New perspectives on the rise of state capacity and development in England 1660-1830

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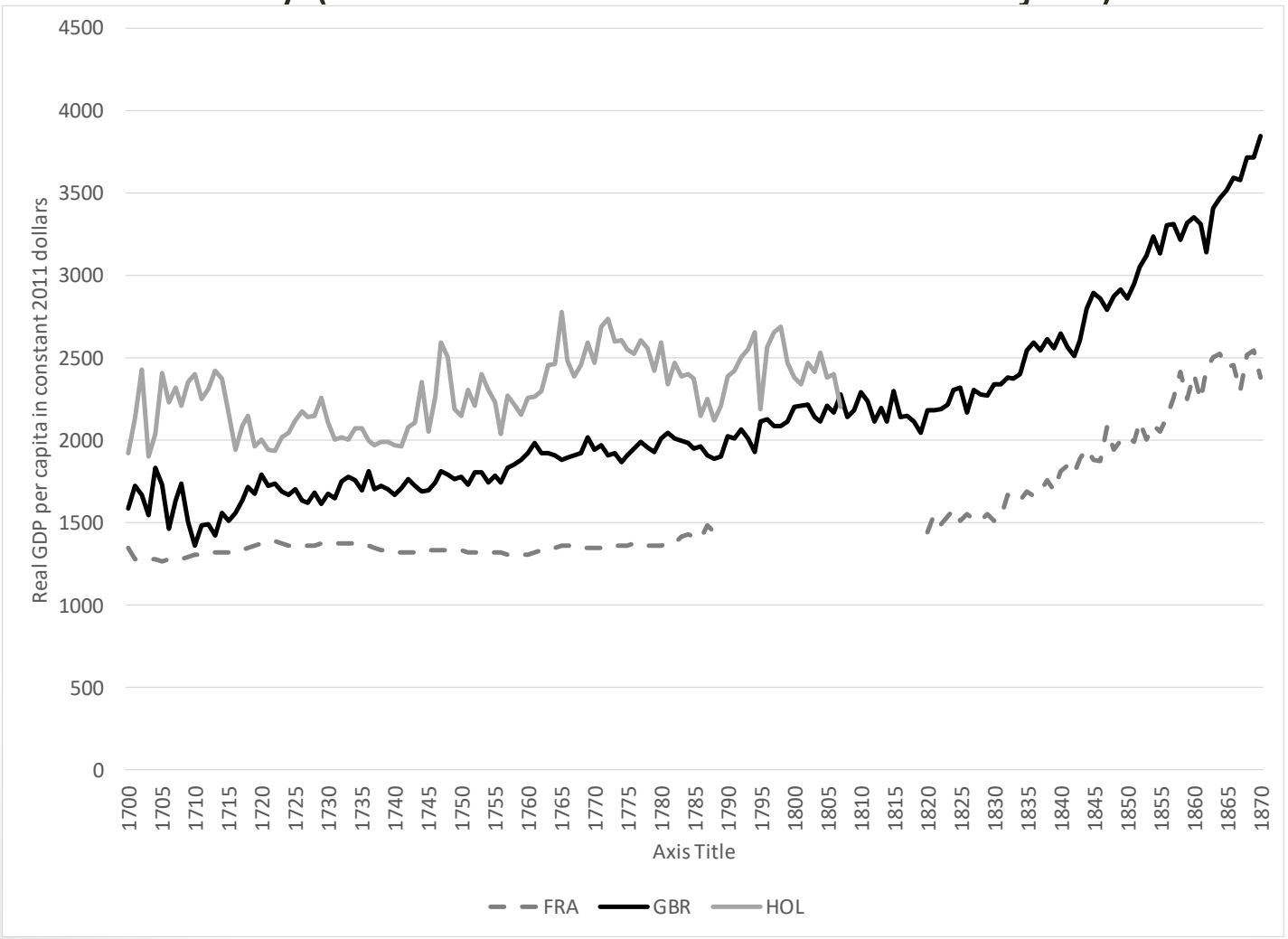
Thanks to many collaborators, mentors, and students

Aims of the presentation

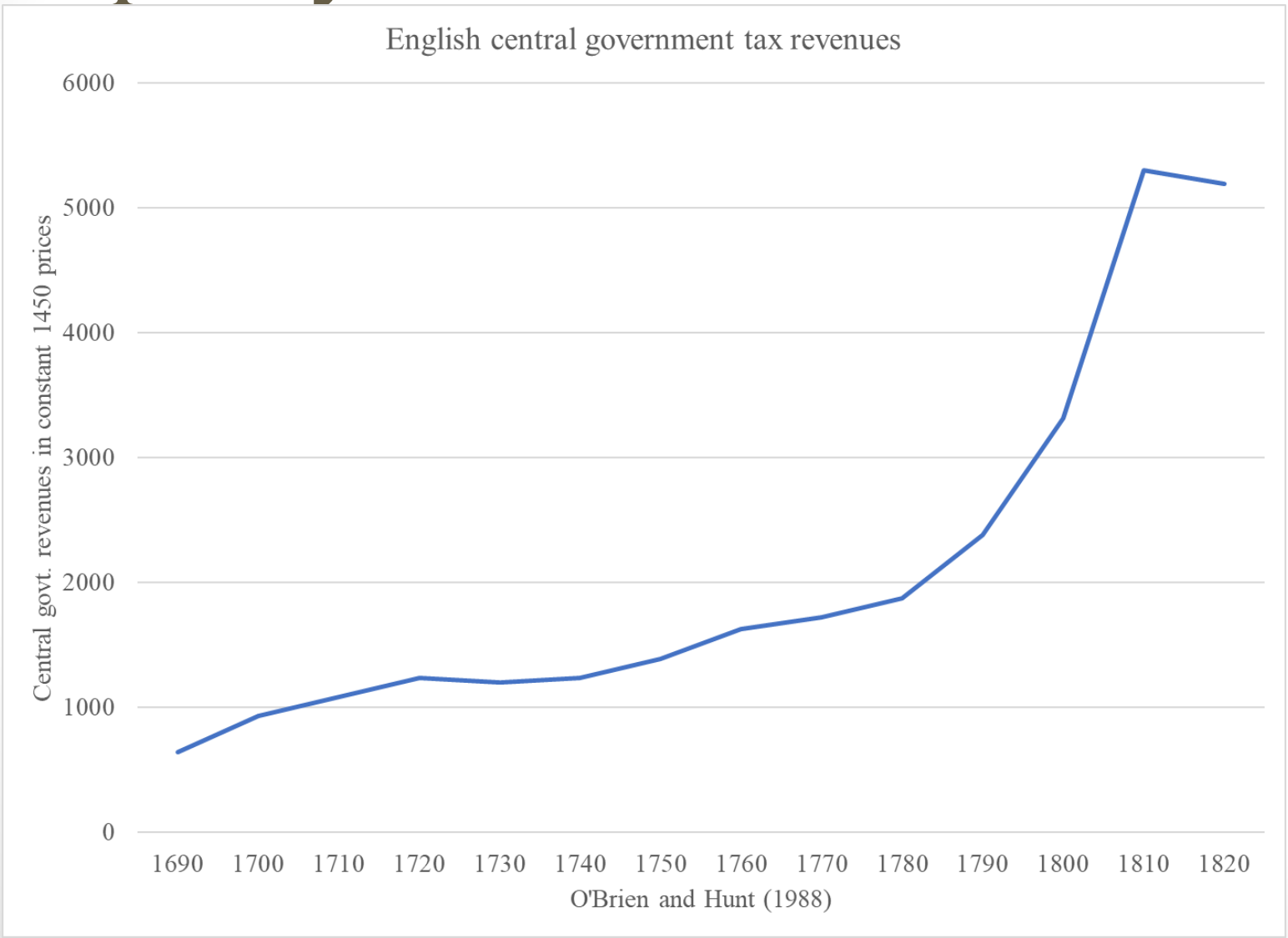
- Present facts on local state capacities in England and Wales from 1660 to 1830
- I also apply simple theoretical frameworks to understand local state capacity's impact and evolution
- I borrow from Besley and Persson, *Pillars of Prosperity,* to define two types of state capacities
  - **Legal capacities** are infrastructures that aid enforcement of contracts (e.g. building court systems, educating and employing judges and registering property or credit)
  - **Fiscal capacities** are infrastructures that aid in the collection of taxes (e.g. competent tax auditors)
- Why are state capacities important?
  - Besley and Persson show that income per capita is positively correlated with measures of legal and fiscal capacity

Britain's economic rise

- Britain's income per capita rose to highest in the world over 18th century (incomes from the Maddison Project)

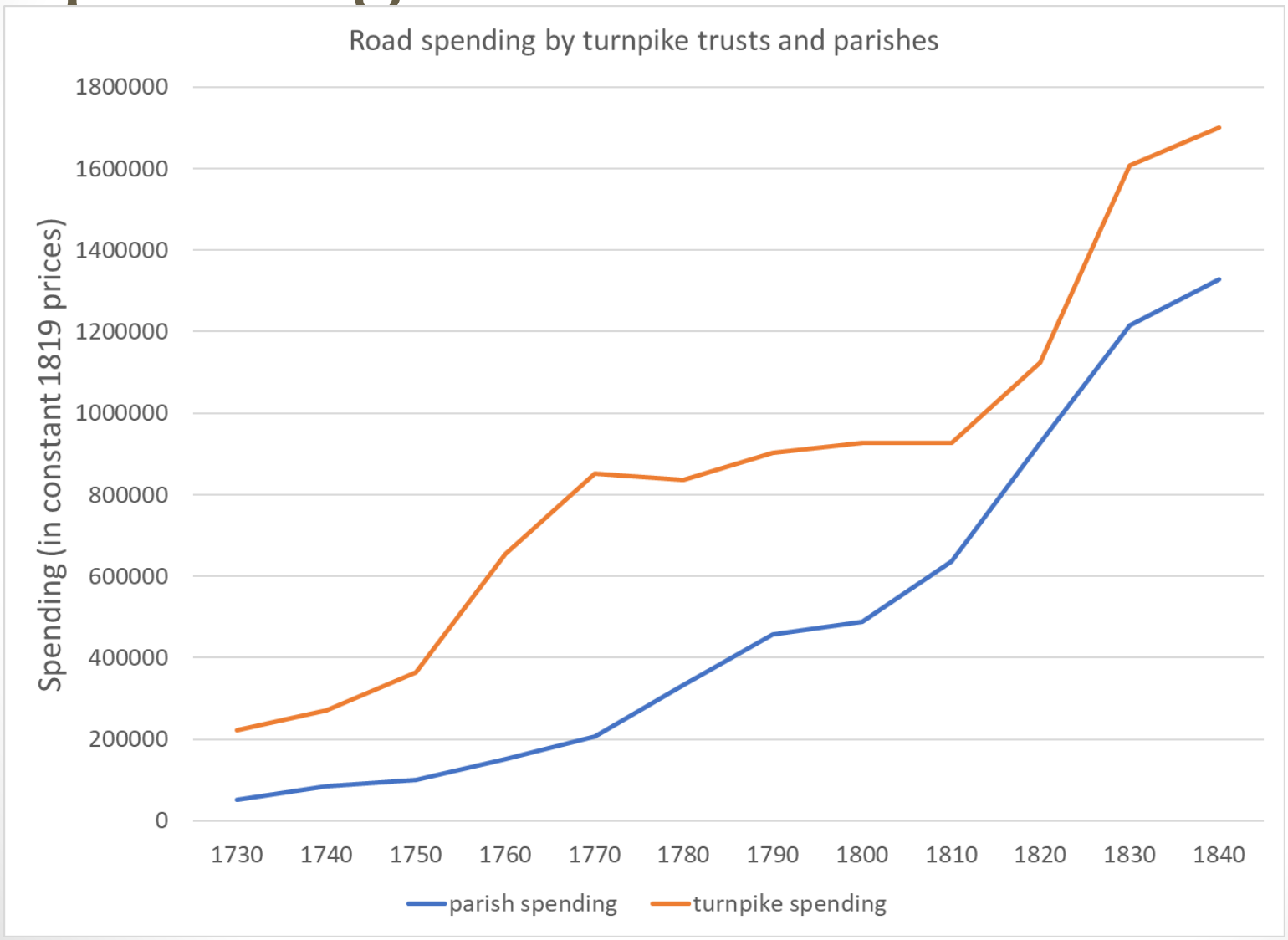


Britain's rising central fiscal capacity: tax revenues



Britain's local fiscal capacity—spending on poor relief

Britain's local fiscal capacity—spending on roads



A wide variety of local authorities

- Two historians, Sidney and Beatrice Webb, famously studied the evolution of local government in England

- They wrote a series of books in early 1900s
- Several books detailed parishes, boroughs, and counties.
- The last was called ***English Local Government: Statutory Authority for Special Purposes***
- They identified various organizations created by statute (i.e. act of parliament) to provide specific types of infrastructure

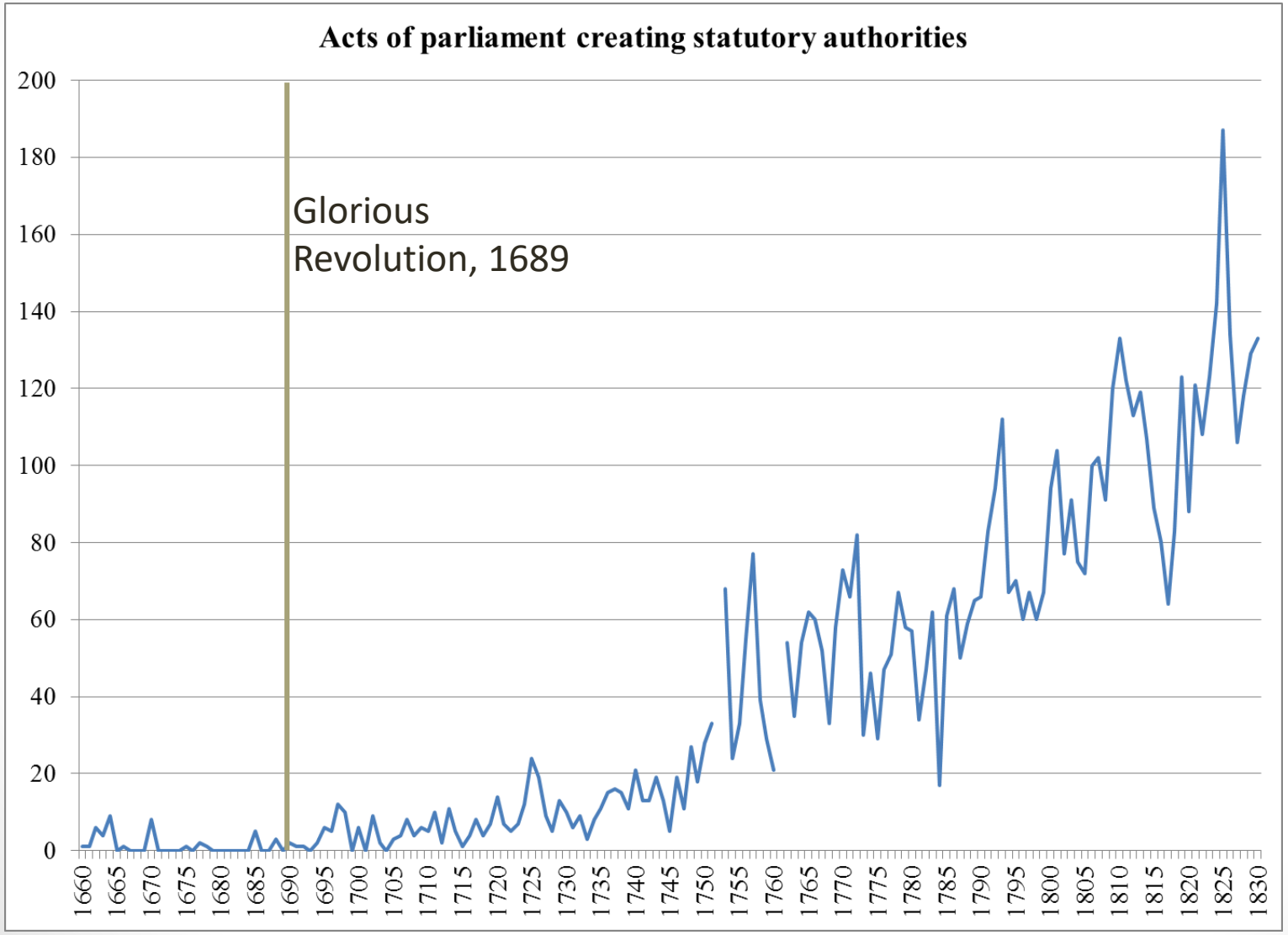
Quantifying statutory authority acts (Bogart and Richardson 2011)

Subcategories for Statutory Authority Acts, 1600-1815

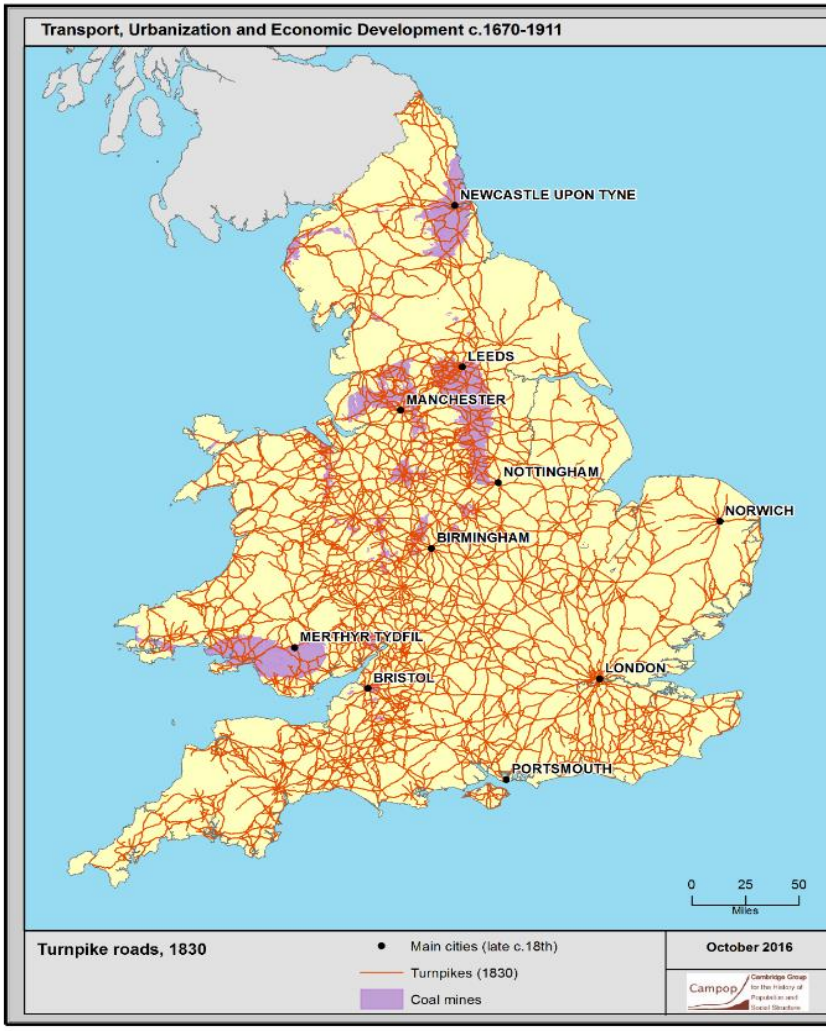
Subcategory	Number of Acts	Percentage of total
Road	2692	55.5
Urban	553	11.4
Canals	255	5.3
Ports	248	5.1
Churches	198	4.1
Rivers	188	3.9
Bridges	168	3.5
Poor Relief	153	3.2
Drainage	123	2.5
Courts of Small Request	83	1.7
County Administration	57	1.2
Railway	24	0.5
Miscellaneous	110	2.3

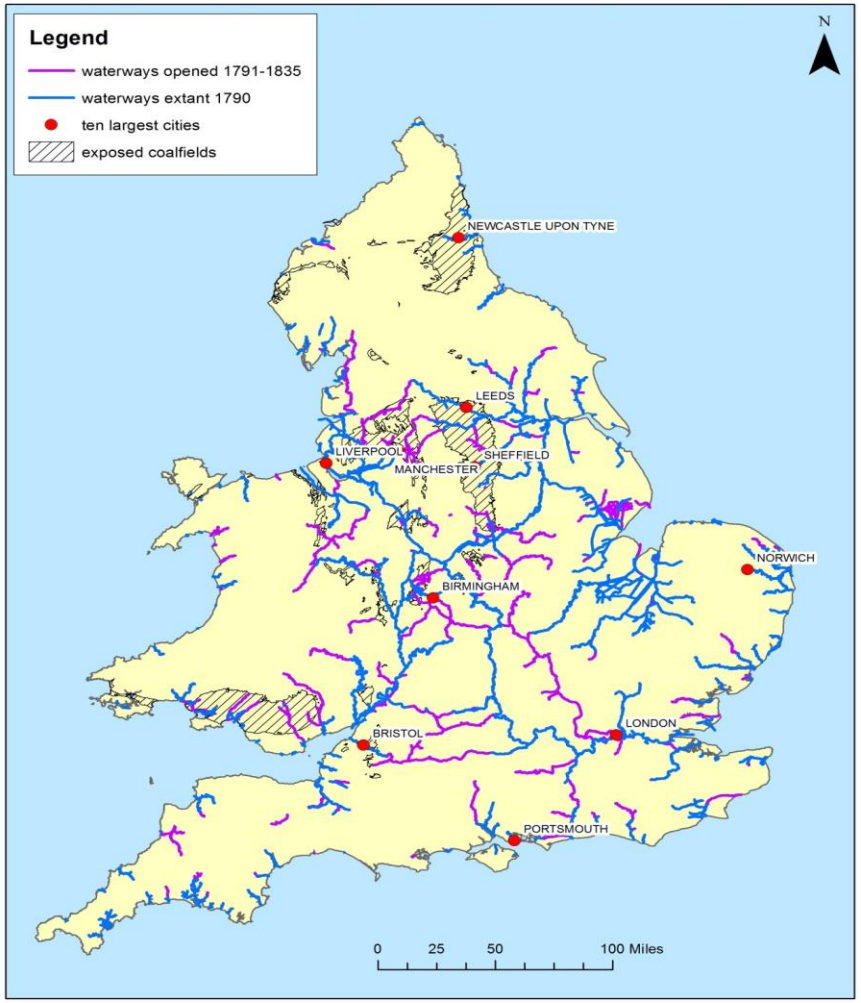
Source: see text.

Rise of statutory authorities



Individual acts lead to national networks (see CamPop transport project)

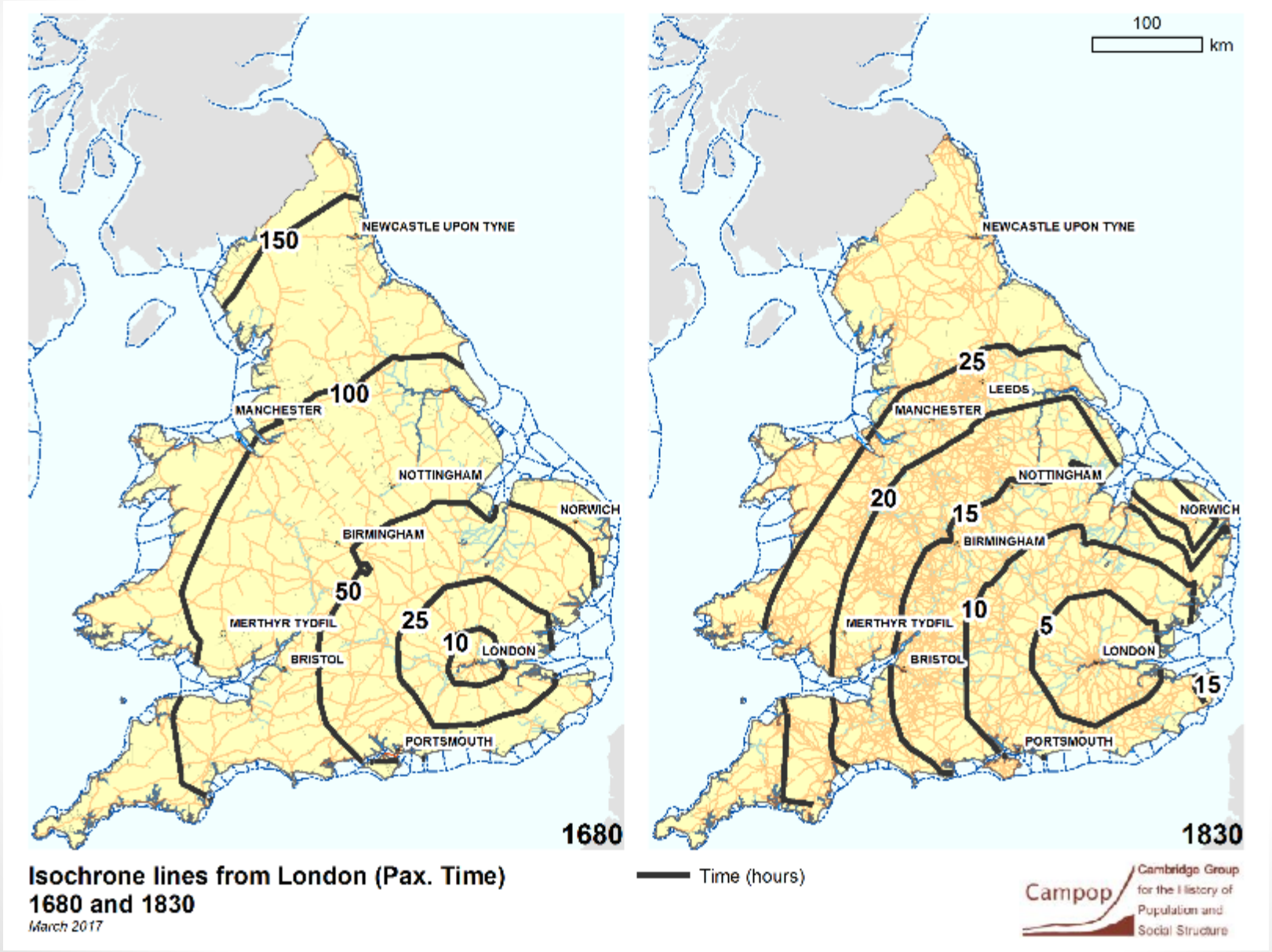




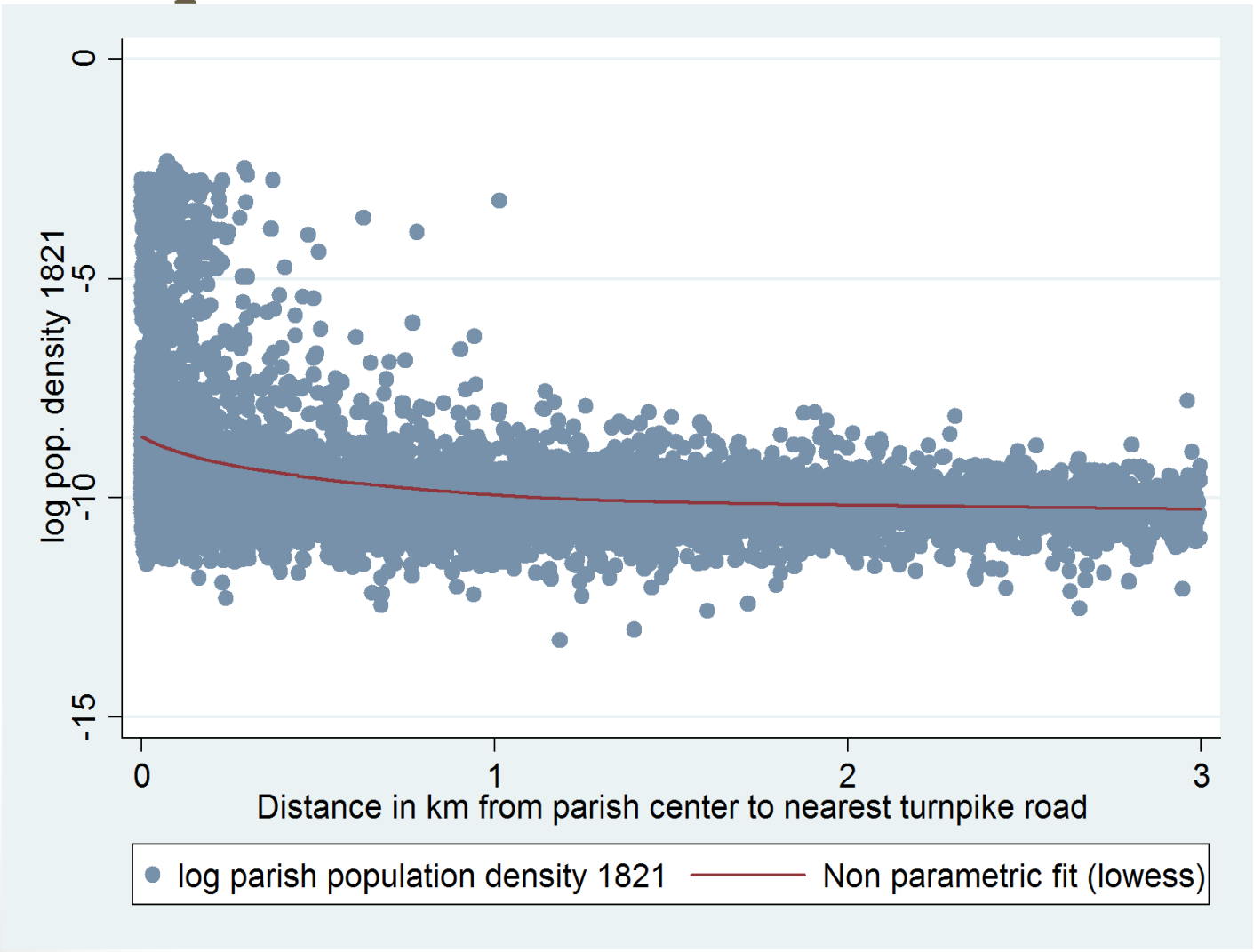
Summarizing economic impacts of statutory authorities

- Transport costs fell once statutory authorities took over or built infrastructures
  - Estimates depend on type of transport: land, water, coastal
- Land values, population density, and secondary employment increased near statutory authorities
- In the aggregate statutory authorities are estimated to increase British GDP by several percentage points in the early 19th century---all before railways
  - See Bogart 2005a, 2009, Bogart et. a. 2018 for details

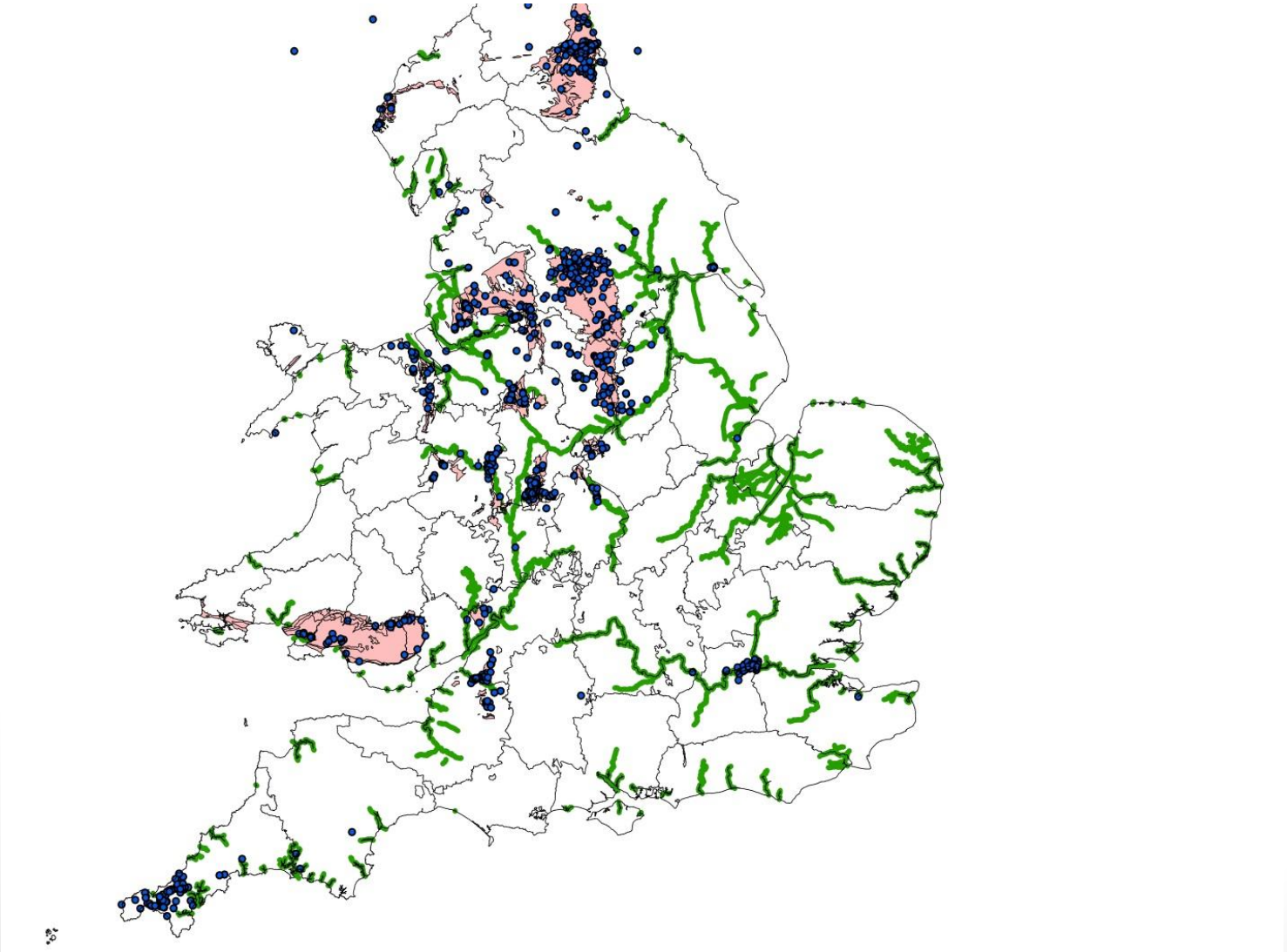
travel times to London fell by a lot!



Population density near turnpike roads



Coal, waterways, and Steam engines adopted 1770-1800

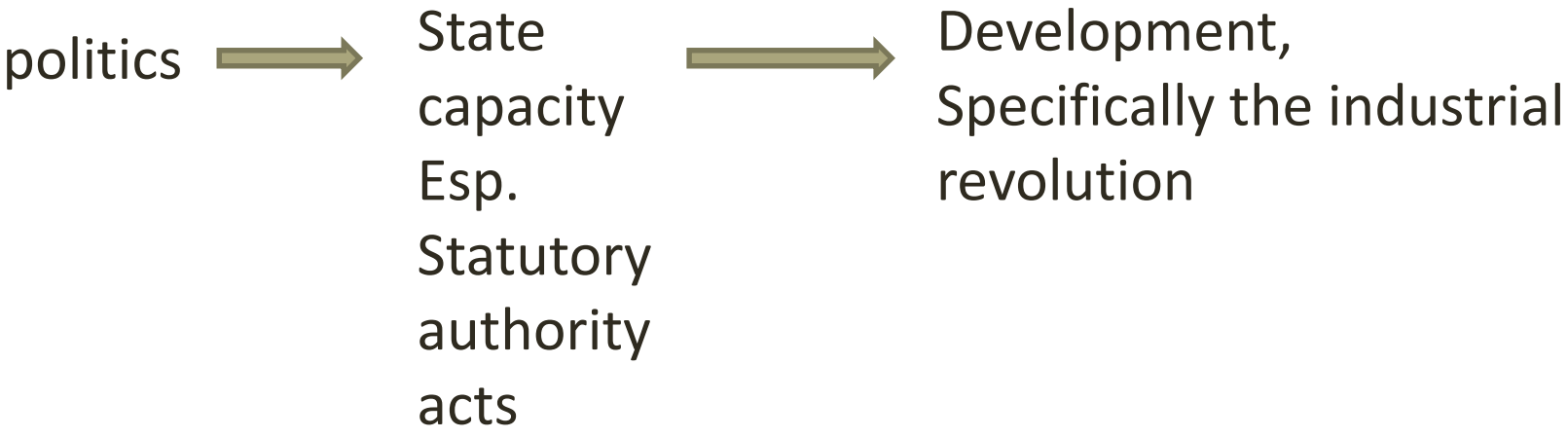


1. Key points

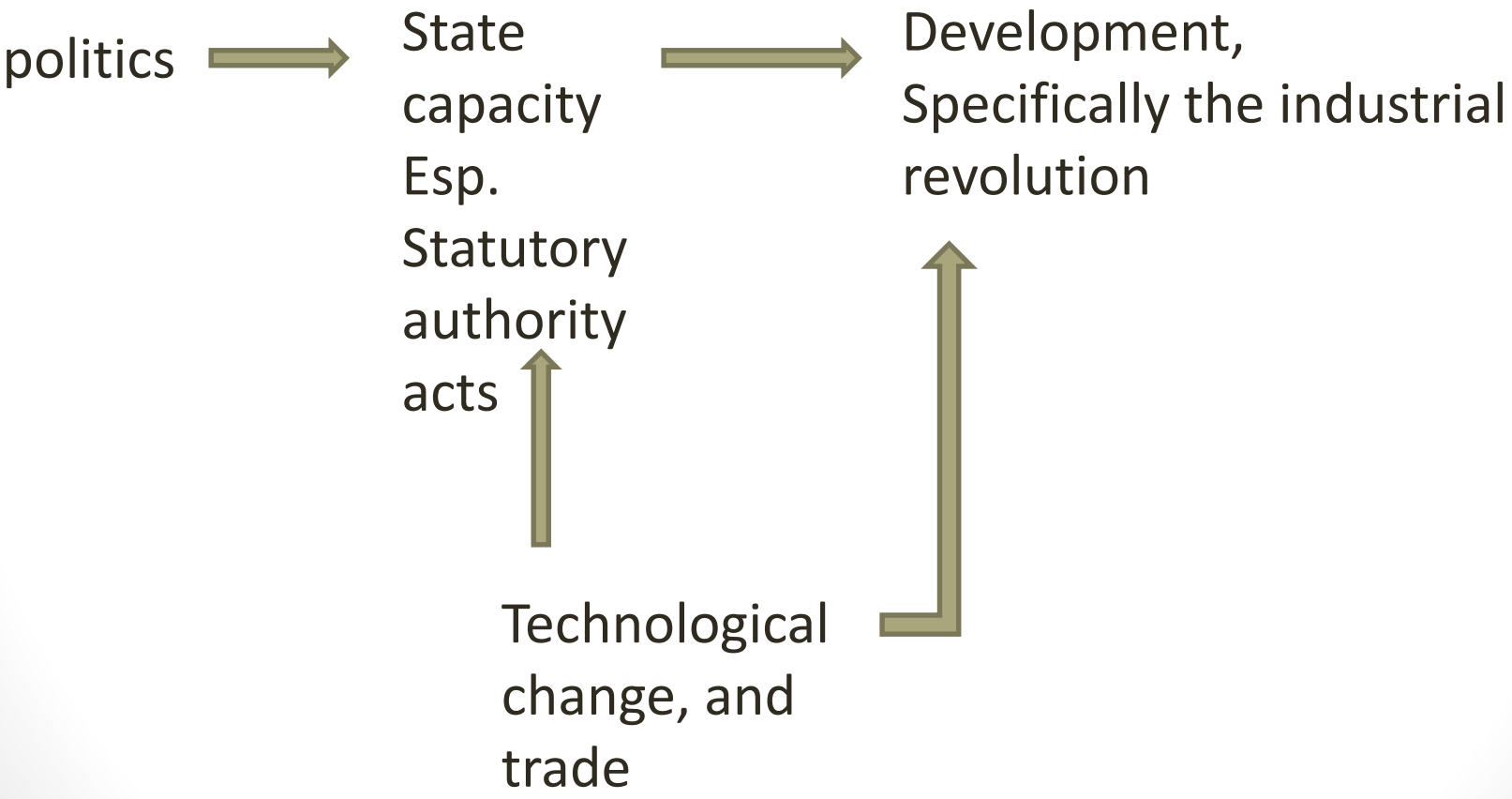
- Statutory authorities become an important feature of England's state capacity
- They contributed to economic development and account for approximately 30% of all local revenues collected (property taxes plus user fees)

- **How to understand rise of statutory authorities in terms of state capacity?**
- Today:
- 1. Develop the argument that statutory authority acts were innovations to fiscal and legal capacity
- 2. Develop the argument that politics affected the establishment of statutory authorities.
  - Acts depended on political stability
  - Political connections and party interests influenced the costs of getting an act

1. The argument: simple version



1. The argument: more complex version



2. Statutory authority acts and fiscal capacity

- Financing is one of the major problems in infrastructure.
- Theory suggest that under certain conditions user fees are the optimal fiscal tool to pay for infrastructure.
- Statutory authority acts introduced user fees (e.g. tolls), which were typically absent in previous fiscal institutions in England
- Acts also introduced regulations on the fees
- User fees ***and*** regulations in acts improved the efficiency of fiscal policies in England

Roads as an example

- Tudor legislation made parishes responsible for roads within their jurisdiction
  - Parishes are given two fiscal tools: statute labor and highway rates
- Contemporaries argued that parishes were ineffective and made demands for reform.
  - Complaints were made about heavy wagons and carriages damaging road, a form of congestion
- In late 17th century proposals were brought to Parliament to create 'turnpike roads'
  - Proposals became bills and eventually 'turnpike' acts
- Turnpike acts named trustees and gave them rights to undertake improvements on a specific road.
  - Trustees were typically local landowners, merchants, and manufacturers.
  - Trustees given rights to levy tolls and borrow against the revenues from tolls.
  - Restrictions like tolls caps, prohibitions on profits.

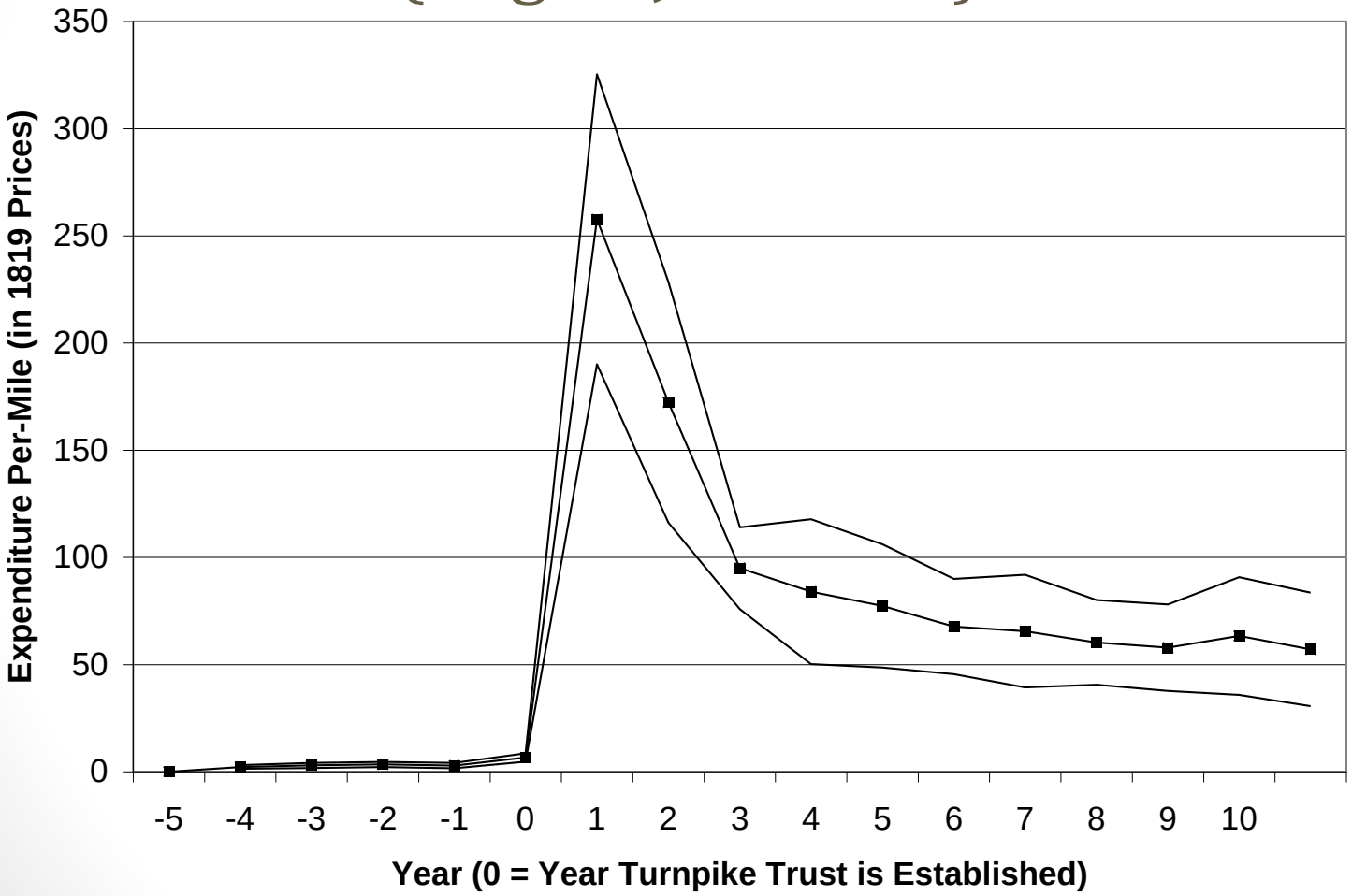
Example of turnpike act

- In 1805 ‘Act for making and maintaining a Road from Hollingwood to Featherstall…and for **making and maintaining several Branches of Road** to communicate therewith..’
- States that road **would be of great benefit and advantage** to the proprietors and occupiers of estates in the neighborhood thereof by providing shorter and better communication.
- Names approximately **200 trustees** from several areas including Manchester
- Trusteees are given the right to levy a range of tolls on users depending on vehicle type (coach, wagon, or cart), **number of horses** drawing (1, 2, 4, or 6), **wheel size** (9 inches, 6 inches, or less than 6 inches), and type of livestock
- States that toll revenues must be devoted to payment of interest on bonds or improvement and maintenance of road
- There were penalties on **evading the tolls**, including a penalty on landowners that allowed travelers to evade through their property

Impacts on road expenditure

- Did turnpike trusts spend more on roads than parishes?
- Ideally one would compare spending on roads before and after turnpike trusts were established to control for local unobservable factors
- Difficult to do because parliament did not survey individual parish spending and there was no survey on turnpike spending until 1821.
- I went to archives and built a sample of parish spending on roads that would come under the authority of turnpikes trusts in the future and I built a sample of turnpike spending on roads.
  - Calculate average road spending per mile in year 0 (turnpike founding date), year 1, year 2, etc.
- Endogeneity is challenging. I address by examining parish spending after a petition for a turnpike act failed in parliament

The Estimated Change in Road Expenditure Per-Mile before and after Turnpike Trusts are Established (Bogart JEH 2005)



endogeneity

Turnpikes as fiscal innovations in theory

- Public finance models can inform the optimal financing of roads
- Following Verhoef (JUE 2006) I focus on a setting where congestion pricing is possible and where road capacity can be adjusted
- Consider a single road with capacity *K*
- Aggregate inverse demand function *D(n)*, where n is a user and *N* denotes the equilibrium flow of traffic
- The average **user cost** depends on congestion through *N* and road capacity *K*. It is denoted *c(N/K)*
  - cost function is homogenous degree of zero.
- The generalized price faced by road users *p(N,K)* is equal to the sum of *c(N/K)* and a toll τ
- Road's **capacity cost** is denoted γK i.e. constant returns

Optimal policies for single road

- Planners problem is to maximize surplus subject to markets clearing

$$\int_0^N D(n)\,\mathrm{dn} - \mathrm{Nc}\left(\frac{\mathrm{N}}{\mathrm{K}}\right) - \gamma\mathrm{K} + \lambda(c\left(\frac{N}{K}\right) + \tau - D(N))$$

- First order conditions for planner yield two conditions for first best
  (1) $\tau = Nc_N$ tolls equal marginal external congestion cost
  (2) $-Nc_K = \gamma$ marginal benefit to capacity equals marginal cost

- A private highway provider will maximize revenues less investment cost

$$\mathrm{N}\tau - \gamma\mathrm{K} + \lambda(c\left(\frac{N}{K}\right) + \tau - D(N))$$

- two conditions for private provider
  (1) $\tau = Nc_N - ND_N$ tolls equal marginal ext. cong. cost plus markup
  (2) $-Nc_K = \gamma$ marginal benefit to capacity equals marginal cost

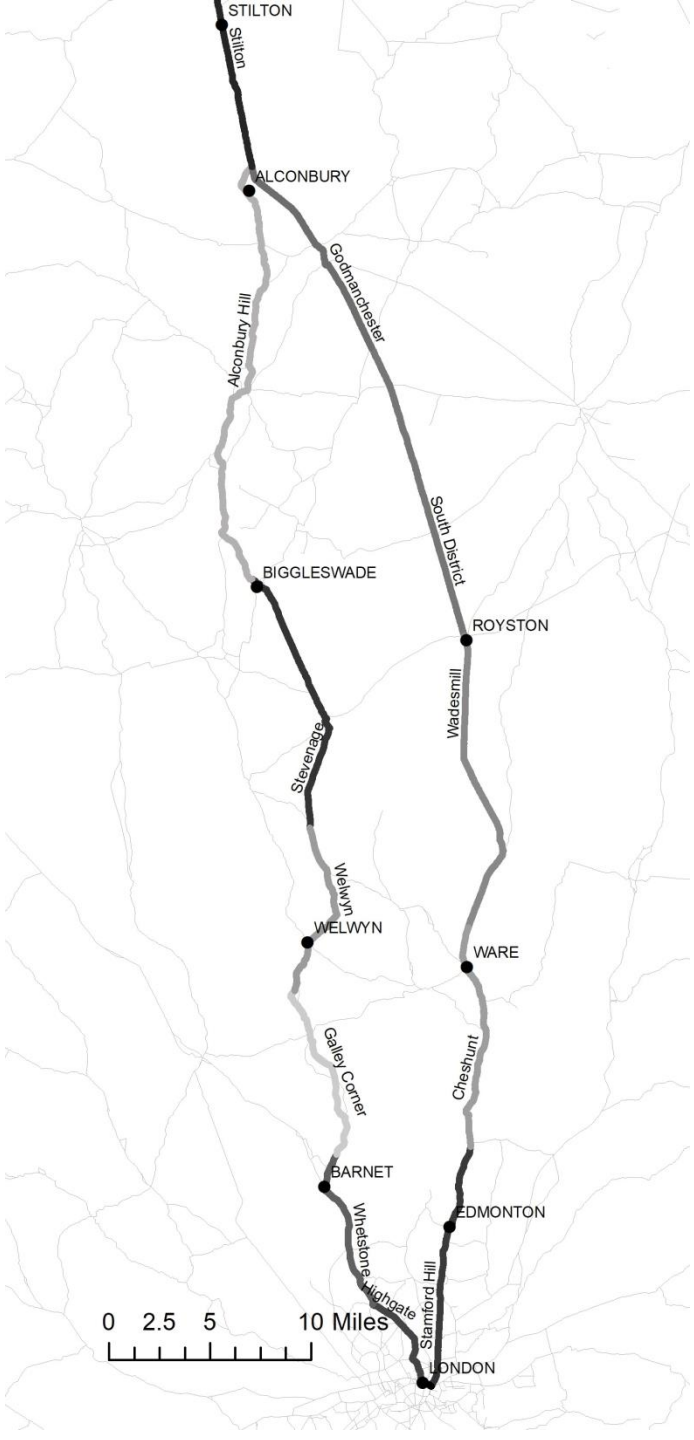
- Private provider sets toll too high and capacity too low
- **If regulator can impose zero profits** then private highway provider will set markup to zero and tolls and capacity choice will be optimal
- Known as the 'Self-Financing' theorem. Note assumptions matter.

Is the assumption of zero profits reasonable in this case?

- In most cases turnpike bondholders earned rates of return equal to investing in long term government debt (Bogart EcHR forthcoming)
- In most cases, turnpike trust revenues equaled trust expenditures, so there were no accounting profits

- What kept profits low or close to zero?
- One reason is that parliament set a binding schedule of maximum tolls in the regulating act.
  - Tolls were often fixed and as inflation rose the real toll declined
- Parliament allowed ‘free entry’ in the long-run, leading to competition between turnpike trusts

Competition Between Trusts On Great north Road



Why didn't parishes choose optimal road capacity?

- Simple answer: they lacked the ability to levy taxes on *all* road users
- Imagine there are parish users and non-parish users of the road with demand functions $D^P(N^P)$ and $D^{NP}(N^{NP})$ where N^P and N^{NP} denote the equilibrium flow of traffic for each
- The average user cost depends on congestion through $N^P + N^{NP}$ and road capacity K. It is denoted $c((N^P+N^{NP})/K)$
- The optimal toll and capacity is given by

(1) $\tau = (N^P+N^{NP})c_N$ and (2) $-(N^P+N^{NP})\, c_K = \gamma$

- Imagine the parish can only tax its citizens through a toll and that it only considers its citizens welfare
- The parish's problem is to maximize taking N^{NP} as given

$$\int_0^{N^P} D^P(n)\,\mathrm{dn} - N^P \mathrm{c}\left(\frac{N^P+N^{NP}}{\mathrm{K}}\right) - \gamma \mathrm{K} + \lambda(\mathrm{c}\left(\frac{N^P+N^{NP}}{\mathrm{K}}\right) + \tau - D^P(N^P))$$

Parish first order conditions

(1) $\tau = N^P c_N$ and (2) $-N^P c_K = \gamma$

Toll on parish users and choice of capacity are less than optimal

2. Statutory authority acts and legal capacity

- Legal capacity refers to infrastructures aiding the enforcement contracts
- In transport infrastructure projects contracting for land is complicated because it requires specific land inputs
  - Landowners can hold up project by demanding an excessive price.
  - Landowners can also suffer losses through negative externalities
- In theory, eminent domain laws can overcome hold up problem by providing equitable compensation to both sides
- Statutory authority acts established eminent domain in piecemeal fashion and were an **innovation in legal capacity**

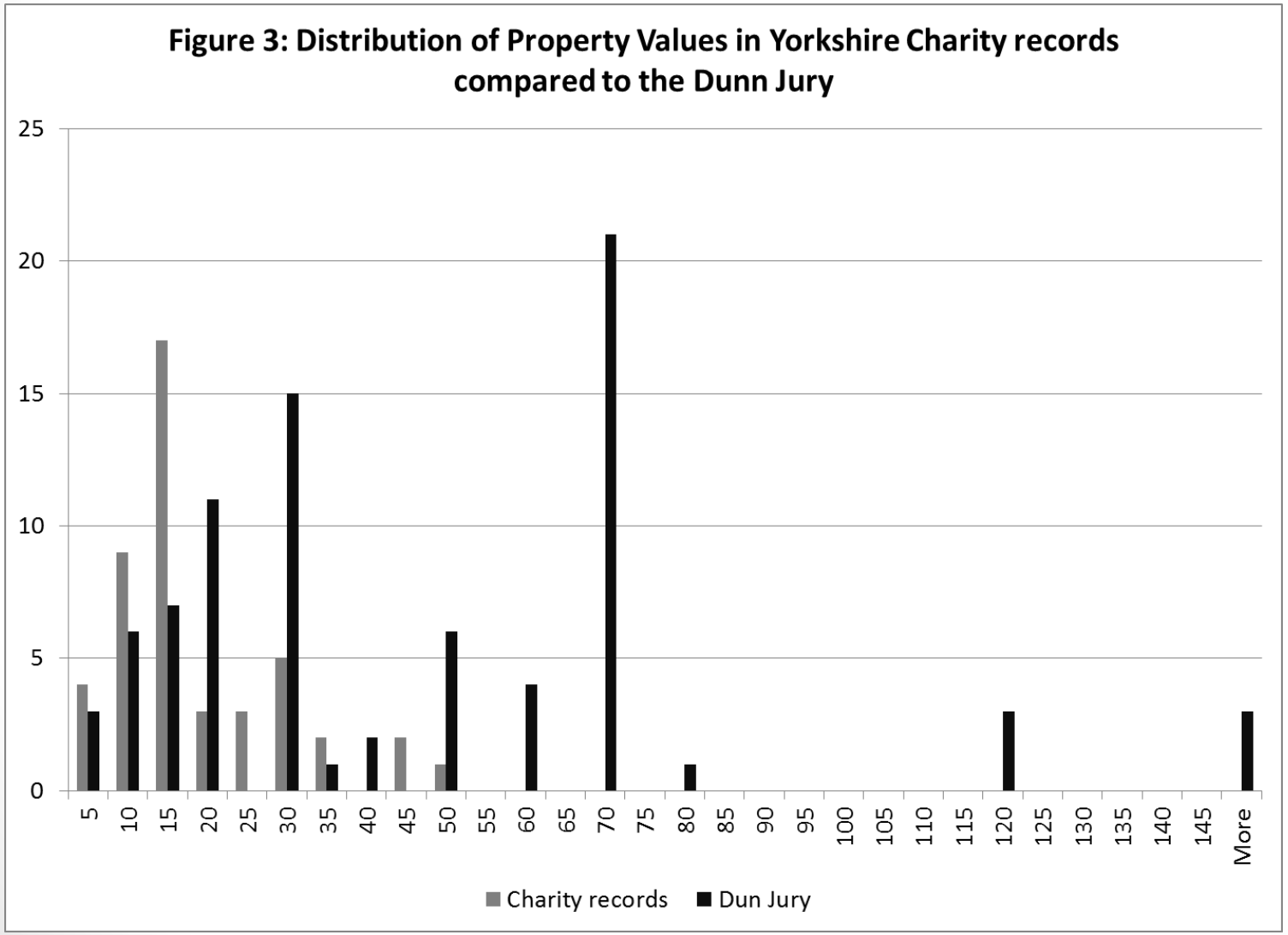
2. River projects as example

- Custom dictated that local groups could petition the crown to form a 'Commission of Sewers,' which had rights to compel landowners to cleanse the river, and if necessary, levy a property tax to pay for expenses
  - Landowners and nearby towns often opposed fearing damages and trade diversion
  - Some commissions failed on this opposition (Willan 1964)
- Bills in parliament for river improvement faced a similar challenge
  - In early 1700s Henry Parsons lobbied against a bill for improving the river Avon arguing that his six mills 'would be rendered useless to the great loss of the poor and to himself'

2. River navigation acts and compensation for land

- River navigation acts established procedures for purchasing land to divert river and compensate for flooding or mills taken down
- Most acts from 1661 to 1668 named a **body of commissioners** who had authority to award compensation if property owners and promoters could not agree privately.
- However after 1688 it became increasingly common for acts to state that juries can be called.
  - Acts typically state if landowners could not come to an agreement with undertakers, the sheriff could issue warrants to impanel a jury of **12 indifferent men of the county where the land lies**.
- I argue that juries provided assurance to landowners for just compensation and ultimately diffused opposition.
- What does the evidence say?
  - I use jury minute books to investigate how juries compensated landowners in comparison to market land values taken from charity records

River Dunn case (Bogart 2011)



Costs and benefits of juries

- Juries helped to ease opposition to infrastructure projects by providing credible compensation to landowners negatively affected by infrastructure
- But juries could be ‘too biased’ to landowners and extract too much surplus from promoters
  - Investment might be deterred
- Jury transfers were unlikely to be extractive given that many projects were promoted and completed

Model of juries

3. Role of politics

- Key points
- Acts creating statutory authorities depended on political stability at the national level.
- Political connections and party interests influenced the costs of getting acts
  - Three channels:
  - (1) ‘old’ corruption. Promoters needed to bribe an MP to get a bill. Connections affected the level of the bribe
  - (2) distributional contests. Promoters needed to lobby Commons to defeat opposition groups
  - (3) political parties running Commons had incentives to target bill outcomes

3. Political stability and statutory authority acts

- Political stability is crucial for security of property rights
- New regimes have incentives to violate the property rights made by past regimes
- In England during the 17th century political regimes changed several times
  - Civil war in 1640s
  - Protectorate under Cromwell in 1650s
  - Restoration of monarchy in 1660
  - Glorious Revolution of 1688
- In each regime, the Crown and Parliament tried to lead in granting rights to improve rivers
- What happened to the rights of statutory authorities as power shifted from Crown to Parliament or vice versa?

Example of patent being renegotiated

- William Sandys invested more than £40,000 in improving the River Avon in Warwickshire in 1630s
- Sandys went into exile after Civil War and acted as a royalist supporter by raising funds for the Restoration of Charles II.
- While in exile, Sandys's rights in the Avon passed to William Say, who was his creditor but also president of the High Court of Justice, a strong supporter of Parliament, and a draftee of Charles I's death warrant
- All of William Say's property was attained after the Restoration and his rights in the Avon passed to James Duke of York, the brother of Charles II
- After Restoration of monarchy in 1660 Sandys petitioned to the Crown to restore his rights in the river. In his petition, Sandys argued that **Say unlawfully took control of the river** by 'receiving thousands more than he paid'. Sandys pleaded to King Charles II to 'prevail with the Duke of York not to be the only severe one..'
- Sandys appeal failed

Why did renegotiations matter?

- The value of act was higher if the rights in an act were more secure and hence security contributed to more promotion and investment
- A simple model illustrates. (see Cox 2012)
- Suppose to initiate a project the promoter must pay a fixed cost. There is some expected benefit if property rights are well protected and a total loss if property rights are not well protected
- Two outcomes:
  - Payoff with protected property rights: $b - F$ with probability q
  - Payoff with expropriation: $-F$ with probability $1 - q$
- The expected payoff to the promoter from initiating a project is $qb - F$. They will only promote the project if $q > F/b$ or the probability of strong property rights exceeds a threshold defined by ratio of fixed costs and benefits

Politics and changes in security

- Arguably the Glorious Revolution of 1689 marks a structural break in the security of property rights (North and Weingast 1989)
- How did it influence the security of rights in river improvement and ultimately investment in river navigation?
- To answer this question I study the enforcement of rights for all promoters who obtained a patent or an act
  - I identify all known cases where tolls were reduced, undertakers were removed, projects modified by the central government decisions (Crown or Parliament)

Probability of rights violations before Glorious Revolution Bogart (2011)

Table 3. *Political settlements, royal decrees, and acts violating the rights of river undertakers established between 1606 and 1688*

River/act or decree	*Year*
Thames	1624
Commissioners from several counties eliminated by new act	
Great Ouse (St Neots to St Ives)	1626
Maximum tolls reduced by decree from Privy Council	
Lark	1638
Route cut in half by decree from king	
Avon (Warwickshire)	1641, 1661
Patentees' rights voided by Commons and later by an act	
Ouse (Yorkshire)	1661
Undertakers' rights voided by Restoration settlement	
Wey	1661
Undertakers rights' voided by Restoration settlement	
Great Ouse (Bedford to St Neots)	1665
Undertakers' rights voided by act	
No. of undertakers established between 1605 and 1688	21
% of undertakers established between 1605 and 1688 that had their rights violated by at least one settlement, decree, or act	33%

Probability of rights violations after Glorious Revolution Bogart (2011)

Table 2. *Acts violating rights of river undertakers established between 1689 and 1749*

River *Provision in act*	*Year*
Colne (near Colchester)	1718, 1739
Maximum tolls reduced by two acts	
Dee	1743
Maximum tolls reduced by act	
No. of undertakers established by act between 1689 and 1749	33
% of undertakers established between 1689 and 1749 that had their rights violated by at least one act after 1689	6%

Investment before and after Glorious Revolution

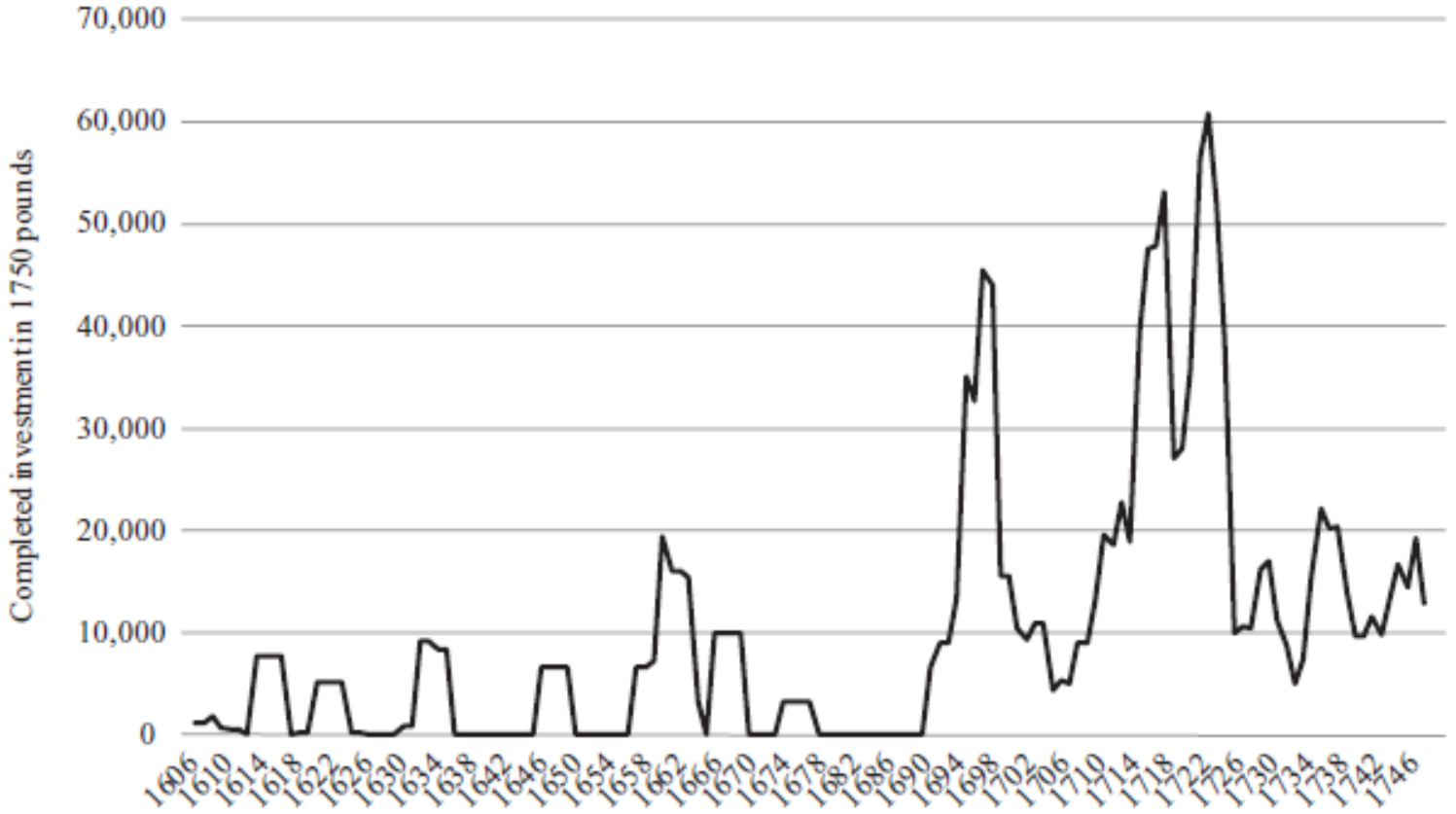


Figure 1. *Four-year moving average of completed investment in road and river improvements, 1607–1749*

Sources: See apps. I, III.

3. Political economy of getting acts

- Statutory authority acts required efforts by Members of Parliament (MPs).
- Someone needed to advocate for bills in House of Commons—time on the floor was scarce.
- Sometimes there was opposition to bills which made their passage more difficult

3. River bills are a good example (Bogart EJ 2018)

- Less than half of all river bills succeeded between 1690 and 1740
- Diffusion of river acts was limited across towns
  - 17% of candidate towns (i.e. without navigable rivers c.1690) had river bills between 1690 and 1741 but only 11.7% of candidate towns got a river act.
- Long delays even if river act was obtained.
  - The average time between first bill and first navigation act was 18.8 years
- Opposition to river bills was common
  - For 782 major towns, 94 made at least one supporting petition for river bill and 62 towns with at least one opposing petition
- Promoters and opposition groups enlisted help of MPs who had connections to the two major parties, the Whigs and Tories, who were engaged in fierce electoral competition

Model of proposing and getting acts: primitives

- Population of potential promoters. They differ in their characteristics which determine their private value of an act
- Promoters must pay bribes and lobby to get bills.
  - Bribes are the entry fee and depend on the promoter.
  - Lobbying increases the chances of a bill succeeding.
- MP and House officials take bribes and offers of political support from promoter in exchange for putting the bill on the agenda
- Neighboring groups: They differ in their characteristics which determine their private benefits or losses
  - Neighbors may lobby for or against a bill to increase its chances of success or failure

Modeling decisions

- Three stages
    1. Decision to promote a bill
    2. Bribing and lobbying of MPs
    3. Political decision to pass a bill or reject

- Backwards induction
- Parliament has a decision rule described by $\mathrm{p}\left(x_i, x_{-i}, l_i, l_{-i}, \theta_p\right)$
    - It depends on promoter and neighbors characteristics and lobbying efforts by each-- $x \; and \; l$
    - If parties are strong think of p as reflecting preferences of the majority party

Modelling promoter decisions

- Promoters decide whether to introduce bills, how much to lobby, and how much to bribe MPs with money or political support

$$U_i^p = \mathrm{p}\left(x_i, x_{-i}, l_i, l_{-i}, \theta_p\right) * b(x_i, \theta_b) - t_i - l_i + \varepsilon_i$$

  - Offers of political support $I_v = \{0,1\}$ are free and are worth $\mathrm{v}(x_i, \theta_v)$ to MPs
- MPs can work on bills and earn $t_i + I_v\{\mathrm{v}(x_i, \theta_v)\} - e$ or not and enjoy their leisure normalized to 0.
  - Note promoters always offer political support if they introduce bill and will pay MPs only their effort costs minus value of support $t_i^* = e - I_v\{\mathrm{v}(x_i, \theta_v)\}$.
- Neighbors as opposition groups. They decide whether to oppose and how much to lobby

$$U_{-i}^o = \mathrm{p}\left(x_i, x_{-i}, l_i, l_{-i}, \theta_p\right) * g\left(x_{-i}, \theta_g\right) - l_{-i} + \mu_{-i}$$

Lobby decisions

- Promoters choose lobbying to maximize expected utility taking opposition decisions as given

$$\frac{\partial \mathrm{p}\left(x_i, x_{-i}, l_i, l_{-i}, \theta_p\right)}{\partial l_i} * b(x_i, \theta_b) = 1$$

- Opposition chooses lobbying to maximize utility taking promoters decisions as given

$$\frac{\partial \mathrm{p}\left(x_i, x_{-i}, l_i, l_{-i}, \theta_p\right)}{\partial l_{-i}} * g\left(x_{-i}, \theta_g\right) = 1$$

- Nash equilibrium for lobbying l_i^* and l_{-i}^* which will depend on characteristics x_i and x_{-i} entering through benefits, losses, and parliament's decision rule p
- In many formulations of p relative lobby efforts will depend on relative benefits and losses b/g and the relative importance of promoter and neighbor characteristics $x_i/\, x_{-i}$

Promotion and opposition decision

- Promoters and opposition groups are forward looking and will anticipate lobbying and bribes made if bill is introduced
- Promoter will introduce bill if

$$\mathrm{p}\left(x_i, x_{-i}, l_i^*, l_{-i}^*, \theta_p\right) * b(x_i, \theta_b) - e + I_v\{\mathrm{v}(x_i, \theta_v)\} - l_i^* > \varepsilon_i$$

- Assuming a distribution for ε_i probability of promoting is

$$\mathrm{F}\left(\mathrm{p}\left(x_i, x_{-i}, l_i^*, l_{-i}^*, \theta_p\right) * b(x_i, \theta_b) - e + I_v\{\mathrm{v}(x_i, \theta_v)\} - l_i^*\right)$$

- Probability promoter gets act is

$$\mathrm{p}\left(x_i, x_{-i}, l_i^*, l_{-i}^*, \theta_p\right) * \mathrm{F}\left(\mathrm{p}\left(x_i, x_{-i}, l_i^*, l_{-i}^*, \theta_p\right) * b(x_i, \theta_b) - e + I_v\{\mathrm{v}(x_i, \theta_v)\} - l_i^*\right)$$

Application to river acts, 1690-1740

- The promoters are assumed to represent towns, whose interests are greatly affected by river acts
- Define $U_{it}^{*} = x_{it}\beta + \varepsilon_{it}$ as the utility of town i getting act in year t
- Define $y_{it} = 1$ if $x_{it}\beta + \varepsilon_{it} > 0$ and 0 otherwise
- This yields an estimating equation $Prob(y_{it} = 1) = \mathrm{f}(x_{it}\beta)$
  - x_{it} includes characteristics of town, characteristics of neighboring towns, local geography, political connections, other statutory authorities, indicators for Whig majority rule, and other controls
  - I also distinguish characteristics of neighboring towns upstream and downstream from the town. All else equal downstream interests lose from extending river navigation (property damage, trade diversion)

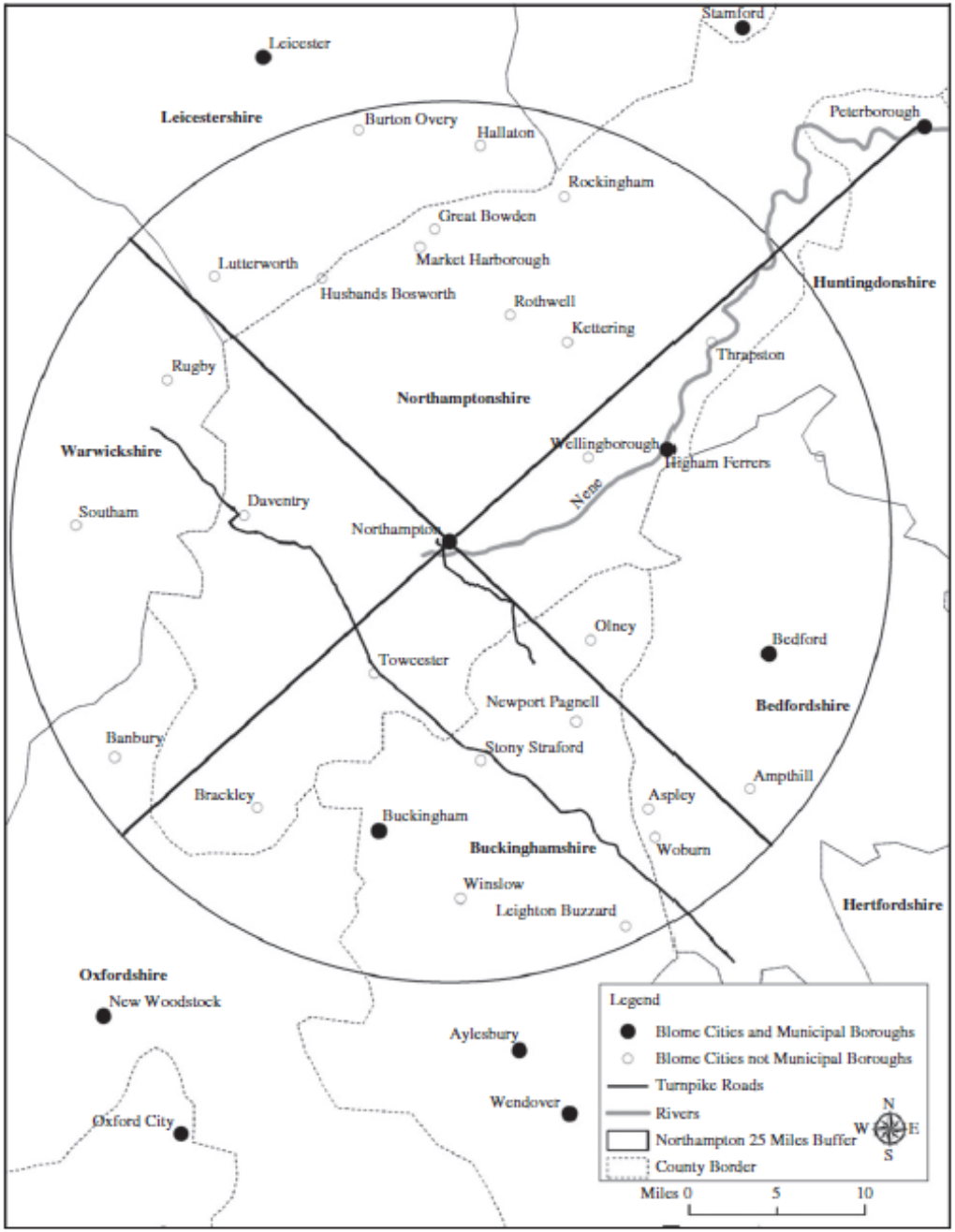


Fig. 3. *Towns and Features Near Northampton and the River Nene*

Source. See text.

Summarizing estimates

Table 7

Adjusted Probability of River Act for Selected Variables at Representative Low and High Values

	Variable low		Variable high		% change in probability
Variables	Average probability	[95% confidence interval]	Average probability	[95% confidence interval]	Low to high
Elevation change to navigation head	0.0898	[0.0481, 0.1316]	0.0001	[0.000, 0.0004]	−99.9
Distance to navigation head	0.0048	[0.0031, 0.0066]	0.0481	[0.0210, 0.0752]	902.1
Town, manufacturing	0.0076	[0.0051, 0.0100]	0.0157	[0.0075, 0.0238]	106.6
Town, municipal govt.	0.0068	[0.0042, 0.0095]	0.0174	[0.0102, 0.0246]	155.9
Local market potential	0.0055	[0.0033, 0.0077]	0.0130	[0.0092, 0.0167]	136.4
Pop. of navigation head in 1,000s	0.0134	[0.0081, 0.0186]	0.0068	[0.0037, 0.0098]	−49.3
Towns with mining up, 25 miles	0.0129	[0.0088, 0.0169]	0.0066	[0.0036, 0.0094]	−48.8
Towns with water nav. up, 25 miles	0.0144	[0.0082, 0.0205]	0.0058	[0.0028, 0.0087]	−59.7
Towns municipal govt. down, 25 miles	0.0143	[0.0075, 0.0212]	0.0052	[0.0021, 0.0083]	−63.6
Towns with turnpike acts, 25 miles	0.0080	[0.0056, 0.0104]	0.0116	[0.0070, 0.0161]	45.0
Whig majority indicator	0.0048	[0.0022, 0.0075]	0.0125	[0.0088, 0.0163]	160.4
Maj. party MPs county	0.0068	[0.0041, 0.0094]	0.0147	[0.0089, 0.0205]	116.2
Maj. party MPs down, 25 mi.	0.0220	[0.0119, 0.0321]	0.0026	[0.0009, 0.0044]	−88.2
N					5,393

Notes. The adjusted probability is the average predicted probability across all candidate towns when a variable is changed but all other variables are kept same. Low is one standard deviation below the mean (or 0 for dummy variables) and high is one standard deviation above mean (or 1 for dummy variables). All calculations are done, using the Margins command in Stata.

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Summarizing estimates

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Summary of what influenced the adoption of river navigation acts

- Town and geographic characteristics mattered
- But economic and political characteristics of navigation supporters and opponents in neighboring areas also had a large effect
  - One was the strength of majority party representation in neighboring political constituencies.

Concluding remarks

- Statutory authorities become an important feature of England's state capacity and contributed to the industrial revolution
- Statutory authorities were an **innovation** to fiscal and legal capacity
- Politics mattered in their diffusion.

- **Multiple paths to greater fiscal and legal capacity**
- England developed capacities that enabled statutory authorities, but the capacity of local governments were less developed until mid 19th century
  - Explains how railways were organized differently in England…less direct government involvement
- Elsewhere, say in France, local governments were made more capable after Napoleonic Wars. Many pieces of the story are unclear though…more research would fill the gaps

journey miles per hour: passenger coaches

Average road freight rates

Figure 4: Real Land Carriages, 1700-1819

Canals and freight rates

- Waterway transport was 1/3 as expensive as road transport
- The introduction of canals to an area dramatically lower transport costs
- Canals created a market for inland transport of high weight and low value goods like coal, timber, and iron over distances of 10 miles
  - Famously the opening of the Bridgewater canal led to the price of coal falling by half in Manchester c.1770
- By 1800 faster waterway services were introduced on canals to compete with faster road services

Impacts of turnpike roads and waterways on pop. density

- Turnpike roads and waterways encouraged urbanization in 18th and early 19th century before railways.
- Consider the following cross-sectional model

$$\log(popdensity1831_i) = \alpha_1 \log(dist.turnpike1830_i) + \alpha_2 \log(dist.waterway\ 1830_i) + x_i\beta + \varepsilon_i$$

- With the coming of railways after 1830 they lost revenues. Most trusts and waterway companies were gone by 1880.
- But impact of turnpike roads and waterways can still be seen in 1891

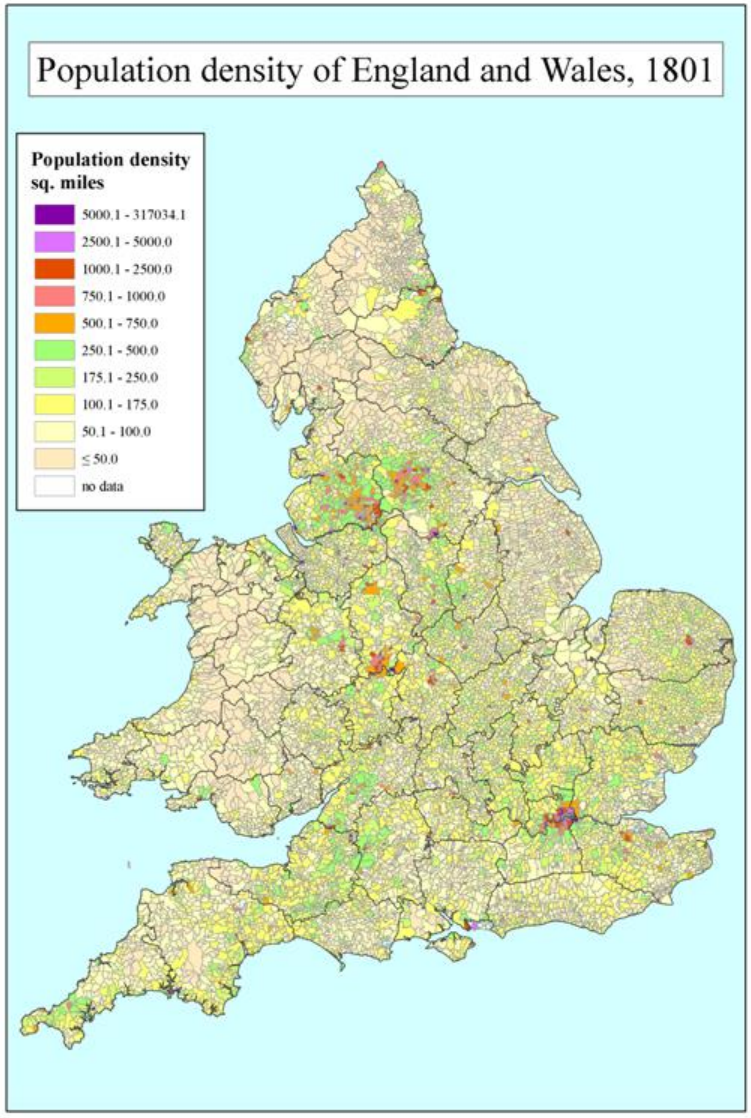
- Consider also the persistence model

$$\log(popdensity1891_i) = \alpha_1 \log(dist.turnpike1830_i) + \alpha_2 \log(dist.waterway\ 1830_i) + x_i\beta + \pi\log(popdensity1831_i) + \gamma \log(dist.railway1851_i) + \varepsilon_i$$

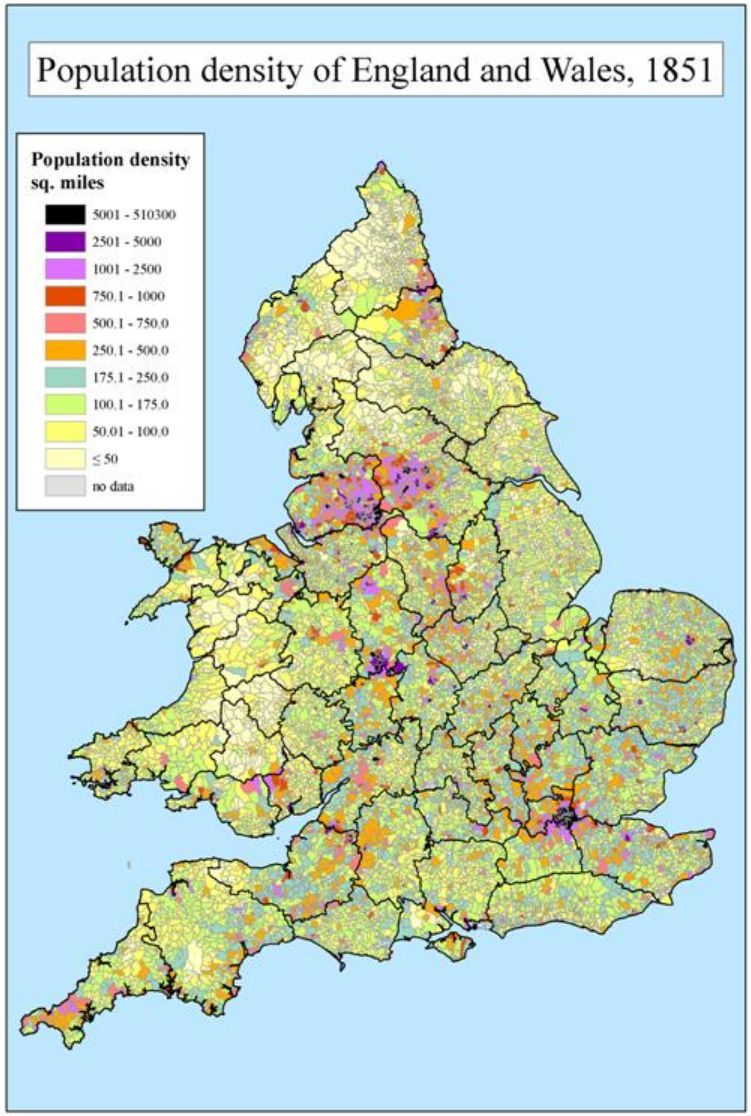
Summary of variables

- Population for 9481 parishes from Cambridge Group for History of Population and Social Structure
- Distance to nearest inland waterway in 1830 and distance to nearest turnpike road in 1830
  - See transport project with Bogart, Alvarez, Satchell, You, and Shaw Taylor
- First nature variables as controls
  - Coal endowments
  - Ruggedness measures
  - Soil types
  - Latitude and longitude
  - 616 Registration district fixed effects
- Instruments for distance to roads and waterways
  - Distance to a least cost path connection London with boroughs and market towns
  - Distance to a least cost path connecting major manufacturing centers
  - Distance to least cost path connecting major tidal rivers

1801 population data from Campop



1851 Population data from CamPop



1891 population from CamPop

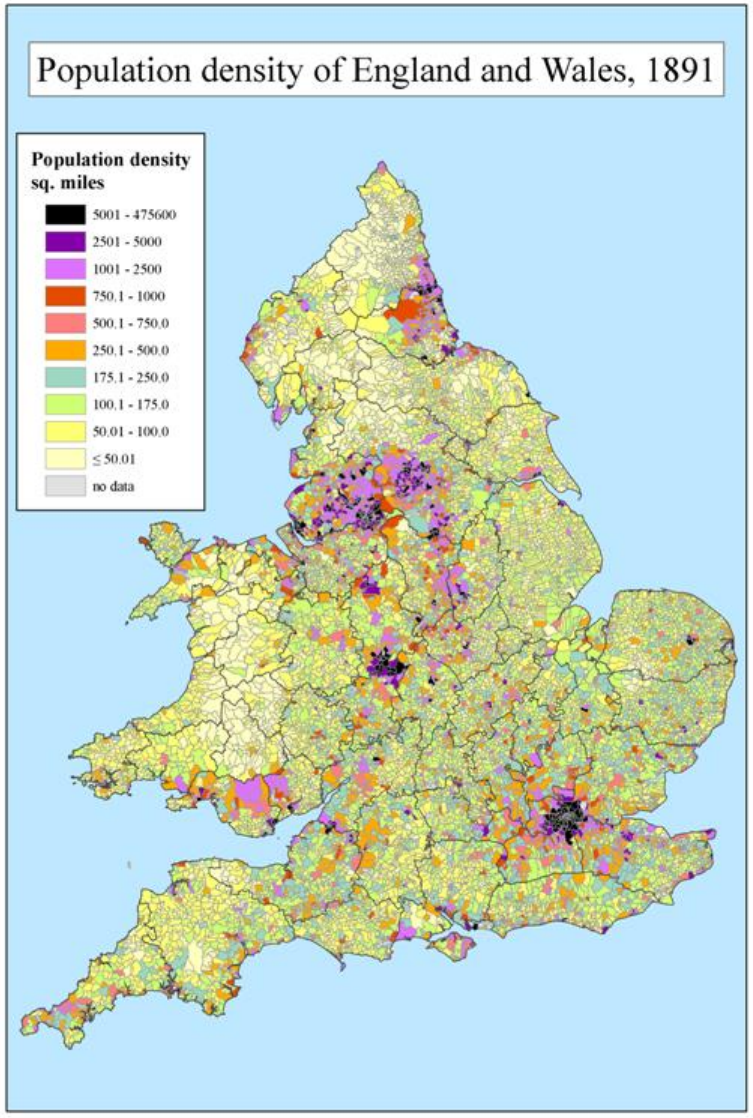


Table : Effect of distance to turnpike roads and waterways on parish population density in 1831

	Population density 1831					
	OLS	OLS	OLS	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
	coeff.	coeff.	coeff.	coeff.	coeff.	coeff.
	(Std. err.)	(Std. err.)	(Std. err.)	(Std. err.)	(Std. err.)	(Std. err.)
Log dist. to nearest turnpike	-0.161***		-0.148***	-0.460***		-0.421***
	(0.010)		(0.008)	(0.047)		(0.083)
Log dist. to nearest waterway		-0.227***	-0.175***		-0.790***	-0.087
		(0.033)	(0.031)		(0.101)	(0.155)
Controls for first nature	Y	Y	Y	Y	Y	Y
Registration district FEs	Y	Y	Y	Y	Y	Y
Include parishes <2km of LCP nodes	Y	Y	Y	N	N	N
Kleibergen-Paap rk Wald F statistic				41.832	41.832	41.832
N	9,488	9,488	9,488	9,120	9,120	9,120

Notes: The dependent variables are the natural log of parish population at the specified dates. Standard errors are clustered on registration district fixed effects. First nature controls include indicators for exposed coal and for coastal, measures of elevation, average elevation slope and standard deviation within parish, and the share of in 9 soil type categories. The instrument is the log distance from the parish to the LCP. See text for more details on instrument. *, **, *** indicate statistical significance for the difference in means test of 10, 5, and 1% respectively.

Table : Effect of distance to turnpike roads and waterways on parish population density in 1891

	Population density 1891		
	OLS	OLS	OLS
	(1)	(2)	(3)
	coeff.	coeff.	coeff.
	(Std. err.)	(Std. err.)	(Std. err.)
Log dist. to nearest turnpike	-0.030***		-0.029***
	(0.003)		(0.003)
Log dist. to nearest waterway		-0.039***	-0.035***
		(0.033)	(0.009)
Log 1831 pop. density	0.968***	0.984***	0.962***
	(0.012)	(0.012)	(0.012)
Log dist. nearest rail station	-0.125***	-0.126***	-0.116***
	(0.011)	(0.011)	(0.011)
Controls for first nature	Y	Y	Y
Registration district FEs	Y	Y	Y
Include parishes <2km of LCP nodes	Y	Y	Y
Kleibergen-Paap rk Wald F statistic			
N	9,488	9,488	9,488

Notes: The dependent variables are the natural log of parish population at the specified dates. Standard errors are clustered on registration district fixed effects. First nature controls include indicators for exposed coal and for coastal, measures of elevation, average elevation slope and standard deviation within parish, and the share of in 9 soil type categories. The instrument is the log distance from the parish to the LCP. See text for more details on instrument. *, **, *** indicate statistical significance for the difference in means test of 10, 5, and 1% respectively.

Parish Road Expenditure per-mile after Turnpike Petition Failed (Bogart JEH 2005)

Road	Number of Parishes	Annual Expenditure Per-Mile 0-5 Years after Petition Failed	6-10 Years after Petition Failed	11-15 Years after Petition Failed	16-20 Years after Petition Failed
Islington-London	4	94.2	62.5	54.2	0
Aylesbury-Bicester	7	0	35.0	46.7	46.7
Stockton-Darlington	8	0	0	3.3	24.8
Farringdon-Fyfield	7	0	0	0	1.8
Kingston-Petersfield	8	12.4	2.2	4.0	16.2
Church Hulme-Newcastle	8	2.8	3.8	2.8	0
Penrith-Cockermouth	9	0	0	0	0
Aylesbury-Buckingham	15	0	16.3		
Northampton to Hillmorton	11	0	0		
Worcester-Birmingham	9	0	0		
Knotting-Harborough	8	0	0		
Brough-Penrith	8	0	0		
Sevenoaks-Tonbridge	5	0	0		
Croyden-London	13	110.1	0		
Kensington-Colnbrook	6	0			
Boroughbridge-Allerton	22	0			
Leeds-Wakefield	7	0			
Worcester-Bewdley	9	0			
Evesham-Broadway	9	0			
York-Thirsk	19	0			
Mean/Total	199	10.4	8.6	15.8	12.8

Modelling the effects of juries

- If the jury was too biased to landowner it could hold up the project and deter investment. A simply model shows when this could happen
- Suppose a promoter gains some gross benefit b. To initiate their project they must pay a fixed cost F and to complete the project they must compensate landowners by the amount t.
- The market value of the land outside the project is v.
- A jury determines compensation t for initiated projects. Its has a bias to landowners and promoters. Assume $t = \theta b + (1 - \theta)v$
  - If θ is 1 then the jury is biased to landowners and awards a compensation equal to B.
- Assume the promoter knows the degree of bias, then it will use backward induction to determine if project is worthwhile.

Stage game

Jury promoter stage game

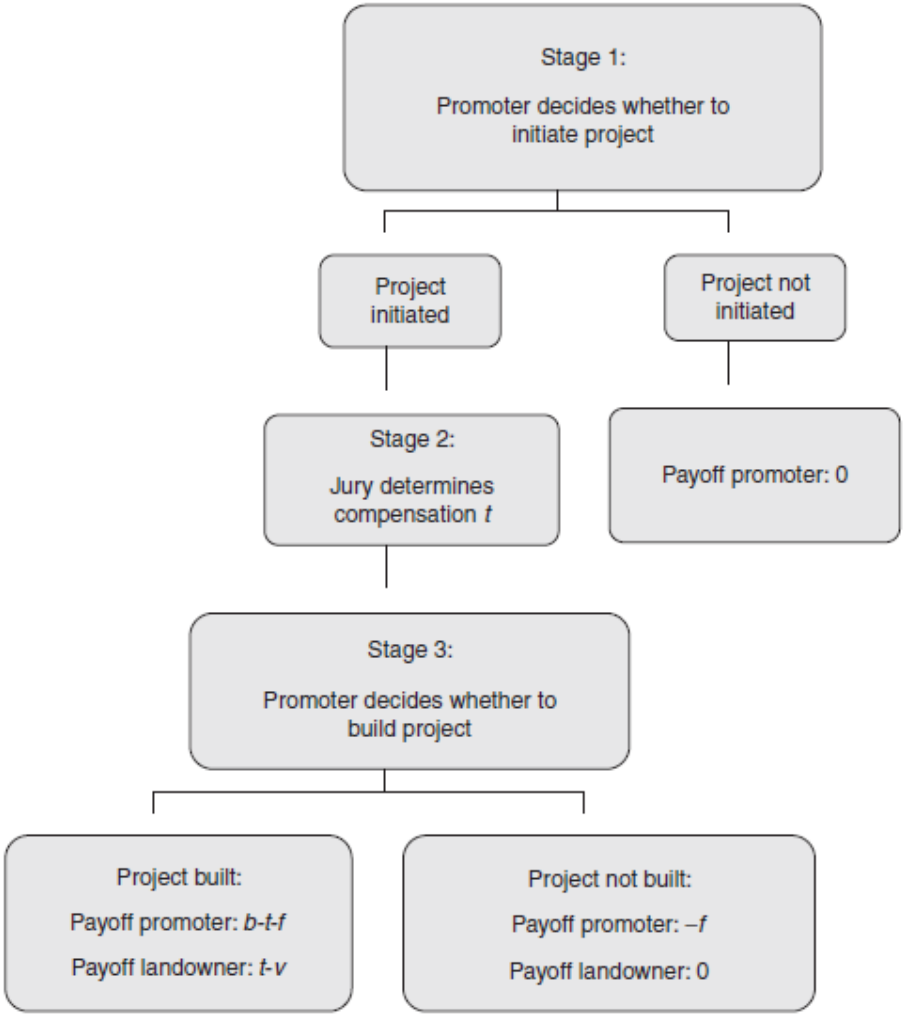


FIGURE 15.1
Jury-promoter stage game

simulation

Simulation of projects initiated

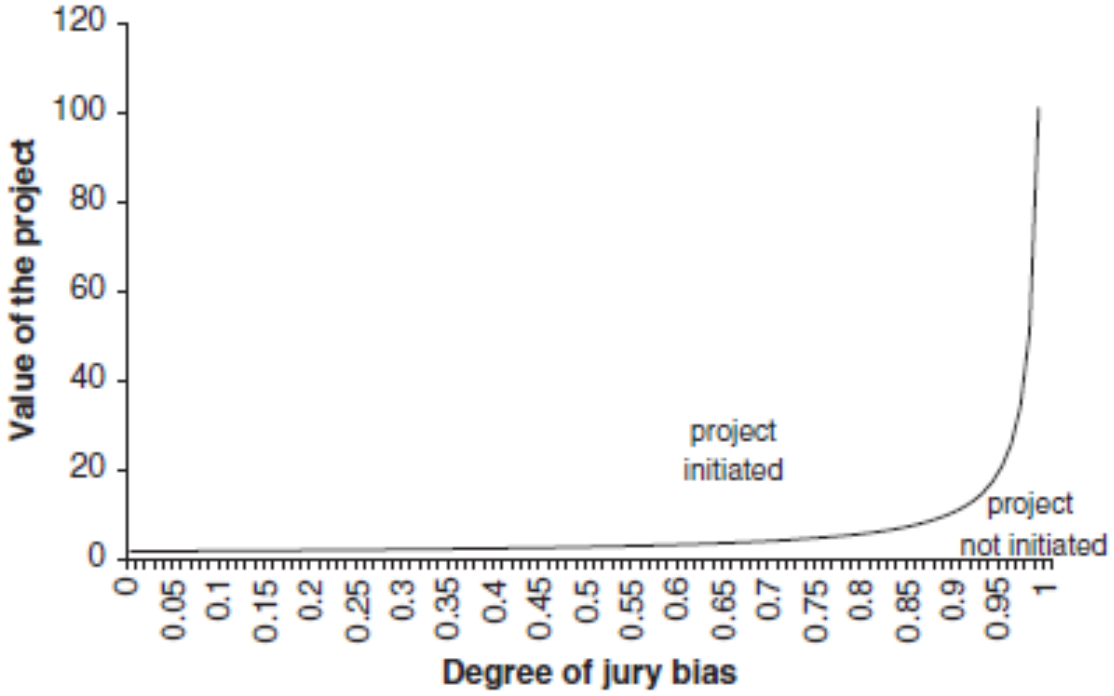


FIGURE 15.2

Range of parameters over which projects are initiated