellow of st john's; freethinker; freethinkers; headmaster; headmistress; instructor; intellectual; language tutor; lecturer; magister artis; member of magdalen college; member of the accademia dei gelati; pedagogist; pedagogue; pens.; pensioner; pensionnaire; philomath; polyglot; polymath; porfessor; preceptor; principal of; principal of the united colleges; proctor; professeur; professeurs; professor; professor of queen's college; professors; prorector; public orator; reader; rector of a college; rector of the university; scholar; scholars; school; school founder; school governor; school-master; schoolmaster; schoolmistress; schoolteacher; sizar; student; students; studied; taught at; taught in Paris; taught navigation to mariners; teacher; teacher of hebrew; teacher of the deaf; teachers; theorist; tutored by; undergraduate; universities; university; university department; university founder; university principal; university teacher; universityof; vice-chancellor of oxford university; warden of all souls, oxford.

Information Industry. A person who works for organizations whose purpose is to produce and process information and to develop the infrastructure and delivery mechanisms to distribute information. This macro-category includes the following sub-categories:

- *Writing.* Keywords: amanuensis; annalist; autobiographer; bibliographer; bibliographers; biographer; biographers; breviaries; calligrapher; chronicler; commentator; compiler; compiler of histories; copyist; diarist; encyclopaedist; encyclopædist; encyclopdist; encyclopedist; epigrammatist; epigrammist; essayist; hagiographer; heraldic writer; journal; journalist; journalistic club; journalists; lexicographer; memorialist; military author; minute-keeper; pamphleteer; pamphleteers; political journalist; political pamphleteer; religious pamphleteer; revolutionary journalist; science-writer; scientific writer; scribe; scrivener; stenographer; translator; travel-writer; writer of memoirs; writer on chronology; writing-master.

- *Information.* Keywords: amanuensis; archivist; ballad collector; bibliophile; bibliophiles; book; book collector; book-collector; book-collectors; book dealer; bookbinder; bookbinders; books; bookseller; bookseller's apprentice; booksellers; censor; chief archivist; copyist; corrector; cryptographer; cryptographers; editing and correcting spanish breviaries and missals; editor; editors; interpreter; journal; journals; librarian; librarians; library; libriarian; literary agent; literary club; literary editor; literary executor; literary reviewer; magazine; manuscript; map publisher; newspaper; newspaper clerk; newspaper editor; newspaper owner; pressman; printer; printers; printseller; publicist; publicists; publisher; publishers; publishers' guild; translator.

- *Postal Services.* Keywords: bearer of letter; carrier; collecting post; conveyor of letters; courier; directeur des postes; director of the postal service; letter carrier; letter-carrier; mailboat; messenger; post service; postal carrier; postal official; postman; postmaster; postal entrepreneur; postal intermediary.

Practitioners. A person who does a job that requires special training, education, or skill. This macro-category embraces practitioners, business people, and technical experts, and includes the following sub-categories:

- *Medicine.* Keywords: alienist; apotecary; apothecaries; apothecary; army medic; barber-surgeon; chair of medicine; chief doctor; chief physician; chiropodist; chirurg; dentist; dietician; druggist; epidemiologist; eye surgeon; geneesheer; gynaecologist; healer; health official; herbalist; islander surgeon; leibarzt; medic; medical; medical adviser; medical author; medical researcher; medical scientist; medical writer; medicin; medico; medicus; midwife; military surgeon; nurse; obstetrician; occulist; oculist; ophthalmologist; optician; opticians; optiker; otologist; paediatrician; pathologist; pharmacist; pharmacists; pharmacologist; physician; physicians; professor of medicine; psychical; psychologist; surgeon; surgeons; therapist; veterinarian.

- *Law.* Keywords: advocate; attorney; attorney-at-law; avocat; barrister; barristers; called to the bar; civil law; commission of the peace; coroner; counsel; court of common pleas; court of the audit;

criminologist; doctors' commons; executor; grand jury; gray's inn; grays inn; grietman; hofkammer rat; inner temple; judicial body; judicial examiner; juris; jurisprudence; jurist; jurists; jury; law; law court; lawyer; lawyers; lay judge; legal agent; legal author; legal body; legal clerk; legal counsel; legal firm; legal institution; legal official; legal professional; legal representative; legal writer; lincoln's inn; l.l.b; l.l.b.; ll.d; ll.d.; member of doctors' commons; member of the hof; member of the rekenkamer; middle temple; notary; notary public; ober-vogt; proctor; regente di cancellaria; serjeant at law; serjeant-at-law; solicitor; solicitors.

- *Management.* Keywords: academic administrator; accountant; accountants; actuary; administrative organization; auditing office; bank; bank clerk; bank official; banker; bankers; banking; bankruptcy officer; broker; business agent; business network; businessman; businesswoman; chargé d'affaires; charity trustee; charity administrator; chief financial officer; church administrator; commissioner of bankrupts; company director; comptroller; contractor; director of the fränkischen reichsgrafenkollegiums; director-general; directors of the orphanage; ecclesiastical administrator; entrepeneur; entrepreneur; entrepreneurs; finance officer; financial; financial expert; financial officer; financier; impresario; industrialist; insurance company; insurer; landrentmeister; maître des comptes; manager; merchant-banker; money lender; moneylender; mortgager; museum curator; overseers; paymaster; school administrator; speculator; stockbroker; stockholder; supervisor; theatre administrator; university administrator.

- *Textile.* Keywords: calico-printer; clothier; cotton spinner; draper; dyer; glover; haberdasher; hatter; head of lineweaver factory; hosier; hosiers; lace mker; milliner; seamstress; shoemaker; silk designer; silk throwster; silk worker; tailor; tailors; tanner; weaver.

- *Trade.* Keywords: auctioneer; cattle dealer; chandler; coal-merchant; coin seller; commercial secretary; copper-dealer; dealer; draper; exporter; fur-trader; fur-trading company; importer; ironmonger; ironmorgers; leatherseller; leathersellers; linen-merchant; member of riga great guild; mercantile firm; mercer; merchant; merchant-taylors; merchant-taylors'; merchants; naval supplier; perfumer; poulterer; provisioner; seller; ship owner; ship-owner; shipowner; shipper; shipping; ship's chandler; shopkeeper; silk-merchant; slave trader; smuggler; stationer; timber-merchant; tobacco-merchant; trade official; trader; traders; tradesman; trading company; trading firm; trading firm manager; warehouse; wholesale druggist; wine-merchant; worshipful company of haberdashers; haberdasher.

- *Estate.* Keywords: colonial landowner; estate; estate manager; estate trustee; estates; foundry owner; freeholder; laird; land company; land speculation company; land speculator; land steward; landlady; landlord; landowner; landowners; landrentmeester; landrentmeister; lessee; magnate; mill-owner; mine owner; owner; plantation corporation; plantation-owner; planter; property developer; property owner; proprietor; proprietors; realtor; squire.

- *Architecture.* Keywords: architect; architects; architectural; designer; developer; draftsman; draughtsman; draughtsmans; garden designer; garden designers; landscape gardener; modeller;

supervised the building of the monument; surveyor; surveyors; urbanist.

- *Decorative Arts.* Keywords: art collector; art collectors; art critic; calligrapher; coach-painter; decorator; graphic artist; illustrator; painter; painters; pastellist; photographer; plasterer; portraitist; rococo painter; scene-painter; sculptor; sculptors; tapestry designer; watercolourist; wax modeller.

- *Other Artists.* Keywords: art dealer; art-dealer; engraver; engravers; epigraphist; etcher; furniture maker; furniture makers; glass-painter; glass-stainer; lapidarist; limner; lithographer; miniaturist; mosaicist; paperer; potter; stuccoist; upholsterer.

- *Other Practitioners.* Keywords: baker; barber; brewer; butcher; chief dike-reeve; confectioner; cook; distiller; farrier; fisherman; fishmonger; grocer; innkeeper; innkeepers; maltster; mason; millener; nurseryman; refiner; stonemason; tiler; wharfinger; balloonist; auditor; skipper; director of extraordinary equipage; sea captain; ship's officer; navigator; boatman; sailor; mariner; seaman; shipmaster; miller; stable-keeper; sugar refiner; vintner.

- *Craft and Manufacture.* Keywords: amateur engraver; apprentice; assistant at the chester mint; blacksmith; bronze caster; builder; cabinetmaker; carpenter; carpenters; carpentier; carver; castermaker; chief engraver; clockmaker; company of undertakers of iron works; computer pioneer; cooper; coppersmith; craftsman; cutler; engraver; engravers; farrier; forger; gilder; glassmaker; glazier; goldsmith; goldsmiths; gun maker; gun-founder; gunsmith; horologist; improver; instrument; instrument maker; instrument-maker; interested in timekeeping; inventor; inventors; iron-founder; ironmaster; ironmasters; ironworker; iron works; jeweller; lens grinder; lens-grinder; locksmith; machine; machines; maker; maker of astronomical instrument; maker of scientific instruments; makers; metal-founder; metallurgist; metalworker; millwright; mint moneyer; needleworker; optical lens grinder; organ builder; organ-maker; rebuilt Dalham Church tower; restorer; saddler; scientific instrument maker; scientific-instrument maker; shipbuilder; ship-carpenter; shipwright; silversmith; spinet-maker; steelmaster; steelmasters; stonecutter; telescope maker; tinsmith; watch-case maker; watchmaker; watchmakers; wheelwright; wood-engraver; woodcutter; worked at the mint; paper maker; paper-maker; paper-makers; papermaker; printmaker; printmakers; type-founder; typefounder; typographer; typographers; cloth manufacturer; freeman; manufacter; manufacturer; manufacturers; porcelain manufacturer; pewterer; wigmaker.

- *Engineering.* Keywords: civil engineer; engineer; engineers; ingenieur; mechanical engineer; military engineer; naval engineer.

Statesman. A person actively engaged in conducting the business of a government or in shaping its policies, or a person who uses or supports strong actions (such as public protests) in support of or opposition to one side of a controversial issue. This macro-category includes the following sub-categories:

- *Colonies.* Keywords: chief settler; colonial administrator; colonial agent; colonial governor; colonial governors; colonial landowner; colonial officer; colonial official; colonial officials; colonial politician;

colonist; colonists; colonizer; conquistador; director of levantic trade; director of new netherland; director of the voc; director of trade in the levant; director of voc; dutch east india company official; dutch west india company; east india agency house; east india company; east india company official; east india trading house; expedition to the west indies; india company officer; in service of the voc; member of the voc; official of the east india company; oost-indische maatschappij; pioneer; royal african company; settler; settlers.

- *State Bureaucracy.* Keywords: administrative official; advocate-fiscal; attorney general; attorney-general; avocat général; bailie; bailiff; bailiff master; bailiffs; baron of the court of the exchequer; baron of the exchequer; baron of the scottish exchequer; chancellor; chief administrator of reale stamperia; chief baron of the exchequer; chief baron of the irish exchequer; chief clerk of the hof; chief clerk of the mint; chief financial officer; chief inspector in the court; chief inspector of customs; chief justice; chief magistrate; chief mintmaster; chief secretary of the states; chief tax director; chief treasurer; civic official; civil officer; civil servant; clerk of the rolls; collector of h.m. customs; collector of the pier dues; comptroller of salt duties; comptroller of the mint; controller; court; court inspector; court official; courtier; cursitor baron of the exchequer; customs officer; customs official; custos rotulorum; deputy; dignitary; drossaard; drossaart; drossart; drost; election officer; equerry; exchequer clerk; exchequer official; gauger in the excise; general treasurer; gentilhomme ordinaire de la chambre du roi; government agent; government official; grafelijkheidsrekenkamer; head of the bureau; herald; heraldist; high sheriff; hofmarschall; hofrat; hofsratspräsident; in service of imperial chancery; judge; judges; justice of the peace; keeper of the rolls; landdrost; local official; lord chamberlain; lord keeper of the great seal; magistracy; magistrat; magistrate; magistrates; master of the rolls; member of the generale rekenkamer; mint-master; mintmaster; officer of arms; officer of the custom house; officer of the customs house; officer of the mint; official at york house; official in the united provinces; one of the barons to the exchequer; ondergeschikte; ontvanger der domeinen; ontvanger der gemene middelen; ontvanger-generaal; palatin agent; parliamentary official; president; president of the court; président; procurator; procureur général à la cour des compte; prosecutor; protonotario; provincial executive; public official; receiver-general; reichspfennigmeister; rouge croix pursuivant; royal; royal agent; royal clerk; royal mint; royal scribe; royal secretary; royal treasurer; schepen; secretario del consejo de camara; sergeant at arms; sergeant-at-arms; sheriff; sheriff's officer; sheriffs; solicitor general; solicitor-general; state employee; state officer; state official; state treasurer; sub-commissioners of excise; supreme court justice; tax book-keeper; tax collector; tax farmer; tax inspector; tax-official; taxman; town clerk; treasurer; treasurer general; treasurer-general; treasurers; tresurer; uditore generale; under-sheriff; undersecretary of state; under-secretary of state; usher of the black rod; warden of the chester mint; warden of the edinburgh mint; warden of the mint.

- *Politician.* Keywords: alderman; aldermen; american (cherokee) tribal leader; american (creek) tribal leader; american (delaware) tribal leader; american (iroquois) tribal leader; assessor; burgemeester; burgermeester; bürgermeister; burgess; burggrave; burgrave; burgmeester; burgomaster; burgomasters; burgomeister; capitoul; chancellor of the exchequer; chief councillor;

chief counsellor; chief governor; chief minister; chief of; chief representative; chiefs of; city father; civic body; colonial governor; colonial governors; colonial politician; committee; conseiller; consistory; councellor; councelor; council; councillor; councillors; councilor; counsellor; counselor; czar; czarina; deputy representative; doge; emir; emperor; empress; garter herald; gedeputeerde staten; gedeputeerde staten-generaal; governing body; government; government adviser; government authority; government committee; government department; government minister; governor; governor-general; governors; grand vizier; grietman; gubernator; hooge raad; house of common; house of commons; houses of lords; khan of tartary; king; landeshauptman; landeshauptmann; landvogt; landvoogd; legislative body; legislative delegates; lieutenant governor; lieutenant-governor; lord chancellor; major; man in power; mayor; mayors; member of congress; member of oudraad; member of parliament; member of staten-general; member of committed councils of the ommelanden; member of the consiglio centumvirale; member of the council; member of the large and small councils; member of the privy council; member of the states of friesland; member of the states of utrecht; member of the town council; member of the veertigraad; member of the vroedschap; member of vroedschap; member vroedschap; members of parliament; military governor; minister of the dutch colony; ministers of the palatinate; ministre; monarch; mp; mps; m p; m.p; m.p.; municipal body; municipal group; parlement; parliament; parliamentary; parliamentarian; pensionary; plenipotentiary; plenipotentiaries; podestà; political agent; political body; politician; politicians; politiican; premier; president of the council of state; prime minister; pro gubernator; province; queen; raad; regent; regional governor; rentmeester; rentmeister; representative; representatives; royalist politician; ruler; selectman; senate; senator; senators; stadholder; stadhounder; stadtholder; stadtholders; starost; starosta; state body; state governor; states general; states-general; statesman; statesmen; steward-general; syndic; syndics; town council; town-councillor; tribal leader; tsar; tzar; vicedominus; viceroy; vizier; vitztum; voivode; wojt.

- *Political Activist.* Keywords: abolition society; abolitionist; activist; campaigner; conservationist; conspirator; counter-revolutionary; covenanter; dissenter; educational reformer; feminist; girondist; insurrectionist; jacobin; jacobite; law reformer; leader; loyalist; monarchist; moral reformer; national group; nationalist; patriot; polemicist; political activist; political activists; political agitator; political club; political controversialist; political group; political hostess; political men; political radical; political reformer; prison reformer; propagandist; radical politician; radical utopian; rebel; regicide; republican; revolutionary; revolutionary activist; revolutionary body; revolutionary financier; revolutionary leader; revolutionary politician; revolutionary salon hostess; royalist; royalist activist; royalist émigré; royalist-émigré; social reformer; social thinker; socialist; suffragist; trade unionist; union; unionist.

- *Diplomat.* Keywords: ambassador; ambassadors; consul; consular official; consuls; diplomat; diplomatic; diplomatist; envoy; envoys; imperial envoy.

- *Member of Parliament.* Keywords: burgess; house of common; house of commons; houses of lords; member of parliament; members of parliament; parlement; parliament; parliamentarian; mp; mps; m

p; m.p; m.p..

- *Military.* Keywords: admiral; admirality; admirals; admiralty; admiralty official; aide-de-camp; american (oneida) army officer; ancient army officer; army; army commissary; army medic; army officer; army officers; artillery; battle; battles; bodyguard; brigadier des armées du roi; captain; captain-soldier; castellan; cavalry officer; chevalier; chief accountant of the military; chief clerk of the admiralty; chief commissary in the swedish military; chief commissary of the swedish admiralty; chief commissioner of the royal army; chief equerry; chief military architect; col. lt; col. lt.; colonel; colonels; commandant; commander; commander-in-chief; commanding officer; commissaris van de monstering; commissioner-general; constable; court-martial; deputy lieutenant; deputy lieutenants; duellist; equerry; field marshal; gecommiterde admiraliteit; gecommiterde raden; gecommiterde raden ter admiraliteit; general; generalmajor; guardian; heer; high constable; in charge of munitions and fortifications; intelligence agent; interrogator; knight; lieutenant; lieutenant-admiral; lieutenant colonel; lieutenant-colonel; lieutenant-general; lord lieutenant; lord lieutenants; lord of the admiralty; lords of the admiralty; maitre de camp; major general; major-general; marechal; maréchal; marechals; maréchals; marine officer; marschall; marshall; member of admiraliteit; member of the garde du corps; mercenary; military; military administrator; military architect; military engineer; military officer; military surgeon; military surveyor; militia officer; naval administrator; naval officer; naval official; navy; oberkriegskommisar; officer at the admiraliteit; police informer; police officer; police-officer; policeman; prefect; privateer; quartermaster; raad ter admiraliteit; rear-admiral; revolutionary army officer; rifleman; royalist army officer; royalist secret agent; scoutmaster-general; sea captain; secret agent; sergeant; sergeant major; sergeant-major; serjeant; soldier; soldier of fortune; soldiers; superintendent of the court-martial; surveyor-general; swordsman; torturer; under-sheriff; vice-admiral; vigilante; warrior; wojski.

Clergy. A member of a religious order or a religious activist, a person who supports one side of a religious controversy. This macro-category includes the following sub-categories:

- *Religious Order.* Keywords: abbe; abbé; abbess; abbot; abbot-elect; abbots; abbott; abot; almoner; anabaptist leader; anti-catholic propagandist; antistes; apostolic internuncio; apostolic protonotary; archbishop; archbishop-elector; archbishops; archdeacon; archevêque; archevêque-duc; archhbishop; archichiragre; archpriest; augustinian; augustinians; aumonier; barnabite; bendectine; benedectines; benedictine; bishop; bishops; bishp; candidate in theology; canon; canoness; canons; capuchin; capucins; cardinal; cardinal-bishop; cardinal-nephew; carmelite; cathedral; chaplain; chaplain-in-ordinary; chaplains; church clerk; church department; church reformator/reformer; churchman; churchwarden; churchwardens; cistercian; clergy; clergyman; cleric; clerics; confessor; congregational minister; consenior; conseniors; cruciferous; curate; curates; deacon; deacons; dean; deanary; director of the priester seminar des deutchen ordens; divine; divines; dominican; ecclesiastic; ecclesiastical body; ecclesiastical court; ecclesiastical judge; elder of; elders; episcopal official; evangelist; franciscan; franciscans; friar; friars; generalsuperintendent; grandmaster of the teutonic

knights; inquisitor; jesuit; jesuits; king-bishop; l'abbé; legat; legate; legates; member of the curia; minim; minims; minister of the reformed church; minister pensionary; minor canon; mission society; missionary; missionary organization; monastery; monk; monks; monsignor; monsignore; mystic; national church department; norbertine; nun; nuncio; nuns; o.p; o.p.; oratorian; ordinary of newgate; papal legate; papal nuncio; papal scribe; parish body; parson of; pasteur; pastor; pastors; patriarch; pope; preacher; prebedary; prebend; prebendaary; prebendary; precentor; prefect of the congregation de propaganda fide; prefect of the sacred congregation de propaganda fide; prelate; premonstratensian; presbyter; presbyterian; presbyterian minister; priest; priests; prieur de roumoules; prince-abbot; prince-bishop; princess-anness; prior; prioress; priors; promoter of the devotion of the holy heart; prophet; prophetess; protestant minister; prothenotaire du st siege apostolique; provincial of; puritan minister; quaker activist; rabbi; radical reformer; reformed minister; reformed ministers; reformed preacher; religious; rev; rev.; reverend; secretaire de la chambre abbatiale; secretary of the congregation de propaganda fide; servite; superintendent of the reformed churches; superintendent of the protestant churches; superior; supérieur; synod; theatine; unitarian minister; unitarian ministers; vicar; vicar-general; vice-legate; vice-provincial; visitandine.

- *Jesuit.* Keywords: jesuit; jesuits; jseuit; jesuit-diplomat; collegio romano.

A.2.2 Descriptive statistics on Correspondents

Table A1: Top 30 Letter Correspondents

#	Letters			Correspondent full name	Macro-Category				
	Total	Sent	Received		Scholar	Professional	Statesman	Information industry	Clergy
1	6027	1719	4308	Locke, John, 1632-1704	1	1	0	0	0
2	3320	289	3031	Hartlib, Samuel, 1600-1662	1	0	1	0	0
3	3263	1530	1733	Oldenburg, Henry, 1619-1677	1	0	1	1	0
4	2967	617	2350	Lhwyd, Edward, 1659-1709	1	0	0	0	0
5	2366	602	1764	Ministers, elders and consistory of the Dutch Church in London	0	0	0	0	1
6	1771	476	1295	Lister, Martin, 1639-1712	1	1	0	0	0
7	1613	926	687	Smith, Thomas, 1638-1710	1	0	0	1	1
8	1440	1099	341	Wallis, John, 1616-1703	1	0	0	1	0
9	1276	762	514	Flamsteed, John, 1646-1719	1	0	1	0	0
10	1259	241	1018	Boyle, Robert, 1627-1691	1	0	0	0	0
11	1166	344	822	Brett, Thomas, 1667-1744	1	0	0	0	1
12	1154	510	644	Aubrey, John, 1626-1697	1	0	0	1	0
13	1104	102	1002	Charlett, Arthur, 1655-1722	1	1	0	0	0
14	1084	0	1084	Witt, Johan de, 1625-1672	1	0	1	0	0
15	1010	825	185	Pope, Alexander, 1688-1744	0	0	0	1	0
16	951	28	923	Wood, Anthony, 1632-1695	1	0	0	0	0
17	942	810	132	Gray, Thomas, 1716-1771	1	0	0	0	0
18	933	888	45	Evelyn, John, 1620-1706	1	0	0	1	0
19	841	454	387	Newton, Isaac, 1642-1727	1	0	0	0	0
20	840	728	112	Dury, John, 1596-1680	1	0	0	0	1
21	807	385	422	Casaubon, Isaac, 1559-1614	1	0	0	0	0
22	696	34	662	Sancroft, William, 1617-1693	0	0	0	0	1
23	681	237	444	Clarke, Edward, 1649-1710	0	0	1	0	0
24	655	544	111	Hume, David, 1711-1776	1	0	0	0	0
25	644	592	52	Addison, Joseph, 1672-1719	0	0	1	1	0
26	611	405	206	Le Clerc, Jean, 1657-1736	1	0	0	1	0
27	604	178	426	King, Peter, 1669-1734	0	0	1	0	0
28	589	85	504	Rawlinson, Richard, 1690-1755	1	0	0	0	1
29	563	230	333	Jurin, James, 1684-1750	1	1	0	0	0
30	555	93	462	Richardson, Richard, 1663-1741	1	1	0	0	0

Table A2: Letter Correspondents by Occupation Macro-Categories

Category	Tot. correspondents (%)	Tot. EMLO correspondents (%)	Tot. EE correspondents (%)	Tot. letters "belonging" to the category (%)
Scholars	19.6	18.5	25.7	78.5
Practitioners	14.5	11.8	28.5	36.0
Statesmen	20.8	17.9	36.0	43.6
Information industry	5.4	4.1	12.0	28.3
Clergy	19.6	20.5	14.6	32.5
Other	39.6	43.5	19.2	20.4

Notes: The table shows the shares of correspondents in each occupation macro-category and the share of letters "belonging" to each macro-category, i.e., letters whose sender or recipient is associated with that macro-category. Our dataset includes 9,765 correspondents in total, of which 8,205 are from EMLO and 1,560 from EE. The percentages in each column are not meant to add up to 100%, as the correspondents' different occupations could fall into more than one macro-category and therefore a letter involving a given correspondent (either as sender or recipient) could "belong" to more than one macro-category.

A.2.3 Topic Analysis

To explore the content of the letters, we perform an unsupervised text analysis using the Latent Dirichlet Allocation algorithm (Blei et al., 2003). Based on this algorithm, each letter is a document and its text can be represented as a mixture of latent topics, that have a distribution over words. The algorithm assigns each word to a temporary topic semi-randomly (following a Dirichlet distribution) and then iteratively checks and updates topic assignments, looping over words in documents. For each word, the topic assignment is updated based on how prevalent that word is across topics and how prevalent are topics in the document, so that for each document it provides the share of topic j discussed in the document (gamma). Before running the algorithm, we follow the literature and pre-process the text following steps:

1. We remove html text that was left in the abstract field, together with some characters such as “nbsp” and “&amp”, that stand for “non-breaking space” and “and”, respectively;
2. Remove the Latin keywords: “recto” and “folio” indicating the front of a page or a page in general;
3. We translate the text of all letters in English.
4. We replace archaic forms of English with the contemporary ones.
5. We remove appellations such as Sir and Lady and correct the spelling and remove some appellations that were reported with spaces. For instance, the keyword “Mister” is often reported as “M r”.
6. We remove names of months and weekdays (and their abbreviations). For instance, the month of October is sometimes spelled as “Oct ”;
7. We put everything to lower case and remove accents;
8. We clean the text from the sender and recipient surnames (whenever they appear). We homogenize the surnames of Harlib, Comenius, and Durey because we realize that they were reported differently in time;
9. We remove the keywords “Editorial comment”, “Extract of a letter”, “Extract of letter” that appear whenever the text of a letter is not fully reported;
10. We clean parenthesis in unicode characters that are reported whenever a word has been reported as reconstructed from the original text of the letter;
11. We clean the text from the place of origin and destination of the letter (whenever available);
12. We remove all appellations such as “Sir”, “Mister”, “Lord”, “Miss”, “Lady”, etc.;
13. We remove numbers, punctuation, name of months;
14. We further substitute some archaic forms of words. For instance we substitute “soe” with “so”, “doe” with “do”, etc.

15. We clean starting greetings. For example, most letters begin with the keyword "Dear" or "Honorable", "Illustrious", "Noble" or "Friend", which are clearly standard forms of addressing a correspondent rather than a proper letter content. To clean the text from these words we focus on the first 150 characters and remove them;

16. We clean closing greetings. For instance, most letters end with the keywords "Adieu", "Farewell", and wordings such as "I am your most humble and obedient servant" or "I am your most affectionate friend". To clean the text from these words we focus on the last 150 characters and remove them;

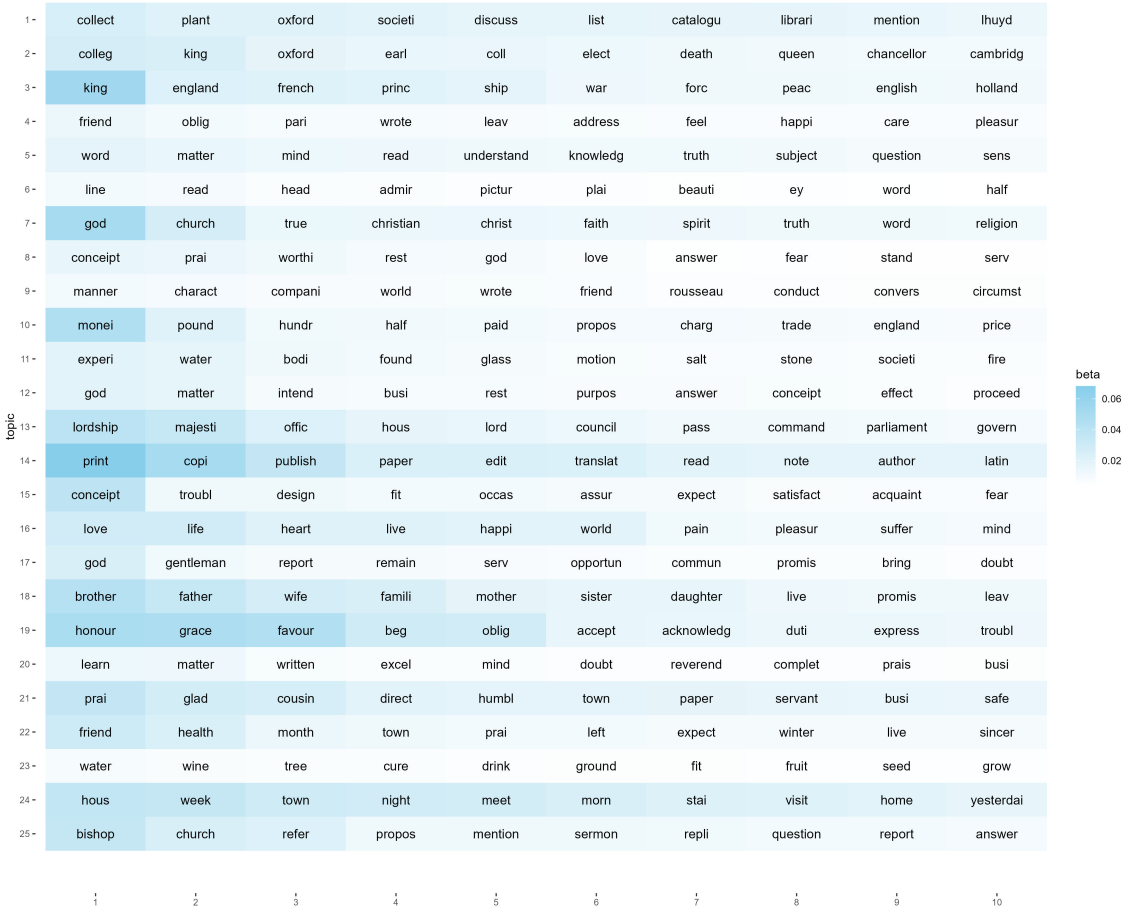
17. We remove English stopwords and replace words with their stems using the Porter stemmer;

18. We compute the term frequency-inverse document frequency (tf-idf) index and drop words whose rank is above 24,000 (thus excluding words that are too common or too rare to meaningfully qualify the content of a document).

Then, we ask the LDA algorithm to classify the content of the letters into 25 topics.[43] Figure A3 reports the 15 topics identified by the algorithm, showing the top-10 terms that mostly represent the content of each topic.

[43] As a standard in this literature, we set the parameter α to 50/2 and the parameter η to 0.1. These parameters are meant to control the mixture of topics for any given document and to control the distribution of words per topic, respectively.

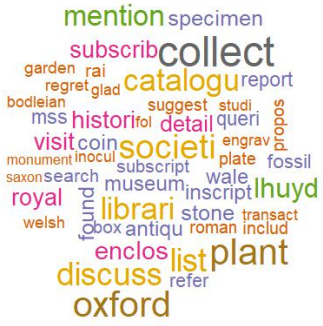
Figure A3: Topic Matrix



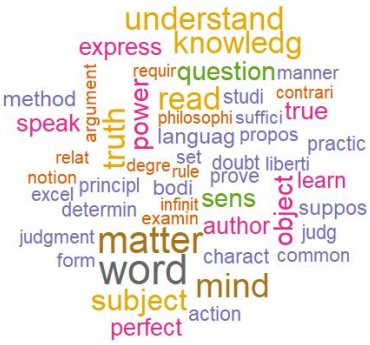
Notes: The matrix displays the 10 keywords with highest weight in defining the 25 topics of the LDA. A lighter color is assigned to keywords with lower weight. Source: own elaborations over the text of 31,069 letters from EMLO and EE.

Finally, we group together topics that pertain to the same macro-topic. Below we present the wordcloud of each topic and a short summary of the content of the topic based on the 30 documents with the highest gamma for that topic. The summaries and the classification into macro-topics were done using Chat GPT 5.1. In particular, for each topic, we submitted to the LLM the following prompt *"I am giving you the text of a series of letters. Abstracting from authors/recipients, please summarize the content of the text in one paragraph. Then, explain in a second paragraph whether the content pertains more to one of the following 5 macro-topics: (1) knowledge; (2) religion; (3) politics; (4) ordinary life matters (i.e.: health, finances, work); or (5) academic gossip."*, followed by the text of the 30 documents with the highest gamma in that topic.

Figure A4: Wordclouds Macro-Topic Knowledge



(a) Topic 1: "Cataloguing"



(b) Topic 5: "Understanding"



(c) Topic 6: "Literature"



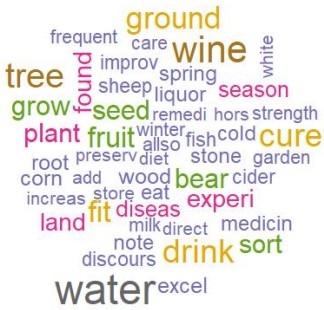
(d) Topic 11: "Experimenting"



(e) Topic 14: "Publishing"



(f) Topic 17: "Pansophia"



(g) Topic 23: "Practical Knowledge"

Notes:

Summary of Topic 1 – "Cataloguing": This collection of letters is an extensive exchange among naturalists, antiquaries, philologists, and members of the Royal Society in the late 17th and early 18th centuries. The writers report fossil discoveries, mineral specimens, plant collections, shell catalogues,

and observations gathered during field travels across England, Wales, and beyond; they discuss proposed publications on fossils, natural histories, plant anatomy, and regional floras; they describe museums, collections, rare books, and newly printed scientific works; and they request specimens, manuscripts, linguistic materials, and antiquarian information. Many letters include very detailed descriptions of local geology, botany, zoology, coins, inscriptions, manuscript sources, and etymologies. At the same time, they comment on scholarly disputes, printing delays, library fires, and the activities of various learned societies.

Summary of Topic 5 – "Understanding": The letters you provided form a vast, intellectually dense correspondence focused almost entirely on philosophical analysis. The writers debate at length the nature of mind, will, liberty, cognition, ideas, extension, matter, immaterial substance, God, and the unity of God. They examine questions such as whether thinking can be a property of matter, how language and perception work, whether brutes think, whether space and extension are real, how free will should be defined, and how certainty arises in human understanding. Much of the material consists of elaborate argument, rebuttal, clarification, definitional refinement, and commentary on one another's treatises (including Locke, Descartes, Norris, Episcopius, and others). The letters also include meta-discussion on method—how to order thoughts, how to conduct meditation, how to classify natural history, and how to construct or revise philosophical works—along with occasional practical remarks about manuscripts, publishing, and personal health.

Summary of Topic 6 – "Literature": The text you provided is an extensive series of 18th-century letters filled with poetry (both original and translated), literary criticism, discussions of dramatic works, aesthetic theory, and commentary on theatrical performances. The correspondents exchange drafts of odes, elegies, choruses, and translations, critique each other's verses line by line, debate prosody and diction, and report on plays, actors, operas, and books. They comment on architecture, landscape, painting, antiquities, and occasionally on local news, travel impressions, weather, gardening notes, and social anecdotes. Interwoven are personal remarks on friendships, health, and daily life, but the core of the correspondence is a continuous dialogue about literature—poetic composition, artistic judgment, and the evaluation of contemporary and classical works.

Summary of Topic 11 – "Experiments": The letters you provide form an immense, wide-ranging body of seventeenth- and eighteenth-century correspondence concerned almost entirely with scientific, philosophical, alchemical, medical, and natural-historical investigations. Across hundreds of pages, the writers describe speculative theories of matter and ether; optical, mechanical, and astronomical problems; the tides, gravity, pendulum isochronism, magnetism, and the vacuum; chemical theories about salts, solvents, "alcahest," alchemical mercury, metallurgical transmutation, and the generation of gems; anatomical dissections (including brains, ears, conjoined twins), physiology, and experimental transfusion of blood between animals; electrical effects, combustion, air chemistry, and maritime meteorology; mining, mineralogy, and natural resources; optical instruments, telescopes, microscopes, burning mirrors, and barometers; and numerous reports of experiments performed for the Royal Society. The letters are

overwhelmingly technical, experimental, speculative, and conceptual—an active exchange of methods, observations, and theories among early modern natural philosophers.

Summary of Topic 14 – "Publishing": The text is an enormous compendium of early-modern scholarly correspondence—thousands of names, titles, and excerpts—centering on the exchange of manuscripts, critical editions, philological notes, emendations, translations, and textual scholarship across Europe. The letters discuss editing Greek and Latin authors (Ignatius, Clement, Theocritus, Menander, Phalaris, Josephus, Callimachus, Theocritus), translating the Bible into numerous languages (Irish, Turkish, Lithuanian, Indigenous American languages), publishing treatises on chronology, ecclesiastical history, chemistry, medicine, astronomy, and antiquities, acquiring manuscripts from libraries across the Continent and the East, and improving scholarly editions through new readings and annotations. They include details about printing problems, amanuenses, booksellers' disputes, manuscript transcription, academic controversies, and highly technical philological debates. Altogether, the collection represents the entire machinery of seventeenth- and eighteenth-century learned communication.

Summary of Topic 17 – "Pansophia": This vast body of correspondence is an early-modern intellectual network in motion: long, dense letters exchanging news, manuscripts, draft treatises, critiques, and practical arrangements surrounding the work of Comenius and other scholars engaged in projects of pansophia, universal language, universal knowledge, pedagogy, mathematics, natural philosophy, alchemy, chemistry, medicine, mechanics, printing, and book distribution. The writers report on the progress of books in press, circulate excerpts, seek funding for collaborators, describe experiments (pyrotechnic, metallurgical, botanical, astronomical), debate the possibility of perpetual motion or the philosopher's stone, evaluate mathematical methods (analysis, algebra, optics, memory arts), discuss proposed reforms of learning and universal systems of knowledge, and report on scholarly reputations and patronage. Scattered through the letters are references to political events (peace treaties, wars), practical travel and health difficulties, and interpersonal frictions, but their center of gravity is the cooperative—and sometimes contentious—intellectual labor of producing, evaluating, and disseminating ambitious scholarly and scientific works.

Summary of Topic 23 – "Practical Knowledge": This extraordinarily long series of letters is a vast compendium of practical agricultural, horticultural, botanical, medical, and household knowledge, written in an instructive and experimental spirit. The writer records detailed observations on producing high-quality cider and perry; managing orchards, grafting, soils, and fertilizers; raising goats, sheep, and cattle; preventing livestock diseases; cultivating grains, beans, and New World crops; malting maize; brewing beer; and improving land with irrigation, tree-planting, and new crops. Interwoven are long digressions on the medical uses of herbs, dietary practices, cures for fevers, wounds, ulcers, gout, scurvy, and other ailments; reflections on climate, air, early modern science, and natural philosophy; notes on beekeeping, fishponds, pearls, and shellfish; and occasional moral or religious commentary. Overall, the letters form an encyclopedic manual of rural improvement, experimental husbandry, and vernacular science, aimed at

increasing the wealth, health, and self-sufficiency of England through empirical trial, observation, and the circulation of practical knowledge.

Figure A5: Wordclouds Macro-Topic Ordinary Life



(a) Topic 10: "Business"



(b) Topic 15: "Child-rearing"



(c) Topic 16: "Romantic relationships"



(d) Topic 18: "Real Estate"



(e) Topic 19: "Patrons"



(f) Topic 21: ""



(g) Topic 22: ""



(h) Topic 24: ""

Notes:

Summary of Topic 10 – "Business": This enormous collection of letters brings together several quite different kinds of material, but the dominant themes are practical administration, finance, trade, and monetary policy. The first group consists of detailed reports on clergy serving in various Irish parishes

under Robert Boyle's impropriations—listing ministers, their reputations, stipends, living conditions, and distributions of charitable payments to vicars and widows. Other large sections concern mercantile correspondence from Virginia and the Chesapeake, describing tobacco shipments, freight arrangements, accounts of sales, debts, bills of exchange, shipping schedules, and proposals for more efficient trading partnerships. A major additional component comprises extensive financial and political discussions about the re-coinage crisis in England: debates on clipped money, milled money, legal provisions, proposals for new forms of token currency, and plans for large-scale public fundraising by new coin issues. Interspersed are accounts from New England about expenditures on missionary work among Indigenous communities, and one highly technical treatise on calculating population and life-expectancy from bills of mortality. Overall, the entire corpus revolves around managing money, labour, resources, and trade across parishes, colonies, and the English state.

Summary of Topic 15 – "Child-rearing": This immense collection of letters revolves almost entirely around the practical, moral, intellectual, and emotional guidance exchanged among friends, parents, tutors, and correspondents, with John Locke at the center of many of them. The bulk of the material concerns child-rearing, pedagogy, discipline, health, study habits, moral formation, travel, tutors, domestic concerns, and the daily challenges of educating and shaping a young gentleman. Alongside this run extensive personal letters on friendship, feelings, quarrels, reconciliation, health updates, household logistics, book shipments, and intellectual projects. Though the tone often reflects philosophical thinking (especially Locke's educational theory), the content is rooted in the practicalities of managing children's tempers, hiring tutors, arranging studies, handling illnesses, maintaining friendships, and navigating everyday difficulties. It is an archive of intimate, domestic, and educational correspondence rather than formal treatises or public affairs.

Summary of Topic 16 – "Romantic relationships": This extraordinarily long corpus consists almost entirely of intensely emotional, intimate, and often feverishly sentimental letters—chiefly Laurence Sterne's—to Eliza Draper, together with a handful of unrelated contemporary letters of friendship, mourning, or patronage. Sterne's letters form a sustained diary-like outpouring of longing, jealousy, illness, eroticized devotion, physical suffering, domestic stress, and imaginative fantasies of future reunion. They detail his daily movements, fevers, bleeding episodes, melancholia, dreams, social visits, literary work, and above all his obsessive attachment to Eliza during her voyage to India. Interwoven are occasional domestic updates, quarrels with his wife, practical travel logistics, literary gossip, and reflections on moral conduct, but the overwhelming tone is that of private passion and personal distress. Added letters by other authors (including Swift's correspondents) similarly concern friendship, sickness, bereavement, and emotional support. Overall, the compilation is a record of personal feeling, interpersonal bonds, physical ailments, and social anxieties rather than public affairs or intellectual argument.

Summary of Topic 18 – "Real Estate": These letters form a long-running, highly detailed exchange between rural kin about the management of a landed estate—its rents, tenants, repairs, taxes, arrears,

leases, lifehold interests, coal-work contracts, legal disputes, and the sale or renewal of lives in copyhold properties. The correspondents track who has paid and who is behind; report tenants' poverty, illnesses, misbehavior, or insolvency; describe the condition of houses, wells, barns, and fields; negotiate abatements, arrears, distraints, lawsuits, and distraints for rent; debate how to handle coal seams, pit-filling obligations, and the sale of small parcels; and discuss the difficulty of raising rents in hard times. They also relay family news—illnesses, deaths, childbirth, travel plans—and occasionally request prayers or moral support. Throughout, the letters revolve around settling accounts, transmitting money, drafting and sealing leases, and deciding how best to preserve the estate's value and manage financially stressed tenants.

Summary of Topic 19 – "Patrons": These letters consist largely of supplicatory, deferential, and often intimate communications to aristocratic patrons—especially a duchess and several political grandees—mixing requests for employment or preferment, explanations of delays, apologies, and updates about health, travel, and family matters. Several correspondents describe their own illnesses, financial anxieties, clerical duties, and domestic constraints, while also managing introductions, seeking patronage for dependents, and commenting on local events or scandals. Some letters involve Daniel Defoe reporting on covert political work he performed for ministers, his involvement in managing periodicals for the government, and his efforts to avoid prosecution or obtain pardon. Interwoven through the corpus are accounts of social visits, literary chatter, worries about reputation, negotiations for church appointments, and details of daily life. Overall, the letters depict a world of patronage, personal entreaty, social maneuvering, and the maintenance of relationships through careful, ceremonious correspondence.

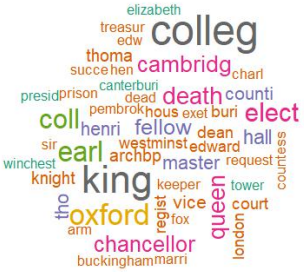
Summary of Topic 21 – "Finances": The letters form an extended, intimate correspondence almost entirely concerned with managing money, property, and household logistics. The writers coordinate mortgages, bonds, interest payments, exchequer notes, tallies, investments, loans, and securities; arrange the transport of clothes, furniture, books, wine, fruit, medicines, and tools by carriers; track debts owed by tenants and acquaintances; and discuss the handling of legal instruments, witnesses, and trust declarations. They update one another on illnesses, travel plans, household needs, servants' errands, and the movement of family members and tutors. Interwoven are occasional mentions of neighbors, merchants, tailors, attorneys, and physicians; expressions of gratitude and affection; health reports (especially concerning lung disease); and practical instructions for supervising children, arranging visits, and coordinating repairs and purchases. Above all, the correspondence is a record of daily financial administration, domestic care, and personal assistance between closely connected relatives.

Summary of Topic 22 – "Friendship": This large body of letters consists mainly of warm, playful, and sometimes teasing correspondence among close literary friends—figures circulating in the social orbit of Swift, Pope, Gay, and the Duchess and Duke of Queensberry. The writers discuss personal finances (South Sea bonds, remittances, investments), health, travel plans, invitations to country houses, and day-to-day life in court and country. They recount news about shared acquaintances, literary projects (such as fables, translations, and forthcoming publications), and light gossip about poets, patrons, and fashionable society.

Much of the tone is intimate, humorous, and affectionate: letters plead for replies, lament the absence of friends, share jokes, mock each other's habits, and report on small domestic or social events. Although money and health appear repeatedly, the correspondence is dominated by lively commentary on the literary world, mutual acquaintances, and the informal politics of patronage.

Summary of Topic 24 – "Travels": This very large collection of letters is an 18th-century family and social correspondence filled with travel updates, household logistics, family news, college life, errands, illnesses, visiting arrangements, plans for journeys, favors requested, and observations about weather, roads, servants, and acquaintances. Parents and children exchange reports about health and conduct; students describe their life at Oxford or Cambridge, their studies, professors, and peers; relatives coordinate visits, lodging, transport, parcels, and money; friends recount social calls, dinners, concerts, and gossip about local personalities; and travelers narrate their routes, mishaps, and impressions of towns, estates, and landscapes. Occasional political events (e.g. the Queen's illness or the coming succession) appear, but only as background to personal concerns. Overall, the correspondence is an intimate mixture of domestic detail, social scheduling, family relationships, and everyday practical matters.

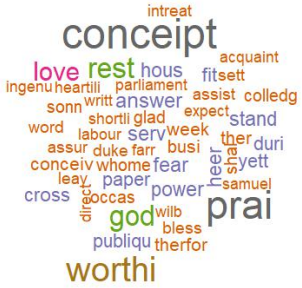
Figure A6: Wordclouds Macro-Topic Politics



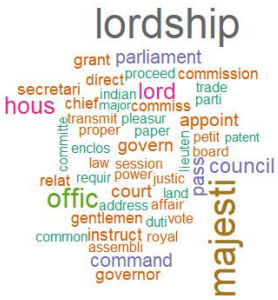
(a) Topic 2: "Court"



(b) Topic 3: "Military"



(c) Topic 8: "Civil War"



(d) Topic 13: "Colonies"

Notes: .

Summary of Topic 2 – "Court": These letters are a dense run of early-modern court and state news: who is in or out of royal favour, who is promoted, fined, imprisoned, or released, and how great offices, titles, and benefices are shuffled. They report on royal progresses, ambassadorial comings and goings, disputed marriages and divorces, the Spanish and French matches, the tensions with the Dutch, and the treatment of Catholics and recusants. There are details of peerage creations, knighthoods, purchases and sales of offices, quarrels and duels among nobles, the fate of prominent prisoners (Coke, Somerset, Northumberland, Oxford, etc.), the financial hunger of the crown and the tricks by which money is raised, debates around Parliament and elections, and even the ceremonial protocols and fees of funerals and the Order of the Garter. Mixed in are notes on sermons, censorship, riots, epidemics, and a few Quaker imprisonments, but always as they intersect with authority and control.

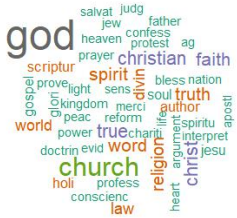
Summary of Topic 3 – "Military": This immense body of letters is a continuous stream of military, diplomatic, and political intelligence drawn from across Europe and the Americas. It reports troop movements, sieges, battles, defections, alliances, naval expeditions, and wars involving Spain, France, the

Dutch Republic, the Holy Roman Empire, Sweden, Poland, Denmark, Portugal, and the Ottoman world. The letters also describe negotiations between courts, dispatches between ambassadors, concerns over neutrality, preparations for campaigns, and fears of invasion. Some passages note the behaviour of ministers, the exchange of diplomats, proclamations of war, grievances over piracy, and the administration of colonies. Mixed in are occasional snippets of personal contact—illnesses, delays, reading of theological works, and requests for books—but these are secondary to the ceaseless flow of international strategic news.

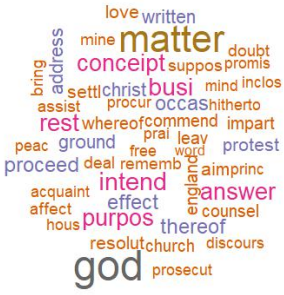
Summary of Topic 8 – "Civil War": This immense correspondence is a dense mixture of political analysis, religious argument, scientific and technical speculation, and social agitation written in the mid-seventeenth century. The writers debate the English Civil War and Commonwealth—disputes between Presbyterians and Independents, the authority of Parliament, the militia, the "negative voice" of king and lords, Scottish politics, army governance, taxation, and constitutional legitimacy. At the same time, they discuss universal languages, printing reform, chemistry and alchemy (Glauber, Helmont, furnaces, "elixirs," composts, perpetual motion), agricultural inventions, drainage, plough design, saltpeter manufacture, and schemes for national improvement. They also reflect on ecclesiastical questions: ministry, liberty of conscience, persecution, church unity, and the role of figures like Dury. Interwoven with these are personal matters—money worries, health, travel, books, and mutual favours—but the letters remain fundamentally programmatic and argumentative, trying to shape public policy, intellectual projects, and church settlement.

Summary of Topic 13 – "Colonies": The text consists of a large set of official royal and colonial administrative documents from the mid-18th century, including orders in council, instructions from the Crown to the Board of Trade, and letters patent appointing or re-appointing various officials in the colony of Virginia (naval-office clerks, attorneys general, governors' correspondents). The materials outline the Crown's policies for governing and regulating the American colonies—especially centralizing correspondence, supervising appointments, managing land grants, and overseeing relations with Indigenous nations. Several letters from the Virginia governor describe practical governance problems, including how to apply the King's Proclamation to earlier land grants, how to handle settlements west of the Alleghenies, how to interpret treaties with Native nations, and how to respond to conflicts on the frontier. Overall, the documents detail the machinery of imperial governance, administrative procedure, and colonial territorial management.

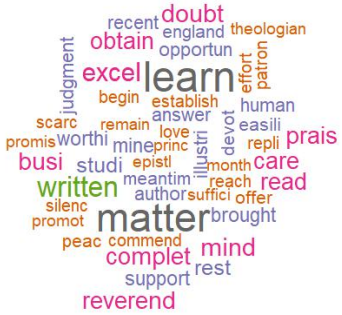
Figure A7: Wordclouds Macro-Topic Church



(a) Topic 7: "Doctrines"



(b) Topic 12: "Protestant Unity 1"



(c) Topic 20: "Protestant Unity 2"



(d) Topic 25: "Religious controversy"

Notes: .

Summary of Topic 7 – "Doctrines": The text is a vast compilation of 17th-century theological letters, treatises, debates, and polemical exchanges. The writers engage in dense, technical argument about Christian doctrine—especially disputes between Protestants and Roman Catholics over the nature of the true Church, its visibility, infallibility, and authority; controversies about faith, justification, salvation, sacraments, and scripture; the meaning of prophecy, miracles, dreams, and divine revelation; debates with Jews about the Messiah; disputes about heresy, church discipline, predestination, the Trinity, the priesthood of Christ, and the interpretation of scripture. Mixed in are examples of moral and spiritual guidance, reflections on ecclesiastical disorder, descriptions of heresy trials, the Inquisition, providential signs, and correspondence about personal faith struggles. Throughout, the text is overtly theological, argumentative, and steeped in doctrinal controversy.

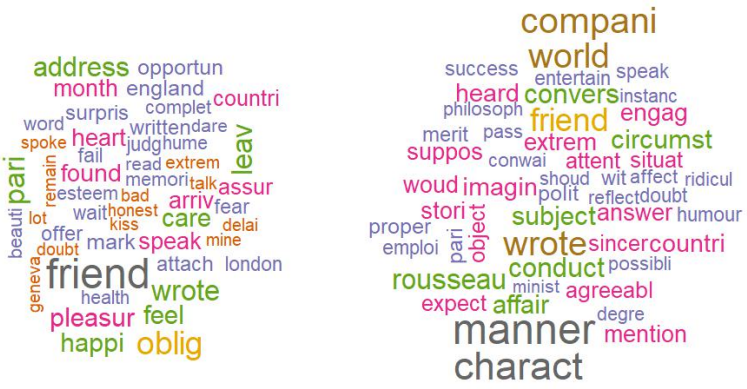
Summary of Topic 12 – "Protestant Unity 1": This very large corpus of letters revolves almost entirely around efforts to achieve ecclesiastical peace and unity among Protestant churches during the seventeenth century, especially through the negotiating travels, theological consultations, and political manoeuvring

of the writer (John Dury). The correspondence records his journeys through German principalities, Switzerland, the Netherlands, and Scandinavia; his conferences with Lutheran and Reformed divines; his attempts to reconcile doctrinal disputes; his dealings with princes, magistrates, ambassadors, and synods; and his constant appeals for books, financial support, and political backing. The letters are filled with reflections on conscience, vocation, spiritual duty, church discipline, sacraments, catechesis, synods, covenants, and the theological foundations of peace. They also contain extended analyses of Protestant relationships to kings, parliaments, and foreign states; discussions of the English Civil War, the Scottish Covenant, and the moral legitimacy of political actions; accounts of personal poverty and practical struggles; and elaborate plans for forging international Protestant correspondence.

Summary of Topic 20 – "Protestant Unity 2": This enormous corpus is a dense, decades-spanning exchange among theologians, scholars, reformers, and intermediaries across Protestant Europe, chiefly concerning church unity, doctrinal controversies, ecclesiastical politics, and scholarly collaboration. The letters address in detail attempts to reconcile Lutherans and Reformed churches; proposals for irenic colloquies; appeals to princes and synods; discussions of Nestorianism, Eutychianism, predestination, the Eucharist, church discipline, confessional identity, and the authority of early councils; and extensive negotiation over who should mediate, write, edit, or sponsor treatises intended to promote concord. The core and constant preoccupation is ecclesiastical: doctrinal controversy, Protestant reconciliation, the Inquisition, patristic authority, synods, church governance, confessional conflict, and the theological basis of unity. The defining thread is the pursuit, defense, and reform of religious doctrine and ecclesiastical peace.

Summary of Topic 25 – "Religious controversy": This corpus consists of a dense series of letters and memoranda from the early-18th-century Nonjuring world, almost entirely occupied with intra-church disputes, doctrinal controversy, liturgical usages, ecclesiastical discipline, and the troubled efforts to negotiate union between various factions of English and Scottish Nonjurors. The writers argue at great length about the legitimacy of episcopal orders, the validity of sacraments, the "usages" controversy (mixture, oblation, invocation, prayers for the dead), accusations of schism, praemunire, and the authority of canons; they examine historical church practices, the writings of fathers and Anglican divines, and debate the interpretation of documents, liturgies, and legal precedents. They recount quarrels among prominent Nonjurors (e.g., Laurence, Deacon, Smith, Gandy, Griffin, Collier, Lothian), discuss accusations, misunderstandings, excommunications, and failed attempts at reunion; they review the theological claims of Waterland, Johnson, Potter, Hickes, Bingham, and others; and they offer long historical and legal arguments about episcopal ordination, lay baptism, the Scottish church, and the rights of patrons. In short, the letters are an intricate record of doctrinal polemic, ecclesiastical law, liturgical theory, and Nonjuring church politics.

Figure A8: Wordclouds Macro-Topic Academic Gossip



(a) Topic 4: "Gossip 1"

(b) Topic 9: "Gossip 2"

Notes: .

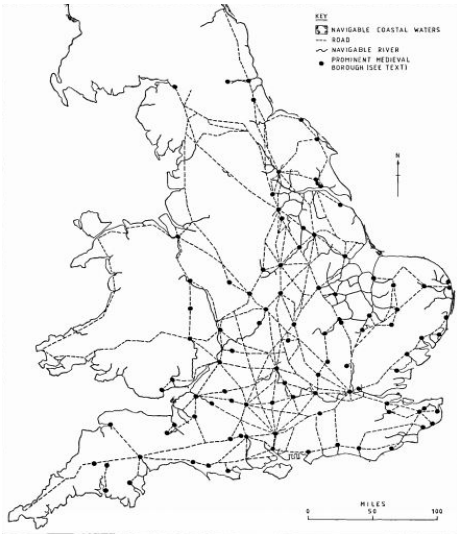
Summary of Topic 4 – "Gossip 1": This long series of letters is an intensely personal, emotional, and often anguished account of a catastrophic rupture between two former friends—most recognizably Jean-Jacques Rousseau and David Hume—told from Rousseau's perspective. The correspondence details his travels to England, his initial gratitude for hospitality, and then his growing suspicion that Hume and Hume's circle were secretly defaming him, tampering with his mail, betraying his trust, manipulating public opinion, and conspiring with Rousseau's enemies in Paris and Geneva. The letters recount misunderstandings, accusations, denials, and desperate attempts to clarify dates, facts, and intentions. They are filled with Rousseau's reflections on persecution, reputation, friendship, memory, illness, emotional turmoil, and the misery of exile. Alongside this central conflict, the letters also discuss practical matters—money, housing, books and manuscripts, correspondence routes, travel hazards, health issues, and mutual acquaintances—while revealing the psychological breakdown of trust between the correspondents.

Summary of Topic 9 – "Gossip 2": This corpus of letters recounts, in obsessive detail, the dramatic personal rupture between David Hume and Jean-Jacques Rousseau in 1766–67, narrated primarily from Hume's perspective. The letters describe Rousseau's increasingly erratic behavior—his flight from hosts, accusations of conspiracies, complaints of persecution, contradictory statements, emotional outbursts, wild letters to ministers, and fabricated suspicions—alongside Hume's own attempts to manage Rousseau's pension, housing, reputation, and mental state. The correspondence also includes Hume's explanations and self-defense to friends in Paris, reflections on gossip circulating in France and England, and lengthy accounts of Rousseau's letters, memoirs, and accusations. Interspersed are unrelated letters from Lord Chesterfield to his son, offering instruction on manners, worldliness, and social conduct. Overall the material is an extended narrative of interpersonal conflict, public scandal, character assassination, and the emotional and reputational fallout surrounding Rousseau's stay in Britain.

A.3 Details on Other Variables

Medieval Routes. We georeference the map of the transport system of medieval England and Wales from Edwards (1987) (see Figure A9). Geo-referentiation is done using the ”Thin Plate Spline (TPS)” transformation and the ”nearest neighbour” resampling method. Lines connecting points have been created through a MultiLineString by writing a CSV file where we listed each segment connecting starting and ending points.

Figure A9: Transport System of Medieval England and Wales



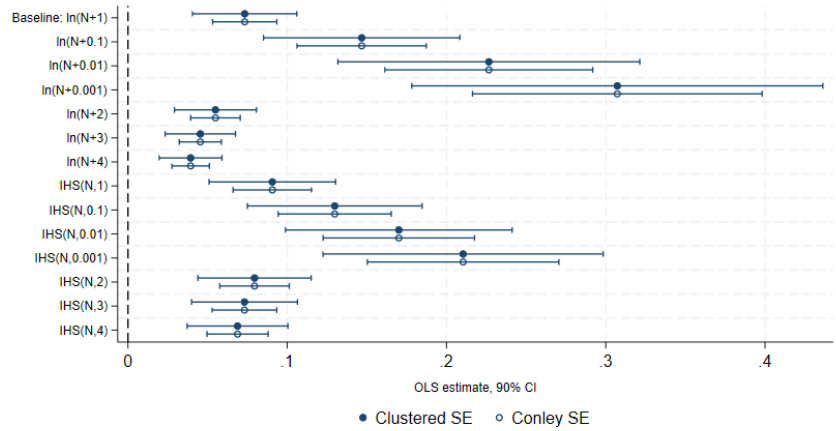
(a) Original Map

Notes: The source is Edwards (1987).

B Robustness Checks

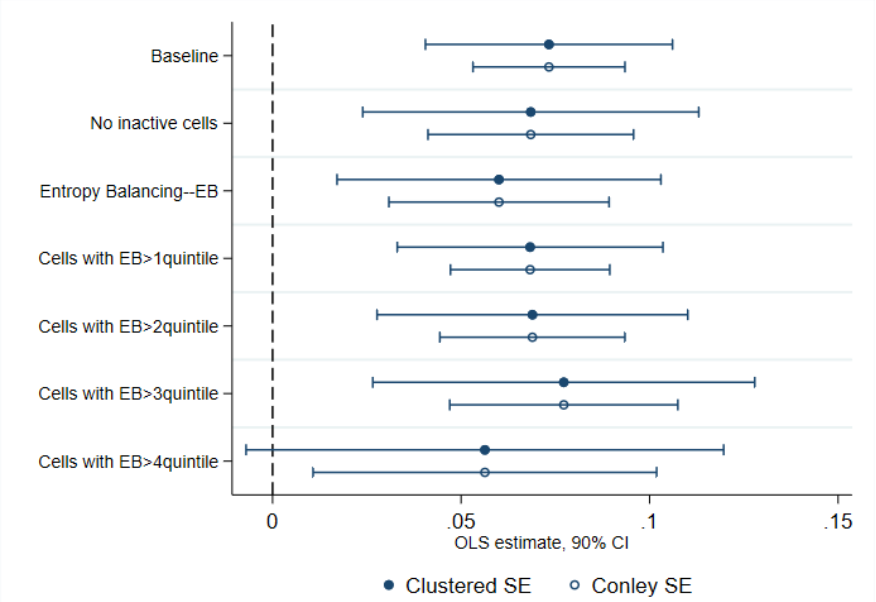
B.1 Presence of a Postal Stage

Figure B1: Presence of Postal Stage and Intensity of Correspondence, Different Transformations of the Dependent Variable



Notes: Each dot represents the OLS-estimated coefficient of the indicator variable *Stage Dummy*$_{it}$ from Equation (1), using the specification in Column 5 of Table 1. *N* indicates the total number of letters sent from and received in each grid cell in a given decade. 90% confidence intervals based on standard errors clustered by grid cell (filled marker) or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space, empty marker) are reported.

Figure B2: Presence of Postal Stage and Intensity of Correspondence, Different Samples



Notes: Each dot represents the OLS-estimated coefficient of the indicator variable *Stage Dummy*$_{it}$ from Equation (1), using the specification in Column 5 of Table 1. 90% confidence intervals based on standard errors clustered by grid cell (filled marker) or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space, empty marker) are reported.

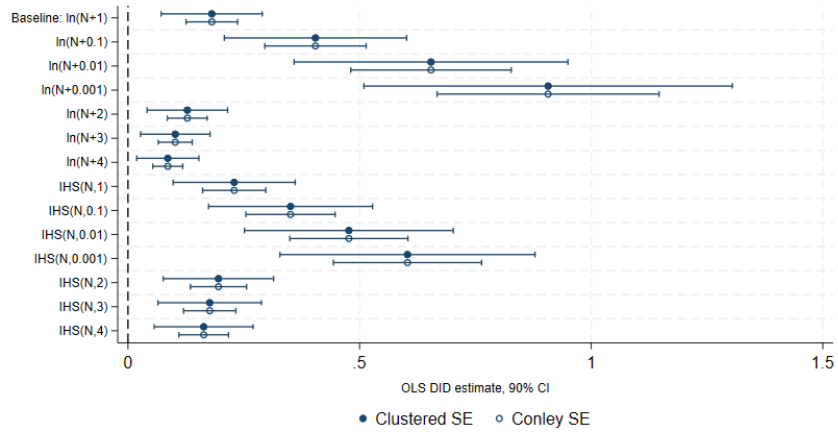
Table B1: Presence of Postal Stage and Intensity of Correspondence, Robustness Checks

Dependent Variable	Log All Letters			
	No London grid cell	No Letters to/from London	No top-15 correspondents	Oxford/Cambridge with stage
	(1)	(2)	(3)	(4)
Stage dummy	0.074	0.075	0.041	0.067
	(0.020)***	(0.020)***	(0.014)***	(0.020)***
	[0.012]***	[0.012]***	[0.010]***	[0.012]***
Decade FE	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓
Stage Dummy × Civil War Dummy	✓	✓	✓	✓
N. Clusters	2,763	2,764	2,764	2,764
N. Observations	55,260	55,280	55,280	55,280
Adj. R-Squared	0.368	0.368	0.443	0.423
Mean of DV	0.092	0.092	0.069	0.095

Notes: OLS estimates. Observations are grid cells observed in each decade from 1570 to 1769 in all columns except Column 1 in which the sample excludes the cell hosting the London General Post Office. In each specification the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one), except Column 2 (where the dependent variable is computed excluding all letters sent to and received from London) and Column 3 (in which the dependent variable is computed excluding letters sent to o received from the top-15 correspondents). The explanatory variable *Stage Dummy*$_i t$ equals one if the grid cell i includes at least one postal stage in decade t, and zero otherwise. In Column 4 the grid cells including Oxford and Cambridge are recoded as always having a postal stage. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<$10%, ** = p-value $<$5%, *** = p-value $<$1%.

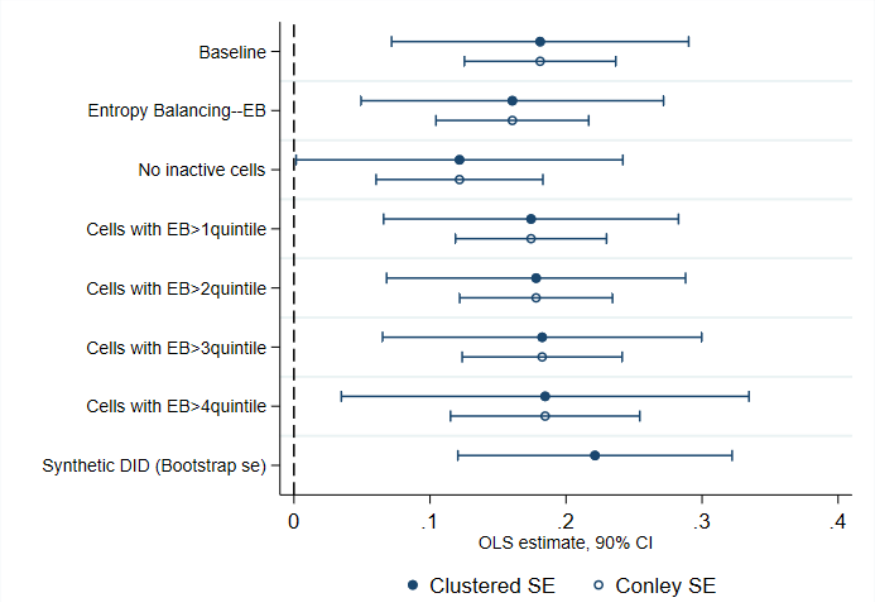
B.2 Main Difference-in-Differences Analysis

Figure B3: Effect of the 1635 Reform on Intensity of Correspondence, Different Transformations of the Dependent Variable



Notes: Each dot represents the OLS-estimated coefficient of the interaction term *Stage Dummy 1620*$_i$ $\times$ *Post-1635*$_t$ from Equation (2), using the specification in Column 5 of Table 2. *N* indicates the total number of letters sent from and received in each grid cell in a given decade. 90% confidence intervals based on standard errors clustered by grid cell (filled marker) or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space, empty marker) are reported.

Figure B4: Effect of the 1635 Reform on Intensity of Correspondence, Different Samples



Notes: Each dot represents the OLS-estimated coefficient of the interaction *Stage Dummy 1620* × *Post-1635* from Equation (2), using the specification in Column 5 of Table 2. 90% confidence intervals based on standard errors clustered by grid cell (filled marker) or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space, empty marker) are reported.

Table B2: Effect of the 1635 Reform on Intensity of Correspondence, Robustness Checks

Dependent Variable	Log All Letters				
	No London grid cell	No Letters to/from London	No top-15 correspondents	Oxford/Cambridge with stage	w/in 10 miles to postal stage
	(1)	(2)	(3)	(4)	(5)
Stage Dummy 1620 × Post-1635	0.176	0.170	0.153	0.181	0.181
	(0.067)***	(0.066)**	(0.049)***	(0.066)***	(0.066)***
	[0.034]***	[0.034]***	[0.028]***	[0.034]***	[0.034]***
Decade FE	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓	✓
Stage Dummy × Civil War Dummy	✓	✓	✓	✓	✓
N. Clusters	2,763	2,764	2,764	2,764	2,764
N. Observations	55,260	55,280	55,280	55,280	55,280
Adj. R-Squared	0.368	0.368	0.444	0.423	0.423
Mean of DV	0.092	0.092	0.069	0.095	0.095

Notes: OLS estimates. Observations are grid cells observed in each decade from 1570 to 1769 in all columns except Column 1 in which the sample excludes the cell hosting the London General Post Office. In each specification the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one), except Column 2 (where the dependent variable is computed excluding all letters sent to and received from London) and Column 3 (in which the dependent variable is computed excluding letters sent to o received from the top-15 correspondents). The explanatory variable *Stage Dummy 1620* × *Post-1635* equals one in all grid cell containing at least one postal stage in 1628 in each decade from 1630 onwards, and zero otherwise. In Column 4 the grid cells including Oxford and Cambridge are recoded as having a postal stage before 1635, while in Column 5 the variable $Stage\ Dummy\ 1620_i$ equals one in all grid cells-decade in which the centroid of the cell is within 10 miles from a postal stage in 1628. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value <10%, ** = p-value <5%, *** = p-value <1%.

Table B3: Effect of the 1635 Reform on Intensity of Correspondence, Post-1635 = 1 from Decade 1640 Onwards

Dependent Variable	Log All Letters				
	(1)	(2)	(3)	(4)	(5)
Stage Dummy 1620 × Post-1635	0.240	0.221	0.204	0.199	0.178
	(0.061)***	(0.063)***	(0.062)***	(0.062)***	(0.066)***
	[0.031]***	[0.032]***	[0.032]***	[0.032]***	[0.033]***
Decade FE	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE		✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE			✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE				✓	✓
Stage Dummy 1620 × Civil War Dummy					✓
N. Clusters	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.416	0.420	0.421	0.423	0.423
Pre-1640 Mean of DV	0.037	0.037	0.037	0.037	0.037

Notes: OLS estimates. Observations are grid cells in each decade from 1570 to 1769. In each specification the dependent variable is the log of (one plus) the total number of letters sent from and received in each grid cell in a given decade. The interaction variable *Stage dummy 1620 × Post-1635* equals one in all grid cells containing at least one postal stage in 1610 in each decade from 1640 onwards, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value <10%, ** = p-value <5%, *** = p-value <1%.

Table B4: Effect of the 1635 Reform on Intensity of Correspondence Exploiting the Full Pre-1635 Postal Network

Dependent Variable	Log All Letters				
	(1)	(2)	(3)	(4)	(5)
Stage Dummy Pre-1635 × Post-1635	0.295	0.274	0.259	0.255	0.242
	(0.057)***	(0.058)***	(0.057)***	(0.056)***	(0.058)***
	[0.028]***	[0.028]***	[0.028]***	[0.028]***	[0.028]***
Decade FE	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE		✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE			✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE				✓	✓
Stage Dummy 1620 × Civil War Dummy					✓
N. Clusters	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.417	0.422	0.423	0.424	0.425
Pre-1630 Mean of DV	0.031	0.031	0.031	0.031	0.031

Notes: OLS estimates. Observations are grid cells in each decade from 1570 to 1769. In each specification the dependent variable is the total number of letters sent from and received in each grid cell in a given decade. The interaction variable *Stage dummy Pre–1635 × Post-1635* equals one in all grid cells ever hosting a postal stage before 1635 in each decade from 1630 onwards, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value <10%, ** = p-value <5%, *** = p-value <1%.

B.3 Main IV Analysis

Table B5: Effect of the 1635 Reform on Intensity of Correspondence, IV Results

Dependent Variable	Log All Letters		Stage Dummy 1620 × Post-1635		Log All Letters	
	(1)	(2)	(3)	(4)	(5)	(6)
Ln Distance Least-Cost Path × Post-1635	-0.036	-0.035	-0.045	-0.043		
	(0.006)***	(0.006)***	(0.005)***	(0.005)***		
	[0.005]***	[0.005]***	[0.001]***	[0.001]***		
Stage Dummy 1620 × Post-1635					0.804	0.810
					(0.151)***	(0.158)***
					[0.102]***	[0.107]***
Decade FE	✓	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE		✓		✓		✓
Log Dist. to Historical Routes × Decade FE		✓		✓		✓
Log Dist. to Medieval Boroughs × Decade FE		✓		✓		✓
Stage Dummy 1620 × Civil War Dummy		✓		✓		✓
N. Clusters	2,764	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.415	0.416	0.709	0.722	-0.015	-0.015
Kleibergen-Paap Wald F-Statistic			72.675	72.010		

Notes: OLS (Columns 1-4) and 2SLS (Columns 5-6) estimates. Observations are grid cells in each decade from 1570 to 1769. In Columns 1, 2, 5 and 6 the dependent variable is the log number of letters sent from and received in each cell in a given decade (plus one). In Columns 3 and 4 the dependent variable is the interaction term *Stage dummy 1620 × Post-1635*, equal to one in in all grid cell containing at least one postal stage in 1628 in each decade from 1630 onwards, and zero otherwise. The indicator *Stage dummy 1620* is instrumented with the distance from a predicted least-cost-path network (see Data Appendix A.1 for more details). Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<10\%$, ** = p-value $<5\%$, *** = p-value $<1\%$.

B.4 Presence of Postal Stage and Effect of the 1635 Reform on Intensity of Correspondence by Occupation of Correspondents

Table B6: Presence of Postal Stage and Intensity of Correspondence by Occupation of Correspondents – Correlational Evidence

Dependent Variable	Log 1 SCH	Log SCH ↔ SCH	Log SCH ↔ STATE	Log SCH ↔ II	Log SCH ↔ PBT	Log SCH ↔ RELI	Log SCH ↔ OTHER	Log SCH ↔ PSI
	(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stage Dummy	0.083	0.049	0.016	0.022	0.038	0.033	0.035	0.049
	(0.017)***	(0.013)***	(0.009)*	(0.009)**	(0.010)***	(0.012)***	(0.008)***	(0.014)***
	[0.011]***	[0.008]***	[0.006]***	[0.006]***	[0.006]***	[0.007]***	[0.007]***	[0.008]***
Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Stage Dummy × Civil War Dummy	✓	✓	✓	✓	✓	✓	✓	✓
N. Clusters	2,764	2,764	2,764	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.379	0.402	0.376	0.409	0.352	0.390	0.348	0.380
Mean of DV	0.068	0.032	0.022	0.015	0.023	0.030	0.025	0.040

Notes: OLS estimates. Observations are grid cells in each decade from 1570 to 1769. In each specification the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one), of which either the sender or the recipient (or both) were scholars (Column 1), or both were a scholar (Column 2). In Columns 3 to 8 the dependent variable is the log number of incoming and outgoing letters in each grid cell-decade (plus one), respectively, involving the following bilateral flows: scholars–SCH and statesmen–STATE (column 4), scholars and the information industry–II (column 5), scholars and practitioners–PBT (column 6), scholars and clergy–RELI (column 7), scholars and uncategorised people (column 8), and scholars and professionals (practitioners, statesmen, and the information industry, column 9). The explanatory variable *Stage dummy*$_{it}$ equals one if the grid cell i includes at least one postal stage in decade t, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<10\%$, ** = p-value $<5\%$, *** = p-value $<1\%$.

Table B7: Effect of the 1635 Reform on Intensity of Correspondence by Occupation of Correspondents – DID Evidence

Dependent Variable	Log 1 SCH	Log SCH ↔ SCH	Log SCH ↔ STATE	Log SCH ↔ II	Log SCH ↔ PBT	Log SCH ↔ RELI	Log SCH ↔ OTHER	Log SCH ↔ PSI
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Stage Dummy 1620 × Post-1635	0.235	0.131	0.102	0.079	0.145	0.109	0.086	0.197
	(0.058)***	(0.040)***	(0.032)***	(0.037)**	(0.046)***	(0.042)**	(0.028)***	(0.050)***
	[0.028]***	[0.020]***	[0.017]***	[0.016]***	[0.019]***	[0.020]***	[0.015]***	[0.023]***
Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Stage Dummy 1620 × Civil War Dummy	✓	✓	✓	✓	✓	✓	✓	✓
N. Clusters	2,764	2,764	2,764	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.379	0.402	0.377	0.410	0.353	0.391	0.347	0.382
Pre-1630 Mean of DV	0.013	0.006	0.005	0.002	0.003	0.007	0.005	0.007

Notes: OLS estimates. Observations are grid cells in each decade from 1570 to 1769. In each specification the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one), of which either the sender or the recipient (or both) were scholars (Column 1), or both were a scholar (Column 2). In Columns 3 to 8 the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one), respectively, from scholars to statesmen (and vice versa), from scholars to people from information industry (and vice versa), from scholars to professionals (and vice versa), from scholars to clergy (and vice versa), and from scholars to uncategorised people (and vice versa), and from scholars to professionals, statesmen, and people from information industry (and vice versa). The explanatory variable *Stage dummy 1620 × Post-1635* equals one in all grid cell containing at least one postal stage in 1628 in each decade from 1630 onwards, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<10\%$, ** = p-value $<5\%$, *** = p-value $<1\%$.

Table B8: Effect of the 1635 Reform on Intensity of Correspondence by Occupation of Correspondents, DV in IHS form

Dependent Variable	IHS(1 SCH)	IHS(SCH ↔ SCH)	IHS(SCH ↔ STATE)	IHS(SCH ↔ II)	IHS(SCH ↔ PBT)	IHS(SCH ↔ RELI)	IHS(SCH ↔ OTHER)	IHS(SCH ↔ PSI)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Stage Dummy 1620 × Post-1635	0.292	0.161	0.124	0.094	0.175	0.133	0.108	0.241
	(0.070)***	(0.047)***	(0.037)***	(0.041)**	(0.052)***	(0.051)***	(0.033)***	(0.059)***
	[0.035]***	[0.024]***	[0.020]***	[0.019]***	[0.023]***	[0.025]***	[0.019]***	[0.028]***
Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Stage Dummy 1620 × Civil War Dummy	✓	✓	✓	✓	✓	✓	✓	✓
N. Clusters	2,764	2,764	2,764	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.362	0.381	0.361	0.392	0.338	0.369	0.326	0.365
Pre-1630 Mean of DV	0.017	0.008	0.007	0.003	0.004	0.008	0.006	0.009

Notes: OLS estimates. Observations are grid cells in each decade from 1570 to 1769. In each specification the dependent variable is the inverse hyperbolic sine transformation of the number of letters sent from and received in each grid cell in a given decade (plus one), of which either the sender or the recipient (or both) were scholars (Column 1), or both were a scholar (Column 2). In Columns 3 to 8 the dependent variable is the inverse hyperbolic sine transformation of the number of letters sent from and received in each grid cell in a given decade (plus one), respectively, from scholars to statesmen (and vice versa), from scholars to people from information industry (and vice versa), from scholars to professionals (and vice versa), from scholars to clergy (and vice versa), and from scholars to uncategorised people (and vice versa), and from scholars to professionals, statesmen, and people from information industry (and vice versa). The explanatory variable *Stage dummy 1620 × Post-1635* equals one in all grid cell containing at least one postal stage in 1628 in each decade from 1630 onwards, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<10\%$, ** = p-value $<5\%$, *** = p-value $<1\%$.

Table B9: Effect of the 1635 Reform on Intensity of Correspondence by Occupation of Correspondents, Excluding Letters Involving Top 15 Correspondents

Dependent Variable	Log 1 SCH	Log SCH ↔ SCH	Log SCH ↔ STATE	Log SCH ↔ II	Log SCH ↔ PBT	Log SCH ↔ RELI	Log SCH ↔ OTHER	Log SCH ↔ PSI
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Stage Dummy 1620 × Post-1635	0.151	0.072	0.061	0.053	0.080	0.072	0.041	0.122
	(0.043)***	(0.027)***	(0.020)***	(0.026)**	(0.030)***	(0.031)**	(0.018)**	(0.033)***
	[0.023]***	[0.015]***	[0.012]***	[0.012]***	[0.014]***	[0.018]***	[0.013]***	[0.017]***
Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Stage Dummy 1620 × Civil War Dummy	✓	✓	✓	✓	✓	✓	✓	✓
N. Clusters	2,764	2,764	2,764	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.421	0.462	0.446	0.447	0.419	0.425	0.390	0.435
Pre-1630 Mean of DV	0.013	0.006	0.005	0.002	0.003	0.006	0.004	0.007

Notes: OLS estimates. Observations are grid cells in each decade from 1570 to 1769. In each specification the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one), of which either the sender or the recipient (or both) were scholars (Column 1), or both were a scholar (Column 2). In Columns 3 to 8 the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one), respectively, from scholars to statesmen (and vice versa), from scholars to people from information industry (and vice versa), from scholars to professionals (and vice versa), from scholars to clergy (and vice versa), and from scholars to uncategorised people (and vice versa), and from scholars to professionals, statesmen, and people from information industry (and vice versa). Letters involving the top 15 correspondents either as sender or recipient are excluded from the sample. The explanatory variable *Stage dummy 1620 × Post-1635* equals one in all grid cell containing at least one postal stage in 1628 in each decade from 1630 onwards, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<10\%$, ** = p-value $<5\%$, *** = p-value $<1\%$.

Table B10: Effect of the 1635 Reform on Intensity of Correspondence by Occupation of Correspondents, IV Results

Dependent Variable	Log 1 SCH	Log SCH ↔ SCH	Log SCH ↔ STATE	Log SCH ↔ II	Log SCH ↔ PBT	Log SCH ↔ RELI	Log SCH ↔ OTHER	Log SCH ↔ PSI
	(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stage Dummy 1620 × Post-1635	0.287 (0.125)** [0.081]***	0.184 (0.090)** [0.057]***	0.127 (0.063)** [0.041]***	0.068 (0.065) [0.035]*	0.170 (0.071)** [0.046]***	0.113 (0.085) [0.048]**	0.040 (0.062) [0.040]	0.255 (0.096)*** [0.061]***
Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Stage Dummy 1620 × Civil War Dummy	✓	✓	✓	✓	✓	✓	✓	✓
N. Clusters	2,764	2,764	2,764	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.020	0.016	0.014	0.018	0.018	0.013	0.010	0.021

Notes: 2SLS estimates. Observations are grid cells in each decade from 1570 to 1769. In each specification the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one), of which either the sender or the recipient (or both) were scholars (Column 1), or both were a scholar (Column 2). In Columns 3 to 8 the dependent variable is the log number of letters sent from and received in each grid cell in a given decade (plus one), respectively, from scholars to statesmen (and vice versa), from scholars to people from information industry (and vice versa), from scholars to professionals (and vice versa), from scholars to clergy (and vice versa), and from scholars to uncategorised people (and vice versa), and from scholars to professionals, statesmen, and people from information industry (and vice versa). The explanatory variable *Stage dummy 1620 × Post-1635* equals one in all grid cell containing at least one postal stage in 1628 in each decade from 1630 onwards, and zero otherwise. The indicator Stage dummy 1620 is instrumented with the distance from a predicted least-cost-path network (see Data Appendix A.1 for more details). Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value <10%, ** = p-value <5%, *** = p-value <1%.

B.5 Presence of Postal Stage and Effect of the 1635 Reform on the Letters' Content

Table B11: Presence of Postal Stage and Intensity of Correspondence by Macro-topic – Correlational Evidence

Dependent Variable	Log Letters				
	Life	Knowledge	Politics	Religion	Gossip
	(1)	(2)	(3)	(4)	(5)
Stage Dummy	0.051	0.035	-0.008	0.001	-0.001
	(0.013)***	(0.009)***	(0.003)***	(0.005)	(0.002)
	[0.008]***	[0.005]***	[0.002]***	[0.003]	[0.001]
Decade FE	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓	✓
Stage Dummy × Civil War Dummy	✓	✓	✓	✓	✓
Avg No. Words and (Avg No. Words)^2	✓	✓	✓	✓	✓
N. Clusters	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.533	0.394	0.442	0.331	0.275
Mean of DV	0.062	0.017	0.005	0.005	0.001

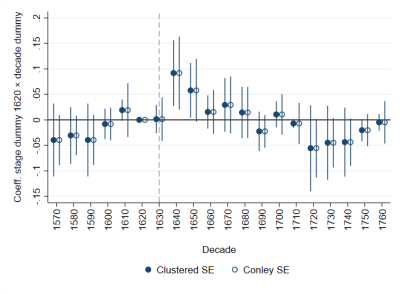
Notes: OLS estimates. Observations are grid cells in each decade from 1570 to 1769. In each specification the dependent variable is the log number of incoming and outgoing letters assigned to the macro-topic indicated in the column title (plus one). The explanatory variable *Stage dummy*$_{it}$ equals one if the grid cell *i* includes at least one postal stage in decade *t*, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<$10%, ** = p-value $<$5%, *** = p-value $<$1%.

Table B12: Effect of the 1635 Reform on Intensity of Correspondence by Macro-topic – DID Evidence

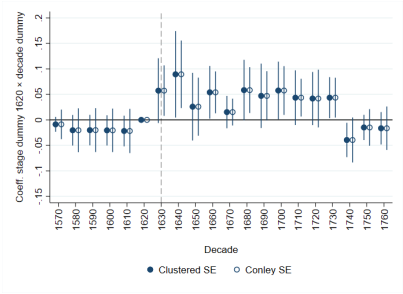
Dependent Variable	Log Letters				
	Life	Knowledge	Politics	Religion	Gossip
	(1)	(2)	(3)	(4)	(5)
Stage Dummy 1620 × Post-1635	0.159	0.083	0.006	0.044	0.022
	(0.047)***	(0.042)**	(0.008)	(0.027)*	(0.025)
	[0.022]***	[0.015]***	[0.011]	[0.011]***	[0.008]***
Decade FE	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓	✓
Stage Dummy 1620 × Civil War Dummy	✓	✓	✓	✓	✓
Avg No. Words and (Avg No. Words)^2	✓	✓	✓	✓	✓
N. Clusters	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.534	0.394	0.441	0.332	0.276
Pre-1630 Mean of DV	0.010	0.001	0.002	0.000	0.000

Notes: OLS estimates. Observations are grid cells in each decade from 1570 to 1769. In each specification the dependent variable is the log number of incoming and outgoing letters assigned to the macro-topic indicated in the column title (plus one). The interaction variable *Stage dummy 1620 × Post-1635* equals one in all grid cells containing at least one postal stage in 1620 in each decade from 1630 onwards, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<$10%, ** = p-value $<$5%, *** = p-value $<$1%.

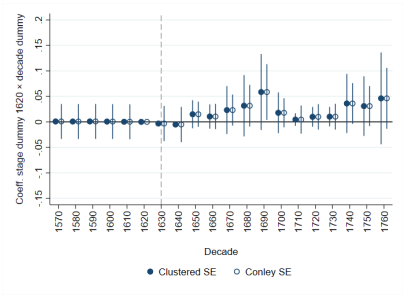
Figure B5: Dynamic Effect of 1635 Postal Reform on Intensity of Correspondence for the Macro-topics Politics, Religion, and Academic Gossip



(a) Topic Politics



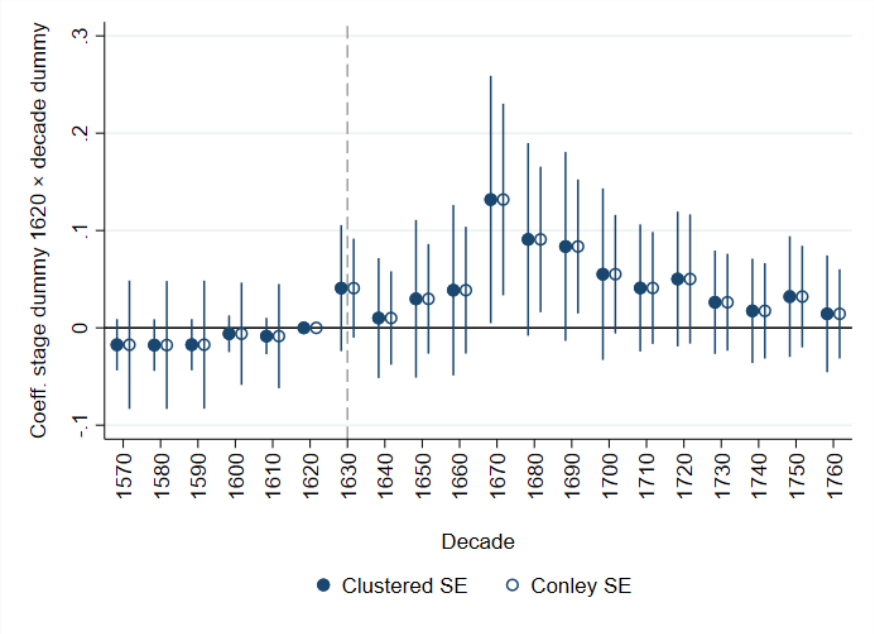
(b) Topic Religion



(c) Topic Academic Gossip

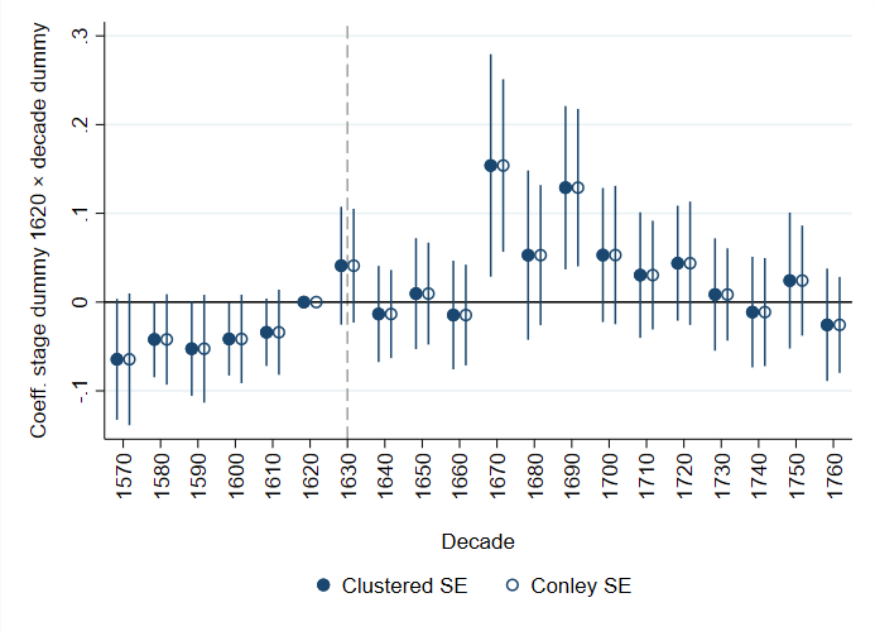
Notes: Each dot in a given subfigure represents the OLS-estimated coefficient of the interaction *Stage Dummy 1620* $\times$ decade fixed effect from Equation (3), using the specification in Table 2, Column 5. The dependent variable is the log number of letters assigned to a given macro-topic, sent from and received in each grid cell in a given decade (+1). The omitted interaction term is *Stage Dummy 1620* $\times$ decade 1620 fixed effect. 90% confidence intervals based on standard errors clustered by grid cell or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space) are reported. The dashed vertical line indicates the decade of the postal reform.

Figure B6: Event Study: Dynamic Effect of 1635 Postal Reform on Intensity of Knowledge-related Correspondence between Scholars



Notes: Each dot in a given subfigure represents the OLS-estimated coefficient of the interaction *Stage Dummy 1620* × decade fixed effect from Equation (3), using the specification in Table 2, Column 5, where the dependent variable is constructed using letters from and to different categories of correspondents. The dependent variable is the log number of incoming and outgoing letters assigned to the topic *Knowledge* in each grid cell-decade (plus one). The omitted interaction term is *Stage Dummy 1620* × decade 1620 fixed effect. 90% confidence intervals based on standard errors clustered by grid cell or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space) are reported. The dashed vertical line indicates the decade of the postal reform.

Figure B7: Event Study: Dynamic Effect of 1635 Postal Reform on Intensity of Ordinary-life-related Correspondence between Scholars



Notes: Each dot in a given subfigure represents the OLS-estimated coefficient of the interaction *Stage Dummy 1620* × decade fixed effect from Equation (3), using the specification in Table 2, Column 5, where the dependent variable is constructed using letters from and to different categories of correspondents. The dependent variable is the log number of incoming and outgoing letters assigned to the topic *Ordinary Life* in each grid cell-decade (plus one). The omitted interaction term is *Stage Dummy 1620* × decade 1620 fixed effect. 90% confidence intervals based on standard errors clustered by grid cell or Conley's spatially-corrected standard errors (accounting for spatial correlation up to 50 km with Bartlett kernel decay in space) are reported. The dashed vertical line indicates the decade of the postal reform.

B.6 Presence of Postal Stage and Effect of the 1635 Reform on Innovation Activity

Table B13: Presence of Postal Stage and Innovation Activity – Correlational Evidence

Dependent Variable	Log All Innovators			Log Tech Innovators			Log Soft Innovators		
	Innovators	Events	Inventions	Innovators	Events	Inventions	Innovators	Events	Inventions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stage Dummy	0.011	0.016	0.004	0.008	0.012	0.004	0.004	0.006	-0.000
	(0.005)**	(0.006)***	(0.001)**	(0.004)**	(0.005)**	(0.001)***	(0.002)*	(0.003)**	(0.001)
	[0.003]***	[0.004]***	[0.001]***	[0.003]***	[0.004]***	[0.001]***	[0.002]**	[0.002]***	[0.001]
Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stage Dummy × Civil War Dummy	✓	✓	✓	✓	✓	✓	✓	✓	✓
N. Clusters	2,764	2,764	2,764	2,764	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.539	0.504	0.580	0.544	0.495	0.540	0.551	0.599	0.535
Mean of DV	0.016	0.020	0.003	0.012	0.016	0.002	0.006	0.006	0.001

Notes: OLS estimates. Observations are grid cells in each decade from 1570 to 1769. The dependent variables are: the log of (one plus) the number of innovators (not considering if they were born in that grid cell-decade); the log of (one plus) the number of events involving innovators (not considering their birth in that grid cell-decade); the log of (one plus) the number of inventions made by innovators. In Columns 4 to 6 and Columns 7 to 9 the above variables are measured using, respectively, only the subset of "technical" innovators and only the subset of "soft" innovators. In Columns 1 to 3 the above variables do not distinguish between different types of innovators. The explanatory variable *Stage dummy*$_{it}$ equals one if the grid cell i includes at least one postal stage in decade t, and zero otherwise. Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<$10%, ** = p-value $<$5%, *** = p-value $<$1%.

Table B14: Effect of the 1635 Reform on Innovation Activity, IV Results

Dependent Variable	Log All Innovators			Log Tech Innovators			Log Soft Innovators		
	Innovators	Events	Inventions	Innovators	Events	Inventions	Innovators	Events	Inventions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stage Dummy 1620 × Post-1635	0.084	0.066	0.015	0.061	0.059	0.013	0.033	0.009	0.010
	(0.035)**	(0.041)	(0.013)	(0.027)**	(0.034)*	(0.014)	(0.020)*	(0.021)	(0.008)
	[0.023]***	[0.031]**	[0.009]*	[0.019]***	[0.027]**	[0.008]*	[0.014]**	[0.017]	[0.006]*
Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cell FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to London × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Historical Routes × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Log Dist. to Medieval Boroughs × Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stage Dummy 1610 × Civil War Dummy	✓	✓	✓	✓	✓	✓	✓	✓	✓
N. Clusters	2,764	2,764	2,764	2,764	2,764	2,764	2,764	2,764	2,764
N. Observations	55,280	55,280	55,280	55,280	55,280	55,280	55,280	55,280	55,280
Adj. R-Squared	0.005	0.004	0.005	0.005	0.003	0.006	0.003	0.003	0.009

Notes: 2SLS estimates. Observations are grid cells in each decade from 1570 to 1769. The dependent variables are: the log of (one plus) the number of innovators (not considering if they were born in that grid cell-decade); the log of (one plus) the number of events involving innovators (not considering their birth in that grid cell-decade); the log of (one plus) the number of inventions made by innovators. In Columns 4 to 6 and Columns 7 to 9 the above variables are measured using, respectively, only the subset of "technical" innovators and only the subset of "soft" innovators. In Columns 1 to 3 the above variables do not distinguish between different types of inventors. The interaction variable *Stage dummy 1620 × Post-1635* equals one in all grid cells containing at least one postal stage in the decade 1620 for all decades from 1630 onwards, and zero otherwise. The indicator *Stage dummy 1620* is instrumented with the distance from a predicted least-cost-path network (see Data Appendix A.1 for more details). Standard errors clustered by grid cell are reported in parentheses, while Conley's standard errors accounting for spatial correlation up to 50 km with Bartlett kernel decay in space are reported in squared brackets. * = p-value $<10\%$, ** = p-value $<5\%$, *** = p-value $<1\%$.