The early British railway system,  
the Casson counterfactual,  
and the effectiveness of central planning

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Abstract. Can industrial policy be effective when dealing with a revolutionary new technology? Mark Casson’s recent book, The World’s First Railway System, offers the intriguing claim that a slight dose of central planning by the British government in the 1840s would have produced a dramatically more efficient railway system for that country, with reductions of cost and mileage in the 25-35% range. Unfortunately, this part of Casson’s work is based on the false assumption that the early Victorians shared our views on the nature of demand for railway service and on economic growth. A study of the railway planning process used in the 1840s refutes Casson’s thesis. That process was based on several mistaken notions. It is actually likely (as was claimed by some experts in the early 1850s) that central planning in the 1840s would have led to an even less efficient system than the one produced by the decentralized, competitive, and admittedly wasteful historical procedure.

1 Introduction

Mark Casson’s book, The World’s First Railway System [5], argues that at its peak a century ago, the British rail system had 50% more track than necessary. More precisely, Casson considered the railway system of Britain (meaning England, Scotland, and Wales, but excluding Ireland) of 1914, when it was close to its maximal route length with about 20,000 miles. In a prodigious feat for a single person, he produced a design for an alternate system of only 13,000 miles that he carefully argued would have provided an equivalent level of service. That represents a saving of 35% in mileage. Since his design would have required more facilities in some places, he estimated that his layout would have saved about 25% of the construction costs of the actual system ([5], p. 17). As cumulative railway investments in Britain amounted to about 60% of GDP by 1913 [24], even a 25% saving would have come to around 15% of GDP, a huge amount. Casson’s smaller system would also have reduced operating costs to a substantial but unquantified extent. Since gross annual revenues of the railway industry were over 5.5% of GDP in 1912 [24], any significant reduction there
would have had a substantial impact on the efficiency and competitiveness of the entire British economy.

These estimates of the degree of inefficiency of the British railway system of 1914 are plausible, and will be assumed here to be correct. It is even shown in Section 2 that similar estimates of the degree of wasteful spending in railway construction had been made in the early 1850s by some knowledgeable observers.

Most of Casson’s book is devoted to the details of his alternate layout of the British rail network, and the validity of that work is not investigated in this paper. However, much of the interest in his study comes from his claim that had Britain made a modest change in government policy in 1845, most of the inefficiency he documents for the British rail network of 1914 would have been avoided. His suggested policy change would have continued and strengthened the expanded role that a certain government agency (the Railway Department of the Board of Trade, from now on referred to as RDBoT) had in railway planning for about a year, from mid-1844 to mid-1845. It is shown here that this part of Casson’s thesis is very likely incorrect. It is more probable that greater government involvement in railway expansion in the 1840s would have produced an even less efficient system than the admittedly wasteful one that came to be. This was the opinion of some eminent railway engineers in the early 1850s, in the aftermath of the huge expansion of the railway network that resulted from the Railway Mania of the 1840s.

Casson is undoubtedly correct in much of his criticism of British railway policy. There was excessive competition between towns, which led to much waste ([5], p. 17). Parliamentary scrutiny of infrastructure projects was generally “well adapted to evaluating the social costs and benefits of stand-alone schemes, but was poorly adapted to taking account of network externalities between different schemes” ([5], p. 277). This was true throughout the Victorian period. Had Parliament adopted a more interventionist policy in the second half of the 19th century, some of the inefficiencies that Casson identifies could have been avoided. However, during the crucial period of the 1840s, there were additional and deep-seated obstacles to efficient planning, going beyond issues of Parliamentary policy. They were grounded in profound misunderstandings about railways and the economy as a whole. (These problems also meant that Parliamentary scrutiny at that time was not “well adapted to evaluating the social costs and benefits” even of stand-alone schemes, since it was based on incorrect assumptions. Among other ills, this produced the investment disaster of the Railway Mania.) Therefore, had Parliament tried to introduce comprehensive planning, it would likely have created even greater inefficiencies.

One of the misleading notions that dominated British thinking in the 1840s was about the nature of demand for railway service. The other was about the nature of economic growth. As is shown in this paper, both notions were incorrect. While there were a few people who through luck or brilliant insight did hold modern views in these areas, the dominant opinions among both the public and among the ruling elite were simply wrong, as we can tell from the documentation that has survived from their planning process. The development of the British rail system was an example of “stumbling to success,” with huge investments made on false premises, and succeeding for reasons that had not been
foreseen. Hence the high level of “first-mover disadvantage” for Britain in railways is not surprising.

First let us consider the nature of demand for railway service. Casson does note several points in his book (e.g., pp. 292–94) that so-called “direct lines,” which connected pairs of major cities by routes as straight as feasible, and bypassed substantial population centers along the way, were popular in the 1840s. However, he appears to regard this as a minor point, one that would not have affected rational planners of the RDBoT. This is unlikely. In a modern phrase that arose in the computer industry some decades ago, “direct lines” were not a “bug,” but a “feature.” Direct lines connecting all major cities to London and to each other were regarded as an ideal by most of the early Victorians. This was just one aspect of the almost universal conviction among contemporary observers, in Britain as well as in other countries, that the main role and main source of revenues of railways was connecting major cities. This is discussed in sections 2 and 6.

Direct lines are not always inadvisable. Modern high speed intercity lines, starting with the Japanese “bullet trains,” and moving on through the French TGV and other systems to the current giant Chinese construction effort, can all be regarded as forms of what in the mid-1840s was sometimes called the “direct principle.” When the demand for high speed transport is high enough, such lines make excellent sense. Even the UK is considering building HS2, which would be the first new domestic trunk line in about a century, to connect London and Manchester. But that is today, when the population is far larger than it was in the 1840s and there is far more travel. Most of the observers during the Railway Mania thought that direct lines should cover the whole country right then. There were about a dozen projects that claimed to be providing a more direct link between London and Manchester, including two that used the same name, Direct London and Manchester Railway.

The importance of direct lines in contemporary thinking is demonstrated by Sir Robert Peel, often regarded as the most influential politician of the era. He was the Prime Minister during the early and most ebullient phases of the Railway Mania, when the crucial decisions were made (including those to first give the RDBoT the job of scrutinizing new schemes, and then to abolish it). Peel was an ardent supporter of direct lines. In June 1847, when the Trent Valley Railway (TVR from now on), one of the most prominent direct lines, was opened, Peel was the guest of honor. He had been a supporter of the line in its early phases, as well as of predecessor projects a decade earlier. (Section 5 has more detail.) In his speech in 1847, he praised the TVR for its adherence to the “direct principle.” He said that when the Roman general Julius Agricola

determined on opening a north-western route ... he determined to take the direct line. ... he took undeviatingly the direct line ... I felt convinced, gentlemen, that if two thousand years ago this straight line had been preferred ... that a direct line would be selected under the more modern and more mighty road administration of the 19th century. (Cheers.)

By the early 1850s, after the collapse of the Railway Mania, direct lines were recognized widely as costly mistakes. (However, the general perception of just what went wrong, and of the exact role of locality of traffic, were still distorted, cf. [32].) Furthermore, some experts
felt that had government planners been in charge, many more direct lines would have been built. Thus during a discussion in 1852 that involved many of the most eminent railway experts of the era, John Hawkshaw, a well-known engineer, declared (apparently without any dissent from the rest of the participants) [34]:

He dissented from the opinion, that great advantages would have arisen, if the Government had laid down, at the first, the lines which were to be followed. It was quite true, that a great deal of money had been wasted, that many mistakes had been committed, and that a larger dividend might have accrued to the shareholder; but this was nothing, in a national point of view, in comparison with the evils which Government interference would have created. Rigid unbending straight lines would have been laid down, and thus have prevented that large amount of accommodation which was now secured to the different towns in the kingdom.

Peel, Hawkshaw, and the 1852 meeting from which the above quote is taken are discussed in more detail later in the paper. It is impossible to be certain what central planning would have done to the British rail network in the 1840s. However, the evidence presented in this paper suggests that Hawkshaw was right, and that the outcome would likely have been even more direct lines and therefore more inefficiency.

Table 1. The development of the railway system in Britain

<table>
<thead>
<tr>
<th>Year</th>
<th>Miles of Railways</th>
<th>Invested Capital (millions pounds)</th>
<th>Capital per mile (pounds)</th>
<th>Total Revenue (millions pounds)</th>
<th>Revenue per mile (pounds)</th>
<th>Passenger Revenue (fraction of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1844</td>
<td>2,148</td>
<td>73</td>
<td>34,000</td>
<td>5.0</td>
<td>2,330</td>
<td>68%</td>
</tr>
<tr>
<td>1853</td>
<td>6,805</td>
<td>265</td>
<td>38,900</td>
<td>17.2</td>
<td>2,530</td>
<td>47%</td>
</tr>
<tr>
<td>1913</td>
<td>20,266</td>
<td>1,282</td>
<td>63,300</td>
<td>119.8</td>
<td>5,900</td>
<td>46%</td>
</tr>
</tbody>
</table>

| 1853* | 11,500            | 265                               | 23,000                 | 45.0                            | 3,000                   | 64%                                 |

The lack of appreciation of just how desirable direct lines seemed to the early Victorians is one of the two main fallacies of the Casson study. The other one is in the assumption about early Victorian growth expectations. Casson’s counterfactual network is designed to accommodate the British traffic patterns of 1914. He connects the savings his system achieves over the actual one to the policy decisions of the 1840s by arguing that the early Victorians were planning for the growth that was observed over the next three quarters of a century ([5], p. 4). That is easy to disprove. We have abundant evidence of the business plans of the railway companies in the 1840s, and they envisaged a substantially different industry than the one that existed in 1914. This is discussed in detail in Section [7] A brief demonstration is given in Table [1]
The early British railway system

The figures for 1844, 1853, and 1913 (which is used instead of 1914 to avoid the disruption of World War I) are based on historical statistics, derived from [24]. The 1853* figures represent investor hopes, and are obviously hypothetical. Their derivation is described and justified in Section 8.

Table 1 shows that the rail network envisaged during the Railway Mania differed greatly from that of 1914, in intensity of traffic, in intensity of capitalization, and in relative importance of passenger to freight traffic. Early Victorians did not have our notions of relatively steady growth. They saw the economy moving up and down around a constant average, with occasional quantum jumps, the results of what were perceived as unpredictable events, such as wars or major technological innovations. Casson’s counterfactual network has very little relation to the planning process of the 1840s, and so says little about the increased efficiencies that might have been obtained through central planning at that time.

The general conclusion of this study is that Casson’s thesis about the potentially beneficial effect of greater British government involvement in railway planning in the 1840s is incorrect. However, this conclusion applies just to Britain in the 1840s, and does not show that industrial policy is always inadvisable. For that, more general investigations are necessary.

Counterfactual designs of the high caliber of Casson’s can be very useful, and should be carried out in several other contexts. The reason is that they are useful in gauging the “first-mover disadvantage,” in which a technology pioneer incurs higher costs due to mistakes made in the early stages of deployment, when neither the capabilities of the technology nor the ways this technology is used by society are known well. Several early railway systems are suggested in Section 13 as worthy subjects for studies such as Casson’s.

Section 2 presents three interesting figures who were prominent in the early (pre-1850) years of the railway system, and documents how their views changed about the nature of economic growth and of locality of railway traffic. This shows that Casson’s assumptions about the knowledge of railway experts in the 1840s who might be involved in network planning are not correct for most people of that era. Section 3 documents the general opinion among British observers in the 1840s and 1850s that their rail system was inefficient. Section 4 presents some more expert views on this subject. Next, Section 5 documents the wide and deep conviction among British observers before 1850 that direct lines were desirable. Section 6 discusses the lack of understanding of the importance of local traffic among early Victorians and its effect on network planning, and in particular in stimulating the preoccupation with direct lines. Section 7 documents how it was only after 1850 that a belief in steady incremental progress became common in Britain, while Section 8 presents some of the evidence of what the expectations were in the mid- to late-1840s for the ultimate size of the rail network. Section 9 considers what some experts might have done had they been tasked with the design of a national rail network for Britain. Section 10 considers the actual role of the RDBoT and what it might have done. Section 11 discusses what seems to have been a consensus about the most eminent of the British railway engineers in the early 1850s about the potentially damaging effects of government planning on the efficiency of the network. Section 12 gets into the role of central planning in the British economy. Section 13 discusses some networks where studies such as Casson’s would be
useful, as they could provide substantial insights into the potential for central planning in the efficient deployment of novel technologies. Finally, Section 13 has the conclusions.

2 Changing technologies and changing minds

The Victorian era was one of great intellectual ferment. The spread of many new ideas (such as slave emancipation, greater democracy, and Darwin’s theory of evolution) was reflected in wide public debate and extensive coverage in contemporary literature, and has been studied by modern scholars. Some ideas, on the other hand, appeared and diffused quietly, without any serious public discussion. Such was the path of the modern notions of economic growth and of locality of railway traffic that Casson assumes. They are indeed natural to us, but were utterly foreign to almost all British observers in the first half of the 19th century. This section discusses three prominent figures, prominent enough to deserve entries in the *Oxford Dictionary of National Biography* [22], who were pioneers in realizing the general public perceptions in these fields were incorrect. Table 2 shows when the thinking of those persons changed on the two key topics. It should be emphasized that these three were pioneers, and that most of investors, public policy makers, and railway managers were considerably slower in changing their minds.

**Table 2.** Dates when three prominent people adopted modern views on the importance of local traffic for railways and on the presence of steady incremental growth.

<table>
<thead>
<tr>
<th>person</th>
<th>importance of locality</th>
<th>continuing growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Hawkshaw</td>
<td>by 1838</td>
<td>after 1845</td>
</tr>
<tr>
<td>James Morrison</td>
<td>mid-1846</td>
<td>by 1836</td>
</tr>
<tr>
<td>Dionysius Lardner</td>
<td>after 1835 and by 1846</td>
<td>after 1838 and by 1841</td>
</tr>
</tbody>
</table>

To be precise, one should distinguish between technological progress and general economic growth. In the interests of brevity, and also because for some 19th century persons it is hard to tell precisely what their views were, this is not done here. The only question that is considered is whether an individual thought growth came in rare spurts, as a result of a dramatic new technological invention such as the development of the railway or of a new business opening up through the cultivation of cotton in India, say, or whether there was a continuous process of incremental technological improvement or of economic growth.
Hawkshaw, 1811–91, was one of the most prominent civil engineers of the late 19th century and eventually became Sir John Hawkshaw. However, he was still very young and obscure when he first caught public attention in late 1838. At that time, an influential group of shareholders in the Great Western Railway (GWR), which was under construction, became concerned about the decisions being made by Isambard Kingdom Brunel, that line’s engineer. These included his 7-foot “broad gauge,” but also other issues, and, more than anything else, the high costs that were increasingly becoming apparent. (Brunel was famous for his engineering talent, but also for ruining the investors who provided funds for his projects, including, in the case of the Great Eastern steamship, himself [36].) Those shareholders pushed GWR directors to commission two studies by external experts, and Hawkshaw was selected for one of them. His report\(^4\) was scathing in its criticisms of practically all of Brunel’s choices. In particular, Hawkshaw argued for the importance of interconnection with other systems, and for necessity of serving local traffic (as well as for various more technical steps). In his history of the GWR, E. T. MacDermot noted ([23], p. 41) that “[e]vents have shown that Hawkshaw was absolutely right in his views except as regards the engines”\(^5\). However, first the GWR directors and then the GWR shareholders rejected Hawkshaw’s views, and backed Brunel’s. Brunel envisaged the GWR system as an isolated one, devoted in the first place to linking Bristol to London, and in the second place to funneling traffic from the countryside to those two cities\(^6\).

The conclusion is that already in 1838 Hawkshaw had views compatible with those of modern transportation planners and of Casson, but that they were contrarian ones for his time. And it should be said that he did not produce any quantitative arguments to back his recommendations in this area. He basically laid out a vision for the role of railways. In retrospect, we can say it was correct, but it was contrary to his audience’s deeply ingrained beliefs.

While Hawkshaw was early in recognizing the importance of local traffic, he was slower to absorb the notion of continuing growth. When he was asked by James Morrison in 1846 during a House of Commons committee hearing: “Is not it in the nature of railway traffic to increase?,” he responded “Yes,” but his responses to the preceding and following questions suggest that he did not include that naturally into his mental planning\(^7\).

James Morrison, 1789–1857, is generally regarded as the richest commoner of the 19th century, although he started out in poverty. (For more background information about him and about Dionysius Lardner, see [27].) He was self-educated, yet was elected into the selective Political Economy Club. He is often called the earliest pioneer of utility regulation. Already in 1836, during the first large railway mania in Britain, he called on Parliament to enact a regulatory framework that would take into account the continuing progress that he saw taking place and was sure was going to continue\(^8\). On the other hand, in the pamphlet [25] (reprinted in [26]) which he published in early 1846, he was a strong advocate of direct lines, and complained that “very large masses of people” were “imperfectly supplied by circuitous routes.” However, in the spring of 1846, Desart’s work on gravity models for railway traffic (see [32]) became known to a substantial number of British observers, and Morrison learned of it somehow. During the hearings of his House of Commons committee on railway policy that year, Morrison asked Samuel Morton Peto, the famous contractor,
some leading questions about Desart’s results. Their interchanges display a rather confused understanding of Desart’s findings, to some extent possibly reflecting Desart’s own misinterpretation of his data, cf. [32]. Morrison and Peto spent quite a bit of time talking of how rural populations had a greater propensity to travel by rail than urban ones, and that is what Morrison put into his famous “2nd report.” (This was the draft Morrison prepared by himself, recommending the radical overhaul of British government policy towards railways that he was advocating, and which he artfully managed to get printed as if it were an official report of his committee [10]. This led to a minor scandal and an investigation by a special committee of the House of Commons.) Still, this exchange shows that both Morrison and Peto were becoming aware of the importance of local traffic. But their understanding was imperfect. Later in the committee hearings, both Morrison and Peto talked of the importance of direct lines, for example of the need for existing railways to “[get] rid of those elbows and curves which they have introduced in many cases.” Thus they had not fully absorbed the implications of Desart’s work. Shortly thereafter, though, Morrison may have realized the inadvisability of direct lines, as his 1848 tract [26] does not mention them, in great contrast to his 1846 work [25].

Dionysius Lardner, 1793–1859, was a famous science and technology popularizer. He was a minor celebrity, publishing voluminously, editing the Cabinet Cyclopaedia series, and lecturing widely. In early 1836, as the first large railway mania in Britain was raging, he published the 5th edition of his book on the steam engine [16]. Among the revisions from the previous edition was the addition of a chapter entitled “Plain rules for railway speculators” [10]. He was clearly trying to capitalize on the interest in railways among investors to boost sales of his book. This chapter was also in the 6th edition, published in mid-1836 [11]. The second rule changed between the 5th and 6th editions. The major change concerned the expected increase in passenger travel as a result of opening a railway line. (This is discussed in [27].) But there was also a slight change in the evidence he cited. In the 5th edition, Lardner referred just to passengers between Liverpool and Manchester. In the 6th edition, there was the addition of the phrase “and the principal neighbouring towns.” This suggests that someone pointed out to Lardner that there was quite a bit of local traffic. But the general emphasis in that chapter continued to be about traffic between terminal cities. The tenth rule in both editions declared that “[t]he more nearly a railroad approaches to an absolute level, and perfect straightness, the more profitably will it be worked.” A decade later, Lardner’s tone changed. In his 1846 survey of railways [18], he wrote that “unquestionably the general impression was, and, so far as we have observed, still is, that the great mass of their traffic is derived from the large cities and towns at their termini,” and then proceeded to produce statistics to dispell this impression. After some discussion, he concluded:

It is clear, then, that the terminal populations have but little connexion with the financial success of railway projects. The main support is short traffic.

Thus between 1835 and 1846, Lardner moved from neglecting local traffic to recognizing its central role. But even in 1846 he understood his view was in the minority.

The popular press, and even some history books, treat Lardner as a laughing stock because of his skepticism about the feasibility of steam travel across the Atlantic. (Some
also deride a few of his opinions on railways, where he several times opposed Brunel.) He was indeed the most prominent skeptic, although by no means the only one, of the ventures being planned in the late 1830s, and gave a widely publicized lecture substantiating his skepticism at the British Association for the Advancement of Science meeting in 1837. That was less than a year before the Sirius and Great Western completed their pioneering trips to New York and back completely under steam. Lardner spent the rest of his life trying to explain away his bad prediction. As to what led him astray, some observers claimed this came from Lardner’s assumption that the power required to move a ship at a constant speed was proportional to displacement. He did make this incorrect assumption (in common with many others, while Brunel and yet others assumed the more nearly correct two thirds power of displacement rule). However, that did not seem to be the main cause of the faulty prediction, since even the small Sirius managed to make the trip. It appears that Lardner was led astray by relying on dated statistics about the efficiency of steam engines. While he was an ardent prophet of technological progress, in common with most people he seemed to think (at least through 1838) of this progress as coming in quantum jumps, and regarded the data he was using as still applicable to the best engines of 1838. After his disgrace in technology through this faulty prediction, he next proceeded to disgrace himself on moral grounds by running away with another man’s wife in 1840. They escaped to the U.S., and perhaps as a result of the exposure to the different environment of the U.S., with its faster growth rates, or perhaps just as a result of reflecting on his technology mistake, Lardner changed his mind, but without admitting he had done so. We find him writing in 1841 ([17], pp. 250–51), in one of the many attempts to explain away his wrong prediction:

Let me remind you that the efficiency of steam power, more especially as applied to navigation, has been constantly increasing, by the continued application of the resources of engineering ingenuity, both in the United States and in England. It is well known to every one in this country [United States], that scarcely a month has passed for several years in which some improvements, of greater or less practical importance, are not effected. My opinions, therefore, whatever they might be, founded on the actual state of steam power in 1835 or 1836, would necessarily require modification when applied to performance in subsequent years.

From that point on, his writings reflect an awareness of the constant incremental improvements in both technology and the economy. Thus in his 1836 “plain rules,” cited above, the first rule was:

No railroad can be profitably worked without a large intercourse of passengers. Goods, merchandise, agricultural produce, &c., ought ot be regarded as of secondary importance.

On the other hand, in his 1846 survey [18], while he noted (p. 492) that 63% of the revenues of the British lines came from passengers in 1845, he also observed that “the rate of increase on the Goods traffic, is even more rapid than the Passenger traffic.” He did say explicitly that this would continue, but that seemed to be the implication, and indeed, that is what took place. To the great surprise of most railway managers and shareholders, goods revenues exceeded those from passengers from 1852 on.
Hawkshaw, Morrison, and Lardner are interesting examples of people changing their minds when faced with reality. The two issues discussed here, and treated later, of the nature of growth and nature of railway traffic, were never subject to wide public debate, and it seems that opinions changed gradually, in ways that are hard to track. There are many puzzles about this process, ones that modern research on social networks may help illuminate. As just one example, let us consider Morrison’s 1836 speech to the House of Commons. He said:

... may we not also look for great improvements in the construction of locomotive engines, and in the whole machinery and management of railroads? These are admitted on all hands to be in their infancy; and yet the House of Commons has been legislating with respect to them as if they had already attained to the highest degree of maturity and perfection.”

So here was a brilliant mind, with an excellent perception of the past and present of the British economy, and a far-sighted view of its future, and yet he did not seem to understand that the House of Commons was indeed “legislating with respect to [railways] as if they had already attained to the highest degree of maturity and perfection” because that is the way most of his fellow MPs thought. His worldview was dramatically different from that of his colleagues, but he did not appear to realize it, as neither in this speech, nor in his later pamphlets [25][26] did he make much of an effort to expound the new reality. This is not an uncommon phenomenon, as modern research has demonstrated the frequent occurrence of widely divergent views of the same issue among different groups. This is frequent in politics, but in other areas as well. For example, someplace around 20 to 25% of the population of the U.S. and of Western Europe believes that the Sun moves around the Earth.

3 The inefficiencies of the British rail network: General views

Casson claims that his estimate of the waste in the British system is far higher than any previous one ([5], p. 2). However, there were numerous observers around the middle of the 19th century who had put forth similarly high or even higher estimates of the waste incurred. In this section and the next we consider a few examples.

In the 1840s, the British public, as well as the ruling elite, believed widely that their rail system was inefficient. Letters to the editors as well as reports of railway shareholder meetings from that period are full of complaints about “wasteful” expenditures. Most of those can be dismissed as not quantifiable, and the result of the usual biased perceptions of investors looking for higher profits. Many were the results of actual construction costs almost invariably exceeding promoters’ and engineers’ estimates. (Actual costs for the lines started in the 1830s turned out to be around 70% higher than projected [27].) Thus in 1842, in the depths of a severe depression, and in the trough in railway share activity between the two railway manias of the mid-1830s and mid- to late-1840s, Charles Vignoles, a railway engineer, wrote about “the reckless, ruinous, and unpardonable excess of expenditure over parliamentary estimates of cost” ([37], p. 128). There were frequent comparisons in the press with other countries’ much lower railway construction figures, and allegations that it was corruption, incompetence, and extravagance that resulted in the high costs for British
railways. One of the many instances of this is the famous series of letters published in *The Times* in the fall of 1846 under the pseudonym “Cato.” They represented a concerted effort by *The Times* and James Morrison to alter the course of British railway policy [10]. They are full of claims that the British system was too expensive. As just one example, one of those letters provided an estimate that established railways in Britain had cost £34,000 per mile, and that this involved “an unnecessary costs of upwards of [£15,000] per mile”[12].

There was also wide belief that much of the inefficiency of the British rail system of the early 1840s was due to the novelty of the technology. Thus a long and thoughtful piece in *The Times* at the end of 1844 claimed that “[s]carcely any one conversant with the subject will deny that the existing railways ... could now be constructed for half [the amount they cost], in consequence of engineers having now gained the necessary experience”[13].

The huge inefficiencies, of 50% in *The Times* piece just cited, or over 40% in the Cato letter earlier, are even higher than those estimated by Casson. However, they were made by writers probably (and certainly in the case of Cato, which was the pen name of John Black, a retired famous journalist) with no knowledge of engineering, and in rather polemical pieces, so hard to take seriously.

4 The inefficiencies of the British rail network: Expert views

There were also estimates of the British network inefficiency comparable in magnitude to Casson’s that do deserve to be considered seriously. This section discusses three, all made in the early 1850s, in the aftermath of the collapse of the Railway Mania. They are not exactly analogous to Casson’s. They are not detailed, and it is not even clear what kinds of changes some of them envisaged. Most important, Casson offers an alternative layout for the British rail system of 1914, designed to satisfy the needs of the British economy of 1914. Those earlier observers were discussing potential savings in the buildout of the British rail system of the early 1850s, when it had about 7,000 miles, as opposed to about 20,000 miles in 1914.

Of the three forerunners of Casson to be discussed here, two came from Britain, and one from the U.S. The two British observers, to be treated first, were Samuel Laing and Robert Stephenson. Laing (1812–1897) was one of the “Five Kings” of the RDBoT. Between 1848 and 1855, and also from 1867 to 1894, he was the Chairman of the London, Brighton, and South Coast Railway, and during his life he was also at various times a politician, a government official (including a stint as Financial Minister in India), and writer on science and other topics. Stephenson (1803–1859) was the most eminent of the British railway engineers of the 1840s and 1850s. Both Laing and Stephenson were regarded highly as railway experts, and frequently testified before Parliamentary committees.

In early 1853, during the Cardwell Committee hearings on railways, Laing was asked what he thought of “the past legislation of Parliament in reference to railways”[14]. Laing’s response was that this legislation had been “exceedingly defective, and has entailed a very great loss.” His estimate of the waste was £70 million out of the £280 million that the lines then in service or under construction were expected to cost, or 25%. This is just about Casson’s estimate for the savings that his design might have realized for the larger system of half a century later[15].
Laing did not present any detailed estimates or alternate designs for the British rail system. He was primarily claiming that the existing railways could have been built for 25% less, although he also admitted that they could “have been more judiciously spread over the country, so as to render to the public a greater aggregate of service than is rendered by the present lines.” Thus his main focus appeared to be on constructing the same lines but at lower cost, as opposed to Casson’s project of coming up with an optimized layout of the network. Laing’s estimate appears to have been an ad hoc one, made in response to the questions he was asked, and without any serious study.

Stephenson was in the audience during Laing’s testimony, and had several days to think about it. Hence his estimates, presented when he testified, can be considered as more deliberate. Furthermore, he was the most eminent railway engineer in the world, whereas Laing had a legal and managerial background, so his opinion is naturally more authoritative. Stephenson thought the waste in the contemporary system was somewhat smaller than Laing’s estimate, £40-50 million as opposed to £70 million. However, he was not too certain:

I saw Mr. Laing’s evidence; I do not believe he has overstated it, but I would rather be within the mark.

A few months later, he raised his estimate. In a speech in Montreal, in which he warned Canadians against repeating the mistakes committed in the UK, he declared that

he could say, upon the authority of the Board of Trade, and from his own knowledge, that, since competing lines commenced, out of 300 millions of pounds expended, 60 millions had been wasted; that is, in duplicate lines.

In this passage, and in most of the Montreal speech, he railed against competition, which led to the wasteful duplicate lines. In his earlier testimony before the Cardwell Committee, he was more explicit, and blamed direct lines, as will be shown in the quote in Section 9.

In any event, both Laing and Stephenson thought that, one way or another, inefficiencies of the British railway system of the early 1850s were comparable in proportion to those found by Casson for this system at its peak in 1914.

Across the Atlantic, an interesting observer thought the waste was even higher. Henry Varnum Poor (whose name lives on in Standard & Poor’s) was a pioneering financial analyst. In the early 1850s, he was the manager and editor of the American Railroad Journal, the world’s oldest English-language serial devoted to the railway industry. When Herbert Spencer’s essay “Railway morals and railway policy” appeared, Poor reprinted it in his paper together with extensive commentary. Spencer accepted Laing’s estimate of about 25% waste in British railway system. Poor added to that a quote from a speech by Stephenson in Canada that also estimated waste at about 25% (likely from a different speech than the one cited above, as it was supposed to have been given in Toronto, not in Montreal, and to have estimated waste at the £70 million level that Laing had used). Poor then raised that estimate of waste, when he wrote (see, p. 105) that “at least one-third of the capital invested in English railroads has been lost.” His higher figure for waste was based on a fundamentally different philosophy of railway construction, which will be discussed in Section 13.
5 The wide spread and persistence of the direct lines delusion

The next section will delve into the origins of the direct lines delusion. This section presents several illustrations of how strong and how pervasive this delusion was during the Railway Mania. The first one features Sir Robert Peel, perhaps the most influential politician of the era. He was the Prime Minister during the crucial early stages of the Railway Mania, leaving office in mid-1846. The Introduction cited his enthusiastic endorsement of the “direct” Trent Valley Railway (TVR). This was a 50-mile line from a station on the London and Birmingham Railway to a station on the Grand Junction Railway. The TVR was designed to provide a more “direct” communication from London to Liverpool and to Manchester by bypassing Birmingham, shortening the approximately 200-mile railway trip by slightly over 10 miles. That it was regarded as a direct line did not stop other promoters from setting up projects for even more direct lines. In 1845, there were two serious proposals for identically named Direct London and Manchester railways, usually named as Rastrick’s and Remington’s lines, respectively, after their engineers. Rastrick’s scheme had on its provisional committee John Gladstone, the father of the future Prime Minister, who was a very wealthy and respected merchant and an early and large railway investor. There were also some less serious projects. In total, over a dozen projects claimed to provide a more direct link between London and Manchester. TVR was enormously lucrative to its early investors, who were bought out at a huge premium just as construction was starting, before they had put much money into it. A few years later, though, after the collapse of the Railway Mania, it was often cited as a financial disaster for the London and North-Western Railway, which acquired and completed it.

The TVR project was a successor to some earlier abortive proposals along the same lines, and one of its features was that it went through Tamworth, the place where the Peel family residence of Drayton Manor was located, and the place that elected him MP. Peel’s brother Edmund was the Chairman of this company.

In 1839, when an unsuccessful predecessor to the TVR, the Manchester and Birmingham Extension Railway (MBER), was debated in Parliament, Peel called arguments against it “preposterous” and some “the most indecent ever offered [in the House of Commons]”. He claimed “that individually no man would suffer more by the measure than he should,” because of the disruption to his landholdings. (This was in the early days of railways, where many landowners, who would later clamor for better railway, were strongly opposed on the grounds their property would be damaged by the disruptive new technology with its noisy and smelly contraptions.) Thus he claimed to be supporting the project on the grounds of public good. Opponents of the MBER frequently pointed out that it would not do much to provide a more “direct” line from London to Manchester, as it would only shorten the distance by 12 miles. (The more precise measure was 12.5 miles.) Supporters, with the help of creative arithmetic, sometimes claimed 20 or 30 miles. Peel, in his speech, tried to paint as positive a picture as he could and yet not depart too far from the truth, so he declared that this line “would shorten [the distance] thirteen miles in point of distance, and seven [additional] miles in gradients.” In the end, after long and contentious hearings, cf. [20], the MBER did not get Parliamentary authorization. But after several abortive attempts in
the intervening years, it was revived in modified form in 1844 as the TVR, to be brought before Parliament in 1845.

In March 1845, the RDBoT was completing its reports on the projected railway schemes, and the House of Commons was giving those schemes its preliminary (“Standing Orders”) scrutiny. During a debate there, Peel gave a speech in favor of direct lines, and the TVR in particular. (The RDBoT had reported a week earlier in favor of the TVR and another, related, line, the Churnet Valley Railway, in a report that was perceived as very enthusiastic about direct links. The RDBoT declared those two schemes, together with existing railways, “[complete] a line of Railway communication between London and Manchester 19 miles shorter than the present one, and which is believed to be practically as short a line as any which can be made between the two points.” While he did not name the TVR, it was clear that is what he meant, as he explained that its current progress was a justification for the course of action he had urged back in 1839, when the MBER was under consideration. He claimed that finally the wisdom of building direct lines was being recognized: “speaking generally, and contemplating ultimate results, he was certain that when they were establishing communication between different parts of this country, and between Scotland and Ireland and the metropolis [London], whatever course they might now take, many years would not elapse before the shortest lines would be preferred.”

Eight months later, when work on the TVR was about to start, Peel was asked to turn the first sod. In his speech, he emphasized that he supported this line not just because of the advantages it would bring to Tamworth and vicinity, but also “from a conviction that the success of this undertaking would be conducive to the public welfare. ... the public welfare would be promoted by establishing a more direct and immediate communication between the metropolis on the one hand, and Dublin and a great part of Ireland on the other; between the metropolis and the West of Scotland; between the metropolis and that great commercial and manufacturing district, of which Liverpool and Manchester are the capitals. (Hear, hear.)”

In June 1847, when the TVR was officially inaugurated, Peel, although no longer Prime Minister, was again the guest of honor, and his encomium to direct lines, with its appeal to the wisdom of the Roman rulers of England, was cited in the Introduction. At this last occasion Peel’s praise of direct lines did not go entirely uncontroversial. George Stephenson made a short speech towards the end of the festivities. In the blunt (some called it tactless) style that was characteristic of him, he criticized not only direct lines but also a few other railway innovations that Peel had at one time or another been enthusiastic about. Still, it is not clear how many of the attendees supported his views, as the notion of direct lines had not yet been fully discredited in the public eye at that time. Few press reports of the event even mentioned Stephenson’s speech, and even fewer cited his critiques.

Another, and perhaps most interesting example of direct line enthusiasm is presented by the evolution in the published opinions of The Times. At the time of the Railway Mania it was a uniquely influential press organ, with circulation greater than that of all other London dailies put together. One British government had waged a “war” on it in the mid-1830s, and another one would do so in the mid-1850s. It was conservative, but
followed its own agenda. During the Railway Mania, *The Times* was the foremost enemy of what it perceived to be dangerously excessive investor exuberance.

At the start of the Railway Mania, *The Times* appeared to take a somewhat skeptical attitude towards direct lines. At the end of 1844, it carried a long piece on “The Railway System and the Board Of Trade”26. About direct lines lines it had the following to say:

Direct lines of railway are now much in fashion: but direct lines of railway which leave out the intermediate traffic, or merely connect important towns by short branches, may produce irreparable local injury, and by being in themselves less remunerative would produce many of the evils we have pointed out. It does not follow either that the line which consists of the least number of miles would actually be the shortest route; for the cost of working, as well as the speed of travelling, entirely depends upon the gradients of the line, and therefore every deviation from the level by an ascending gradient virtually adds so much to the length fo the line as frequently to convert an apparently shorter line into a longer one.

All very insightful and sensible, and, in retrospect, completely correct. But it was opposed to the prevailing trend of thought.

Later, as time passed, and the general enthusiasm for direct lines grew, the tone of *The Times* started changing. On 29 September 1845, the business column (“City article”) claimed:

It is curious also to notice at the present time the rage existing for direct lines of railway, and no sooner does one appear than several others start, promising increased facilities and shorter routes for precisely the same district. Our advertising columns are very day exhibiting fresh proofs of the extension of the mania. There are now three or four schemes for direct Manchester Railways, two or three for Oxford and Worcester, ...

but on this occasion it did not say whether this was utter folly, or just many competitors competing for a chance to earn outsized profits. A few weeks later, a leader came out strongly in favor of direct lines, claiming the country was “involved in a labyrinth of railroads, and it is as much the [Prime Minister’s] fault as any other man’s that we have not more direct lines.”27. A few days later this was followed by an even stronger leader:

The Railway Department of the Board of Trade last year, careful and painstaking as it was, did not succeed. It failed to win the respect of the Legislature. In one important point it ran counter to the obvious necessities of the case, and the opinion of all unprejudiced authorities, including the Premier himself–viz., in favouring existing railways, to the prejudice of direct lines. Its idea was a system of endless ramifications, with as few trunks as possible. The result of such a plan would be a maze of railway, devious with branches, and knotty with junctions, which might be partially convenient to some localities, but would be generally inconvenient to the whole. But this is the prevailing error of our railway communications. Why must a man wind about or zigzag over half England because he wants to go to Edinburgh, to Exeter, or to Dover?28
The Times continued its support of direct lines into the year 1846, when some of the crucial decisions were being made. For example, on 10 April 1846, it claimed in a leader that “the country wants new lines, and direct lines.”

Peel and The Times present some of the most respectable and respected figures of the time. When we look at the general press, we find it crowded with ads for direct lines, reflecting popular enthusiasm. The London correspondent for the Glasgow Argus was a supporter of direct lines (as was his editor, Charles Mackay, the author of Extraordinary Popular Delusions and the Madness of Crowds, see [30], and, more briefly, Section 6). However, he did have some sense for excess, and in one of his columns he reported that an engineer friend of his complained to the secretary of a projected railway in Wales that it had the disadvantage that it “goes right over the top of Snowdon [the highest mountain in Wales].” The secretary reportedly responded “That is nothing, my dear Sir, compared to the disadvantage which we would labour under if the line was not advertised as a direct one!” [29]. This report may not have been exaggerated, as is shown by a piece in a railway paper which described the Grand London and Dublin Approximation Railway (which may or may not have been the one involved in the incident recounted by the Glasgow Argus). It was to “proceed in a nearly straight line” from London to Holyhead, which by necessity would take it very close to Snowdon. It was claimed that “though the passes in the mountainous districts of North Wales are somewhat difficult, they present no obstacles of an insurmountable character.” [30]. The actual prospectus of this line was a bit more realistic, as it reluctantly admitted that at one point in Wales “a deviation from the straight line may be requisite to avoid tunnelling.” [31].

The blind enthusiasm for direct lines did lead to a plethora of satirical pieces, especially in Punch, as well as to one of the more famous spoofs of that era. Henry Cole (later to be Sir Henry Cole, K.C.B., and known as “King Cole”) was a senior civil servant, but devoted most of his energy during that period to railway promotion, writing for the Railway Chronicle, publishing pamphlets, and playing a key role in the propaganda war associated with the “gauge wars.” He got the Railway Chronicle to publish a full-page prospectus for “The Great National Direct Independent Land’s End and John O’Groat’s Atmospheric Railway, with Steam Ferries to the Scilly and Orkney Isles, and Coasting Docks at both Termini.” [32]. For those not acquainted with the geography of the UK, Land’s End and John O’Groat’s are the two points in Britain that are furthest apart. Furthermore, while scenic, both are desolate places. The proposed railway was to go between them, and was claimed to be designed to transport passengers from one end to the other in 7 hours, without any stops. The satire in the long “prospectus” was very thick, but Cole reported in his autobiography ([7], vol. 1, p. 70) that “[i]t was received as serious!” This does not appear to be an old man’s embellishment, written four decades after the event, as in the very next issue following the spoof, the Railway Chronicle (p. 1632) hastened to explicitly label the proposal as “absurd,” to squelch the interest its publication had aroused among the public.

Aside from satire, British press did carry a few items (primarily letters to the editor) skeptical about direct lines. But they were almost uniformly based on subjective opinions. Perhaps the closest to a convincing quantitative argument that has been found is in a series of pieces in one of the railway papers in early 1846 [33]. They did argue that local traffic was
important, and there would not be enough demand to pay for the direct lines. But these pieces came rather late, and were directed at specific direct lines.

6 Locality of traffic and gravity models

Casson does treat direct lines several times in his book, most extensively in Section 7.9 (pp. 292–94). He ascribes their popularity to a desire to prevent competition from other railways, and also to a desire by terminal cities to avoid competition from towns that were being bypassed. He regards the second reason as the less important one, and this is consistent with the findings of this author’s studies. Except for special cases, merchants in large cities often did extensive business with towns in the vicinity, and were interested in better ways to reach them. As for the first reason, competition, it did play a central role, but in a complicated way that needs to explained, since it was grounded in a misunderstanding of how railways would be used.

In the 1830s, when many of the early trunk lines were laid out, competition was not much of an issue, as there was wide concern about viability of the novel railway technology. This changed in the 1840s. Thus, for example, we find John Wilson Croker, a famous politician, writer, and public intellectual, declaring at a meeting of the London and Southwestern Railway (LSWR) in 1847:

There was no safety as to the success of any railroad which did not go in a direct line between two important points. That was an axiom which was not discovered for some time, but when their 3 per cent. premium got down to par then everybody found out that circuitous lines would not do, and that there was no safety for railway property except by taking the shortest line.

The concern there was about new direct lines springing up and taking away traffic from established ones. The main reason this was thought to be a threat is because of an exaggerated view of the importance of traffic between terminal cities.

The main drive from for direct lines before and during the Railway Mania reflected a general conviction, not just in Britain, but also in continental Europe and America, that the main purpose of railways was to connect pairs of major cities, and that most of rail traffic would be between such pairs of major cities. As just one example, consider the London and Brighton Railway. After a fierce Parliamentary battle among about half a dozen competitors in 1836, and a rejection by the House of Lords of the proposal selected by the House of Commons (which was the most direct of the proposed lines), a study on the smaller number of survivors was commissioned in 1837 from Captain Robert Alderson of the Royal Engineers. He reported that he had “no hesitation in stating, that the line proposed by Mr. [Robert] Stephenson, considered in an engineering point of view alone, is preferable to either of the others.” However, considering the nature of the region the line would go through, he decided to concentrate on “the accommodation [candidate lines] afford to the metropolis at one end, and the town of Brighton at the other.” This led him to “adhere to the opinion already given in favour of the direct line [by Rennie].” Thus in this case an engineer decided that it was not engineering excellence that should be primary, but the directness of the line. That was just a reflection of the prevailing public opinion.
Opinions such as those of Captain Alderson were consistent with the business plans that railway companies advertised in their prospectuses and submitted to Parliament. They are treated in detail, with many examples, in [27]. Those generally projected in a quantitative form that the bulk of revenues would come from long distance travel. As just one example (to add to those of [27]), consider the Manchester and Leeds Railway, a 60.6-mile line that was sanctioned by Parliament in 1836. The House of Commons committee on its proposal reported that its business plan projected 442,000 passengers per year, “equivalent to 226,733 and a fraction, along the whole line”[36]. Thus the average length of a passenger trip was expected to be 31.1 miles. However, the actual average trip length in the first half of 1843 was 14.4 miles (or 16.6 miles if we weight the trips by the ticket price, as first class passengers on average traveled further than those in second or third class) [12]. Thus expectations were far from reality, and this was common (although a miss by a factor of two, as for this line, or the London and Brighton Railway, was among the larger ones).

As an aside, the Manchester and Leeds Railway projections in 1836 were for annual revenues from passengers of £115,256 (a steady level, with no expectations of growth). Actual passenger revenues for the first half of 1843 (as derived from the figures in [12]) give an annualized figure of £105,400, or just 10% under the projection. This is a remarkable level of accuracy, especially for a largely untested technology. It is seldom achieved on modern mass transportation projects, in spite of all the experience we have accumulated in the intervening almost two centuries. Yet this level of accuracy was typical of the demand projections made for railways in the 1830s, as is shown in [27]. This striking accomplishment was due to a short-lived class of professionals, the “traffic takers,” who used a systematic methodology that was sanctioned by Parliament. This methodology succeeded, though, through cancellation of mistakes. In the case of the Manchester and Leeds Railway, the 1836 projection was that it would carry 442,000 passengers per year for an average distance of 31.1 miles, at an average price of two of the old pence (of which there were 240 in a pound sterling) per mile. The results for the first half of 1843 correspond to 1,105,000 passengers being carried each year, for an average distance of 14.4 miles, at an average charge of 1.6 pence per mile. Thus practically everything about the forecast was far removed from actual results, but the final outcome was remarkably accurate. This accuracy is what led to the railway mania of the 1830s being a financial success, in spite of the engineers underestimating costs, as they usually do. Apparently this was the only giant and wildly speculative mania that succeeded in the sense of providing investors with above-market returns [28]. It is shown in [27] that had British observers understood what had happened with the lines started in the 1830s, they could have anticipated the financial disaster of the Railway Mania of the 1840s. However, it appears that no systematic studies had been carried out to determine how well the business planning process had performed.

As time went on, awareness of the importance of local traffic started to spread. Section 2 showed approximately when Hawkshaw, Lardner, and Morrison adopted modern views. But they were pioneers, and most British observers were slower. Part of the reason was lack of data and lack of familiarity with quantitative thinking. For example, as was already mentioned in Section 2 Hawkshaw in his report on GWR in late 1838 laid out a vision of railways concentrating on providing excellent local service. But this was a soft
vision, without any hard data about travel patterns to substantiate it. Lardner in his 1846 survey went a bit further, in that he cited statistics on railway trip lengths. Since the average trip was about 15 miles, he concluded, as was cited in Section 2, that short trips were key to the success of railways. But that conclusion does not follow just from the statistics he quoted. One could have short average trips by having many people traveling one mile to suburban stations, and a smaller group traveling the entire length of the line. Under those conditions, the local travelers would surely have been money-losers to the line, and it would have been the long-distance travelers who would have kept the line afloat. Lardner surely understood this, and from personal experience, if nothing else, must have known that the distribution of trip lengths was not this pathological. But he did not say anything about it.

A separate paper will discuss in more detail how British observers learned (and often refused to learn) about the importance of locality of railway trips. Had they paid attention to the issue and collected more information, they could have learned enough to avoid the mistake of direct lines and other ventures. However, they did not do this. Even when they learned of Desart’s discovery in Belgium of what are now called “gravity models for social interaction,” which are a basic tools of modern transportation planning (and were used by Casson in his optimized layout for the British rail system), they usually misinterpreted it. That is what Morrison and Peto did, as was discussed in Section 2. That is also what the Morning Chronicle, an important London daily, did. In its account, it not only presented a garbled account of Desart’s work (on top of misspelling his name), but it concluded that it was a curiosity of continental European traffic patterns, as things were “the reverse in England.”

As the Railway Mania was inflating in 1844 and 1845, the knowledge of the importance of local traffic, and therefore of the inadvisability of direct lines, was growing slowly. On the other hand, the opposing tendency, the desire for direct lines, was rising rapidly. Thus we find the Economist in late 1845 declaring about the GWR:

They came into the west in the infancy of railway enterprise, before experience had taught any of the public the vast, but then undeveloped, resources of the railway system. They wended their way from town to town, unable to see that direct lines would ultimately be demanded for public convenience; and the consequence is, that they have constructed lines which do not satisfy the public requirements, and are now compelled, at great cost, to curb their curves and cut off their elbows. We do not say that they are to be blamed for not seeing what people did not see when they commenced their work (though Thomas Gray had been preaching it for years), but we think that experience of the past would justify them in occasionally reviewing their system, ...

With increasing willingness of investors to provide funds for railway expansion, many observers, such as the Economist writer above, saw direct lines as something that was finally becoming attainable, a goal that had been compromised away earlier when money was tight and the viability of the railway industry was in doubt.

An extreme but instructive example of a direct line enthusiast is Charles Mackay. Today he is best known for his book Extraordinary Popular Delusions and the Madness of Crowds,
usually cited as containing the first comprehensive treatment of bubbles. In the mid-1840s, he was the editor of the *Glasgow Argus*, and was an enthusiastic supporter of the Railway Mania [30]. He was also an extreme direct line enthusiast. In the spring of 1846, he published a leader on railways\(^ {39}\), in which he claimed:

The great trunk lines at present are not direct lines, as every traveller knows; and it is easy enough to foresee that when the panic of 1845 and 46 is forgotten; when trade has revived, and speculation is free again to enter, with more wisdom than heretofore, into the full development of which the railway communication of these kingdoms is susceptible, that direct lines will be started to compete with the roundabout ones at present in existence.

He even expected the 40-mile and almost straight Edinburgh and Glasgow Railway to be superseded by a more direct line! Studying his writings on railways from this period, one is led to suspect that much of his enthusiasm for direct lines was stimulated by the hope that a new wave of construction of such lines would provide an opportunity to remedy what he saw as policy mistakes, see [30]. As an ardent *laissez faire* proponent, he felt the government could not impose any *ex post* conditions on existing railways, beyond what was in their charters. In the leader quoted above, he declared that “[a]s regards these lines there is no remedy. The mistake has been made, and the nation must submit.” However, the new direct lines could have the grant of their charters conditioned on acceptance of conditions more conducive to public good. Thus Mackay demonstrates yet another source for the support for direct lines.

A substantial contributor to the enthusiasm for direct lines during the Railway Mania was the hope that new railways would be constructed at lower costs. The quote from *The Times* at the end of 1844 in Section 3 referred to the widespread opinion that because of the experience the industry had gained in the preceding decade, construction costs would be half of what they had been. Lardner in his 1846 survey [18] noted that existing railways in Britain had cost about £35,000 per mile, and that the lines sanctioned by Parliament in 1845 were supposed to cost £16,268 per mile. He was extremely skeptical, and concluded that “[w]e shall probably be near the truth if we allow £30,000 per mile, for the lines still to be constructed.” As it turns out, he was an optimist, the costs were even higher than that, cf. Table [1]. But many observers, even those not directly tied to railway promotion, were even more optimistic than Lardner, even if slightly skeptical of the promised cost savings. Of course, it is in the nature of investors to be optimistic, and in the nature of engineers and promoters to stimulate and cultivate that optimism. Hence the picture that was dangled in front of potential investors in new direct lines meant to compete with established ones was an alluring one. They could build out their project to provide what was felt to be the main desideratum, namely connection between terminal cities, at lower cost, and so could offer lower prices to lure away the traffic that the older line had proved existed. Since they were going to offer a superior service, they could overcome opposition in Parliament to duplicate lines, and could then hope to drive the established line into the ground (or else force it to buy up the new project, as happened with the TVR). With hindsight, we can say that these hopes were misplaced, costs were not going to be as low as promised,
and rapid travel between terminal cities was not the main source of revenues. At the time, though, these hopes were widely shared.

7 Growth rates

The dominant view in Britain until 1850 was that infrastructure investments, such as canal and railways, would produce essentially constant revenues and profits. Not a single prospectus has been found from this period that mentions continued growth in traffic as an expectation. There are frequent citations of prospects of increased revenues as a result of some new business developments (new connecting railways being built, a coal mine opening up close to the line, etc.), but these were understood to depend on exogenous events and to be uncertain. There was awareness of the population growing at about 1.5% per year, but that was low enough that it was seldom discussed, and was not incorporated into business plans. The assumption was that once a railway started serving customers, there would be a “development of traffic” to a steady level. For more extensive discussion of this world view, see [27]. This basic assumption was seldom stated explicitly, because there was no need to state it. Everybody (with a few exceptions, such as James Morrison as early as 1836) just knew that this is how the world ran. This section cites just a few illustrative examples, mostly of cases where people were realizing the consensus view was not correct.

The general expectations among railway observers during the Railway Mania seemed to be that the “development of traffic” to its full potential on a new line would take at most a year or two. In early 1848, as unease about their lines’ prospects spread among railway investors, George Hudson, the Railway King, attempted to pacify his shareholders. He declared that “it could not be expected, that, upon the immediate opening of new lines ... traffic ... should be suddenly developed, three years being the average time usually allowed for that process”\(^{40}\). But the clear implication of this statement is that he was still expecting revenues to level off, it’s just that it would take a bit longer than his impatient and nervous audience expected. If Hudson by this time had come to believe in continued growth (as William Chaplin, the Chairman of the London and Southwestern Railway, had, see Section 4 of Appendix 8 of [27]), he dared not say it in public, as too radical a notion.

In the fall of 1849, The Times, which had been the fiercest critic of the Railway Mania, surprised many by publishing a prominent leader with a positive message for railway investors\(^41\). At that time the railway share market was at about its lowest level, reeling from declining dividend rates and the disclosures of George Hudson’s frauds and accounting irregularities at other lines. The Times, though, predicted that profits would improve, and advised railway shareholders not to sell their shares. The basis for this optimism was a forecast, based on the progress of transportation over the previous three quarters of a century, that by 1875, “the internal travelling and traffic of this nation will be nearly doubled, if not more.”

This was a bold forecast for that period. Population growth of about 1.5% per year would have suggested an increase in traffic of about 47% in the 26 years from 1849 to 1875. Robert Lucas Nash the elder, a pioneering financial analyst, whose contribution to the collapse of railway share prices in late 1848 was greatly augmented by the publicity
that *The Times* had provided for his work, cf. [29], broke with his old ally. He declared that *The Times* was acting on “expediency rather than principle,” and that on railways, their suffering *condition* and prospective improvement, the oracle singularly fails. Instead of sober reasoning based on statistical data to prove the present depreciation of railway property exaggerated and undue, we have for comfort to despairing shareholders visionary estimates of increased traffic, some six-and-twenty years to come ... [42]

As it turned out, the doubling of revenues that *The Times* thought might take until 1875, and that Nash regarded as purely “visionary,” took place by 1857, in just 8 years.

The 1850s were the first decade of “the great Victorian boom,” which ushered in fast and relatively steady growth in the economy. Hence by the middle of that decade, it was more common to hear comments about, and expectations for, further growth in railway traffic. Still, this view was not held universally even then. In 1856, in his inaugural address after election as President of the Institution of Civil Engineers, Robert Stephenson felt it necessary to note that “[t]here has been no instance, in the annals of any railway, where the annual traffic has not been of continuous growth” [43] This reminder may have been needed. Just the year before, Edwin Chattaway, a railway engineer and manager, published a survey of the railway industry [6], oriented towards investors, which received positive reviews in the press. In that work, he claimed (p. 27):

> The traffic returns seem to have reached their culminating point, and, save in a few exceptional cases, the probability of any appreciable increase under this head is very remote.

Even Robert Stephenson in the early 1850s did not seem to have fully appreciated how much growth was in store for railways. During the 1853 Cardwell Committee hearings, where he blamed direct lines for part of the woes of this industry (in testimony partially quoted in Section [9], he named the Great Northern Railway (GNR) as one of the direct lines that he regarded as big investment mistakes. (He had been one of the main witnesses before a Parliamentary committee in 1845, and argued against GNR, or rather GNR’s predecessors, and in favor of a competing proposal by George Hudson.) At the time of the Cardwell committee hearings, the GNR was still regarded as a financial failure. However, within a few years, revenues on the GNR grew sufficiently to make it nicely profitable and thus negate Stephenson’s criticism.

### 8 Railway expansion

Given the expectations for a couple of years of “development of traffic” on new lines, and then static revenues, as outlined in the preceding section, it is clear that investors and government policy makers during the Railway Mania were not planning for the rail transportation needs of the British economy of 1914, which is what Casson’s network is designed for. But what were they expectations? That is hard to say. Most promoters, engineers, investors, ..., were thinking of their particular projects, not of the shape of the
entire national network. Still, as is discussed in Section 21 of [27], it appears that the general consensus was that Britain was going to need, and would have, between 20,000 and 30,000 miles of railway, roughly the extent of the turnpike system. The disagreement was largely about the speed with which this network was going to be constructed. Thus on one hand the expectation was for an even more extensive network than the actual one of 1914, and on the other for a network with a far lower intensity of traffic (and of capital investment).

Since there was no comprehensive planning for the future of the British rail network, we have to make do with anecdotal evidence. An interesting item is the implicit forecast in James Morrison’s 1846 pamphlet [25], discussed in Section 29 of [27]. In some ways it was amazingly accurate. He explicitly declared that he expected cumulative railway investment to reach £560 million and to produce annual £28 million in profit, for a profit rate of 5%, possibly as soon as “in some 20 or 30 years.” As it turns out, total capital investment reached £560 million in 1872, 26 years later, operating profits (including interest on borrowings, guaranteed and preference dividends, etc.) reached £28 million in 1875, or 29 years later, and the profit rate varied between 4.74% and 4.45% during the period 1872–1875. One could hardly ask for a more accurate long-term financial projection than Morrison’s. He did not mention the size of the network, but implicit in his discussion, which cited the lines recently approved by Parliament, is the expectation of costs of about £20,000 per mile, which would have given a network of about 28,000 miles, even larger than the actual network of 1914.

The 1853* figures in Table 1, which are listed as representing investor hopes at the height of the Railway Mania, were obtained as follows: The mileage figures were those for all the lines authorized for Britain through the end of 1852, primarily during the Railway Mania, which is here taken to refer to the period from 1844 to 1849. Almost all of the approximately 5,000 miles authorized but not built by 1853 were abandoned (but were then resurrected in succeeding decades). The capital per mile figure is approximate, mixing the lines in service at the beginning of the Railway Mania, which cost over £30,000 per mile, with the new ones, which engineers and promoters were promising would be built for about £20,000 per mile. The 64% figure for revenues that were to come from passengers was derived by considering the business plans of the British lines approved during the 1844 session by the House of Commons, as presented to Parliament. As for revenues, the lines authorized during the 1845 session promised an average dividend of about 6.4%. These promises were based on the systematic demand estimation methodology that was sanctioned by Parliament. However, as is shown in Section 22 of [27], investors were hoping for 10% profit rates. To achieve that, with average costs per mile of £23,000 and an estimated working expense ratio of about 33%, their railways had to produce average revenues of about £3,000 per mile.

Many of the estimates that went into the 1853* entries in Table 1 are thus somewhat arbitrary, and one could easily justify modifying them somewhat. The point remains, though, that during the Railway Mania nobody in Britain was thinking of a rail system designed for the needs of the economy of the year 1914.
9 A “directing genius” and potential for efficient design

There is nothing that can promote efficiency as much as a benevolent and wise dictator. But benevolence and wisdom are rare in one person, especially in a person with the skills and desire to achieve dictatorial powers. In the case of the British railway system, there were some engineers who likely would have devised a better layout than was actually constructed, had they been given a free hand. John Hawkshaw almost surely would have. Already in the late 1830s he had a good intuitive sense for the patterns of rail traffic, and the network architecture that was needed. Robert Stephenson might also have provided a better layout. In his summer 1853 lecture in Montreal he declared that “[l]ines had been located, which never would have been built, had a directing genius presided over the chartering of them” ([15], vol. 2, p. 183). He was surely thinking of himself as the genius who would have come up with an efficient design. It is quite possible that he would have. As is noted by Casson ([5], p. 21), Stephenson did lay out some regional networks. Furthermore, at the Cardwell Committee hearings early in 1853, when asked whether it was true that “more lines have been made than the country requires,” he responded:

Yes, and not laid out, in consequence of that competition, in the best possible direction for the public. The argument at one time with Parliament was, to select the most direct line; that was the pivot upon which many of the important decisions hinged in Parliament; and I have no hesitation in saying that, with very few exceptions, all the direct line decisions were erroneous; and that a body of engineers or commercial men, if they were to sit down dispassionately to consider how they could contribute to the convenience of the towns that are scattered over the country, would not have adopted one direct line; I will not say one, but they certainly would have rejected nine out of ten. At the time that mania ran so high, I took the liberty of writing a letter, or rather of requesting my father to write one, to the late Sir Robert Peel, pointing out to him that it was a ruinous system that Parliament was proceeding on, the direct line system; because it did not by any means follow, that because one line was five miles shorter than another, that goods or passengers could be carried more cheaply or quickly upon it. On the direct lines, if they saved five miles, the Committees always attached importance to it; whereas, if they had taken velocity into account they would only have had minutes to consider.

This is certainly an emphatic denunciation of direct lines (which is reinforced by the rest of Stephenson’s testimony). But it may also be colored by the benefits of hindsight. At the height of the Railway Mania, one of the most prominent of the proposed direct lines was the Manchester and Southampton Railway. (It passed the House of Commons in the session of 1846, but was turned down by the House of Lords at the very end of that session.) The engineers for the Manchester and Southampton line were the eminent George Parker Bidder and his long-time partner and even more eminent Robert Stephenson!

While engineers were sometimes the initiators of railway projects, especially when there was little new construction and they were looking for work, they were in general not independent agents, and were subordinate to those who controlled the purse strings. (Casson’s claim, p. 55 of [5], that it was “engineers who masterminded strategy in the early years”
does not seem to be representative, although it may have applied to Brunel’s lines.) Thus when John Miller, best known for his work on Scottish railways, was asked by a Parliamentary committee in 1846

Is not there another important difference in the views of engineers, some preferring to select a direct line between two great points; others, in the selection of a line, looking to the accommodation of the local traffic along the line?

he agreed that this difference existed, “arising from the different objects of the promoters.”51 Thus whether particular engineers were involved with direct lines or not does not necessarily say much about what they honestly thought was best. Hopefully more research into private papers of engineers, promoters, and managers from this period will provide more information on their opinions about optimal railway design.

An interesting example is that of “Castleman’s Corkscrew,” officially known as the Southampton and Dorchester Railway. Charles Castleman, the main promoter of this line, was a local lawyer, and he apparently wanted a “direct” line from Southampton to Dorchester. However, the engineer that he and the other promoters hired, Captain William Scarth Moorsom, persuaded them to accept the “corkscrew,” a circuitous line that went through many smaller towns. Moorsom’s obituary praised the design as one that achieved its goal “to secure the short local trade as well as the ‘through traffic’ ... in a manner so complete that not even a van, and hardly a carrier’s cart, now runs on the adjacent roads, owing to the better accommodation afforded by the railway.”52 It would be natural to think that this efficient design was inspired by Moorsom’s experience on the Birmingham and Gloucester Railway. There the directors during the planning process in the 1830s resisted the entreaties of almost all towns in the area to route their line through them. Against the advice of engineers such as Brunel, they insisted on a very direct line through difficult terrain. Moorsom accepted the job and ended up building the infamous Lickey Incline [21]. One might think that this experience would have taught him the folly of direct lines. But if so, it seems it did so only partially. His report to Castleman and the other promoters on the Southampton and Dorchester Railway suggested the “corkscrew” design primarily in order to minimize expenses of construction, avoiding many branches, not to accommodate local traffic. He accepted the promoters’ expectation that the main goal of the line was to provide for communication from the area to Southampton so they could reach London faster. (Given what we know of locality of traffic now, we can be fairly certain that such traffic must have contributed a very small fraction of revenues once the line was built. Unfortunately we do not have statistics for traffic on that line, which was absorbed very quickly into the LSWR.) For the Dorchester to Weymouth extension he proposed a direct line using the atmospheric system to cope with the hills in between [14].

10 The Railway Department of the Board of Trade (RDBoT)

Given the consensus among the early Victorian contemporaries about presence of large inefficiencies in the British railway system, could the RDBoT have achieved the savings of Casson’s counterfactual system, had Casson’s recommendations been followed in 1845? The answer is almost certainly no, for a combination of reasons.
The first obstacle is that by 1845 it was too late to avoid some of the inefficiencies of the British system, as many basic decisions had been made a decade or more earlier. Thus, for example, Casson’s counterfactual design has a single trunk line serving to connect London with Southampton and Bristol. However, by 1845, each of those cities had its “direct” line. Both were very profitable, and one of the most prominent direct line projects of 1845 was the Direct London and Exeter Railway. It was to run between those two, and was supported by The Times and James Morrison, although nothing came of it. There was still much that could have been done to make the system more efficient, as there were only slightly over 2,000 miles in service. But the RDBoT was not dealing with a tabula rasa.

The second obstacle to RDBoT’s constructing an efficient railway system was that it had neither the mandate nor the competence to do so. Gladstone certainly did wish to give it such a mission. But then he also wanted more radical moves, including eventual government ownership of railways. The opposition was too strong for that, however, as it was for direct government planning. The 5th report of his 1844 railway committee, which led to the enlargement of the role of the RDBoT, made a bow to the prevailing dogma, by citing the committee’s “strong prepossession against any general interference by the Government in the management and working of Railways” (p. vii). It never suggested that the government should plan any railways. The RDBoT was only to examine proposals brought to it by promoters. There were only a few small back doors to planning, as in the recommendation the RDBoT might, in evaluating a submission, take into consideration “a preferable scheme [that] is in bona fide contemplation, although not sufficiently forward to come simultaneously [to Parliament]” (p. xv). Note that the RDBoT was allowed to consider only projects that were well under way, not ones they thought up themselves.

Casson writes, for example, that the RDBoT “published detailed recommendations regarding the future structure of the network in 1845, based on over 20 detailed regional plans” ([5], p. 2). That is very questionable. The RDBoT did not publish detailed recommendations for the structure of the network. It published general guidelines (many reprinted in [5], Section 6.4, pp. 236–38). It then made detailed evaluations of proposed submissions and recommendations for Parliamentary action.

The RDBoT was also less of an outlier in British railway policy making than reading Casson’s book might make the reader think. Parliament was taking steps other than setting up the RDBoT mission to bring more cohesion to its decision (even though those steps did not go far). The House of Commons, as just one example, set up the Select Committee on Railway Bills Classification, to assign railway projects that were competing or related to the same committee. Further, as Casson notes, “almost all of the recommendations of the Board of Trade were accepted by [Parliament in 1845]” ([5], p. 238). House of Commons committees on railway projects of that year had to report on the degree to which they followed the RDBoT recommendations, and those reports were summarized conveniently in a book [3]. Overall, the differences were not that large.

Phasing out the RDBoT scrutiny of railway projects does not appear to have made a very large difference. Casson writes ([5], p. 239) that “[t]he ’agenda’ for 1846 therefore became to approve as many schemes as possible, and without the [RDBoT] there was no effective check on Parliament.” This claim is hard to accept. During the 1845 session,
Parliament, relying to some extent on the advice of the RDBoT, passed 121 railway acts based on consideration of 249 schemes. In the 1846 session, when presented with 558 projects, and without any assistance from the RDBoT, it passed 272 acts, for an almost identical 49% success rate\(^5\). That more than half the submitted projects were rejected also serves to qualify Casson’s repeated claims that MPs were reluctant to make hard decisions (e.g., \(^5\), p. 18). They often made hard decisions, because they had to. In very many cases, they were faced with directly competing proposals, and they had to select just one. Thus in the 1845 contest for a trunk line from London to York, there were three main competing proposals. The RDBoT recommended the Cambridge and Lincoln Railway, while the House of Commons committee voted in favor of the London and York Railway. Although none of those three lines overlapped another too much, it was understood universally that at most one would be approved. (In the case of the two lines called the Direct London and Manchester Railway, there was extensive overlap, and it seemed to be accepted univerally that at most one would be approved. In the end, those two schemes merged before going to Parliament, but their proposal failed Standing Orders scrutiny in early 1846, so does not even enter into the statistics cited above.)

In addition to lacking a mandate to design the British railway system, the RDBoT lacked the expertise to do it. In general, the RDBoT was perceived as lacking the gravitas appropriate for its role, and it did not have any railway engineers on its staff. Hence a railway paper, hostile to the the RDBoT, wrote, just as this body was beginning to issue its first opinions:

> We have all along been impressed with the persuasion that a juvenile peer, one or two specially juvenile barristers, a theorist “closet-man,” and a ci-devant Secretary “to some railway in the North,” could scarcely be expected to form very trustworthy arbitrators in perhaps the most important, extensive, and perplexing question, of what we may term the physical polity of the empire, that have ever yet been entered on by any sub-official body.\(^5\)

While this was an extreme attack on the RDBoT, other, more respectable, sources were often almost as scathing. Thus *The Times*, the epitome of Victorian respectability, also criticized the members of the RDBoT, one-by-one. Of Dalhousie, the head of the RDBoT, it wrote that he was “a young nobleman whose knowledge of these subjects, if he possesses any, must be intuitive, as on none of these points can he have had any practical experience.” It also wrote that of the two RDBoT members best acquainted with railways, the senior one “is well known to railway people; but he is known more by the amusement than by the instruction he has afforded them”\(^5\). *The Times* concluded that the RDBoT “does not possess the ability for the present duties it has to perform; and even if it did possess the ability, it would be utterly impossible for it to investigate with the necessary care a quarter of the new railway schemes now under consideration.”

Suppose, though, that by some miracle, the RDBoT had been given the mandate to plan the British railway system, and had been headed by a senior duke to give it respectability, with a couple of prominent railway engineers to do the technical design work. Would they have produced a system as efficient as Casson’s? It is essentially inconceivable that they would have anticipated the growth of the economy and of railway traffic in particular,
and so they would not have planned for the demands of 1914, as Casson did. Further, the RDBoT was generally supportive of direct lines (as in its positive evaluation of the TVR), although not as enthusiastic as The Times at the end of 1845 thought it should have been, as shown in the 19 November 1845 leader quoted in Section [5]. But the RDBoT did its work in late 1844 and early 1845, when the enthusiasm for direct lines was still far from its peak. Given the strength and pervasiveness of the mania for direct lines, documented earlier in this paper, chances are that a greatly empowered RDBoT would have partaken of the delusion, or had it imposed on them by an explicit mandate by Parliament.

11 British railway experts in early 1850s and government planning

The conclusion of the preceding section that strengthened government planning in 1845 would likely have produced an even less efficient system is supported by opinions of many of the top railway experts in the aftermath of the collapse of the Mania.

The quote from Hawkshaw in the Introduction about “the evils which Government interference would have created” through imposition of “[r]igid unbending straight lines” comes from a series of meetings of the Institution of Civil Engineers (ICE) in the spring of 1852. On 27 April, Braithwaite Poole presented a paper, “The economy of railways as a means of transit, ...”, which led to extensive discussion that also consumed the next two weekly meetings of the ICE (and thereby forced an unscheduled postponement of lectures planned for those slots). Poole’s paper together with a very detailed report (although not by any means a verbatim transcript) of that discussion was printed by the ICE [34]. Poole advocated amalgamation of railways of Great Britain into four territorial divisions. He claimed that

It would, perhaps, have been wise and much more economical, if the Government had, in the first instance, determined the directions in which railways should have been constructed throughout Great Britain and Ireland, instead of sanctioning the expenditure of such a large amount of extra capital, in making so many duplicate and unnecessarily competing lines; thereby causing traffic to be carried temporarily at ruinous fares and rates, until such limited opposition became consolidated, and ended in leasing, guaranteeing, or amalgamating the properties; in fact, present competition is now, in railway parlance, understood to mean eventual combination.

This brought out Hawkshaw’s rejoinder, quoted in the Introduction. In attendance and participating in the discussion were almost all of the most prominent railway engineers of that era (Stephenson, Locke, Bidder, Brunel) as well as some other railway figures (such as Captain Mark Huish, who had presented a paper on railway accidents at the 20 April meeting). Since there is no record of any of them objecting to Hawkshaw’s claims, it seems safe to conclude that they found them credible.

A year later, during the Cardwell Committee hearings, Robert Stephenson, in the passage partially quoted in Section [9] also blamed the preoccupation with direct lines for much of the inefficiency of the British railway network. These explicit declarations of Hawkshaw
The early British railway system

12 British central planning in the 19th century

There was very little chance of the RDBoT being given an effective and comprehensive planning mandate in 1845. It would have required too radical a departure from British political doctrine and practice of the time. (For a general discussion of British government and its interactions with the railway industry, see [33].) Grahame Boyes asked, in his review of Casson’s book, whether the policy change advocated by Casson was really feasible in the 1840s [2]. Gordon Biddle, in a letter commenting on the Boyes review, went further, and asserted that he was ready to “dismiss” the Casson work, and that counterfactuals such as that of Casson are pointless [2]. Biddle’s argument was that “[t]he UK’s railway system is what it is because of nineteenth century social, political and economic beliefs and practices, and the technology available at that time.” There is certainly much to be said for this view, since the same railway planning process, with the same widely acknowledged deficiencies and inefficiencies, continued for the rest of the 19th century. Laissez faire was the reigning doctrine, and markets were expected to be regulated by competition. James Morrison’s was a lonely voice back in 1836 in the advocacy of railway regulation.

Still, the early Victorians were pragmatic (as is noted by Casson, e.g., [3], p. 30). Their policies were influenced heavily by the abundance of capital in the country, and the desire to keep it from being wasted on foreign adventures. That was a key reason for the willingness to approve a variety of railway schemes. (See, for example, the extensive arguments of James Morrison in [25] as to why his proposed policies would not have these undesirable effects.) When they wanted to accomplish something that purely private capital was not willing to carry out, those early Victorians often did go against their laissez faire principles. Thus, for example, James Wilson, the founding editor and proprietor of the Economist, was one of the most doctrinaire of the free market advocates, and this made him callous towards the victims of the Irish Famine. Yet, as a government official, he worked hard to bring railways to India, then a British possession, and “he certainly elaborated,–and he believed that he originally suggested,–the peculiar form of State guarantee” that was used to finance those railways ([1], pp. 26–27). The British government also provided loans for the construction of Irish railways in the 1850s, in another controversial departure from the dominant dogma.

It seems likely that a centralized planning process of the kind envisaged by Casson could have arisen and produced a far more efficient system if the following two facts had been widely foreseen (for the first) or recognized (for the second) at the start of the Railway Mania of the 1840s:

- railway investments of the 1840s were going to be largely unprofitable
- railway revenues were coming primarily from local traffic

Neither of these facts went counter to any basic and deeply held religious, political, or socio-economic dogmas, and so could have been incorporated into public and private railway
planning relatively painlessly. Had there not been a plethora of private capital eagerly chasing (illusory, as it turned out) profits, the British elites might have resorted to a more systematic planning process. That was done in India under Dalhousie (who surely benefited from his experience as the head of the RDBoT during its critical 1844–45 period). It was also done for Ireland in the late 1830s, when a royal commission was set up to consider railways in that country. This commission spent almost two years, assisted by two experienced railway engineers, Charles Vignoles and John Macneill, and produced a remarkable report of over 700 pages (including a variety of appendices) with a design for a comprehensive system of railways.

13 Railway system counterfactuals and effects of industrial policy

Biddle’s criticism, which in principle applies to all counterfactuals, seems to go too far. Casson’s study is very valuable in showing in a precise quantitative form how much inefficiency had accumulated in the British railway system. It would be even more valuable if we had similar counterfactuals for other systems from that era, to see what effect various types of planning had. The railway system of India, for example, is a natural object of study. So is the Irish system, where we can compare the system recommended by the Commission of late 1830s to what was actually built, and to what would have been optimal for 1914.

Perhaps the most interesting comparison would be with the Belgian system, which, properly speaking, was the the world’s “first railway system,” in that it was the first to be planned as a whole. The Belgians were not pioneers in the development of railways, as they took their inspiration and much of the technology from Britain. However, soon after gaining their independence from the Netherlands, and as part of a conscious nation-building effort, they designed and built “a radical, top-down, territory-covering instrument” [9]. The main legislative acts were passed in 1834 and 1837, and by the early 1840s Belgium had a unified system of 345 miles, built and operated by the government. That was far short of the extent of British or American railways, but relative to either territory or population, it had the highest density in the world. It was often cited in debates about reforming British railway policy. A project similar to Casson’s, evaluating the efficiency of the system that developed in Belgium in the rest of the 19th century (through both government and private construction) would be very enlightening.

Many other European systems would also be valuable objects of study, since they invariably involved central government planning. Even more interesting would be studies of the American railroad network. In common with the British one, it grew up in a decentralized fashion. However, it was built based on very different principles, as was mentioned in Section [4] Costs were far lower than in Britain as a result of different design decisions, driven by a different environment, with higher costs of capital and higher growth rates. Counterfactuals could provide us with insights into whether the contrasting American and British approaches were optimal for their respective countries. They could also allow for an evaluation of whether the British railway building style was optimal for some of the other countries where it was adopted (such as Argentina, Australia, India). Would those coun-
tries have been better off following the American model and building something cheaply to a low standard first, and rebuilding later? This issue does not appear to have been considered in the literature.

14 Conclusions

Casson’s thesis that a slight change in policy in 1845 would have produced a dramatically more efficient railway system for Britain by 1914 appears very improbable. Given what most of the public and the policy makers knew at that time, it is more likely that a stronger role for government planners would have produced an even less efficient network.

On the other hand, most of the work that went into Casson’s project has high value. Even though his counterfactual design has little relation to what would likely have been produced in the 1840s, it does provide a very valuable quantitative estimate of the “first-mover disadvantage” that Britain suffered from as a pioneer, building a railway system before it was understood how it would be used, or how the economy as a whole would develop. Important insights into the potential of industrial policy, when faced with a revolutionary new technology, could be obtained if counterfactuals similar to Casson’s were produced for other railway systems of that period.

Notes

1Nor is any consideration given to the circularity involved in the Casson approach. He designed a network to accommodate the actual traffic demand of 1914. However, that traffic depended on economic developments that were influenced by the actual network that grew up in Victorian times. Had Casson’s network design been adopted in the 1840s, the economy and the rail traffic of 1914 would surely have been different. But one has to accept some limits on sophistication of counterfactuals.

2Aside from his Table 6.2, where he calls it the Railway Department, Casson consistently calls this body the Railway Committee. That is very unusual terminology, which, if it ever occurred during the Railway Mania, must have been very rare. The press and officials almost always cited the Railway Department, and the official reports that Casson discusses on proposed new railways were labeled as coming from the Railway Department. Inside the Board of Trade, and occasionally in the press, the group of five officials, often called “The Five Kings,” which was charged with preparation of the reports was sometimes referred as the Railway Board, cf. Parliamentary Papers 1844 (599) XLI.1 and 1845 (479) XXXIX.125. It was this Board that was set up in August 1844 and dissolved in July 1845. The Railway Department had existed before, and continued to exist afterwards, it was only its added function of scrutinizing new schemes that was short-lived.

3Railway Times, 3 July 1847, pp. 871–875. A similar transcription of the speech is given in The Times, 18 June 1847, p. 3.
4. It was reprinted, along with the other reports and Brunel’s response, in the *Railway Times*, issues of 5 and 8 January 1839. It was also reprinted in *Civil Engineer and Architects’ Journal*, vol. 2, Feb. 1839, pp. 48–53, where it is followed by Brunel’s response.

5. In the engine case, he went too far in stressing light trains for local connections and neglected the importance of high speed long distance travel.

6. It should be noted, though, that there never was a vote just about the importance of locality of traffic. There were many other issues involved, although they all focused on Brunel and his proposals.


8. Speech of 11 May 1836, in the House of Commons, reprinted in [26].


10. Sometimes, as on the title page, and in numerous newspaper reprints, rendered as “Plain maxims for railway speculators.”

11. It was eliminated from the 7th edition of 1840, most likely because investor interest in railways had died down, and the subject matter did not really fit in a book about technology.


14. *Select Committee on Railway and Canal Bills Second Report, Minutes of Evidence, Appendix*, Parliamentary Papers 1852–53 (170) XXXVIII.5. Laing’s testimony starts with Question 78 on Feb. 16, 1853. Stephenson’s testimony starts with Question 883 a week later, and was presented on three days, Feb. 23 and 25, and March 18. The John Hawkshaw testimony cited later is from the third report of this committee, PP 1852–53 (246) XXXVIII.175.

15. Laing’s general estimates of the British rail system were only approximately accurate. He was expecting to see soon a 7,000-mile system built at a cost of £40,000 per mile. In fact, as he was speaking, the UK (including Ireland, which he surely included in his estimates) already had about 7,300 miles of railways in service, built at a cost of about £37,000 per mile, see Table 2 in [27].

16. There were many savings that Laing might have been taking into account. In addition to such frequently mentioned moves as putting up simpler station buildings or using single track as opposed to double, there were the extra costs incurred because the competition for labor and materials during the heat of the Railway Mania raised prices. Furthermore,
landowners likely held out for higher compensations, and railway promoters were more willing to yield, when the Mania was raging.

17 Questions 1043–44 in PP 1852–53 (170) XXXVIII.5.

18 *Morning Chronicle*, 9 Sept. 1853, p. 3. A few years later Stephenson mentioned the higher figure for inefficiency, about 25%. However, that is not comparable, as on this latter occasion, in his “Address on election as President” of the Institution of Civil Engineers (ICE), *Minutes of Proceedings of the Institution of Civil Engineers*, vol. 15, 1856, p. 139, he claimed that about a quarter of all railway expenses went for land purchases (which was incorrect, land acquisitions costs were closer to 15%). He also claimed that this was an unjustified expenditure, since landowners almost always gained from the increased value of their remaining property. These claims were criticized, for example by *The Times*, Jan. 14, 1856, p. 8, as biased for blaming Parliament, shareholders, and landlords, and absolving management and engineers from blame for the financial problems of the industry.

19 Spencer’s essay was reprinted in the 25 November and 2 December 1854 issues. The commentary, which was published anonymously, but which it seems safe to attribute to Poor, appeared in those two issues as well as the next two. Poor’s commentary was in turn reprinted by Spencer in the book version of his essay [35].


21 Prospectus of the line, *The Times*, 12 August 1845, p. 10. John Dillon, James Morrison’s partner in the Fore-street textile business, was the temporary Chairman of the Committee of Management at that stage.

22 *The Times*, 5 May 1839, p. 3, and the *Morning Chronicle* of that day, p. 2.

23 Parliamentary Papers 1845 (118) XXXIX.411.

24 Hansard’s Parliamentary Debates, 3rd ser., vol. 78, 1845, cc. 1230–1235. The speech was given on 20 March, a week after the RDBoT issued its opinion in favor of TVR.


26 *The Times*, 16 December 1844, p. 5. This piece was not among the leaders, but also not part of the business section. In style it was similar to a leader, with news, analysis, and emphatic recommendations all mixed in.

27 *The Times*, 15 November 1845, p. 4. The previous day, *The Times* carried a report of Peel’s speech at the turning of the first sod at the TVR. In a leader in that issue, it did caution Parliament against approving too many “Direct Independents,” but the concern there appeared to be not that they were “direct,” but rather that by being “independent,” they were meant to compete with established lines.

28 *The Times*, 19 November 1845, p. 4.
29 Glasgow Argus, 19 January 1846.

30 Railway Record, 20 September 1845, p. 1135.

31 The Times, 15 October 1845, p. 4.

32 Railway Chronicle, 11 October 1845, p. 1524.

33 Herapath, 31 January 1846, pp. 154–155 and 14 February, pp. 217–218, for example. An earlier piece in this same publication, 18 October 1845, p. 2177, could be read as expressing some skepticism about the proposed Direct London and Exeter Railway, but also said that “good will very possibly come out of [the direct lines].”

34 Railway Times, 4 December 1847, pp. 1484–90.

35 The Times, 3 July 1837, p. 6.


37 Morning Chronicle, 12 September 1846, p. 2.

38 Economist, 8 November 1845, p. 1110.

39 Glasgow Argus, 23 April 1846, p. 2.

40 Herapath, 26 February 1848, p. 229, report on the semiannual meeting of the Midland Railway.

41 The Times, 22 September 1849, p. 4.


45 To be fair, one should reduce the 28,000 mile figure, as Morrison appeared to be talking of the entire UK, thus including Ireland.

46 Report of Proceedings of Railway Department, 1852, Parliamentary Papers 1852-53 [1696] LV.1, p. ix. The authorization mileage is given there as 12,561, but that includes Ireland, so 1,061 was subtracted as an approximation.


48 Supplement and Appendix to Votes and Proceedings, House of Commons, 1844.
Table in *Railway Chronicle*, 16 August 1845, p. 1015, and in *Morning Post* of that same day, p. 3.

Parliamentary Papers 1852–53 (170) XXXVIII.5, Q990.

Morrison committee hearings, *Parliamentary Papers*, 1846 (687) XIV.5, Q1154.


*Select Committee on Railways (on Railway Bills and Standing Orders)* Fifth Report, ..., Parliamentary Papers 1844 (318) XI.17.

Various figures are available, even in official government sources, but they do not differ substantially. The numbers of railway acts are taken from *Parliamentary Papers* 1867 [3844] [3844-I] [3844-II] [3844-III] XXXVIII Pt.I.1, 127, XXXVIII Pt.II.1, 579, Appendix EK. The numbers of projects cited here refer just to those projects that survived the preliminary scrutiny on Standing Orders, and were assigned to the “committees on merits.” For 1845, the figure is derived from *Parliamentary Papers* 1845 (620) XXXIX.7. For 1846, it is obtained from the 25 reports of that year’s Select Committee on Railway Bills Classification, *Parliamentary Papers* 1846, vol. XIII.


*The Times*, 16 Dec. 1844, p. 5. This was before the RDBoT had issued any reports.

“Second Report of the Commissioners Appointed to Consider and Recommend a General System of Railways for Ireland,” *Parliamentary Papers* 1837-38 [145] XXXV.449. Among the many conclusions one can draw from this work is further support for the argument that the early Victorians were unable to foresee the railway needs of their country as far in the future as 1914. The Commissioners planned out a network of railways for Ireland of about 1,000 miles, and thought it would be marginally viable. As it turned out, Ireland had 3,400 miles of railways in 1912, and, while not extremely profitable, they were on average slightly more profitable than English ones, see *Parliamentary Papers* 1914-16 [Cd. 8038] LX.643.

References

3. *Special Reports of Committees on Railway Bills Relating to the Adoption or Rejection of the Recommendations of the Board of Trade*, Sess. 1845, James Bigg and Son, 1845.


15. J. C. Jeaffreson, *The Life of Robert Stephenson, F.R.S., etc. etc. Late President of the Institution of Civil Engineers*, with chapters by W. Pole, 2 vols., Longman, Green, Longman, Robert & Green, 1864.


