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INCENTIVES IN CORPORATIONS: EVIDENCE FROM THE AMERICAN WHALING INDUSTRY

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ABSTRACT

In the 1830s, when whaling was a prosperous American industry, a number of whaling corporations were chartered. All of them were short-lived. This paper analyzes the failure of corporations in American whaling, and argues that the corporate form was unable to create the incentives requisite for success in the industry. Most nineteenth-century whaling ventures were owned by a small number of local investors, and were configured to provide powerful incentives for their managers. The effect of the corporate form on productivity is analyzed using a newly-collected panel dataset of 874 whaling voyages. Many whaling corporations were managed by individuals who had previously (or would subsequently) manage ventures with the usual ownership structure. Using an individual-fixed-effects framework, a strong negative effect of the corporate form on productivity is identified.

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Consider the problems faced by a prospective investor in a nineteenth-century whaling venture. The business would be managed by an "agent," a managing partner, who would purchase supplies and hire a captain and crew, and plan the voyage on behalf of the investors.[1] The agent's performance may have been difficult for the investor to evaluate, or even observe. Then the vessel was entrusted to the captain and crew and sent on a voyage to seas tens of thousands of miles away for periods of three years or longer, often circumnavigating the earth in the process. The actions of the crew would have been nearly impossible to observe while the voyage was underway, as would the efforts of the agent hire a good captain, and supervise the voyage. Incentive problems arise in the financing of any business, but in whaling these problems were particularly acute.

The contracts and organizational forms employed in whaling in the nineteenth century evolved in response to these problems. Most American whaling enterprises were closely held by a small number of local investors, and the allocation of ownership rights within these ventures was configured to provide powerful incentives for their managers. The industry's agents usually held substantial ownership shares in their ventures, thus aligning their interests with those of the other investors. Organized as unincorporated partnerships, these enterprises dominated the industry from its inception in the seventeenth century, through its decline in the late nineteenth century.

In the 1830s, a new mode of organization was introduced into the industry: the corporation. These whaling corporations were created at a time when the use of incorporation began contribute to the development of many nineteenth century industries.[2] Indeed, some have argued that the growth of corporations was "the most important and conspicuous feature of the development of society in Europe and America."[3] These early whaling corporations attempted to create diffusely-owned enterprises, governed by a formal structure including a board of directors and a committee of executive officers. This represented a significant departure from the traditional reliance on concentrated ownership to resolve incentive conflicts in the industry, and it failed: none of the whaling corporations survived

[1] A full account of the responsibilities of whaling agents is presented in Davis, Gallman and Gleiter (1997).

[2] The evolution of the use of the corporation as an organizational form in the late ninteenth and early twentieth century is documented by Kim (2003), Lamoreaux (2003), and Atack and Bateman (1995).

[3] Davis (1905), p. 1.

beyond the 1840s, and few experienced much financial success, at a time the American whaling industry as a whole continued to expand.

This paper will analyze the failure of corporations in the American whaling industry. The whaling corporations of the 1830s and 1840s did not alter the production process used by unincorporated ventures—they paid their crews using the same incentive contracts known as "lays," they used similar vessels, and their day-to-day operations were managed by an agent with the same responsibilities.[4] They differed from other whaling enterprises mainly in their ownership structures and their hierarchical form of governance. Although these features offered many potential advantages to small investors, they were unable to create the incentives requisite for success in the industry. The managers of these corporations, who did not hold significant ownership stakes, did not perform as well as their peers in unincorporated ventures, and as a result, the enterprises "failed to yield the profit anticipated," and were abandoned.[5]

The American whaling industry presents an ideal setting in which to analyze the effects of organizational forms on productivity in the development of the American economy. The entrepreneurs of the business—the agents—often managed dozens voyages over their careers, each of which can be regarded as separate business units, and many of which might have had different investors. The customs records that were created for each voyage contain detailed information not typically available for early-nineteenth-century firms, and present a unique opportunity to follow the different ventures of entrepreneurs over time.

This paper endeavors to exploit these features of the whaling industry and its surviving records through the analysis of a newly-constructed panel of 874 whaling voyages from 22 different ports, managed by 106 different agents. Many whaling corporations were founded and managed by entrepreneurs who had previously managed (or would subsequently manage) unincorporated partnerships with the usual ownership structure. The dataset contains a number of whaling voyages managed by these entrepreneurs, and the effect of incorpora-

[4]Because they did not modify the production process, but merely imposed a different governance structure on the same production process employed by other enterprises, these corporations did not differ from their unincorporated counterparts in the extent to which they faced the tradeoffs associated with joint production, as assumed, for example, in Allen and Lueck (1998). The "lay" system of incentive compensation contracts is analyzed in Davis, Gallman and Gleiter (1997), and Hohman (1928).

[5]Ruttenber (1875), referring to the Newburgh Whaling Co. of Newburgh, NY.

tion can thus be identified in an individual-fixed-effects framework from these observations. The entrepreneurs who formed whaling corporations were certainly a self-selected group, located in ports with little whaling activity (in a business dominated by a few large ports that specialized in whaling), and may have lacked the talents or experience requisite for success. However, the estimated results indicate a robust negative effect on productivity in the entrepreneurs' incorporated enterprises, compared to their unincorporated partnerships. Thus, even if only a self-selected group of unsuccessful entrepreneurs formed corporations, their corporate ventures were even less successful.

The paper proceeds as follows. In the next section, the evolution of the organizational forms of whaling enterprises is examined, with a particular focus on the role of the provision of incentives, and the allocation of rights of control. The history is followed through the many phases of the industry's development, into the 1830s, when whaling corporations were formed. The section that follows—Section 2—a presents a discussion of the experience of whaling corporations, and an analysis of their governance structures. Section 3 suggests some explanations for the failure of these corporations, and Section 4 presents an empirical analysis of the performance of whaling corporations. Section 5 discusses the results and concludes the paper.

The contracts between the investors and managers of whaling ventures in the nineteenth century evolved from earlier schemes used in 18th century whaling voyages, which, in turn, had evolved from contracts used in the much earlier shore whaling industry. The next section presents a brief description of the evolution of the contracts employed in the industry.

1 History of Whaling Enterprises and their Organization

In the earliest British settlements in Massachusetts and on Long Island, the commercial exploitation of whales commenced almost immediately upon the colonists' arrival. A small number of merchants usually owned the capital employed by the "companies" of men who were based on shore, and pursued whales in small craft. Rather than owning a stake in a formally-organized firm, these "adventurers uppon the whale designe" might each have contributed some of the goods and supplies involved in whaling, and received a commensurate

share of the proceeds.[6] In general, the crews were paid in shares of the oil they produced, with the owners of the vessel and equipment receiving the balance; usually the crew and the owners each received half. The shares paid to the different sailors appear to have been equal; each member of a six-person crew would have received a "sixthe part of a halfe fish."[7] The shore whaling companies on Long Island and in Massachusetts all seem to have used this arrangement, with a "half share" paid to the crews, and the balance retained by the owners.[8]

In order to pursue larger, more distant populations of whales, the passive shore-based approach was gradually supplanted by voyages in larger craft capable of travelling greater distances. This early deep-sea whaling, which began in the late seventeenth century, was carried out in small vessels of around 30 to 50 tons, on voyages lasting a few weeks, with crews of twelve or thirteen.[9] The companies would hunt whales from the decks of these vessels, or, in the case of the larger schooners, might carry small whaleboats on board, which would be launched when whales were spotted. These "offshore" whalers pursued populations of right whales that roamed farther out at sea, a transition that was accelerated as local whale populations began to decline due to the predations of the industry.[10] But they also began to pursue another species of whale that remained far offshore, unreachable to the shore whaling companies: the sperm whale.[11]

Whaling enterprises evolved along with whaling techniques. Deep-sea whaling required a greater amount of capital, both in the form of the larger vessel, and in the supplies and equipment necessary for the larger crews on their longer voyages. A precise description of

[6] *Records of the Town of East Hampton*, December 2 1675.

[7] *Records of the Town of East Hampton*, June 1675 (vol. 1, p. 376). See also contracts entered July 4, 1675; December 2, 1675; December 27, 1677; and March 13, 1678. Similar contracts are found in the *Records of the Town of Southampton*, in April 7, 1675; January 30, 1677; and January 20, 1676.

[8] Some of the owners may have also held indentures of men, usually Indians, who were employed as sailors in the company. See, for example, *Records of the Town of East Hampton*, March 13, 1678. Vickers (1983) describes the importance of indentured Indian labor, and the use of debt peonage, in the whaling industry on Nantucket. There is some evidence that enslaved Africans were also employed in whaling in the eighteenth century; see Palmer (1959).

[9] The tonnage figures are from Starbuck (1878, p. 22). See also Macy (1835).

[10] Right whales are baleen whales, meaning that they have keratinous strands of this substance in their mouths. The oil produced from their blubber is denoted "whale oil," in contrast to the oil from sperm whales.

[11] The blubber of sperm whales produces an oil of superior quality to (right) whale oil, and is odorless, whereas even refined right whale oil emits a fishy smell. Moreover, encased in their enormous heads is a waxy substance, spermaceti (sometimes called "head matter"), which was even more valuable.

the configuration of whaling enterprises from this era is found in a letter written by Micajah Coffin, a whaling merchant (and former whaling captain) on Nantucket. In response to an inquiry from a friend in another city, who was considering entering the whaling business, about the organization of a whaling voyage, Coffin wrote:

> In the first place, a whale voyage is performed with Thirteen men which forms the said voyage into thirteen shares because we have our men on shares that all the men on board may have an interest in the success of said voyage. The master has for his wages one share of the whole, that is $\frac{1}{13}$ of said voyage. The mate has $\frac{1}{20}$ of the voyage, the third man or harpooner has one twentysixth of ditto the fourth man or harpooner has one Thirtieth of said voyage and nine men more have half shares of three quarters which in a good voyage is tolerable good wages; in a poor voyage there is no wages to pay. The vessel Draws for her share fore ware & tare one fourth of said voyage. The remainder is for them that lay in the Stores or pay for them (which we call with us adventurers) stores such as provisions Boats oars whale Irons barrels &c. The charge commonly Expended with us on a voyage is about one hundred & Eighty five pounds which voyage is performed in about six months heretofore but I conceive a voyage to the coast of Guinea & Brazille will be nine months sailing...Find partners agreeable to own a vessel of about one hundred; or one hundred ten or twenty Tons...[12]

The basis for the crew's pay was a modified form of the "share" system from the early shore whaling companies: for a crew of thirteen, the proceeds were divided into thirteen shares. The letter also indicates that the owners of the vessel received one fourth, as they did in shore whaling, and the the other investors or "adventurers," who paid for the supplies and equipment used in the voyage, received the balance, or around one fourth.[13] But because the productive process now occurred onboard the vessel, rather than taking place partly on land, the owners of the vessel itself assumed greater control over the enterprise. As maritime law grants the owners of the vessel the right to control its voyage[14], this implied that the investors who paid for the supplies and equipment of the voyage—the very materials that would be expended—had no rights of control or, in the language of Grossman and Hart (1986), *residual rights.* In exchange for a fixed share of output, the investors paid to finance a voyage whose conduct and expenses they could not control.

[12]Micajah Coffin, letter to Capt. Nath. Bacchus, August 13 1773 (Coffin, 1773).

[13]The amount paid to the owners of the vessel, one fourth, seems to be relatively constant among different vessels at the time. See Vickers (1983).

[14]See Blunt's (1829) discussion of the rights of vessel owners (ch. 8).

Conflicts between the investors and the vessel owners under this arrangement were inevitable. In a 1769 printed broadside, Boston merchants who had financed whaling voyages listed quantities of supplies they agreed were necessary for a whaling voyage, and wrote:

> Inasmuch as it is found from several Years Experience in the Whale-Fishery, that the Method of fixing out for that Business has been unequal, and much to the Prejudice of the Fixers: Wherefore, in Order to put the same upon a more just and equal footing in the future, We the Subscribers do agree to grant...such Stores...as is specified above, *and no more.*[15]

Unless the vessel owners granted rights to the investors, these outsiders did not have a legal basis to influence the conduct of the voyage, or, for example, to recall their equipment if they felt it was improperly used.

In the late eighteenth and early ninteenth centuries, American whaling vessels began to venture into more distant oceans, on ever longer voyages.[16] The size of the vessels employed increased, and reached an average of more than 300 tons; the size of the crews increased with the vessels, growing from around thirteen in the 1770s to around 30 after 1815; and the length of voyages increased to around two years by 1815.[17] These voyages required much larger investments in vessels and in supplies, and the allocation of rights of control in the industry's financial contracts evolved in response.[18]

In particular, the class of investors who financed a voyage's expenses in exchange for a share of profits, with no rights of control, disappeared. Instead, investors in whaling voyages purchased ownership shares in the vessels themselves. As co-owners, maritime law guaranteed them rights of control over the voyage, in proportion to their stake in the vessel. They were also collectively responsible for the expenses of the voyage, in proportion to their

[15] Anon., "Articles of Agreement relative to the Whale Fishery," 10 February 1769, *Early American Imprints*, first series, no. 11162. Emphasis in original.

[16] Starbuck (1878, p. 168) presents a detailed tabulation of American whaling voyages in the eighteenth century; his tables include statistics for vessel tonnages and voyage lengths. The innovation that facilitated these longer voyages was the introduction of on-board "tryworks," the apparatus used to render the oil from blubber, sometime during the mid-eighteenth century.

[17] In their sample of New Bedford voyages, Davis, Gallman and Gleiter (1997) carefully document average vessel tonnages and lengths of voyages for this period.

[18] Data on the costs of early whaling voyages are scant, but in the 1770s, the cost of the equipment and provisions for whaling voyages was generally around £180, and the vessels and rigging cost between £200 and £1000 (Alden, 1774-1816; Rotch, 1771). By the 1830s, By 1835, the cost of the supplies for a voyage had risen to $18,000, and the cost of a typical 300-ton vessel was $20,000 (Macy, 1835).

ownership stakes, and, after the crews were paid, received the profits from the voyage. It is likely that this change in the structure of the contracts used in financing whaling voyages was important in facilitating the larger investments that were made in the industry during the nineteenth century.

Most whaling vessels of this era therefore had many owners.[19] But they were sent on voyages that were far more complex than their shorter, eighteenth-century predecessors, and the successful management of these ventures required substantial expertise. In response, the planning and management of these voyages was delegated to a merchant or merchant firm, known as the vessel's "agent," who specialized in managing whaling voyages.[20] The agent would handle all of the important decisions for the voyage: he would purchase the supplies; hire the captain and crew; keep all the vessel's accounts; give the captain his orders for the voyage, which included the locations where he was to seek whales; supervise the captain while the voyage was underway, by corresponding with the captain whenever possible; and determine the timing of the sale of the vessel's output. Essentially, the agent served the same role as the vessel owner in the previous arrangement, except that his co-owners possessed the same rights of control as he did.

The management of whaling voyages was not governed by any articles of agreement. The co-owners simply delegated management of the vessels' day-to-day operations to the agent, and participated only in the most crucial decisions for the voyage, such as its itinerary over the oceans. In order to ensure that the agent had strong incentives to act in the owners' interests, the agent usually retained a substantial ownership share in the vessel, and in some ports the agents retained, on average, 44% of the equity in their vessels.[21] Given the wide range of responsibilities held by the agent, this was a crucial source of incentives for the manager to perform fulfill his responsibilities diligently.

[19] In the sample of voyages from the 1830s and 1840s presented below, the average number of owners of the vessels is around 9.

[20] This arrangement is similar to the position of managing owner or "ship's husband" employed in other maritime trades with jointly-owned vessels.

[21] Systematic data on the size of ownership shares of agents becomes available on the late 1840s, when this information was recorded on the vessels' registers. In Davis, Gallman and Gleiter's (1997) sample of New Bedford vessels from 1846-60, the average ownership share of the agents was more than 30%. Hilt (2003) finds that in New London during this period, the agent's retained 44% on average. On the effectiveness of concentrated ownership in resolving incentive conflicts, see for example, Jensen and Meckling (1976) and Shleifer and Vishny (1986).

Other complimentary mechanisms were employed to create the necessary incentives for the agents. The relatively small number of owners, each holding a substantial share in the vessel, had strong incentives to monitor the agent's activities. In addition, most of the investors in whaling voyages lived in the same towns as the agents whose voyages they helped finance.[22] Personal, and sometimes even familial, relationships between the investors and the agents probably helped create additional incentives for the agent. Moreover, Davis, Gallman and Gleiter (1997, chapter 10) document that groups of investors tended to invest in voyages together, usually with the same agent. Thus the prospect of repeated interaction, and in particular, future investments, probably also created an important source of incentives for the agent, which complemented the incentives arising from his ownership share.

In the many port cities in which whaling became an important industry in the nineteenth century, whaling voyages were owned and managed in this way. This highly successful mode of organization survived through the late nineteenth century, when the whaling industry itself became nearly extinct in the United States. The only significant deviation from this model occurred in the 1830s, when a number of whaling firms were organized as corporations.

2 Whaling corporations

Although most of the firms that served as agents for whaling voyages were partnerships, and thus typical of other New England merchants, the whaling vessels they managed were separate business entities that were not formal partnerships.[23] Whaling vessels resembled partnerships in some respects, in that the assets of the vessel owners and the assets of the vessel were not considered legally distinct. As such, the owners of the vessel were personally liable for whatever debts or legal judgements the vessel incurred. But there were important features of the shipowning arrangements used in whaling, as well as other maritime trades,

[22] In a sample of major whaling ports, Hilt (2003) documents that about 75% of vessel owners resided in the city in which the voyages were managed.

[23] For a description of partnerships and a discussion of their prominence among early business enterprises, see Lamoreaux (1995; 1997), Bodenhorn (2000), and Kim (2003).

that enabled the vessels to enjoy many of the privileges normally reserved for corporations.[24] For example, the vessels were treated by their agents as distinct business entities, and accounts were kept in the vessels' names. More importantly, whereas partnerships usually terminated upon the death or withdrawal of a partner, ownership shares in vessels could be transferred without affecting the vessel.

In the 1830s, a few whaling entrepreneurs—some with experience as agents, and others simply wishing to enter the business—applied to their state legislatures for charters of incorporation. The formation of whaling corporations in the 1830s coincided with a large increase in incorporations generally, as state legislatures became more willing to grant charters to businesses.[25] Initially, they met with some resistance, as legislators were particularly wary of granting charters to maritime firms that might eventually develop into monopolistic entities like those

> under the European governments that have been considered an evil, and such is the British East India Company, such was the South Sea Company, and such the Dutch East India Company...[26]

Eventually, however, the charters were granted.[27]

The content of the charters of whaling corporations in different states varied somewhat, but in general they included: the right to own land, up to some specified amount; the right to exist over a specified period of time; the right to act in law, or to sue and be sued as a separate entity; a clear governance structure; the right of shareholders to transfer ownership stakes; and some limitations, in the form of minima and maxima, on the firm's capital stock. Although synonymous with incorporation today, limited liability was not granted to any

[24] An exploration of shipowning in general is presented in Albion (1941). Boyce (1992) describes similar institutions in Britain.

[25] In general, the types of organizations that states were willing to charter evolved slowly after the Revolution, beginning first with non-business organizations (churches, libraries, schools, etc.); then businesses where there was some public interest involved, such as banks, insurance companies, and land companies; and finally, railroads and manufacturing companies. Massachusetts, for example, began to charter manufacturing companies on a wide scale only after 1809. See, for example, Dodd (1954, p. 226). Wallis (2003) documents the differences across states in the willingness of governments to grant corporate charters to businesses.

[26] "Report of the Committee on Trade and Manufactures,on an engrossed bill from the Senate, entitled 'An Act to Incorporate the North River Whaling company'," New York Assembly, April 16, 1833. Most bills to incorporate whaling firms encountered some resistance of this nature.

[27] The state legislatures that granted the charters may have charged fees or otherwise extracted revenue from the incorporators. See Wallis (2003).

of the whaling corporations of this era.[28] The Massachusetts whaling corporations were in fact required to print an admonishment of unlimited liability on their stock certificates.

What advantage, then, did the corporate form of ownership offer to whaling entrepreneurs and investors? Although the right to act in law, and to sue and be sued, would probably have simplified interactions with other firms, there does not seem to have been a pressing need for this feature of corporate charters.[29] Moreover, the owners of unincorporated vessels possessed at least some limited right to transfer their shares, and the right to exist as an enterprise so long as the vessel existed, and so did not need to apply for a charter for these privileges. More likely, it was the formal governance structure (and with it, the carefully specified voting rights and disclosure requirements), coupled with the official imprimatur embodied in the corporate charter granted by the state. Compared to the industry's unincorporated ventures, where there were no articles of agreement and no formal procedures for decisionmaking—most decisions were simply delegated to the agent—these features offered the potential to make an investment in a whaling venture more attractive to small investors.[30]

Thus whaling corporations were formed at least in part to create an alternative mode of organization for the industry's firms, that was believed to be attractive to greater numbers of shareholders. The incorporators envisaged large enterprises, with diffuse ownership among many investors, whose interests would be protected by an elected board of directors. In some cases, perhaps in an attempt to safeguard the interest of small investors, the corporations prohibited any investor from owning more than a small number of shares.[31] In general, these firms were able to attract investments from large numbers of investors.

[28] See, for example, "An Act to Incorporate the Poughkeepsie Whaling Company," New York *Session Laws*, April 20 1832; and "An Act to Incorporate the Fall River Whaling Company," Massachusetts *General Court Laws*, April 9 1836. Many of the rights and privileges to which corporations were entitled were in flux in the early nineteenth century, and varied significantly between states, and between different industries within states.

[29] In lawsuits between whaling vessels, the vessels "and owners" were named as litigants. This would pose a problem only if some of the owners of each vessel were the same; an individual can not be on both sides of a lawsuit.

[30] This suggests another possible reason that investors in whaling ventures tended to live in the ports in which their vessels were based: these individuals probably knew one another, and may have been able to reach agreement over contentious questions more easily in the absence of a formal structure of decisionmaking.

[31] In the case of the Portsmouth Whaling Company, no shareholder was permitted to own more than 5 (out of a total of 100) shares. "An Act to Incorporate the Sundry Persons by Name of the Portsmouth Whaling Company," *Laws of New Hampshire*, 22 June 1832.

As with unincorporated whaling ventures, the investors owned the corporations' assets, and possessed rights of control over them. However, the investors in corporations delegated their rights of control to a substantial extent to a board of directors, and/or an executive committee of corporate officers. These directors and officers would then delegate the management of the day-to-day operations of the vessels to an individual, who was usually called the corporation's agent. It should be noted that the configuration of production within these corporations was precisely the same as it was in the unincorporated ventures: an agent would plan and supervise the voyage, and would hire a crew, who would be paid in the same share or "lay" system used in all whaling voyages at the time. The corporations thus simply grafted a much more diffuse pattern of ownership and a more formal governance structure onto an enterprise organized in the typical fashion in most other respects.

But as these corporations sought to become owned as diffusely as possible, the agent was not envisaged to be a major investor in the firm, and in fact usually held only a small stake.[32] At least in one case, the agent's compensation came principally in the form of a fee of $2\frac{1}{2}\%$ on all expenses—the purchase of vessels, supplies, etc.—which created strong incentives for spending, rather than effort.[33] The agent's role evolved into something like that of a professional manager, whose incentives to perform his duties diligently and act in the interest of the shareholders arose chiefly from the monitoring of the directors and officers.[34]

The success of these firms depended critically on the strength of this governance structure, and its ability to create the appropriate incentives for management. This meant that the directors needed to have been capable of monitoring and evaluating the performance of the agent, and using their power to fire and replace him if necessary. Rather than relying on management's stake in the firm to provide incentives, these corporations created an alternative incentive mechanism, an example of what Williamson (1985) has termed hierarchies. After more than 100 years of deep-sea whaling from American ports, these corporations

[32]Data on individual shareholdings are scant, but in the Cold Spring Whaling Co., Portsmouth Whaling Co., Fall River Whaling Co., and Wilmington Whaling Co., the agent owned shares equivalent to less than 5% of the firms. In comparison, Hilt (2003) documents that agents in some ports owned as much as 44% of their ventures, on average. See also Davis, Gallman and Gleiter (1997).

[33]Ichabod Goodwin, agreement with the Portsmouth Whaling Co., 30 May 1832.

[34]See, for example, the "By-Laws of the Cold Spring Whaling Company," in Cold Spring Whaling Co. (1837-51).

represented the first attempt to organize and govern a whaling venture in this fashion.

Of the whaling corporations that were chartered in the 1830s and early 1840s, none survived past the late 1840s. The American whaling industry continued to thrive until the Civil War, and enjoyed some years of success in the postbellum period, but most whaling corporations were unable to remain in business long enough to sponsor more than a few voyages. The next section will attempt to determine the sources of the failure of these corporations.

3 Determinants of the corporations' failures

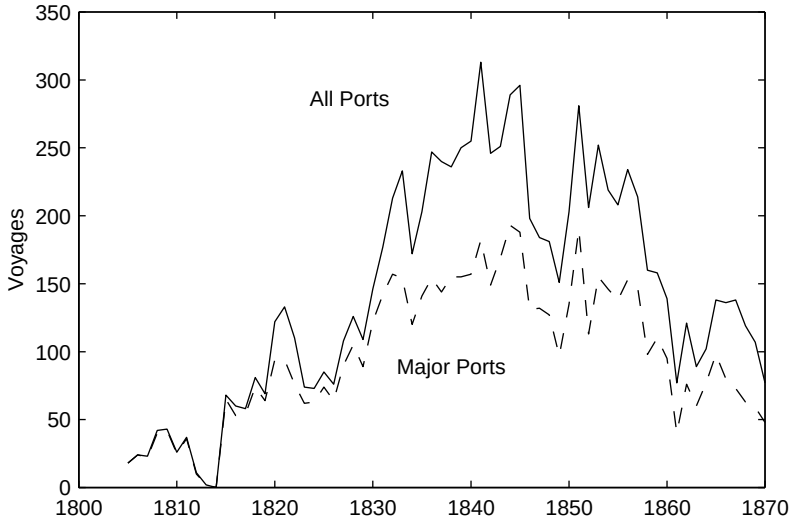
The heavy reliance on concentrated ownership throughout the history of the American whaling industry suggests a need for powerful incentives that a corporation may not have been capable of providing. However, there were many other forces, unrelated to incentive problems, that undermined the success of the whaling corporations. The founders of whaling corporations, for example, generally had little experience in whaling, and simply may not have possessed the requisite knowledge or skills to succeed. Incompetence may have doomed these firms, irrespective of their ownership structure.

The locations in which the corporations were founded suggest another possible explanation for the failure of whaling corporations. 78 different American ports sponsored at least one whaling voyage, but the industry was dominated by a relatively small number that specialized in whaling. Figure 1 plots the number of voyages from American ports from 1805-70, and illustrates the share of the five major whaling ports—Nantucket, New Bedford, Fairhaven (MA); Sag Harbor (NY); and New London (CT)—which together accounted for 68% of whaling voyages during the period.[35] If there were significant agglomeration externalities in the industry, for example in the form of better prices for supplies, or more accurate information about the past success of potential captains or the location of whale populations, then firms located outside these ports would suffer a natural disadvantage.

Table 1 presents a list of whaling corporations that were chartered before 1845, along with their locations. In none of the five largest whaling ports of the 1820s were corporations

[35] Calculations from data in Starbuck (1878).

Figure 1:
Whaling Voyages from American Ports, 1805-70



Note: "Major ports" includes Nantucket, New Bedford and Faihaven, MA; Sag Harbor, NY; and New London, CT. Sources: Author's calculations from Starbuck (1878).

formed. Instead, whaling corporations were founded in ports that were only marginal participants in the industry.

Thus, whaling corporations were often founded by new entrants into the industry, located in ports with little history of whaling activity, who may have been unable to finance a whaling voyage (or succeed in the business) using the traditional organizational structures, and who obtained a charter to help raise money. Many of the corporations chartered had difficulty attracting sufficient capital to commence operations—the charter of Dutchess Whaling Co. was amended so that its founders could have additional time to raise the required $50,000 capital stock, and the charter of the Cold Spring Whaling Co. was amended so that it could commence operations after only $40,000 had been paid in, rather than the $50,000 initially required.[36] Successful whaling entrepreneurs, who would have been able to finance their investments through the cash flows generated by their firms' existing operations, would have derived little benefit from the features of corporate charters, unless they wanted to obtain better access to capital by making their businesses more attractive

[36] "An Act to amend an act to incorporate the Dutchess whaling company," April 11, 1834, and "An Act to revive and amend an act to incorporate the Cold-spring whaling company," April 28, 1840, in the New York State *Session Laws*.

Table 1:
Whaling Corporations

Name	City	State	Incorporated
New York Whaling Co.	Brooklyn	NY	1831
Newburgh Whaling Co.	Newburgh	NY	1832
Portsmouth Pier Co.	Portsmouth	NH	1832
Portsmouth Whaling Co.	Portsmouth	NH	1832
Poughkeepsie Whaling Co.	Poughkeepsie	NY	1832
Dutchess Whaling Co.	Poughkeepsie	NY	1833
Hudson Whaling Co.	Hudson	NY	1833
Newark Whaling, Sealing & Mfg. Co.	Newark	NJ	1833
North River Whaling Co.	Newburgh	NY	1833
Wilmington Whaling Co.	Wilmington	DE	1833
Westchester Whaling Co.	Peekskill	NY	1834
Wiscasset Whale Fishing Co.	Wiscasset	ME	1834
Dorchester Whaling Co.	Dorchester	MA	1836
Fall River Whaling Co.	Fall River	MA	1836
Staten-Island Whaling Co.	Port Richmond	NY	1838
Cold Spring Whaling Co.	Oyster Bay	NY	1838
Duxbury Whaling Co.	Duxbury	MA	1841

Sources: State *Session Laws* of DE, MA, ME, NH, NJ, and NY, 1830-1845.

to small investors.

Another potential source of the inferior performance of whaling corporations could be that these enterprises pursued a different approach or technique to whaling. At a minimum, these corporations probably faced a different cost of capital, which should have influenced their investment decisions.[37] But if their diffuse ownership structures effectively insured their owners and managers against the risks of their operations, their risk-taking decisions may have been affected. These factors may have resulted in voyages that were less productive in *ex post* measures of performance.

There are several potential explanations for the failure of whaling corporations. Unfortunately, detailed financial data on whaling ventures from this era are scant, meaning that direct tests on the financial performance of whaling corporations can not be conducted. However, it is possible to measure from surviving records the productivity of the whaling voyages, and therefore to compare the productivity of voyages sponsored by corporations to those sponsored by unincorporated owners.[38] Moreover, many voyage characteristics, ranging from the size and age of the vessels employed, to the itinerary of the voyages and the prior experience of the captain, can be obtained from surviving records, so that differences in the types of voyages pursued, or inputs employed, can potentially be included as controls in an empirical test. If a negative effect of the corporate form on productivity can be identified, then this would support the notion that corporations were unable to create adequate incentive structures for their agents. In the next section, the dataset used to conduct an empirical test, and the identification strategy employed, are described.

[37] Whether this cost of capital was higher or lower than that of the unincorporated ventures is unclear. On the one hand, in principle the small and presumably more diversifiable stakes held in corporations could have led their owners to demand a lower rate of return. On the other hand, many of these corporations had difficulty raising capital and attracting investors, suggesting that they faced binding constraints on their access to capital.

[38] It should be noted that, to the extent that firms in smaller ports faced higher costs, the measure of productivity presented below may understate the average difference in financial performance between corporate whaling ventures and their unincorporated counterparts.

4 Empirical Analysis

4.1 Data

In order to identify the effects of organization as a corporation on the success, or productivity, of whaling voyages, a dataset of 874 voyages from 22 different ports, from 1830-1849, was assembled. A detailed account of the sample, and the sources employed, is presented in the Data Appendix. In order to ensure that the sample contained as broad as possible a range of whaling firms, data on agents from major whaling ports, including New London, New Bedford, Fairhaven and Sag Harbor, as well as many different minor ports were obtained. The voyages in the sample were sponsored by 106 different agents, and include those of 14 corporations.[39] Except for the voyages from New Bedford, New London, and Sag Harbor, where a 20% sample was taken, all voyages where data was available were included in the sample. The 874 voyages in the dataset are equivalent to 19.5% of the total population of whaling voyages initiated in the United States during the period.

The identities of the owners of each vessel, and the vessels' characteristics (their age and tonnage), were obtained from vessel registers.[40] For many vessels owned by corporations, the name of the corporation, rather than the name of each shareholder, was listed on the register. However, in some cases, the names of all the shareholders were listed on on the register; these names were compared to the names listed as founders in the charters of the corporations to identify which corporation owned the vessel. The departure date, itinerary (Atlantic, Pacific, or Indian Ocean), arrival date, and proceeds (barrels of sperm oil and whale oil, and pounds of baleen) were obtained from Starbuck (1878). Data on the identity of the captain, his experience (measured as number of previous commands), and whether he died during the voyage was obtained from Lund (2001).

In order to compare the success or productivities of the different voyages, an index

[39] 17 charters of incorporation were granted to whaling enterprises between 1830 and 1850; see Table 1. 3 of these corporations were unable to raise the minimum paid-in capital required by their charters to commence operations, and are therefore sponsored no voyages that could be included in the sample. See the Data Appendix.

[40] After 1790, registers were required of all domestic vessels engaged in foreign trade. The register listed the name of the captain, the vessel's owners and their managing owner or agent, the dimensions and age of the vessel and the place in which the vessel was built. Around 1850, these registers also began to record the fraction each owner held in the vessel.

of voyage productivity was constructed. This index measures the log of output produced per unit of inputs. As these voyages returned with quantities of sperm oil, whale oil, and baleen—that is, the oil of sperm whales, the oil of right whales and other similar whales, and the flexible keratinous material known as "whalebone"—these amounts (in gallons in the case of oil, and in pounds for baleen) were summed, with the gallons of sperm oil and pounds of baleen first multiplied by their relative prices at the time of arrival.[41] The quantities are thus expressed in whale-oil-gallon-equivalent amounts. The denominator, the quantity of inputs, is measured as the vessel tonnage multiplied by the number of months at sea, and is thus expressed in ton-months.[42] The productivity index is the log of this ratio, or:

$$\text{Productivity} = \ln\left(\frac{whale\ oil + (sperm\ oil \times rel.\ price) + (baleen \times rel.\ price)}{tons \times months}\right)$$

For 50 of the voyages in the sample, the vessel was lost or sufficiently damaged to be "condemned" in a foreign port, and did not return home. For 43 of those voyages, Starbuck (1878) does not record how much, if any, of the output of the voyage had been produced until the point where it was damaged, or how much was recovered and sent home. The loss of these voyages was regarded as a separate event, and excluded from the productivity regressions. However, a dummy variable equal to one for lost vessels was recorded.

Finally, the experience of each agent, measured as the number of voyages managed prior to the sample period, was also recorded from Starbuck (1878), as was the total voyages in each city from 1815-1829. For the corporations, if the agent (as identified on the vessel register) had some experience prior to incorporating the firm, the number of voyages that agent had sponsored is recorded as the prior experience of the corporation. Summary statistics for each of the variables collected is presented in Table 2.

The characteristics of the voyages sponsored by corporations and by unincorporated

[41] Relative prices were obtained from Starbuck (1878).

[42] The limitation of this approach is that the quantity of labor input is not measured. Unfortunately, data on the crews of voyages from small whaling ports is scant. Moreover, there was very high rates of desertion from whaling voyages, which makes the quantity of labor observed at the vessels' departures a poor measure of total labor input. However, as the size of the crew varied with the size of the vessel—larger crews were necessary to operate larger vessels—the data on vessel tonnage should serve as a reasonable proxy for total inputs. Some verification of this is provided below. In addition, an important indicator of the quality of labor inputs, the level of experience of the captain, is included separately in the regressions below. For a discussion of the determinants of crews on whaling voyages, see Davis, Gallman and Gleiter (1997).

Table 2:
Descriptive Statistics

Name	Definition	*N*	Mean	Std. Dev.	Min.	Max
Corporation	Dummy = 1: vessel owned by corp.	874	0.09	–	0	1
Firm experience	Voyages managed prior to sample	874	4.69	6.67	0	28
Port experience	Voyages from port, 1815-29	874	177.14	185.03	0	418
Owners	Number of owners of vessel	717	11.41	13.88	1	93
Vessel tons	Vessel tons (size)	874	339.71	66.03	107	699
Vessel age	Years since vessel was built	858	17.48	8.79	0	46
Captain's experience	Number of voyages as captain	860	1.58	1.85	0	13
Pacific	Dummy = 1: voyage to Pacific	874	0.56	–	0	1
Indian	Dummy = 1: voyage to Indian	874	0.19	–	0	1
Atlantic	Dummy = 1: voyage to Atlantic	874	0.25	–	0	1
Specialization in sperm	Dummy = 1: voyage specialized	831	0.31	–	0	1
Voyage Length	Months of voyage	832	28.23	11.37	4	57
Productivity	Voyage productivity index	831	2.50	0.44	1.07	4.21
Vessel lost	Dummy = 1: vessel didn't return	874	0.06	–	0	1
Captain died	Dummy=1: captain died	861	0.02	–	0	1
Crewmembers/ton	Crewmembers/vessel tons	376	0.08	0.01	0.04	0.17

Table 3:
Firm and Voyage Characteristics: Corporations vs. Others

	Means:		
	Corporations	Unincorporated Ventures	P > |t|
Firm Characteristics			
Firm experience (voys.)	0.50	2.89	0.08
Port experience (voys.)	0.57	167.08	0.00
Voyage Characteristics			
Number of owners	40.98	8.95	0.00
Vessel tons	329.74	340.73	0.15
Vessel age	13.87	17.83	0.00
Captain's experience (voys.)	1.21	1.62	0.06
Pacific ocean	0.59	0.55	0.55
Indian ocean	0.21	0.19	0.65
Specialization in Sperm oil	0.31	0.31	0.94
Voyage length (mos.)	29.62	28.09	0.26
Crewmembers/ton	0.08	0.08	0.96

Note: P > |t| denotes the significance level of a two-sided test of differences in means. The statistics in the first panel, firm characteristics, are calculated as the unweighted means of the different firms in the sample. For the corporations, firm experience is calculated as the number of voyages managed by the founders of the corporation. In the second panel, voyages, all of the variables except voyage length, vessel age, and crewmembers per ton, are available for all 874 observations. For voyage length, vessel age, and crewmembers per ton, this is available for 832, 858, and 376 observations, respectively.

partnerships are compared in Table 3, which also includes the significance level of a two-sided t-test. As one might expect, the characteristic for which the corporations and the other ventures differ most substantially is their average number of owners: 41 for corporations, compared to 9 for partnerships. The corporations were also located in ports with far less experience in whaling prior to the sample period, and founded by entrepreneurs who were less experienced than the partnerships' agents.

However, in many respects the choices that the corporations made for their voyages were not so different from those of the partnerships. They used vessels of approximately the same size, and roughly similar ages; they sent their vessels to the Atlantic and Pacific Oceans with

Table 4:
Productivity: Corporations vs. Others

	Means:		
	Corporations	Unincorporated Ventures	P > |t|
Vessel idle btwn. voyages (mos.)	4.05	3.92	0.72
Voyage productivity index	2.23	2.53	0.00
Standard dev., productivity	0.49	0.42	0.06
Vessel lost	0.09	0.05	0.24

Note: P > |t| denotes the significance level of a two-sided test of differences in means. The number given for differences in the standard deviations of productivity, however, is the significance level for a two-sided F (variance ratio) test. Vessel idle between voyages is defined as the number of months between successive voyages of the same vessel, and is computed for the 453 such voyages in the sample. The voyage productivity index is available for 831 voyages.

roughly the same frequency as the partnerships; they managed voyages that specialized in obtaining the oil of sperm whales about as often as their counterparts did; and the average length of their voyages was just slightly longer. This is important because it suggests that any differences in the productivity among the different types of firms were unlikely to be due to differences in methods or approach, at least across these observable dimensions. At a minimum, this suggests that the whaling voyages sponsored by corporations were not different from those sponsored by partnerships in any fundamental way.

Two other features of the data are worth noting: perhaps because they were based in ports with less whaling activity, the corporations hired captains who had somewhat less experience, measured as the number of voyages on which the captain had previously been master. The difference (1.2 vs. 1.6 voyages) is nearly statistically significant at the 5% level, and suggests that an analysis of voyage productivity should control for the captain's experience.

Secondly, the number of crewmembers per vessel ton is the same in both groups. This is critical, because it implies that there are no systematic differences in the relationship between crew size and vessel size, between the corporations and the unincorporated ventures. This implies that the the vessel tonnage—as used in the productivity index described above—is a reasonable measure of the quantity of inputs employed on the voyages.

Table 4 presents measures of productivity for the voyages in the sample. The first measure presented, the number of months a vessel sits idle between voyages, is a general indication of the efficiency with which the firms made use of their capital. Although the corporations tended to take somewhat longer to refit their vessels and send them back out to sea, the difference is not statistically significant. Moreover, the delay might simply be the result of the fact that the corporations tended to be located in obscure ports, where supplies were somewhat more difficult to obtain.

The second and third rows of the table present the means and standard deviations of the voyage productivity index. The voyages sponsored by corporations were significantly less productive than those managed by partnerships. This is a much clearer indication that the performance of whaling voyages was significantly different than that of the voyages sponsored by partnerships. The standard deviation of this measure is only slightly higher for the corporations, suggesting that (at least *ex post*) it does not appear to be the case that their managers undertook riskier voyages. The higher rate at which corporate vessels were lost (9% vs. 5%), however, could be an indication of this, although it could also simply be an indication of poor performance or management.

These tabulations suggest that the voyages sponsored by corporations were very similar to those sponsored by partnerships, except that they were less productive. One must be careful not to infer a causal relationship from these results—the corporations do not represent a randomly-assigned treatment group, after all. The next section presents an analysis of voyage productivity in an individual-fixed-effects framework, in order to try to identify a causal effect, or at least rule out the possibility that the productivity difference observed are due purely to selection.

4.2 Estimation Results

The 874 voyages in the dataset are organized as a panel, with the groups being the 106 different agents that sponsored the voyages. Many of the corporations in the dataset were founded and managed by agents who had some prior experience in whaling, and/or would have subsequent experience in whaling after the corporation was dissolved. Comparing the productivity in the voyages managed by these agents in corporations and in partnerships

can therefore be used as a source of identification of the effect of the corporate structure, in an individual-fixed-effect framework. The dataset contains 91 voyages sponsored by such agents, and the effect of the corporate form will be identified from these observations.

The effect of organizational form on productivity will be estimated in the context of a simple empirical model of the determinants of the productivity of voyages. For the voyage of agent i in year t, the model is as follows:

$$y_{it} = \alpha_i + \delta_t + \gamma corp_{it} + \mathbf{x}_{it}\beta + u_{it},$$

where α_i is an agent fixed effect, δ_t is a year effect, $corp_{it}$ is a binary variable for the corporate form of organization, and $\mathbf{x}_{it}$ is a vector of voyage characteristics. The hypothesized sign of γ, the coefficient on the corporation variable, is negative.

The voyage characteristics in the regression include data on the vessels, the captain, and the itinerary of the voyage. In their careful study of the determinants of productivity of New Bedford whaling voyages, Davis, Gallman and Gleiter (1997) that there were (mildly) decreasing returns to scale in the industry; larger vessels should therefore be somewhat less productive on a per-ton basis. Therefore the tonnage of the vessels will be included, as will the age of the vessels. Only very coarse measures of the "cruising grounds" to which the voyages were sent is available; the ocean listed as the primary destination of the voyage will also be included in the regression.

The role of the captain at sea was critical in the prosecution of the voyage, and the captain's performance of his role was certainly an important determinant of the success of the voyage. The measure of the captain's experience will therefore be included, as it may help control for the quality of the captain commanding the vessel. On about 2% of the voyages in the sample, the captain died during the voyage, usually due to injuries sustained on board the vessel, but sometimes due to disease. When this occurred, the captain would usually have been replaced by one of the mates, leaving the vessel with one fewer officer, and this would have impacted the productivity of the crew. But in addition, in response to the death of the captain, the mates would sometimes bring the vessel into port and attempt

to contact the agent to decide how to proceed, disrupting the progress of the voyage.[43] Therefore, a dummy variable measuring whether the captain died during the voyage will also be included.

Davis, Gallman and Gleiter document that hunting pressure—the quantity of vessels on the oceans pursuing whales—had a negative effect on productivity, and these forces, combined with declining quality of the crews hired in whaling, caused productivity to decline over the period covered by the sample. The year fixed effects included in each specification should capture the effects of these (and related) influences on productivity over time.

The results are reported in Table 5. Column (1) reports the results when only the corporation variable is included, along with the fixed effect for the individual agents, and for the years. The estimated coefficient is negative and highly significant, and approximately equal to 90% of a standard deviation of the dependent variable. This is a strong indication that the voyages of corporations were less productive than those of unincorporated enterprises, and this can not be attributed to selection.

In column (2), the characteristics of the vessels and the captains, and the voyage itineraries, are included as covariates.[44] As expected, the size of the vessel has a negative effect on productivity, as does the vessel's age (although the latter effect is not statistically distinguishable from zero.) The ocean to which the vessel was sent also had an important effect on productivity; voyages sent to the Pacific were less productive, relative to those sent the excluded (Indian) ocean. The productivity of voyages sent to the Atlantic, however, was essentially no different from that of the Indian. The captain's experience increases productivity, although again the estimate is quite imprecise.[45]

As expected, the effect of the death of the captain is large and highly significant. It should therefore be noted that the effect of organization as a corporation, even with the various vessel and voyage characteristics included as controls, is actually *larger* than the effect of the death of the captain (-.36 vs. -.34).

[43] Some examples of this are mentioned in Starbuck (1878).

[44] The data on the age of the vessel is missing for 22 voyages in the sample. In many cases, this is due to the fact that the vessel entered the fleet as a prize vessel—a vessel captured from a foreign power by a privateer. For these vessels, the date it was constructed was not known or recorded in the registers.

[45] In general, the effects of the voyage itinerary and vessel characteristics are consistent with those found by Davis, Gallman and Gleiter (1997).

Table 5:
Voyage Productivity Regressions

The Dependent Variable is the Index of Voyage Productivity

	(1)	(2)	(3)	(4)
Corporation	-0.402**	-0.356**		-0.259*
	(0.153)	(0.094)		(0.126)
Number of owners/10			-0.152*	-0.130
			(0.064)	(0.068)
(Number of owners/10)^2			-0.001	-0.002*
			(0.001)	(0.001)
Atlantic		0.048	0.076	0.071
		(0.051)	(0.048)	(0.051)
Pacific		-0.108**	-0.100*	-0.102**
		(0.038)	(0.039)	(0.039)
Vessel tons		-0.001**	-0.001**	-0.001**
		(0.000)	(0.000)	(0.000)
Vessel age		-0.003	-0.004	-0.004
		(0.002)	(0.003)	(0.003)
Captain's experience		0.006	0.008	0.008
		(0.011)	(0.012)	(0.012)
Captain died		-0.337**	-0.411**	-0.403**
		(0.082)	(0.113)	(0.110)
Constant	2.989**	3.346**	3.354**	3.339**
	(0.116)	(0.131)	(0.118)	(0.118)
Year Effects	yes	yes	yes	yes
Agent Effects	yes	yes	yes	yes
Observations	831	809	671	671

Note: Standard errors, adjusted for clustering on ports, in parentheses. ** denotes significance at the 1% level; * denotes significance at 5%.

Is the large negative effect of the corporate form on productivity due to weak incentives, or other forces? One way to look for evidence corroborating the importance of incentives is to examine the effects of ownership structure on productivity throughout the sample. Among the voyages sponsored by agents who were never involved in corporations, there was substantial variation in the number of owners of the vessels. Some unincorporated voyages had large numbers of owners, and in some ways even attempted to become somewhat more corporate-like in their emphasis on small shareholders.[46] If the productivity of these voyages was lower than that of the voyages with fewer owners (again, in the context of a model with agent fixed effects), this would be consistent with the finding of the importance of weak incentives for productivity in whaling corporations. Diffuse ownership should diminish the incentives of individual shareholders to monitor the agent.

Column (3) in Table 5 presents estimates for a specification similar to the one presented in column (2), only it includes the the number of owners of each vessel (divided by 10), and a quadratic term in this number, in lieu of the variable for corporations. The estimated effect of the number of owners is negative and substantial. The coefficients imply that, at the mean, a one-standard-deviation increase in the number of owners reduced the value of the voyage productivity index by 0.140, the equivalent of 32% of a standard deviation of the dependent variable.

This raises the question of whether the effects of the corporate form arise from the large number of shareholders in corporations, or whether there other features of the corporations form that affected productivity. Column (4) presents an attempt to address this question, by including both the corporation variable, and the variables measuring the number of owners, in the same specification. With both ownership variables included, the effect of the corporation variable becomes smaller but remains significant, while the variable for the number of owners also becomes smaller. This is at least consistent with the notion that corporations had some effects on productivity independent of the diffuse ownership structures they created. The fact that the agents themselves tended to hold small stakes, for example, may have played a role in diminishing productivity, independently of the fact

[46] Several merchants in the port of Sag Harbor, for example, managed whaling "companies" with relatively large number of owners and some corporate-like features. See Tiffany (1840-48).

that there were few other large shareholders within the same ventures.

Are these effects plausible? Could the efforts of the manager make such a difference? One response is to note that in their careful study of whaling agents in New Bedford, Davis, Gallman and Gleiter (1997) find substantial differences in the average productivity of the different agents. This implies that the efforts of the agents were important determinants of voyage productivity, and anything that reduced the incentives of the agents to perform their roles diligently might have a substantial effect on the outcome of the voyages.

Some further evidence suggestive of diminished incentives in corporations is found in the behavior of one corporation's agent, whose letter book survives. Rather than identifying and hiring a captain and crew himself, as would normally have been the case for whaling agents, this agent wrote to a friend in New Bedford and asked him to hire an agent for his vessel. For another voyage he agent delegated all authority to the captain for hiring the crew, and negotiating their wage contracts.[47] Certainly this agent exerted less effort in the process of hiring the captain and crew than his counterparts in unincorporated ventures normally would have.

In the next section, the robustness of the findings is examined in more detail.

4.3 Robustness of the Results

The results presented in Table 5 identified a strong negative effect on productivity of the corporate form within the voyages managed by agents who were involved in both partnerships and corporations. The results can refute the notion that the poor performance of corporations was due purely to selection.

However, there are other reasons to question whether a causal relationship has been identified. There is the possibility, for example, that agents whose productivity was declining joined corporations, as this provided a way for them to reduce their exposure to their voyages' returns. If this were the case, then the lower productivity observed in corporations would not be caused by the corporate form, but would simply be due to the fact that after the agent joined a corporation, his productivity continued to decline due to other forces. In

[47] Ichabod Goodwin, agent of the Portsmouth Whaling Co., letter to Charles Whitredge (24 January 1836), and letter to captain Charles Barnard (14 July 1832).

Table 6:
Voyage Productivity Regressions

The Dependent Variable is the Index of Voyage Productivity

	(1)	(2)	(3)	(4)
Corporation	-0.379*	-0.352**	-0.340**	-0.316**
	(0.170)	(0.112)	(0.104)	(0.063)
Agent Eff. & Agent-Specific Trend	yes	yes	yes	no
Agent-Specific Quadratic Trend	no	no	yes	no
Port Effects & Port-Specific Trend	no	no	no	yes
Observations	831	809	809	809

Note: Column (1) reports only the estimated coefficient on the corporation variable from the same specification as column (1) in Table 5, with the addition of an individual-specific trend. Columns (2) and (3) report the results for the same specification as column (2) in Table 5, with the addition of individual-specific trend, an individual-specific quadratic trend, respectively. Column (4) reports the results for the same specification as column (2) in Table 5, with port fixed effects and port-specific trends, rather than individual effects. All specifications include time effects. Standard errors, adjusted for clustering on ports, reported in parentheses. ** denotes significance at the 1% level; * denotes significance at 5%.

order to address this possibility, some of the regressions in Table 5 were re-estimated with agent-specific time trends included as well. That is, the model presented above would be modified, to become,

$$y_{it} = \alpha_i + \delta_i t + \delta_t + \gamma corp_{it} + \mathbf{x}_{it}\beta + u_{it},$$

where $\delta_i t$ is the agent-specific trend. These time trends should control for such changes over time in the productivity of the agents.

Table 6 presents the results of these specifications. (The table reports only the estimated coefficient on the corporation variable, and omits all the others.) Columns (1) and (2) report the estimates from the same equations as columns (1) and (2) in Table 5, respectively, only with the addition of agent-specific time trends. Column (3) in Table 6 considers the more complicated possibility of nonlinear time trends in the agents' productivities, by estimating the same equation as column (2) in Table 5, with the addition of linear and quadratic agent-specific trends. None of the results are meaningfully different from those reported in Table

Table 7:
Corporations vs. Unincorporated Ventures
(Agents Observed in Both)

	Means:		
	Corporations	Unincorporated Ventures	P > |t|
Vessel age	15.72	15.94	0.91
Vessel tons	335.30	354.53	0.33
Captain's experience (voys.)	0.95	1.28	0.28
Pacific ocean	0.67	0.58	0.41
Indian ocean	0.16	0.14	0.77
Specialization in sperm oil	0.21	0.19	0.87
Voyage length	28.95	21.24	0.06
Vessel idle btwn. voyages (mos.)	4.00	3.95	0.92
Voyage productivity index	2.10	2.52	0.00
Standard dev., productivity	0.48	0.51	0.75

Note: P > |t| denotes the significance level of a two-sided test of differences in means. The number given for differences in the standard deviations of productivity, however, is the significance level for a two-sided F (variance ratio) test. Vessel idle between voyages is defined as the number of months between successive voyages of the same vessel, and is computed for the 453 such voyages in the sample. The voyage productivity index is available for 831 voyages.

5. The issue of agents selecting into corporations in anticipation of poor performance, at least as far as it can be captured by agent-specific trends, does not seem to have played a role in the productivity differences documented above.

A further check of the robustness of the results is to use fixed effects for the ports in the sample, rather than the agents, thus comparing the corporate-managed voyages to the unincorporated ventures within the same ports. If the observed effect were substantially different, this might suggest that the agents who formed corporations were somehow unrepresentative of the agents from the same port. Estimates for a specification that includes port effects and port-specific trends are presented in column (4) of Table 5, and the effect is quite similar.

Finally, Table 7 compares the characteristics of the 91 voyages managed by the agents

observed in both corporations and partnerships, in order to examine whether the agents managed these voyages in a way that differed somehow (and may have influenced productivity.) There are a few differences in their voyages—they hired captains with somewhat less experience, they sent vessels to the Pacific with slightly greater frequency, and, of course, the voyage productivity was lower. In addition, their corporate voyages were much longer. It is likely that this is due to the lower productivity of these voyages (meaning that the captain chose to remain at sea in order to obtain a reasonable catch.)

In most other respects, the voyages are very similar. In particular, the standard deviations of the voyages' productivities are quite similar, so this *ex post* measure of risk taking does not seem to indicate any difference between organizational types. It does not appear to be the case, for example, that these agents took greater risks in their voyages when they were within corporations.

5 Discussion and Conclusion

In the 1830s, the corporate form began to find widespread use among businesses in the United States, and some of the entrepreneurs who obtained charters did so to create whaling corporations. Whaling was a thriving American industry in this period, and was dominated by closely-held enterprises in a small number of specialized ports. The new whaling corporations faced many disadvantages—they were located in obscure ports, and were founded by individuals with relatively little experience in the business.

This paper has shown, however, that there was another important obstacle to these ventures' success: the corporate form itself. The empirical analysis compared the productivity of whaling voyages sponsored by the same managers within corporations, and within unincorporated ventures, and found that these managers' voyages were less productive when they were employed by corporations. Thus the estimated effect is not due to the obscure ports in which the corporations were located—the managers' various voyages were all based in the same ports—or the lack of talent or experience of the manager. The diffuse ownership structure of the corporations, and the reduced stakes held by their managers, likely diminished the incentives for the managers to perform their roles diligently.

The analysis of this paper has shown that the problems identified by Berle and Means (1932) in the large firms of the 1930s were likely to have been endemic in much earlier corporations as well. About 100 years before the publication of their study, the first whaling voyages sponsored by an American corporation were launched. The corporations that sponsored these voyages represented a significant departure from the usual mode of organization of whaling ventures. These corporations were diffusely owned, and were run by agents whose role began to resemble that of professional managers. Whaling was a business where consistent success was very difficult to achieve, and the weaker incentives produced by these corporations at least contributed to their poor performance. Perhaps because of their organizational forms, these enterprises proved themselves to be "nothing but land lubbers."[48]

[48] Wilmington *Gazette,* 6 May 1834.

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Data Appendix

Whaling corporations were identified by searching the session laws of the states of Delaware, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, New Hampshire, and Maine, and examining all of the corporate charters that were granted as special acts of the legislatures. Of the 17 corporations listed in Table 1, 14 were able to raise the paid-in capital required by their charters to commence operations. Each of these corporations' voyages are included in the sample. The three that were never able to commence operations were the New York Whaling Co., North River Whaling Co., and Westchester Whaling Co.

The dataset contains 874 voyages initiated in 22 different American ports. These include Salem, Dorchester, Fall River, Fairhaven, Duxbury, and New Bedford, Massachusetts; Newport, Bristol, Warren and Providence, Rhode Island; Sag Harbor, Poughkeepsie, Newburgh, Hudson, Port Richmond, and Oyster Bay, New York; Wiscasset and Portland, Maine; and Newark, New Jersey; Portsmouth, New Hampshire; Wilmington, Delaware, and New London, Connecticut. 4 of the 5 major whaling ports—New Bedford, Fairhaven, Sag Harbor, and New London—are included in the sample. (Nantucket is excluded because very few registers for Nantucket vessels are in the possession of the National Archives.) The ports included in the sample were the ports from which the best records are available. In its distribution of major and minor ports, the sample is generally representative of the population: 68% of the voyages in the sample are from major ports (vs. 66% of the population for the sample period), and 32% of the voyages are from minor ports (vs. 34% of the population.) Population statistics were computed from data contained in Starbuck (1878).

Vessel registers were used to identify the agent or firm managing each whaling voyage, and also for the vessels' tonnage and age, and the number of owners. (A description of the purpose and content of vessel registers is found in Stein, 1992.) For the voyages originating in the states of New York, New Jersey, Delaware, New Hampshire, Connecticut, and Maine, these registers were found at the National Archives, Washington D.C. (Records of the Bureau of Marine Inspection and Navigation—Group 41). For the vessels originating from the ports of Massachusetts and Rhode Island, the compilations of vessel registers produced by the Survey of Federal Archives of the Works Progress Administration were used. These volumes included: *Ship Registers and Enrollments of Dighton-Fall River, Massachusetts 1789-1938* (1939), *Ship Registers of New Bedford, Massachusetts, 1796-1850* (1940), *Ship Registers and Enrollments of Bristol-Warren, Rhode Island, 1773-1939* (1941), *Ship Registers and Enrollments of Providence, Rhode Island, 1773-1939* (1941), and *Ship Registers and Enrollments of Boston and Charlestown* (1942). For the vessels originating from Salem, Massachusetts, the source used was Hitchings and Phillips, *Ship registers of the district of Salem and Beverly, Massachusetts, 1789-1900*, Salem: Essex Institute (1906).

Usually, the registers of vessels owned by corporations listed the name of the corporation as the owner on the register. However, in some cases, the names of all the shareholders were listed on on the register; these names were compared to the names listed as founders in the charters of the corporations to identify whether a corporation owned the vessel. In cases where the individual shareholders were not listed on the vessel registers, the names of the shareholders (used to compute the number of owners) were obtained from stock certificates or stock transfer ledgers. These included: the Cold Spring Whaling Co. "Ledger of Stockholders;" the Portsmouth Whaling Co. stock certificates, the Fall River Whaling Co. "Stock Transfer Ledger," and the Wilmington Whaling Co. "Stock Ledger." Few vessel registers survive for the port of Sag Harbor. The vessel characteristics and the identity of

the managing agent of each vessel was obtained from the manuscript "List of Shipping Owned in Sag Harbor in 1839" in the John Jermain Library, Sag Harbor NY.

The number of crewmembers on board the vessel at its departure was obtained for vessels originating in the ports of Hudson, Poughkeepsie, and Newburgh, NY; New London, CT; Newport, RI; and Salem, Fall River, Fairhaven, and New Bedford, MA. For the ports in New York, these were taken from the crew lists of vessels from the port of New York, in the National Archives, New York (Records of the Customs Service—Group 36). For the ports in Connecticut, Rhode Island, and Massachusetts, these were taken from the crew lists of the various ports in the National Archives, Boston. (A description of the purpose and content of official crew lists is found in Stein, 1992.)

The departure and arrival dates of the voyages, the number of barrels of whale oil and sperm oil taken, the dummy variable for whether the vessel was lost, the voyage itineraries, and the characteristics of the different ports were all compiled from Starbuck (1878).

Data on the identity of the captain, his experience, and whether he died during the voyage was obtained from Lund (2001).