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THE LIGHTHOUSE IN ECONOMICS*

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I. INTRODUCTION

THE lighthouse appears in the writings of economists because of the light it is supposed to throw on the question of the economic functions of government. It is often used as an example of something which has to be provided by government rather than by private enterprise. What economists usually seem to have in mind is that the impossibility of securing payment from the owners of the ships that benefit from the existence of the lighthouse makes it unprofitable for any private individual or firm to build and maintain a lighthouse.

John Stuart Mill in his *Principles of Political Economy*, in the chapter "Of the Grounds and Limits of the Laissez-Faire or Non-Interference Principle," said:

. . . it is a proper office of government to build and maintain lighthouses, establish buoys, etc. for the security of navigation: for since it is impossible that the ships at sea which are benefited by a lighthouse, should be made to pay a toll on the occasion of its use, no one would build lighthouses from motives of personal interest, unless indemnified and rewarded from a compulsory levy made by the state.¹

Henry Sidgwick in his *Principles of Political Economy*, in the chapter, "The System of Natural Liberty Considered in Relation to Production," had this to say:

. . . there is a large and varied class of cases in which the supposition [that an individual can always obtain through free exchange adequate remuneration for the services he renders] would be manifestly erroneous. In the first place there are some utilities which, from their nature, are practically incapable of being

* It is with great pleasure that I acknowledge the helpfulness of members of Trinity House and of officials in the Department of Trade and of the Chamber of Shipping in providing me with information on the British lighthouse system. They are not, however, in any way responsible for the use I have made of this information and should not be presumed to share the conclusions I draw.

¹ John Stuart Mill, *Principles of Political Economy*, in 3 *The Collected Works of John Stuart Mill* 968 (ed. J. M. Robson, 1965).

appropriated by those who produce them or would otherwise be willing to purchase them. For instance, it may easily happen that the benefits of a well-placed lighthouse must be largely enjoyed by ships on which no toll could be conveniently imposed.²

Pigou in the *Economics of Welfare* used Sidgwick's lighthouse example as an instance of uncompensated services, in which "marginal net product falls short of marginal social net product, because incidental services are performed to third parties from whom it is technically difficult to exact payment."³

Paul A. Samuelson, in his *Economics*, is more forthright than these earlier writers. In the section on the "Economic Role of Government," he says that "government provides certain indispensable *public* services without which community life would be unthinkable and which by their nature cannot appropriately be left to private enterprise." He gives as "obvious examples," the maintenance of national defense, of internal law and order, and the administration of justice and of contracts and he adds in a footnote:

Here is a later example of government service: lighthouses. These save lives and cargoes; but lighthouse keepers cannot reach out to collect fees from skippers. "So," says the advanced treatise, "we have here a divergence between *private* advantage and money cost [as seen by a man odd enough to try to make his fortune running a lighthouse business] and true *social* advantage and cost [as measured by lives and cargoes saved in comparison with (1) total costs of the lighthouse and (2) extra costs that result from letting one more ship look at the warning light]." Philosophers and statesmen have always recognized the necessary role of government in such cases of "external-economy divergence between private and social advantage."⁴

Later Samuelson again refers to the lighthouse as a "government activit[y] justifiable because of external effects." He says:

Take our earlier case of a lighthouse to warn against rocks. Its beam helps everyone in sight. A businessman could not build it for a profit, since he cannot claim a price from each user. This certainly is the kind of activity that governments would naturally undertake.⁵

Samuelson does not leave the matter here. He also uses the lighthouse to make another point (one not found in the earlier writers). He says:

² Henry Sidgwick, *The Principles of Political Economy* 406 (3rd ed., 1901). In the first edition (1883), the sentence relating to lighthouses is the same but the rest of the wording (but not the sense) is somewhat changed.

³ A. C. Pigou, *Economics of Welfare* 183-84 (4th ed. 1938).

⁴ Paul A. Samuelson, *Economics: An Introductory Analysis* 45 (6th ed. 1964). All references to Samuelson's *Economics* will be to the 6th edition.

⁵ Paul A. Samuelson, *supra* note 4, at 159.

. . . in the lighthouse example one thing should be noticed: The fact that the lighthouse operators cannot appropriate in the form of a purchase price a fee from those it benefits certainly helps to make it a suitable social or public good. But even if the operators were able—say, by radar reconnaissance—to claim a toll from every nearby user, that fact would not necessarily make it socially optimal for this service to be provided like a private good at a market-determined individual price. Why not? Because it costs society *zero extra cost* to let one extra ship use the service; hence any ships discouraged from those waters by the requirement to pay a positive price will represent a social economic loss—even if the price charged to all is no more than enough to pay the long-run expenses of the lighthouse. If the lighthouse is socially worth building and operating—and it need not be—a more advanced treatise can show how this social good is worth being made optimally available to all.⁶

There is an element of paradox in Samuelson's position. The government has to provide lighthouses because private firms could not charge for their services. But if it were possible for private firms to make such a charge they should not be allowed to do so (which also presumably calls for government action). Samuelson's position is quite different from that of Mill, Sidgwick or Pigou. As I read these writers, the difficulty of charging for the use of a lighthouse is a serious point with important consequences for lighthouse policy. They had no objection to charging as such and therefore, if this were possible, to the private operation of lighthouses. Mill's argument is not, however, free from ambiguity. He argues that the government should build and maintain lighthouses because, since ships benefitted cannot be made to pay a toll, private enterprise would not provide a lighthouse service. But he then adds a qualifying phrase "unless indemnified and rewarded from a compulsory levy made by the state." I take a "compulsory levy" to be one imposed on ships benefitted by the lighthouse (the levy would be, in effect, a toll). The element of ambiguity in Mill's exposition is whether he meant that the "compulsory levy" would make it possible for people to "build lighthouses from motives of personal interest" and therefore for government operation to be avoided or whether he meant that it was not possible (or desirable) for private firms to be "indemnified and rewarded from a compulsory levy" and that therefore government operation was required. My own opinion is that Mill had in mind the first of these alternative interpretations and, if this is right, it represents an important qualification to his view that building and maintaining lighthouses is "a proper office of the government." In any case, it seems clear that Mill had no objection in principle to the imposition of tolls.⁷ Sidgwick's point (to which Pigou refers) raises no problems of inter-

⁶ *Id.* at 151.

⁷ Compare what Mill has to say on tolls in *supra* note 1, at 862-63.

pretation. It is, however, very restricted in character. He says that "it may easily happen that the benefits of a well-placed lighthouse must be largely enjoyed by ships on which no toll could be conveniently imposed." This does not say that charging is impossible: indeed, it implies the contrary. What it says is that there may be circumstances in which most of those who benefit from the lighthouse can avoid paying the toll. It does not say that there may not be circumstances in which the benefits of the lighthouse are largely enjoyed by ships on which a toll could be conveniently laid and it implies that, in these circumstances, it would be desirable to impose a toll—which would make private operation of lighthouses possible.

It is, I think, difficult to understand exactly what Mill, Sidgwick and Pigou meant without some knowledge of the British lighthouse system since, although these writers were probably unfamiliar with how the British system operated in detail, they were doubtless aware of its general character and this must have been in the back of their minds when they wrote about lighthouses. However, knowledge of the British lighthouse system not only enables one to have a greater understanding of Mill, Sidgwick and Pigou; it also provides a context within which to appraise Samuelson's statements about lighthouses.

II. THE BRITISH LIGHTHOUSE SYSTEM

The authorities in Britain which build and maintain lighthouses are Trinity House (for England and Wales), the Commissioners of Northern Lighthouses (for Scotland) and the Commissioners of Irish Lights (for Ireland). The expenses of these authorities are met out of the General Lighthouse Fund. The income of this Fund is derived from light dues, which are paid by ship-owners. The responsibility for making the arrangements for the payment of the light dues and for maintaining the accounts is placed on Trinity House (whether the payments are made in England, Wales, Scotland or Ireland) although the actual collection is made by the customs authorities at the ports. The money obtained from the light dues is paid into the General Lighthouse Fund, which is under the control of the Department of Trade. The lighthouse authorities draw on the General Lighthouse Fund to meet their expenditures.

The relation of the Department of Trade to the various lighthouse authorities is somewhat similar to that of the Treasury to a British Government Department. The budgets of the authorities have to be approved by the Department. The proposed budgets of the three authorities are submitted about Christmastime and are discussed at a Lighthouse Conference held annually in London. In addition to the three lighthouse authorities and

the Department, there are also present at the conference members of the Lights Advisory Committee, a committee of the Chamber of Shipping (a trade association) representing shipowners, underwriters and shippers. The Lights Advisory Committee, although without statutory authority, plays an important part in the review procedure and the opinions it expresses are taken into account both by the lighthouse authorities in drawing up their budgets and by the Department in deciding on whether to approve the budgets. The light dues are set by the Department at a level which will yield, over a period of years, an amount of money sufficient to meet the likely expenditures. But in deciding on the program of works and changes in existing arrangements the participants in the conference, and particularly the members of the Lights Advisory Committee, have regard to the effect which new works or changes in existing arrangements would have on the level of light dues.

The basis on which light dues are levied was set out in the Second Schedule to the Merchant Shipping (Mercantile Marine Fund) Act of 1898.⁸ Modifications to the level of the dues and in certain other respects have been made since then by Order in Council but the present method of charging is essentially that established in 1898. The dues are so much per net ton payable per voyage for all vessels arriving at, or departing from, ports in Britain. In the case of "Home Trade" ships, there is no further liability for light dues after the first 10 voyages in a year and in the case of "Foreign-going" ships, there is no further liability after 6 voyages. The light dues are different for these two categories of ship and are such that, for a ship of given size, 10 voyages for a "Home Trade" ship yield approximately the same sum as 6 voyages for a "Foreign-going" ship. Some categories of ship pay at a lower rate per net ton: sailing vessels of more than 100 tons and cruise ships. Tugs and pleasure yachts make an annual payment rather than a payment per voyage. In addition, some ships are exempt from light dues: ships belonging to the British or Foreign Governments (unless carrying cargo or passengers for remuneration), fishing vessels, hoppers and dredges, sailing vessels (except pleasure yachts) of less than 100 tons, all ships (including pleasure yachts) of less than 20 tons, vessels (other than tugs or pleasure yachts) in ballast, or putting in for bunker fuel or stores or because of the hazards of the sea. All these statements are subject to qualification. But they make clear the general nature of the scheme.

The present position is that the expenses of the British lighthouse service are met out of the General Lighthouse Fund, the income of which comes from light dues. In addition to expenditures on lighthouses in Great Britain

⁸ 61 & 62 Vic., c.44, sch.2.

and Ireland, the Fund is also used to pay for the maintenance of some colonial lighthouses and to meet the cost of marking and clearing wrecks (to the extent that these are not reimbursed by a salvaging firm), although these payments amount to only a very small proportion of total expenditures. There are also expenditures on lighthouses which are not met out of the Fund. The expenses of building and maintaining "local lights," those which are only of benefit to ships using particular ports, are not paid for out of the Fund, which is restricted to the finance of lighthouses which are useful for "general navigation." The expenditures for "local lights" are normally made by harbour authorities, and are recovered out of port dues.

III. THE EVOLUTION OF THE BRITISH LIGHTHOUSE SYSTEM

Mill, writing in 1848, and Sidgwick, in 1883, to the extent that they had in mind the actual British lighthouse system, would obviously be thinking of earlier arrangements. To understand Mill and Sidgwick, we need to know something of the lighthouse system in the 19th century and of the way in which it had evolved. But a study of the history of the British lighthouse system is not only useful because it helps us to understand Mill and Sidgwick but also because it serves to enlarge our vision of the range of alternative institutional arrangements available for operating a lighthouse service. In discussing the history of the British lighthouse service, I will confine myself to England and Wales, which is, presumably, the part of the system with which Mill and Sidgwick would have been most familiar.

The principal lighthouse authority in England and Wales is Trinity House. It is also the principal pilotage authority for the United Kingdom. It maintains Homes and administers charitable trusts for mariners, their wives, widows, and orphans. It has also many miscellaneous responsibilities, for example, the inspection and regulation of "local lights" and the provision of Nautical Assessors or Trinity Masters at the hearing of marine cases in the Law Courts. It is represented on a number of harbour boards, including the Port of London Authority, and members of Trinity House serve on many committees (including government committees) dealing with maritime matters.

Trinity House is an ancient institution. It seems to have evolved out of a medieval seamen's guild. A petition asking for incorporation was presented to Henry VIII in 1513 and letters patent were granted in 1514.⁹ The charter gave Trinity House the right to regulate pilotage, and this, together with its

⁹ G. G. Harris, *Trinity House of Deptford 1515-1660*, at 19-20 (1969). My sketch of the early history of Trinity House is largely based on this work, particularly ch. 7, *Beacons, Markes and Signes for the Sea* and ch. 8, *An Vncertaine Light*.

charitable work, represented its main activity for many years. It did not concern itself with lighthouses until much later.

There seem to have been few lighthouses in Britain before the seventeenth century and not many until the eighteenth century. There were, however, sea-marks of various kinds. Most of these were on land and were not designed as aids to mariners, consisting of church steeples, houses, clumps of trees, etc. Buoys and beacons were also used as aids to navigation. Harris explains that these beacons were not lighthouses but "poles set in the seabed, or on the seashore, with perhaps an old lantern affixed to the top."¹⁰ The regulation of seamarks and the provision of buoys and beacons in the early sixteenth century was the responsibility of the Lord High Admiral. To provide buoys and beacons, he appointed deputies, who collected dues from ships presumed to have benefitted from the marks. In 1566 Trinity House was given the right to provide and also to regulate seamarks. They had the responsibility of seeing that privately owned seamarks were maintained. As an example, a merchant who had cut down, without permission, a clump of trees which had served as a seamark, was upbraided for "preferring a tryfle of private benefitt to your selfe before a great and generall good to the publique."¹¹ He could have been fined £100 (with the proceeds divided equally between the Crown and Trinity House). There seems to have been some doubt as to whether the Act of 1566 gave Trinity House the right to place seamarks in the water. This doubt was removed in 1594, when the rights of beaconage and buoyage were surrendered by the Lord High Admiral and were granted to Trinity House. How things worked out in practice is not clear since the Lord High Admiral continued to regulate buoyage and beaconage after 1594 but gradually the authority of Trinity House in this area seems to have been acknowledged.

Early in the seventeenth century, Trinity House established lighthouses at Caister and Lowestoft.¹² But it was not until late in the century that it built another lighthouse. In the meantime the building of lighthouses had been taken over by private individuals. As Harris says: "A characteristic element in Elizabethan society were the promoters of projects advanced ostensibly for the public benefit but in reality intended for private gain. Lighthouses did not escape their attention."¹³ Later he says: "With the completion of the lighthouse at Lowestoft, the Brethren rested content and did no more . . . when

¹⁰ *Id.* at 153.

¹¹ *Id.* at 161.

¹² *Id.* at 183-87.

¹³ *Id.* at 180-81.

in February 1614 they were asked to do something positive, and erect lighthouses at Winterton in response to a petition by some three hundred shipmasters, owners and fisherman, they seem to have done nothing. Failure to respond to demands of this sort not only shook confidence in the Corporation; since there was a prospect of profit, it was tantamount to inviting private speculators to intervene. They soon did so."¹⁴ In the period 1610-1675, no lighthouses were erected by Trinity House. At least 10 were built by private individuals.¹⁵ Of course, the desire of private individuals to erect lighthouses put Trinity House in a quandary. On the one hand it wanted to be recognized as the only body with authority to construct lighthouses; on the other, it was reluctant to invest its own funds in lighthouses. It therefore opposed the efforts of private individuals to construct lighthouses but, as we have seen, without success. Harris comments: "The lighthouse projectors were typical of the speculators of the period: they were not primarily motivated by considerations of public service. . . . There was a strong foundation of truth in what Sir Edward Coke told Parliament in 1621 'Proiectours like wattermen looke one waye and rowe another: they pretend publique profit, intende private.'"¹⁶ The difficulty was that those who were motivated by a sense of public service did not build the lighthouses. As Harris says later: "Admittedly the primary motive of the lighthouse projectors was personal gain, but at least they got things done."¹⁷

The method used by private individuals to avoid infringing Trinity House's statutory authority was to obtain a patent from the Crown which empowered them to build a lighthouse and to levy tolls on ships presumed to have benefitted from it. The way this was done was to present a petition from ship-owners and shippers in which they said that they would greatly benefit from the lighthouse and were willing to pay the toll. Signatures were, I assume, obtained in the way signatures to petitions are normally obtained but no doubt they often represented a genuine expression of opinion. The King presumably used these grants of patents on occasion as a means of rewarding those who had served him. Later, the right to operate a lighthouse and to levy tolls was granted to individuals by Acts of Parliament.

The tolls were collected at the ports by agents (who might act for several lighthouses), who might be private individuals but were commonly customs officials. The toll varied with the lighthouse and ships paid a toll, varying with the size of the vessel, for each lighthouse passed. It was normally a rate

¹⁴ *Id.* at 187.

¹⁵ D. Alan Stevenson, *The World's Lighthouses Before 1820*, at 259 (1959).

¹⁶ G. G. Harris, *supra* note 9, at 214.

¹⁷ *Id.* at 264.

per ton (say $\frac{1}{4}d$ or $\frac{1}{2}d$) for each voyage. Later, books were published setting out the lighthouses passed on different voyages and the charges that would be made.

In the meantime, Trinity House came to adopt a policy which maintained its rights while preserving its money (and even increasing it). Trinity House would apply for a patent to operate a lighthouse and would then grant a lease, for a rental, to a private individual who would then build the lighthouse with his own money. The advantage to a private individual of such a procedure would be that he would secure the co-operation rather than the opposition of Trinity House.

An example of this is afforded by the building, and rebuilding, of what is probably the most celebrated British lighthouse, the Eddystone, on a reef of rocks some 14 miles offshore from Plymouth. D. Alan Stevenson comments: "The construction of 4 lighthouses in succession on the Eddystone Rocks by 1759 provides the most dramatic chapter in lighthouse history: in striving to withstand the force of the waves, their builders showed enterprise, ingenuity and courage of a high order."¹⁸ In 1665, a petition for a lighthouse on the Eddystone Rocks was received by the British Admiralty. Trinity House commented that, though desirable, it "could hardly be accomplished."¹⁹ As Samuel Smiles, that chronicler of private enterprise, says, ". . . it was long before any private adventurer was found ready to undertake so daring an enterprise as the erection of a lighthouse on the Eddystone, where only a little crest of rock was visible at high water, scarcely capable of affording foothold for a structure of the very narrowest basis."²⁰ In 1692, a proposal was put forward by Walter Whitfield, and Trinity House made an agreement with him under which he was to build the lighthouse and Trinity House was to share equally in whatever profits were made. Whitfield did not, however, undertake the work. His rights were transferred to Henry Winstanley, who, after negotiating with Trinity House, made an agreement in 1696 under which he was to receive the profits for the first five years, after which Trinity House was to share equally in whatever profits were earned for 50 years. Winstanley built one tower and then replaced it with another, the lighthouse being completed in 1699. However, in a great storm in 1703, the lighthouse was swept away, and Winstanley, the lighthousekeepers, and some of his workmen, lost their lives. The total cost up to this time had been £8,000 (all of which had been borne by Winstanley) and the receipts had been £4,000. The government gave Winstanley's widow £200 and a pension of £100 per annum. If the construction of light-

¹⁸ D. Alan Stevenson, *supra* note 15, at 113.

¹⁹ *Id.*

²⁰ 2 Samuel Smiles, *Lives of the Engineers* 16 (1861).

houses had been left solely to men with the public interest at heart, the Eddystone would have remained for a long time without a lighthouse. But the prospect of private gain once more reared its ugly head. Two men, Lovett and Rudyerd, decided to build another lighthouse. Trinity House agreed to apply for an Act of Parliament authorizing the rebuilding and the imposition of tolls and to lease their rights to the new builders. The terms were better than had been granted to Winstanley—a 99 year lease at an annual rent of £100 with 100 per cent of the profits going to the builders. The lighthouse was completed in 1709 and remained in operation until 1755 when it was destroyed by fire. The lease still had some 50 years to run and the interest in the lighthouse had passed into other hands. The new owners decided to rebuild and engaged one of the great engineers of the time, John Smeaton. He determined to build the lighthouse entirely of stone, the previous structure having been made of wood. The lighthouse was completed by 1759. It continued in operation until 1882, when it was replaced by a new structure built by Trinity House.²¹

We may understand the significance of the part played by private individuals and organizations in the provision of lighthouses in Britain if we consider the position at the beginning of the nineteenth century. The 1834 Committee on Lighthouses stated in their report that at that time there were in England and Wales (excluding floating lights) 42 lighthouses belonging to Trinity House, 3 lighthouses leased by Trinity House and in charge of individuals; 7 lighthouses leased by the Crown to individuals; 4 lighthouses in the hands of proprietors, held originally under patents and subsequently sanctioned by Acts of Parliament; or 56 in total, of which 14 were run by private individuals and organizations.²² Between 1820 and 1834, Trinity House had built 9 new lighthouses, had purchased 5 lighthouses leased to individuals (in the case of Burnham, replacing the one purchased by building two lighthouses not counted in the 9 new built lighthouses) and had purchased 3 lighthouses owned by Greenwich Hospital (which acquired the lighthouses by bequest in 1719, they having been built by Sir John Meldrum about 1634). The position in 1820 was that there were 24 lighthouses operated by Trinity House and 22 by private individuals or organizations.²³ But many of the Trinity House lighthouses had not been built originally by them but had been acquired by purchase or as the result of the expiration of a lease (of which the Eddystone Lighthouse is an example, the lease having expired in 1804). Of the 24 light-

²¹ This account of the building and rebuilding of the Eddystone lighthouse is based on Stevenson, *supra* note 15, at 113-26.

²² See Report from the Select Committee on Lighthouses, in Parl. Papers Sess. 1834, vol. 12, at vi (Reports from Committees, vol. 8) [hereinafter cited as "1834 Report"].

²³ *Id.* at vii.

houses operated by Trinity House in 1820, 12 had been acquired as a result of the falling in of the lease while one had been taken over from the Chester Council in 1816, so that only 11 out of the 46 lighthouses in existence in 1820 had been originally built by Trinity House while 34 had been built by private individuals.²⁴

Since the main building activity of Trinity House started at the end of the eighteenth century, the dominance of private lighthouses was even more marked in earlier periods. Writing of the position in 1786, D. A. Stevenson says: "It is difficult to assess the attitude of Trinity House towards the English coastal lighthouses at this time. Judging by its actions and not by its protestations, the determination of the Corporation to erect lighthouses had never been strong: before 1806, whenever possible it had passed on to lessees the duty of erecting them. In 1786 it controlled lighthouses at 4 places: at Caister and Lowestoft (both managed in virtue of its local buoyage dues), and at Winterton and Scilly (both erected by the Corporation to thwart individuals keen to profit from dues under Crown patents)."²⁵

However, by 1834, as we have seen, there were 56 lighthouses in total and Trinity House operated 42 of them. And there was strong support in Parliament for the proposal that Trinity House purchase the remaining lighthouses in private hands. This had been suggested by a Select Committee of the House of Commons in 1822, and Trinity House began shortly afterwards to buy out certain of the private interests in lighthouses. In 1836, an Act of Parliament vested all lighthouses in England in Trinity House, which was empowered to purchase the remaining lighthouses in private hands.²⁶ This was accomplished by 1842, after which date there were no longer any privately owned lighthouses, apart from "local lights," in England.

The purchase by Trinity House between 1823 and 1832 of the remainder of the leases that it had granted for Flatholm, Ferns, Burnham and North and South Forelands cost about £74,000.²⁷ The rest of the private lighthouses were purchased following the 1836 Act for just under £1,200,000, the largest sums

²⁴ Of the 24 lighthouses operated by Trinity House in 1820, Foulness (1), Portland (2), Caskets (3), Eddystone (1), Lizard (2), St. Bees (1) and Milford (2), appear to have been acquired by the falling in of the leases and to have been built, as well as operated, by private individuals. This is based on information contained in D. Alan Stevenson, *supra* note 15. I have assumed, when a patent for a lighthouse was obtained by Trinity House and was then leased to a private individual, that the construction was undertaken and paid for by that individual, which appears to have been the case. See *id.* at 253 & 261.

²⁵ *Id.* at 65.

²⁶ An Act for vesting Lighthouses, Lights, and Sea Marks on the Coasts of England in the Corporation of Trinity House of Deptford Strond, 6 & 7 Will. 4, c.79 (1836).

²⁷ 1834 Report, at vii.

being paid for the Smalls lighthouse, for which the lease had 41 years to run and for three lighthouses, Tynemouth, Spurn, and Skerries, for which the grant had been made in perpetuity by Act of Parliament. The sums paid for these four lighthouses were: Smalls, £170,000; Tynemouth, £125,000; Spurn, £330,000; Skerries, £445,000.²⁸ These are large sums, the £445,000 paid for Skerries being equivalent (according to a high authority) to \$7-10 million today, which would probably have produced (owing to the lower level of taxation) a considerably higher income than today. Thus we find examples of men who were not only, in Samuelson's words, "odd enough to try to make a fortune running a lighthouse business," but actually succeeded in doing so.

The reasons why there was such strong support for this consolidation of lighthouses in the hands of Trinity House can be learned from the Report of the Select Committee of the House of Commons of 1834:

Your committee have learned with some surprise that the Lighthouse Establishments have been conducted in the several parts of the United Kingdom under entirely different systems; different as regards the constitution of the Boards of Management, different as regards the Rates or Amount of the Light Dues, and different in the principle on which they are levied. They have found that these Establishments, of such importance to the extensive Naval and Commercial Interests of the Kingdom, instead of being conducted under the immediate superintendence of the Government, upon one uniform system, and under responsible Public Servants, with proper foresight to provide for the safety of the Shipping in the most efficient manner, and on the most economical plans, have been left to spring up, as it were by slow degrees, as the local wants required, often after disastrous losses at sea; and it may, perhaps, be considered as matter of reproach to this great country, that for ages past, as well as at the present time, a considerable portion of the establishments of Lighthouses have been made the means of heavily taxing the Trade of the country, for the benefit of a few private individuals, who have been favoured with that advantage by the Ministers and the Sovereign of the day.

Your Committee cannot consider it warrantable in Government, at any time, unnecessarily to tax any branch of the Industry of the Country; and particularly unwarrantable to tax the Shipping, which lies under many disadvantages, in being obliged to support unequal competition with the Shipping of other countries. Your Committee are of opinion that the Shipping ought, on very special grounds, to be relieved from every local and unequal tax not absolutely necessary for the services for which it is ostensibly levied.

Your Committee, therefore, strongly recommend that the Light Dues should in every case be reduced to the smallest sums requisite to maintain the existing

²⁸ Report from the Select Committee on Lighthouses, in Parl. Papers Sess. 1845, vol. 9, at vi [hereinafter cited as "1845 Report"].

Lighthouses and Floating Lights, or to establish and maintain such new Establishments as shall be required for the benefit of the Commerce and Shipping of the country.

Your Committee have, further to express their regret that so little attention should have been paid by the competent authorities to the continued exaction, contrary to the principle just expressed, of very large sums which have been annually levied, avowedly, as Light Dues, to defray the expenses of Lighthouses but, in reality, to be applied to the use of a few favoured individuals, and for other purposes not contemplated at the time of the establishment of the Lighthouses. It further appears particularly objectionable to have continued these abuses by the renewal of the Leases of several Lighthouses, after a Select Committee of this House had called the particular attention of Parliament, 12 years ago, to the subject. . . .²⁹

Although there was emphasis in this report on the untidiness of the then existing arrangements and suggestions (here and elsewhere) that some of the private lighthouses were not run efficiently, there can be little doubt that the main reason why the consolidation of lighthouses under Trinity House received such strong support was that it was thought that it would lead to lower light dues. The suggestion was, of course, made that lighthouses should be paid for out of the public treasury,³⁰ which would lead to the abolition of light dues, but this was not done and we need not discuss it here.

It is not apparent why it was thought that the consolidation of lighthouses under Trinity House would lower light dues. There is some basis for this view in the theory of complementary monopolies, but Cournot did not publish his analysis until 1838 and it could not have affected the views of those concerned with British lighthouses even if they were quicker to appreciate the significance of Cournot's analysis than the economics profession itself.³¹ In any case, there were good reasons for thinking that little, if any, reduction in light dues would follow the consolidation. Since compensation was to be paid to the former owners of lighthouses, the same amount of money would need to be raised as before. And, as was pointed out by Trinity House, since "the Dues were mortgaged as security for the repayment of the money borrowed . . . the Dues cannot be taken off until the debt shall be discharged."³² In

²⁹ 1834 Report, at iii-iv.

³⁰ For example, the Select Committee on Lighthouses of 1845 recommended "That all expenses for the erection and maintenance of Lighthouses . . . be henceforth defrayed out of the public revenue. . . ." 1845 Report, at xii.

³¹ See Augustin Cournot, *Researches into the Mathematical Principles of the Theory of Wealth* 99-104 (Nathaniel T. Bacon trans., 1897). See also Marshall's discussion of Cournot's analysis, 1 *Principles of Economics* 493-95 (9th (Variorum) ed., 1961).

³² 1845 Report, at vii.

fact, the light dues were not reduced until after 1848, when the loans were paid off.³³

Another way in which some reduction in light dues could have been achieved would have been for Trinity House not to earn a net income from the operation of its own lighthouses. This money was, of course, devoted to charitable purposes, mainly the support of retired seamen, their widows and orphans. Such a use of funds derived ultimately from the light dues had been found objectionable by Parliamentary Committees in 1822 and 1834. The 1834 Committee, noting that 142 persons were supported in almshouses and that 8,431 men, women and children received sums ranging from 36 shillings to 30 pounds per annum, proposed that all pensions cease with the lives of those then receiving them and that no new pensioners be appointed, but this was not done.³⁴

In 1853, the Government proposed that the proceeds of the light dues no longer be used for charitable purposes. Trinity House responded, in a representation to Her Majesty, claiming that this income was as much its property as it was for private proprietors of lighthouses (to whom compensation was paid):

The management of lighthouses has been entrusted to [Trinity House], from time to time, by special grants from the Crown or the Legislature. But the acceptance of such grants has in no respect changed the legal position of the Corporation as a private guild, except in so far as it has necessitated the maintenance of lights as a condition of retaining such grants. The legal position of the Corporation with regard to the Crown and the public has in no respect differed from that of individual grantees of light dues or other franchises, as markets, ports, fairs, etc. The argument that the Corporation was ever legally bound to reduce the light dues to the amount of the expenses of maintenance, inclusive or exclusive of interest on the cost of erection, and that they had no right to make any other appropriation, is altogether unfounded in reason or law . . . a grant is valid, if the dues granted are reasonable at the time of the grant, and continues so valid, notwithstanding that from a subsequent increase of shipping the dues may afford a profit. The Crown in these cases acts on behalf of the public; and if it makes a bargain, reasonable at the time, it cannot afterwards retract. . . . The title of the Corporation to the lighthouses erected by them is equally valid with the titles [of private proprietors] . . . , and the charitable purposes to which a portion of those revenues is applied, render the claims of the Corporation at least as deserving of favourable consideration as those of individuals. . . . The lighthouses and light dues belong to [Trinity House], for the purposes of the Corporation, and are, in the strictest sense, their property for those purposes. . . . The proposal of Her Majesty's Government appears to be that the use of the whole of this vast mass

³³ T. Golding, *Trinity House from Within* 63 (1929).

³⁴ 1834 Report, at xiii.

of property shall be given to the shipowners, without any charge beyond the expense of maintaining the lights. It is, as affecting the Corporation's charities, an alienation of property, devoted to the benefit of the decayed masters and seamen of the merchant's service, and their families, and a gift of that property to the shipowners.³⁵

This representation was referred to the Board of Trade, which found the arguments of Trinity House without merit:

The Lords of the Committee do not call in question the title of the Corporation of the Trinity House to the property so alleged to be vested in them; but there is . . . this distinction between the case of the Corporation and that of the individuals referred to, that the property so vested in the Corporation has been held and is held by them, so far at least as relates to the light dues in question, in trust for public purposes, and liable, therefore, to be dealt with upon considerations of public policy. Their Lordships cannot admit that is any violation of the principle of property in the reduction of a tax levied for public purposes, where no vested interests have been acquired in the proceeds of the tax; and where the tax in question is one levied upon a particular class of Your Majesty's subjects, without that class deriving any adequate advantage in return (and any excess of light dues beyond the amount necessary to maintain the lights is a tax of this character), the reduction of such a tax not only involves no violation of the principle of property, but is in the highest degree just and expedient. Their Lordships cannot recognise any vested interests in the expectants of the bounty dealt out to poor mariners and their families, at the pleasure of the Corporation, from the surplus revenues of the lights; since it is of the essence of a vested interest that the individuals to whom the privilege is secured are ascertained and known to the law; and while their Lordships would religiously abstain from interfering in the slightest degree with the pensions or other benefits already conferred upon any person whatsoever, they can acknowledge no injustice in resolving, upon grounds of public policy, to confer upon no new persons a right, to which at present no individual can advance any claim or title. . . . Their Lordships consider that the lights should be maintained by the light dues; and that what the providence of former generations has done in applying dues levied upon ships to the erection of lights for the preservation of ships from shipwreck, is the natural and just inheritance of those who navigate the coasts of the United Kingdom at the present time, and ought to be freely enjoyed by them at the lowest possible charge which the circumstances of the case may permit, and that no other consideration whatever should on any account be suffered to enter into the question.³⁶

The use of the proceeds of the light dues for charitable purposes ceased in

³⁵ Trinity House Charities: Representation from the Corporation of the Trinity House to Her Majesty in Council, on proposal of Government to prevent the Application of Light and Other Dues to Charitable Purposes, in Parl. Papers Sess. 1852-53, vol. 98, at 601, 602-03.

³⁶ *Id.* at 605-06.

1853. As a result, some reduction in the light dues was made possible, price moved closer to marginal cost and numerous ancient mariners and their families, unknown to the law and to us, were worse provided for. But it will be observed that it was not necessary to have a consolidation of all lighthouses under Trinity House to bring about this result.

This change was part of the reorganisation which, in 1853, established the Mercantile Marine Fund, into which the light dues (and certain other monies) were paid and out of which the expenses of running the lighthouse service and some other expenses incurred on behalf of shipping were met.³⁷ In 1898, the system was again changed. The Mercantile Marine Fund was abolished and the General Lighthouse Fund was set up. The light dues (and only the light dues) were paid into this fund, which was to be used solely for the maintenance of the lighthouse service. At the same time, the system for computing the light dues was simplified, the charge made on each voyage no longer depending, as it had before, on the number of lighthouses which a ship passed or from which it could be presumed to derive a benefit.³⁸ What was established in 1898 was essentially the present system of lighthouse finance and administration described in Section II. There have, of course, been changes in detail but the general character of the system has remained the same since 1898.

IV. CONCLUSION

The sketch of the British lighthouse system and its evolution in Sections II and III shows how limited are the lessons to be drawn from the remarks of Mill, Sidgwick and Pigou. Mill seems to be saying that if something like the British system for the finance and administration of lighthouses is not instituted, private operation of lighthouses would be impossible (which is not how most modern readers would be likely to interpret him). Sidgwick and Pigou argue that if there are ships which benefit from the lighthouse but on which tolls cannot be levied, then government intervention may be called for. But the ships which benefit from British lighthouses but do not pay would

³⁷ The Merchant Shipping Law Amendment Act of 1853, 16 & 17 Vic., c.131 §§ 3-30.

³⁸ Merchant Shipping (Mercantile Marine Fund) Act of 1898, 61 & 62 Vic., c.44. See the Committee of Inquiry into the Mercantile Marine Fund, Report, Cd. No. 8167 (1896), also found in Parl. Papers Sess. 1896, vol. 41, at 113, for the reasons why this change was made in the way light dues were computed. The recommendations of this Committee were adopted by the Government and were incorporated in the 1898 Act. Objections to the old system arose because the list of lighthouses from which ships were presumed to benefit on a given voyage was based on the course of a sailing ship rather than that of a steamship, because the foreign rate was charged to the last port reached in the United Kingdom in the course of a voyage and not to the first, while much was made of the complexity of the old method of calculating the dues.

presumably be, in the main, those operated by foreign shipowners which do not call at British ports. In which case, it is not clear what the character of the required government action is or what governments are supposed to act. Should, for example, the Russian, Norwegian, German and French governments compel their nationals to pay the toll even though their ships do not call at British ports or should these governments take action by paying a sum raised out of general taxation into the British General Lighthouse Fund? Or is the British government supposed to take action by raising revenue out of general taxation to be paid into the Lighthouse Fund to offset the failure of these foreign governments to compel their nationals to contribute to the Lighthouse Fund?

Now consider what would be likely to happen if support out of general taxation were substituted for the light dues (which seems to be what Samuelson would like). First of all, it would increase the extent to which the British Government and particularly the Treasury would feel obliged to supervise the operations of the lighthouse service, in order to keep under control the amount of the subsidy. This intervention of the Treasury would tend to reduce somewhat the efficiency with which the lighthouse service was administered. And it would have another effect. Because the revenue is now raised from the consumers of the service, a committee has been established, the Lights Advisory Committee, representing Shipowners, Underwriters and Shippers, which is consulted about the budget, the operations of the service and particularly about new works. In this way, the lighthouse service is made more responsive to those who make use of its service and because it is the shipping industry which actually pays for additional services, they will presumably support changes in the arrangements only when the value of the additional benefits received is greater than the cost. This administrative arrangement would presumably be discarded if the service were financed out of general taxation and the service would therefore become somewhat less efficient.³⁹ In

³⁹ The Chairman of the Committee of Inquiry into the Mercantile Marine Fund (see *supra* note 38), was Leonard Courtney, M.P. Mr. Courtney, who was an economist, made essentially the same point in the debate in the House of Commons. Replying to those who had suggested that the lighthouse service should be supported out of general taxation, Mr. Courtney commented: ". . . there is one substantial argument in favour of our maintaining the service as it is, and that is that there is an impression among shipowners—and it is a very useful one—that they have to bear the burden, and they are extremely jealous of the expenditure, and they would claim hereafter, if not now, a share in the administration; that is to say, that they being the people called upon to pay in the first instance, scrutinise the expenditure in which they are interested, and jealously guard it. This is a great advantage, and I conceive that by it economy and efficiency in the coast light service are obtained, and I think that to change a system which secures a frugal and yet sufficient administration of the service would be most inexpedient. The shipowners are jealously watching the whole of the administration, and they claim, I think justly, to have a voice in the matter conceded them. If the cost of

general, it would seem to be a safe conclusion that the move to support the lighthouse service out of general taxation would result in a less appropriate administrative structure. And what is the gain which Samuelson sees as coming from this change in the way in which the lighthouse service is financed? It is that some ships which are now discouraged from making a voyage to Britain because of the light dues would in future do so. As it happens, the form of the toll and the exemptions mean that for most ships the number of voyages will not be affected by the fact that light dues are paid.⁴⁰ There may be some ships somewhere which are laid up or broken up because of the light dues, but the number cannot be great, if indeed there are any ships in this category.⁴¹ It is difficult for me to resist the conclusion that the benefit which would come from the abandonment of the light dues would be very unimportant and that there would be some loss from the change in the administrative structure.

The question remains: how is it that these great men have, in their economic writings, been led to make statements about lighthouses which are

lighting the coasts were thrown directly upon the Votes every year, there would not be the same check as is now existing upon unbounded demands which might be made in those ebullitions of feeling to which the nation is always exposed after some great maritime calamity." 40 Parl. Deb. (4th Ser.) 186-87 (1898). That is to say, Mr. Courtney was arguing that the method of finance meant that the shipowners were led to exercise at this early date the same influence over expenditures as is now exercised through the Lights Advisory Committee.

⁴⁰ There is no further liability for light dues after the first 10 voyages in a year for "home-trade" ships and the first 6 voyages for "foreign-going" ships. It seems to be the opinion of those conversant with the shipping industry that the vast majority of ships will not need to pay light dues on their last voyages in the year. A cross-channel ferry could probably meet the requisite number of journeys in a few days. Ships trading with Europe or North America will normally not be required to pay light dues on their last voyages. However, the ships trading with Australia will usually not be able to complete the number of voyages necessary to avoid light dues.

⁴¹ I have not been able to secure any precise figures but all indications are that light dues form a very small proportion of the costs of running a ship trading with the United Kingdom. Such statistics as exist support this view. Payments into the General Lighthouse Fund in 1971-1972 were £8,900,000. General Lighthouse Fund 1971-1972, H.C. Paper No. 301 (in cont. of H.C. Paper No. 211) at 2 (July 3, 1973). In 1971, the earnings of ships owned by U.K. operators and of ships on charter to them for carrying U.K. imports and exports, visitors to the U.K. and U.K. residents were about £700 million. In addition, about £50 million was earned in the U.K. coastal trade. Payments to foreign shipowners for carrying U.K. imports and exports were probably of the order of £600 million in 1971. This suggests that the annual costs of running ships trading with the U.K. must have been about £1,400 million. These estimates are based on figures kindly supplied to me by the Department of Trade. Some of the separate figures brought together to obtain these totals are very rough estimates but they give the order of magnitude and whatever error they contain would not affect the conclusion that payments into the General Lighthouse Fund form a very small proportion of the cost of running a ship trading with the U.K.

misleading as to the facts, whose meaning, if thought about in a concrete fashion, is quite unclear, and which, to the extent that they imply a policy conclusion, are very likely wrong? The explanation is that these references by economists to lighthouses are not the result of their having made a study of lighthouses or having read a detailed study by some other economist. Despite the extensive use of the lighthouse example in the literature, no economist, to my knowledge, has ever made a comprehensive study of lighthouse finance and administration. The lighthouse is simply plucked out of the air to serve as an illustration. The purpose of the lighthouse example is to provide "corroborative detail, intended to give artistic verisimilitude to an otherwise bald and unconvincing narrative."⁴²

This seems to me to be the wrong approach. I think we should try to develop generalisations which would give us guidance as to how various activities should best be organised and financed. But such generalisations are not likely to be helpful unless they are derived from studies of how such activities are actually carried out within different institutional frameworks. Such studies would enable us to discover which factors are important and which are not in determining the outcome and would lead to generalisations which have a solid base. They are also likely to serve another purpose, by showing us the richness of the social alternatives between which we can choose.

The account in this paper of the British lighthouse system does little more than reveal some of the possibilities. The early history shows that, contrary to the belief of many economists, a lighthouse service can be provided by private enterprise. In those days, shipowners and shippers could petition the Crown to allow a private individual to construct a lighthouse and to levy a (specified) toll on ships benefitting from it. The lighthouses were built, operated, financed and owned by private individuals, who could sell the lighthouse or dispose of it by bequest. The role of the government was limited to the establishment and enforcement of property rights in the lighthouse. The charges were collected at the ports by agents for the lighthouses. The problem of enforcement was no different for them than for other suppliers of goods and services to the shipowner. The property rights were unusual only in that they stipulated the price that could be charged.⁴³

⁴² William S. Gilbert, "The Mikado."

⁴³ This arrangement avoided a problem raised by Arrow in discussing the lighthouse example. Arrow says: "In my view, the standard lighthouse example is best analyzed as a problem of small numbers rather than of the difficulty of exclusion though both elements are present. To simplify matters, I will abstract from uncertainty so that the lighthouse keeper knows exactly when each ship will need its services, and also abstract from indivisibility (since the light is either on or off). Assume further that only one ship will be within range of the lighthouse at any moment. Then exclusion is perfectly

Later, the provision of lighthouses in England and Wales was entrusted to Trinity House, a private organisation with public duties, but the service continued to be financed by tolls levied on ships. The system apparently favoured by Samuelson, finance by the government out of general taxation, has never been tried in Britain. Such a government-financed system does not necessarily exclude the participation of private enterprise in the building or operation of lighthouses but it would seem to preclude private ownership of lighthouses, except in a very attenuated form and would certainly be quite different from the system in Britain which came to an end in the 1830's. Of course, government finance would be very likely to involve both government operation and government ownership of lighthouses. How such governmental systems actually operate I do not know. Bierce's definition of an American lighthouse—"A tall building on the seashore in which the government maintains a lamp and the friend of a politician"⁴⁴—presumably does not tell the whole story.

We may conclude that economists should not use the lighthouse as an example of a service which could only be provided by the government. But this paper is not intended to settle the question of how lighthouse service ought to be organised and financed. This must await more detailed studies. In the meantime, economists wishing to point to a service which is best provided by the government should use an example which has a more solid backing.

possible; the lighthouse need only shut off its light when a nonpaying ship is coming into range. But there would be only one buyer and one seller and no competitive forces to drive the two into a competitive equilibrium. If in addition the costs of bargaining are high, then it may be most efficient to offer the service free." See Kenneth J. Arrow, *The Organization of Economic Activity: Issues Pertinent to the Choice of Market Versus Nonmarket Allocation*, in U.S. Cong., Jt. Econ. Comm., Subcomm. on Economy in Government, 91st Cong., 1st Sess., *The Analysis and Evaluation of Public Expenditures: the PPB System*, vol. 1, at 47, 58 (J. Comm. Print, 1969). Arrow's surreal picture of a lighthousekeeper shutting off the light as soon as it became useful while arguing with the captain about the charge to be made (assuming that the vessel has not run on the rocks in the meantime) bears no relation to the situation faced by those responsible for lighthouse policy. In Britain, no negotiation has been required to determine individual charges and no lighthousekeeper has ever turned off the light for this purpose. Arrow's conclusion that "it may be most efficient to offer the service free" is unexceptionable but also unhelpful since it is equally true that it may not.

⁴⁴ Ambrose Bierce, *The Devil's Dictionary* 193 (1925).