

Government, trusts, and the making of better roads in early nineteenth century England and Wales

Alan Rosevear¹, Dan Bogart² & Leigh Shaw-Taylor³

Abstract

This paper introduces new data to explain how public, private, and non-profit sectors sponsored, financed, and technically developed better roads in early 19th century England and Wales. Our findings show that central Government direct financing was limited to sections of the politically important London-Holyhead Mail Road. By comparison non-profit organizations, known as turnpike trusts, built more new roads by attracting private investors and capable surveyors. We also show the Government Mail Road had the highest quality. Nevertheless, most turnpike trust roads were good quality, indicating their practical achievements. The broader implications for infrastructure and state capacity are also explained.

Keywords: State capacity, infrastructure, roads, turnpike trusts, non-profit sector, public private partnerships

JEL codes: N7, N4, H1, R4

¹ Research Affiliate, University of Cambridge, UK, rosevear1@aol.com

² Professor, Department of Economics UC Irvine, dbogart@uci.edu

³ Associate Professor, Faculty of History, University of Cambridge, UK, lmws2@cam.ac.uk

1. Introduction

Poor quality infrastructure is common in many economies. One of the current challenges is the reluctance of sponsors, who might advocate, plan, and invest in infrastructure projects (World Bank 2017). In many cases, sponsors are public entities, like the Ministry of Transport (Dabla-Norris et al. 2012). In other cases, they could be a variety of private sector organizations, both for-profit and not (Engel, Fischer, and Galetovic 2020). Financing is a further challenge as infrastructure projects are often very expensive. Public financing can come from equity, like direct transfers from the treasury, and from state owned banks which make loans. Public sponsorship and public financing often go together, but private sponsorship does not necessarily imply private financing, nor does it imply reliance on equity over debt (World Bank 2017). Implementing new technologies can present challenges, even though these may reduce the high costs of construction and maintenance, which are often major barriers.

In this paper, we examine an interesting historical case to better understand the creation of new infrastructure. Our focus is the improvement of the main public roads in England and Wales during the early 19th century. At this time, England had emerged as one of the world's leading economies. Along with its economic development, English roads had been significantly improved during the late 18th century. However, the volume and weight of road traffic had increased and by 1800, roads were considered only fair to bad in parts of England. This was even more evident in Wales, whose economy remained largely undeveloped. Nevertheless, the potential for making high-quality roads increased in the early 1800s, as the engineering community developed new technologies and maintenance systems. Explaining exactly which bodies sponsored, financed, and technically developed better roads is one the

main contributions of our analysis. Another contribution is to employ textual analysis and GIS tools to Parliamentary records and historical maps. We quantify the mileage managed by different authorities or organizations, distinguishing the mileage of new main roads built, and where they were built. We also digitize, map, and analyse the first national survey on the condition of all main roads in England and Wales in 1838.

Our analysis demonstrates that central Government sponsorship and financing focused on the Holyhead Mail Road (see later Figure 1), a politically important route connecting London with Holyhead and hence to Ireland. The largest investments went into the North Wales section, a mountainous area with low population density. Improvements on the Holyhead Road were completed under the supervision of Thomas Telford, considered the best technical road engineer of the day. While central Government involvement in roads is confirmed to have increased, we also show that most new roads in the early 19th century were built by turnpike trusts, an early example of privately financed, non-profit organizations. Going back to the early 1700s, turnpike trusts were sanctioned by Acts of Parliament to better maintain thousands of miles of public road. They were managed by a group of self-selected trustees (generally drawn from the propertied and business class in an area). Trustees were barred from any financial reward and the trusts had no shareholders. Capital was raised by issuing bonds, usually purchased by individuals from the area near the road, and without Government guarantees.

Employing textual analysis of Parliamentary Acts, we show that turnpike trusts became more involved in building new roads during the 1820s. One stimulus was the growth in economic activity in particular regions. Other stimuli were favourable credit markets, allowing trusts to issue more bonds, and the diffusion of cost-saving techniques associated with the

engineer John McAdam. Collectively, we estimate trusts built about 4000 miles of new road in England and Wales, mostly in the period 1810 to 1838. This figure represents almost 30 times more new road mileage than had been achieved through the Government sponsored and financed Holyhead Road. Moreover, using GIS mapping, we show most new turnpike roads were built in industrializing and coastal areas where need for fresh infrastructure was greatest.

Turning to the national survey on road conditions in 1838, we find the Holyhead Mail Road ranked in the highest quality category. Moreover, some London coach operators switched to using the English section of the Holyhead Road after it was improved, though traffic growth through North Wales was modest. The quality of the North Wales section was better than that on similar mail roads in Central and South Wales which were managed by turnpike trusts. Nevertheless, we also find that most turnpike trust roads were of good quality in 1838, indicating their practical success in improving the wider network. In short, Government sponsored and financed improvements yielded the best quality, but they were limited in scale and use when compared with turnpike trust roads.

Our findings contribute to the literature on the sources of improved roads in 19th century England and Wales.⁴ The consensus view is that turnpike trusts slowly improved bad main roads through the 18th century until the rapid expansion of railways around 1840. The central Government in London mainly played an indirect role by scrutinising and facilitating Acts of Parliament creating turnpike trusts⁵. There is a revisionist view that Governments made a

⁴ Improvements on roads in other parts of Britain, particularly Scotland and Ireland, are not in our study.

⁵ For a discussion of turnpike trusts see Webb and Webb (1913), Albert (1972), Pawson (1977), Barker and Gerhold (1995), Bogart (2005, 2019), Gerhold (2014a), and Rosevear et al (2019). Roads were not unique; facilitation of infrastructure through Acts was a major activity of Parliament starting around 1700. See Hoppit (1996), Bogart and Richardson (2011), and Cox (2016).

more significant direct contribution to improvements on certain main roads. Guldi (2012), in *Roads to Power*, argues that between 1803 and 1835 Government funding and standardisation were the driving forces for creating corridors of better British roads radiating from London. This revisionist account is controversial (see Gerhold 2014b), yet not implausible. There is an argument that Tory-led Governments between 1815 and 1830 introduced some economic reforms (Gordon 1979, Brock 2014, Craig 2020). Moreover, it is consistent with the Government's increased capability following the fiscal build-up of the Napoleonic Wars (O'Brien 2016, O'Brien and Palma 2020, Cox 2020).

Here we provide a new synthesis. Consistent with the revisionist account, our evidence suggests the greatest Government intervention delivered the highest quality. However, we also demonstrate that Government sponsorship and financing was the exception. Turnpike trusts, mostly operating independently of the Government and obtaining their own private financing, built far more new roads. We also argue that Governments sought to work with the trusts by obliging them to improve and be more transparent in their financial managements and open to surveying of their engineering and maintenance. Government also eased access to some finance and increased awareness of what could be achieved using skilled surveyors and close management. In sum, Governments had their widest impact by regulating and strengthening turnpike trusts, rather than replacing them.

While our focus is on England and Wales, it should be noted that other economies faced similar challenges developing their roads during the early 19th century. Standard practice had local communities maintain roads through forced labour (see Duran et al. 2020). In more developed European states, like France and Spain, the monarch would coordinate and fund

highway improvements on routes of strategic importance, especially into their capital. While there is some evidence that ‘royal roads’ were well made (Pablo-Martí et al. 2021), it is notable that market integration in France and Spain remained limited and trade was difficult (Herranz-Loncan 2007, Grafe 2011, Nogues-Marco et. al. 2019, Chilosi et. al. 2013 and Federico et. al. 2021). The English and Welsh model, in which Government worked with and through turnpike trusts, successfully improved road quality and responded to changes in demand.

We also contribute to the broader state capacity literature. The conventional narrative posits that wars helped developed state fiscal capacity in Europe, which eventually led to more public goods spending by the state (see Besley and Persson 2008, Dincecco and Prada 2012, Johnson and Koyama 2017). It is well known that this narrative does not describe the British experience accurately, since its railways, canals, and waterworks were built by for-profit, joint stock companies (Ward 1974, Casson 2009, Tomory 2017, Campbell et. al. 2021). Our analysis suggests another difference by emphasizing the role of privately financed, non-profit organizations such as turnpike trusts. Other examples involve harbour and bridge trusts, and lighthouse authorities like Trinity House. The influence of trusts would wane as road traffic declined and eventually roads would become the responsibility of municipal authorities and rural districts, both public actors.⁶ Even so, trusts provide an illustration of a developmental path, where non-profits play a significant role partnering with private and public authorities.⁷

⁶ See Webster (2021), Chapman (2021), Millward (2005), Bogart et. al. (2022) for details on how public authorities became more significant in the late 19th century.

⁷ See Zwalf’s (2022) analysis of the successful of collaboration with not-for-profits in building modern toll roads in Australia. For more on non-profits see Bennett and Iossa (2010), Mendel and Brudney (2012), Oechler Solana (2014), Glaeser and Xiong (2017).. For more on private partnerships see Engel, Fischer, and Galetovic (2020).

Finally, this paper contributes to a general history of infrastructure development. Many insights have been drawn from studies of individual sectors or countries (e.g. Goldsmith 2014, Cassis et. al. 2016, Offer 2022). Nevertheless, common issues are found in different settings, such as risk allocation, the appropriate level of public subsidy, and governance structures.

2. Actors involved in road improvement

Turnpike trusts were important sponsors of road improvement in England and Wales. Trusts (composed of local landowners, Justices of the Peace, clergy, and commercial interests) were given authority over the planning, improvement, and maintenance of roads by individual Acts of Parliament. The system had its origins in the late 17th century, but it flourished in the decades after 1720. By the early 19th century there were close to 1000 trusts managing different sections of the main road network.

Broadly, the early turnpike system operated with limited public oversight and scrutiny. Trustees initiated nearly all proposals for new roads and improvements. Parliamentary committees had some influence over proposals when reviewing bills establishing or extending trust's term of authority; yet there is no evidence that committees significantly shaped trustee proposals.⁸ Trustees also took the lead in procuring land, when necessary for improvement.

Trustees also had considerable control over finances. Parliamentary Acts set maximum toll schedules for different users, including wagons, coaches, and drovers, but trusts had the ability to vary the tolls below the maximums and to "compound" (i.e. negotiate) with regular individual users for an annual ticket, effectively subsidising particular types of traffic. Trustees

⁸ For a survey of turnpike trusts, see Albert (1972), Pawson (1977), Bogart (2017).

largely determined debt levels and hence levels of risk; important since extensive debt overhang could inhibit essential works. It is also striking that trusts did not have to report income, expenditure, and debt levels. Their finances were partly revealed in committees reviewing bills for individual trusts, but no systematic report was required for all trusts until the 1820s. Their activity was restricted to the roads named in their Act and a major financial limitation was that trustees could not earn any profits or pay themselves a salary. This characteristic is why we consider trusts to be non-profit organizations.

There were two primary public sponsors of road improvement in England and Wales. The first were civil parishes relying on taxes on land and Statute Labour (called corvee labour in other contexts). Parishes were mainly responsible for minor roads and are not the focus of our analysis. Local Justices of the Peace and juries assisted in transactions to acquire land for new roads; this was one notable aspect of public intervention (Bogart 2011). However, we emphasize Government administrations in London. They were headed by Tory ministries from 1807 to 1830, which covers much of our period. The ministry's primary political concerns were war, suppressing revolution, and unification with Ireland. The Tories generally followed *laissez faire* economic principles, but there were some MPs, Government boards, and agencies, like the Post Office, arguing for more intervention. There was a precedent for Government sponsorship and financing in Scotland through the Commission of Highland Roads & Bridges, established in 1803⁹. It acted like a public agency sponsoring and financing infrastructure in the

⁹ There had been Government intervention on a road south of the Scottish Border in 1751, after the Jacobite Rebellion. The Military Road constructed along Hadrian's Wall was administered by a Turnpike Trust but Lawson (1966) records that the initial survey was conducted by two army engineers and there was a general view that turnpike tolls alone would be insufficient to fully finance the road. The preamble to the Act makes clear its importance for the passage of Troops and Carriages speedier passage of His Majesty's armies and, presumably in recognition of this, the Treasury made a direct grant to the trust of £3k.

less developed, politically sensitive, upland areas. But no such Commission existed for England and Wales, prior to the foundation of the Holyhead Road Commission in 1819.

Road users were another potential pressure group advocating for improvement. London stage-coach operators and freight carriers had an obvious interest in better roads. They had some influence serving as witnesses to Parliamentary committees. The gentry and clergy were frequent travellers on horse-back or in hired postchaises and private carriages. Some regularly commented on the state of roads in their diaries¹⁰ or complained in letters to newspapers and a few published private tracts with their views. Notably, Arthur Young, summarised his views, first in the 1770s and from the 1790s in reports to the Board of Agriculture, a voluntary association promoting improvement. It is possible the gentry and clergy, some of whom were trustees, exerted social pressure for improvement. On the other hand, improvements brought higher tolls, and the influential MP, Henry Parnell (1833) suggested that some users fundamentally preferred poorer roads and low charges. The Post Office was the strongest supporter of improved roads. But it was not a typical road user, as it was a public body.

Besides sponsorship, financing was another crucial factor in road improvement. There were numerous private individuals who lent to turnpike trusts by purchasing their bonds. Trust mortgage registers indicate bondholders tended to be local landowners and manufacturing interests (Albert 1972). For some trusts, especially in urban areas, bondholders could be women, charities, and shopkeepers (Buchanan 1986). London-based investors were not common, although the details on the scope of the turnpike bond market are not known (Albert

¹⁰ The Published diaries of the Witts family (1788-1845) give a regular commentary on the state of the roads in Gloucestershire.

1972). The Public Works Loan Board or PWLB was the major public investor in turnpike bonds. It was founded in 1817 to allocate Government-funded loans to local authorities (see Webster 2018) with an aim to provide relief and stimulate the economy when credit was tight. However, the PWLB also insisted on repayment, so it was like a public bank. The PWLB appears to have been the single largest holder of turnpike bonds, although its share was not large overall (Bogart 2019). The predominance of individual bondholders is why we consider turnpike trusts to be mainly privately financed. The UK treasury was another potential public investor in roads, but as we show its role was restricted to the Holyhead Mail Road.

It is worth emphasizing right away that turnpike bondholders bore default risk. Many trusts missed interest payments occasionally and some regularly. In the 1830s, interest payments averaged approximately 4% of the debt outstanding across all trusts, while the contracted rate on most bonds was 4.5 to 5% (Bogart 2019). When railways spread after the mid-1840s many trusts missed interest payments. Considering the risks, one significant challenge was to convince individuals to purchase turnpike bonds. Some reassurance came from mortgaging the toll revenues, but still foreclosing was difficult and rare in practice.

If there was interest in sponsoring and financing a road project, then who supervised it and what technologies were used? Each turnpike trust employed a local surveyor who led the process of hiring labour and procuring materials. In the 19th century, for major projects it became common to also take advice from a more experienced General Surveyor. There were two well-known road surveyors articulating different approaches. Thomas Telford argued for a 'scientific' approach with detailed specifications and documented planning for a road with well-placed stone foundations and a surface cover of rammed, broken stone. John McAdam was the

second well-known surveyor. McAdam's system used pragmatic engineering adjusted to local conditions and methods that others had practised but not promulgated (good drainage, well-sifted broken stone or gravel, gentle curvature of the road profile). His "innovations" were in management, avoiding unnecessary expenses but selecting good quality materials. One MP observed "Mr McAdam's system is at variance with the opinion of all engineers, and yet that whenever it has been adopted, it has entirely succeeded".

The starting point for our analysis is the early 19th century when the state of the roads became a larger public issue. The initial turnpike trusts, many founded in the 1750s and 60s, were successful in rectifying the dangerous and impassable sections of main roads and brought maintenance standards up to a more consistent level of quality using traditional road making technology. Yet in the early 1800s, only a fraction of the turnpike miles were regarded as good carriage roads. Analysis of the problems and suggested solutions were recorded in a series of Parliamentary enquiries and reports,¹¹ which in turn led to Government interventions.

3. Parliamentary enquiries and Government intervention

The first focused enquiry was the 1810 Select Committee "to enquire into the state of the road from Shrewsbury to Holyhead". The Committee was convened in the wake of the Act of Union with Ireland in 1801 to facilitate rapid and reliable communication with Dublin (Guldi 2012). The engineer Telford was contracted to survey the Irish Mail routes and make recommendations for improvement. Telford's reports identified the ideal route, most of which was then managed by turnpike trusts¹². But this, and Telford's subsequent report of 1814 (BPP

¹¹ The reports are listed in the study of industrial archaeology of the Holyhead Road in Wales by Quartermaine et al (2003).

¹² BPP 1810/11 Appendix

1814), were damning about the road's current condition, saying that the whole line needed improvement if it was to be used by the fastest coaches. This supported the Post Office view that the existing Holyhead Road was the worst route used by its Mail coaches¹³.

Telford detailed multiple failings, some arising from engineering challenges, but also the result of poor management by the trusts¹⁴. His standards were more demanding than a private traveller might use; the Mail needed to run at high average speed, at night and throughout the year. The Committee heard Post Office reports that through North Wales horses had been killed or maimed on the poor surfaces and Mails had over-turned at tight bends in the night and were at risk from unfenced precipices¹⁵. Along the whole route from London, witnesses criticised turnpike road surveyors, who in their view used poor quality materials, laid in a slovenly manner with poor foundations, and took narrow crooked paths up unnecessary gradients¹⁶. The Committee concluded that turnpike trusts on much of the Welsh section of the London to Holyhead Road were beyond redemption¹⁷ and that the future care and management thereof should be taken out of the hands of local turnpike trustees¹⁸. The Committee further argued that reasonable tolls were inadequate to pay for keeping it even in tolerable repair and could not repay the cost of improvement¹⁹. Hence, grants of public money were essential. It justified them as follows: "...appeals from Ireland to English Law courts, ... property disputes, carrying on of a trade exceeding £20 million in annual value between

¹³ BPP 1810 p42

¹⁴ BPP 1810/11 Appendix

¹⁵ BPP 1814/15 p366.

¹⁶ BPP 1814/15 p357; reiterated in BPP 1817 p253 and in Telford's later reports BPP 1824 Appendix.

¹⁷ BPP 1814/15 p358; and in Telford's later reports BPP 1824 Appendix p27

¹⁸ BPP (1831)

¹⁹ BPP 1814/15 p358; This point was repeated in BPP 1819, p127 when the Committee considered the section across Anglesey

England & Ireland; for family connections, and the benefit of better classes in Ireland educating their children in England are political objects of such great public consideration... *and justify the most liberal aid being granted by Parliament*²⁰.

Momentum for Government sponsorship and financing of the Holyhead Road grew and in 1817 another Select Committee made proposals which led to concrete action. A dedicated Holyhead Roads Commission comprising nine MPs was set up by an Act of Parliament in 1819 under the chairmanship of the leading Irish MP, Sir Henry Parnell. It also included a member of the existing Commission of Highland Roads & Bridges in Scotland and the First Commissioner of Woods, Forests and Land Revenues, who managed the finance of public works (Hughes 1964). Its chief technical adviser was Telford²¹.

The Holyhead Commission intervened in various ways. First, seven turnpike trusts on the road between Shrewsbury and Bangor were abolished or had their responsibility for substantial mileage of road transferred to the new Holyhead Commission. The Commission would recommend improvements and Government funds would be channelled through it under a single management. The Commission would retain the road after completion and collect tolls on road users to finance maintenance.

A second type of intervention applied to a branch of the Holyhead Road and the worst sections through England, between London and Shrewsbury. Temporarily, financing would be channelled through the Holyhead Commission. Once completed the sections of new road would be transferred to the adjoining, existing turnpike trust, who would remain responsible for

²⁰ BPP 1814/15 p359; This was recited and expanded by the Committee in BBP 1817, p8

²¹ There were eventually 15 Commissioners, dramatically fewer than for instance the Oswestry Trust which alone had 300 Trustee/Commissioners (Hughes 1964).

financing maintenance thereafter. But these trusts would be obliged to accept oversight, in which the whole of the road would be surveyed annually. If necessary, the Commission could force the trusts to raise tolls and pay for the required work and further improvements.

In a third type of intervention some turnpike trusts along the Holyhead Road were merely supported; this was less prescriptive but crucially left local trustees in control (Parnell 1833, p288). It involved surveillance by the Commission, and potentially critical advice by Telford and his deputy engineers. It also meant support in obtaining loans from the PWLB.

After the Holyhead Commission had been established, a second line of Parliamentary enquiries emerged through the “Select Committee on the Turnpike Roads & Highways in England & Wales and their better repair and preservation.” (The Turnpike Roads Committee). This sat between 1819 and 1823 (BPP 1819, BPP 1821 & BPP 1823), taking evidence from London coach operators and from trustees. The Post Office had a prominent voice, as did the Board of Agriculture, through Sir John Sinclair, who had been advised by the improver, Arthur Young (Webb & Webb 1913 p172). Evidence to the Committee highlighted failures of road management and poor maintenance by surveyors in some turnpike trusts. A few surveyors were lauded for meeting the challenges. The surveyor most frequently mentioned was McAdam. Witnesses spoke of the transformation of turnpike roads using McAdam’s system; that this was achieved at no extra expense was remarkable.²² The Committee helped to advertise McAdam’s system and he or his associates were soon working for numerous turnpike

²² McAdam had critics, particularly those who favoured the “scientific” approach of Telford. Although McAdam’s and Telford’s methods of road construction shared common features, their allies were quick to criticise the weaknesses of the other; Telford’s strong foundations were too expensive or McAdam’s roads might fail under heavy traffic and require more maintenance (Reader 1980).

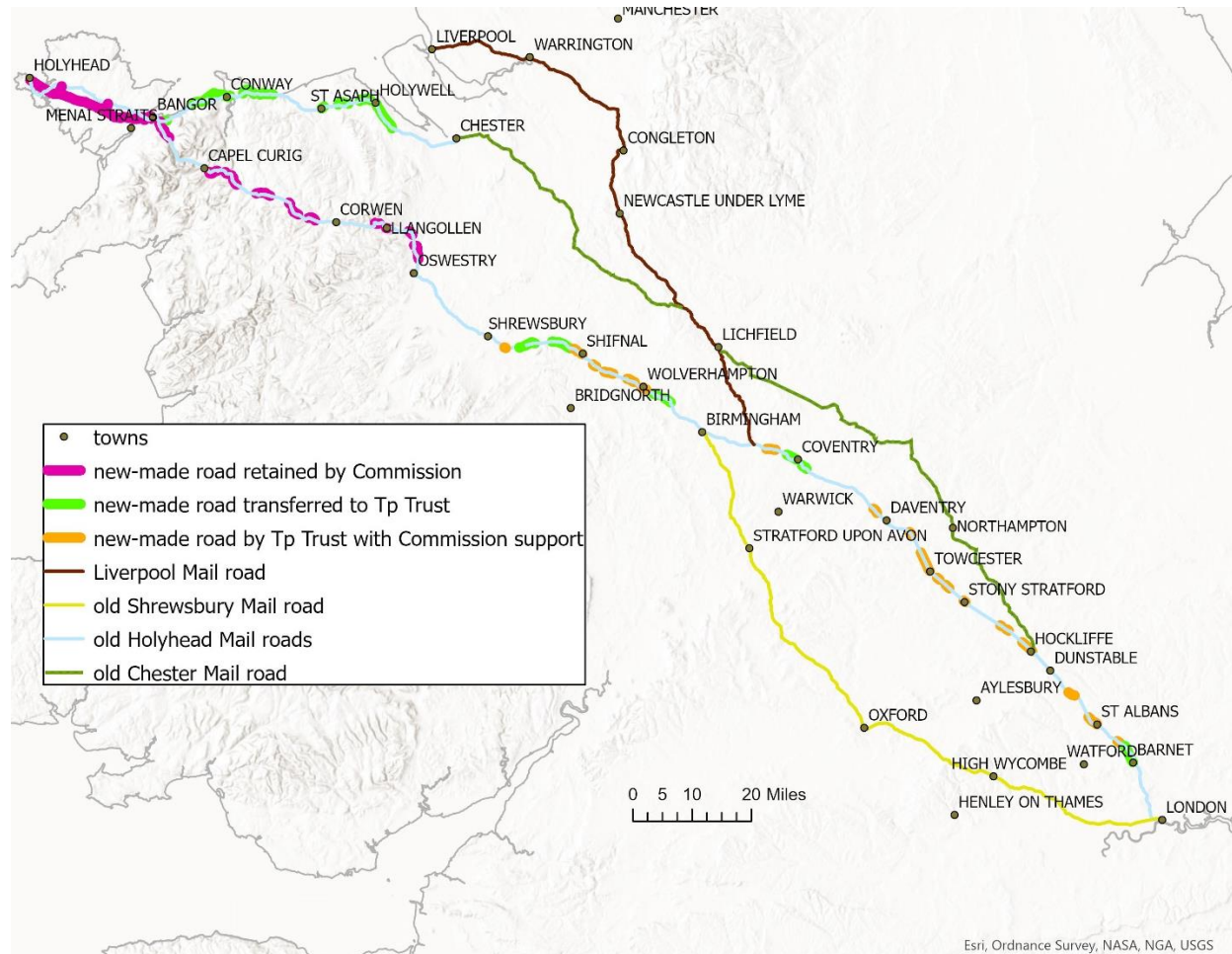
trusts. Public, annual reporting of trust revenues, expenses, and debts also became a requirement following the Committee's enquiry. However, this Committee was of the opinion "for leaving generally the direction of the affairs of the different turnpike trusts in the hands of their respective Commissioners (Trustees), whose experience, character and interest, afford the best pledges of ability, attention and economy" (BPP 1819 p343). They excluded the Holyhead Road from their deliberations but thought one exception to the general view was a need to deal with the numerous small turnpike trusts around London²³.

4. Accomplishments of the Holyhead Roads Commission

Figure 1 maps new sections of road that were eventually built under three categories of intervention by the Holyhead Roads Commission. The first type, roads retained by the Commission, are thick purple lines. The second, roads improved by the Commission and then transferred to trusts, are thick green. The third, where trusts along the English section were supported by the Commission, are thick orange. All these interventions were on the 'Holyhead Road', from London through Birmingham ending in Holyhead and the branch from Chester to Bangor. Thin lines identify other Mail roads to Chester and Liverpool which could potentially be used for the Irish Mail and were totally managed by turnpike trusts.

²³ The consolidation of these trusts is dealt with by Spiro (1956).

Figure 1. Classification of improvements made directly and indirectly by the Holyhead Roads Commission.



Sources: created by authors using a GIS version of John Cary's map of the 1820s with the 1st Series Ordnance Survey (OS) map.

Following the first type of intervention, improvements on the Welsh Section of the Holyhead Road required £150k over 106 miles of road, of which 52 miles was on a new-made line (the purple lines in Figure 1); these were directly funded by the Government as grants (BPP 1831)²⁴. Building the suspension bridges over the hazardous waters of the Menai Straits and

²⁴ The grants of £339k from Parliament not to be repaid, referred to in BPP1830, include the Irish Roads and the Harbours

Conway estuary required a loan of £333k which was to be repaid from the bridge tolls²⁵. By 1826 Telford was reporting that all the high priority new sections had been completed and the rest of the road brought to a high standard. Where the old road had been only 12 feet wide in places, the new road was 24 to 30 feet wide and gradients were no more than 1 in 30, rather than being up to 1 in 8 as before. Between the new sections, the highway had been upgraded so the entire route had good foundations with broken stone as the running surface and adequate drains to carry away surface water. This provided a firm reliable road on which coaches could maintain a high speed. Although very costly, the project had generally been kept to budget²⁶ and tolls set were sufficient to ensure long term maintenance, under competent management.

The second type of intervention led to 22 miles of new alignments on the Chester to Bangor Road along the North Wales coast. The new road was completed at similar pace and to the same high standard as the Holyhead Road at a cost of £53k in Government grants²⁷. Eleven sections of the road through the English Midlands had been identified as needing essential improvements by Telford. Though each of these was on a much smaller scale than the Welsh roads these required funding of £44k through the Commission and a further £83k from other loans, secured on the tolls and later repaid²⁸. The shorter sections had been speedily dealt with

²⁵ By 1831, this postage had raised £54k at Menai and £14k at Conway. Though important links, like bridges elsewhere on the network, these new crossings were administered separately and are not included in our analysis of road improvement.

²⁶ The technically challenging Menai bridge suffered significant over-runs on the original budget and the new road across Anglesey required an additional expenditure of £10k in 1832 (Guldi 2012). In a Parliamentary debate in 1830, Parnell stated that of 152 contracts, only one had over-run and that by just £75.

²⁷ A further £16k was requested in 1831. (PP 1831 p21)

²⁸ By 1831 £30k of the principal on the initial loans of £44k from the Commission had been repaid by the trust on the English section of the road along with £13k interest (BPP 1831 p16). Interest had been paid on the other loans but only £9k of principal redeemed.

under direct supervision by Telford. The larger projects near Barnet, Coventry and Wolverhampton, took longer but by 1826 these new roads were open and after completion were handed over to the local trusts. Summing over the first and second types of intervention, the Holyhead Commission received £203k in grants and £127k in repayable loans for road construction, which are not insignificant sums. For comparison, total toll revenues for turnpike trusts were £1,034k in 1821 (BPP 1840).

There were also changes resulting from the third or “supporting” intervention on the other English sections of the Holyhead Road. The annual surveys by Telford and his assistants were forthright in naming and shaming poor surveyors and bad practice. Several trusts had the confidence to undertake independent improvements, some financed in part by PWLB loans. With cuttings and embankments, they reduced hills, filled valleys, and widened carriageways. Some might follow suggestions made by Telford but not necessarily adopting his chosen course or roads were lifted and re-laid following the alternative methods recommended by McAdam.

Positive, but varied, impacts followed from the interventions made by the Holyhead Commission. Communications with London were significantly improved. The schedule for the Holyhead Mail from London had been cut from just over 41h to 28h, allowing the Mail packet to sail earlier for Dublin. But the travel and trade flows on the Welsh Holyhead section were not enormous. Only two regular stagecoach services were established while a string of others ran intermittently and then failed²⁹. Gentlemen travelling privately were the Holyhead road’s main source of toll income. Moreover, fewer than 5,000 head of cattle passed through the Commission’s gates each year; by comparison in 1816 over 118,000 animals passed the gates of

²⁹ Named in the Annual Reports of the Commission accounts Tables from BPP 1824 to BPP (1840)

the Dunstable Trust near London. The heaviest use was the unexpected increase in lime and coal traffic from collieries on adjoining roads³⁰.

Closer to London, on the already busy English section of the Holyhead road, the interventions of one-off support and closer regulation of the existing turnpikes had more significant outcomes for road traffic. Stagecoaches ran regular high-speed journeys, now performing the 110 miles journey from London to Birmingham in 11.5h rather than 18h. This increased coaching traffic between London and Birmingham in particular³¹. Although these were Mail routes, the greatest benefit was to the many stagecoaches, postchaises and private carriages that valued speed and comfort and could absorb the toll costs. Public carriers and private carts, moving freight, were paying higher tolls but they too benefitted from reduced congestion and lower operating costs on the improved roadways.

5. New Roads built by turnpike trusts

The new Holyhead Road was celebrated as a national achievement and an example of what could be done by systematic application of engineering principles. However, as detailed in this section, exclusively focusing on the Holyhead Road obscures the increased construction of other new roads in the early 19th century, mostly made by turnpike trusts. We explore two sources for this; first the text of turnpike Acts and secondly a sequence of road maps.

³⁰ In Nov 1821, 245 carts and 52 waggons carrying coal from the Ruabon collieries had passed through their toll gate (BPP 1822 p14). In 1830, 22,206 horses pulled carts between the Wrexham Road and Oswestry sections, each hauling two ton loads of minerals (BPP 1831/2 p581).

³¹ For instance the annual toll income on the Hockcliffe Division, north of Dunstable, almost doubled between 1820 and 1838 (BPP 1821 and BPP 1840 Appendix)

Textual analysis of the titles of all turnpike Acts³² identifies when “new” roads were built by trusts, rather than merely improving an existing main highway. We document that the term “making a road” or “making a new road”³³ became more frequent in Acts. Between 1750 and 1799 there were 57 Acts that mentioned making a new road or a new extension to an existing turnpike road. Between 1800 and 1835 the number that involved new lines rose substantially with a further 280 such Acts (see Figure 2)³⁴.

Peak years for Acts to build new roads, like 1825-27, were generally associated with low interest rates and higher trade (Bogart and Richardson 2011). These economic stimuli will be discussed more below. Notably the Acts series does not show a clear link between new road making Acts and Telford’s first report in 1810 up to the passage of the Holyhead Act in 1819. However, examining the dates at which McAdam and his sons took up contracts as surveyors (Figure 2) does shed light on another channel. The McAdams were employed by many turnpike trusts making improvements to existing lines of road, including some of the largest trusts in the

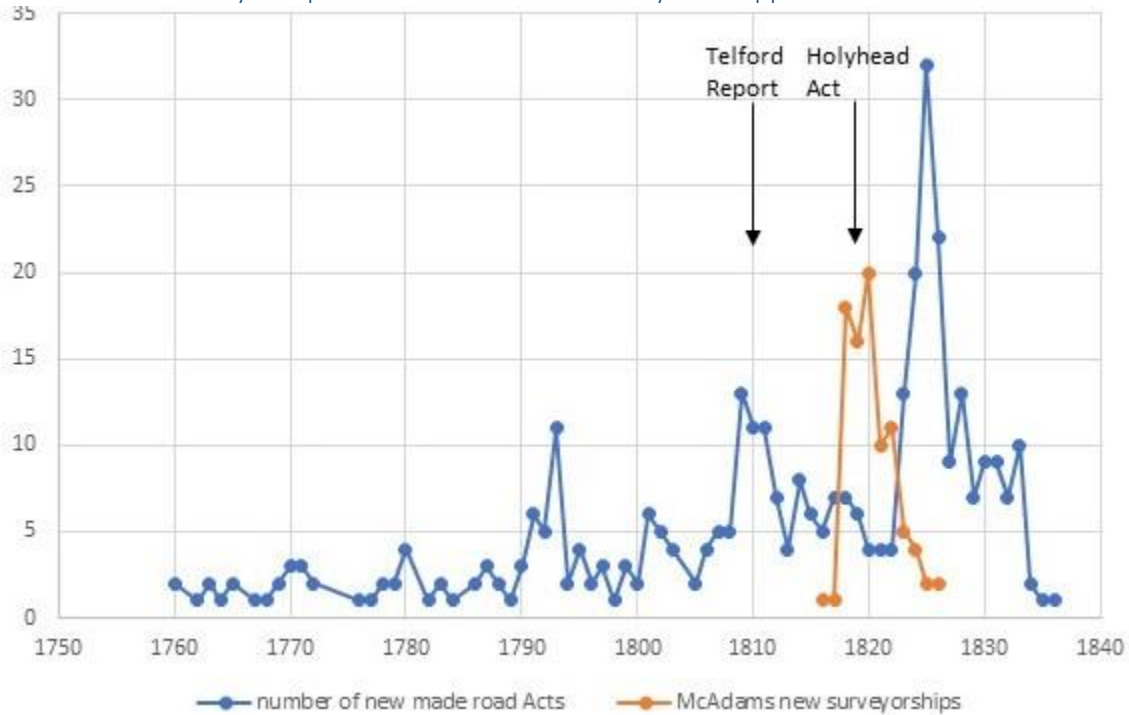
³² A full list of the *titles* of all Turnpike Acts after 1700 was obtained from the Parliamentary Archive. See Bogart and Richardson (2011) for details.

³³ Although most turnpike trusts reconstructed the old highways under their management, these improvements such as widening or reducing gradients were usually along the existing line of road, particularly in lowland areas. Making a new road generally involved constructing the highway on a new alignment across land not previously designated for this. The cost of constructing a new road would be significantly greater than improving an existing road line. Contemporary documents distinguish three main categories of new road; a diversion was a new loop out of the existing line, replacing an old section; a branch was a new line from a point on the original turnpike to a new terminus; a new road Act would be sought for a totally new line between terminals. In ten instances the terms “...and make the road turnpike” or “..making a carriage road (of present highway)” were used but from maps we found no significant deviation from the ancient line. All were after 1800 and were excluded from the “new” category in our analysis.

³⁴ This change in emphasis is not surprising, considering that the 18th century turnpikes were taking over some of what were designated “Great Roads” or “Cross Roads” by cartographers such as Ogilby in the 1680s and Rocque in the 1750s. These we refer to as ancient roads which were well established highways and routes, albeit in a poor condition. Increasingly by the 19th century roads which had previously only served a local parish function were being repurposed and interconnected to become main roads.

country (Bristol in 1816, Exeter 1820, Bath and The Metropolis Roads in 1826). Macadam’s methods plausibly encouraged new road building as they aimed to reduce the cost.

Figure 2; Number of Turnpike Acts mentioning “new road making” in each year, plotted alongside the number of new surveyorship to which the McAdam family were appointed.



Source: See Assigning New roads in data appendix. For McAdam surveyors see Reader (1980).

We also trace on digital maps where trusts were empowered to build new roads. Our sources are the list of all turnpike titles, local studies of individual trusts (e.g. Rosevear 2003, 2010; Gulland 2016) and historical GIS-maps for (i) the turnpike network derived by us from the Acts, (ii) all main roads shown on detailed (generally inch to a mile) maps of many individual English Counties from the 1770s to 1790s, (iii) all main roads on a national map published by John Cary c.1825, and as a base map a georeferenced copy of the 1st Series Ordnance Survey (OS) for the whole country c.1850. For some southern counties of England, the OS draft surveys

of c.1810 provides a further reference point for change. The sources are detailed further in the appendix.

Comparing the GIS version of John Cary's map of the 1820s with the OS map of the 1850s, confirms the new lines of road authorised in the turnpike Acts in the 1820s and 30s. Comparisons of the Cary map with the earlier County maps reveals sections of road constructed from c.1780 to 1820 and referencing to the OS drafts and local studies informs the probability of the changes being made after 1800. The comparisons demonstrate that textual analysis was generally successful at identifying where a trust had built new roads. Nevertheless, on average 16% of the mileage in these Acts was not on new alignments but along existing parish roads that were upgraded and linked. This comprehensive analysis also revealed many more sections of new road than were specified in the wording of Acts. These were new 'diversions' from the alignment of road managed by existing turnpike trusts³⁵. Some of these were associated with other new infrastructure, such as bridges or canals, and others with changes in land use such as enclosures, drainage schemes and particularly extension of parks around Country Houses. However, most were smooth deviations around impediments such as sharp junctions, meandering paths or steep inclines. Some new sections were over 5 miles in length, other

³⁵ Most of these can be dated by reference to local studies and clauses in turnpike renewal Acts. Where a diversion was part of an Act post-1838 or could be dated from local studies it is not credited as an improvement made before 1838. Similarly diversions made as the result of railway construction (post 1840) were not included. However, some diversions made after 1838 (e.g. by a Highways Board) may still be credited in the total mileage in the Table. Nevertheless, we believe this over-accounting is small since the parlous state of most trust finance meant that undocumented new road building was unlikely after 1838.

individual lengths deviated for only a few hundred yards from the ancient alignment but were often clustered along a much longer length of road³⁶.

Between 1750 and 1838, there were 4,000 miles of new-made road and diversions on new alignments integrated into a turnpike network that had grown to 23,000 miles of road³⁷. In the period after 1810, The Holyhead Road Commission directed finance for 92 miles of road on new alignments in England and Wales, whereas turnpike trusts had independently created almost 2,700 miles; almost 30 times more. Table 1 summarises the relative changes in older and new-made turnpike roads over time. It also reports total mileage of all highways under either parish or turnpike control. In 1838, 17% of the turnpike network had been built as diversions or new-made roads. Only 31% of this new mileage was created before 1810, the majority being laid during the following three decades up to 1838. As trusts build more new roads in the early 1800s, they relinquished management of older roads, which reverted to the parish. Through this 'dis-turnpiking,' trusts perhaps avoided the expense of maintaining redundant roads and adjusted their network to current needs.³⁸

Figure 3 maps new sections of road and their integration with the turnpike network in 1838. The Government financed sections of the Holyhead Road are green. The much larger mileage of new roads built independently by turnpike trusts are orange. Other turnpike roads,

³⁶ Based on GIS mapping, between 1800 and 1838, 2,9314 miles of highway was made under Acts for "New made" turnpike roads (2,457 on new alignments) and 882 miles of "new alignment" diversions on existing turnpikes and 92 on new alignments by the Commission.

³⁷ This includes the 52 miles of new alignments on the Shrewsbury to Holyhead Road.

³⁸ The potential coordination between trusts and parishes, managing more than 80% of total highway mileage in E&W deserves more research.

which continued along the ancient lines, are blue. These may have been improved by widening and resurfacing³⁹ and were not necessarily worse in quality as we show in the next section.

Table 1; Changes in total turnpike mileage, new roads, and dis-turnpiking relative to parish Highway mileage

miles	1750	1770	1790	1810	1830	1838
(1) Turnpike total	3967	15650	17925	20640	22896	22914
(2) Diversions and new-made Turnpike*	73	177	351	1243	3625	3991
(3) Dis-turnpiked, returned to parish**	5	38	183	594	2191	2778
(4) Total parish & turnpike roads #	123768	123872	124046	124938	127320	127686
(5) % of total roads that were turnpike	3%	13%	14%	17%	18%	18%

* Cumulative amount; The methodology will not identify “diversions” made before detailed county mapping ca 1775 so will underestimate new sections across open common and moor, e.g. by John Metcalf (Kellett 2009)⁴⁰; sections of new made turnpike running along ancient lines are omitted. In 1838 there were a further 491 miles of road that were part of Acts for new made roads but were judged to run along the alignment of an existing parish road. We estimate a potential uncertainty on the post 1800 figures of about 100 miles. The reported new alignments total includes approximately 700 miles in Counties for which do not have good 18th century maps. We have found up to 16% of roads in Acts for “new making” were along parish roads only identified on pre-1800 County maps so this total may be reduced by 100 miles in 1838. However, some Diversions are only identified on the 18th century maps, so can potentially increasing the mileage by a similar amount.

in Table 11 of BPP1840 Appendix for 1838 mileage of non-turnpike highways for wheeled vehicles was estimated as 104,772 miles. Combined mileage estimated assuming that all 1838 parish roads existed in 1680 and the only new roads were built by turnpike trusts so 123,333 miles of parish road in 1680.

** cumulative, estimated from comparison of GIS mapping of turnpikes in 1750 and 1838.

The map reveals considerable variation in the distribution of new roads across the country⁴¹. Broadly, new turnpike roads were most common where economic activity was growing, as in South Wales and Durham where mining was increasing. New roads also appear

³⁹ It is not possible to judge changes in the road laid along existing lines of road, for roads managed by the Commission or by the trusts.

⁴⁰ Though not relevant to subsequent discussion of post 1800 improvements

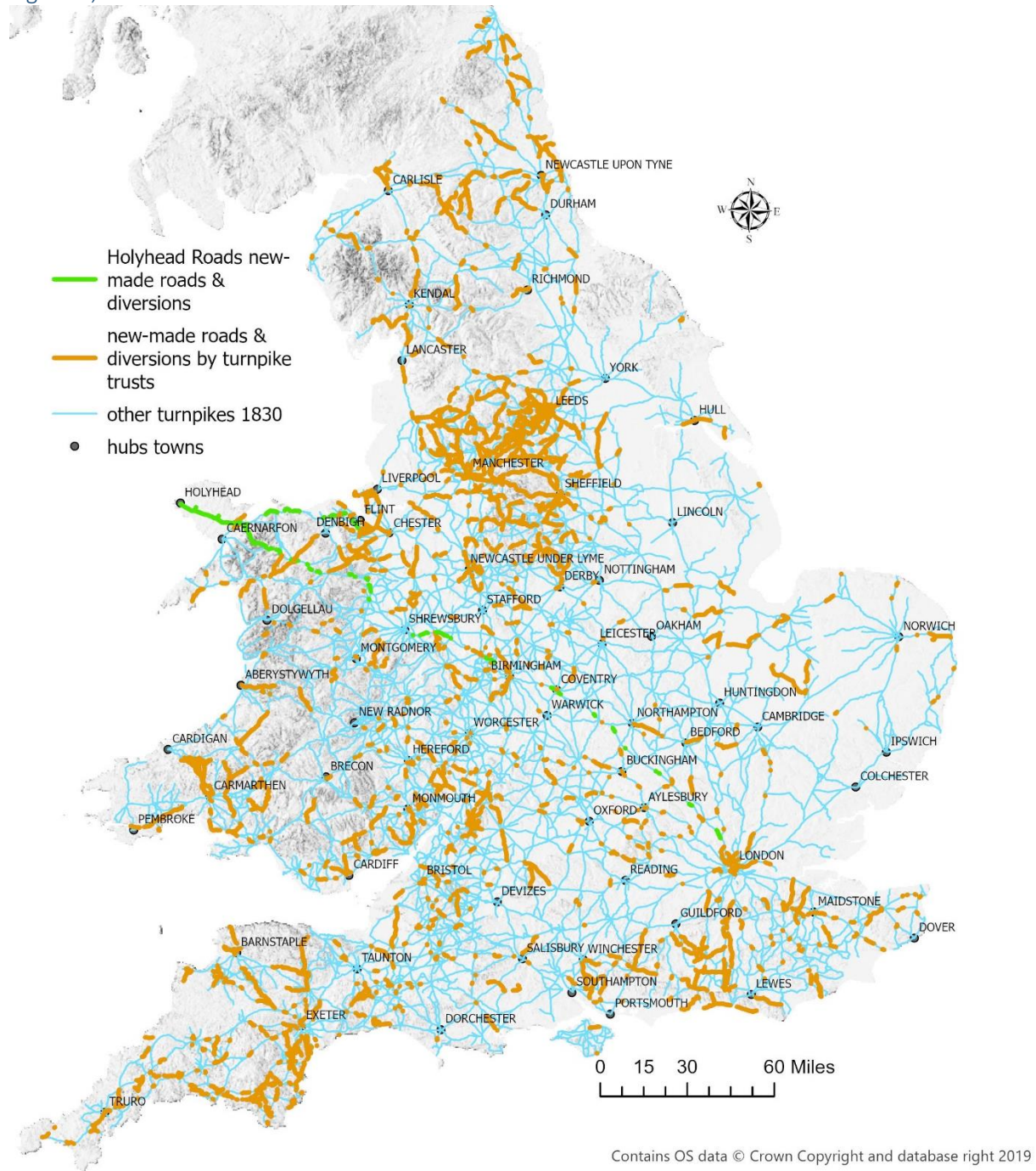
⁴¹ There were virtually no new roads in the rural counties of Leicester, Huntingdon, Hertford, Radnor and Montgomery (2% or less), whereas in the industrialising counties of the West Riding of Yorkshire and Lancashire the proportions were 37% and 31%. Southern agricultural counties such as Buckingham, Oxford, Bedford and Suffolk had no more than 8% new mileage whereas counties with extractive industries such as Northumberland and Derbyshire had over 30% new roads and along the Channel coast, 27% of the roads in Sussex were new.

along the coast of Southwest England, Sussex and Hampshire, which was providing recreational and leisure outlets for the newly affluent. But the greatest concentrations were in the expanding manufacturing region of Lancashire and West Yorkshire, particularly between the two large inland towns of Manchester and Leeds. New turnpike road building in their vicinity is further illustrated in the appendix.

In large part trusts financed new roads by mortgaging their toll revenues with new debt. Tables annexed to Reports by two Parliamentary Committees (BPP1821 & BPP1840 – data from 1819 and 1838) show the mortgage debt for each trust and the dates when these loans were taken out. For instance, the nine turnpike trusts converging on Leeds had debts totalling more than £150k from the building of new roads. The longest of these, the 18 miles of the Leeds to Whitehall trust, had an outstanding debt of £65k⁴² from a loan in 1806 when it was created. In total for all of England and Wales, turnpike debt increased from £4.4 million in 1820 to £7.3 million in 1840, an increase of 66% (see Bogart 2019).

⁴² This is equivalent to £3.6k/m; nearby the Buxton to Manchester road cost £1.2k/m in 1825. New sections on the Bangor section of Telford's road cost £2.4k/m and his estimates for new roads on Anglesey were generally over £2k/m (BPP 1810). The increased cost of better construction is illustrated by comparison with similar new roads built before 1800, e.g. the Leek Buxton road in 1765 cost £165/m, the nearby Congleton to Buxton road in 1790 cost £290/m (Roberts 1992).

Figure 3; *New roads constructed between 1800 and 1838*



Sources: Authors calculations. See appendix for methods and sources.

Trusts' borrowings were facilitated by several factors. One was the development of Britain's financial markets in the early 1800s. Along with bond and equity markets, private credit

markets became more integrated and intermediaries, like banks, expanded in number and in risk-taking (see Neal 2000, Brunt 2006, Trew 2010, Campbell et. al. 2021). In this context, when interest rates in the London market fell, as in 1823 and 1824, trusts were able to capitalize and borrow more easily. It also likely that the requirement for regular reporting of common financial statements to Parliament helped as well. This was introduced steadily from 1821 with reports through County Clerks and from 1834 very detailed tables were published in reports to Parliament. Mandatory financial reporting required a more professional approach from trustees and indirectly the recruitment of skilled road engineers to manage this. Additionally, it gave lenders information, which should have encouraged more lending to trusts.

The Government funded Public Works Loan Board (PWLB) was potentially another boost to trust borrowing. Trusts took out loans ranging from a few hundred pounds to £16.5k for the Plymouth to Exeter trust. In total the PWLB lent £401k to 107 trusts in England and Wales between 1817 and 1832 (Bogart 2019). While £401k is non-trivial, recall that between 1820 and 1840 the mortgage debt of all turnpike trusts rose by a net £2.9 million⁴³. Instead of relying on PWLB loans, most trusts chose to continue borrowing from private individuals⁴⁴.

6. The quality of roads

Road quality is an alternative metric to measure the success of Government interventions and the more typical management by turnpike trusts. Key evidence concerning road quality comes from a survey of trusts in 1838 (The State of the Roads Report, BPP 1840

⁴³ This would be sufficient to finance ca 2000 miles of typical new road.

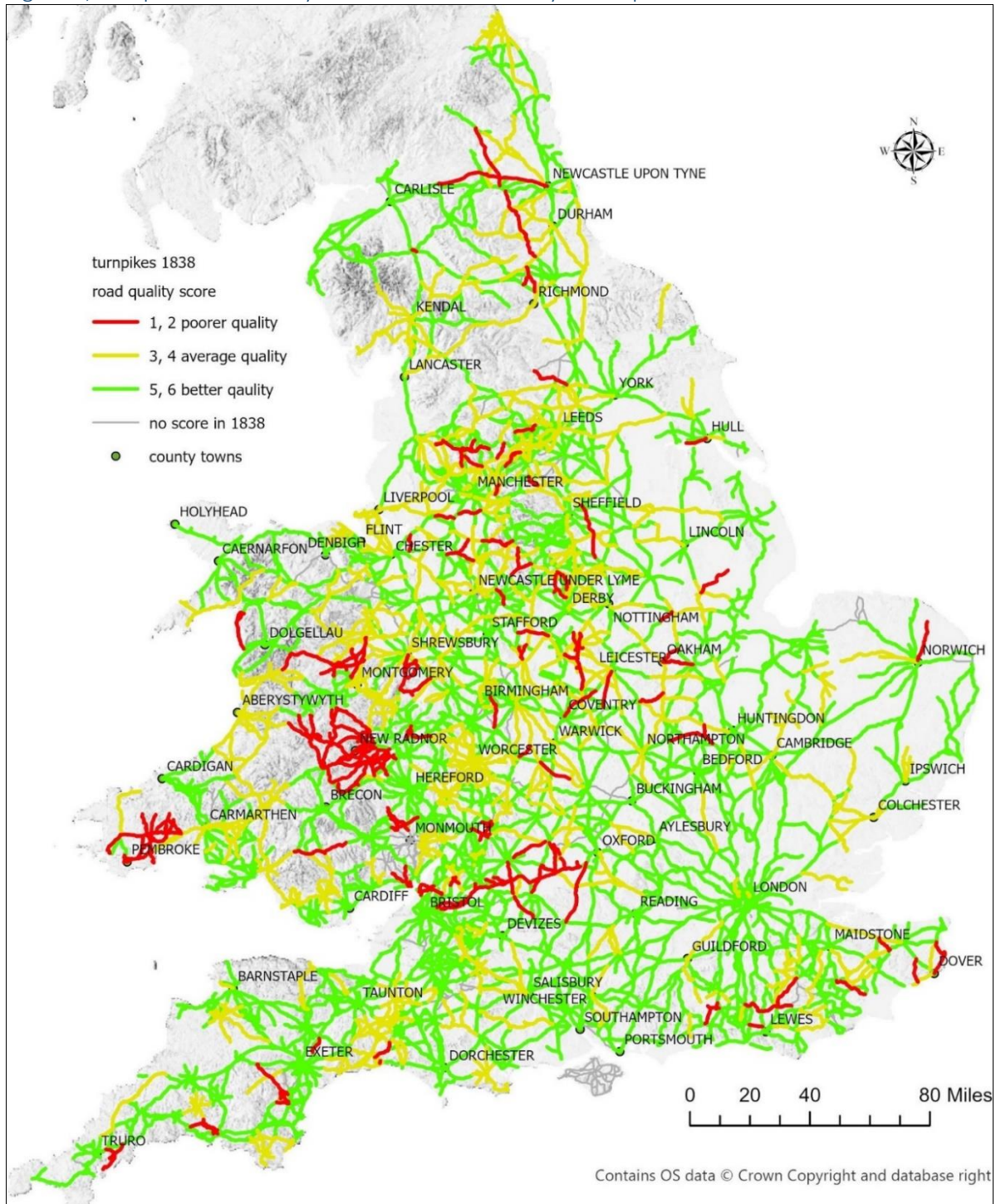
⁴⁴ For example, the Epping and Ongar Trust used local mortgagees in preference to a PWLB loan for the new road through Epping Forest in 1831 (Winstone 1891). A lower interest rate may have influenced this. Webster (2021) reaches a similar conclusion, that PWLB loans were not always effective in boosting municipal financing in the late nineteenth century.

Appendix). One question asked the trusts to self-assess the condition of their road. Although it is like asking students to mark their own exams, the responses were open to public scrutiny and hence had to be plausible. Nearly all trusts responded to the survey and this question. We link their response to the GIS road maps shown in Figure 3. Of special interest are trusts associated with the Holyhead Commission and the roads managed by the Commission itself.

We adopt a six-point scoring system for words and phrases used in the responses to rank the quality of the roads in the 1838 survey⁴⁵. Of the total turnpike mileage, 62% was characterised as “Good” or “Very good” (score 5 or 6) and a relatively small, 7%, was classified as “Bad” or “very bad” (score 2 or 1). The remainder, 27%, was “Not Good” or “Acceptable” (score 3 or 4). Figure 4 maps the simplified quality score for the turnpike roads of 1838. Top quality ratings were common throughout England & Wales, including some upland areas, suggesting turnpike roads were generally good. The lowest quality turnpikes were more common in mid and West Wales and parts of western England.

⁴⁵ This system was created for general use beyond the current study. At the extremes of this scale terms such as execrable or very bad mark the road quality as 1 - very poor, whereas excellent or the finest, mark it as 6 - very good. A mark of 4—acceptable, is given for terms such as tolerable, adequate, indifferent good. 4% of turnpike mileage could not be scored.

Figure 4; Turnpike Road Quality scores from 1838 survey of turnpike trusts



Sources and notes: see text.

Table 2 gives a summary of road quality scores for turnpikes that received different levels of Government intervention. Those supervised or assisted by the Holyhead Commission had a

higher mean quality score of 5 compared with 4.4 for independent trusts. The mean difference (5 vs. 4.4) is statistically significant, based on a two-sample t-test with unequal variances. This is particularly impressive since a comparison with Telford’s 1814 report shows that the Holyhead Road had been in a very poor condition compared with adjoining roads. A map in the Appendix illustrates the dramatic quality upgrade on the Holyhead Road using the same quality scoring system between 1814 and 1838.

Table 2; Road Quality scores in 1838 for various levels of Government intervention and assistance

	Mean quality score	Std. dev. score	Min. score	Max. score	Number of trusts
(1) Holyhead Commission new road	5		5	5	1
(2) Improved road by Commission, transfer to Trust and PWLB loan	5	0.5	4	6	8
(3) No Commission assistance but PWLB loan	4.5	1.1	2	6	70
(4) No Commission assistance or PWLB loan—-independent turnpike trust	4.4	1.2	1	6	1058

Sources: authors’ calculations. See Data appendix for details.

Notes: data only for PWLB loans of more than £1k and for trusts with a road quality score.

Table 2 also illuminates the role of the PWLB. Where a PWLB loan was made to an independent trust to build a new road or divert an existing one, the mean quality score in 1838 (4.5) was little different from that on turnpike roads receiving no assistance (4.4)⁴⁶. This suggests that the road quality achieved by selecting “good” schemes through the PWLB was no better than through private mortgaging⁴⁷. Despite this, the impacts of the PWLB loans deserve further attention, as they might have assisted trusts in worst circumstances.

⁴⁶ For trusts that had finance through PWLB loans, of the 15 that received more than the mean loan value of £7.5k⁴⁶, four had a score of only “adequate” (3 or 4).

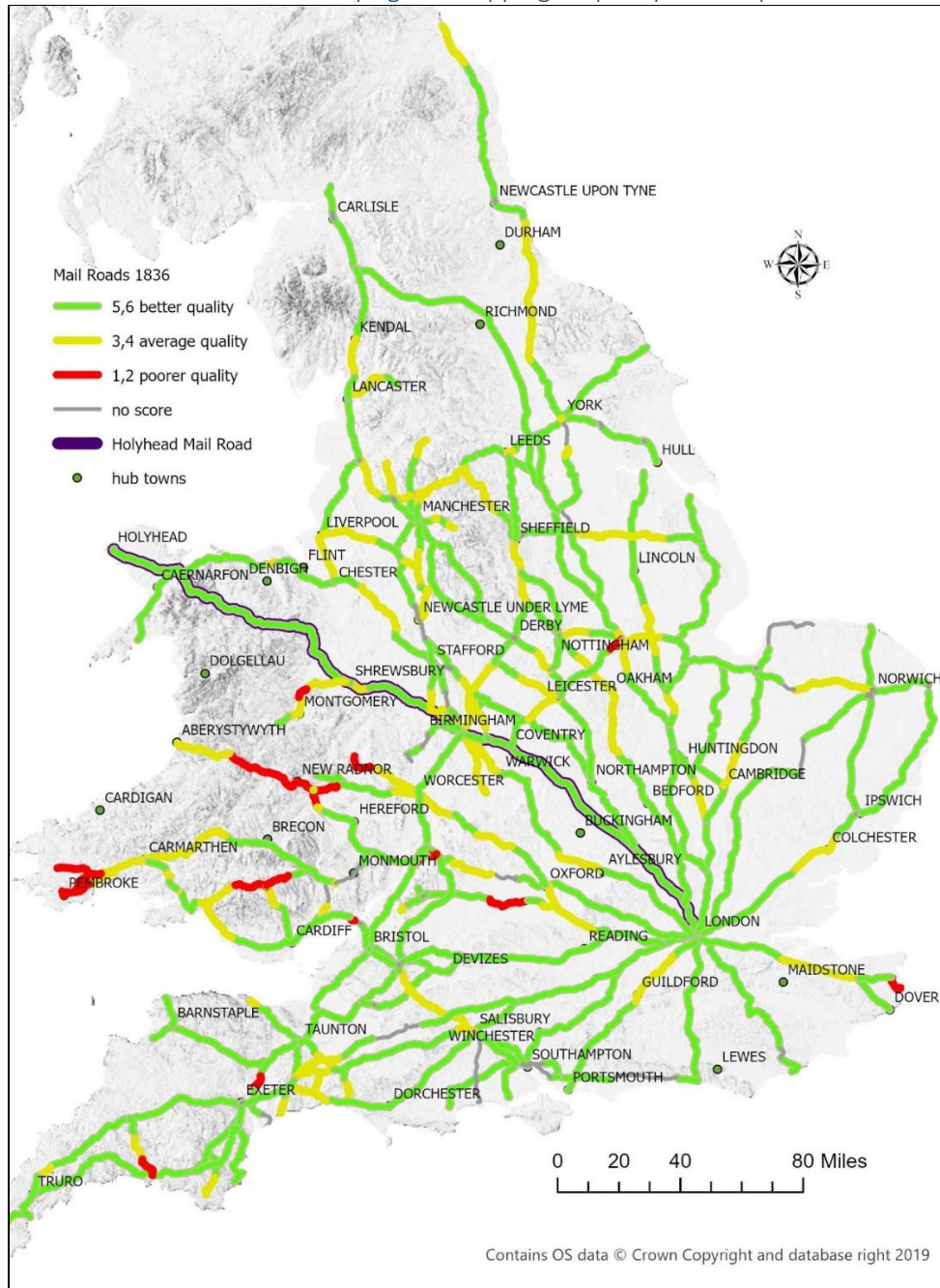
⁴⁷ Webster (2021) reaches a similar conclusion, for municipal financing in the late nineteenth century.

A better quality comparison for the Holyhead Road were the other roads used by Mail coaches, which are listed for 1836 by Bates (1969) and mapped in Figure 5⁴⁸. Most Mail routes in England and Wales were maintained by turnpike trusts and 27% of total turnpike mileage was used by Mail coaches. The Figure illustrates that long, unbroken sections of the Mail routes radiating from London were rated better than average as far as Dorchester, Poole, Brighton and Leicester. We find that 72% of Mail routes had a quality score of 5 or 6. Thus, in general Mail roads administered by turnpike trusts were closer to the high standard on the Holyhead Mail Road (97% of which rated 5 or 6)⁴⁹. Only 3% of the Mail routes were scored as poor (1 or 2). Much of the poor sections were in Central and South Wales near the extremities of the longer routes, generally mountainous, and economically poor (for example to Aberystwyth). Arguably these sections of the Mail routes provide the best comparison for the Welsh sections of the Holyhead Road which had a quality score of 5. The visibly poor quality of the Central and South Welsh sections shows that in a like-for-like comparison in remote areas, turnpike trusts yielded inferior quality to the Government funded Holyhead Road.

⁴⁸ The routes described by Bates were digitised from the GIS map of turnpike roads for 1838 by the authors

⁴⁹ Secondary evidence of wider improvement comes from the average speed of regular Mail coaches which had not only improved on the Holyhead road (rising from 7.5 in 1811 to 9.4 mph in 1836) but also on other Mail routes such as to Bath and Norwich, which rose from 8 and 8.5 mph respectively in 1811 to 9.7 and 9.3 mph in 1836.

Figure 5; Mail coach routes in 1836 overlaying the mapping of quality for turnpike roads in 1838



Sources: Mail routes are identified in Bates (1969) and mapped by authors.

Data on advertised stage coach services⁵⁰ illustrate how quality improvements attracted traffic from other roads. The three main routes between London and Birmingham provide a

⁵⁰ from data in Rosevear et al (2019).

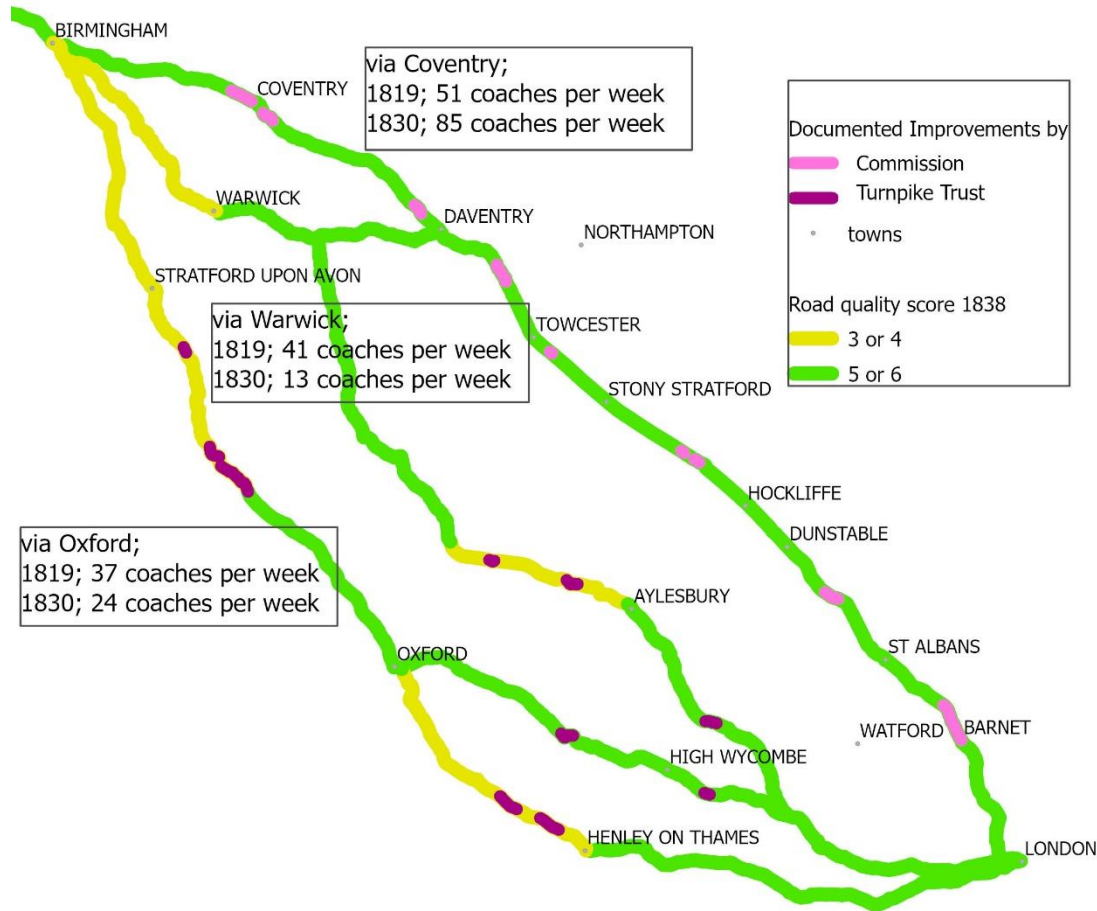
revealing comparison (Figure 6). The route through Coventry was part of the Holyhead Road. Those through Oxford and Warwick were managed by turnpike trusts without intervention. In 1819 prior to road improvements there were 51 weekly coach services to Birmingham via Coventry and 78 via Oxford and Warwick combined. In 1830, there were 85 weekly coaches via Coventry, compared to only 37 via Oxford and Warwick⁵¹. The superiority of the whole Coventry route, selected by Telford and improved through the partnership of the Holyhead Commission, turnpike trusts, and private road contractors is revealed in the high quality of this route in the 1838 survey. The other two routes by contrast had significant sections of “average” quality, despite some improvements carried out by the independent trusts with less Government involvement⁵². In this revealing case, consistent quality pulled existing services away from routes managed to a less consistent quality standard⁵³.

⁵¹ The carrying capacity of individual coaches had increased over this period in part due to better roads; the split between routes is the significant change.

⁵² Significantly, several of the good quality sections of these roads were sections of other Mail routes.

⁵³ The Coventry road was slightly shorter and avoided the problematic Cotswold Hills but went through fewer large towns.

Figure 6; Stage coach traffic from London to Birmingham, before and after improvements on the English sections of the Holyhead Road with road quality data from the 1838 survey.



Sources: Services in 1819 from Pigot Directory; in 1830 from Robson Directories. See Rosevear et al (2019) for more details on these sources.

Notes: The Government funded/assisted sections were via Coventry.

7. Wider powers for a Roads Commission

The success of the Holyhead Road Commission in supervising improvement along a whole Mail route prompted calls to replicate this to directly improve other major Mail Roads⁵⁴. In 1827, as work on the Holyhead Road was nearing completion the Commission was given powers under a new Act to survey and recommend improvements on the Liverpool Mail Road. This branched off the London Holyhead Road at Stonebridge, between Coventry and

⁵⁴ see Guldi p119

Birmingham (see Figure 1). Telford made proposals for a better line of road with a new bridge over the Mersey at Runcorn (total estimated cost £173k to reduce the Mail journey by 2.5 hours) (BPP 1826/7). He completed a survey on the turnpike trust roads along this route (BPP 1829) identifying several poor sections but praising improvements that had been made by the Darlaston Turnpike Trust under the direction of a surveyor whom he had recommended⁵⁵. However, no new funds were granted to the Commission for the Liverpool Road and there is no map evidence suggesting new alignments were constructed.

In 1830 a Northern Roads Bill was put before Parliament, replicating the Commission to supervise improvement to the Edinburgh Mail Road through York and the West Coast Mail Road from London through Carlisle to Portpatrick⁵⁶. Again Telford had prepared proposals for substantial sections of new road. However, the Act ran into serious opposition with complaints that it was a “Scottish Job”, improving mainly Scottish Roads with English taxes, that the Edinburgh Mail was already faster than the Holyhead Mail and that the eventual cost would be substantial⁵⁷. Amidst a storm of opposition this attempt to replicate the Holyhead Road Commission failed to get Parliamentary approval⁵⁸.

The success of the policy of working with trusts may have been a factor in not creating another English Roads Commission. By 1830, McAdam’s work had already improved several Mail roads through England, so there was less scope for further costly construction for small benefit. However, although there is no explicit mention of railways it may be no coincidence

⁵⁵ This included the new road at Talke which Telford had recommended in his 1814 report.

⁵⁶ BPP 1830 - This would replicate the arrangements on the English Section of the Holyhead road with any new roads being handed to adjoining turnpike trusts after completion

⁵⁷ House of Commons Debates 3rd June 1830, Vol 24. See <https://api.parliament.uk/historic-hansard/commons/1830/jun/03/northern-roads-bill>

⁵⁸ Webb & Webb (1913) p 179.

that by 1830 a spectacularly successful railway had opened between Liverpool and Manchester and much larger schemes were being planned. Dyos & Aldcroft (1969 p77) attribute the loss of the Northern Roads bill to “the stampede of people willing to spend ... private money on schemes which had ... a touch of fire and steam”. Ultimately, by the time the intervention on the Holyhead Road was complete, some were beginning to question the supremacy of the road as the fastest means of inland travel.

8. Discussion and synthesis

The Government sponsored Holyhead Road was a demonstration of best available technology and an example which surveyors around England and Wales might follow. However, Telford’s high standards of construction on less than 100 miles were not replicated on most of the several thousand miles of new road built independently by turnpike trusts in the 1820s and 1830s. It was certainly a politically important route, but the greatest intervention was limited to the section through Wales. There was “assertive support” for the trusts on the English section, including the commercially vital route to Birmingham. This was more tightly regulated and maintenance standards were higher than other turnpike roads, as is demonstrated by road quality in 1838. Other politically important national routes, for instance towards Scotland and other Irish sea ports appear to have remained under turnpike management. The attempts to expand further the model of the Holyhead Road Commissions to manage national roads failed to get Parliamentary support under the Tory government. So, as far as the quantity of new roads built is concerned, we do not find evidence for the British Government directly creating

corridors of good infrastructure, particularly in England⁵⁹. More research is needed on road building and quality in Scotland, and on the contribution of the Commission on Highland Roads, to establish the equivalent position on the smaller mileage of main roads in Northern Britain.

There is little doubt that the Holyhead Road was of high quality, despite running through some of the most challenging terrain in the country. Nevertheless, a much greater mileage of good quality was managed by turnpike trusts, much of this newly constructed and some through mountainous areas in northern England. The 106 miles of the Shrewsbury to Holyhead road, comprising both new alignments and intervening sections of improved road managed by the Holyhead Road Commission, had a high score for road quality in 1838. However, more than 14,000 miles of equivalent improved road under turnpike trust management had a similar quality score. Long stretches of good quality turnpike radiated from London to places of commercial and cultural importance such as Bristol, Derby, Southampton and Brighton. However, as the Mail routes illustrate, sections of lower quality road interrupted the journeys more frequently the further one travelled from the economic heart of the country⁶⁰. In summary, the revitalised turnpike trusts continued to be a more than adequate means of building and maintaining good quality arterial roads across the more prosperous parts of England, not just on London radials. They were less successful in the poor, remoter upland

⁵⁹ Unlike Guldi, our data and analysis does not extend to Scotland and Ireland. The mileage of main road in these nations was much smaller than for England. Although in Scotland the ratio of Government Commission roads (1,194 miles) to turnpikes (5,678 miles) was relatively high, Government focus on Highland roads created a regional imbalance with the more populous Lowlands. We are not aware of detailed studies that measure difference in outcomes for these regimes.

⁶⁰ The Liverpool Mail Road and two Scottish Mail roads (through Carlisle and Newcastle) that were included in the failed Northern Roads bill had several sections in Northern England that were only average quality (see Figure 4)

areas, notably in most of Wales and adjoining parts of western England. Here Government sponsorship and financing did provide one excellent quality road.

It is useful to consider the relative economic success of the policy options. The Holyhead Road Committee recognised that investment in a new road could not be justified by the toll income it might generate, even allowing for the benefits of a single authority. In the absence of financial targets there were no criteria against which to assess the engineering options and Telford was free to build the best possible with current technology. This was more expensive than the average turnpike trust could justify, even on busy routes where traffic and toll income were high. In contrast the turnpike trusts were obliged to match investment to potential future toll income and so would adopt McAdam's pragmatic approach. One crucial intervention by the Government was to require tolls to be increased (effectively a tax on road users) to fund improvements on the whole Holyhead Road, setting a precedent for others. Trusts had been exposed to local pressure keeping tolls low and granting exceptions on some traffic, effectively lowering regular interest income and reducing resources for improvements. The tendency to keep tolls low would continue on some turnpikes, particularly those away from the great arterial routes.

Given the politics of the time, it is inconceivable that the Government financed Commission model could be replicated along all nationally important roads. Parliament was already baulking at the expense of the Holyhead Road and it's even more costly associated harbours and bridges. Furthermore, Government administrative capacity was still under-developed⁶¹ despite its increased fiscal capacity after the Napoleonic Wars. It was far more

⁶¹ As Guldi (2012) argues there was no "Ministry of Transport" in 1820.

effective to work in partnership with the existing turnpike trusts and influence them to minimise the negative aspects of their localism, under-pricing, under-skilled staff, and lack of strategic planning. With targeted monitoring, reporting as regulation and users such as the Post Office to provide pressure, the turnpike trusts demonstrated that they were a force for improvement that responded to both local, regional and to a lesser extent national needs. The turnpike model continued to provide a mechanism that matched adequate, not necessarily excellent, road infrastructure to economic demand. Trusts favoured the McAdams as contractors to advise on good and robust road building and maintenance. This had the unexpected, though beneficial effect of providing a consistent engineering standard along the arterial roads, even when these were managed by a mosaic of local trusts.

The generally high quality of the turnpike road network in 1838 points to the success of a policy using an early type of “Public Private not-for-profit Partnership” (PPNP), the “regulated turnpike trust”, to develop and maintain most of the main road infrastructure in England. Prior to 1810 the existing turnpike trusts had effectively been private, not-for-profit organisations which had dealt with the acute, local problems of poor quality main roads with very little Government oversight. By the 1820s, the direct and indirect interventions by Government had strengthened the public component requiring better governance. Financial reporting became mandatory and public, increasing the confidence of investors, and exposing any ill-judged financial strategies. Increased scrutiny of the management of the roads and publicising best practice promoted both employment of skilled surveyors and the introduction of good pragmatic technology on a national scale. This partnership approach resulted in a sustained

improvement in existing roads and the building of new roads to accommodate economic growth during the next two decades.

This novel arrangement was to end in the 1840s in the face of an external technological challenge. The dramatic expansion of the steam powered railways decimated the long distance road traffic, denying turnpikes their main source of income. The last Mail coach ran on the London to Holyhead road in 1839 when the Mail was carried to Liverpool by train and thence to Dublin by steam packet (Watson 1917). Elsewhere the turnpike system began to fail as a means of financing, eventually to be replaced by public administration financed through taxation.

9. Conclusions

We have shown that before the expansion of railways, a network of good quality main roads across England & Wales provided a transport infrastructure which was fit for purpose. This contrasted with the generally expressed view that main roads had been in a poor state at the turn of the century. Government had intervened during this period but the extent to which it was responsible for infrastructure improvement has been unclear. Our analysis demonstrates that turnpike trusts were responsible for building 4,000 miles of new, good quality road in England and Wales, much of it between 1810 and 1838. On a directly comparable basis, the not-for-profit trusts built thirty times the mileage than had been built with direct Government funding during the early 1800s. Nevertheless, Government intervened successfully in less direct, subtle ways across the wider road network.

Firstly, it provided a framework in which interest groups and Government actors could explore both the problems and solution to meeting demand. The MP Parnell described their

input as “working with the trusts”, though in practice there was intervention for a short period in some trusts and increased regulation and greater public reporting for all.

Secondly, although the Government funded works of Telford created an iconic road to Holyhead, the exposure and approval given to McAdam and his methods in Government enquiries persuaded many more trusts to employ him. This ultimately led to the age of standardisation which was an indirect triumph for Government intervention. We believe that this voluntary adoption of the expert-led approach resulted from the partnership of Government with the not-for-profit turnpike trusts. It left some localism and conveniently kept the costs of road infrastructure on the road user, not direct taxation.

Finally, our analysis illustrates how the growing state capacity in England & Wales did not directly lead to a large increase in public goods and road infrastructure. In the main, it led to better regulation and support of not-for-profit trusts which could hold and efficiently manage nationally important infrastructure assets. The framework of support, targeted management intervention, and regulation established by Government made the independent turnpike trusts of the early 19th century more capable than those which had begun to fail in the late 18th century. As such our work points to a synthesis between the traditional view that turnpike trusts were the principal actors in creating the good road network of England & Wales, and the revisionist view which sees Government as playing a large and leading role.

References

- Albert W. (1972). *The turnpike road system in England 1663-1840*. Cambridge: Cambridge University Press, Cambridge.
- Bates A. (1969). *Directory of Stage Coach Services 1836* Newton Abbot: David & Charles.
- Barker, T. C. and Gerhold, D. (1995). *The rise and rise of road transport, 1700-1990*. Cambridge University Press, Cambridge.
- Besley, T., & Persson, T. (2008). Wars and state capacity. *Journal of the European Economic Association* 6, 522-530.

- Bennett, J., & Iossa, E. (2010). Contracting out public service provision to not-for-profit firms. *Oxford Economic Papers*, 784-802.
- Bogart, D. (2005). Did Turnpike Trusts Increase Transportation Investment in 18th century England? *The Journal of Economic History* 65, 439-468.
- Bogart, D. (2017). The Turnpike Roads of England and Wales. In *The Online Historical Atlas of Transport, Urbanization and Economic Development in England and Wales c.1680-1911*, eds. L. Shaw-Taylor, D. Bogart and M. Satchell.
- Bogart, D. (2019). Investing in early public works: financial risks and returns in English and Welsh turnpikes, 1820–82. *The Economic History Review* 72, 848-868.
- Bogart, D. and Richardson, G. (2011). Property rights and Parliament in industrializing Britain. *The Journal of Law and Economics* 54, 241-274.
- Bogart, D., Dunn, O. B., Alvarez-Palau, E. J., & Shaw-Taylor, L. (2022). Organizations and efficiency in public services: The case of English lighthouses revisited. *Economic Inquiry* 60, 975-994.
- British Parliamentary Papers (1810). Second Report from Committee on Holyhead Roads & Harbour (33) IV 41
- British Parliamentary Papers (1810/11). Report from Committee on Holyhead Roads (197) 801
- British Parliamentary Papers (1814/15). Report from Select Committee on Holyhead Roads III 355
- British Parliamentary Papers (1817). Fifth Report from the Select Committee on The Roads from Holyhead to London III 245.
- British Parliamentary Papers (1819). Report from the Select Committee on the Highways of the Kingdom (509) V;339.
- British Parliamentary Papers (1821). Report from the Select Committee appointed to consider the Acts now in Force regarding Turnpike Roads and Highways in England & Wales. (747) IV:343.
- British Parliamentary Papers (1822). Shrewsbury and Bangor Ferry Road Annual Report of the Commissioner (126) 14
- British Parliamentary Papers (1823). Report from the Select Committee on Mr McAdam's Petition (476). 53.
- British Parliamentary Papers (1824). First Report of the Commissioners of Road from London to Holyhead (305) 27.
- British Parliamentary Papers (1826/7). Report of Mr Telford on the state of the Road from London to Liverpool VII (352).
- British Parliamentary Papers (1829). Sixth Report of the Commissioners appointed under the Acts.... for the further improvement of the Road from London to Holyhead and from London to Liverpool (316).

- British Parliamentary Papers (1830). A Bill for the improvement of roads from London to Edinburgh and from London to Portpatrick; and for further improvement of the roads from London to Holyhead , and from London to Liverpool (435).
- British Parliamentary Papers (1831). Report of the Commissioners of Holyhead Roads, relative to the origins of the Commission of Holyhead Road. (298) 17.
- British Parliamentary Papers (1831/2) Ninth Report of the Commissioners for improvement of the road from London to Holyhead and London to Liverpool (584) 573.
- British Parliamentary Papers (1840); Report of the Commissioners for Enquiring into the State of the Roads in England & Wale, (256) XXVII;1
- Buchanan, B. J. (1986). The evolution of the English turnpike trusts: lessons from a case study. *Economic History Review* 39, 223-243.
- Brock, W. R. (2014). *Lord Liverpool and liberal toryism*. Cambridge: Cambridge University Press.
- Brunt, L. (2006). Rediscovering risk: Country banks as venture capital firms in the first industrial revolution. *The Journal of Economic History*, 66, 74-102.
- Campbell, G., Grossman, R. S., & Turner, J. D. (2021). Before the cult of equity: the British stock market, 1829–1929. *European Review of Economic History*, 25, 645-679.
- Cassis, Y., De Luca, G., & Florio, M. (Eds.). (2016). *Infrastructure finance in Europe: insights into the history of water, transport, and telecommunications*. Oxford: Oxford University Press.
- Casson, M. (2009). *The world's first railway system: enterprise, competition, and regulation on the railway network in Victorian Britain*. Oxford: Oxford University Press.
- Chapman, J. (2021) Interest Rates, Sanitation Infrastructure, and Mortality Decline in Nineteenth-Century England and Wales. *The Journal of Economic History* 82, 1-36.
- Chilosi, D., Murphy, T. E., Studer, R., & Tunçer, A. C. (2013). Europe's many integrations: Geography and grain markets, 1620–1913. *Explorations in Economic History*, 50, 46-68.
- Cox, G. W. (2020). British state development after the Glorious Revolution. *European Review of Economic History* 24, 24-45.
- Cox, G. W. (2016). *Marketing sovereign promises: Monopoly brokerage and the growth of the English state*. Cambridge: Cambridge University Press.

- Craig, D. (2020). Tories and the Language of 'Liberalism' in the 1820s. *The English Historical Review* 135, 1195-1228.
- Dabla-Norris, E., Brumby, J., Kyobe, A., Mills, Z., & Papageorgiou, C. (2012). Investing in public investment: an index of public investment efficiency. *Journal of Economic Growth*, 17, 235-266.
- Dincecco, M & Prado, M. (2012). Warfare, fiscal capacity, and performance. *Journal of Economic Growth* 17, 171-203.
- Duran, X., Páez, H., & Torres, C. (2020). The arrival of wagons to the Andes: Construction of the Cambao Wagon Road in 1880s Colombia. *The Journal of Transport History*, 41, 70-88.
- Dyos, H.J. & Aldcroft, D.H. (1969). *British Transport – An Economic survey from the seventeenth century to the twentieth century*. Leicester: Leicester University Press.
- Engel, E., Fischer, R.D., & Galetovic, A. (2020). *When and how to use public-private partnerships in infrastructure: lessons from the international experience*. No. w26766. National Bureau of Economic Research.
- Giovanni, F., Schulze, M.S., and Volckart, O. (2021). European goods market integration in the very long run: from the Black Death to the First World War. *The Journal of Economic History* 81, 276-308.
- Gerhold, D. (2014a). The Development of Stage Coaching and the Impact of Turnpike Roads 1653-1840, *Economic History Review* 67, 818-845.
- Gerhold, D. (2014b). Review of Roads to Power. *Victorian Studies*, 56, 291-293.
- Glaeser, E. L., & Xiong, W. (2017). Urban productivity in the developing world. *Oxford Review of Economic Policy*. 33, 373-404.
- Goldsmith, H. (2014). The Long-Run Evolution of Infrastructure Services. Available at SSRN 2532911.
- Gordon, B. (1979). *Economic Doctrine and Tory Liberalism 1824–1830*. London: Springer.
- Grafe, R. (2011). *Distant Tyranny: Markets, Power, and Backwardness in Spain, 1650-1800*. Princeton University Press.
- Guldi J. (2012). *Roads to Power-Britain invents the Infrastructure State*. Cambridge: Harvard University Press.
- Gulland, P. (2017). The Toll Roads of Buckinghamshire 1706-1881. *Buckinghamshire Archaeological Society Aylesbury*.
- Herranz-Loncán, A. (2007). Infrastructure investment and Spanish economic growth, 1850–1935." *Explorations in Economic History* 44, 452-468.
- Hoppit, J. Patterns of Parliamentary legislation, 1660–1800. *The Historical Journal* 39, 109-131.
- Hughes, M. (1964). Telford, Parnell and the Great Irish Road. *Journal of Transport History* 4, 199-209.

- Johnson, N. D., and Koyama, M. (2017). States and economic growth: Capacity and constraints. *Explorations in Economic History* 64, 1-20.
- Kellett, A. (2009). *Blind Jack of Knaresborough*. Stroud: History Press.
- Lawson, W. (1966). The origin of the Military Road from Newcastle to Carlisle. *Archaeologia Aeliana*. 44, 185–207
- Mendel, S. C., & Brudney, J. L. (2012). Putting the NP in PPP: The role of non-profit organizations in public-private partnerships. *Public Performance & Management Review*, 35, 617-642.
- Millward, R. (2005). *Private and public enterprise in Europe: energy, telecommunications and transport, 1830–1990*. Cambridge: Cambridge University Press.
- Neal, L. (2000). How it all began: the monetary and financial architecture of Europe during the first global capital markets, 1648–1815. *Financial History Review*, 7, 117-140.
- Nogues-Marco, P., Herranz-Loncán, A. and Aslanidis, N. (2019). The making of a national currency: Spatial transaction costs and money market integration in Spain (1825–1874). *The Journal of Economic History* 79, 1094-1128.
- Oechler Solana E.F. (2014). Public private not-for-profit partnerships: delivering public services to developing countries” *Procedia Engineering* 78, 259-264.
- O’Brien, P. K. (2016). The triumph and denouement of the British fiscal state: taxation for the wars against revolutionary and Napoleonic France, 1793–1815. In Storrs, C., ed. *The Fiscal-Military State in Eighteenth-Century Europe*. Londo: Routledge, 181-214.
- O'Brien, P. K., and Palma, N. (2020). Danger to the Old Lady of Threadneedle Street? The Bank Restriction Act and the regime shift to paper money, 1797–1821. *European Review of Economic History* 24, 390-426.
- Offer, A. (2022). *Understanding the Private–Public Divide: Markets, Governments, and Time Horizons*. Cambridge: Cambridge University Press.
- Pablo-Martí, F., Alañón-Pardo, A. and Sánchez, A. (2021). Complex networks to understand the past: the case of roads in Bourbon Spain *Cliometrica* 15, 477-534.
- Parnell, H. (1833). *A Treatise on Roads*. London: Longman.
- Pawson, E. (1977) *Transport and Economy: the Turnpike Roads of 18th Century Britain* London: Academic.
- Quartermain J., Trinder B. & Turner R. (2003). Thomas Telford’s Holyhead Road – the A5 in North Wales. *CBA Report 135*, *Council for British Archaeology*.

- Reader W.J. (1980). *The McAdam family and the Turnpike Roads 1798-1861*. London: Heineman.
- Roberts A.F. (1992). *Turnpike Roads around Buxton* Buxton: privately published.
- Rosevear A. (2003). *Turnpike Roads around Oxford*. Wantage: privately published.
- Rosevear A. (2010). Turnpike Roads to Banbury. *Banbury Historical Society*, 31.
- Rosevear, A., Bogart, D., and Shaw-Taylor, L. (2019), The Spatial Patterns of Coaching in England and Wales from 1681 to 1836: A Geographic Information Systems Approach. *Journal of Transport History*, 40, 418-44.
- Spiro, R.H. (1956). John Loudon McAdam and the Metropolis Turnpike Trust. *Journal of Transport History* 2, 209-213.
- Tomory, L. (2017). *The history of the London water industry, 1580–1820*. Baltimore: JHU Press.
- Trew, A. (2010). Infrastructure finance and industrial take off in England. *Journal of Money, Credit and Banking* 42, 985-1010.
- Watson E. (1917). *The Royal Mail to Ireland*. London: Edward Arnold.
- Webb S. & Webb B.P. (1913). *English Local Government: The Story of the King's Highway*. London: Longman Green & Co..
- Webster, I. (2018). The Public Works Loan Board and the growth of the state in nineteenth-century England. *The Economic History Review* 71, 887-908
- Webster, I. (2022). Making the municipal capital market in nineteenth-century England. *The Economic History Review*, 75, 56-79.
- Winstone, B. (1891) *Minutes of the Epping & Ongar Highway Trust 1769-1870*. London: Harrison & Sons.
- World Bank. (2017). *Who Sponsors Infrastructure Projects? Disentangling Public and Private Contributions*. Washington, DC: World Bank.
- Zwalf, S. (2022). From turnpikes to toll-roads: a short history of government policy for privately financed public infrastructure in Australia. *Journal of Economic Policy Reform*, 25, 103-120,

Appendix:

Official Papers

Parliamentary Papers on Committee Reports and 19th century Turnpike Acts were downloaded from The Chadwyck-Healey ProQuest web based Collection. Earlier turnpike Acts were from the private collection of original published Acts held by the authors and from a sample set of Acts obtained as pdfs from the House of Commons Library.

The mapping

Road maps were generated from earlier mapping of turnpike roads in ARC GIS Pro. The main shapefile was generated using the First series OS ca 1850 as the base onto which the polylines representing the line of turnpike roads were drawn individually using visual inspection of 18th and 19th century maps. The principal source was Cary's map of England and Wales – sheets 1 to 62, printed at 2 miles to the inch – digital images from the Cambridge University Collection – originally georeferenced and plotted in Arc Map by Max Satchell. The polylines were assigned to particular turnpike trusts and dates of the relevant Act added based on the original Acts mentioned above.

A separate shapefile was created for the Cary mapping of all main roads (post roads, turnpikes and “other main roads”) with some of the “other” roads added to aid triangulation of improvements.

A third layer of digital mapping was generated as a single shapefile using Bryant's maps from the 1830s for a number of southern counties (all classes of road on these maps were included – turnpike and non-turnpike; Herts, Bucks, Oxon, Gloucs, Monmouth).

A fourth layer of digital mapping for the late 18th century was generated as a number of shapefiles for nominated cartographers for all northern counties and a few southern counties (all “turnpike” roads were mapped and for the northern counties all non-turnpike roads were also mapped). Note that for the “new roads” the northern counties were considered particularly important based on reading of the turnpike Acts – there are no good quality on-line 18th century maps available for several southern, western and Welsh counties.

Reference was made to the OS draft map sheets on Wikimedia Commons where available (many parts of Southern England and Wales ca 1810/20.).

Each map layer was continuously refined while working on the other layers (i.e., uncertainties resolved by cross referencing and modification of all layers when confirmed). The subsidiary roads were particularly important since these provided well defined junctions which could be triangulated to follow changes in the line of the main roads. This was further enhanced by creating shapefiles of well-defined point features; shapefiles of “place points” (e.g. parish churches or road side inns), bridges, ferries and mills (from the OS and 18th cent maps), tollhouses (from turnpikes.org.uk web site -by A Rosevear). These were generally placed on the OS First series base map.

In some areas, over the period of the map series, the minor roads had been altered by Parliamentary Enclosures and large land drainage schemes. These stand out as rectilinear roads on the OS base map. So far as possible the roads drawn on the digital maps followed the profile on the old county maps, picking up old residual features such as sections of footpath and field boundaries where appropriate. However, where the rectilinear roads on the OS map broadly followed the more sinuous line on the old

map (e.g. over featureless open moor), the former was adopted as the default option when only the start and terminus of the old road could be unambiguously specified.

Assigning New roads

In this analysis the aim was to identify sections of road that had been constructed along new alignments during the turnpike era. Although many pre-existing roads (here categorized as Ancient Roads) were adopted and improved by turnpike trusts it is not easy to identify where and when improvements such as widening, gradient reduction, surface improvement and better drainage were made since these do not change the line on the map at the available resolution (for the early maps 1 inch to the mile). However, it is possible to identify new lines of road by comparing mapping at two or more time points; importantly these new lines are likely to involve the most important changes in quality (they use the latest engineering methods) and required greater investment per mile to build than routine improvement of an existing line. In judging the relative importance of Government and local investment in roads, comparing roads built on new alignments provides a sound comparison of like with like.

New lines were identified from two sources: the Turnpike Acts and comparative mapping.

Wording of Turnpike Acts; The use of the word “make” or “making” in the title or preamble to a turnpike Act was taken to indicate that the whole road, or a branch was to be constructed along a new alignment; “turning” occurs occasionally and was taken to indicate a diversion along a new path for part or end of an existing road. There were 380 potential candidates based on this, dating from 1729 to 1866: 377 up to 1836 relevant to this study. The candidate new roads were processed to give the number per year and compared with when McAdam had contracts (to generate Figure 2).

Comparative matching on maps; The “new made” candidate turnpikes were classified in the shapefile. This allocation was done by the century in which the improvement was made based on the date of the relevant turnpike Act (N17 and N18 for pre and post 1800). Those sections of road financed through the Holyhead Road Commission were classified separately. With the relevant 18th century map visibly overlaying this turnpike layer, the validity of the assumption that “making or turning” identified a section of new line of road was checked. Ten Acts were excluded as not sufficiently “new” to qualify for the mileage calculations – these were either because in 3 cases the phrase was “making turnpike” and in the preamble it was clear that there was an existing road or in the others, there was an existing track on the 18th century map, albeit across moorland in 3 cases and along an old Roman Road in another. On some other roads there were sections where a portion of pre-existing (parish) road can be seen on an earlier map but these sections did not connect and did not constitute an “existing road between the named terminal towns”. In lowland England, a new road would inevitably come close to, or overlay some sections of existing parish lanes (which would be poor quality) whereas in northern Britain the lines of many new roads were totally separate from any previous lane or parish road. Where the new road followed the line of an old parish road it was classified separately for analysis.

A first iteration was made of new Diversions (deviations where a new section of improved road loops out of the main line for sufficient distance to be apparent on the scale of these maps). This used the Cary map (of the 1820s) – in many cases Cary showed a short distance of parallel main roads (i.e. the old and new line) and one was easily assigned to be “new”. To date these, reference was made to the wording of Acts (for stated improvements) or local history studies of turnpikes. A number had to be dated by estimation – by checking whether the roads shown by Cary were on pre-Cary maps (18th century County maps) or post Cary maps (Bryant or the OS). Diversions made after Cary were identified

by comparing Cary with the roads carrying milestones, tollhouses or labelled as “XX Turnpike Trust” on First Series OS map. Pre-1800 diversions were identified as differences in line between the Cary map and the 18th century county maps. There are few printed Acts accessible for this period so identifying a date for the improvement is less certain and an estimated date was entered (but the analysis only requires knowing the century which is clear). In some cases, it is assumed that the “improvement” occurred at or near the date of turnpiking (i.e. the trust made an improvement as soon as it was granted powers).

The Total Parish mileage for all English and Welsh counties was calculated from the Appendix tables in the questionnaire survey (BPP 1840). Mileages were calculated back from this by adding in those ancient roads that had been turnpiked- it is assumed that no new milage had been created by the parishes. This will be an approximation since 1680 to 1840 spans a period of enclosures, drainage schemes and emparkment which did alter the line and number of roads in some parishes. In general these decreased the length of parish roads by simplification and straightening but had much less impact on roads to be turnpiked. This means that the calculation of parish road mileage for the earlier dates will be underestimated. The table adds new milage made during each period and returns to the parish roads what was disturnpiked as a result of non-renewal of Acts or replacement of a road by a new section.

[Analysis of Loans for road building.](#)

The size of the outstanding loan made to the trust by the Exchequer (i.e. PWLB) as reported by trust in the questionnaire sheets of PP1840 (for 1838) are summarized along with the year in which the loan was taken.

[Analysis of Traffic on Holyhead Road](#)

The information given in the annual reports to the Holyhead Road Commission on income and number of vehicles passing through one of the gates” was used. Note the selected gate changed in 1817; there is uncertainty over which gates were chosen but they were probably on the mid-section near Corwen.

Appendix table 1: Main roads on these 18th century County maps digitised; maps were downloaded from the McMasters Digital Archive and the National Library of Scotland web sites.

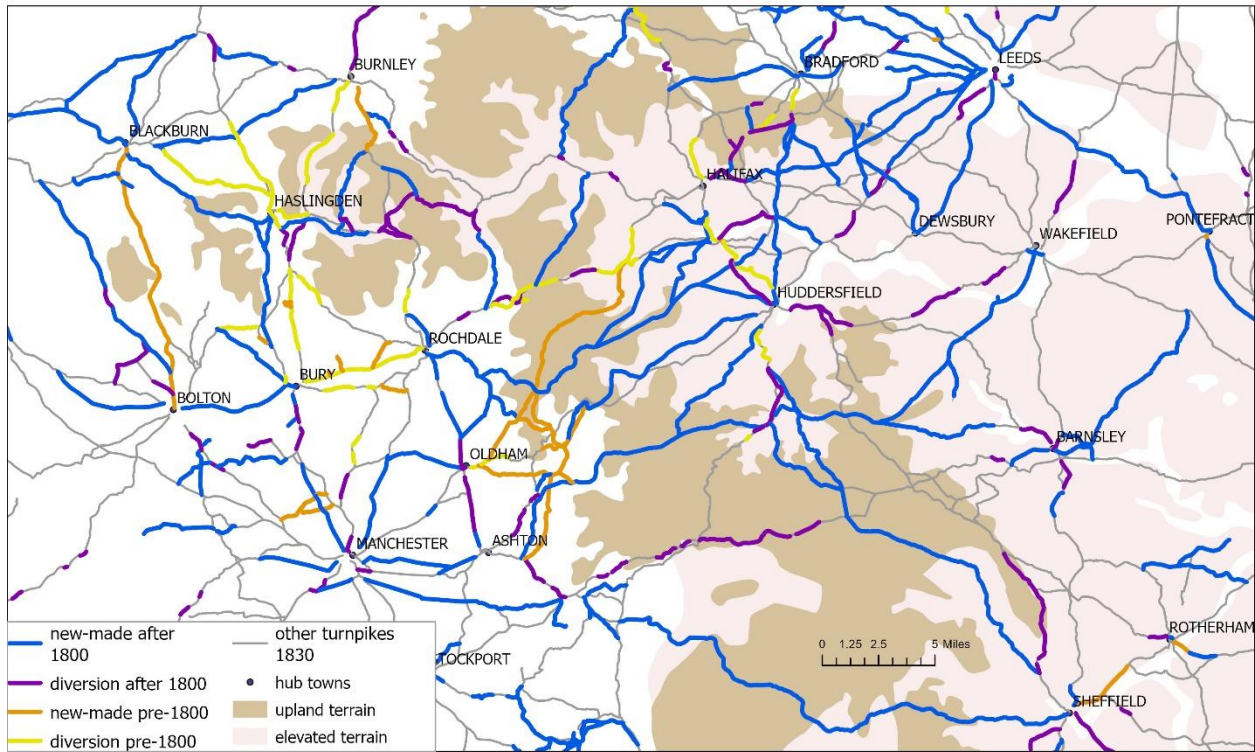
County	Cartographer	date publ.	date survey
Buckinghamshire	Jefferys, Thomas	1770	1766-8
Cheshire	Burdett & Faden	1794	
Cumberland	Donald	1774	
Derbyshire	Burdett, Peter	1767	1762-6
Devon	Donn, Benjamin	1765	
Durham	Jefferys, Thomas	1768	
Essex	Chapman & Andre	1777	1772-4
Hampshire	Milne	1791	
Herefordshire	Taylor & Faden	1786	
Lancashire	Yates, William	1786	
Lincolnshire	Armstrong, Andrew	1779	
Norfolk	Milne & Faden, William	1797	1790-4
Northamptonshire	Faden, Jefferys & Eyre	1791	reviewed at assizes 1775;
Northumberland	Armstrong, Andrew	1769	
Nottinghamshire	Chapman	1774	
Oxfordshire	Jefferys, Thomas	1768	
Staffordshire	Yates, William	1775	
Suffolk	Faden, William	1783	
Warwickshire	Yates, William	1793	1787-9
Westmoreland	Jefferys, Thomas	1770	1768
Worcestershire	Taylor, Isaac	1772	
Yorkshire	Jefferys, Thomas	1771	

Illustration of road building in Lancashire and West Riding of Yorkshire

Appendix Figure 1 focuses on the relationship between new roads and the existing turnpike network stretching from Leeds to Manchester. This region grew rapidly in economic importance and population during the industrial revolution. It is bisected by the high Pennine hills with deep incised valleys so had a poor endowment of old roads suitable for wheeled transport. This combination of factors meant that the response to increased traffic was different from that in the intensively settled areas around London, where existing lines of road were normally upgraded.

The majority of new turnpike roads were constructed between 1800 and 1835, with a particularly large mileage running westwards from Leeds and north-eastwards from Manchester. There were several new roads across the Pennines uplands between textile towns of Halifax, Elland, and Huddersfield towards Oldham. One paralleled an older road, but two others were completely new routes. West of Leeds a radial web of new turnpikes was built, dramatically increasing the road capacity into the expanding industrial area. Manchester had new turnpike roads along its important corridors of commerce, with long straight road running to the west, north and east paralleling the older turnpikes.

Appendix Figure 1; New sections of road constructed by turnpike trusts in the area around Manchester and Leeds in the northwest of England

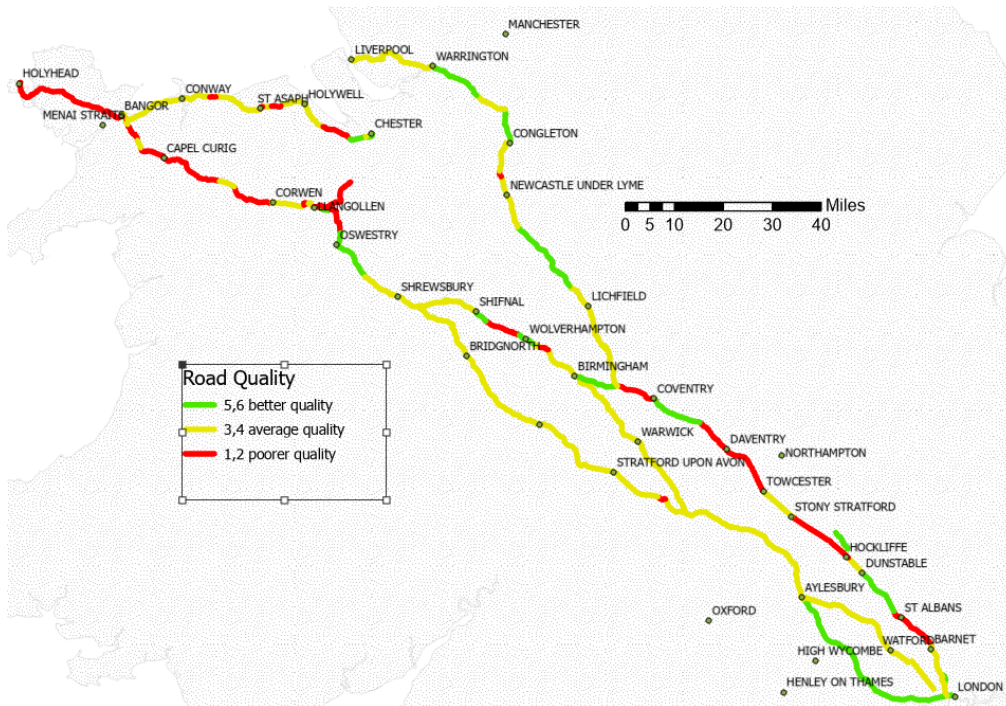


Sources: Authors calculations.

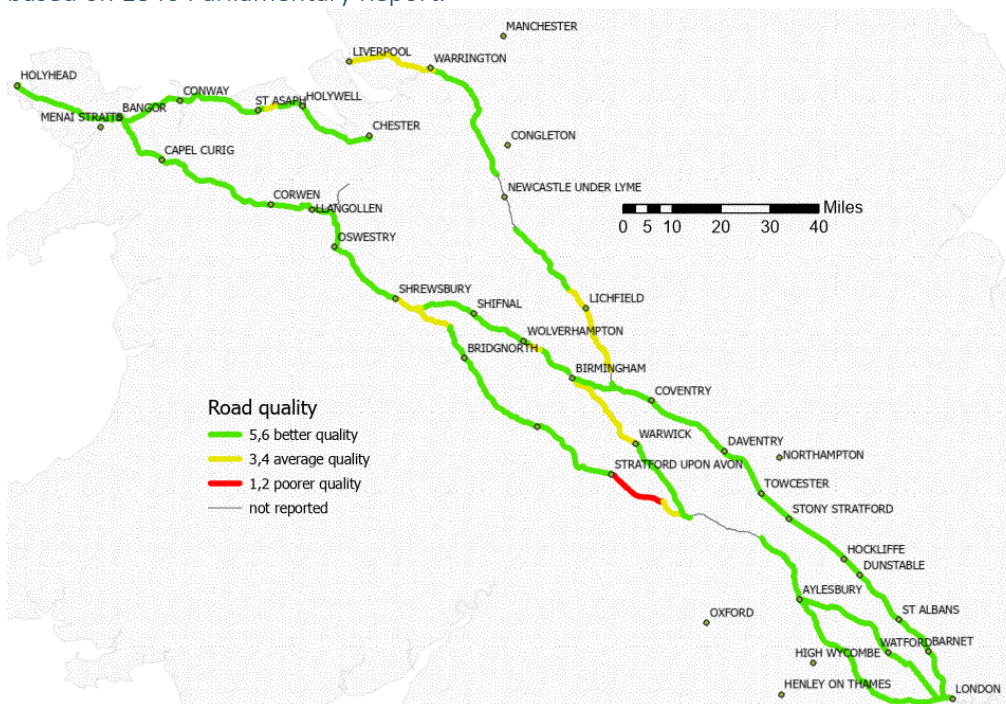
Illustration of changes in road quality on the Holyhead Road

Appendix Figure 2a shows road quality reported by Telford on potential routes ca 1814. This map gives a starting point against which to judge success for improvement along the Holyhead route selected by Telford. Appendix Figure 2b shows Road quality reported in 1838 on the improved roads; including the Government sponsored and funded Holyhead Road. It shows a marked of success of the Holyhead Commission.

Appendix Figure 2a; Telford’s evaluation of road quality on Mail roads in northwest England and Wales, in 1814



Appendix Figure 2b; Evaluation of road quality on Mail roads in northwest England and Wales in 1838 based on 1840 Parliamentary Report.



Sources: Authors calculations.