A travel revolution: the spatial patterns of coaching in England and Wales 1681 to 1836[1]

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December 20, 2018

Abstract

This paper documents the spatial patterns of scheduled coach services in England and Wales between 1681 and 1836 using trade directories and Geographic Information Systems (GIS). Digital mapping highlights the differential development of long-distance services from London, between English industrial towns and those within remoter regions and illustrates the increase in commuter traffic around the large conurbations. Overall it documents a substantial change in the structure of the coach network between 1760 and 1830. An extensive, interlinked network of long-stage coaches grew across the whole country and a short-stage, radial network of daily-return services grew up on the roads leading into London. England experienced a travel revolution coinciding with its industrial revolution.

JEL codes: N33, N73

Keywords: coaches, travel, transport revolution, connectivity, mobility

[1] This paper was made possible by three research project grants: The Leverhulme Trust (F/09/774/9) ,*The Occupational Structure of England and Wales c.1379-c1729.* led by Leigh Shaw-Taylor (Cambridge Uiversity); Leverhulme Trust (RPG-2013-093) *Transport, urbanization and economic development in England and Wales c.1670-1911* led by Leigh Shaw-Taylor (Cambridge University); and National Science Foundation (SES-1260699) *Modelling the Transport Revolution and the Industrial Revolution*, led by Dan Bogart. We are grateful to both the Leverhulme Trust and the National Science Foundation for their generous support.

A crowded passenger coach with four fine horses is the iconic image of early 19th century travel in England. Transport historians have been drawn to examine the evolution of coaching from a few slow, heavy vehicles illustrated by Hogarth in the 1750s to these swift, elegant coaches of the mid 1830s painted by Pollard. The wealth of contemporary records in trade directories and newspaper adverts has encouraged studies to enumerate and list the routes used by the coaches over a period of two centuries prior to the completion of railways into London (Jackman 1916; Copeland 1968; Chartres & Turnbull 1983; Gerhold 2005, 2014; Turvey 2005; Bogart 2014). The bulk of the records, and hence most published work, relate to coaches to and from London but where individual provincial towns have been examined, it is clear there were a significant number of provincial coach services by 1830 (Gerhold 2012). Although simple route maps have been drawn for individual towns, the important task of integrating these into a national network has not been attempted.

The published studies provide a general framework for the development of scheduled coach services in England and Wales. In the late-17th century, the nascent coaching trade was essentially a radial array of services from a London hub to a few important towns in lowland Britain. By the mid-1830s national coaching services had differentiated into four, inter-dependent sectors; (I) long-stage trunk services between London and many provincial towns; (II) long-stage trunk services radiating from the major provincial towns; (III) the Royal Mail and Cross Mail coaches carrying some passenger to the main postal towns and ferry terminals and (IV) short-stage (suburban) services particularly into London.

There are several existing studies examining different sectors of English coaching.[2] Gerhold (2014) estimates that sectors II (i.e. provincial services) and IV (suburban services) had grown so rapidly by 1836 that each was similar in size to sector I (London services) in terms of passenger miles per annum. Similarly, Chartres & Turnbull (1983) illustrated the rapid growth in London sub-urban services (IV), initially into Middlesex, and then into Kent and Surrey after 1820. Austen (1981) has shown that sector III grew rapidly in the decade after Mail coaches were introduced in 1784 but stagnated during the early 1800s and remained static as stage coach services expanded. The few studies of growth in provincial services (II) are limited to small areas, particularly Hampshire (Freeman 1975), West Yorkshire (Dickenson 1959) and Chester (Herson 2002), Gloucester/Oxford (Pawson 1977) or to detailed studies of an

[2] There are relatively few studies on coaching outside of England. Blonde (2010) and McShane and Tarr (2003) are exceptions.

individual city, e.g. Bristol (Gerhold 2012). All these point to growth in London and provincial traffic, but few are easily compared because of differences in origins and time periods of the source material. Although the isolated studies may have recognised that the whole network could not be fully understood through an individual component, handling the large amount of data for a national study has proved daunting with traditional methodology.

This paper builds on methodologies for counting services developed in earlier studies. It achieves a greater scope using Geographic Information System (GIS) software to handle the enormous amount of spatial and numerical data. GIS digital mapping of individual services integrates the tabular data from Directories with geographical information on the main roads. The individual routes are mapped in detail and the number of coaches using each can be recorded for the years under consideration.

There are several major outcomes from this use of GIS to enumerate coach services. Firstly, the substantial growth of services between provincial towns in the North and West of England is quantified. Secondly the whole network is mapped for the first time. Including all services gives a broader spatial expansion in national coach services than that shown previously for London alone. Thirdly, mapping at dates across the period highlights differential rates of growth for services from London to individual provincial destinations. The growth in London services which began around 1760, and continued to a peak around 1835, was greatest to destinations in the South East of England and there were more services to leisure resorts than to industrial towns. Conversely, Country coach services were predominantly between industrial towns. From the 1820s short-stages into London from the suburbs expanded rapidly and this was replicated on a smaller scale around the large manufacturing towns, such as Manchester.

To summarize, this study finds a substantial change in the structure of the coach network over the late 18th and early 19th centuries. In parallel with the increased number and reach of long-stage London services an extensive network of long-stage coach services radiating from provincial towns emerged, connecting many more towns in northern and western England. In addition, an independent, short-stage, radial network of daily-return services grew up on the roads leading into London.

Our identification of this 'travel revolution' has several implications. It challenges the dominance of London as the sole focus for dissemination of social trends and commercial intelligence and illustrates the importance of intra and interregional relationships. The relatively large number of services to places of leisure and pleasure compared with

those of manufacture and trade emphasise that consumerism was an important motivation for much of the travel on scheduled long stage coach services from London. It was also a revolution that brought the convenience of shared public transport to many thousands of new travellers between all the large towns of England and facilitated the further expansion of the dormitory area of London. Finally, although turnpike roads were a pre-requisite for fast coach travel and most scheduled coach services map onto the turnpike network, away from London there were turnpikes that carried no services, so coaching alone cannot be used to explain the turnpiking of many miles of provincial roads.

I

Digital mapping is a vital component of this study and, unlike earlier work which relied on simple directional lines, it requires a detailed knowledge of the geography of each road through intermediate towns. The digital maps produced in the Transport, Urbanization and Economic Development in England and Wales c.1670-1911 Project and the cataloging of changes in turnpiking during the intermediate period are the foundation for these.[3]

The growth of coach services is inextricably linked with the improvement of the roads during this era. London coach services began in the 17th century when individual parishes maintained sections of each road. They expanded during a period of radical change in the mid-18th century when turnpike trusts were given responsibility to improve and maintain the principal roads and reached a peak after these trusts had built well-engineered new roads in the 1820s. The number of other road users, including public carriers of freight, also expanded over the same time period but these are not the subject of this paper.

Turnpike trusts were created through a legislative process of creating private and local bills. The first turnpike Act was in 1663, but the second was not until 1695, and it was not until the 1720s that trusts became common along the major highways leading into London. Between 1750 and 1770 turnpike trusts diffused throughout much of the road network, especially in the industrializing areas of the West Midlands and the North. After 1770, the network continued to expand, even as canals were being built. By 1840 there were around 1000 turnpike trusts managing 20,000 miles (see footnote 3).

[3] For details on the Transport, Urbanization and Economic Development in England and Wales c.1670-1911 Project see https://www.campop.geog.cam.ac.uk/research/projects/transport/.

The pressures a growing road transport industry placed on the highways was a factor in the early turnpiking of the Bath Road and the Great North Road; the Acts setting up the Maidenhead Trust of 1717 and the Galley Corner Trust of 1729 both mention “many heavy carriages frequently passing through” as the cause for the poor condition of the road. A century later, the grand project to improve and build new sections of the Holyhead Road was driven by the need to run a better coach service through England to North Wales and Ireland (Albert 1972, Guldi 2012).

Although this article refers simply to coach services, these changed over the period considered. The term “coach” is used here for all passenger vehicles, including a machine, fly, diligence, post-coach or omnibus. “Stage coach” refers to a passenger vehicle running to a published schedule with fares per person and making regular stops to change horses. “Mail coach” refers to a passenger vehicle that is contracted to carry the Royal Mail and only a few passengers. The term “London service” is a route which has London as one terminus; a “Country service” is a route that runs between two provincial towns. A licensed service is one where the Office of the *Commissioners of Stamps* collected a duty on stage coaches starting in 1776. The duty was levied on miles travelled from 1783 to 1836.

Prior to 1725, substantial lengths of road were so badly maintained that coaches had to be strongly built, heavy vehicles dragged by strings of horses. Although turnpiking increased the extent of the usable road network through the mid-18th century, services were still run with heavy vehicles carrying 6 inside passengers, during daylight hours and travelling slowly. Average journey speeds to London by coach were less than 5 miles per hour in 1755 (Gerhold 2014). By most accounts the coaching trade changed relatively little in the first half of the eighteenth century.

Coach design did not respond to the better roads until the mid-1760s when technical innovations such as the steel spring allowed coachmasters to use lighter, faster vehicles on the continuous lengths of turnpike road that by then radiated from London. Initially these vehicles had a low carrying capacity as 2-passenger post chaises, 3-passenger diligences and 4-person post coaches (Gerhold 2012, 2014), but the improved speed and comfort of these coaches for only small changes in cost expanded the market for coach travel. Coaches could run safely, even at night and in winter, on long stretches of reliable roads. Improvements in management, particularly the stage coach, which used teams of fresh horses changed every 10 to 12 miles, further increased productivity and the range of services. Consortia of coachmasters spreading the risk and management on long routes, allowed reliable scheduling of services and opportunities to forward passengers to connecting services. The capital and management requirements of coachmasters increased, particularly those with large coaching inns in central London, so the expanding number

of these services were run by a smaller number of professional operators. In 1791 the ten leading London coachmasters ran 56% of services over 100 miles and 46% of all services over 25 miles. By 1836 the corresponding proportions were 90% and 68% of services.[4] All together there was a progressive development of coach design, specially bred horses and technical improvements in turnpike roads supervised by engineers such as McAdam. This meant that by the 1830s, frequent, scheduled stage coaches were carrying up to 4 inside passengers and 11 outside passengers. The average speed was 10 mph on journeys across England and most of Wales. The average fare was about three pence per passenger mile for inside passengers and half that for the less comfortable outside places (Hart 1960, Gerhold 2014).

II

The Trade Directories listed in Table 1 are used here as the primary sources on coaching services for 1680 to 1836. As a first step in our methodology, the London services listed in the directories were screened by a process we have termed 'tabular matching'. The information on the inn, departure day, time and frequency were entered into a spreadsheet and these characteristics matched to consolidate potential duplicate entries where intermediate stops were listed or coaches calling at more than one London inn. In the 18th century directories where summer and winter services differed, an average was used. The service lines from tabular matching of the coach routes were plotted over the GIS main road map for the nearest relevant year using the ancient highway and turnpike road GIS shapefiles for 1680 to 1838. GIS point files for the towns were created by Satchell et al (2017) and Rosevear et al (2017).[5] The GIS table associated with each line had fields for all the tabular data and fields holding information on (1) intermediate stops, (2) route length and (3) the number of services per week at each date for that line. Very few long-distance coach service lines had to deviate from present or future turnpike lines. For some short-stage routes non-turnpiked roads had to be used.

[4] These figures are based on Directories described below.

[5] Shaw-Taylor, L., Satchell, M., Potter, E., Bogart, D., 'Candidate Towns of England and Wales, c.1563-1911 GIS shapefile', 2017. A description of the dataset can be found in M. Satchell, 'Candidate Towns of England and Wales, c.1563-1911 GIS shapefile.' Rosevear, A., Satchell, M., Bogart, D., Shaw Taylor, L., Aidt, T. and Leon, G., 'Turnpike roads of England and Wales, 1667-1892', 2017. This dataset was created with funding from the Leverhulme Trust (RPG-2013-093), the NSF (SES-1260699), and the British Academy (SG121870). A description of the dataset can be found in Bogart, D, Rosevear, A. and Satchell, M., 'Turnpike roads of England and Wales 1667-1892 GIS shapefile documentation.' The documentation for both datasets can be found at: http://www.geog.cam.ac.uk/research/projects/occupations/datasets/documentation.html

Table 1. *Directories used for scheduled coach services 1680 to 1839 for England & Wales*

Date published	
	London Services
1681	The Present State of London, Thomas de Laune
1705	The Traveler's and Chapman's Daily Instructor (Sawbridge)
1715	The Merchants and Traders Necessary Companion (Hide)
1727	The Tradesman' Guide or Chapman's and Traveler's Companion (Pickman)
1738	The Intelligencer or Merchant's Assistant (Meadows)
1760	Complete Guide to all persons or concerns with the City of London, 8th Edition (Hitch & Hawes)
1770	Baldwin's New Complete Guide
1779	The Shopkeeper's and Tradesman's Assistant (Causton - successors to Kent)
1791	Universal British Directory (UBD) – Volume 2 – London, publ. Stalker
1810/19/28	Cary's Road Book (ebooks)
1828	Pigot's London Directory
1828/30	Pigot's National Directories (individual southern counties for 1830, individual northern counties 1828, Sussex 1832 –(Kent, Essex & Surrey augmented with 1839))
1830, 1835, 18361839	Robson London Directory (including Table of London licenses 1835/69)
	Country Services.
1793/4	Universal British Directory (UBD) – Volumes 3 & 4 – Provincial, publ. Stalker
1828/30	Pigot's National Directories (individual southern counties for 1830, individual northern counties 1828, Sussex 1832 –(Kent, Essex & Surrey augmented with 1839))
1835, 1836, 1839	Robson's London Directory (including table of Country licenses 1835/6/9)
1839	Robson's Directory for counties of Norfolk, Suffolk, Hunts, Cambs, Oxon, Beds, Bucks, Wilts, Hants, Gloucs, Dorset, Devon, Somerset and Birmingham/Sheffield

Note: Services to Scotland are included but are treated as terminating at the border with England

The data from the 1791 Universal British Directory (UBD) was used to create the initial set of GIS polylines which mapped the coach routes from London. The tabular data from the earlier Directories was then entered into this, working backwards in time, with the most appropriately dated main road map as base. Where the Directory data were consistent with an existing route line this was used, otherwise new lines were drawn using the most plausible direct route on the map and maximising the use of existing turnpikes. The services advertised in the early 19th century directories were assigned directly to the pre-1800 network, adding new routes as necessary; an additional field recorded the names of coaches used at each date.

The Robson London Directories for 1830, 1835, and 1836 have the fullest descriptions of routes and were used as a more certain base to amend any ambiguous earlier entries. Robson listed the towns with advertised coach services and also tabulated the coaches licensed to operate in London and another table of branch and other coaches licensed in the Country. The licensed stage coach services listed in Robson's Directories of 1835/36 were assigned to routes based on the nearest equivalent advertised services (The coach licenses have no information about the route from A to B). The final dataset of GIS polylines centred on London for the period 1681 to 1839 contained 90,800

miles of route in 980 service lines, some only minor variations of others and longer services involving more options; there were 4,800 miles of route in 90 lines used for 1681 and 25,500 miles of route in 351 lines used for 1835.

For country routes the number of service trips per week was entered for all towns listed in the Provincial/Country volumes of the UBD (1793 & 4). A sample set of 50 "hub" towns was selected based on the most frequently mentioned towns in the "Cross-Country or local stage coaches" section of services for 1836 compiled by Bates (1969). These captured at least 95% of the service lines for 1793/4. The map assignment method was used to select suitable routes from this base network and assign service frequency for scheduled coach services listed under each of the sample towns in Pigot's National Directories 1828/30. Finally, all the service routes in the Country license list of Robson's Directories for 1835/6 were mapped. Hubs were treated in alphabetical order so that duplication of earlier entries could be ruled out. The resulting dataset of GIS polylines for Country services in the period 1790 to 1839 comprised 84,700 miles of route in 2,195 service lines; 22,600 miles of route in 815 service lines were used in 1835.

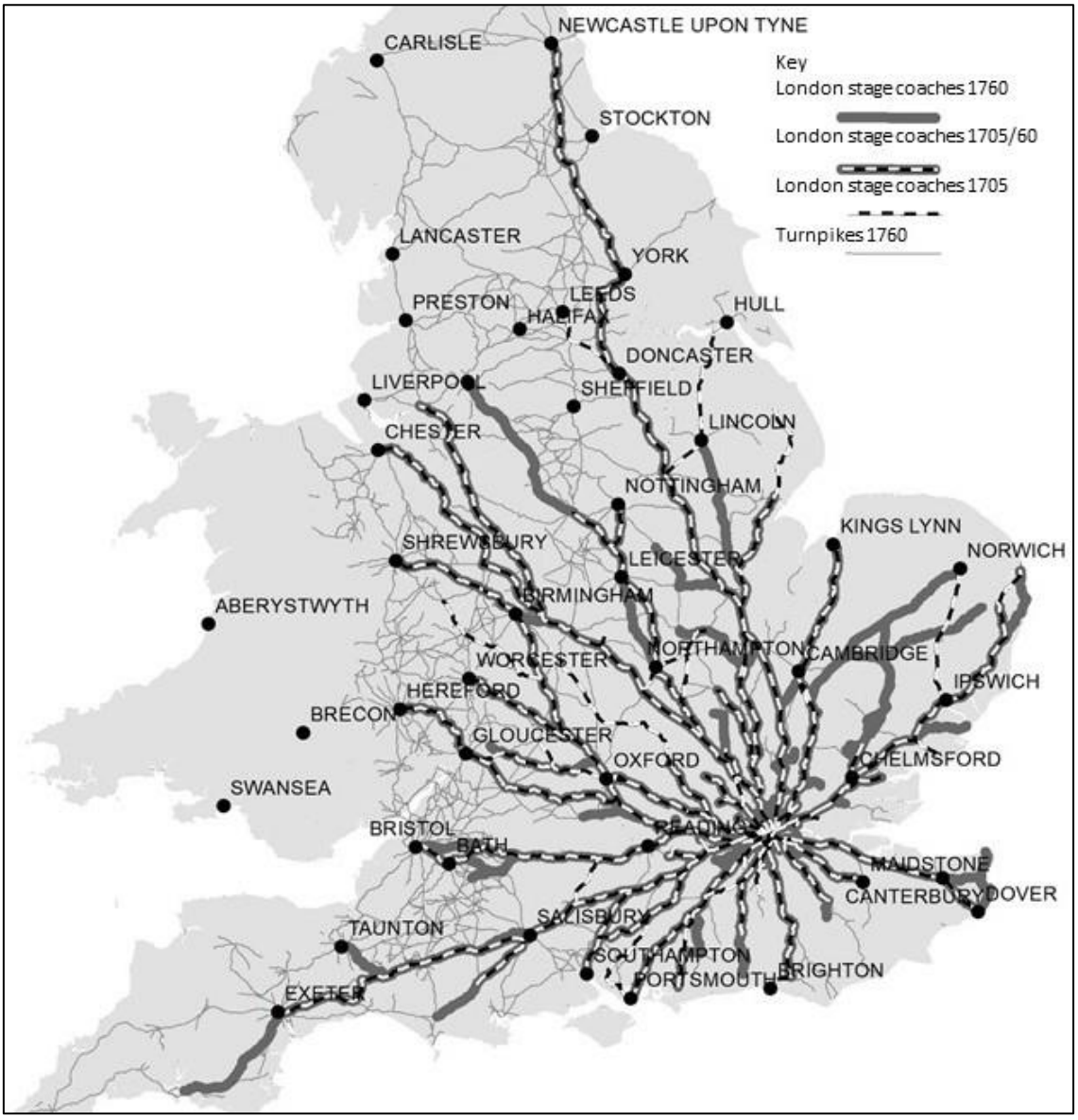
III

The service data held in the GIS can be represented in digital maps that plot and visualise the geographic distribution of passenger traffic. This spatial information gives a unique perspective on the areas served by coaches, patterns of development over time, and the relationship between service routes and the turnpike network. We will deal first with the coach services from London and have mapped services at dates that are representative of the main phases of development revealed by the Directories in Table 1. Our analysis will show (1) the geographic spread of London services over time, (2) the growth of services to new versus old destinations and by distance, (3) the distribution of services across town types, (4) traffic volumes near London, and (5) the growth of coach passenger miles over time.

Figure 1 plots the 1760 service routes on top of the 1705 routes for England and Wales; a few town points are shown on each map to allow orientation, but not service significance. The 1705 routes are dashed and the 1760 routes are grey. Dashed routes with dark outlines represent services present in 1705 and 1760. The fine lines are turnpike roads in 1760. Several patterns are evident. First, there was a persisting radial distribution of services, which inevitably means towns close to London are on, or close to, many services, whereas most towns in the provinces are less well served. Second, although most of the turnpike roads near to London carried a coach service there was a large

mileage of turnpike road in the North and West with no London coach services. Third, there was a modest entry of new services between 1705 and 1760. Notice the grey lines to Manchester, Norwich, Margate and Taunton. There were some exiting services as well; these are shown as dashed lines without a dark outline. For example, notice the exit of early services to Bridgnorth and Hull. Overall it appears there was a modest extension of the spatial distribution of London coaching services between 1705 and 1760.

Figure 1. *Comparison of advertised London stage coach routes for 1705 and 1760 on the 1760 turnpike map.*

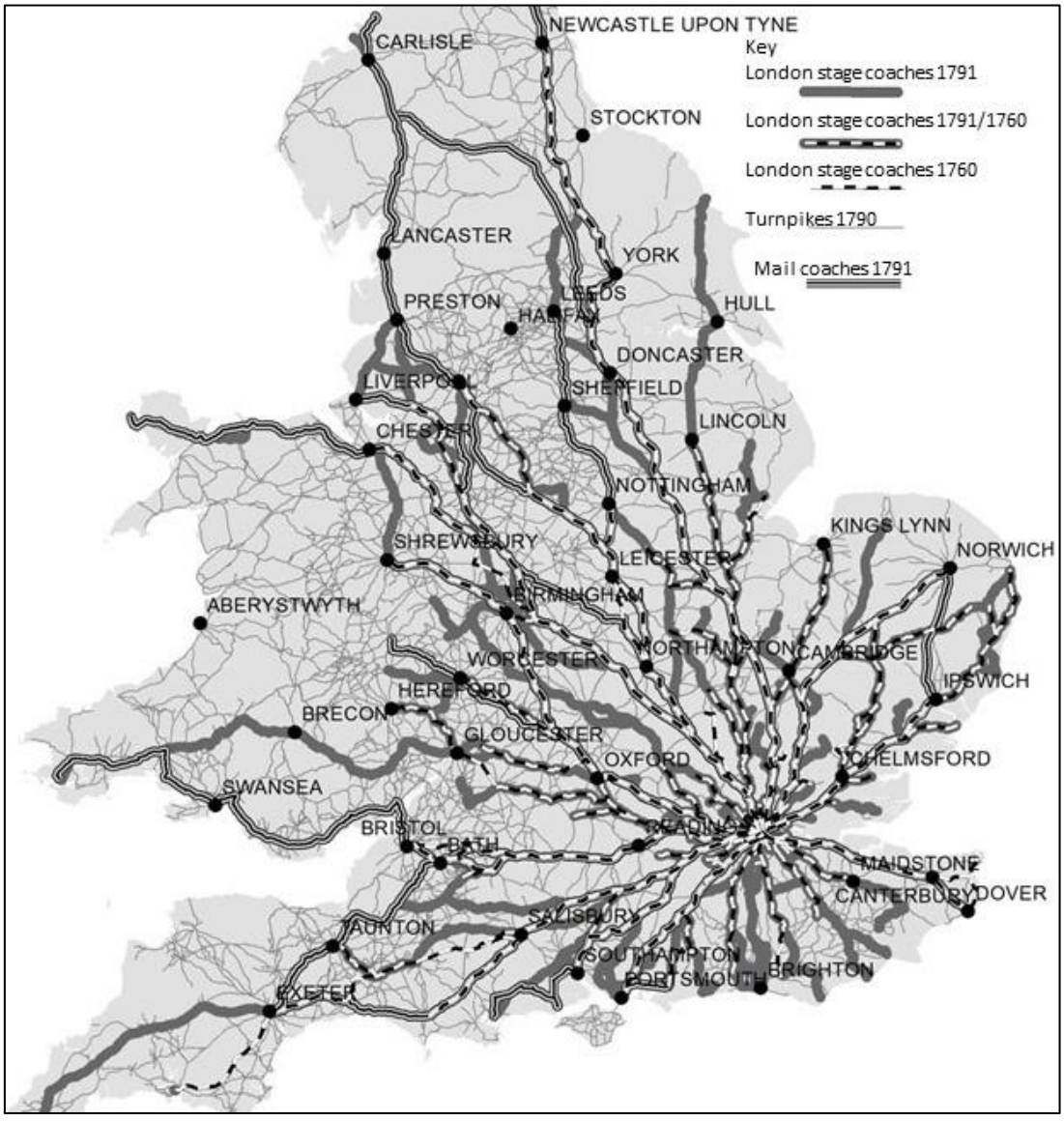


Sources: see text.

Figure 2 compares the geographic distribution of coach services in 1760 and 1790. Again, the earlier routes (1760) are dashed and the later routes (1791) are grey. The fine lines are turnpike roads in 1790. The grey centre-stripes reflect mail coaches in 1791. There is a striking transformation of the London coach routes into a national service by

1791. There were services to the largest English towns and key towns in Scotland and ports of Wales, and hence Ireland. There were new extended service routes to the Channel coast, to North & South Wales, the Midlands, the Northwest and Cornwall. Several of these long-distance routes are Mail coach services which had been introduced in 1784; these are particularly significant in the north-west and Wales. Many of these extended routes following the new turnpikes created during the 1770s. Nevertheless, despite this increase in services, there were still a substantial number of turnpikes in the north and west of England and in Wales that carried no London services by 1791.

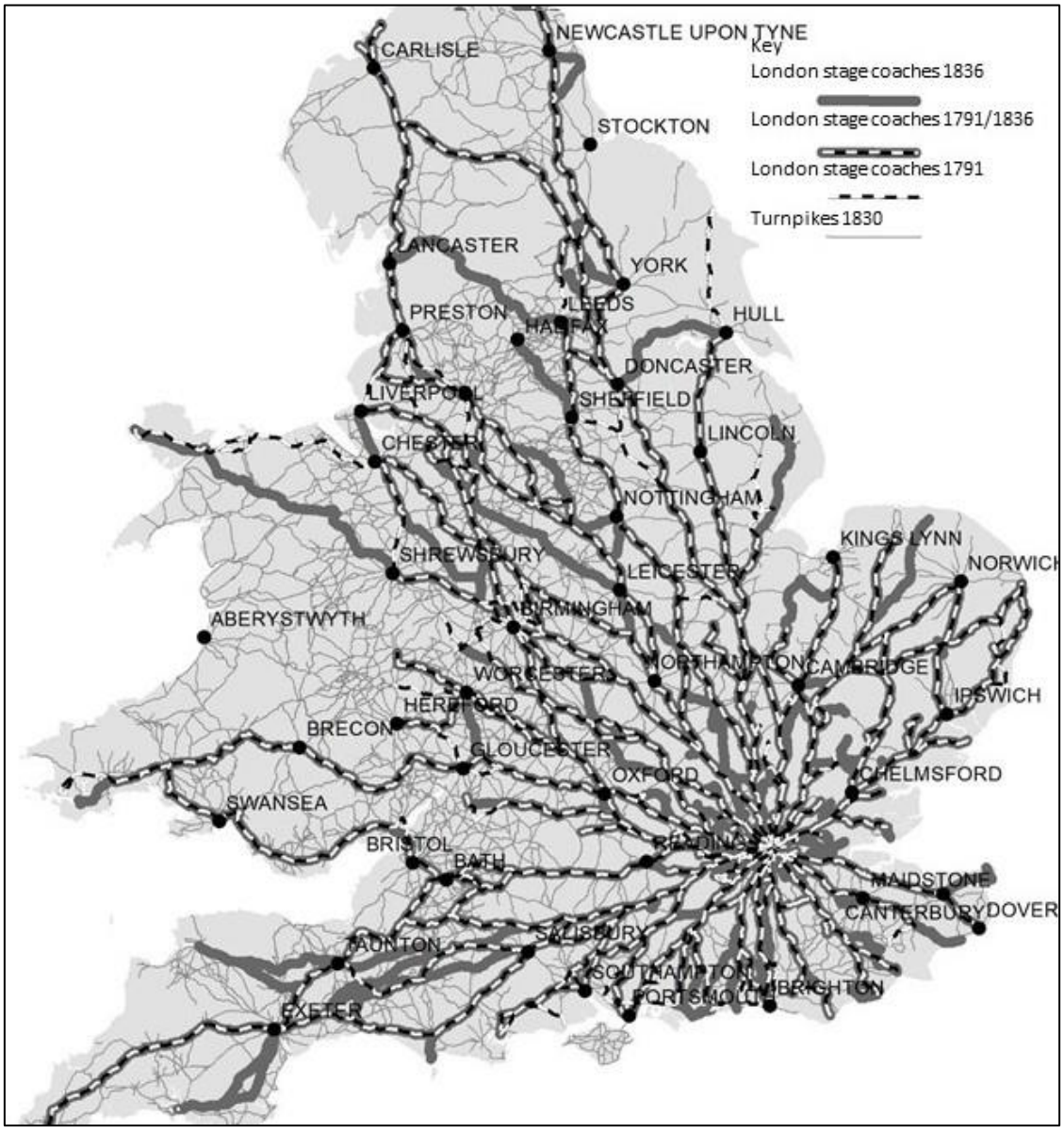
Figure 2. *Comparison of advertised London stage coach routes for 1760 and 1791 and Mail coaches for 1791 on the 1790 turnpike map.*



Sources: see text.

Figure 3 illustrates changes between 1791 and 1836. Here, the London coach services listed by Robson for 1836 form the base map. When the 1791 network is laid over this, it shows the evolution of a denser network over much of the country, with multiple routes to the south-west and East Anglia and the new Holyhead road to North Wales. There was again significant new entry of routes shown in grey. Many are near London and industrial towns in the north-west. Services were lost from London to East Yorkshire and along the North Wales coast. Overall there was a very extensive geographic network for London coaching services by 1836. That said, there was still a marked absence of direct London services to central Wales, North Yorkshire or the Pennines north of Leeds.

Figure 3. *Comparison of advertised London coach routes for 1791 and 1836 on the 1830 turnpike map.*



Sources: see text.

Next, we decompose the growth of London services into new and existing destinations and into different distance categories. A destination is the last town visited. For example, a service might first arrive at town A and end in town B. We consider B the destination. Table 2 shows the decomposition for the two phases of rapid expansion in London services (1760-1791 and 1791-1836). In both periods, more growth was due to new destinations than to existing destinations. Also in both periods, the greatest increase was in services to destinations less than 10 miles from London, whereas the increase was least for services over 80 miles. The two phases were distinguished by a relatively higher growth of services to new locations at all distances in the first period but a relatively higher rate of growth to existing locations less than 10 miles coupled with high growth to new intermediate locations (over 10 miles) in the second period. The decline in long distance services to existing destinations in the later phase reflects, in part, extension of routes to new final destinations further along the road (i.e. it is not a reduction in the number of coaches serving these intermediate towns).

Table 2. *Change in the number of London services per week during phases of rapid growth*

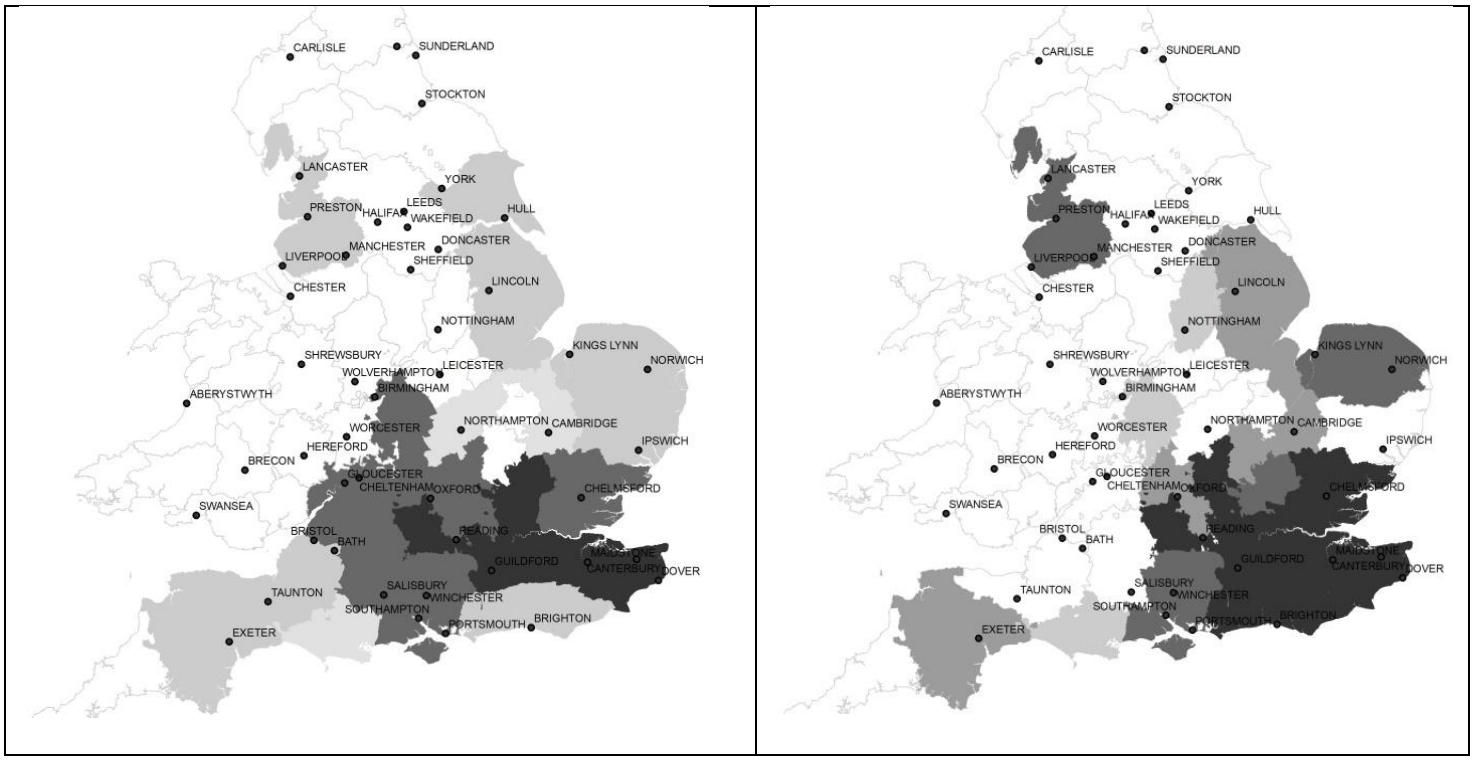
Destination distance (miles)	1760 to 1779	1791 to 1835
existing under 10 *	638	3357
existing over 10 & under 80	294	91
existing over 80	28	-283
Total change to existing	**959**	**3165**
new under 10	994	2223
new over 10 & under 80	391	1437
new over 80	318	531
Total change to new	**1702**	**4191**

Notes: Calculations made by the authors using directories listed in Table 1. Each service counted only once, for the final destination. The 10 miles limit has been used by others to separate out local traffic in data sets (Gerhold 2014)

The counties with most new destinations over 10 miles are highlighted in Figure 4a & 4b. Naturally, since growth to destinations between 10 and 80 miles from London was greater than for over 80 miles, then growth in destinations nearer London will be higher. However, the maps illustrate that the pattern of growth was neither symmetrical nor constant over time. During the first period centred on the 1770s most new services were to counties abutting London but with a general increase to destinations in the Thames catchment and towards Birmingham and Bristol. In the second period centred on the 1820s, the greatest growth to new destinations was in the Home Counties with secondary growth to final destinations in Lancashire and Norfolk. The increased traffic to terminal towns in Lancashire (i.e. Manchester & Liverpool) would also increase flow through Midland towns that had earlier been terminals, but by no more than the growth to these Lancashire destinations. Taking into consideration that all

additional services must also pass through the counties near London which already display the largest growth to new destinations, the bulk of the growth in services for London coaches was the immediate hinterland of southeast England and not regions north of the Trent or west of the Severn.

Figure 4. *Counties where the number of new destinations for London coach services increased*



Notes: Graph (a) between 1760 and 1779 and (b) between 1791 and 1835. Shading categories over 10, 15, 25 and 50 services per week increase for (a) and 10, 20 40 and 100 services for (b) – only the final destination is considered.

Destinations varied by type of town. We classify all into six types. Port, Military, Resort Inland, Resort Coastal, Industrial, and "Other" (typical in each class were the commercial port of Southampton, the military complex at Chatham, the inland resort of Bath, the coastal resort of Brighton, the industrial town of Birmingham, and uncategorised provincial town such as Buckingham). Table 3 illustrates that the partitioning of London services to the first five destination types and the total over the entire period.

London coach services to resorts, such as inland resorts grew, particularly from the 1770s. Growth to the coastal resorts was particularly strong, increasing at almost 10% per annum in the late 18th century, a much faster rate than to destinations as a whole. Consequently, resorts (coastal and inland) made up about 15% of all services by the 1830s. Services to naval or army facilities increased from the 1770s, initially at over 10% per annum. Military destinations grew into the period of the Napoleonic wars but declined after, leading to slight growth by the mid-

1830s. Together with traffic to ports, these made up about 25% of London coach services. The proportion of London services to industrial towns was low, but their share rose from 5% of the total in 1705 to just under 10% of the total in 1830. Overall these five destination categories grew from a sixth of the total in the early 18th century to almost half of the much larger number of destinations in the 1830s.

Table 3. *Number of London coach services per week to categories of destination (more than 25 miles distant)*

Year	Port	Military	Resort inland	Resort coastal	Industrial	Others	Total
1681	19		2		2	149	172
1705	21			1	10	158	190
1715	31			1	4	158	194
1727	37	6	2		9	211	265
1738	33		4		3	159	199
1760	53	1	15	2	20	205	296
1779	205	30	39	29	69	658	1030
1791	349	54	33	34	82	986	1538
1810	368	94	39	116	106	1100	1823
1828/30	429	50	81	209	174	838	1781
1830	408	104	42	233	198	1030	2015
1835	405	86	72	314	196	1228	2301
1836	406	86	78	251	172	1381	2123
Growth %/a							
1681-1760	1.3		2.6		3		0.7
1760-1791	6.3	13.7	2.6	9.6	4.6		5.5
1791-1835	0.3	1.1	1.8	5.2	2		0.9

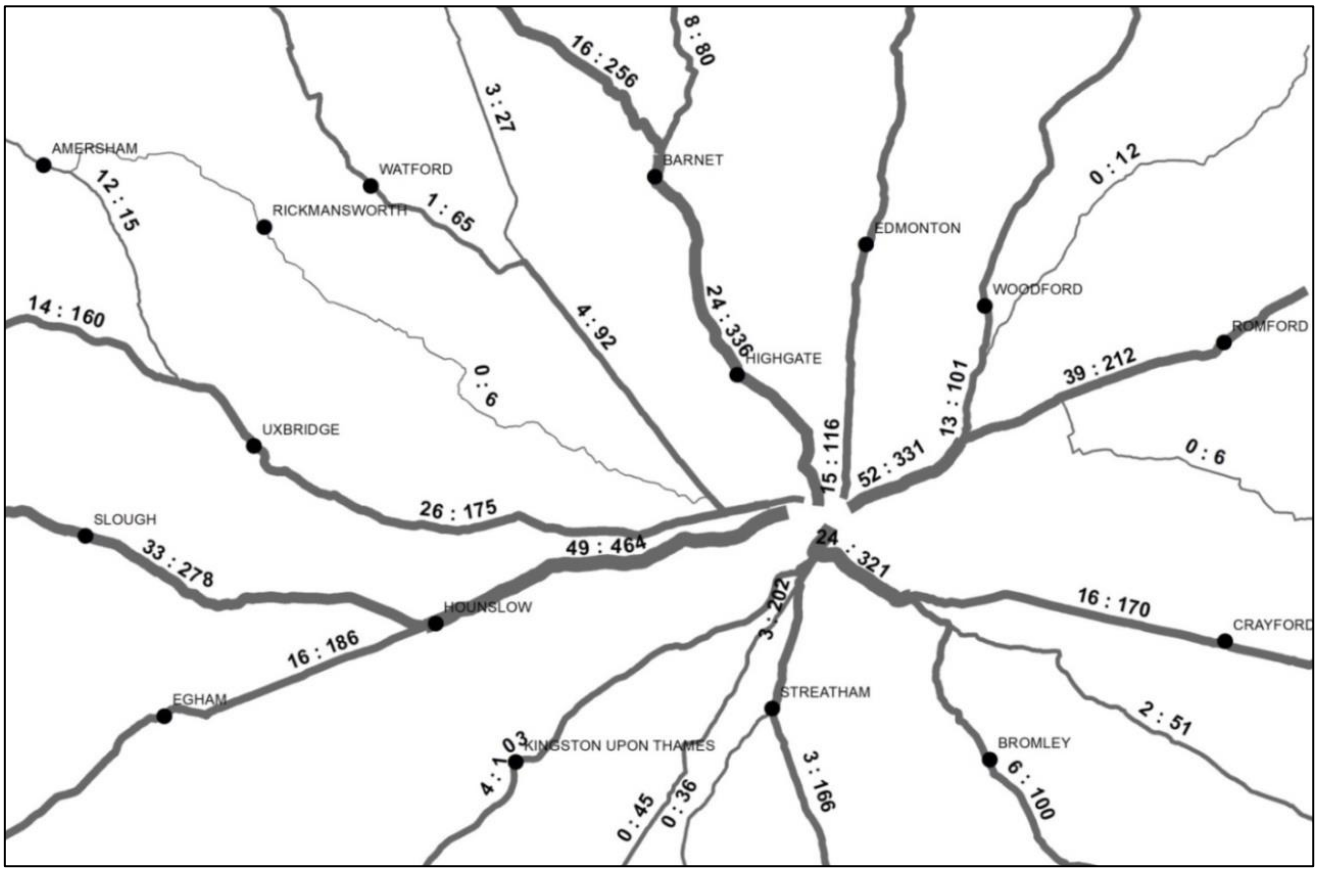
Notes: the services are taken from directories described in Table 1. The 25 miles limit avoids interference from commuter traffic.

It appears there was a change in motivation and destination for longer distance travel from London. The particularly high overall growth rate in the 1760-91 period has been attributed by others (e.g. Gerhold 2014) to technical improvements in coach construction and management. It seems likely that this would have initiated a switch of existing travellers from saddle horse to coach travel, but as this latent demand was saturated the growth rate would slacken after 1790. However, the partitioning between types of destination suggests that other factors were also important. The relative decline in population and in economic importance of county towns (in the "other" category) is a probable factor. Also, the rise in resort destinations suggests that public travel for social activity had increased substantially over this period. Many of these destinations were a similar distance from London as the unclassified destinations so increased range of improved services would not explain this shift.

An increase in the number of long-distance services inevitably increased traffic density on roads close to London. Figure 5 focuses on services over 25 miles distant. It illustrates by line width the volume of coach traffic on the

various main roads radiating from London in 1835 and gives a numerical measure of the growth in long-stage services over the preceding century since 1738.

Figure 5. *Long distance coach traffic from London (services per week over 25 miles) in 1738 and 1835*



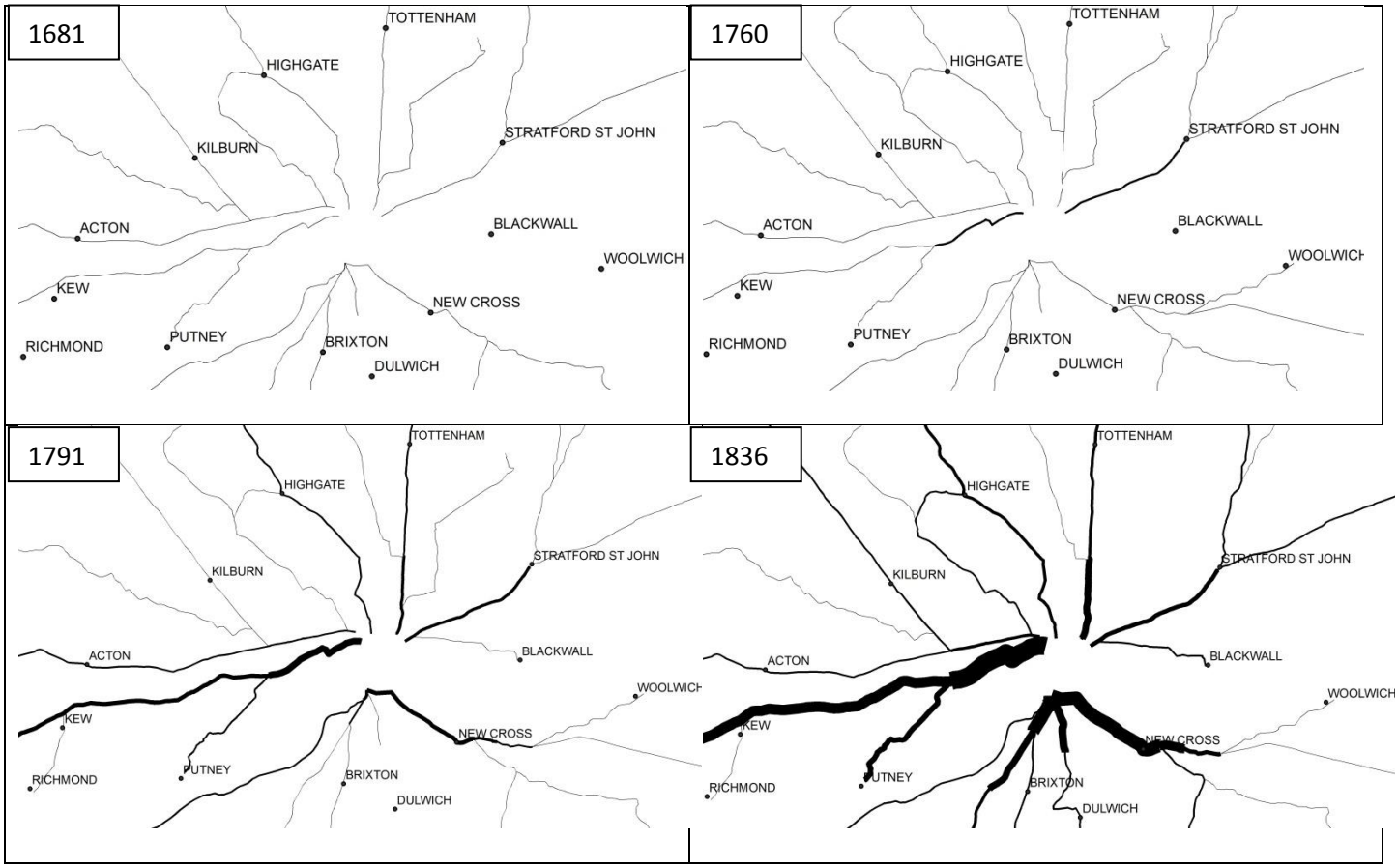
Notes: The numbers show services in 1738 and 1835. Line width is proportional to services in 1835.

The overall growth in service numbers on all roads into London over this period is 10-fold. The map highlights the persisting importance of the roads running west and southwest towards Bristol, Oxford and Exeter. There is faster growth on the Holyhead Road (through Barnet) to the Midlands (up 15-fold) and on all the roads southwards from London to the Channel coast (in aggregate up over 30-fold). In contrast there is lower growth of coach traffic running north-eastwards on the Great Roads to Ipswich, Norwich and York. Evidence given to Parliamentary Committee suggests that by the 1830s coaches on East Anglian routes were suffering competition from steam packets and so perhaps that was a limiting factor (PP 1837b). Notice also that coach traffic on the Banbury/Buckingham road (through Amersham) stagnated as traffic concentrated on the improved Holyhead road and the alternative new turnpike road though Watford and Aylesbury.

These digital maps demonstrate that a general increase in long distance coach traffic (i.e. over 25 miles) was not partitioned equally in all directions and the pattern differed from that of freight traffic seen in the Directories. Even with the strong flow of traffic westwards from London for instance, it was the Bath Road through Hounslow which carried most traffic along the Thames Valley, rather than the Uxbridge or Amersham roads. Mapping of traffic along the road rather than enumerating services to destinations highlights the flow of coaches through Hounslow and Barnet, places rarely mentioned in the Trade Directory lists, but vital staging stops on the busiest roads. Long-stage coach traffic had grown to make these vehicles a common feature on the main roads into London. There were 464 coach services per week or about 75 journeys in each direction per day through Hounslow.

Figure 6 shows the growth of all passenger traffic into London, both short and long distance. It illustrates that the heavy traffic on the roads through Kew and New Cross in the mid-1830s arose from the particularly large number of short–stage services running westwards through Kew to Brentford, and southwest towards Deptford (note the sudden increase in line thickness close to London). These were commuting services to the new residential areas of West London and the parishes on the Surrey and Kent banks which had benefitted from the building of the new Thames bridges in the 1820s (Chartres & Turnbull 1983). These short-stage services use the same roads as the long-stage coaches for sections of the route into London and result in a step change in traffic volumes over the final five miles into the City. If account is taken of short-stage traffic, there were potentially 1319 services per week by advertised coaches passing the Kew Bridge junction in 1836 and 2337 at Knightsbridge (equivalent to 360 daily journeys each way allowing for some Sunday services). Passenger traffic is more evenly partitioned between the main radial roads between 1681 and 1791, and density does not rise dramatically on the approach to London, reflecting the preponderance of longer distance coach services into London during the 18th century.

Figure 6. *Advertised coach traffic from London (all services/week); line width proportional to numbers per week*



Notes: The traffic scale has 18 increments up to 2400 services per week. Enumeration is at 5 mile intervals or major junctions.

The timing and pace of the London 'travel revolution' is summarized by the growth in passenger miles at six benchmark dates between 1681 and 1836. Passenger miles are the product of vehicle miles and the average number of passengers per vehicle. Vehicle miles are the product of services numbers and length of the round trip. These are calculated for advertised London services over 10 miles using the data described above. The average number of passengers per vehicle is generally assumed to be 6 until 1750 (Gerhold 2014). In 1836, the coach licenses provide firm ground for estimates of passenger capacity per vehicle with a typical long-stage coach on the London Birmingham route licensed for 4 inside and 11 outside passengers. For other services using smaller coaches, we assume a typical capacity of 13 as estimated by Gerhold (2014), which is consistent with what was quoted by coach operators in Parliamentary enquiries (PP 1837a/b). We interpolate between 1836 (13 passengers) and 1750 (6 passengers) to get an average capacity for 1791.

Table 4 shows our estimates of London passenger miles per week using advertised services as a constant source throughout the period and capacity as a constant load factor. The average growth rate is 4.0% per year over the period 1760 to 1835. The most significant period of growth in service numbers was from 1760 to 1791, which also

had the greatest geographical expansion in London coaching services. This was the period when the coaching industry underwent a step change with a growth rate substantially greater than the growth in National GDP.

Table 4. *Growth in passenger miles capacity for advertised London services of over 10 miles.*

London	vehicle miles/wk	Passengers/vehicle	passenger miles/wk	annual growth since previous observation
1681	27,665	6	165,989	
1727	43,580	6	261,482	1.0%
1760	52,065	6	312,391	0.5%
1791	294,449	9	2,650,039	7.1%
1830	421,121	13	5,474,568	1.8%
1835	457,210	13	5,943,724	1.7%

Notes: authors calculations based on the directories listed in Table 1.

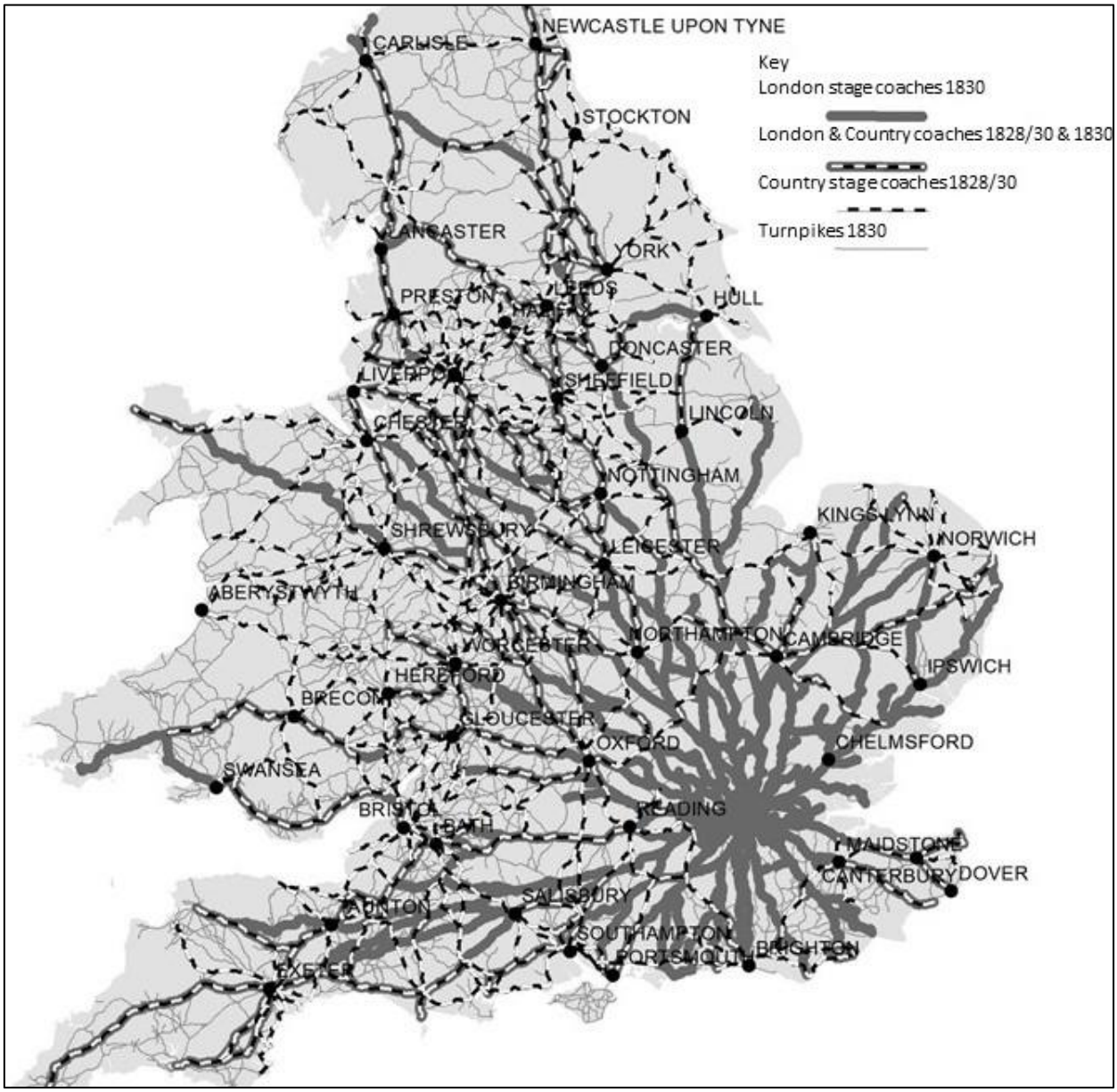
It is worth noting that our London passenger mile growth estimates differ from Gerhold (2014), who estimated a 3.4% annual growth rate for a similar period (1755 to 1836). Gerhold used the licensed services in the Robson Directory for 1836 as a reliable fixed value. For the important period between 1765 and 1827, he sampled towns (including 10 of the largest provincial towns) for which the service information was least ambiguous because there were secondary sources and local directories to resolve uncertainties. For these sample towns, Gerhold calculated the ratio of the number of London services advertised in 1836 and the number in the directories for intervening years and then used the 1836 licensed services as the maximum against which to proportion the number for the intervening years. This value for the sample towns was scaled up to estimate the total number of services to all places in four distance bands from London. In the appendix, we show that the licensed services are different from advertised services in 1836, and explain how the combined use of licensed and advertised leads to an under-estimate of London passenger mile growth from 1765 to 1836.

IV

We now turn to coach services that did not originate in London. The GIS mapping from 1790 to 1830 shows the fundamentally different pattern of the provincial or Country services. There were several prominent regional hubs which were relatively close to each other so that radial services from each interconnected and formed a network. London services ran to these individual hubs, crossing some arms of the provincial routes and incorporating the isolated terminals of London services into an integrated national network.

When these provincial services for ca 1830 are plotted the network of routes in the northern and western areas is striking (Figure 7). The Country services are dashed and the London services are grey. Country services look just as extensive as London services and together they overlay much more of the turnpike network. Notice also that many country services have distinct routes from London services, especially in the northwest.

Figure 7. *London and Country coach services ca 1830*



Notes: *London services from Robson's Directory of 1830; Country Services from Pigot National Directories of 1828/30.*

Table 5 shows the number of direct services between towns with high interconnectivity (i.e. direct services to at least two other hubs). For example, in the first entry there are 24 services between Manchester and Birmingham. The latter two towns were particularly important in this provincial network, whereas towns such as Oxford and

Cambridge were much less interconnected. In practice interconnectivity was even greater when forwarding from the hubs and the connections provided by London radials (e.g. Birmingham on to Manchester) are factored in. The busiest route was between the Manchester and Liverpool, two important hubs only 37 miles apart. The proposers of the Manchester Liverpool railway used this large, proven demand for passenger services to justify their revenue projections for the first passenger railway line that would open shortly after these figures were collected.[6]

Table 5. *Number of direct coach services per week between main provincial town hubs advertised in Pigot 1828/30*

	Birmingham									
Manchester	24	Manchester								
Bristol	55	13	Bristol							
Leeds	66	55		Leeds						
Newcastle		6		24	Newcastle					
Liverpool	52	146	7	38	6	Liverpool				
Nottingham	19	12					Nottingham			
Oxford	27		18					Oxford		
Cambridge	19	12						3	Cambridge	
Southampton	12		21					18		Southampton
Shrewsbury	15	18	3			18				

Notes: figures based on authors' calculations from directories described in Table 1.

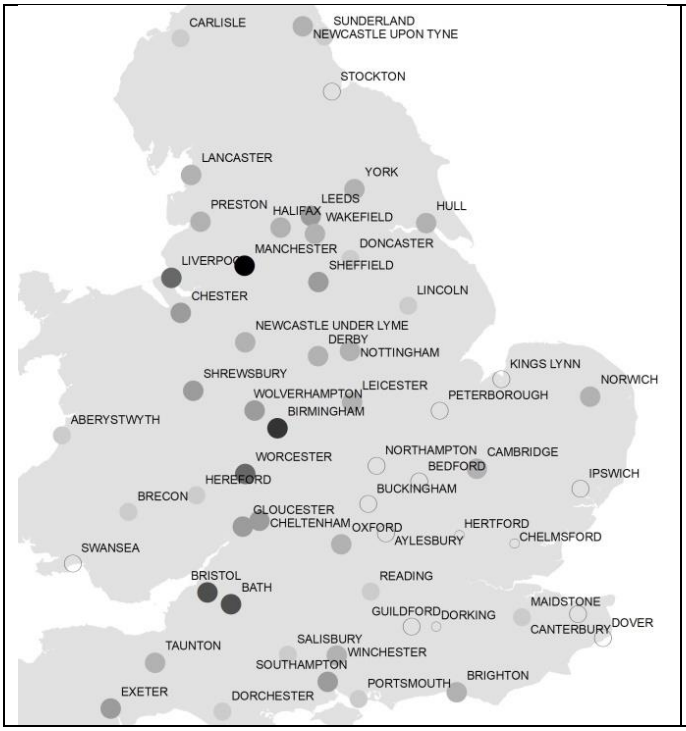
The distribution of services within the network seen in Figure 7 was examined further. Towns up to 40-miles distant from London were predominantly served only by routes radiating from London and had almost no Country routes connecting them to other provincial towns away from these radials. This pattern is shown in the left hand map of Figure 8. The darker circles reflect higher numbers of provincial routes through a town. Connections between provincial towns on different London radials are relatively few through eastern England, whereas many provincial routes pass through the towns in western England creating an interconnected network.

The pattern emerging by 1828 (shown in Figures 7 and 8) was of two overlapping networks with different structures. The towns of south-eastern England were served by a London-centric network with almost no intra-regional links. North and west of London there was a dense network connecting major hubs in Birmingham, Manchester, Leeds and Bristol, with lesser hubs on the periphery such as Norwich, Shrewsbury, Oxford, Southampton and Exeter. These were well connected to each other and were on the London radial network. They did not have strong direct links to

[6] As it happened the number of coach services then fell to one a day (see overall fall reflected in Table 6) and the number of rail passengers was three times that projected (PP 1832)

towns in the Home Counties, around 50 miles from London. The Country network provided the bulk of the routes to the remoter parts of Northern and Western England and Wales.

Figure 8. *Number of provincial coach routes through individual towns advertised in Pigot 1828/30*



Population 1831	Ratio of Country routes in 1830 to 1000 population 0-0.33	0.34-1	over 1
up to 6,000	Buckingham, Dorking, Hertford, Chelmsford, Bedford	Guildford, Aylesbury, Peterborough	Dorchester, Brecon
6,000-12,000	Truro, Dover	Stockton, Salisbury, Doncaster	Newcastle-u-Lyme, Portsmouth, Gloucester, Winchester, Taunton
12,000-18,000	Kings Lynn, Swansea, Canterbury, Northampton	Aberystwyth, Maidstone, Carlisle, Sunderland	Cheltenham, Halifax
18,000-25,000	Ipswich	Oxford, Lancaster, Cambridge, Exeter, Derby, Wakefield	Southampton, Worcester, Shrewsbury, Chester
25,000-100,000	Hull, Brighton, Newcastle-u-Tyne, Norwich	York, Preston, Leicester, Wolverhampton, Nottingham, Sheffield, Bristol	
over 100,000	Leeds, Liverpool, Manchester	Birmingham	

Notes: *Grey scale from 80 to 10 routes for large circles, 10 to 1 routes in hollow circle, no provincial routes in small circle.*

The population of towns was a factor in hub importance, but it was not the entire story (see Table in Figure 8). Towns within 40 miles of London were relatively small, but even allowing for this, the towns of the Home Counties north from London to Norfolk had few provincial connections; e,g. Buckingham and Ipswich have a low services to population ratio, and several have none e.g. Chelmsford. In contrast the medium sized towns of western England have a high provincial connectivity for their size (e.g. Gloucester or Dorchester ratio of services to population greater than 1). Although in absolute terms the very large conurbations have high Country connectivity, based on population they are less connected than the medium sized towns of the Midlands and Northern England e.g. Manchester has a low services to population ratio. Through-traffic tends to boost the route numbers for these intermediate towns which are often in the sphere of influence of more than one of the larger hubs. The large hubs on the other hand have many links to smaller isolated towns diluting the overall proportion of traffic to other hubs.

The composition of Country services by distance and by passenger numbers is shown in Table 6. The number of advertised services and passengers from London that passed through or terminated at the hub are entered for comparison (columns 7 and 8). The passenger loadings are estimated at an average of two thirds nominal capacity:

stage coaches carrying 9 passengers and mail coaches 5 (loading based on figures provided in evidence to Parliamentary Committees (PP1837a/b).

Table 6. *Scheduled coach services per week originating or passing through provincial hubs in 1835*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Hub	*coach services up to 12 miles*	*coach services 12 up to 70 miles*	*coach services over 70 miles*	*Country passengers /wk over 12 miles*	*Stage coaches from London*	*Mail coaches from London*	*London passengers/ wk calling at the town*	*London passengers calling/wk per 1000 population*	*proportion of London services terminating here*
Northern England									
Carlisle	14	28	*19*	419	12	14	178	12	0.7
Halifax	0	131	*10*	1269	6	0	54	4	1.0
Hull *	62	56	*0*	504	6	7	89	3	1.0
Lancaster	0	31	*31*	558	12	7	143	6	0.7
Leeds	119	144	*50*	1746	*18*	7	197	2	1.0
Liverpool *	45	42	*19*	549	48	7	467	3	1.0
Manchester	1432	634	*78*	6408	*48*	7	467	2	0.7
Newcastle	531	199	53	2264	18	14	232	4	0
Sheffield	32	142	*26*	1508	*18*	7	197	3	0
York	0	107	*39*	1314	24	7	251	9	0.2
Midlands									
Birmingham	333	292	*135*	3843	127	14	1213	8	0.6
Leicester	15	69	*19*	792	*89*	7	836	21	0.1
Northampton	0	20	2	194	*89*	14	871	57	0.1
Nottingham	5	132	29	1445	42	7	413	8	0.4
Oxford	6	66	*3*	621	159	14	1501	73	0.2
Shrewsbury	0	87	*43*	1166	24	7	251	12	0.2
East Anglia									
Cambridge	0	36	*12*	432	*72*	7	683	30	0.5
Ipswich	0	38	0	342	*54*	14	556	27	0.2
Kings Lynn *	0	6	3	81	15	0	135	10	0.8
Norwich	2	72	*6*	698	*36*	14	394	6	1.0
Western England									
Bristol *	14	85	*32*	1053	*48*	7	467	8	0.9
Exeter	31	77	*67*	1296	*42*	14	448	19	0.3
Gloucester	69	112	*59*	1535	30	7	305	31	0.2
Salisbury	0	51	*20*	639	*54*	14	556	56	0.2
Taunton	12	35	*42*	693	*12*	7	143	13	0.3
Worcester	13	129	*53*	1638	36	7	359	19	0.4
Southern England									
Brighton	90	63	*6*	621	156	7	1439	35	1.0
Canterbury	37	169	0	1521	*91*	13	884	61	0.1
Maidstone	27	64	0	576	45	0	405	26	0.7
Portsmouth *	3	28	*7*	315	51	7	494	53	1.0
Southampton*	0	78	*37*	1035	54	7	521	27	0.8
Winchester	6	25	*6*	275	54	7	521	51	0
Wales									
Brecon	0	9	22	279	0	7	35	7	0
Swansea	0	24	*3*	243	6	7	89	6	0.5

Notes: * towns from which ferries or packets may carry coach passengers onward.

The figures in Table 6 analyse the traffic to and through a number of provincial towns (the 12, 70 and over 70 mile categories were chosen to be typical for separating, local traffic (short stage licences), intra-regional traffic and inter-regional traffic for the Northwest, Northeast, West Midlands etc.). These demonstrate the size and extent of the coach networks around Manchester and Birmingham in particular. Coaches could reach Birmingham in only 12 hours

from London and with a Midland location it became a hub for both intra and inter-regional services (under and over 70 miles in Table 6) fed by many London services. Manchester was at least a 20 hour journey from London and had fewer London services but was well placed as the large hub for intra-regional routes to industrial towns on both sides of the Pennines.

Table 6 also demonstrates that towns such as Liverpool, Leeds, Sheffield, Leicester, Nottingham, Gloucester and Bristol were important hubs. Based on Trade Directories, inter-connected networks (i.e. rather than local distributive services to towns with no other link) could not be found around Portsmouth, Ipswich, Northampton, Carlisle or Salisbury. Canterbury and Brighton only had linear connections along the coast. Except for Liverpool (which already had a railway), the number of long-distance Country services through the northern towns is significantly larger than the number of services from London (compare column 4 and 7).

The number of regional stage coach services (between 12 and 70 miles) was several times greater than the London stage coach services (compare column 2 and 5). As a consequence, the number of passengers carried to or through these towns from places over 12 miles distant far exceeded the numbers from London. In the case of Halifax and Manchester the ratio is more than an order of magnitude, so even if some of these were smaller coaches the contrast is large. In the West of England and South Wales local travellers exceeded London travellers by more than a factor of two. See for example Bristol, Worcester, Gloucester, Bristol and Swansea. Conversely, London travellers dominated arrivals at Brighton, Winchester and Portsmouth and in East Anglia for Kings Lynn, Ipswich and Cambridge. Geography inevitably affected the nature of the hubs. There were no large towns to serve further along the Dover, Norwich or Brighton roads and the journey time from London to hubs such as Manchester and Exeter (ca 20 hours) might have been at the limit of endurance for all but the dedicated traveller.

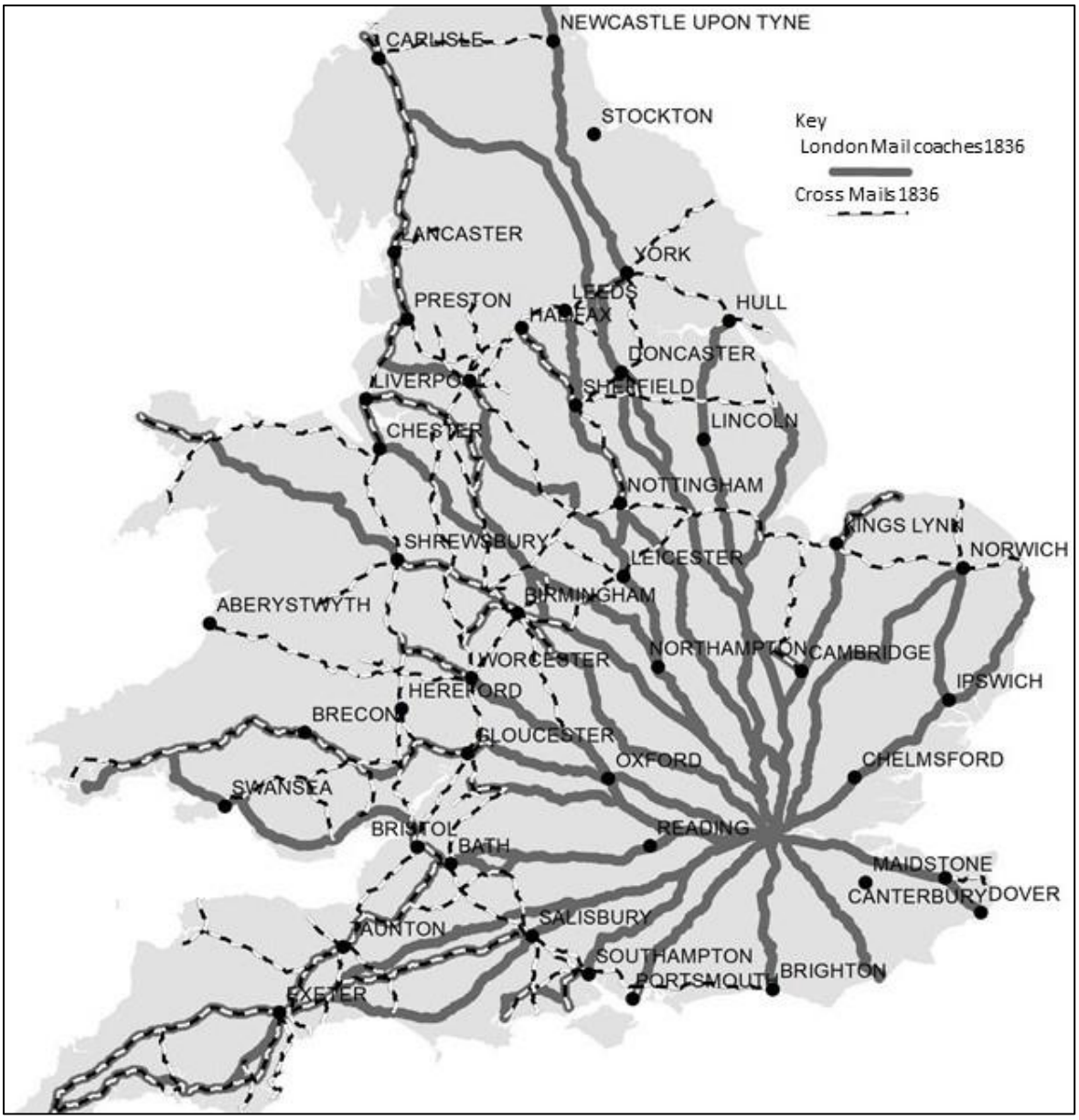
The analysis of passenger numbers cannot distinguish between those who finished their journey at an intermediate town and those for whom it was a short stop on a longer journey. However, market forces would probably mean that services were assigned to final destinations to maximise occupancy in the coach to the terminal, so loss of passengers on a Manchester coach say at Birmingham may occur but not alter the overall pattern significantly. Some of the towns listed in Table 6 were terminals, so most passengers from London may be assumed to stop there (see column 9). Several were ports from which ferries carried some passengers onwards (e.g. from Portsmouth to the Isle of Wight). Many of the Midland towns were only intermediate stops for London coaches and no coaches terminated

at Sheffield, whilst 90% of the coaches calling at Leicester or Northampton were bound for further destinations. Birmingham was a particularly important hub. It had many services terminating at the town, but since it was on the route to major destinations in the northern England, Birmingham had almost as many services passing through and had a large number of Country services radiating from it.

V

Royal Mail services were a significant component of the passenger services from London to the northern and western areas as illustrated in column 6 of Table 6. The introduction of Mail coaches into this network after 1784 coincided with a step change in the provision of long-distance services. Figure 9 shows the routes used in 1836 by Royal Mail coaches from London and the Cross Mails that ran from large postal towns such as Chester, Birmingham and Bristol. The London Mails duplicated some of the main stage coach routes, but the number of Mail routes changed only slowly after 1800. Thus, the proportion of Mails in the carrying capacity of London coaches were diluted as new stage coaches were added both on existing routes and on the alternative routes to towns through southern England. By the 1830s Mail coaches were less than 10% of the carrying capacity on busy routes such as those to Brighton. Cross mails paralleled some stage coach routes and were more evenly distributed across the Provinces than were the Country long-stages, serving smaller towns that could not sustain a commercial stage coach service. These were particularly important in providing the majority of the passenger services to some coastal areas of North Wales, North Norfolk and North Devon as well as the Welsh Valleys and Lincolnshire. Cross Mails were important even where commercial stagecoaches overlap; for instance in 1836 at Bangor where the Holyhead road crossed there were only three stage coach services, all licensed from Shrewsbury (linked to London services) while both the London Mail and the Cross Mail from Chester ran through here. Austin (1981) elaborates on the impact of mail coaches and so we direct readers to that work for more details.

Figure 9; *Mails or Cross Mails in 1836s*



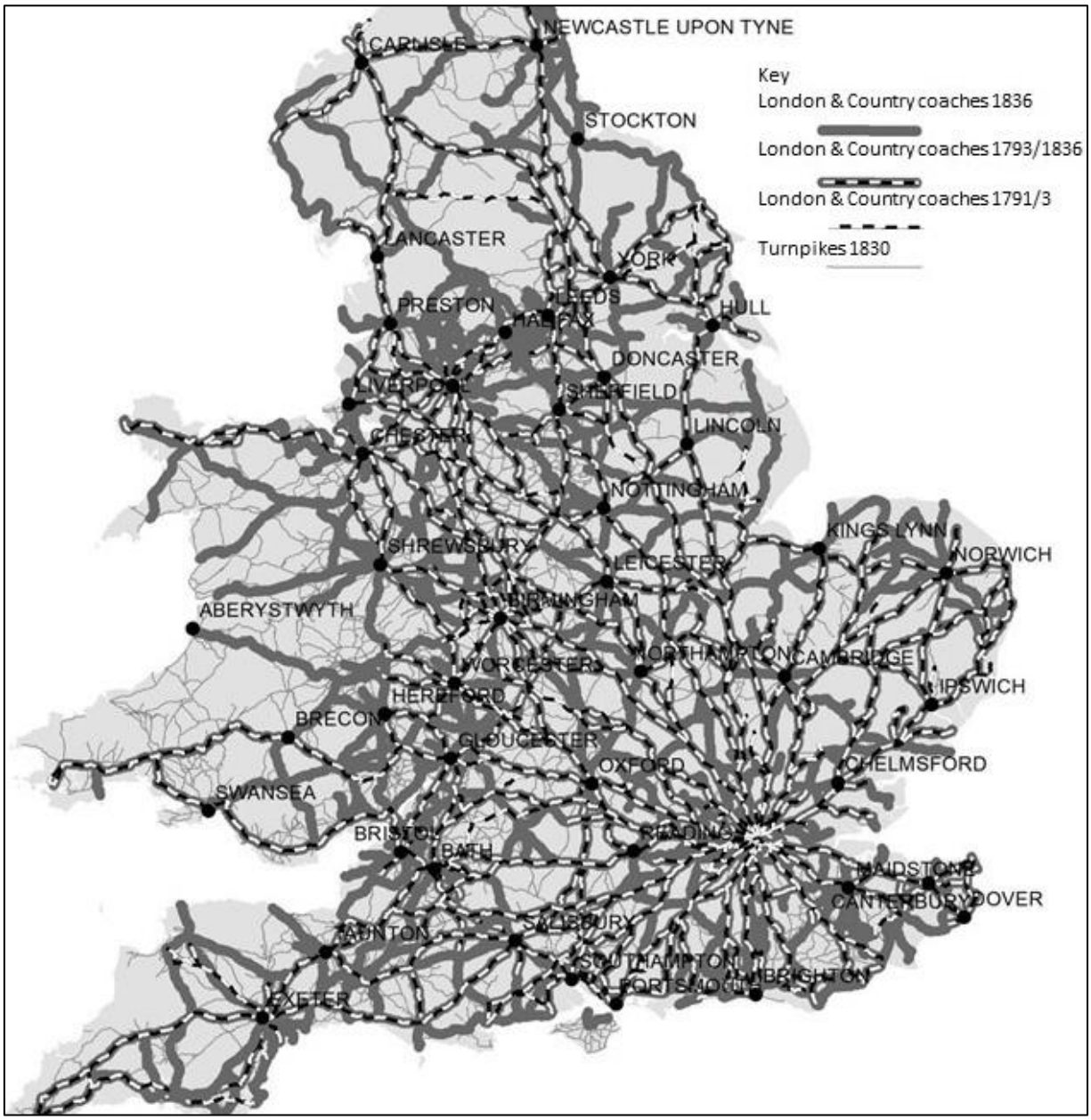
Notes: *London Mails from Bates (1836), Cross Mails from lists of Country licences in Robson's Directory of 1836.*

VI

The emergence of the provincial coach network appears to be a late 18th century phenomenon. There is no evidence in the Trade Directories for sustained cross-country services before 1760 and detailed studies of individual hubs e.g. by Gerhold (2012) have already noted this. However, once regional services were established, they grew at a faster rate than the London services after 1790 to achieve a similar overall size to the well-established London market by the mid-1830s. Importantly, this was multipoint growth that developed a dense network of services. Figure 10 shows the national coach network (i.e. London and Country services combined) in the early 1790s as dashed lines – this is primarily made up of London services. The national network in 1836 based on stage coach licenses shows many

more routes, the majority of which start from provincial hubs (contrast with Figure 3 which shows just London services for similar years).

Figure 10. *London and Country coach services in 1791/93 plotted above London and Country coach services in 1836*



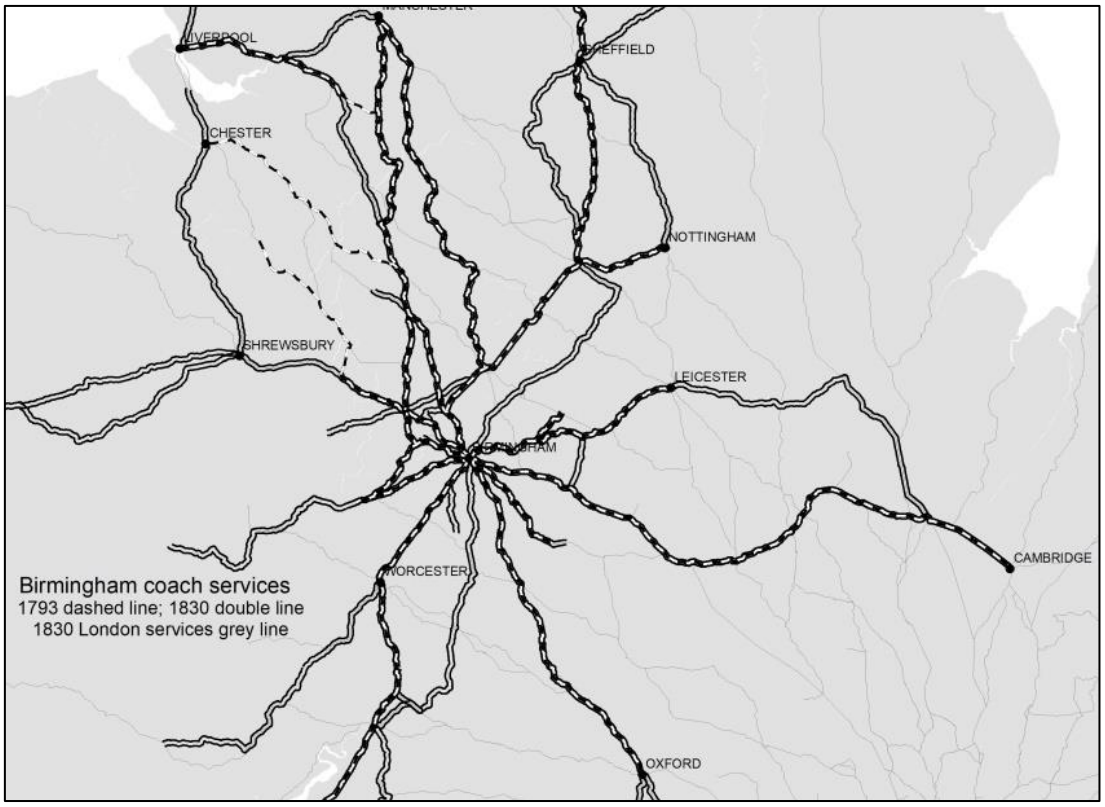
Notes: 1791 *London services and 1793 Country services combined from Universal British Directory; 1836 London and Country Services from Robson licenses list.*

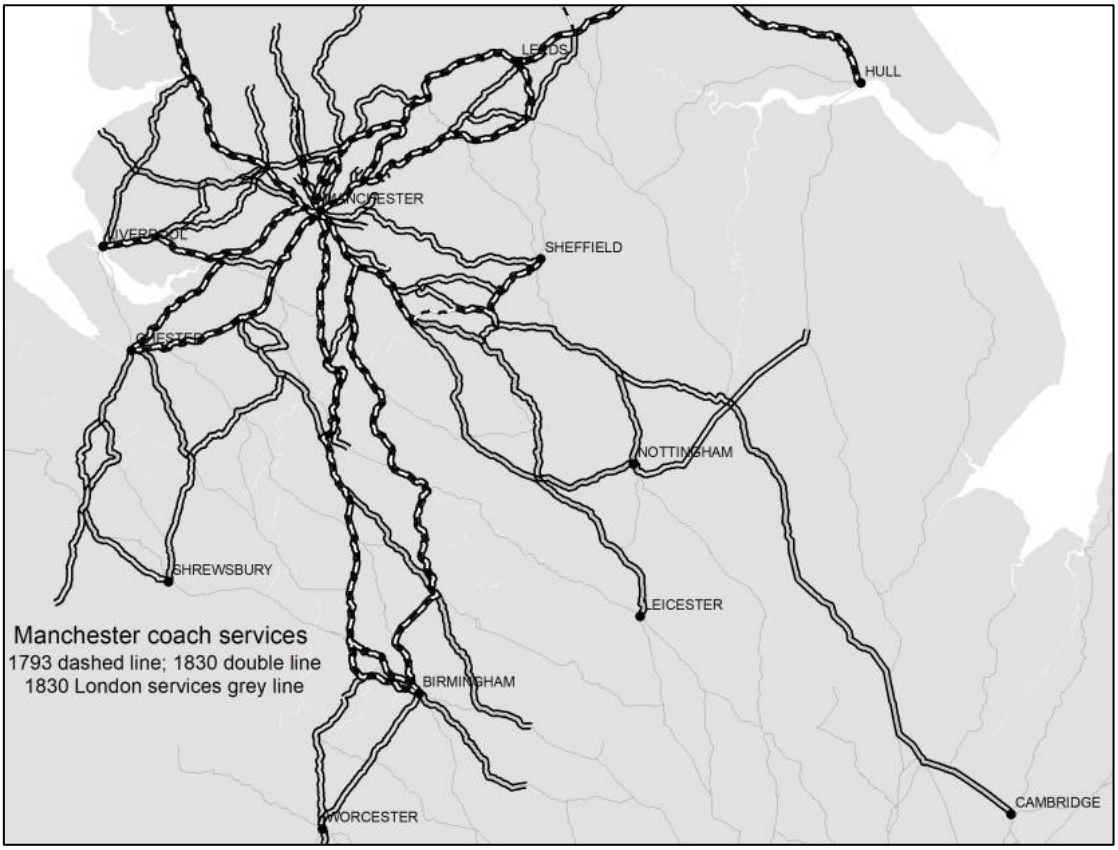
Interconnecting cross-country routes increased in a band running northwards from Bristol, through Birmingham to Manchester and Leeds. This western route complemented the eastern routes along the line of the Great North Road from London. Travellers between provincial towns could avoid going into London and then out again on another

radial route. Passengers were fed into the larger hubs with London services, but some of these services inevitably ran along the axis of the London route (Figure 7). This Country network was more easily extended outwards by these local operators increasing the overall growth rate and out-competing the longer London services at their extremities.

Although the Country coach network in total grew to be similar in scale to the London coach network, the individual hubs towns within the Country network were inevitably smaller and the individual networks associated with them less extensive. Figures 11a & 11b illustrate the character of the networks centred on Manchester and Birmingham, which were the busiest provincial hubs. The dashed lines are coach services in 1793 and the double lined are services in 1830. A dash without a double line is a service that exited after 1793 (e.g. Birmingham to Chester in 10a); a service with no dashes entered by 1830 (e.g. Birmingham to Shrewsbury in 11a). A service running at both dates is shown as a double line enclosing dashes (e.g. Birmingham to Leicester). Whereas Birmingham lay at the centre of a symmetrical web of long-stage routes, Manchester had a larger number of shorter regional routes heading northwards into industrial Lancashire and West Yorkshire. Both hubs had a basic long stage-network established by 1793 but service frequency increased and new routes to secondary destinations were established by 1830. There were 15 Country services per week between Manchester and Birmingham in 1793 but this only grew to 18 direct and 19 through-services by 1830. However, services from Manchester to Leeds grew from 1 per week in 1793 to 42 in 1830 and Manchester to Sheffield from 3 to 27. In general, this growth was lowest on routes which duplicated sections of London service roads and much greater on routes that linked to hubs on other London radials (i.e. from Manchester eastwards and from Birmingham to the south and west). Nevertheless, the long-stage networks associated with Birmingham and Manchester were each only a sixth of the London network by 1830; after this date railways started to affect these provincial hubs. The short-stage network was much smaller in the provincial towns than in London, although local coach services into Manchester began to rise rapidly by the mid-1830s as the novel omnibus was introduced on some short stage routes and journeys to railway stations increased. Just over 50% of all Country services in 1830 were from five hubs; Manchester, Birmingham, Leeds, Newcastle and Bristol. These five made up a dominant 61% of all vehicle miles travelled by Country services.

Figure 11 a & b. *1793 and 1830 Country coach services from and through Birmingham and Manchester*





Note: Authors depictions from *1793 from UBD and 1830 from Pigot Regional Directory*.

Although London had a much larger number of long-distance services than Birmingham and Manchester, only about 10% of the London services connected to industrial towns (see Table 3) whereas a very large proportion of the Manchester services were to other industrial towns. Hence the scale of commercial travel from the northern hubs may have been of similar magnitude to that of London. Figures 11 a & b illustrate how the Country network was actually a mosaic of interconnected networks around large regional hubs such as Bristol, Birmingham, Manchester and Leeds. Regional coach masters controlled important distributor routes and were competing for business on the sections of the London routes close to their hub. Thus, passenger journeys to London in the 1830s may have involved a regional coach to a hub such as Birmingham, and then a London operated coach from there to the City, rather than the single London coach service that had been the only option in the 18th century. This curtailing of the longer London routes and some substitution of double journeys through the congestion of London by shorter inter-regional journeys, would tend to restrain growth in London services. In areas where competition was growing this would have led to a slow decline.

VII

The geographic and temporal fluctuations revealed by this analysis are difficult to analyse within a single, national market. The changes fit better a four-part division of the coach trade. The first segment (A) is the London-centric market for travel to provincial towns; this has been the principal focus of most previous studies. Between 1681 and 1760 this was the only significant scheduled coaching market. It grew relatively slowly in service numbers, though service lengths slowly increased to reach most of the major ports and large provincial towns of England, but not Wales. Between 1760 and 1790 there was a step change in the coaching business, probably driven by the technical improvements to coaches which could benefit from the long, continuous stretches of improved road that had been created by contiguous turnpike trusts in the 1750s. The growth in London coach services was principally to the Home Counties but there was also growth to destinations within an area bounded by Dover, Southampton, Bristol and Birmingham. After 1790 the growth in the long-stage sector was marked by a large increase in the services to Channel coast towns and to society resorts such as Brighton after 1810. This travel was a near monopoly for London coachmasters as most travellers from the north could only access these prestigious locations through London. These services were a discretionary, luxury spend for the rising middle class “consumers” conscious of fashion and style.

In parallel with this, a second sustainable market segment (B) emerged about 1760 and began to grow rapidly. This served travellers going between the expanding industrial towns of the Midlands, South Lancashire and West Yorkshire but also increased their access to the northern terminals of the London network. Although each provincial hub was much smaller than London, the combined market grew to be a similar scale to that of London by the mid-1830s; services through Manchester, Birmingham, Leeds, Newcastle and Bristol made up almost two thirds the provincial total in 1830. The strength of this second segment gave operators the power to out-compete London services beyond the closest major hubs such as Birmingham and Bristol. So, during the rapid growth in overall traffic that occurred after 1800 the London trade expanded strongly to the coastal fringes of the South East with more frequent services, but failed or chose not to compete with the provincial coach masters for new business in the north and west. For London coachmasters these were long distance routes whereas for the provincial masters these were intermediate distance routes that could be run with a smaller number of coaches and were kept profitable with passengers fed into their provincial hub by frequent, reliable services. Having a forward ticketing arrangement was probably a better strategy than running a new service from London.

The third market segment (C) was travel in the neglected areas on the periphery, well beyond the industrial town network. These were economic 'backwaters' such as the Atlantic and Welsh coasts from Cornwall to Conway, the North Sea coastal areas from North Norfolk to the Humber and the North Pennines or areas such as South Wales that are isolated by the Bristol Channel. Here, from 1790 to the early 1830s, Mail coaches and Cross Mails rather than stage coaches were the dominant, and occasionally the only coach service for all but a few towns such as Bangor. This segment experienced a step change when mails were introduced, but then grew only slowly. It was the main roads through some of these areas that were improved by direct Government intervention to speed the mails to the seaport terminals at Pembroke, Holyhead and Port Patrick and to the Scottish capital. This category alone might lend weight to the arguments of those who see the improvements to the Mail roads by Telford, financed by government, as direct political intervention in a predominantly free market in coach travel (Guldi 2012).

The fourth segment (D) was the new market for short distance travel from suburban areas up to 10 miles from London. Using these services, travellers could reach central London, undertake their business, and return home within the day. This allowed those working in the city to travel daily from the pleasant new suburbs and others to enjoy social activities in town.

By 1836, railways were beginning to change the scheduled coaching network. The London segment (A) had peaked as demand for the long-distance traffic to its peripheral hubs such as Birmingham, Southampton and Bristol was curtailed, first by termination of services at the temporary stations at Boxmoor and Blisworth, or Woking and Farnborough, or Maidenhead and Steventon, before eventually the full inter-urban railway services were completed from 1838, 1840 and 1841. The Country segment (B), though it had lost some of its passengers to railways, still had another decade of growth in prospect and the benefits of feeder services to the new railway stations. The peripheral segment (C) was becoming the last bastion of long-distance coach travel, albeit small and eventually doomed. It was segment D, the London short-stages, that was to prosper and grow as it evolved into horse-drawn omnibus services that successfully competed with as well as serviced the new railways.

VIII

By using GIS we have displayed the actual roads used at particular time points during the 150 years when scheduled stage coaches grew to dominate inland public transport of people. At the start of this period, those who could afford would generally travel on horseback (Pawson 1977), by the end of the period they would generally travel in a shared coach, drawn by horses. Route maps using consistent national data highlight that the growth in scheduled coach services cannot be fully appreciated by just considering those radiating from London. Our maps show the evolutionary development of services from London illustrated by Hogarth through to Pollard, with better vehicles on routes that grew in number and reach. However, this growth was disproportionately into the counties of southern England and an increasing portion of these services were for recreational travel. In parallel with this was a more revolutionary growth in coach services within the regions, creating an interconnected network which linked the diverging lines of London services. This depended on a few regional hubs with substantial independent, long distance services, linking towns that would never warrant a direct service to London. They expanded the market and allowed a flexible response to changing demand. The period between 1760 and 1790 saw the most significant change in all services and was probably the time of transition in preference from saddle to coach for long distance travellers across the country. In addition, by the 1830s a new market for short-stages had emerged, providing daily commuter services along the existing radial road close to the capital and smaller networks around the larger industrial conurbations such as Manchester. These last two categories were far less concerned with leisured travel.

Importantly it was the full national network that demonstrated the potential travel market for the coming railways and would be adapted to complement the railways as they grew.

The wider perspective on coach services also suggests some reassessment of how transport may have contributed to strengthening of a national market and the breaking down of regional differences (Pawson 1977). Prior to 1800 the London network dominated stage coach services and linked most major towns to the capital, providing a channel for disseminating metropolitan cultural and business influence by visitors. However, by 1830, although towns in the South-east and Channel Coast were even better connected to London, at the peak of the coaching era, most northern towns were better networked by stage coach services between each other than to London. Midland towns were at least as well connected to the industrial North as to London. Most coach passengers reaching places such as Manchester came from other provincial towns, not from London, which points to a greater emphasis on regionalisation and a rise in the provincial centres as focus of influence in the 1830s. Beyond the large provincial centres, there was greater reliance on the mail coach network that ran under Government contracts, some on roads improved by Government loans, that continuing to provide the influence of London, not just along the main routes to the national capitals but to all parts of the nation, irrespective of economic prosperity.

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Minutes of evidence before Lords Committee; Chester and Birkenhead Railway (on line) PP (1837a) (June 1837)

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Datasets

Satchell, M. Rosevear, A., Dickinson, G., Bogart, D., Alvarez, E., Shaw-Taylor, L., 'Candidate main roads of England and Wales, c. 1680' (2017). This dataset was created with funding from the NSF (SES-1260699) and the Leverhulme Trust (RPG2013-093). A description of the dataset can be found in Satchell, M., and Rosevear, A., 'Candidate main roads of England and Wales, c. 1680 GIS shapefile documentation' available at: http://www.geog.cam.ac.uk/research/projects/occupations/datasets/documentation.html

Appendix

Appendix Table 1 compares licensed with advertised services. There is a consistent mismatch between advertised services and licensed services over 10 miles, with the licensed services 20% below the value for advertised services.

Appendix Table 1*. Number of advertised and licensed services per week in London Directories, classified by mileage length of journey.*

	advertised services / week			Licensed services / week		
Distance in mi.	1835	1836	1839	1835	1836	1839
10 to 24	1248	1122	1198	1126	1177	1472
25 to 49	674	643	641	416	450	453
50 to 99	855	773	757	751	731	735
100 to 199	573	509	400	545	577	413
>200	206	200	132	83	94	46
total over 10	3556	3247	3128	2921	3028	3118

Sources: see Appendix 1.

Notes: licensed journeys/week halved to give services/week;

Comparison of individual routes suggests the incongruence between advertised and licensed may arise from not comparing like-for-like "services"; i.e. advertisements are for a different service than was licensed. We the think this is due to the following factors:

(a) A significant number of licenses are not congruent with the most probable equivalent advertised services. Several of the advertised long distance London services are split at intermediate hubs such as Liverpool, York and Birmingham with a Country licence covering the distant section. Some short services from London are cut so that the quieter outer section has a Country license

(b) There was an incentive for operators to over license short-stages around London and a few other hubs because in the 1830s they only paid tax on services that were actually provided, unlike long-stage which were taxed against the license maximum.

(c) On less popular routes some advertised daily services were amalgamated, reduced to 3 day operation or even suspended during slack periods, such as the winter when demand fell, especially when this was discretionary travel for social and leisure purpose.

(d) Elsewhere, particularly on services to "resorts", advertised and unadvertised service only ran "during the season" i.e. holidays. Operators would choose a licensing schedule that minimised liability in the winter.

(e) Some operators may have avoided having licenses for the whole service for the whole time.

(f) The Robson Directory list for Mail coaches was prepared the previous November, and it seems likely that the license list was compiled at the same time, which would be during the slackest period of the coaching year. In contrast the advertised services were probably a declaration of all services that are likely to run in the coming year, based on the peak levels of the previous summer months.

(g) Finally, the deficit in long-stage licenses is much greater for services running north and east from London than those running south and west.

So can any reliable estimate be derived from these data sets? The license concession for London short-stages confirms the uncertainty that must be applied in using service data on these coaches. It also is reasonable to assume that the long-stage license data represents what was running at the time the list was compiled. The unlicensed services and the licensed services that did not run are likely to be of a similar, small magnitude so balance each other out. Hence if the license list is from the winter, it would measure the minimum service level during a year. The advertised services may be regarded as the upper edge of the service level intended at the busiest months of the year. On some roads the two levels are quite similar; on others the services are overstated in advertisements but at certain peak times actual service levels could be more than 25% higher than the listed license level. This could be the result of the frequency of individual services being reduced, merging of services from a hub for the last leg to London or speculative new services failing.

In estimating traffic, the proposers of railways used the Stamp Office license information rather than the advertised services and so it might be assumed that license data is a closer, conservative match to the average annual services. However, since in years before 1835 estimates can only be made on advertised services uncertainty must inevitably arise when comparing pre-1830 services with the licensed services after 1835 and estimating growth rates. Although advertised service numbers will certainly over-estimate what was actually operated on average during the year, it is likely that the degree of overstatement was similar across the period. Hence when estimating growth rate as in table 4, it is legitimate to compare like with like and use the number of advertised coach services across the whole period to calculate the percentage change (i.e. the same degree of uncertainty is applied to the earliest and latest numbers).