CHAPTER FIFTEEN

British Legal Institutions and Transaction Costs in the Early Transport Revolution

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INTRODUCTION

For centuries scholars have tried to identify which features of legal systems are crucial to economic activity. Recently the legal origins school has posited that some legal systems contribute to different degrees of transaction costs and hence different levels of trade, investment, and innovation. The common law legal system is often singled out because it is believed to provide strong protection for property rights.[1] According to the standard narrative, British landowners could invest in their property with little fear of government expropriation or judicial activism. Laws and norms protecting rights to land were eventually extended to contractual arrangements in finance following the political transformations of the seventeenth century (North and Weingast 1989; Neal 1990). In the long run, Britain succeeded economically, so the argument goes, because its legal system was conducive to development.

The legal origins view may be helpful in explaining Britain's precocious leadership in agriculture and finance, but it is not an obvious fit in the infrastructure sector.[2] Infrastructure projects often pit landowners against promoters because land is an input into infrastructure investment. In most societies, the legal system has to choose between the rights of landowners and promoters when determining compensation for land taken or damaged. Given that Britain's legal system has traditionally provided strong property rights to land, it is not clear that courts would be friendly to infrastructure promoters in condemnation proceedings.

The link between British legal institutions and infrastructure has broader implications. There is a growing body of scholarship showing that transport improvements were a key driver of economic development in Britain.[3] Hence legal deterrents to infrastructure investment could affect the economy greatly.

This chapter examines the role of juries in implementing rights of way in Britain during the early transport revolution. Juries have a long history in criminal trials, but their role in civil litigation, specifically condemnation proceedings, is more nuanced. In the seventeenth century, commissions composed of large landowners were given the authority to determine compensation for infrastructure projects. There was a shift following the Glorious Revolution of 1688–1689 in that parliamentary acts gave juries composed of small and large landowners the authority to recommend compensation. The role of juries increased in the eighteenth and nineteenth centuries as they were called to determine compensation for thousands of road, river, canal, and railway projects.

There is divided opinion on the effects of juries in the law and economics literature. Some scholars favor the legal origins view, which asserts that juries are a key bulwark against inefficient state incursion. Others view juries as a hindrance to investment and innovation. For example, it is argued that most U.S. corporations are established in Delaware in part because its main civil court does not have a jury (Kahan and Kramar 2002; Roe 2007). Some nineteenth-century commentators took a similar view of juries. Sir Rowland Hill, a member of the Royal Commission on Railways in 1865, argued that "exorbitant prices often have to be paid through fear . . . of partial awards of juries." He went on to argue that juries encouraged redistribution, stating that "while railways have notoriously conferred enormous benefits on the public, at the same time greatly enhancing the value of land and other fixed property, the general result to those whose capital and energy have produced this beneficial change has been unsatisfactory and too often disastrous."[4]

Subsequent research on railways has offered additional perspectives on juries. Pollins (1952) estimates the proportion of land purchases in total railway investment costs. The data indicate that land purchases represented 14 percent of investment costs on average, suggesting that juries could indeed affect profitability. Kostal (1994) documents that railway companies in the 1830s and 1840s had a heightened concern that jury members would be biased in favor of their fellow landowners. Interestingly, Kostal also notes that landowners were concerned that jury members would be biased in favor of railways because they had invested in railway securities. It appears that jury bias could cut both ways.

This chapter moves the literatures on juries in a new direction. First, a theoretical framework is developed to highlight the link between jury bias and investment incentives in infrastructure projects. The key intuition is the following: once a promoter has initiated a project, the jury can redistribute most of the surplus to the landowner, leaving an insufficient amount to cover the promoter's sunk costs. As a result, if the promoter anticipates that the jury is biased and will redistribute most of the profits to the landowner, the promoter will not initiate the project to begin with.

Second, the behavior of juries is investigated empirically through two case studies involving river navigation projects in the eighteenth century. The evidence shows that juries awarded landowners compensation well above the market value of land. The premiums ranged from 50 percent of the market value to as much as 270 percent.

Third, I investigate whether jury premiums significantly affected investment incentives. A simulation analysis shows that internal rates of return would have increased by around 0.2 percent if juries engaged in no redistribution. The simulation also shows that without redistribution, some navigation projects would have changed from earning a return below the yield on government bonds to earning a return above this threshold.

Overall the findings suggest that juries redistributed profits from river navigation promoters to landowners and in the process discouraged projects at the margin of profitability. These conclusions need to be qualified because juries had other beneficial effects. Juries awarded compensation quickly, often within a few months. Jury decisions were also final, preventing negotiations from dragging on endlessly. Swift and final adjudication prevented capital from being tied up in infrastructure projects. In prerevolutionary France, infrastructure projects could be delayed for decades because courts were slow and indecisive (Rosenthal 1992).

The analysis of juries also needs to be placed in a broader legal and political context. Of most relevance is the fact that British property rights were transformed through the passage of thousands of enclosure, estate, and statutory authority acts in the century following the Glorious Revolution. These intrusions into private property rights had a potential to cause great harm to landowners and other vested interests. Bogart and Richardson (forthcoming) argue, however, that procedures for changing property rights were consensual in the sense that affected individuals or groups had a voice in the process and generally came out as well or better off than before. Jury redistribution provides an important illustration of how the "losers" from changes in property rights were compensated in Britain.

BACKGROUND ON INFRASTRUCTURE PROMOTION AND IMPLEMENTATION IN BRITAIN

The limitations of Britain's medieval transport system became a problem in the seventeenth century as its economy began a long period of ascent. The Stuart monarchy that prevailed in the early 1600s was unwilling or unable to undertake investments. Instead it enabled individuals or local communities to initiate projects. Promoters sought various types of enabling rights, including patents and acts, but few were successful.

Political turmoil greatly impacted infrastructure promotion. Both the crown and Parliament sought to control the supply of rights, sometimes at the expense of the other. Their ability to exert control fluctuated with political changes such as the era of Personal Rule (1629–1640), the period of Civil War (1641–1649), and the Restoration (1661–1669). The Glorious Revolution of 1688–1689 finally settled the issue of regulatory authority. After 1689 all promoters turned to Parliament for rights first. King William and his successors to the throne ratified parliamentary bills supplying rights but were not instrumental in the process (Bogart forthcoming).

Infrastructure bills were first submitted to the Commons and then approved by the Lords and eventually the king. There were no formal "barriers" to submitting bills. Essentially any individual or community could submit a petition. For example, in 1725 the Master, Wardens, Searchers, Assistants, and Commonality of the Corporation of Cutlers in Hallamshire petitioned to improve navigation on the river Dun. In their petition they state: "Making the River Dun navigable from . . . Doncaster . . . to . . . within two miles of Sheffield will be advantageous not only to the said corporation but also to the public in general by preserving the roads and by a cheap conveyance of commodities to and from London."[5]

Once submitted, a private bill committee heard evidence from witnesses and petitions from groups opposed to the bill. The committee then made a recommendation to the entire House of Commons or Lords. Committee proceedings often determined the success or failure of a bill (Hoppit 1997).

There were costs associated with getting a parliamentary bill passed. Promoters had to pay a schedule of fees dictated by legislative procedures known as standing orders. In general, the further the bill went in the process, the more the total fee increased. The fees were paid to various officers of the House who performed services such as handling the bill or engrossing the bill on parchment. MPs and Peers did not directly receive these fees.

Promoters also hired parliamentary agents or solicitors to advance their bill. The agents played an important role because they organized

witnesses, ensured bills did not fail for technical reasons, and helped persuade MPs and Peers of the merits. Agent fees could be the most substantial expense in obtaining rights, sometimes exceeding 80 percent of the total cost.[6]

Once a promoter obtained an improvement act, he faced the difficult task of implementing the project. One of the most challenging hurdles involved negotiations with property owners for the purchase of land. These negotiations were crucial because many infrastructure projects could not be completed without the land input. The negotiations were also complicated because particular pieces of land were often necessary to widen rivers and roads or to construct a canal or railway.

Parliamentary acts typically contained clauses determining how property owners would be compensated for lands taken or damaged. In the early 1600s, patents and acts named a body of commissioners who had authority to award compensation if landowners and promoters could not agree privately. Commissions could be unpopular, and there were cases where bias seems likely. For example, a commission appointed by the crown in 1638 recommended that the promoter for the River Lark should pay landowners £40 per acre.[7] The market value for land in the early seventeenth century was around £10 per acre or one-fourth the compensation recommended by the commission.[8]

After 1689 the rules for compensating landowners changed. Increasingly commissioners were required to impanel juries if promoters and landowners could not agree. In eleven river navigation acts from 1661 to 1688, only one included a jury provision.[9] However, in the sixteen river navigation acts from 1690 to 1714, eight stated that juries must advise and recommend compensation. The trend continued after 1715, with nearly all road improvement and river navigation acts empowering juries.

The minute books for a number of commissions and juries have survived and provide insights into their behavior. I briefly review these sources for a jury that was impaneled to determine compensation for the Aire and Calder River navigation. The Aire was authorized to be made navigable from Leeds to Ferrybridge by an act in 1699. It was promoted by merchants in the nearby woolen textile town of Leeds, who later became the undertakers for the Aire and Calder navigation company. They were known locally as the "fourth estate of the realm" because they were enriched by the substantial profits from the navigation (Wilson 1971, p. 140).

The Aire and Calder Act named a body of nearly 100 commissioners that included members of the nobility, gentry, and other classes.[10] The act also included a clause that the jury was to "inquire and assess damages upon oath; the Commissioners were to give judgment accordingly by

examinations on oath and determine all controversies touching the said matters."

The commissioner minute books describe the condemnation proceedings.[11] The first entry in September 1699 states that the undertakers came to an agreement with Charles Robinson for the sale of a dam and lock near Fleet Mills. The sale of Robinson's land was approved by seven commissioners in the same month. The second entry in October 1699 states that a jury was impaneled and issued a verdict on the value of land. The jury included twelve men described as "able and sufficient men of the county of Yorkshire." None appear to have been nobles. The commission ordered the undertakers to award the compensation recommended by the jury. Additional entries in 1700 and 1702 describe similar verdicts by the jury and commissioners' approval.

From this case it is clear that juries could play a pivotal role in determining compensation for infrastructure projects. There is similar evidence that juries determined compensation for the Dun River navigation project in the 1730s. Below I will compare the compensation awarded by the juries for the Aire and Calder and the Dun navigations with the market value of land in Yorkshire where these two projects were located. First, the following section provides an analytical framework for studying juries.

A MODEL OF JURY COMPENSATION AND INFRASTRUCTURE PROMOTION

Jury behavior has been modeled from a number of perspectives, but there is little theoretical work on the relationship between jury decision making and investment decisions.[12] This section combines a model of jury behavior and infrastructure promotion. It illustrates how jury bias influences compensation awards and hence the incentive to invest. The model is based on a stage game involving promoters and juries. The stages and payoffs are described in Figure 15.1.

In Stage 1 the promoter decides whether to initiate the project. If the promoter does not initiate, then he receives a payoff of zero and the game ends. If the promoter initiates, he must pay private bill fees f. Private bill fees are a "sunk" cost: once paid they cannot be recovered. Private bill fees are assumed to be exogenous, but they can be endogenously determined in an extension of the model.[13]

In Stage 2 the jury must determine a compensation award t to the landowner. Juries are assumed to have no financial stake in the project, but they may be biased in favor of landowners or promoters.[14] Juries are

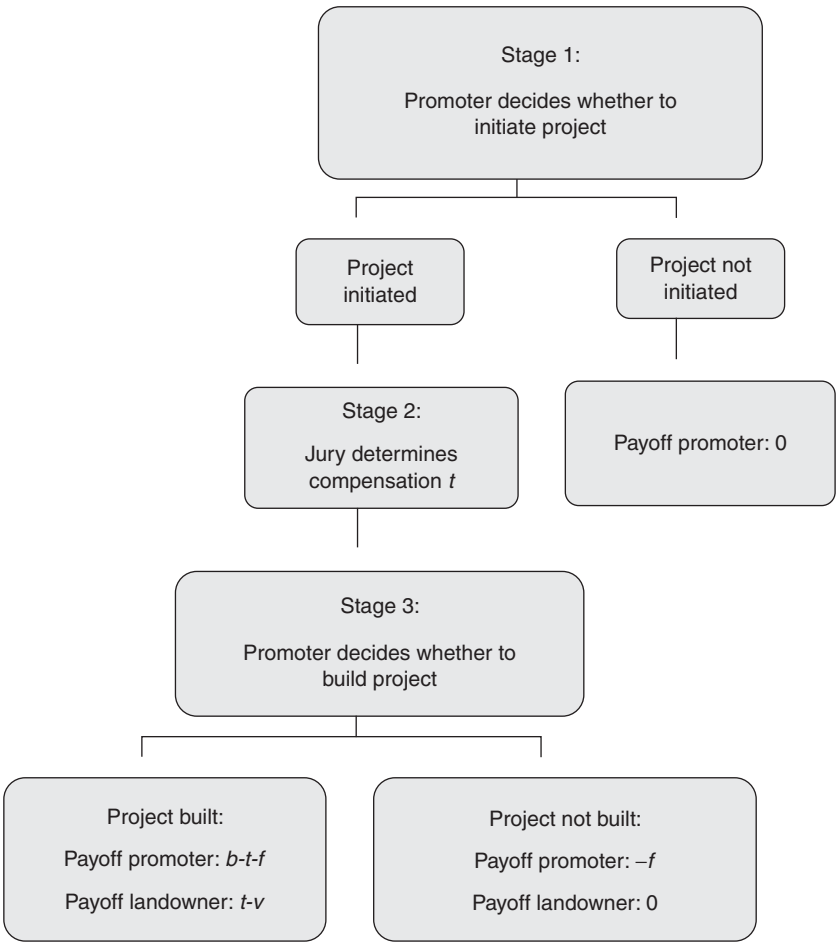

FIGURE 15.1
Jury-promoter stage game

also assumed to have no ability to commit. In particular they cannot guarantee the promoter a positive return on their project.

In Stage 3 the promoter decides whether to build the project. If the project is built, the payoff to the promoter is $b-t-f$, where b is the net present value of the project, t is the compensation award, and f is the private bill fee. The payoff to the landowner is $t-v$, where v is the market value of the land in its normal use. If the project is not built, then it is

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assumed that the promoter does not compensate the landowner because the property is not taken or damaged. The payoff to the promoter is $-f$ if the project is not built. Throughout I assume that $b-f-v>0$, which implies that the project has a positive social as well as private value.

The equilibrium is a triplet $\{I,t,B\}$, where $I \in \{0,1\}$ is an indicator taking the value 1 if the promoter initiates; $t \in (0, \infty)$ is the transfer payment awarded by the jury; $B \in \{0,1\}$ is an indicator taking the value 1 if the promoter builds. There are two equilibriums. In the first, projects are initiated and built, and the transfer t is less than $b-f$. In the second, projects are not initiated and built and no transfers are made.

The equilibriums are identified using backward induction beginning with the build decision in Stage 3 and working backward to the compensation and promotion decisions in Stages 2 and 1. Suppose first that the promoter has initiated the project in Stage 1 and the jury has made a compensation award t to landowners in Stage 2. In Stage 3 the promoter's decision whether to build is straightforward. If the payoff from building the project $b-t-f$ is greater than the payoff from not building $-f$, then the promoter builds. Simplifying this expression implies the project is built if $b \geq t$. Notice that the private bill fee f is irrelevant at this point in the game because it was paid in Stage 1. Notice also that the promoter does not necessarily earn a positive payoff from building. The payoff $b-t-f$ could be less than zero if the transfer is close to b, but building is still worthwhile because the losses from moving forward are less than scrapping the project and suffering a loss of $-f$.

Next consider the jury's decision to award compensation in Stage 2, assuming that in Stage 1 the promoter has initiated the project. A key assumption is that the jury awards a greater transfer if it is biased in favor of the landowner. In general we can define the jury's compensation as $t^*(q)$, where q is a parameter between 0 and 1. A value of q close to 1 represents greater favoritism to the landowner. A value of q close to 0 represents greater favoritism to the promoter. To illustrate ideas, it is useful to consider an example where $t^* = qb + (1-q)v$. In this case, the transfer approaches the value of the project b as the jury becomes more biased in favor of the landowner, and it approaches the value of the land v as the jury becomes less biased in favor of the landowner.[15] Later it will be useful to analyze the premium earned by the landowner measured by the ratio: $(t^*-v)/v$. In the example the premium is $q(b-v)/v$ and is increasing in the degree of jury bias to the landowner.

Next consider the promoter's decision whether to initiate the project in Stage 1. The promoter knows the degree of bias, and therefore he anticipates the transfer payment in Stage 2. The promoter's payoff is $b-t^*-f$

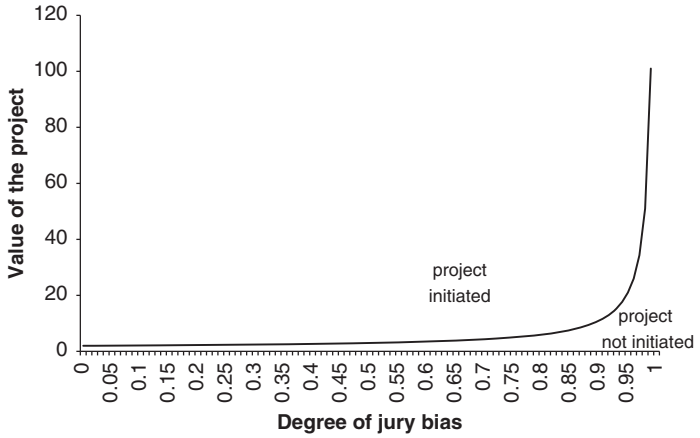

FIGURE 15.2
Range of parameters over which projects are initiated

if he initiates and 0 if not. Rearranging terms implies that the promoter will initiate only if $t^* < b - f$. If the transfer t^* is close to the value of the project b, then the promoter will not initiate since the return is insufficient to justify the payment of private bill fees f.

The promoter is less likely to initiate the project if the jury is biased in favor of the landowner because the compensation t^* increases in the bias. In the example where $t^* = qb + (1 - q)v$, the condition for the promoter to initiate is $q < (b - v - f)/(b - v)$. If the jury becomes sufficiently biased in favor of the landowner (i.e., q approaches 1), then the inequality above will not hold. This example also illustrates how the value of the project b is crucial. If the jury is not completely biased in favor of the landowner, then the promoter will initiate for large b. Figure 15.2 shows the range of values for b and q where projects are initiated, assuming v and f equal 1. For sufficiently large values of b or sufficiently small values of q, promotion will occur.

As a final remark it is important to emphasize that the jury cannot commit to give the promoter a positive payoff once it has initiated the project. If the jury could commit, then it would promise never to award a transfer larger than $b - f$, which is the condition for positive payoffs at the initiation stage. Redistribution from the promoter to the landowner could still occur, but it would not discourage the initiation of projects.[16]

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EMPIRICAL ANALYSIS OF JURY REDISTRIBUTION AND INVESTMENT

The theoretical framework illustrates how juries had the potential to redistribute profits to landowners and potentially undermine the incentives to invest in infrastructure. Jury decisions were recorded in minute books that list the compensation awarded to each landowner. In this section I use jury minute books for the Aire and Calder River navigation and the Dun River navigation to investigate how juries compensated landowners in the early eighteenth century.

The minute book for the Aire jury shows that the degree of compensation varied across ninety-five landowners.[17] Two received £50 per acre as compensation, twelve received £40 per acre, and eighty-one received £15 per acre. Some of the landowners in the latter group held land subject to common rights or at a greater distance from Leeds, which partly explains the lower compensation. Across all plots the average compensation was £19 per acre.

These payments can be compared with the average price of land in Yorkshire, where the Aire was located. The charity commission records compiled by Greg Clark (1998) provide a sample of land transactions for charities from the 1600s to the 1900s. The data show that the average price across fifty transactions between 1680 and 1720 was £12.6 per acre, and the standard deviation is 8.5. I use this sample to test whether the average land value in the charity data between 1680 and 1720 was statistically different from the average compensation awarded by the Aire jury. The test statistic for a difference in means is 15.03, with a p value close to 0. The ratio of the average compensation awarded to the average market value was 1.5 (= 19/12.6). This indicates that the Aire jury awarded a 50 percent premium to landowners.

A 50 percent premium is substantial, but it does not necessarily follow that total investment costs were substantially affected because land was only one input in construction. The Aire navigation company raised a total of £26,700 for construction, including compensation to landowners (Wilson 1971).[18] The jury minute books do not indicate the total area taken and thus the total amount paid for land. Nevertheless, it is likely that navigation companies purchased one acre of land or less, because their activities were confined to widening or making new cuts in the river. Therefore, I assume that promoters purchased one acre from each plot listed in the jury minute book. The total compensation if one acre was purchased would be £1,795, or 7 percent of the total investment cost. The 50 percent premium implies that if the Aire jury gave landowners the

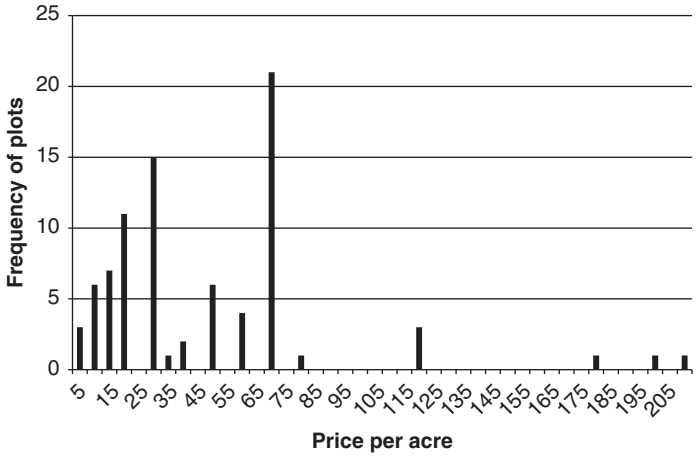

FIGURE 15.3
Distribution of prices per acre awarded by the Dun jury

market value in Yorkshire around 1700, then total compensation would have decreased to £1,189, which represents a 2.5 percent decrease in total investment costs.

A similar comparison is made for the Dun navigation project. The Dun navigation was authorized by a series of acts in the late 1720s. It was promoted by the Corporation of Doncaster and merchants in the metal-working districts near Sheffield in Yorkshire. The Dun is also unique because it was one of the first joint-stock transport companies. A jury was impaneled in 1729 to determine compensation for landowners near the Dun. Over a five-year period the jury awarded compensation on eighty-three plots.[19] The price varied between a minimum of £10 per acre and a maximum of £600 per acre. Figure 15.3 plots the distribution of compensation awards per acre across the eighty-three plots. Most of the awards were less than £70, but some exceeded this amount. Across all landowners the average compensation was £52 per acre.

The charity data show that the average price across fifty-nine transactions in Yorkshire between 1710 and 1750 is £13.8 per acre, and the standard deviation is 10.3. As before, we can reject the hypothesis that the average market value was the same as the average compensation awarded by the Dun jury. The test statistic for the difference in means between the two samples is 4.47, with a p value close to zero. Taking the average value for the compensation to be £52 per acre implies that the Dun awarded a 270 percent premium to landowners. The premium is

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still large if outliers are dropped. Without compensation awards above £100, the average is £38 per acre, or 175 percent more than the market value of land.

The compensation awarded by the Dun jury had a large effect on total investment costs. Willan (1964) states that the Dun company raised £24,750 for construction. Assuming the company purchased one acre from all the landowners listed in the jury minute books implies a total compensation of £4,298, or 17 percent of the total investment cost. If the Dun jury had given landowners the market value in Yorkshire around 1730, then compensation would have fallen to £1,140, which would represent a 12 percent decrease in total investment costs.

The compensation awarded by the Dun and Aire juries is striking because it greatly exceeded the market value of land. The Dun jury awarded more than 175 percent of the market value, and the Aire awarded 50 percent more. These figures suggest that juries engaged in substantial redistribution because they were biased in favor of landowners. There is a caveat in that juries might have awarded compensation in anticipation of the increases in land values following the completion of river navigation projects. Transport improvements generally increase property values. Econometric studies of turnpikes, canals, and railroads in Britain and the United States find that land values were increased by 15 to 25 percent.[20] If we assume that river navigations increased land values by the same amount, then this can explain some of the premiums awarded by juries. However, there is still a large residual—particularly for the Dun jury—which appears to reflect redistribution above any returns warranted by higher land values from the river improvement.

The remaining issue to consider is whether the observed redistribution patterns significantly affected investment promotion. According to the model, investment promotion occurs when the value of the project is greater than private bill fees and expected compensation payments. In practical terms this meant that a project had to have sufficiently high operating profits or sufficiently low investment costs net of compensation payments and private bill fees. The proportion of projects that met this criterion can be characterized using simulation analysis and information on the distribution of operating profits and investment costs.

To begin, I estimate the internal rate of return using the net present value formula:

$$\text{Net Present Value} = \sum_{t=0}^{\infty} \frac{toll_t - k_t}{(1+r)^t}$$

where $toll_t$ is the toll income in year t, k_t is the investment cost in year t, and r is the internal rate of return. The toll income is used as a proxy for

TABLE 15.1

Distribution of investment costs and toll income per mile for a sample of projects

Investment cost per mile	Frequency	Toll income per mile (1750)	Frequency
0–499	1	25–50	1
500–999	4	51–75	4
1,000–1,499	4	76–100	3
1,500–1,999	0	101–125	1
2,000–2,499	1	126–150	0
2,500–2,999	0	151–175	1
3,000–3,499	0	176–200	1
>3,500	2	>200	1

SOURCES: See Appendix.

operating profits because toll collection costs were already deducted, and maintenance costs for river navigations were small (Willan 1964). The internal rate of return is equivalent to the interest rate at which a project's net present value is zero. In all the calculations, investment costs are spread evenly over ten years, and the annual rate of growth in tolls is 1.6 percent from 1700 to 1830.

The values for investment costs and toll income are taken from a sample of river navigation projects. Table 15.1 summarizes the frequency of toll income per mile in 1750 and investment cost per mile. The appendix provides details on the sample and sources. Clearly there is a distribution across projects. In the following analysis, the internal rate of return for projects is simulated at different percentiles. The assumption is that the observed distribution reflects the population distributions. However, there will be some bias since implemented projects will tend to have higher toll income and/or lower investment costs. Moreover, investment costs and toll incomes may not be independent.

Panel A in Table 15.2 summarizes the internal rate of return for the 25th and 75th percentiles of toll income and investment costs reported in Table 15.1. The interest rate on government debt was around 5 percent in the early eighteenth century. Therefore, I use 5 percent as the threshold internal rate of return for a river navigation project to be initiated. In the baseline scenario, projects in the bottom quartile of toll income and the upper quartile of investment costs would not be initiated because they earned a return below 3.5 percent. Projects above the 50th percentile in toll revenues and below the 50th percentile in investment costs would be initiated because they earned a return in excess of 5.9 percent. Projects within the 25th and 50th percentiles for toll revenues and within the 50th and 75th percentiles for investment costs earned around 4.9 percent

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TABLE 15.2

Simulation of internal rates of return for river navigation projects

Panel A: Baseline		
	50th PCTL investment cost	75th PCTL investment cost
25th PCTL toll income	4.9	3.5
50th PCTL toll income	5.9	4.1
Panel B: Counterfactual with lower jury redistribution		
	50th PCTL investment cost	75th PCTL investment cost
25th PCTL toll income	5.2	3.7
50th PCTL toll income	6.3	4.3

NOTE: PCTL = percentile.

and 4.1 percent, respectively. In other words, they were below or at the margin of profitability.

Now consider the counterfactual where juries awarded the market value for land. In other words, assume that juries engaged in no redistribution and did not anticipate increases in land values from the transport improvement. The earlier evidence suggests that investment costs would have declined by between 2.5 and 12 percent if juries awarded the market value. For the purposes of the counterfactual, consider the case where reducing jury premiums would lower investment costs by 7 percent at all points of the investment cost distribution. The rates of return in this case are reported in Panel B of Table 15.2. Not surprisingly, the returns are all higher, increasing by 0.2 to 0.3 percent. More important, the rate of return for the project in the 25th percentile of toll revenues and the 50th percentile of investment costs is now 5.2 percent and above the threshold for project initiation. The implication is that jury redistribution may have discouraged some projects in the second quartile of the distribution of toll revenues.

CONCLUSION

Juries played a pivotal role in condemnation proceedings for infrastructure projects in the eighteenth and nineteenth centuries. Juries had the power to redistribute profits from promoters to landowners and in theory could deter promoters from initiating projects. Drawing on the cases analyzed in this chapter, it appears that some juries engaged in substantial redistribution and deterred the promotion of projects that were at

the margin of profitability. Overall it appears that juries might have been a hindrance to infrastructure investment in Britain. These findings remain tentative because more studies on jury redistribution are needed. Second, there may have been benefits from juries, such as expedited dispute resolution, which are not captured by the model described above. It is also worth noting that transportation facilities are natural monopolies, and thus the owners can earn substantial rents from receiving rights of way. Juries may have helped to spread some of the gains to small- and medium-sized landholders.

Juries also need to be placed in the context of other institutional changes that emerged in the post–Glorious Revolution period. Infrastructure promotion was associated with substantial transaction costs. There was a risk of government manipulation of improvement rights in the 1600s because of the conflict between crown and Parliament. Several undertakers had their rights violated following the Civil War and the Restoration. After the Glorious Revolution, improvement rights became more secure. Only a small fraction of undertakers obtaining rights between 1689 and 1750 suffered violations. The greater stability of the political regime in the eighteenth century contributed to a lower risk of government manipulation and ultimately encouraged investment (Bogart 2009). Other institutional changes involving negotiations among promoters, opposition groups, sponsoring MPs, parliamentary committees, and party leaders were of crucial importance as well. Future research will reveal how these other institutional changes mattered along with juries.

APPENDIX

Table 15.3 shows the average toll income per mile for various rivers using data on toll leases. The sample consists of river navigations covering 175 miles, which is more than 35 percent of the total made navigable by 1750. Some of the observations come from 1750 while others come from the 1720s, 1730s, and 1740s. It is necessary to extrapolate the toll income to 1750 to estimate the distribution of toll income in 1750. Detailed data on the Aire show that the average annual growth rate from 1740 to 1750 is 3.7 percent. Extrapolating toll income to 1750 using this growth rate yields the estimates of average toll income per mile in the last column.

The annual growth rate of toll income must also be estimated for the rate of return simulation. The data indicate that toll income for the Great Ouse navigation grew at 1.3 percent per year before 1750 but was stagnant in real terms after 1750. Toll income for the River Dun grew by 2.2 percent in the 1740s. Toll income for the Cam grew by 0.4 percent from

TABLE 15.3

Toll income per mile on river navigations (net of collections costs)

River	Time period	Annual toll income (in £)	Miles	Estimated toll income, 1750 (in £)	Estimated toll income per mile, 1750 (in £)
Aire and Calder	1750	4,400	25	4,400	176
Beverley Beck	1730s	99	0.75	130	173
Cam	1750	430	7	430	61
Dee	1740	556	8	780	98
Dun	1740	1,500	18	193	83
Great Ouse	1750	1,784	23	1,784	77
Kennet	1720s	667	20	1,312	66
Lark	1742	332	14	435	31
Tone	1720s	386	11	813	74
Weaver and Dane	1730s	1,674	20	2,271	114
Wear	1732	1,200	11	2,208	221
Yorkshire Ouse	1732	600	18	1,104	61
Average		1,136	15	1,322	103

SOURCES: For the Aire and Calder, Beverley Beck, Dun, Kennet, Tone, Weaver and Dane, and Yorkshire Ouse rivers, see Willan (1964, pp. 124–130). For the Cam, Great Ouse, and Lark, see Summers (1973, pp. 150, 226–228). For the Dee and Wear, see Journals of the House of Commons, February 6, 1732, and March 5, 1743. The mileage of rivers is taken from Priestly (1969) and Shead (2007).

TABLE 15.4

Investment by river navigations, 1600–1750

River	Time period	Amount invested (£)	Miles	Investment per mile (£)
Aire	1720s	26,700	25	1,068
Avon	1640s	30,000	42	714
Beck	1720s	1,400	1	1,400
Dee	1740s	56,461	8	7,058
Douglas	1720s	6,000	17.5	343
Dun	1730s	24,750	18	1,375
Exe	1690s	21,000	4	5,250
Great Ouse	1630s	10,000	14	714
Kennet	1720s	44,603	20	2,230
Salwerpe	1660s	6,000	5	1,200
Weaver	1720s	18,000	20	900
Wey	1650s	15,000	19.75	759
Average		21,660	16	1,918

SOURCES: For the Avon, Beck, Douglas, Dun, Kennet, and Weaver rivers, see Willan (1964, pp. 66–72). For the Salwerpe and Wey rivers, see Bogart (2009). For the Aire and Calder, see Wilson (1971, p. 138). For the Great Ouse, see Summers (1973, p. 50). For the Dee, see Journals of the House of Commons, March 5,1743, and for the Exe, see Journals of the House of Commons, February 15, 1699. The mileage of rivers is taken from Priestly (1969) and Shead (2007).

1750 to 1813. Toll income for the Aire grew by 3 percent per year from 1700 to 1750, 3.3 percent from 1750 to 1772, and 1.3 percent from 1775 to 1827. The rate of return calculation assumes an average annual growth rate of 1.6 percent.

Secondary sources and the Journals of the House of Commons provide information on total investment for a sample of river navigations (see Table 15.4). The sample of projects covers 187 miles or nearly 40 percent of the total made navigable by 1750. The price level was fairly stable over this period, so the investment figures were not corrected for inflation.

NOTES

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1. For a sample of works in this large literature, see Hayek (1960), Mahoney (2001), La Porta et al. (2004), and Klerman and Mahoney (2007).

2. It is also possible to argue that the common law was not necessarily conducive to manufacturing because of restrictions on business organization. See Harris (2000) for a discussion of these points.

3. See Bogart (2005) and Leunig (2006) for recent evidence on the effects of transport improvements.

4. Hill's quotes are drawn from the Report of the Board of Trade Railway Conference (Board of Trade 1909).

5. See the Journals of the House of Commons, 11.3.1725 (March 11, 1725).

6. For more details, see the survey of the bills charged by parliamentary agents in the 1820s and 1830s (House of Commons 1833 XII, pp. 248–251). The report also lists the average fees collected on various bills in the House of Commons in 1832.

7. Willan 1964, pp. 27–28.

8. The prices of land in Suffolk near the River Lark are taken from the Charity Commission records (Clark 1998). These will be discussed later in the chapter.

9. See the Parliamentary Archives for copies of all river navigation acts. Some acts relating to road and river improvements before 1714 are available in the *Statutes of the Realm*, but most require archival sources.

10. See William III, 1698: "An Act for the makeing and keeping navigable the Rivers of Aire and Calder in the County of Yorke [Chapter XXV. Rot. Parl. 10 Gul. III. p. 4. n. 10]," Statutes of the Realm: vol. 7: 1695–1701 (1820), pp. 534–538. http://www.british-history.ac.uk/report.aspx?compid=46958 (accessed February 18, 2010).

11. See the National Archive RAIL 800/1.

12. There are some recent works addressing judicial agency from a contract theory perspective. See Bond (2009) for one example.

13. Private bill fees were partly determined by the degree of opposition to a bill. More opposition meant greater expenditures on parliamentary agents,

identifying witnesses, influencing MPs, and so forth. The interaction between opposition and promoters could influence jury deliberations and vice versa, but this is not explored here.

14. This assumption seems appropriate, given that jury members were drawn from the population of tenants and landowners in a county. Most investors in transport were drawn from a narrow group, at least before railways, so they were unlikely to be investors in the project.

15. This particular transfer rule is one among many cases. It can be derived by assuming the jury sets the compensation to maximize the objective function $q\log(t-v)+(1-q)\log(b-t)$, which weighs the utilities of the promoter $\log(b-t)$ and the landowner $\log(t-v)$. Taking first-order conditions and solving for t^* yields $t^*=qb+(1-q)v$.

16. It could be argued that commissioners provided a check on the jury's decision and hence encouraged commitment. This possibility could be considered in an extension of the model.

17. See the National Archive RAIL 800/1.

18. It was typical in accounting practices at the time to regard compensation payments and private bill fees as investment costs.

19. See the National Archive RAIL 825/7.

20. For a sample of works, see Heckelman and Wallis (1997), Craig, Palmquist, and Weiss (1998), and Bogart (2009).

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