



# The political economy of lighthouses in antebellum America

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## ABSTRACT

The study of the lighthouse features prominently in debates over the private provision of public services. However, little attention has been devoted to how lighthouse systems operated once governments took charge of its production. We exploit the fact that Antebellum America came close to the ideal textbook solution to providing public goods and we assess how the government allocated lighthouses before the Civil War. We find some evidence that the lighthouses were built according to commercial needs. However, we discover stronger evidence that political considerations played a role in selecting where lighthouses would be built.

## 1. Introduction

The lighthouse has long been a classroom example of a public good. Because lighthouse services are non-rivalrous and non-excludable, it has been argued that their supply would be suboptimal if left to private entrepreneurs (Mill 1848 [2004]; Samuelson 1964). As such, it is unsurprising to find that it holds a place of honor in illustrating economic justifications for the state.

Equally unsurprising is the large number of economists who have used the example as an opportunity to debate what truly qualifies as a public good and the extent to which private firms can be efficient providers of public goods. Starting with Ronald Coase (1974), many have argued that the lighthouse never qualified as a public good because exclusion was possible (which made it more akin to a club good) through a variety of means (e.g., bundling with insurance services, pilotage services, harbor fees). Many went a step further and argued that private provision was efficient (Barnett and Block 2009; Carnis 2013; Mixon and Bridges 2018; Candela and Geloso 2018a, b; 2019a, b; Saito 2019) – a hotly debated claim (Van Zandt 1993; Taylor 2001; Bertrand 2006; Lindberg 2015; Levitt 2020; Bogart et al. 2022).

However, there are two glaring holes in that literature. First, the efficacy of lighthouse provision once the public sector takes over is rarely considered. Effectively, this means the debate is centered around the possibility of market failure without being weighed against the possibility of government failure. Second, modern studies of privatization, liberalization, public-private partnerships and state capacity often devote considerable attention to *why* certain courses of action are chosen by governments (e.g.; Biais and Perotti, 2002; Clark and Pitelis 2005; Lazzarini 2022). As the motivation for intervention seems to matter to outcomes, the “why” is an important question. Yet, the motivation for lighthouse nationalization has only been summarily studied.<sup>1</sup> In this paper, we argue that by

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<sup>1</sup> One notable exception is Candela and Geloso (2019b).

answering *how* lighthouses were allocated, we can address both issues.

To do so, we focus on American lighthouses during the Early Republic and Antebellum eras (1790–1860). In those years, America came the closest to approximating what textbooks suggest governments should do when facing a public goods problem: nationalized and funded out of general tax revenues (rather than solely out of user fees). We find that the American decision to “federalize” (i.e., nationalize) lighthouses in 1789 and the subsequent expansion of the lighthouse network to 1860 was motivated in part by the lure of political benefits.

Lighthouse provision created sizable political rents. With public provision came the ability to dispense patronage to reward party members and court voters. It introduced the possibility of lighthouses being constructed according to political needs rather than economic considerations. This implies governments may not have used a pure societal cost-benefit analysis which led to inefficient production (Niskanen 1971; Migué and Bélanger 1974). Moreover, public provision also provided the ability to cement coalitions of interest groups such as merchants and pilot associations. Merchants in coastal states gained heavily as funding through general tax revenues was cheaper for them than paying previously existing fees based on ship category. Moreover, merchants also used the nationalization as a backdoor to (successfully) lobby for protection in the form of discriminatory rules against foreign shipping. Local pilot associations – constituencies that were politically organized as early as during the colonial era – benefitted because lighthouses were complementary to their work. Furthermore, merchants and pilots were not homogenous groups across the United States. Depending on the state they hailed from, they were affiliated with different parties. Combined with the mechanism that played for patronage, this meant that merchants and pilots in a given state were competing for political favors against those of other states. This does not only mean that rent-seeking regional merchants competed for favor. It also means that American sectional politics (i.e., North v. South) weighed heavily in decisions to expand the lighthouse system.

To see the importance of political rents, we formally test the determinants of the number of lighthouses and lightships per 1000 miles of coastline between 1790 and 1860. We essentially want to know if lighthouses were geographically allocated according to economic needs or political needs. The former speaks to what a benign and well-informed social planner would do whereas the latter speaks to how he would try to use his powers for his own purposes. The more heavily political considerations weigh, the greater the likelihood that lighthouses were inefficiently allocated. This setup concentrates on the spatial distribution of lighthouses as the mechanism for suboptimal provision since it is the one that people debated back then. As we explain in Section 2, members of Congress frequently argued that some states were privileged in lighthouse allocation. Congressional testimonies also point to overcrowding of lighthouses in some areas and dearth of service elsewhere. This speaks to geographic misallocation.

To determine suboptimal allocation, we take inspiration from the literature on the political economy of New Deal spending (Wright 1974; Anderson and Tollison 1991; Wallis 1987; 1998; Couch and Shughart 2000) and on poverty spending during President Johnson’s Great Society (Bailey and Duquette 2014) as templates. These literatures attempt to econometrically determine the relative importance of economic and political factors. In doing so, they are essentially running a horse race between “political variables” and “economic variables”.

Our horse races for lighthouse allocation suggest that political variables weighed heavily. We use conventional measures such as the share of house seats, the president’s home state and the state of the chairman of the House’s Commerce Committee. These measures are significant determinants of lighthouse allocation in many but not all regression specifications. As these measures could be deemed to be more relevant to 20th century political settings, we also create our preferred political variable: the voter overrepresentation measure. It relies on slaves being counted as 3/5th of a free person. Voters in states with slave populations essentially saw the power of their votes enhanced relative to an apportionment rule based on free voters only. This variable is often significant and negative suggesting that slave states were indeed being penalized.

We conduct several robustness checks to assess the validity of our results. Our main dependent variable is the stock of lighthouses and lightships (relative to shoreline). In Section 3, we explain that this is potentially problematic. Two robustness checks are used to deal with this problem. First, we reproduce our results with the lagged values of lighthouses and lightships. Second, we switch our specifications to the interdecadal growth in lighthouses and lightships. With both checks, political variables are strong and significant determinants of lighthouse allocation.

Another potential issue with our main dependent variable is that it assumes that all lighthouses are equivalent to each other. This is obviously false as lighthouses differed in type, size, height, quality or equipment. To deal with this issue, two additional robustness checks are employed. First, we excluded lightships – which became popular after the 1830s – because they were qualitatively (and cost-wise) different from lighthouses. Political variables are stronger for lighthouses only. This suggests that the qualitative dimensions of navigational aids might be acting as a foil. This is why we introduce the most important of our four robustness checks: the use of congressional appropriations for lighthouse construction. Although appropriations for new lighthouses and lightships do not fully capture the political rents we seek to measure,<sup>2</sup> they do capture differences in lighthouse features through differences in costs. It also allows us to switch to a measure of flow at the same time. Using this variable, we again find that political variables weighed heavily.

Across all specifications (i.e., in the main specification and in the robustness checks), economic variables (i.e., exports per capita, coastal cities, specially chartered corporations, customs houses, urbanization and two estimates of GDP per capita) are generally not significant. When an economic variable is significant in one specification, it is not significant in others. As such, the pattern suggests that political considerations weighed more heavily than economic ones. To shore up this conclusion, we also use the partial R-squared approach to test the relative importance of the variables. We find that political variables were almost always substantially more potent

<sup>2</sup> They only capture the rents associated with new lighthouses rather than the ongoing stream after construction (i.e., salaries to keepers, contracts for oil provision, maintenance projects, provisions for keepers, etc.)

than economic variables.

Our results pertaining to the “how” of public provision is tied to the “why” there was nationalization. This is of relevance to two important ongoing discussions in economics. The first is the debate on state capacity (e.g., Besley and Persson 2008, 2009, 2010; Johnson and Koyama 2017; Cox and Figueroa 2021). Defined as the “government’s ability to accomplish its intended policy goals” (Dincecco 2017: 3), state capacity is tied positively to economic growth through the supply of productive services by the state. However, the American lighthouse system was fully nationalized to create and cement political coalitions rather than stimulate economic growth. Our results support a more nuanced view of state capacity where public choice and public interest forces are complementary (Yandle 1983; Leeson 2019; Geloso and March 2020; Geloso 2020).<sup>3</sup> In the case of the American lighthouse system, state capacity increased because politicians and merchants tapped some of the societal gains even if public provision was far from the ideal proposed in textbooks. This suggests that the new arrangement may have been politically more efficient rather than economically more efficient.

The second contribution is to the literature on the efficacy of privatization and nationalization (e.g., Hart et al. 1997; Lazzarini 2022) where the lighthouse is recurrently used as an example of the benefits of privatization.<sup>4</sup> “Privatization [of public goods] can be particularly problematic in cases where private operators can substantially profit from inattention to social or public dimensions that are difficult to specify” (Lazzarini 2022: 12). However, if nationalization is motivated by the desire to extract rents, politicians have few incentives to care about these dimensions of the service. In the case of the American lighthouse system, public provision for the purpose of extracting political rents meant that there was little motivation for providing lighting aids in an economically optimal manner. The “why” of nationalization thus makes it easier to compare public and private provision of lighthouses. As many refer to Coase (1974) and the lighthouse in debates about privatization, our results help move the conversation forward.

In Section 2, we present the historical background for the lighthouse in Antebellum America and how it was provided after nationalization. In the same section, we present qualitative evidence regarding the battles for rents that were fought after federalization. In Section 3, we explain our econometric strategy to substantiate the qualitative claims made in Section 2. In Section 4, we present and discuss our results. Section 5 concludes.

## 2. The lighthouse in antebellum America

During the colonial era, aids to navigation (i.e., buoys, lighthouses and fog signals) were a largely local and sometimes a private affair. As a result, historians have not agreed on the exact number of lighthouses. In one part, this is due to the inability, pre-1790, to enumerate all lighthouses. In another part, the disagreement is fueled by disagreement on what structures constitute a lighthouse (Mixon and Bridges 2018; Holland 1972).<sup>5</sup>

However, most historians do agree on three things. First, the growth of the number of lighthouses during the colonial era was “spectacular” and it was beneficial to the shipping industry (McCusker 1967: 86f; Stevenson 1959: 123, 387–89). Most of the lighthouses were in Massachusetts which had more lighthouses per 1000 miles (3.95) of shoreline than Britain (2.22) or France (2.18). Second, America’s lighthouse system pre-1790 was either private, semi-private (varying by state and quite akin to public-private partnerships) or fully private (in some states) (Mixon and Bridges 2018; Karentz, 2008). Third, there had been an incremental nationalization process before 1789. While many of the initial lighthouses were privately erected (Mixon and Bridges 2018), lighthouse keepers, who were also pilots, lobbied the state governments to restrict entry directly and indirectly (Candela and Geloso 2019b). Eventually, some colonial legislatures appropriated themselves the rights to name lighthouse keepers and use public funds to finance construction (Keller 1977; Johnson 1997; Finger 2010). For colonial legislatures, nationalization of the lighthouse meant that they became entitled to the profits and incomes thereof (Stevenson 1959: 274).<sup>6</sup> As such, many states began imposing tonnage duties (generally around 6 pence per ton) to fund the lighthouses and, by the time of federalization, most lighthouses were owned by states.

Given these points of agreement, it is easy to understand the motivations for the nationalization (i.e., federalization) by the federal

<sup>3</sup> The idea of the public interest viewpoint is that state interventions are motivated by concerns for the general welfare. It has been invoked to explain key moments of American legislative history: meat regulation in the late 19th century (Olmstead and Rhode 2015), asylum expansion after 1870 (Sutton 1991), occupational licensing (Law and Kim 2005; Law and Marks 2009), antitrust laws (Bork 1966), and utilities regulation (Neufeld 2017). In contrast, public choice theorists frequently argue that this concern for the public welfare is a façade and, using the same examples as public interest theorists, argue that there was rent-seeking at place (DiLorenzo 1985; McChesney 1986; Boudreaux and DiLorenzo 1992; Libecap 1992; Delorme et al. 1997; Newman 2018; 2019).

<sup>4</sup> For example, Grimsey and Lewis (2007) use the lighthouse as an example of why states should not fully takeover provision of certain goods. Shleifer (1998, p. 140) used the example to justify that “schools, universities, hospitals, day care centers” could operate as non-profits firms in ways that are superior to both government-run firm and for-profit firms (see also Glaeser and Shleifer 2001). Lazzarini (2022) uses it as an example to argue that many proponents of privatization have underappreciated the importance of the state’s shadow in the ability of private firms to operate efficiently. Failing to fully appreciate the details of the lighthouse’s case, he argues that they overextended their claims regarding privatization.

<sup>5</sup> For example, before formally becoming a lighthouse, Vermont’s Juniper Island Light (on Lake Champlain) was merely a private beacon consisting of a lantern tied to a post (D’Entremont 2014). Bonfires were frequently used in the 17<sup>th</sup> century to provide guidance to ships in Rhode Island (Mixon and Bridge 2018: 87). These bonfires and other lights (Mixon and Bridges 2018) cause underestimation of light aids to navigation. The often-cited number of 13 lighthouses in 1789 (Miller 2010: 16) is thus conservative.

<sup>6</sup> There was an eight-fold increase in the volume of trade for the colonies up to 1775 (Shepherd and Walton 1972: 38). Given that the marginal cost of a lighthouse does not increase (if it increases at all) rapidly as shipping volumes increase, this meant important and alluring potential revenues for state governments.

government of all lighthouses in 1790. After independence, federalists in power wanted to erect a strong central government. This led federalist Secretary of the Treasury Alexander Hamilton to find creative ways to diminish the influence of state governments. One easy path Hamilton saw was to nationalize the lighthouses. The legislation of 1789 placed the control of state lighthouse funding to the federal government (Grace 2004; 2005). By 1795, all states had given up control of their lighthouses to the federal government, paving the way for a new system of providing navigational aid in the United States.

It is argued by many that the first decades of the lighthouse service confirm its role as “state-building” because it raised revenues for the federal government. Technically speaking, there were no lighthouse dues as lighthouses were funded by general revenues (Conway 1923: 13). However, there was a tonnage tax whose revenues used to be collected by state governments when ships (foreign and domestic) entered ports. That tonnage tax was now being collected by the federal government. Because light dues were previously paid on the basis of the number of lighthouses a ship passed by, this was no longer a user-fee as the rate was fixed per ton regardless of how many lighthouses there were along a shipping route. As a result, lighthouses became directly tied to the ability of the federal government to collect revenues as more ships meant more revenues even though merchants ended up paying less than they had prior to federalization.

Thus, at first glance, lighthouse federalization fits the conventional public economics textbook justification for state intervention. Some would even add that *because* the federal government collected revenues from lighthouses through greater trade volumes, it had an incentive to provide the optimal level of lighthouses.<sup>7</sup> The revenues from duties would inform the federal government (i.e., the social planner) as to where lighthouses need to be placed to protect economic activity. Moreover, direct control could have led – as some have argued in the case of Britain’s public providers (Bertrand 2006; Bogart et al. 2022) – to lower costs and higher quality notably due to direct public supervision.<sup>8</sup> In other words, federalization fits the “public interest” explanation of state growth whereby interventions are motivated by concerns for the general welfare.<sup>9</sup>

First glances are misleading. Politicians and key constituencies stood to gain from federalization in ways unrelated to the general welfare. Moreover, the motivations behind federalization also suggest strong “public choice” considerations in play.

Historians indicate that Hamilton was trying to tie himself to two key constituencies. The first was the harbor pilots (those who took control of ships to bring them to port). Pilots frequently used lighthouses as stations where they would safely wait for incoming ships to signal the need for services rather than scouring waters for clients (Candela and Geloso 2019b). However, as lighthouses were complements to pilotage, the two could be bundled so that new pilots could use new navigational aids to compete with incumbent pilots. Candela and Geloso (2019a) point out that pilot guilds across the world often restricted entry by gaining control over the supply of navigational aid of all sorts (e.g., bonfires, fog signals, buoys, lighthouses). It is thus unsurprising to find that pilot groups were key backers of federalization in order to restrict entry on the pilotage market. For example, in Massachusetts, the Boston Marine Society (a society of ship captains that essentially managed harbor pilots) was enlisted to help muster support for federalization (McKenzie 2006).

The second constituency was the growing merchant class who played a substantial role in shaping the Lighthouses Act of 1789 (Wells 2020: 22). First, the tonnage tax rate of six cents per ton for American ships (United States Congress, 1789: 27) appeared to be a nominal reduction for some states (Hill 1893: 19).<sup>10</sup> However, the way the tonnage tax was charged meant that there was a reduction relative to the quantity of services used. Traditionally, merchants paid what essentially amounted to a user fee which was calculated according to how many lighthouses they passed on their route. The tonnage tax was a flat fee which means that, especially when combined with the expansion of the lighthouse network, there was an effective reduction for most states.

That the merchants gained most from public provision does not negate the public interest justification. However, the higher rate set on foreign ships does suggest that merchants piggy-backed public choice considerations on the back of the public interest horse. The tonnage tax was part of America’s protectionists measures in the early republic. James Madison, in the first Congress, argued that the tonnage duty was “necessary for the support of light-houses, hospitals for disabled seamen, and other establishments incident to commerce” (Stewart, 1991: 3; Grace 2004). However, he also defended the idea that there should be discriminatory rates according to the origins of a ship entering port. As such, when nationalization occurred, a higher rate was set on foreign ships: 50 cents per ton (United States Congress, 1789: 27).<sup>11</sup> By 1804, another act was passed imposing extra tonnage of 50 cents per ton on non-American vessels for the purposes of funding lighthouses (United States Shipping Board, 1922: 7; Berglund 1921: 188). By 1812, the rate was further increased to \$1.50 (Berglund 1921: 188). Between 1789 and 1812, the ratio against foreign ships increased from 8.7:1 to 25:1.

In contrast, during the colonial and confederation periods, states discriminated against foreign ships but not as much as during the early republic and after. For example, colonial Massachusetts let British ships free of tonnage duties (Hill 1892: 86) and many colonies

<sup>7</sup> Here we are referring to the state capacity literature that argues that rulers can have an “encompassing interest” in increasing productivity because, by increasing wealth for everyone, they take the same share of a greater stock (see Besley and Persson 2008; 2009; 2010; Olson 1993; Dinicco 2017; Piano 2019; Geloso and Salter 2020).

<sup>8</sup> There exists little data about operating cost and fees pre-1789 in the United States, but the discussion below on tonnage duties (i.e., light money) suggests that “fees” (for lack of a better) increased post-1789.

<sup>9</sup> Wallis and Weingast (2018) pointed out that state governments took the lead on most internal improvement projects during the antebellum period and left the federal government with few potential projects. Because the federal government was constitutionally limited in its ability to tax the benefits of internal improvements, it could not spend on projects with large local benefits. Rather, it was forced to spend on public goods which would have had more well-distributed benefits. Lighthouses fell in that category and thus the argument of Wallis and Weingast probably situates itself most closely to the public interest argument with regards to lighthouses.

<sup>10</sup> Many charged no tonnage duty on American ships by 1789 (United States Shipping Board 1922: 6-7) while others taxed them in excess of six cents per ton (Zornow 1955a).

<sup>11</sup> Ships built in America but owned by foreigners (partly or wholly) had a rate of 30 cents rather than 50 cents (Berglund 1921: 188).

that used to submit British ships to tonnage duties eventually removed them (Hill 1892: 86). During the confederation period, pro-tariff advocates pointed out that there was little discrimination of foreign ships (Zornow 1956: 41). While it appears true that, on average, there was less discrimination against foreign vessels, there was also wide variance in discrimination. For example, New Hampshire was particularly discriminatory of French and English vessels entering its ports (at rates close to those that followed after 1789) (Zornow 1954a). Other states were far less discriminatory than what would be observed during the early republic (a ratio generally around 2:1 and rarely exceeding 3:1) (Zornow 1954b: 7; Zornow 1954c: 314; Zornow 1955b: 160; Zornow 1956: 54). Some states, like South Carolina, did not discriminate at all (Zornow 1955a: 39). The federalization of lighthouses essentially ended this competition between states with regards to the treatment of foreign ships. It made it easier to adopt protectionist policies. In other words, the financing of lighthouses was used for protectionist purposes and it is unsurprising that merchants played a key role regarding the Lighthouses Act of 1789 (Grace 2004).

These rent-seeking origins of lighthouse federalization were accompanied by important benefits to political actors who saw federalization as a way to dispense patronage and cement coalitions of interest groups. The sums that could be used for patronage, as can be seen from Fig. 1, were not trivial and they were increasing as a share of GDP. Appropriations for new lighting aids represented 33% of all expenditures by the Lighthouse Establishment from 1791 to 1860. Maintenance expenditures and salaries constituted the rest of the expenses.

The key patronage function of the Lighthouse Establishment was served through the operational ties with the Customhouse service. As early as 1791, most superintendents of lighthouses were also customs collectors (Weiss 1926: 6). This was heightened in 1820 when the new head of the Establishment (Stephen Pleasanton who headed it until 1852)<sup>12</sup> directed that “local collectors of customs take responsibility for supervising the building of new lighthouses” (Karamanski 2020: 36). This is of relevance because a collector’s appointment to the Customhouse service was usually secured by political favor from the president (Fish 1905; Tabachnik 1971). This collector would, in turn, appoint subalterns. This patronage created a local party machine that tied “local politics to a unified national party” (Tabachnik 1971: 225). By tying itself to the Customhouse Service, the Lighthouse Establishment served the same patronage-dispensing purpose.<sup>13</sup> The results were well-described in an 1843 report from the House of Representatives (1843: 58) that quipped that “other keepers are active fishermen, and still more active politicians, leaving their proper duties to make speeches in some village tavern”.<sup>14</sup> The same report added that “frauds” by contractors picked by collectors and keepers were “common occurrence” and well-known to the public (House of Representatives 1843: 20).<sup>15</sup> In 1852, Senator James Pearce of Maryland referred to a study by a professor Pierce of Harvard University<sup>16</sup> that showed that the American lighthouse system did “not compare in economy” with other countries and that it was not meant to satisfy the “requirements of navigation and commerce” (Rives, 1852: 2459).

Furthermore, throughout the antebellum period, “Congress decided where lighthouses were needed, usually based on petitions from state and local officials, and appropriated requisite funds” (Dolin 2016: 82). This invited considerable political considerations into the decisions to build and fund lighthouses.<sup>17</sup> The result was the overlap of sectional politics onto deliberations over lighthouse allocation. In the decade after federalization, Alexander Hamilton and other federalists used the new powers to allocate seven of the ten new lighthouses to federalist strongholds (Miller 2010: 21) in order to generate local political benefits to their electoral coalitions (McKenzie 2006: 5, 3, 12) in spite of the fact that these strongholds were already well-served compared to Southern states that had higher trade volumes per capita. Similarly, in 1852, South Carolina senator William De Saussure argued that southern states had been shortchanged and that there was an excessive “accumulation of lights” in the northern states to the point of being a “nuisance” (Rives, 1852: 2461–2462). Senators James Pearce and Thomas Pratt of Maryland made similar claims of inefficient allocation favoring

<sup>12</sup> It is also worth noting that in addition to the patronage mentioned below, there was also room for clear corruption. Pleasanton long entertained a close friendship with a ship captain, Winslow Lewis, who became the main supplier of illuminating equipment after 1812. Historians deem that relationship corrupt (Hyde 1995: 17; Dolin 2016; Karamanski 2020: 38, 112). Lewis, who was also a former President of the aforementioned Boston Marine Society (Dolin 2016: 83), was frequently successful in securing contracts and he expended considerable efforts to disparage technological breakthroughs in order to preserve his lamp-manufacturing business (a design based on the inferior version of the Argand lamp) (Dolin 2016: 72, 111).

<sup>13</sup> In an 1830 address to Congress, President Andrew Jackson explicitly argued that the lighthouse was for patronage purposes when he stated that “these expenses [for lighthouses] have at times been extravagant and disproportionate, is very probable”, that the “multiplication of lighthouses” had not improved “security of navigation” but that it had served to increase patronage (House of Representatives 1830: 15–16). In his refusal to sign the Lighthouse Appropriation bill of 1830, Jackson clearly indicates that the lighthouse expansion serves as a form of pork-barrel spending on projects that were “neither necessary nor useful” (House of Representatives 1830: 16). Similarly, historian Theodore Karamanski describes the first decades of federal efforts at creating maritime infrastructures (inclusive of lighthouses) as having being “betrayed by cronyism and the absence of engineering expertise” (Karamanski 2020: 39).

<sup>14</sup> Moreover, keepers were “not selected with reference to their knowledge” (Rives 1852: 2459).

<sup>15</sup> The publishers of the famed *American Coast Pilot* (a book of navigational knowledge which went through nineteen editions to 1863) wrote a statement to Congress in 1837 arguing against the “evils of the contract system” (House of Representatives 1843: 52).

<sup>16</sup> We have been unable to track that study, but the *Congressional Globe* debates suggest that most interlocutors in the senate agreed with its conclusion.

<sup>17</sup> For example, the *House Journal* for the 21<sup>st</sup> Congress that sat from 1829 to 1831 (when an important bill over lighthouses was debated) has 34 petitions from 14 states and territories. The petitions were also used to justify amendments to appropriation bills (e.g., Rives 1852: 2319). They were also frequently presented by mercantile interests arguing for their particular project being a priority over other potential lighthouses. In addition, the Commerce Committee commissioned 7 studies and surveys for new lighthouses. Also, there are multiple examples of amendments proposed to exclude or add a particular lighthouse and change the appropriated sum (e.g., Rives 1852: 2457).

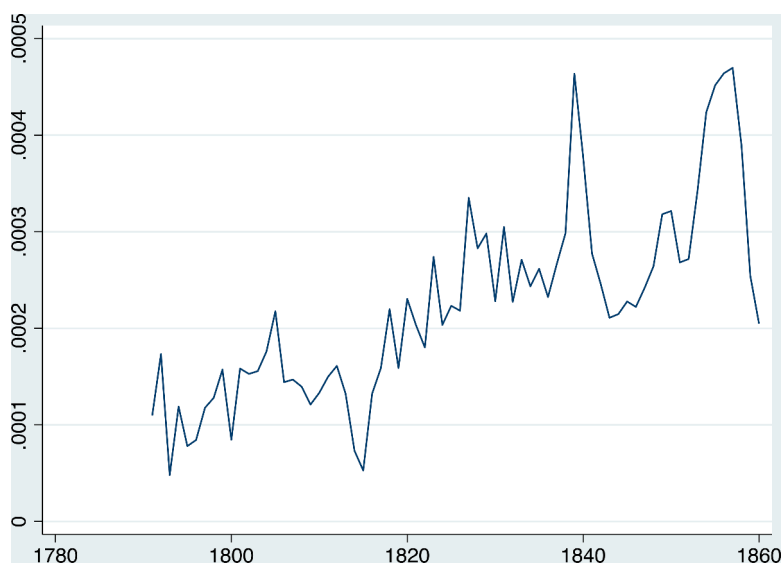


Fig. 1. Lighthouse Establishment Expenditures as a Share of GDP, 1791 to 1860, Source: Weiss (1926: 132) and Johnston and Williamson (2022).

northern states which were immediately contested by senators John Davis of Massachusetts and Isaac Toucey of Connecticut (Rives, 1852: 2459).<sup>18</sup> The divide was not just along the Mason-Dixon line. For example, in 1852, congressman Smart of Maine scolded his Ohio colleagues for having too many lighthouses (relative to the state's small coastline) whereas his state had too few (Rives, 1852: 2073). As such, it appears that Great Lakes, northern and southern states competed for lighthouse appropriations (Karamanski 2020: 60–114).<sup>19</sup>

These debates regarding the quantity and quality of lighthouse services over sectional lines are consistent with empirical evidence. First, the complaints of southern states that they were being ill-favored in the allocation of lighthouses (Jackson 1966: 274–75; Majewski 2011: 110; 2013: 245–46) despite the importance of their exports (e.g., cotton and tobacco) have a kernel of truth. In table 1, using the data discussed later in Section 3, we can see that slave states had greater trade volumes than free states while also having fewer lighthouses relative to their shorelines. In other words, well-organized interest groups in the northern states (i.e., the aforementioned merchants who pushed for protectionist measures) seem to have enjoyed a greater ability to secure additional lighthouses for their benefit. In so doing, northern states could have routed commerce to specific ports in ways that bestowed distinctly local benefits (Gordon and Simpson 2018: fn 3).<sup>20</sup> Second, Gordon and Simpson (2018) found that appropriations for some 9000 internal improvement projects between 1789 and 1882 (inclusive of lighthouses) went to relatively few districts and that appropriations could be predicted by variables that speak to partisan divide lines.

Political pressures regarding the allocation of lighthouses seem to have generated a deterioration in the relative extent and quality of America's lighthouse network. In table 2, we show the ratio of lighthouses to the shoreline of different countries (which allows us to account for America's territorial expansion) between 1800 and 1860. Most countries actually saw faster expansions in their own network of lighthouses. Thus, if anything, America fell behind. This is not due to some unique geographical features of the United States where the shoreline might be a less relevant metric of the service area. Indeed, by the early 20th century, the mainland United States would have as many lighthouses per mile of coastline as Britain (Wryde 1913: 307; Conway 1923: 14) suggesting that the United States was trying to catch up with the level of service observed elsewhere. This underperformance during the antebellum era hides much as it concentrates on the country as a whole whereas the aforementioned congressional debates suggest that there might have been overprovision in some places and under-provision elsewhere. For example, in 1860, Massachusetts had more lighthouses per 1000 miles of shoreline (38.84) than Britain (31.63). In contrast, Louisiana – with a shoreline half that of Britain – had less than a tenth of the British ratio.<sup>21</sup> Finally, we must also consider the quality of the services rendered. The Blunt brothers, publishers of the *American Coast Pilot* offered testimony to Congress saying that the system was poorly maintained, antiquated and deficient (Dolin 2016: 125). A

<sup>18</sup> Interestingly, the southern senators spoke fondly of the recently nationalized British lighthouse system and the long-nationalized French lighthouse system (see notably Rives 1852: 2460–2461). This echoes Majewski (2011; 2013) and Newman (2021) who claim that the southern states had no “laissez-faire” compulsion in opposing internal improvements, they only opposed them on the perception that they would not get their fair share.

<sup>19</sup> Similar evidence of sectional lines is found in other debates over lighthouse bills (e.g., the 1847 bill – see Rives 1852: 421). It should also be noted that this meant that rent-seeking merchants in the North had a greater ability to obtain lighthouses than those in the South.

<sup>20</sup> It could also have led to an inefficient geographic positioning of lighthouses even within a given state. For example, one official in Maine in 1838 noticed that three separate lighthouses were built 150 feet apart in Nauset (Noble 1997: 9).

<sup>21</sup> This is even though Louisiana had export and imports volumes far superior to those of Massachusetts (more than 3:1 during the 1820s through 1840s and close to 4:1 in 1850) (Fisher 1854: 119, 147).

**Table 1**  
Regional Patterns of Lighthouse Allocation and Export Volumes.

	Slave States	Free States
Lighthouses in 1790 per 1000 miles of coastline	0.39	2.69
Lighthouses in 1860 per 1000 miles of coastline	4.89	17.97
Ratio of Exports per capita (Slave States/Free States)		
Exports per capita, 1790s	2.10	
Exports per capita, 1850s	2.45	

Source: See [Section 3](#)

**Table 2**  
Number of lighthouses per 1000 miles of shoreline.

	1800	1860
United States	0.83	7.11
United Kingdom	3.57	31.63
France	3.51	49.40
Sweden and Norway	0.38	2.39
Italy	–	15.87
Denmark	1.21	21.11
Netherlands	10.09	57.18
Spain	1.11	11.07
Germany	4.88	14.21
Portugal	–	9.10
Japan	0.67	3.16

Source: The estimates for 1800 are drawn from [Stevenson \(1959\)](#) with the exception of those for Japan which are taken from the work of [Saito \(2019\)](#). Several other sources from 19th century sources confirm, with some positive and negative errors, the accounting of Stevenson. We thank prof. Saito for sending clarifications regarding the Japanese numbers for 1800. For 1860, we use the September 1886 edition of *The Engineer*. Lightships are not included.

Massachusetts captain also offering testimony to Congress in 1842 stated that “all the lighthouses” in his district were “very poorly constructed and most miserably lighted” ([House of Representatives 1843](#): 202). Moreover, while the Fresnel light was being adopted throughout Europe ([Levitt 2013](#); 2020), the lighthouse service preserved an inferior variant of the Argand lamp.<sup>22</sup> Overall, this suggests that lighthouse provision might very well have been suboptimal.

### 3. Data and methodology

The above discussion suggests that there were competing public and private interests influencing lighthouse allocation. On the one hand, lighthouses could be allocated to where they were most needed. This would be the public interest justification where the benevolent social planner uses the available economic information to judiciously allocate lighthouses according to his objective function.<sup>23</sup> Under this view, suboptimal allocation results from missing or erroneous information. On the other hand, there were private interest forces at play as well. Politicians stood to gain by allocating lighthouses to where they were most *politically* needed to secure the political coalitions needed for electoral victory. Rent-seeking merchants, if they could successfully petition Congress, could have lighthouses allocated to them before less politically privileged merchants. If public interest forces dominate, then the allocation of lighthouses should come closest to yielding the predictions from any standard public economics textbook solutions to public goods problems (i.e., the social planner’s benign maximization for societal welfare). However, the stronger the private interest forces are, the further away from these predictions the allocations will be.

Our baseline empirical strategy estimates the following function:

$$Lights_{it} = \beta_o + \beta_1 Economic_{i,t-1} + \beta_2 Political_{i,t-1} + \beta_3 V_t + \beta_4 V_t + \epsilon_{it}$$

where we explain the number of lights, the growth in the number of lights, the number of lighthouses (not including lightships) or average annual appropriations for lighthouses (relative to the coastline of each state) in the present by the economic and political variables in the preceding decade. For example, in the case of the dependent variable as the number of lighthouses and lightships, the

<sup>22</sup> This technical stagnation is not trivial. As [Bogart et al. \(2022\)](#) point out, there was only a two-fold increase in the number of lighthouses in England between *circa* 1750 and 1831 but the percentage of coastal routes that were lit rose seven-fold due to new technologies.

<sup>23</sup> This assumes that we know what the social planner cares for and that the economic factors used below measure accurately the inputs to his function.

count in 1830 in state  $i$  is explained by economic variables in the 1820s and by the different political variables for that state during the 1820s. The coefficients  $\beta_3$  and  $\beta_4$  are included to capture state-fixed and year-fixed effects.

This approach is the same as that used by (Wright 1974), Anderson and Tollison (1991), Wallis (1987; 1998), Couch and Shughart (2000) and Fleck (2008) regarding New Deal spending during the Great Depression and regarding poverty alleviation spending during Lyndon Johnson's presidency (Bailey and Duquette 2014). When allocating relief funds, President Roosevelt and Congress could either allocate funds to further their political needs (i.e., re-election) or to help out the worst-hit areas of the country. While the authors involved in this debate disagree as to the relative importance of economic and political considerations, they do agree that *both* played a role as the horse race they run between both types of variables suggest some effect for each. In the case of poverty relief spending during Johnson's presidency, political factors apparently played a trivial role in spending patterns relative to economic considerations. Regardless of the results in all these articles, they all use a horse race strategy that is ideally suited to our purposes.

To create the number of lighthouses and lightships per state, we used a wide array of different primary and secondary sources (Lighthouse Board of the United States 1852; 1893; Putnam 1917; Conway 1923; Snow 1945 [2005]; Holland 1972; Hyde 1995; Noble, 2014; De Wire and Dempster 2004; Dolin 2016) as well as multiple websites of lighthouse enthusiasts who list a great number of lighthouses with dates of construction and decommission.<sup>24</sup> This compiling approach was made necessary by the fact that annual reports of the lighthouse board only begin in 1852 (National Archives 2020) and available publications do not provide an easily accessible breakdown of lighthouses and lightships per state during the antebellum period.<sup>25</sup> To make sure we had compiled the full list of lighthouses, we relied on the 1860 tabulation of lighthouses, the first complete tabulation (see footnote 24), by the Bureau of Lighthouses (Conway 1923: 14) which stated that there were 425 lighthouses and 47 lightships at the time. If our compilations of construction and decommission dates are correct, we should arrive at the same figures. For lightships, we arrive at the correct number. For lighthouses, we actually found a slightly greater number of lighthouses (433). Our greater number is in large part due to the fact that the Bureau of Lighthouses stated that there were a number of "minor lights" that were not fully accounted for in their reports (Conway 1923: 14).<sup>26</sup>

The tally of lighthouses is then divided by the state's shoreline (as measured by the National Oceanic and Atmospheric Administration) to reflect the public good features of the lighthouse. Under the theory of public goods, the marginal social benefit is the sum of all benefits at each quantity which reflects the non-rivalrous aspect of a public good. Thus, dividing the lighthouses per state by population in order to compare the widely different would create a misspecification by divorcing our function above from theoretical foundations.<sup>27</sup> However, the shoreline provides a proxy for the market being served. This is more reflective of the nature of public goods. Taking the ratio of these two will measures best the availability of navigational aids.

This formulation of the dependent variable has two important limitations that we address with four different solutions. First, it is a stock variable and not a flow variable. As such, we produce two robustness checks: the inclusion of the lagged value for lights relative to coastline and the use of the interdecadal growth in lights relative to coastline. These two solutions, unfortunately, do not address the second problem – lighthouses are not homogenous goods. For example, lightships were costlier than lighthouses and offered a different type of information about navigational perils. As such, one additional robustness check consists in excluding lightships from the results. However, this solution is imperfect as even land-based lighting aids were also heterogenous. This is why we employ our fourth and last robustness check by creating a new variable: state-level estimates of congressional appropriations for all lighting aids. Extracted using the *Accounts of Receipts and Expenditures* of the United States from 1791 to 1860 (see Appendix 1 for greater details about the source materials), appropriations allow us to capture differences in the features of lighthouses that would present themselves in the form of costlier projects. We use this variable for robustness checks rather than as our main dependent variable because appropriations do not capture the continuous flow of patronage that follows once a lighthouse is operational.<sup>28</sup> While individually flawed, these different approaches taken together allow us to credibly assess which set of variables (i.e., political or economic) mattered most in deciding lighthouse allocation.

We have seven measures of economic interests. All seven measures have their flaws and limitations. The first is real exports per capita. Export data from 1791 through 1850 is found from Fisher (1854). We use the Secretary of the Treasury's annual report titled

<sup>24</sup> Most notably the website [www.lighthousefriends.com](http://www.lighthousefriends.com) allowed us to find details that allowed us to properly identify the relevant primary and secondary sources to identify the construction dates of lighthouses and lightships.

<sup>25</sup> Two issues made matters more complicated. First, the organization was not even fully aware of how many lighthouses it actually operated. The Bureau of Lighthouses stated in notes to nation-wide tabulations of navigational aids that "the information prior to 1850 should be considered approximate only" (Conway 1923: 14). They are only certain of their tabulations for 1860 onwards. This is confirmed in the first annual report of the Lighthouse Board (1852: 12) which stated that the "list of light-houses and light-vessels is defective in many respect". Second, we needed to distinguish the different types "lighted aids" (harbor lights, lightships and lighthouses) and "unlighted aids" (fog signals, spindles, whistling buoys, bell buoys, beacons) that were in use at the time. This was not easily done from names only.

<sup>26</sup> The Board defined minor lights as "generally" not being "attended as a rule by resident keepers" (Conway 1923: 11). Their maintenance was assured "by persons living in the vicinity, who are not obliged to devote their entire time to the work and who sometimes have several lights (...) in their charge" (Conway 1923: 11). When this criterion was clear, we excluded those minor lights from our compilation but this information was not always available.

<sup>27</sup> Once a market gets a lighthouse, the full market is being served. If the population composing that market increases, there is no need for an extra lighthouse (Cornes and Sandler 1996). Thus, what matters is the number of markets/populations needing service.

<sup>28</sup> The *Accounts* do report expenditures for maintenance but the state-level totals are not complete because many contracts of large size (e.g., lighting oil, equipments) were "national" and cannot be assigned to a particular state. In many years, these national contracts account for more than 30% of maintenance expenditures.



“Commerce and Navigation of the United States” for 1850–1859.<sup>29</sup> The second measure is the number of cities of more than 2000 people that were less than 20 km away from the coast provided in census tabulations. However, it could be argued that both measures capture the importance of the shipping lobby in each state and would thus fall under the heading of a “political variable”. Moreover, the exports variable speaks poorly to the Great Lakes state where a large share of shipping services was interstate and thus not measured as exports. This explains our use of the five additional measures. The third and fourth measures are different estimates of GDP per capita. In Appendix 2, we explain how these were computed for 1790 to 1860. However, these two measures are approximations of GDP per capita rather than direct estimates. This explains the last three variables: urbanization rates (for cities of more than 2000) and incorporations per million. Both are indirect proxies. Urbanization rates (taken from census publications) are used because richer states are expected to be more urbanized than poorer states (Crowther 1976). Incorporation rates are taken from Sylla and Wright (2007) and are meant to represent the level of non-farm business activity in a state which is expected to increase with economic development.<sup>30</sup> Finally, customshouses are also employed. As most federal revenues came from trade tariffs, the federal government’s interest in lighthouse allocation could be tied to the presence of a taxable flow of traded goods. The number of customs houses (the construction of this variable is explained in Appendix 3) captures this link. Moreover, it deals effectively with the problem of Great Lakes states since ports that were used for interstate trade were also used for trade with Canada regardless of relative volumes.

We use four political variables in our regression – all of which will be averaged over the preceding decade for the same reasons as economic variables. Our first variable of interest is the share of seats that each state held in the House of Representatives. This is meant to represent the political influence of a state. The second is the state of origin of the president which is of relevance as he appointed the Treasury Secretary who was the ex officio president of the Lighthouse Board.<sup>31</sup> The third is a dummy variable for whether a state had one of its congressmen as the chairman of the commerce committee during the preceding decade.<sup>32</sup> The fourth variable is included to preempt a potential criticism of our use of the share of house seats. One could retort that this variable reflects population size and thus approximates an economic variable. To deal with this potential concern, we relied on the way slaves were counted as 3/5th of a free person. We calculated the extra electoral weight that a free white man obtained due to slavery. We believe this last variable and the share of house seats to be the most historically relevant variables as both speaks to the electoral weight of states or/and sectional politics. While committee chairmanship and presidential home state do seem to have mattered during the 19th century (see footnotes 30 and 31), their relevance is greater in the 20th century.

To further disentangle the relative importance of political and economic factors, we also rely on partial R-squared statistics which divide the difference of the sums of squared errors between a reduced and a full model by the sum of squared error in the reduced model. By leaving out regressors in the reduced model, the partial contribution of a variable (or set of variables) can thus be assessed. This is the approach that Bailey and Duquette (2014) used to find out that political variables explained less than 1% of the variations in poverty relief spending during the Johnson presidency.

Table 3 below shows the descriptive statistics for the dataset we assembled.<sup>33</sup> It is an unbalanced panel with twenty-six states from 1790–1860 (because of the admission of new states and the unavailability of some economic variables for some states in some years).

#### 4. Empirical results

Our results are illustrated below. Table 4 shows our results using all variables separately with only state-fixed and year-fixed effects. We use robust standard errors. At first glance, it appears that only the *House Share* and *Overrepresentation in Congress* variables are significant, both in the expected direction. The other political variables are not significant, and neither are the seven economic variables.

In table 5, we run the horse races between the different economic variables and our political variables. *House share* is statistically significant at the 10% level or greater in all but one specification, which is the one where we include exports per capita (column 9).<sup>34</sup> In four cases, *House share* is significant at the 5% level. These results are large in magnitude, with a standard deviation increase in *House share* corresponding to 54 to 76% of a standard deviation increase in lighthouses and lightships (per 1000 miles of shoreline).

<sup>29</sup> Fisher (1854) does not have data going into the 1850s, but this book’s advantage is a more expansive collection for the previous sixty years. We could not find reliable estimates of state-exports for the 1780s to match with the 1790 lighthouse data. Fortunately, thanks to the work of Shepherd and Walton (1972; 1976), we have exports per capita for 1768-1772 which we will use as our lagged value of exports for 1790. We deflate using the price index produced by McCusker (1992: Table A-2) with 1768-1772 set as base year.

<sup>30</sup> All these measures have a common flaw namely that they have different coverages for states. For example, the method for estimating GDP depends on whether labor force estimates exist. If not, the state provides no estimate. For exports, numerous states reported little information.

<sup>31</sup> It was also of relevance in presidential elections. In the debates over the 1847 Lighthouse Bill, congressman Thomasson of Kentucky was accused of trying to use the bill to have “a bearing over Presidential elections” (Rives 1852: 422).

<sup>32</sup> Committee chairmanships are generally believed to be more important in the 20<sup>th</sup> century. However, their importance should not be underplayed for lighthouse allocation in the 19<sup>th</sup> century. Indeed, the Committee had the power to commission studies for new lighthouses and propose new lighthouses. For example, senator Cass of Michigan in 1852 noted that he wanted the Committee Chairman to come up with a better proposed system before he would vote on a proposed reorganization (Rives 1852: 2458).

<sup>33</sup> We excluded the data we collected for the states of Oregon, Washington and California because, while they had lighthouses, they provided little to no information for the economic variables described during the antebellum period. In any case, they arrive too late to have some of the economic variable data (for example, California has no exports to use for the 1850s).

<sup>34</sup> We believe that this is indicative of the possibility we highlighted above that exports per capita is both an economic and a political variable. It captures the economic importance of a state but also the political clout of the maritime trade interests.

**Table 3**  
Descriptive Statistics.

VARIABLES	(1) N	(2) mean	(3) sd	(4) Min	(5) max
Lighthouses and Lightships per 1000 miles of shoreline	199	7.094	11.266	0	66.67
Percentage change in Lighthouses and Lightships per 1000 of shore	173	33.515	54.383	-10.129	381.649
Lighthouses per 1000 miles of shoreline	199	6.709	10.976	0	66.67
Percentage change in lighthouses per 1000 miles of shoreline	173	32.414	54.451	0	381.649
Appropriations (logged)	142	-0.748	3.209	-8.952	5.378
Overrepresentation in Congress (Percentage Points)	157	0.155	0.213	0	0.815
House share (Percentage Points)	156	4.697	4.233	0.413	17.92
Committee Chairman	202	0.114	0.318	0	1
President's Home State (Dummy)	202	0.079	0.271	0	1
Log of Exports per Capita (1768–1772\$)	141	0.980	1.817	-6.180	4.813
Coastal Cities (2k+, 20 km)	202	1.228	2.513	0	18
Log of GDP per Capita 1 (1840\$)	148	4.389	0.309	3.739	5.042
Log of GDP per Capita 2 (2000\$)	146	7.158	0.427	6.433	8.363
Urbanization rate	168	0.082	0.102	0	0.556
Corporations per 1M	153	270.048	255.513	0	1388
Customs Houses	198	3.394	4.432	0	24

**Table 4**  
Regression Results, All Variables Separately.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
House Share	1.651* (0.843)							
Overrepresentation in Congress	-24.46* (13.74)							
President's Home State	-3.748 (2.447)							
Committee Chairman	-3.107 (2.167)							
Exports per Capita		0.698 (1.227)						
Coastal Cities			0.476 (0.589)					
GDP per capita 1				8.186 (6.575)				
GDP per capita 2					4.712 (5.903)			
Urbanization rate						26.33 (20.39)		
Corporations per 1M							0.001 (0.003)	
Customs Houses								-0.049 0.286
Constant	-5.946 (4.996)	-0.428 (2.123)	1.657 (1.072)	-31.32 (26.64)	-30.00 (39.97)	-0.395 (2.066)	1.195 (1.603)	1.867 (1.194)
Observations	156	141	199	147	145	165	153	198
R-squared	0.577	0.578	0.462	0.494	0.489	0.531	0.473	0.456
Number of states	26	24	26	26	25	26	26	26
State FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

*Overrepresentation in Congress* is negative and statistically significant in three specifications. This may appear strange at first since voters in states like Virginia and South Carolina had more political powers than voters in free states. However, as we pointed out above, sectional politics weighed heavily in the allocation of lighthouses. The most recurrent complaint was from slave states that argued that they were not receiving their fair share. The *Overrepresentation in Congress* results reflect this. *President's Home State* is negative and significant in three specifications, suggesting that states of the presidents were not allocated extra lighthouses. Note, though, that *not a*

**Table 5**

Regressions Results, Comparing Importance of Political and Economic Factors (Dependent Variable: Lighthouse and Lightships per 1000 miles of shoreline).

VARIABLES	(9)	(10)	(11)	(12)	(13)	(14)	(15)
House Share	0.128 (0.520)	1.738** (0.813)	2.005** (0.835)	1.963** (0.860)	1.433* (0.698)	2.020** (0.904)	1.707* (0.910)
Overrepresentation in Congress	-25.35** (12.09)	-22.45 (13.98)	-16.23 (13.84)	-18.52 (14.09)	-10.83 (14.51)	-24.61* (13.28)	-24.00* (13.58)
President's Home State	0.182 (1.565)	-3.737 (2.603)	-6.053** (2.640)	-5.290* (2.571)	-2.528 (2.142)	-5.068* (2.646)	-3.120 (2.487)
Committee Chairman	-2.188 (1.328)	-3.002 (2.018)	-2.479 (2.191)	-2.817 (2.292)	-2.484 (1.774)	-2.885 (2.454)	-2.909 (2.277)
Exports per capita	1.554 (1.372)						
Coastal Cities		0.559 (0.657)					
GDP per capita 1			13.65 (8.236)				
GDP per capita 2				8.459 (7.902)			
Urbanization Rate					32.61 (21.85)		
Corporations per 1M						0.002 (0.005)	
Customs Houses							-0.190 (0.385)
Constant	1.809 (3.677)	6.921 (5.053)	-61.77* (31.74)	63.14 (51.44)	-8.895** (3.968)	-6.685 (5.300)	-6.076 (5.038)
Observations	138	156	141	139	153	142	156
R-squared	0.633	0.584	0.603	0.595	0.574	0.591	0.578
Number of states	24	26	26	25	26	26	26
State FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

single economic variable is statistically significant.<sup>35</sup> Particularly telling is the lack of significance of the customs houses. Indeed, one alternative argument would be that the federal government had a strong incentive to build lighthouses as a complement to its efforts to collect revenues from trade tariffs. Our results suggests that this was not the case.

In table 6, we replicate the above results, but with lagged values of the dependent variable. As explained earlier, this is a robustness check to account for the fact that the dependent variable measures stocks rather than flows. In this first robustness check, no economic variables (again) come back as significant, and they are in conflicting directions. Four economic variables (exports per capita, coastal cities, urbanization rate, and corporations per 1 million) are associated with more lighthouse allocations, while three (both measures of GDP per capita and customs houses) are negative. However, with the exception of the setups that use exports per capita and urbanization rate, *House Share* is always significant above the 10% level and has the expected sign. In one regression specification, *Overrepresentation in Congress* has a significant negative effect. The other political variables do not appear to play a statistically significant role. These results are also economically significant. For columns 10 through 12 and 14 through 15, where the house share variable is significant, a one standard deviation increase in house share corresponds to 30 to 37% of a standard deviation increase in our dependent variable.

Another way to evaluate whether our dependent variable is problematic because it measures stocks consists in redefining it as the interdecadal growth in the number of lighthouses and lightships (i.e., making it a flow variable). This is depicted in table 7.<sup>36</sup> Once again, *House share* remains a strong predictor in the growth of lighthouses and lightships in six specifications. *Overrepresentation in Congress* is only negatively and statistically significantly related to fewer lighthouses and lightships twice. Perhaps surprisingly, the dummy variable for committee chairman is negatively related to the growth in lighthouses. Again, no economic variable is significantly (statistically) related to the growth of lighthouses.

In table 8, we repeat the exercise from table 5 but we only examine lighthouses (and no longer include lightships) as the dependent

<sup>35</sup> It is also interesting to note that customs houses are never significant either in the main results or in the robustness checks. As customs houses were located in ports where both intranational and international trade took place, this means that the issue of our economic variables not being able to fully capture intranational trade appears minimal.

<sup>36</sup> We also performed a similar analysis, but with growth rates in only lighthouses. The results are available upon request. *House share* is positive and statistically significant in every specification, while *Overrepresentation in Congress* is negative and significantly related to the growth of lighthouses in all but one specification. Similarly, no economic variables are statistically significant.

**Table 6**

Regressions Results, Comparing Importance of Political and Economic Factors (Dependent Variable: Lighthouse and Lightships per 1000 miles of shoreline).

VARIABLES	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Lagged Dependent Variable	0.740*** (0.102)	0.762*** (0.058)	0.781*** (0.057)	0.781*** (0.059)	0.724*** (0.058)	0.771*** (0.059)	0.752*** (0.069)
House Share	-0.0182 (0.230)	0.855* (0.440)	0.794* (0.428)	0.799* (0.443)	0.614 (0.388)	0.888* (0.469)	0.979* (0.511)
Overrepresentation in Congress	-12.18* (6.168)	-9.799 (7.284)	-10.49 (7.449)	-10.85 (7.010)	-7.257 (7.617)	-7.786 (6.283)	-10.15 (7.110)
President's Home State	-0.411 (0.755)	-1.815 (1.303)	-1.578 (1.104)	-1.695 (1.202)	-1.32 (1.100)	-1.811 (1.113)	-0.959 (1.054)
Committee Chairman	-0.542 (0.553)	-1.876 (1.195)	-2.060 (1.334)	-2.003 (1.307)	-1.695 (1.080)	-1.981 (1.309)	-1.768 (1.222)
Exports per capita	0.689 (0.619)						
Coastal Cities		0.213 (0.189)					
GDP per capita 1			-3.494 (5.058)				
GDP per capita 2				-3.763 (4.249)			
Urbanization Rate					3.930 (9.911)		
Corporations per 1M						0.006 (0.006)	
Customs Houses							-0.365 (0.223)
Constant	1.846 (1.492)	-2.055 (2.295)	12.480 (19.490)	23.810 (27.600)	-1.061 (1.878)	-3.132 (2.772)	-1.540 (2.174)
Observations	125	143	141	139	140	142	143
R-squared	0.841	0.811	0.811	0.812	0.792	0.815	0.812
Number of states	24	26	26	25	26	26	26
State FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

variable.<sup>37</sup> This is to account for differences in the features of lighting aids. When this is done, the results for political variables are even stronger. The important *House Share* variable is now significant in all but one specification (column 16, exports per capita). *Overrepresentation in Congress* still yields significant effects in four specifications. Now, only one economic variable (urbanization rate) is positive and statistically significant at the 10% level.

We also examine congressional appropriations in table 9 as a final robustness check.<sup>38</sup> As discussed earlier, appropriations towards lighthouse and lightship construction allows us to capture differences in the quality of lighthouses while also being a flow variable. In this robustness check, *House share* is still positive and significant for six specifications (again, all but the one that includes exports per capita). For Columns 38 through 43, where the house share variable is significant, a one standard deviation increase in house share corresponds to 37 to 40% of a standard deviation increase in our dependent variable, which is weaker than it was in Table 5. Two other political variables (*Overrepresentation in Congress* and *President's Home State*) are significant in five and seven specifications, respectively. Only one economic variable (column 42, *Corporations per 1 M*) is positive and significant. Exports per capita is actually *negative* and statistically significant (column 37).

In order to evaluate the relative impact of political variables to economic ones in determining lighthouse allocations, we compare the partial r-squares of our different regressions. In panel (a), which reports results from the baseline horse race regression (table 5), we find that the political variables matter more than economic ones in every case but one (column 12, GDP per capita 2). When we examine the results from table 6 in panel (b) of this table (including lagged dependent variables), we find that political variables *still* explain more than economic variables in every case. The lagged dependent variable explains the overwhelming majority of the variation. For appropriations (panel c), political variables explain more than economic in only two cases.

In aggregate, there appears to be somewhat consistent effects of political considerations regarding the allocation of lighthouses. However, economic considerations cannot be ruled out entirely. Thus, lighthouses and lightships were not built *exclusively* out of

<sup>37</sup> The same analysis, but with lagged dependent variables are available upon request. *House share* is almost always statistically significant, as well as *Overrepresentation in Congress*. No economic variable is statistically significant.

<sup>38</sup> When include the lagged value of appropriations (which are available upon request), the only economic variable that is statistically significant is *Corporations per 1M*. *House share* is positive and significant in five specifications.

**Table 7**

Regressions Results, Comparing Importance of Political and Economic Factors (Dependent Variable: Growth in Lighthouse and Lightships per 1000 miles of shoreline).

VARIABLES	(23)	(24)	(25)	(26)	(27)	(28)	(29)
Lighthouses and Lightships (logged)	-66.54*** (7.870)	-58.83*** (6.582)	-64.45*** (7.241)	-64.43*** (7.231)	-68.85*** (9.832)	-65.50*** (7.828)	-59.23*** (6.328)
House Share	2.129 (1.506)	6.350* (3.174)	8.333** (3.854)	8.351** (3.859)	2.714** (1.223)	9.022** (3.931)	6.323* (3.181)
Overrepresentation in Congress	-109.500 (74.440)	-120.900 (73.410)	-151.500** (70.810)	-149.300** (71.190)	-71.590 (71.850)	-124.400 (74.840)	-121.600 (74.68)
President's Home State	2.817 (10.610)	-8.155 (15.460)	-12.790 (17.410)	-12.860 (17.490)	4.056 (11.500)	-14.970 (18.370)	-12.890 (16.830)
Committee Chairman	-15.320 (9.311)	-18.210 (10.670)	-23.070* (11.630)	-22.920* (11.660)	-18.470* (9.616)	-20.540* (11.090)	-18.340* (10.250)
Exports per capita	2.469 (7.375)						
Coastal Cities		-1.038 (3.048)					
GDP per capita 1			-52.86 (41.070)				
GDP per capita 2				-48.65 (41.590)			
Urbanization Rate					-7.475 (99.450)		
Corporations per 1M						0.00115 (0.051)	
Customs Houses							1.039 (1.229)
Constant	47.150** (18.890)	24.600 (22.820)	263.500 (165.500)	377.400 (279.500)	47.880** (17.460)	39.430* (22.540)	23.050 (22.640)
Observations	114	130	115	114	127	116	130
R-squared	0.498	0.446	0.469	0.468	0.603	0.475	0.447
Number of states	20	25	24	23	24	25	25
State FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

concern for political factors. This finding has strong implications for other literatures. First, it helps explain state capacity in ante-bellum America. Our results suggest that public choice considerations might have complemented public interest considerations.<sup>39</sup> The motivation for nationalizing lighthouses might have been in part the societal gains from greater provision, but provision was only politically feasible because politicians and key interest groups gained access to rents. In other words, to make the pie bigger it was necessary to promise a large share of the gains to certain key groups. Our results also suggests that the net gains from public provision (in the manner suggested by the standard public economics textbook) were smaller than could be expected. They may even have been negative because of elements such as the protectionism masquerading in the discriminatory tonnage rates and the overprovision in some areas. This echoes some other case studies where state capacity expansion did not increase economic activity even though it benefited key interest groups and political actors (e.g., [Geloso and Makovi 2022](#) on state capacity in colonial Canada). This lowers the bar for assessing the efficacy of private provision relative to expansion in state capacity to take over the provision of public goods such as the lighthouse.

Second, our results also speak to the debates on privatization/nationalization. In assessing whether or not to delegate provision to the private sector, policymakers must be able to set, enforce and monitor clear terms of provision. If not, public provision (i.e., nationalization) might be preferable ([Lazzarini 2022](#)). This way of framing up the privatization debates omits the problem of the policymaker's motivations. If the motivation for nationalization is to extract rents, then it might be preferable to have a less-than-ideal private provision. While many contributors to that literature appreciate this point, they have never applied before to the lighthouse's case. As "foundational debates about public service provision originate with the study of private lighthouses" ([Bogart et al. 2022](#): 275), our attempt to evaluate the efficacy of public provision completes the picture for this emblematic public good. [Table 10](#)

## 5. Conclusion

Lighthouses have commonly been used as the emblematic public good, leading to many scholars to debate the possibility of efficient private provision. Few, though, have examined why governments nationalized them. We argue that the "how" of public provision shines light on the "why".

<sup>39</sup> As John Nye remarked to us, if there had been *no* public interest consideration in play, there would have been congressional appropriations for lighthouses in Iowa.

**Table 8**

Regressions Results, Comparing Importance of Political and Economic Factors (Dependent Variable: Lighthouse per 1000 miles of shoreline).

VARIABLES	(30)	(31)	(32)	(33)	(34)	(35)	(36)
House Share	0.278 (0.518)	1.875** (0.820)	2.152** (0.847)	2.111** (0.873)	1.587** (0.707)	2.181** (0.912)	1.849* (0.919)
Overrepresentation in Congress	-23.72** (11.36)	-22.63* (13.19)	-16.85 (12.78)	-19.38 (12.99)	-10.32 (13.38)	-24.23* (12.24)	-24.03* (12.71)
President's Home State	0.588 (1.512)	-3.307 (2.581)	-5.557** (2.631)	-4.808* (2.579)	-2.075 (2.113)	-4.603* (2.627)	-2.723 (2.433)
Committee Chairman	-2.122 (1.374)	-2.913 (2.054)	-2.419 (2.215)	-2.753 (2.338)	-2.381 (1.787)	-2.833 (2.501)	-2.824 (2.307)
Exports per capita	1.546 (1.355)						
Coastal Cities		0.509 (0.635)					
GDP per capita 1			13.02 (8.03)				
GDP per capita 2				7.487 (7.409)			
Urbanization Rate					35.39* (19.41)		
Corporations per 1M						0.003 (0.004)	
Customs Houses							-0.180 (0.390)
Constant	0.740 (3.596)	-7.514 (4.997)	-59.82* (30.87)	-57.20 (48.06)	-9.851** (3.850)	-7.557 (5.274)	-6.750 (4.999)
Observations	138	156	141	139	153	142	156
R-squared	0.598	0.561	0.582	0.573	0.551	0.572	0.555
Number of states	24	26	26	25	26	26	26
State FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses. \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Table 9**

Regressions Results, Comparing Importance of Political and Economic Factors (Dependent Variable: Logged Appropriations).

VARIABLES	(37)	(38)	(39)	(40)	(41)	(42)	(43)
House Share	0.205 (0.138)	0.291** (0.128)	0.294** (0.116)	0.291** (0.117)	0.289** (0.131)	0.278** (0.120)	0.303** (0.112)
Overrepresentation in Congress	-4.316 (4.767)	-7.510* (3.723)	-6.799* (3.914)	-6.841* (3.896)	-6.708 (3.984)	-7.404* (3.646)	-7.490* (3.671)
President's Home State	-1.052* (0.575)	-1.262** (0.506)	-1.381** (0.517)	-1.316** (0.509)	-1.232** (0.531)	-1.126** (0.508)	-1.176** (0.542)
Committee Chairman	-0.005 (0.450)	0.234 (0.487)	0.287 (0.519)	0.257 (0.501)	0.256 (0.483)	0.177 (0.528)	0.246 (0.502)
Exports per capita	-0.406** (0.182)						
Coastal Cities		0.013 (0.085)					
GDP per capita 1			1.449 (1.797)				
GDP per capita 2				1.234 (1.354)			
Urbanization Rate					3.462 (2.716)		
Corporations per 1M						0.003** (0.001)	
Customs Houses							-0.035 (0.099)
Constant	4.081*** (1.401)	-4.680*** (1.267)	-10.63 (7.730)	-13.09 (9.704)	-4.899*** (1.261)	-4.434*** (1.141)	-4.640*** (1.168)
Observations	124	142	141	139	139	141	142
R-squared	0.584	0.558	0.561	0.560	0.549	0.565	0.558
Number of states	24	26	26	25	26	26	26
State FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses. \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Table 10**  
Partial R<sup>2</sup> by Variable Group.

Panel a: Table 5 (Comparing Importance of Political and Economic Factors; Lighthouses and Lightships, No Lagged Dependent Variable)							
Variables	9	10	11	12	13	14	15
Political Variables	0.342	0.115	0.206	0.135	0.134	0.080	0.138
Economic Variables	0.003	0.064	0.081	0.155	0.063	0.045	0.000
Panel b: Table 6 (Comparing Importance of Political and Economic Factors; Lighthouses and Lightships, With Lagged Dependent Variable)							
Variables	16	17	18	19	20	21	22
Lagged Dependent Variable	0.831	0.767	0.761	0.739	0.760	0.777	0.782
Political Variables	0.052	0.036	0.017	0.036	0.039	0.029	0.034
Economic Variables	0.001	0.000	0.006	0.001	0.004	0.028	0.004
Panel c: Table 9 (Comparing Importance of Political and Economic Factors; Appropriations, No Lagged Dependent Variable)							
Variables	37	38	39	40	41	42	43
Political Variables	0.013	0.020	0.046	0.041	0.014	0.068	0.028
Economic Variables	0.001	0.075	0.236	0.226	0.061	0.159	0.010

Notes: The column numbers correspond to the respective model from Tables 5, 6, and 9.

We analyzed the case of American lighthouses from 1790 to 1860, mainly due to the fact that the federal government followed the vast majority of what would later become the textbook solutions to the public goods problem. We contend that the ability to use provision of lighthouses to confer rents was an important factor in federalization. It allowed Congress to control an important source of patronage and use the expansion of the lighthouse network to further political interests. We argue that there were competing public interest and public choice factors that determined the number of lighthouses that were allocated to a given state. There appears to be qualitative and quantitative evidence in favor of both theories as lighthouses were allocated for *both* economic and political reasons even though political forces appear more robustly significant and generally stronger.

Our results are consistent with the idea that public choice considerations and public interest considerations often act as complements (Wallis 1987; 1998; Leeson 2019; Geloso 2020; Geloso and March 2020). These findings are important to the “why” of nationalization. The presence of political rents was a key ingredient in motivating *and* securing nationalization. Without the lure of these rents, nationalization would not have occurred. Here, we confirm the point of Besley and Persson (2008, 2009, 2010) that rulers need to tap some of the returns of “doing the good thing” in order to be incentivized to do so. But more importantly, the way these rents were shaped also introduce the possibility that, absent nationalization, outcomes would have been superior. This latter possibility requires further investigation in the future.

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## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.eurocorev.2023.104425](https://doi.org/10.1016/j.eurocorev.2023.104425).

## References

- Anderson, G.M., Tollison, R.D., 1991. Congressional influence and patterns of new deal spending, 1933-1939. *J. Law Econ.* 34, 161–175.
- Bailey, M.J., Duquette, N.J., 2014. How johnson fought the war on poverty: the economics and politics of funding at the office of economic opportunity. *J. Econ. History* 74 (2), 351–388.
- Berglund, A., 1921. Discriminatory duties on imports in American bottoms. *Ann. Am. Acad. Pol. Soc. Sci.* 94 (1), 185–195.
- Besley, T., Persson, T., 2008. Wars and state capacity. *J. Eur. Econ. Assoc.* 6 (2/3), 522–530.
- Besley, T., Persson, T., 2009. The origins of state capacity: property rights, taxation, and politics. *Am. Econ. Rev.* 99 (4), 1218–1244.
- Besley, T., Persson, T., 2010. State capacity, conflict, and development. *Econometrica* 78 (1), 1–34.
- Bertrand, E., 2006. The Coasean analysis of lighthouse financing: myths and realities. *Cambridge J. Econ.* 30, 389–402.
- Biais, B., Perotti, E., 2002. Machiavellian privatization. *Am. Econ. Rev.* 92 (1), 240–258.
- Block, W., Barnett II, W., 2009. Coase and Bertrand on lighthouses. *Public Choice* 140 (1/2), 1–13.
- Bogart, D., Dunn, O.B., Alvarez-Palau, E.J., Shaw-Taylor, L., 2022. Organizations and efficiency in public services: the case of English lighthouses revisited. *Econ. Inq.* 60 (2), 975–994.
- Bork, R., 1966. Legislative intent and the policy of the sherman act. *J. Law Econ.* 9, 7–48.
- Boudreaux, D., DiLorenzo, T.J., 1992. The protectionist roots of antitrust. *Rev. Austrian Econ.* 6 (2), 81–96.
- Candela, R.A., Geloso, V.J., 2018a. The lightship in economics. *Public Choice* 176 (3–4), 479–506.

- Candela, R.A., Geloso, V.J., 2018b. The lighthouse debate and the dynamics of interventionism. *Rev. Austrian Econ.*
- Candela, R.A., Geloso, V.J., 2019a. Why consider the lighthouse a public good? *Int. Rev. Law Econ.* 60, 105852.
- Candela, R.A., Geloso, V.J., 2019b. Coase and transactions costs reconsidered: the case of the English lighthouse system. *Eur. J. Law Econ.* 48 (3), 331–349.
- Carnis, L., 2013. The provision of lighthouse services: a political economy perspective. *Public Choice* 157 (1/2), 51–56.
- Clarke, T., Pitelis, C. (Eds.), 2005. *The Political Economy of Privatization*. Routledge.
- Coase, R.H., 1974. The lighthouse in economics. *J. Law Econ.* 17 (2), 357–376.
- Conway, J., 1923. *The United States Lighthouse Service*. Department of Commerce, Lighthouse Service, Washington D.C.
- Cornes, R., Sandler, T., 1996. *The Theory of Externalities, Public Goods, and Club Goods*. Cambridge University Press, New York.
- Crowther, S.J., 1976. Urban Growth in the Mid-Atlantic States, 1785–1850. *J. Econ. History* 36 (3), 624–644.
- Couch, J.F., Shughart, W.F., 2000. New deal spending and the states: the politics of public works. In: Heckelmen, J.C., Moorhouse, J.C., Whaples, R.M. (Eds.), *Public Choice Interpretations of American Economic History*. Springer, Boston, MA.
- Cox, G.W., Figueroa, V., 2021. Political fragmentation, rural-to-urban migration and urban growth patterns in western Eurasia, 800–1800. *Eur. Rev. Econ. History* 25 (2), 203–222.
- D'Entremont, J., 2014. *The Lighthouse Handbook: New England*. Cedar Mill Press, Kennebunkport, Maine.
- DeLorme, C.D., Scott Frame, W., Kamerschen, D.R., 1997. Empirical evidence on a special-interest-group perspective to antitrust. *Public Choice* 92 (3–4), 317–335.
- De Wire, E., Dempster, D., 2004. *Lighthouses of the South*. Voyageur Press, Stillwater MN.
- DiLorenzo, T., 1985. The origins of antitrust: an interest-group perspective. *Int. Rev. Law Econ.* 5, 73–90.
- Dincecco, M., 2017. *State Capacity and Economic Development*. Cambridge University Press.
- Dolin, E.J., 2016. *Brilliant Beacon: A History of the American Lighthouse*. Liveright, New York, New York.
- Finger, S., 2010. A Flag of defiance at the masthead: the Delaware River pilots and the sinews of Philadelphia's Atlantic world in the eighteenth century. *Early Am. Stud.* 8 (2), 386–409.
- Fish, C.R., 1905. *The Civil Service and the Patronage*. Longmans, Green, and Company, New York.
- Fisher, R.S., 1854. *Progress of the United States of America from the Earliest Periods*. J.H. Colton & Company, New York.
- Fleck, R.K., 2008. Voter influence and big policy change: The positive political economy of the new deal. *J. Polit. Econ.* 116 (1), 1–37, 2008.
- Geloso, V., 2020. Collusion and combines in Canada, 1880–1890. *Scandinavian Econ. History Rev.* 68 (1), 66–84.
- Geloso, V., Makovi, M., 2022. State capacity and the post office: evidence from nineteenth century Quebec. *J. Government Econ.* 5.
- Geloso, V., & March, R. (2020). *Rent-Seeking for Madness: The Political Economy of Mental Asylums in the US, 1870 to 1910*. SSRN Working Paper available at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3421728](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3421728).
- Geloso, V., Salter, A.W., 2020. State capacity and economic development: causal mechanism or correlative filter? *J. Econ. Behav. Org.* 170, 372–385.
- Glaeser, E.L., Shleifer, A., 2001. Not-for-profit entrepreneurs. *J. Public Econ.* 81 (1), 99–115.
- Grace, A.S. (2004). From the lighthouses: how the first federal internal improvement projects created precedent that broadened the commerce clause, shrunk the takings clause, and affected early nineteenth century constitutional debate." *Alb Law Review*.
- Grace, A.S. (2005). *Federal-State Negotiations over Federal Enclaves in the Early Republic: Finding Solutions to Constitutional Problems at the Birth of the Lighthouse System*. *Miss. LJ* 75:545.
- Grimsey, D., Lewis, M., 2007. *Public Private Partnerships: The worldwide Revolution in Infrastructure Provision and Project Finance*. Edward Elgar Publishing.
- Gordon, S.C., Simpson, H.K., 2018. The birth of pork: local appropriations in America's first century. *Am. Political Sci. Rev.* 112 (3), 564–579.
- Hart, O., Shleifer, A., Vishny, R., 1997. The proper scope of government: theory and an application to prisons. *Q. J. Econ.* 112, 1127–1161.
- Hill, W., 1892. *Colonial Tariffs*. *Q. J. Econ.* 7 (1), 78–100.
- Hill, W., 1893. *The First Stages of the Tariff Policy of the United States*. American Economic Association.
- Holland Jr., F.R., 1972. *America's Lighthouses: Their Illustrated History since 1716*. The Stephen Greene Press, Brattleboro, VT.
- Hyde, C.K., 1995. *The Northern Lights: Lighthouses of the Upper Great Lakes*. Wayne State University Press.
- House of Representatives, 1843. Document No. 183: Examination – Lighthouse Establishment. Government Printing Office.
- Jackson, C. (1966). *The Internal Improvement Vetoes of Andrew Jackson*. *Tennessee Historical Quarterly* 25(3): 261–279.
- Johnston, L., & Williamson, S.H. (2022). *What was U.S. GDP Then? MeasuringWorth*. <http://www.measuringworth.org/usgdp/>.
- Johnson, L.R., 1997. *The Lighthouse Reform Movement in Antebellum America*. The State University of New Jersey, Rutgers, Department of Economics, mimeo, p. 43 pages.
- Johnson, N.D., Koyama, M., 2017. States and economic growth: capacity and constraints. *Explorations Econ. History* 64, 1–20.
- Karamanski, T., 2020. *Mastering the Inland Seas: How Lighthouses, Navigational Aids, and Harbors Transformed the Great Lakes and America*. University of Wisconsin Press.
- Karentz, V., 2008. *Beavertail Light Station On Conanicut Island*. Booksurge Publishing, Charleston, SC.
- Keller, K.W., 1977. The Philadelphia pilots' strike of 1792. *Labor History* 18 (1), 36–48.
- Law, M.T., Kim, S., 2005. Specialization and regulation: the rise of professionals and the emergence of occupational licensing regulation. *J. Econ. History* 65 (3), 723–756.
- Law, M.T., Marks, M.S., 2009. Effects of occupational licensing laws on minorities: evidence from the progressive era. *J. Law Econ.* 52 (2), 351–366.
- Lazzarini, S.G., 2022. *The Right Privatization: Why Private Firms in Public Initiatives Need Capable Governments*. Cambridge University Press.
- Leeson, P.T., 2019. Do we need behavioral economics to explain law? *Eur. J. Law Econ.* 48 (1), 29–42.
- Levitt, T., 2013. *A Short Bright Flash: Augustin Fresnel and the Birth of the Modern Lighthouse*. WW Norton & Company.
- Levitt, T., 2020. When lighthouses became public goods: the role of technological change. *Technol. Cult.* 61 (1), 144–172.
- Libecap, G., 1992. The rise of the Chicago packers and the origins of meat inspection and antitrust. *Econ. Inq.* 30, 242–262.
- Lighthouse Board of the United States, 1852. *Report of the Officers Constituting the Light-House Board, Convened Under Instructions from the Secretary of the Treasury to Inquire into the Conditions of the Light-House Establishment of the United States Under the Act of March 3, 1851*. A. Boyd Hamilton, Washington D.C.
- Lighthouse Board of the United States, 1893. *List of Lights and Fog Signals of the Atlantic and Gulf Coasts of the United States*. A. Boyd Hamilton, Washington D.C.
- Lindberg, E., 2015. The Swedish lighthouse system 1650–1890: private versus public provision of public goods. *Eur. Rev. Econ. History* 19 (4), 454–468.
- Majewski, J., 2011. *Modernizing a Slave economy: the Economic Vision of the Confederate Nation*. University of North Carolina Press.
- Majewski, J., 2013. *Imagined economies: economic nationalism in the American and confederate independence*. In: Thompson, P., Onuf, P. (Eds.), *State and Citizen: British America and the Early United States*. University of Virginia Press.
- McChesney, F.S., 1986. Government prohibitions on volunteer firefighting in nineteenth-century America: a property rights perspective. *J. Legal Stud.* 15, 69–92.
- McCusker, J.J., 1967. Colonial tonnage measurement: five Philadelphia merchant ships as a sample. *J. Econ. History* 27 (1), 82–91.
- McCusker, J.J., 1992. How Much Is That in Real Money? A Historical Price Index For Use as a Deflator of Money values in the Economy of the United States. *American Antiquarian Society, Worcester, MA*.
- McKenzie, M., 2006. Navigating federalism: Federalists, the Boston Marine Society, and the establishment of federal authority in Boston, 1789–1792. *Northern Mariner* 16 (3), 1–14.
- Migué, J.L., Bélanger, G., 1974. Toward a general theory of managerial discretion. *Public Choice* 17, 27–51.
- Mill, J.S., 2004. *Principles of Political Economy*. Prometheus Books, Amherst, MA.
- Miller, A.S., 2010. The lighthouse top i see: lighthouses as instruments and manifestations of state building in the early republic. In: *Buildings & Landscapes: Journal of the Vernacular Architecture Forum*, 17. University of Minnesota Press, pp. 13–34.
- Mixon, F.G., Bridges, R.S., 2018. The lighthouse in economics: Colonial America's experience. *J. Public Finance Public Choice* 33 (1), 81–101.
- Newman, P., 2018. Revenge: John Sherman, Russell Alger, and the origins of the Sherman Act. *Public Choice* 174 (3–4), 257–275.
- Newman, P., 2019. *The Big Meat: The Beef Trust, Regulatory Capture, and Government Intervention*. Available at SSRN at <https://ssrn.com/abstract=3213676>.



- Newman, P., 2021. Cronyism: Liberty versus Power in Early America. Ludwig von Mises Institute, Auburn, AL, pp. 1607–1849.
- Neufeld, J.L., 2017. Selling Power: Economics, Policy, and Electric Utilities Before 1940. University of Chicago Press, Chicago, IL.
- Niskanen, W.A., 1971. Bureaucracy and Representative Government. Transaction Publishers.
- Noble, D., 2014. Lighthouses & Keepers: The US Lighthouse Service and Its Legacy. Naval Institute Press.
- Olmstead, A.L., Rhode, P., 2015. **Arresting contagion: Science, policy, and Conflicts Over Animal Disease Control**. Harvard University Press, Cambridge, MA.
- Olson, M., 1993. Dictatorship, democracy, and development. *Am. Political Sci. Rev.* 87 (3), 567–576.
- Piano, E.E., 2019. State capacity and public choice: a critical survey. *Public Choice* 178 (1-2), 289–309.
- Putnam, G.R., 1917. Lighthouses and Lightships of the United States. Houghton Mifflin Company, Boston and New York.
- Rives, J.C. 1852. *Congressional Globe*, 21-22. 32nd Congress, 1st Session.
- Saito, K., 2019. Lighthouse provision in premodern Japan. *Econ. Inq.* 57 (3), 1582–1596.
- Samuelson, P., 1964. Theoretical notes on trade problems. *Rev. Econ. Stat.* 46, 145–154.
- Shleifer, A., 1998. State versus private ownership. *J. Econ. Perspect.* 12 (4), 133–150.
- Shepherd, J.F., Walton, G.M., 1972. Shipping, Maritime Trade and the Economic Development of Colonial North America. Cambridge University Press.
- Shepherd, J.F., Walton, G.M., 1976. Economic change after the American Revolution: Pre-and post-war comparisons of maritime shipping and trade. *Explorations Econ. History* 13 (4), 397–422.
- Snow, E.R., 2005. *The Lighthouses of New England*. J. Applewood Books.
- Stevenson, D.A., 1959. *The World's Lighthouses Before 1820*. Oxford University Press, London.
- Stewart, W.J., 1991. *The Lighthouse Act of 1789*. Senate Historical Office, Washington D.C. U.S.
- Sutton, J.R., 1991. The political economy of madness: The expansion of the asylum in progressive America. *Am. Sociol. Rev.* 56 (5), 665–678.
- Sylla, R., Wright, R.E., 2007. **U.S. corporate development, 1801-1860 NSF Grant 0751577**.
- Tabachnik, L., 1971. Political patronage and ethnic groups: foreign-born in the united states customhouse service, 1821-1861. *Civil War History* 17 (3), 222–231.
- Taylor, J., 2001. Private property, public interest, and the role of the state in nineteenth century Britain: the case of the lighthouses. *Historical J.* 44 (3), 749–771.
- United States Shipping Board, 1922. *Report On the History of Shipping Discriminations and On the Various Forms of Government Aid to Shipping*. US Government Printing Office, Washington D.C.
- van Zandt, D.E., 1993. The lessons of the lighthouse: “government” or “private” provision of goods. *J. Legal Stud.* 22 (1), 47–72.
- Wallis, J.J., 1987. Employment, politics, and economic recovery during the great depression. *Rev. Econ. Stat.* 49, 516–520.
- Wallis, J.J., 1998. The political economy of new deal spending revisited, again: with and without Nevada. *Explorations Econ. History* 35, 140–170.
- Wallis, J.J., Weingast, B.R., 2018. Equilibrium federal impotence: why the states and not the American national government financed economic development in the antebellum era. *J. Public Finance Public Choice* 33 (1), 19–44.
- Weiss, G., 1926. *The Lighthouse Service: Its History, Activities and Organization*. Johns Hopkins Press.
- Wells, J., 2020. *Shipwrecked: Coastal Disasters and the Making of the American Beach*. UNC Press Books.
- Wright, G., 1974. The Political Economy of New Deal Spending: An Econometric Analysis. *Rev. Econ. Stat.* 56, 30–38.
- Yandle, B., 1983. Bootleggers and baptists: the education of a regulatory economist. *Regulation* 7 (3), 12–16.
- Zornow, W.F., 1954a. New Hampshire Tariff Policies 1775 to 1789. *Soc. Stud.* 45 (7), 252–256.
- Zornow, W.F., 1954b. Georgia Tariff Policies, 1775 to 1789. *Georgia Historical Q.* 38 (1), 1–10.
- Zornow, W.F., 1954c. The Tariff Policies of Virginia, 1775-1789. *Virginia Mag. History Biography* 62 (3), 306–319.
- Zornow, W.F., 1955a. Tariff Policies in South Carolina 1775-1789. *South Carolina Historical Mag.* 56 (1), 31–44.
- Zornow, W.F., 1955b. North Carolina Tariff Policies, 1775-1789. *North Carolina Historical Rev.* 32 (2), 151–164.
- Zornow, W.F., 1956. New York tariff policies, 1775-1789. *New York History* 37 (1), 40–63.