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Labor



In the words of Elmo Hohman, “The method of wage payment in the whaling industry was a singular one.” A whaleman, whether captain or greenhand,

[was] not paid by the day, week, or month, nor was he allowed a certain sum for every barrel of oil or for every pound of bone captured. Instead, his earnings consisted of a specified fractional share, known as a lay, of the total net proceeds of a voyage. . . . The earnings of a whaleman thus constituted a reward not only for the performance of labor under peculiarly trying conditions, but also for the assumption of personal, business, and physical risks. For the size of his lay, representing wages, depended directly upon the business risks centering about price fluctuations, as well as upon the physical risks of storm, fire, stranding, and poor luck on the whaling grounds.¹

The effect of business and physical risks on earnings is illustrated by the experience of 1,082 captains of whaling vessels that sailed from New Bedford in the years 1840–58. Their monthly earnings averaged \$98.31, but ranged from a low of \$0.66 to a high of \$345.34.²

1. Hohman 1928, 217, 222. See also Hohman 1926, 644–71. Hohman’s description is true of the industry through its middle phase. Later, although still risking the dangers of the voyage, whalemen were protected from the vagaries of the market. “By the closing decades of the nineteenth century, in an attempt to counteract the effect of falling market prices, the lay agreements also specified unit prices for oil and bone upon which the lays were to be computed’ (Butler 1973, 62–63).

The lay was unusual, but it was not unique. Similar systems have appeared in other industries. For example, some Argentine sheep farms in the nineteenth century paid “the person who cared for the flocks . . . a third of their production in remuneration” (Cortés Conde 1985, 328). “He [the shepherd] derived his remuneration either from an interest in the flock (usually a third) or from a monthly salary. The former mode of payment was the more general; the latter may be said to be the only one in use now” (U.S. Department of State 1900, 1:582 [from D. Mayer, Consul, Buenos Aires]).

2. In these years 1,637 voyages began in New Bedford (see table 5A.1). For 423 we do not have a crew contract (the source of lay data). For 115 for which we have a crew contract, the captain’s lay is not recorded. In seventeen additional cases the value of the catch has not been computed.

A crewman's life was not easy. He was at personal risk individually while working aboard ship, jointly with his boatmates while chasing whales, and jointly with his shipmates when their vessel faced unknown reefs, or hurricanes, or attacks by angry South Sea islanders or Inuit. Injury and death were common. In a letter to the *Whalemen's Shipping List* dated December 1857, the captain of the *Alexander* reported that, in a gale the month before, Patrick Connely had been washed overboard and drowned, Thomas Quinn had broken his collarbone, Albert Braley had broken his leg, Martin Bodmer had broken his back, and "every man on deck was more or less injured."³ Comments such as "fell from the stern overboard and was drowned" and "taken out of the boat by a foul line, and drowned" are sprinkled through the reports of whaling masters. Only the last clause of the April 1856 statement by the captain of the *Alfred Gibbs* sets it apart from hundreds of others: "Put in to land John Prior, who fell from the main top-gallant cross trees in a fit, fracturing his jaw bone, and injuring him internally; he providentially fell upon a dog which was lying on deck, which no doubt saved his life."⁴

In the boats all crewmen were constantly at risk. The boat and six-man crew of the *Harvest's* second mate, for example, disappeared while trying to secure a dead whale. More common are reports such as that of the captain of the *Montgomery*: his third mate's boat and crew were "carried out of sight by the whale" to which they were fastened. "The ship cruised two days for the missing boat, but could not find her."⁵

The vessel itself did not guarantee safety. Several were attacked by sperm whales; the *Essex*, the *Ann Alexander*, and the *Kathleen* were sunk.⁶ The *Can-*

(In six of these the vessel was lost at sea, condemned in another port, or sold in another port: in four others the vessel returned to port clean after a voyage of less than a month, usually because of the illness of the captain.)

The monthly earnings reported in the text are nominal amounts. In 1880 dollars the range is from \$0.88 to \$392.43 (Warren and Pearson "All Commodities" wholesale price index [U.S. Department of Commerce 1975, series E-52]).

3. Martin Bodmer had died by the time the captain wrote his letter (*WSL* 2 March 1858).

4. *WSL* 23 April 1844, 5 January 1858, 7 October 1856 (Captain Nichols doesn't mention the fate of the dog).

5. *WSL* 23 July 1850, 10 February 1857. In 1865 the *WSL* (11 April) reported having received a letter from Hezekiah Allen, the first mate of the *Josephine*, who said that the *Waverly* "had lost her third mate, Mr. Holt, and a whole boats crew the first of the season. They were fast to a whale just at dark, and had not been heard of since."

6. The wreck of the *Essex* is the most famous of these. Her first mate, Owen Chase, wrote (or perhaps provided facts to a ghostwriter for) an account of the disaster and its aftermath, *Narrative of the Most Extraordinary and Distressing Shipwreck of the Whale-ship Essex, of Nantucket; Which was Attacked and Finally Destroyed by a Large Spermaceti-Whale, in the Pacific Ocean: with an Account of the Unparalleled Sufferings of the Captain and Crew during a Space of Ninety-three Days at Sea, in Open Boats in the Years 1819 & 1820* (published in 1821), which Melville read with close attention and which furnished a model for the sinking of the *Pequod*. "I have seen Owen Chase, who was chief mate of the *Essex* at the time of the tragedy: I have read his plain and faithful narrative; I have conversed with his son; and all this within a few miles of the scene of the catastrophe" (Melville [1851] 1983, chap. 45).

The whale attacked on 20 November 1819: the *Essex* sank on the 22th. The crewmen, in three boats, set out for the coast of Peru, four thousand miles away. On 20 December they landed.



From the sketchbook of a crew member on the bark *Orray Taft* on her sixth New Bedford voyage, April 1864 to October 1865. When this drawing was reproduced by Kenneth Martin in *Whalemens' Paintings and Drawings*, he titled it "Bowheading: Another Unexpected Plunge."

Reproduced courtesy of The Kendall Whaling Museum, Sharon, Massachusetts, U.S.A.

ton's crew, after abandoning their sinking ship, rowed and sailed sixty-five hundred miles in open whaleboats for forty-nine days before arriving in Guam (during the trip they were misidentified as pirates and almost fired upon by

unexpectedly, on uninhabited Henderson Island, where they found water and a few fish. Most set sail again on 27 December. (Three chose to stay on the island and were eventually rescued in the spring.) Chase was in a five-man boat which, on 12 January 1820, became separated from the other two.

On 20 January the first of Chase's boatmates died, and "[t]he next morning we committed him to the sea." On 8 February the second died. "We kept his corpse all night, and in the morning my companions began . . . to make preparations to dispose of it in the sea . . . I addressed them on the painful subject of keeping the body for food . . . [W]e set to work as fast as we were able to prepare it so as to prevent its spoiling. We separated his limbs from his body, and cut all the flesh from the bones; after which, we opened the body, took out the heart, and then closed it again . . . and committed it to the sea. We now first commenced to satisfy the immediate craving of nature from the heart, which we eagerly devoured, and then eat sparingly of a few pieces of the flesh; after which, we hung up the remainder, cut in thin strips about the boat, to dry in the sun: we made a fire and roasted some of it, to serve us during the next day." On 18 February they encountered a British vessel, the *Indian*, and were rescued.

The quotations from Chase's *Narrative* are from Heffernan 1981.

government troops on Tinian).⁷ When the *Parker* sank, the survivors among its crew had an easier trip to land. They rowed for a mere eight days and seven nights of “intense suffering from hunger and thirst” before arriving at Ocean Island—but they were marooned there for six months.⁸ The *George Howland* was hijacked by convicts from an Ecuadorian penal settlement when she stopped for wood and water at the Galapagos Islands. The hijackers stranded most of the crew ashore and forced the remainder to sail them to freedom.⁹ During the Civil War, Confederate raiders destroyed many whalers, beginning with the firing of the *Eben Dodge* by the *Sumpter* in December 1861. Despite their misfortunes the crewmen of these vessels fared better than those of the *Emigrant*; a captain reported finding her capsized, but “nothing is known of the crew” (*WSL* 4 February 1862, 16 October 1849).

And then there were native peoples. The crews escaped the wrecks of the *Arabella*, the *New Bedford*, and the *America* off Kamchatka, but eleven men were killed by Inuit when they came ashore. In 1853 the *Inga* was seized by natives of Pleasant Island in the Carolines, and the white members of the crew were killed. Two years later, two South Sea islanders stole the *John*, killing the captain, the first and second mates, and many seamen in the process (*WSL* 21 October 1851, 20 April 1853, 6 November 1855).

Hohman (1926, 651) examined the records of a number of whaling voyages, but it is not clear which voyages they were or how he analyzed the data he found. He says only, “The detailed figures serving as a warrant for these statements were secured through an analysis of hundreds of individual accounts found in the collection of scores of original manuscript whaling account-books now in the New Bedford Public Library.”

This chapter expands Hohman’s work in some new directions, modifies a

7. The *Canton* struck a reef “said not to be laid down in any chart” (*WSL* 24 April 1855).

8. During their sojourn on Ocean Island, “it was estimated that they killed rising of 7000 sea fowls, and about 50 seals. From the old wreck of the *Parker* they obtained some pieces of copper, which were manufactured into cooking utensils. They sent off 120 sea fowls, with tallied pieces of wood attached to them, hoping some one would be caught, which would in hieroglyphic language relate the situation of the crew of the *Parker*. Thus month after month passed away. Every morning and evening the captain was accustomed in his tent to conduct religious services.” There is no record of anyone’s deciphering their hieroglyphics, but they were eventually rescued by the *James Stewart* of New Brunswick and the *Nassau* of New Bedford (*WSL* 7 November 1843).

9. The *George Howland*’s captain seems to have unintentionally connived at his misfortune. The convicts told him they wanted to escape, and he allowed his cooper to help them repair an old whaleboat they’d found for that purpose. Then he employed them to catch four of his crew who had deserted on their island, offering the convicts provisions for their escape in exchange. He entertained several of them on his ship, he went to visit them on land, and he set up a system of signals that allowed the convicts, having seized him, to lure two more boatloads of his crew to shore and capture. The story is told by the cooper, not by the captain (*WSL* 20 April, 27 April, 4 May, 8 June, 5 July, 10 August, 12 October, 2 November 1852).

Thirteen years later, the *WSL* (18 July 1865) published the following news story: “CLAIM AWARDED.—The claim of the owners of ship *George Howland*, of this port, upon the government of Ecuador, for the seizure of said ship by convicts at the Gallipagos Islands in 1852, and taken by them to Guyaquil, and the subsequent breaking up of the voyage, has been allowed to the claimants. The amount awarded is \$50,000.”

few of his findings, and directly disputes others. At its core is an examination of 34,753 labor contracts drawn between whaling agents and the crewmen who signed on to 1,250 voyages that left New Bedford between 1 January 1840 and 31 December 1858, and between 1 January and 31 December 1866 (see tables 5A.1 and 5A.3). These are almost three-quarters of the voyages that departed New Bedford during those years.¹⁰ The labor data have been linked with information on the voyages, permitting the contracts to be examined in light of the vessels used, the grounds hunted, and the results of the hunt.

Twenty-nine men manned a typical ship, twenty-six, a typical bark. Differences between crews seem to have been related to sizes of vessels, dates of sailing, projected lengths of voyages, and vessels' destinations, rather than to differences in rigging; the crews of a typical ship and a typical bark were organized very similarly. Each vessel had (1) a captain and some number of mates—always at least one, usually three, sometimes as many as five; (2) a set of skilled professional mariners—between two and six boatsteerers, sometimes a shipkeeper; (3) a number of artisans—almost always a cooper and a carpenter, often a blacksmith, occasionally a boatbuilder, a painter, a sailmaker, a caulker, or a coppersmith; (4) some service personnel—almost always a cook and a steward; (5) a number of seamen—some skilled, some semi-skilled, some unskilled (“greenhands”), and often a boy or two. Table 5.1 and figure 5.1 show the occupational structure of a typical whaling crew. (They do not take account of the structural changes that occurred between 1840 and 1866.)

5.1 The Whaleman's Lay

Each member of a whaler's crew, from the captain to the cabin boy, received a predetermined fraction of his vessel's net catch. Even in this day of sophisticated businessmen-actors, the experience of the motion picture and television industries shows that there's many a slip 'twixt the gross and the net. It is easy to cheat on expenses, and thus preferable for the entertainer to draw a contract that depends on a percentage of gross rather than net income. Read *Variety* or the *Los Angeles Times*, though, and you will see that actors still sign net contracts.

In nineteenth-century New Bedford, whalemen, if not agents and captains, were no more sophisticated: the lay was calculated on the net value of the

10. The voyages seem to be representative, so far as value of output and voyage duration are concerned. See table 5A.2. The 1,250 voyages include all but the nine unreadable lists among the Whalemen's Shipping Papers in the collection of the Melville Whaling Room at the New Bedford Free Public Library that (1) include information on the whaleman's station and lay, and (2) pertain to voyages in the Voyages Data Set.

The Stations and Lays Data Set contains 36,453 records, but most analyses in this chapter refer only to the records of crew members who sailed with the vessel when it left New Bedford—a total of 34,753. Crewmen added later (many of whom replaced men who deserted, died, or were discharged) are generally left out of account. We believe that the crew lists include only a small fraction of replacement crewmen. See chapter 3 for a description of the Stations and Lays Data Set.

Table 5.1 Average Numbers of Crewmen in Occupational Categories, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866

Occupation	Total	Sailed
Officer		
Captain	1.00	1.00
Mate	3.26	3.21
Skilled maritime		
Boatsteerer	3.59	3.48
Miscellaneous	0.23	0.22
Artisan		
Cooper	0.91	0.89
Blacksmith	0.58	0.55
Carpenter	0.82	0.78
Miscellaneous	0.14	0.13
Service personnel		
Cook	1.06	1.00
Steward	1.04	0.99
Seaman		
Skilled seaman	2.35	2.19
Semi-skilled seaman	2.67	2.55
Unskilled seaman	10.85	10.21
Boy	0.63	0.57
Total	29.16	27.80

Source: Stations and Lays Data Set (see chapter 3).

Notes: The “Total” column reports averages, by occupation, of all crewmen listed on the vessel’s roster. The “Sailed” column reports averages only of those crewmen who left New Bedford with the vessel. See chapter 3 for a discussion of this difference.

Not all crewmen had only one occupation aboard ship. This table includes those with two (for example, “cooper and ordinary seaman”), counting them as one-half a man for each occupation. Other tables in this chapter exclude dual-occupation crewmen. See appendix 5B for a description of paired occupations and an analysis of the effect of two occupations on crewmen’s lays.

catch.¹¹ The difference between gross and net was a standard set of charges incurred during the voyage. The nature (not the amount) of these charges was specified in advance, and the labor contract was written to guarantee that the crewman (along with the agent and owners) bore his share. Charges always included payments for pilotage, wharfing, cooperage, watching, cleaning,

11. In regard to the sophistication of captains, A. B. C. Whipple (1954, 126–29) relates the following story: Captain Thomas Scullun of the *Cape Horn Pigeon* was stopped by a Russian naval vessel in the Sea of Okhotsk in September 1892. The Russians charged that he had been hunting in Russian territorial waters, and Scullun (and his vessel) were taken to Vladivostok. Scullun insisted that he had been in international waters. After nine days the Russians let him go, but by then it was too late to hunt the Arctic that year. Scullun billed the Russians for the expenses he had incurred while in Vladivostok harbor—a small amount—plus the opportunity cost of missing the hunting season, for a total bill of \$49,500. The controversy went on for ten years. The Russians finally gave in and agreed to abide by the decision of an arbitrator, the arbitration to take place in the Netherlands. Scullun amended his charges to include interest for the ten years, and ended up collecting \$56,675.63.

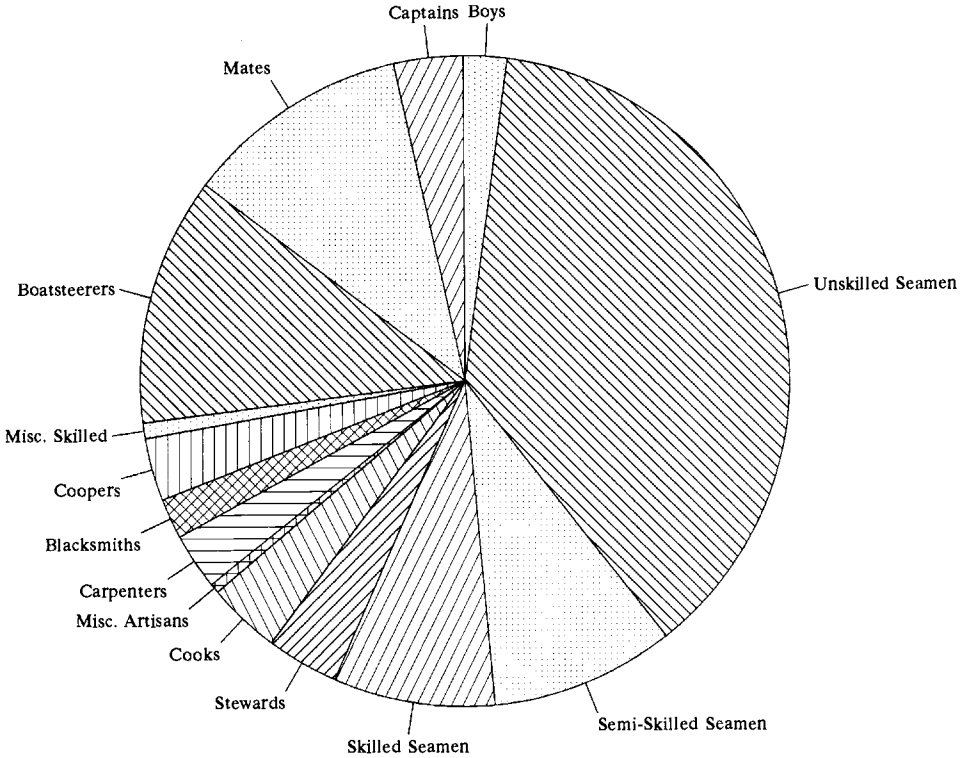


Fig. 5.1 Proportions of crewmen in various occupational categories, New Bedford whaling voyages, sailing years 1840–58 and 1866

Source: Computed from the Stations and Lays Data Set. See table 5.1.

loading, and unloading.¹² Toward midcentury, as the industry’s organizational structure became more complex, charges began to include commissions and insurance on oil and bone shipped home during the voyage.

The whaleman’s contract does not appear to have presented the problems

12. See, for example, the crew contract for the *Oneida’s* 1857 voyage: “In consideration of the said Owners having released the Officers and Seamen from their obligations to load and discharge said Ship at the commencement and termination of her voyage, each of the Officers and Seamen, parties hereto, consent and agree that the Sum of Ten dollars may be deducted from our several shares for the loading of said Ship, and the sum of Eight dollars for the discharging thereof, and that said sums may be respectively charged to, allowed and paid by us. And it is further agreed that the Sum of Three dollars may be charged in our several accounts, and shall be allowed and paid by us at the termination of said voyage for the expence of the Medicine Chest on board said Ship. And it is further agreed that interest and insurance upon all advances to us respectively, during said voyage, together with a commission of 2 1/2 per cent on the proceeds Sales of the cargo for guaranty of the payment for the same may be charged by said Owners, and deducted from our respective shares or lays” (Whalemens Shipping Papers).

that plague the entertainment industry. The expenditures were all made by the captain, the value of whose lay depended on the size of the net. Moreover, the captain's behavior was monitored—on the spot by the other ship's officers, whose income also depended inversely on the size of the charges, at a distance by the agent, who had the same incentive.

Crew members were usually paid in cash or in a bill of exchange that could be converted to cash, but the agent could, if he chose, give them their shares in kind. A crewman was entitled to a full share if he returned on the vessel on which he sailed, a prorated share (based on the catch to date) if he died or was discharged for illness or other good cause. Until the 1860s he was not legally entitled to any remuneration if he deserted.¹³

It is difficult to determine the effect of the agent's right to pay in kind. Hohman suggests two reasons for the frequent use of such payments when a crewman was discharged during a voyage. First, since there was often a lack of information about the prices of whale products, it was difficult to agree on the level of remuneration. Second, if the payment was substantial, the captain would want to preserve his limited cash reserves. The first point implies that paying men in oil avoided the necessity of agreeing on prices. But since the seaman's payment was a *net* value, resort to prices could not be avoided; in ports with U.S. consuls, these officials provided the necessary prices.¹⁴ Hohman's second point, however, seems to be valid. At least seamen often received oil when discharged. For example, over the course of eight midcentury years a number of whalers of the ship *Canton* were paid off during voyages with oil, in amounts that ranged from 74 to 393 gallons.¹⁵

At the end of a voyage, payment in kind was usually made only if there was a dispute between crewmen and agent over the value of the catch. In-kind payments are rarely mentioned either in contemporary accounts or in the whaling literature, but a letter from the New Bedford agent and shipowner Charles W. Morgan to his Boston lawyer suggests they may have been more common than the standard literature implies.

13. This rule was originally based on British common law, but it was often reconfirmed in American courts. In 1851, for example, in a case involving a minor who signed on the whaler *Abraham H. Howland* and after some time deserted, the U.S. district court in Boston "held that unjustifiable and continued desertion, occurring during the voyage, worked in all cases an entire forfeiture of wages" (*WSL* 5 August 1851).

14. "Honolulu . . . CIRCULAR RATES. The price fixed by the Consuls for payment of discharged seamen is 40 cents per gallon for Polar oil, and \$1,20 for sperm, and 33 cents for bone" (*WSL* 22 January 1856). On 13 December 1864 the newspaper reported, in addition to the prices set by the consul at Honolulu, a new rule "established by the Consulate . . . The usual deduction of 8 per cent. for leakage and shrinkage, from the above prices, will be allowed *only*, in cases where the masters shall file an affidavit in writing, stating to the best of his knowledge and belief, that the oil and bone, upon which the seamen's lays are to be calculated, are the full amount taken during their several terms of service."

15. Hohman 1928, 226. See also Whitecar 1864, 168: "a French cook, who left the *Alexander* at Stewart's Island and joined the *Eliza*. He was discharged from the *Alexander*, and the oil belonging to him was rolled ashore."

The universal custom is for the owner to make up the voyage at a certain price after which it is optional with them to take it, or deliver the crew as they may elect & it is always the right of the crew to demand their oil but they cannot demand money if the owner is unwilling to pay it. The *Condor's* cargo has in part remained on the wharf & in store since its arrival & I have never yet settled with all concerned. I have this day been delivering to the Capt and one boatsteerer their parts or share of the oil and coffee as we never could agree upon a price & I have after several weeks delay declined purchasing much of the oil of another crew arrived since the *Condor* & many of them have taken away their oil & some have yet left it on the wharf. . . .

P.S. You will understand that voyages are always made up at a certain price whether the crew intends to purchase their shares or not. They [the agents] often decline purchasing & on the other hand the crew often declines selling.¹⁶

Whatever the importance of the right to pay in kind, the rules governing the earnings of men who failed to complete voyages became steadily more important as the duration of voyages increased—first as the fleet moved to more distant grounds and then as agents found they could keep vessels at sea longer by using Pacific cities as transshipment points. Between 1840–41 and 1957–58, the average voyage length in the New Bedford fleet as a whole increased from thirty-one to forty-three months: in the Atlantic from sixteen to thirty-two, in the Indian Ocean from twenty-seven to thirty-eight, and in the Pacific from thirty-eight to forty-four. (Among the 1,250 voyages examined in this chapter, six lasted five years or more.)

There was a high and increasing level of labor turnover. The *George Howland*, for example, a New Bedford ship that normally carried a crew of twenty-eight to thirty, sailed six times between 1840 and 1866. Over these voyages the number of whalemens who died, were discharged, or deserted ranged from twelve to twenty-four, averaging 63 percent of the original crews.¹⁷

As Hohman points out, the form of the labor contract was idiosyncratic: each crewman negotiated his lay. The flavor of such negotiations comes through in a letter from Charles W. Morgan to his captain, Thomas A. Norton (21 November 1834, Morgan Collection), discussing the staffing of the *Hector*. After spelling out the range of lays that he was “accustomed to give in a four boat ship” (third mate 1/70 to 1/75, boatsteerers 1/90 to 1/95, seamen 1/125 to 1/130, ordinary seamen 1/135 to 1/150, greenhands 1/150 to 1/180, boys green 1/185 to 1/200, and boys not green 1/150 to 1/175), he continues: “Mr.

16. Charles W. Morgan to S. Bartlett (Boston), 24 May 1837, Morgan Collection. The *Condor* had arrived thirty-six days before Morgan put pen to paper.

17. *George Howland* Account Book. Desertion was not an entirely new phenomenon, as a report from 1763 indicates. The sloop *Dolan* put in to Cape Cod to take on water “prior to its departure for the whaling grounds, and four men who had signed for the voyage silently jumped ship and disappeared, ‘Like Roges they are and we must go to the Vineyard [Martha’s] for more hands.’ Although the vessel eventually managed to put to sea, ‘with a fool crew,’ the delay cost them four days” (Vickers 1985, 287).

Mayhew (a third mate) had $1/65$ last voyage but that was higher than I have before given. I think $1/70$ a fair lay for Mr. Wimfrenn but would give $1/67$ rather than not have him.”

The traditional dividing line between good and mediocre wages was a lay of $1/100$. Hohman says officers, coopers, and boatsteerers received short lays—lays less than $1/100$.¹⁸ This is generally correct, but there was a boatsteerer on the *Sappho* in 1866 and a cooper on the *Chandler Price* in 1854 who received only $1/150$. There were also two coopers and 114 boatsteerers whose lays were between $1/105$ and $1/140$. On the other side, the Stations and Lays Data Set lists four carpenters, thirteen cooks, thirty-three stewards, seventeen shipkeepers, nineteen seamen, ten ordinary seamen, and forty-two greenhands who received lays shorter than $1/100$.

The outliers fall into two categories. Most seem to result from the perceived *ex ante* competence of the individual crewman—that is, from the agent’s and the crewman’s recognition that there were substantial differences in potential productivity among applicants for the same job. Each of the seven boatsteerers who sailed with the vessel from New Bedford and received a lay longer than $1/120$ were on a voyage whose agent had signed his peers at much shorter lays.¹⁹ The three other boatsteerers on the *Sappho* in 1866, for example, received lays of $1/75$, $1/75$, and $1/100$. Well-paid seamen on vessels hunting in the Indian, Pacific, and Western Arctic grounds were often characterized as “able” or “extra skilled”; their shipmates received lays more in line with tradition.

Skill differences do not explain all of the outliers. Vessels cruising in the Atlantic were typically smaller and had smaller crews than vessels sailing to more distant grounds. Since the distribution of net income between labor and capital was, on average, about the same in all grounds (one-third to labor and two-thirds to capital), lays were necessarily shorter in the Atlantic than elsewhere.²⁰

Most whalemens filled one station at a time, but a few filled two at once. Those with double occupations are treated in appendix 5B.

Hohman (1928, 217) says, “The able and ordinary seamen, stewards, cooks, and blacksmiths were entitled to shares which varied from $1/100$ to $1/160$; the green hands and boys had to be content with ‘long lays’ which fluctuated from

18. Or greater, depending on how you look at it. A lay of $1/90$ is shorter than a lay of $1/100$. The denominator is smaller; the amount is bigger. Hohman (1926, 645) says short lays were $1/100$ or less, and long lays, $1/100$ or more—that is, $1/100$ is both short and long.

19. Although the lay was a fraction, it was often referred to as the reciprocal, that is, a lay of $1/175$ was often called “a 175.”

20. This does not mean that seamen in the Atlantic made higher monthly earnings. For example, imagine two vessels, one of three hundred tons and a crew of thirty, the other of one hundred tons and a crew of ten. Suppose further that the net values of the monthly catches of the two vessels are proportionate to their tonnages: \$1,250 and \$416.67, respectively. If the share of the crew in the net proceeds is 30 percent in each case, the seamen on each vessel would average \$12.50 per month. The average lay of the large vessel would be $1/100$, that of the small, $1/33.3$.

1/160 to 1/200; and instances of fractions as small as 1/250, or even 1/350, were not unknown." This is generally, if not exactly, correct. Well-paid stewards, cooks, and seamen have been noted, but they were the exceptions: most fell into Hohman's long-lay range. There are contracts for boys that called for lays as low as 1/4,500, several that worked out to be less than 1/10,000 (e.g., ten cents per month), twenty-four boys who signed on for "clothes," and one boy in the Stations and Lays Data Set who received no payment whatever (he signed on for "board").

Hohman (1928, 230) says that, with the exception of those of captains and mates, lays became longer as time passed. "His wage bargain entitled him [the whaleman], as time went on, to a smaller fractional share of the voyages for which he shipped." This degradation he attributes to three factors: (1) "the gradually deteriorating character and efficiency of the crews," (2) an increasing "temptation to exploit . . . inferior crews," and (3) the substitution of capital for labor (233). For the period covered by this study, Hohman's generalization concerning trends in lays is only partly correct. In addition, his estimates capture both the time trend and the effect of shifts in the grounds hunted; he fails to recognize, let alone disentangle, the two.

Table 5.2 gives average lays by year and ground for the twelve most common occupations. Table 5.3 gives all-ground averages for an additional five occupations that appear too infrequently to permit ground-by-ground breakdowns.

Between 1840 and 1866 lays rose for some occupations and fell for others. As a result, although the all-year averages in table 5.4, computed on the basis of the data underlying tables 5.2 and 5.3, give an accurate picture of the shares earned by occupational groups across the entire period, they do not describe the earnings hierarchy at any particular time. Note that the range in lays is very wide. If the unskilled seaman is the comparison base, a captain on average received twelve times as large a share, a cooper more than three times as large, and a boy less than six-tenths.

Much of Hohman's discussion is focused not on relative lays but on their redistribution, and particularly on the lengthening of all but those of captains and mates.²¹ Starting at the top of the income hierarchy, the data show a shortening of officers' lays (i.e., an increase in their potential earnings) from 1840–43 to 1855–58: captains' lays by 18 percent, first mates' by 24, second mates' by 21, third mates' by 20, and fourth mates' by 10.

For skilled workers the picture is less clear. On the one hand, between 1840–43 and 1855–58 coopers' lays shortened by 9 percent, shipkeepers' by 12 percent, and stewards' and boatsteerers' by less than 1 percent.²² On the

21. The terms *lengthening* and *shortening* are somewhat confusing. Since the lay was often referred to by its reciprocal, a change from a 150 to a 170 was called a lengthening, despite the fact that it involved a reduction of the worker's share from 0.67 to 0.59 percent. Similarly, a change from a 19 to a 16.5 was called a shortening, despite the increase from 5.3 to 6.1 percent.

22. According to Brown (1887, 239), "From the time the vessel arrives at her wharf until she sails, unless she is laid up for a considerable length of time, she is in charge of a ship-keeper, who has absolute control." If the captain headed a boat, the shipkeeper was in control of the vessel while the captain was engaged in the hunt.

Table 5.2 **Average Lays by Occupation and Ground, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866**

Year	All Grounds ^a	N	Atlantic	N	Indian	N	Pacific	N	Western Arctic	N
A. Captain ^b (N = 1,125)										
1840	16.5	15	16.5	2	17.0	1	16.5	11	—	
1841	16.5	55	15.8	4	16.5	17	16.6	34	—	
1842	16.5	58	15.3	8	16.4	24	17.0	22	—	
1843	16.6	47	—		16.2	5	16.9	27	—	
1844	16.0	70	13.0	3	15.5	15	16.3	40	—	
1845	16.6	52	15.2	5	16.4	5	16.7	26	—	
1846	16.0	58	14.0	4	15.3	11	16.3	32	—	
1847	16.0	52	—		15.4	9	16.3	29	—	
1848	16.2	55	15.0	1	16.0	4	16.2	45	—	
1849	15.8	53	12.0	1	15.8	13	15.9	35	17.0	2
1850	15.0	67	15.5	2	14.3	7	15.1	41	15.3	16
1851	14.8	106	14.2	10	13.3	8	15.3	56	14.8	27
1852	14.6	54	14.9	7	14.4	7	14.6	34	14.5	6
1853	14.6	75	13.5	6	15.3	7	14.7	48	14.6	14
1854	14.1	74	12.8	5	13.9	11	14.0	40	15.0	15
1855	13.6	63	13.3	6	12.7	9	13.9	36	13.9	7
1856	13.2	57	12.7	3	12.5	4	13.4	34	13.1	8
1857	13.8	51	12.0	1	14.4	7	13.7	29	14.0	10
1858	14.0	37	14.0	2	14.6	6	14.0	21	14.0	7
1866	14.0	26	12.9	12	15.0	2	15.0	9	16.0	2
Means	15.2		14.0	82	15.2	172	15.3	649	14.6	114
B. First Mate (N = 1,224)										
1840	27.7	15	24.0	2	29.0	1	28.4	11	—	
1841	25.7	56	20.5	4	25.1	17	26.5	35	—	
1842	25.5	59	22.1	8	25.5	24	26.5	23	—	
1843	26.6	50	—		25.7	7	26.9	27	—	
1844	26.2	72	25.0	3	24.1	15	26.8	42	—	
1845	25.7	52	23.4	5	25.4	5	26.0	26	—	
1846	24.9	62	20.3	4	24.7	11	25.9	34	—	
1847	25.8	55	—		24.3	10	26.4	31	—	
1848	25.4	54	22.0	1	23.7	3	25.7	45	—	
1849	24.4	53	20.0	1	23.8	13	24.9	35	23.0	2
1850	22.2	68	18.5	2	21.3	7	22.2	41	22.9	17
1851	21.5	110	20.1	9	20.2	10	21.9	58	21.9	28
1852	21.0	60	19.3	9	20.1	7	21.7	37	21.2	6
1853	21.0	84	19.2	6	19.9	7	21.3	54	20.7	16
1854	20.3	83	15.8	5	20.5	11	20.4	47	21.3	17
1855	20.1	72	18.5	6	20.2	12	20.2	40	20.3	9
1856	19.5	70	16.0	3	19.5	6	19.6	41	19.6	11
1857	19.4	65	17.0	2	19.2	10	19.8	36	19.2	13
1858	20.7	49	20.0	2	19.8	8	21.0	26	21.4	11
1866	21.8	35	21.2	15	21.3	2	22.5	13	22.4	4
Means	22.9		20.2	87	22.8	186	23.3	702	21.2	134

(continued)

Table 5.2 (continued)

Year	All Grounds ^a	<i>N</i>	Atlantic	<i>N</i>	Indian	<i>N</i>	Pacific	<i>N</i>	Western Arctic	<i>N</i>
C. Second Mate (<i>N</i> = 1,234)										
1840	46.3	15	42.5	2	43.0	1	46.5	11	—	
1841	42.2	53	35.0	1	41.0	17	42.9	35	—	
1842	42.1	58	37.1	7	40.8	24	44.7	23	—	
1843	43.4	50	—		42.7	7	43.6	27	—	
1844	41.0	72	33.7	3	37.5	15	43.0	42	—	
1845	42.9	51	36.5	4	37.8	5	43.4	26	—	
1846	41.2	59	37.0	3	38.0	11	43.1	33	—	
1847	42.0	57	—		39.9	10	42.6	32	—	
1848	40.3	56	35.0	1	38.8	4	40.3	46	—	
1849	39.2	53	30.0	1	38.3	13	39.6	35	42.8	2
1850	36.9	68	26.0	2	37.1	7	37.3	41	37.1	17
1851	37.2	113	35.2	9	37.7	10	37.9	58	36.9	31
1852	35.7	62	31.0	9	37.3	7	36.1	39	40.0	6
1853	36.3	84	31.8	5	33.1	7	36.5	54	37.9	17
1854	35.1	82	28.0	5	35.2	11	35.8	46	35.5	17
1855	34.6	72	30.5	6	33.2	12	35.6	40	33.9	9
1856	33.6	74	30.0	3	35.7	6	33.8	43	34.3	13
1857	32.8	70	30.0	2	32.3	10	33.6	39	32.7	15
1858	34.4	50	29.0	2	30.8	8	35.3	26	35.1	12
1866	34.5	35	33.4	15	32.0	2	35.6	13	37.3	4
Means	38.0		33.0	80	37.4	187	38.8	709	36.1	143
D. Third Mate (<i>N</i> = 1,024)										
1840	65.3	12	—		57.5	1	65.6	10	—	
1841	64.2	36	—		67.3	10	63.0	26	—	
1842	61.1	35	55.0	1	60.2	13	61.8	17	—	
1843	66.1	36	—		65.0	4	65.7	20	—	
1844	60.9	57	55.0	3	56.5	10	63.6	37	—	
1845	62.9	43	53.0	1	57.2	6	64.7	23	—	
1846	63.3	41	65.0	1	62.5	4	62.9	27	—	
1847	61.6	45	—		60.2	6	63.8	26	—	
1848	61.9	50	—		62.5	2	61.7	45	—	
1849	59.4	42	—		59.0	8	59.6	31	57.5	2
1850	58.6	60	—		56.0	3	57.8	39	60.6	17
1851	54.8	102	48.7	6	52.2	6	55.7	56	55.1	31
1852	54.5	51	53.3	4	52.2	6	54.8	35	56.2	6
1853	52.5	73	45.7	3	52.6	5	52.4	47	53.4	17
1854	52.3	71	48.3	3	50.7	7	53.0	40	52.4	19
1855	51.2	61	50.0	2	52.3	9	50.8	36	51.5	10
1856	50.9	68	—		56.6	5	51.3	43	47.9	13
1857	49.3	68	40.0	1	44.6	9	50.3	40	51.4	16
1858	54.2	47	50.0	1	52.6	7	53.9	25	56.3	12
1866	54.1	26	53.3	10	55.0	1	56.0	10	52.0	4
Means	56.7		51.3	36	56.4	122	57.4	633	54.0	147

Table 5.2

(continued)

Year	All Grounds ^a	<i>N</i>	Atlantic	<i>N</i>	Indian	<i>N</i>	Pacific	<i>N</i>	Western Arctic	<i>N</i>
E. Boatsteerer (<i>N</i> = 4,101)										
1840	91.0	45	85.8	6	88.3	3	91.4	33	—	
1841	85.0	167	52.8	9	84.9	55	87.9	103	—	
1842	84.4	172	65.4	20	84.2	66	88.0	72	—	
1843	90.7	164	—		82.6	19	91.5	93	—	
1844	86.8	225	69.6	5	76.6	41	91.6	141	—	
1845	90.1	166	67.1	10	87.1	18	92.1	87	—	
1846	88.3	187	72.7	11	80.0	29	92.7	108	—	
1847	88.6	182	—		77.8	30	92.7	108	—	
1848	91.2	192	62.5	2	82.5	10	92.5	164	—	
1849	86.4	164	67.0	1	82.9	37	87.4	112	92.0	7
1850	87.5	219	45.0	3	71.3	16	88.7	135	91.4	62
1851	89.4	404	69.6	25	80.3	35	91.6	215	93.5	114
1852	86.1	204	65.1	21	85.0	22	88.6	138	92.9	21
1853	83.5	284	65.0	15	75.3	20	84.0	183	88.6	60
1854	83.6	268	59.6	11	74.5	30	85.3	144	89.1	73
1855	86.0	245	65.3	15	87.1	39	87.4	145	86.6	31
1856	84.9	250	65.0	6	79.9	21	86.9	153	86.8	45
1857	87.1	264	65.0	6	81.8	35	88.5	151	89.9	60
1858	88.4	175	80.8	6	83.3	27	89.2	89	90.2	46
1866	89.1	124	81.3	49	88.6	7	94.9	47	95.6	18
Means	87.1		69.7	221	81.6	560	89.3	2,421	90.5	537
F. Cooper (<i>N</i> = 983)										
1840	59.0	12	54.0	2	55.0	1	60.6	9	—	
1841	56.7	40	75.0	1	55.6	13	56.6	26	—	
1842	61.6	42	62.5	4	60.3	18	63.4	17	—	
1843	61.3	44	—		60.8	6	61.7	23	—	
1844	59.4	60	55.0	1	59.6	12	58.9	38	—	
1845	54.3	46	62.7	3	51.0	5	54.4	25	—	
1846	58.8	50	55.0	2	61.1	9	58.7	26	—	
1847	57.0	42	—		54.9	7	56.7	23	—	
1848	56.7	41	—		55.0	2	57.5	37	—	
1849	58.1	36	—		59.6	7	58.3	26	60.0	1
1850	52.9	50	—		51.0	5	52.0	32	55.7	12
1851	54.2	95	53.8	4	61.1	9	53.5	47	53.3	31
1852	55.9	53	58.7	6	62.5	6	53.9	34	60.0	6
1853	56.8	73	70.8	6	54.4	5	55.4	45	56.8	15
1854	58.6	77	70.0	4	58.5	10	57.3	39	60.5	21
1855	54.7	54	48.3	3	58.1	9	54.4	30	57.4	7
1856	52.5	54	45.0	1	53.0	6	52.1	28	55.0	11
1857	55.4	61	60.0	1	57.5	8	54.2	34	55.5	15
1858	55.2	35	52.5	2	49.0	2	56.0	20	54.2	9
1866	66.7	18	65.0	6	61.0	2	70.3	9	—	
Means	56.8		60.9	46	57.9	142	56.4	568	56.2	128

(continued)

Table 5.2 (continued)

Year	All Grounds ^a	<i>N</i>	Atlantic	<i>N</i>	Indian	<i>N</i>	Pacific	<i>N</i>	Western Arctic	<i>N</i>
G. Carpenter (<i>N</i> = 811)										
1840	150.8	6	—		150.0	1	151.3	4	—	
1841	149.7	36	90.0	1	152.2	9	151.2	26	—	
1842	150.4	32	128.3	3	153.0	13	151.1	14	—	
1843	153.8	29	—		152.0	5	150.0	16	—	
1844	155.0	43	137.5	2	146.7	9	158.6	25	—	
1845	162.6	34	100.0	1	166.7	3	162.2	16	—	
1846	161.0	40	127.5	2	154.2	6	165.5	22	—	
1847	162.4	27	—		156.0	5	162.9	14	—	
1848	164.8	40	—		—		163.8	38	—	
1849	158.2	35	150.0	1	157.9	8	161.9	21	157.5	2
1850	165.8	46	—		145.0	3	166.7	29	170.4	13
1851	169.2	85	145.7	7	163.8	8	172.1	43	174.4	25
1852	167.4	41	148.8	4	166.0	5	171.0	24	167.5	6
1853	168.2	53	140.0	2	165.0	3	167.4	35	175.4	12
1854	168.4	65	150.0	1	157.5	12	171.5	33	175.0	16
1855	172.4	45	149.4	5	180.0	6	171.5	23	176.9	8
1856	170.7	47	—		162.5	4	177.6	27	161.4	7
1857	171.3	58	100.0	1	171.7	9	175.0	32	170.0	13
1858	172.1	29	160.0	1	175.8	6	168.5	13	177.9	7
1866	185.8	20	173.1	8	185.0	2	198.8	8	185.0	1
Means	165.1		145.9	39	160.0	117	166.6	463	172.6	110
H. Cook^c (<i>N</i> = 1,240)										
1840	141.9	13	140.0	1	150.0	1	141.0	10	—	
1841	134.8	53	103.3	3	138.9	16	135.7	34	—	
1842	132.9	58	111.6	8	134.0	24	138.0	22	—	
1843	140.9	50	—		131.7	7	141.1	27	—	
1844	139.4	70	106.7	3	135.4	14	144.5	42	—	
1845	143.1	53	113.0	5	142.0	5	147.5	26	—	
1846	137.9	64	115.0	4	135.0	12	141.9	34	—	
1847	139.3	55	—		134.4	9	140.7	31	—	
1848	145.1	58	130.0	1	140.0	4	147.2	48	—	
1849	135.2	51	—		137.1	14	133.9	33	140.0	2
1850	139.2	68	82.5	2	122.9	7	142.6	42	145.3	16
1851	142.7	115	128.5	10	141.7	12	143.4	58	147.7	31
1852	138.2	64	120.0	9	144.6	7	139.5	40	146.4	7
1853	139.4	81	131.4	7	130.0	6	141.1	48	140.5	19
1854	140.9	82	128.0	5	131.0	10	144.8	46	143.9	18
1855	143.9	70	125.8	6	143.0	10	142.6	40	156.7	9
1856	142.9	74	127.5	2	138.6	5	143.9	45	146.9	13
1857	141.7	74	125.0	2	131.5	10	145.4	41	142.6	17
1858	146.8	51	132.5	2	148.1	8	146.2	25	148.8	13
1866	148.9	36	148.0	15	145.0	2	150.0	13	149.0	5
Means	140.7		125.3	85	136.6	183	142.6	705	146.0	150

Table 5.2 (continued)

Year	All Grounds ^a	<i>N</i>	Atlantic	<i>N</i>	Indian	<i>N</i>	Pacific	<i>N</i>	Western Arctic	<i>N</i>
I. Steward (<i>N</i> = 1,192)										
1840	137.0	16	130.0	1	115.0	1	141.7	13	—	
1841	133.2	50	90.0	2	137.7	15	133.8	33	—	
1842	132.8	56	126.9	8	126.8	22	139.1	22	—	
1843	137.9	50	—		140.0	7	135.6	27	—	
1844	137.0	68	147.5	2	134.0	15	138.8	41	—	
1845	136.8	47	114.0	5	142.0	5	139.0	21	—	
1846	136.5	54	117.5	4	135.0	9	137.0	28	—	
1847	138.2	52	—		130.0	8	142.2	29	—	
1848	140.5	56	160.0	1	136.4	3	140.5	46	—	
1849	137.3	49	—		142.3	11	135.6	34	145.0	2
1850	138.3	61	—		120.0	6	139.2	40	145.0	14
1851	136.9	110	115.6	8	135.6	9	140.1	58	137.8	30
1852	130.6	60	105.0	7	134.7	6	132.6	40	140.0	6
1853	134.3	85	128.0	5	130.0	6	134.8	55	137.6	17
1854	133.7	78	126.0	5	130.0	8	135.1	45	133.1	18
1855	131.0	65	111.0	5	129.0	10	131.1	37	143.3	9
1856	134.4	77	131.7	3	138.0	5	135.6	44	136.4	16
1857	131.7	72	117.5	2	123.0	10	131.5	39	138.8	17
1858	139.3	48	125.0	2	144.3	7	136.4	25	142.3	11
1866	133.9	38	125.3	16	132.5	2	139.3	14	146.0	5
Means	135.4		120.9	76	133.0	165	136.6	691	139.0	145
J. Skilled Seaman ^d (<i>N</i> = 2,643)										
1840	143.8	44	134.6	8	150.0	4	145.2	31	—	
1841	137.8	133	98.3	6	136.3	47	141.6	80	—	
1842	136.3	164	117.2	26	134.8	71	145.0	50	—	
1843	145.1	154	—		145.9	16	142.7	71	—	
1844	147.1	188	121.5	10	137.1	39	153.2	111	—	
1845	153.9	104	117.5	8	145.0	9	158.3	60	—	
1846	146.0	155	125.6	8	137.2	35	154.7	79	—	
1847	147.7	128	—		141.9	27	152.5	63	—	
1848	150.7	127	135.0	4	142.0	11	153.4	98	—	
1849	149.0	118	125.0	3	147.7	26	149.3	74	167.0	5
1850	151.8	151	97.1	7	142.2	16	154.2	91	160.3	37
1851	156.3	212	143.1	27	143.8	16	158.5	98	165.0	63
1852	154.0	98	129.0	10	151.3	16	157.4	53	160.6	17
1853	151.3	131	133.2	14	145.0	9	151.0	73	161.0	30
1854	150.9	120	125.0	9	134.6	12	153.3	71	161.0	24
1855	156.4	114	138.5	10	163.3	12	156.7	77	153.1	8
1856	156.9	134	143.0	5	151.8	14	158.7	70	158.0	32
1857	160.9	172	133.3	3	153.6	25	163.9	92	160.0	37
1858	166.9	81	—		146.7	6	168.8	49	169.3	22
1866	163.7	115	155.3	46	163.0	5	172.4	51	174.0	5
Means	151.0		133.6	204	142.1	416	154.5	1,442	162.1	280

(continued)

Table 5.2 (continued)

Year	All Grounds ^a	<i>N</i>	Atlantic	<i>N</i>	Indian	<i>N</i>	Pacific	<i>N</i>	Western Arctic	<i>N</i>
K. Semi-skilled Seaman ^c (<i>N</i> = 3,118)										
1840	160.1	56	144.2	6	—		161.9	49	—	
1841	155.5	202	130.0	19	151.1	58	161.4	125	—	
1842	155.5	147	120.0	11	148.5	64	167.7	66	—	
1843	163.5	168	—		149.8	21	165.5	109	—	
1844	162.6	161	135.0	5	142.7	22	170.8	111	—	
1845	162.8	134	131.7	18	166.9	8	165.8	81	—	
1846	162.6	134	146.5	10	148.4	18	169.5	90	—	
1847	166.3	155	—		147.7	13	170.7	111	—	
1848	170.2	151	150.0	1	161.7	6	170.5	141	—	
1849	159.5	119	135.0	3	155.0	17	160.4	92	168.3	6
1850	168.9	120	—		152.1	16	173.4	75	168.0	25
1851	170.7	299	149.1	23	170.6	33	172.9	156	173.7	78
1852	171.5	162	140.7	14	157.3	12	177.2	121	168.2	11
1853	167.5	191	132.7	11	159.5	10	167.7	122	176.5	48
1854	166.9	169	129.4	9	156.2	17	168.2	90	176.8	46
1855	167.5	142	164.6	8	166.6	32	165.5	66	175.0	20
1856	166.7	117	156.4	11	174.6	12	170.2	63	168.9	9
1857	171.2	199	140.0	3	163.0	25	171.4	111	177.0	56
1858	177.2	156	142.2	9	181.0	30	174.9	66	185.5	43
1866	184.5	136	169.3	42	190.0	4	195.1	52	186.7	36
Means	166.9		145.8	203	157.8	418	169.7	1,897	176.8	378
L. Unskilled Seaman ^c (<i>N</i> = 12,646)										
1840	178.0	122	153.9	9	180.4	12	178.1	85	—	
1841	175.6	441	112.3	22	176.2	138	180.3	281	—	
1842	177.8	490	140.1	47	184.6	190	179.8	210	—	
1843	178.4	388	—		165.7	47	179.8	204	—	
1844	178.6	658	148.6	25	169.1	133	185.5	392	—	
1845	186.8	526	142.4	26	186.2	57	188.5	250	—	
1846	179.5	565	147.1	33	169.8	86	186.1	314	—	
1847	184.5	530	—		171.0	87	187.9	317	—	
1848	187.4	513	160.0	11	172.7	39	191.1	411	—	
1849	182.9	496	158.8	8	174.6	133	186.2	322	197.9	21
1850	184.8	715	104.2	18	164.2	53	186.6	443	194.2	194
1851	189.4	1,287	165.8	82	178.7	71	191.4	714	196.1	367
1852	185.3	664	151.6	85	180.5	64	191.6	437	191.5	74
1853	185.8	929	159.5	43	175.1	80	187.1	615	192.0	187
1854	185.0	930	148.3	43	174.8	96	187.3	541	192.2	218
1855	188.0	866	157.8	60	190.4	131	189.3	484	193.1	129
1856	190.6	907	150.2	27	183.0	61	194.8	545	192.8	184
1857	193.4	746	159.7	15	186.6	95	194.4	432	199.9	164
1858	192.5	551	170.5	20	184.4	75	193.7	303	197.5	137
1866	201.5	322	189.6	139	202.9	14	214.2	109	205.4	51
Means	186.0		158.5	713	178.2	1,662	188.9	7,409	194.9	1,726

Source: Stations and Lays Data Set.

Table 5.2 (continued)

Notes: These figures are reciprocals. A lay reported here as 16.5, for example, is actually 1/16.5, or 6.06 percent. The table excludes crewmen who signed on in more than one capacity—for example, shipkeeper and blacksmith. It also excludes crewmen who signed on after the beginning of the voyage.

“All Grounds” figures are averages over all the available voyages, including those sixty-one that went to more than one ground. They are not averages over the voyages reported in the ground-specific columns of this table.

^bThe lays almost certainly understate the actual incomes of captains. In 125 cases (10 percent of the crew lists we analyzed), the captain signed a special contract that was not reported with the normal contracts. (Special contracts were also signed by a few mates and one boatsteerer.) When these special contracts could be found, they usually involved some bonus payment over and above the lay. This table reports the average lays among those for whom lays were reported in the crew lists; it excludes those who signed special contracts.

^cThe value of the cook’s lay was almost always less than his total income from the voyage. In addition to the lay he was typically entitled to between one-third and one-half of the slush fund, as the money received from the sale of slush (refuse grease and fat from cooking) and other ship’s refuse was called. On the voyage of the *George Howland* that began on 25 June 1846, for example, Andrew Lewis, the cook, earned \$357.73 from his 1/140 lay and an additional \$124.00 from his one-half of the slush. His effective lay was thus 1/104. See *George Howland Account Book*. Captains also frequently shared in the slush.

^dSeamen, able seamen, whaling seamen, extra prepared seamen, bow hands, leads, and lookouts.

^eOrdinary seamen, oarsmen, mariners, “one voyage,” “has been coasting,” “past green hand,” “used to boat,” “5 years crawling,” “has been to sea,” “extra green hand,” boatmen, and “in the boats.”

^fGreenhands, landsmen, green oarsmen, green Portuguese, green Canakas, green Malays, “Spanish Islands,” green blacks, and green colored.

other hand, the lays of cooks, carpenters, blacksmiths, and miscellaneous artisans lengthened by 5, 13, 15, and 11 percent, respectively. For seamen, Hohman is unambiguously correct. The lays of skilled seamen lengthened by 14 percent and those of semi-skilled and unskilled seamen by 8.

Hohman did not distinguish ground-to-ground differences in lays, but there were systematic differentials that did not erode over time and were responsible for a significant fraction of the lengthening he observed. Table 5.5 shows their general outline. Lays were shortest in the Atlantic, 7 to 9 percent longer in the Indian Ocean, and 11 to 14 percent longer in the Pacific and Western Arctic. The differentials persisted throughout the period, despite the longer voyages to the western grounds and the greater loss rates experienced by barks in the Pacific and by all vessels in the Western Arctic.

The explanation of these persistent interground differences is far from obvious, but an attempt is made to provide one below. Here we are interested in their effects on the trends in lays noted in Hohman’s analysis. Part of the lengthening in the average seaman’s lay resulted from the redistribution of the fleet from the short-lay Atlantic and Indian grounds to the long-lay Pacific and Western Arctic. Between 1840 and 1843, 6 percent of the labor contracts were for voyages to the Atlantic and 27 percent for voyages to the Indian Ocean. By 1855–58 the Atlantic’s share had declined to 4 and the Indian’s to 13 percent. Between 1840 and 1858 about 15 percent of the observed lengthening in the average lay of a skilled seaman can be attributed to geographic redistribution.

Table 5.3 Average Lays by Occupation, All Grounds, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866

Year	Fourth		Shipkeeper		Blacksmith		Misc. Artisan ^a		Boy	
	Mate	<i>N</i>		<i>N</i>		<i>N</i>		<i>N</i>		<i>N</i>
1840	82.5	2	117.5	2	146.3	4	151.7	3	223.8	12
1841	75.9	8	90.0	4	156.4	20	155.0	4	235.2	29
1842	73.1	8	120.6	5	157.5	27	152.9	12	228.4	32
1843	74.0	12	128.3	9	163.3	23	159.2	6	400.8	33
1844	73.1	17	125.0	7	158.6	33	166.3	4	338.7	55
1845	78.1	17	97.5	4	175.9	16	163.3	3	219.7	34
1846	76.4	20	115.0	4	165.6	26	181.0	7	562.4	37
1847	73.2	12	135.0	3	164.8	30	171.4	7	463.5	33
1848	75.4	20	112.5	4	171.7	29	175.7	7	391.3	45
1849	68.0	7	111.7	3	166.9	26	160.0	7	225.6	24
1850	70.6	21	133.3	3	175.3	35	155.8	10	307.5	42
1851	72.3	33	100.0	6	176.2	64	176.9	21	396.8	34
1852	69.8	17	126.3	4	177.2	29	168.8	4	226.7	18
1853	72.9	17	146.7	3	177.7	37	180.0	5	254.7	32
1854	70.5	19	116.4	11	171.4	43	177.1	7	254.5	28
1855	67.7	22	92.5	2	182.1	38	155.0	7	237.3	42
1856	63.9	21	108.8	4	181.6	30	180.6	8	248.9	46
1857	67.7	24	110.0	5	179.0	39	177.5	2	254.7	37
1858	70.2	12	80.0	1	184.5	19	190.0	1	247.6	34
1866	68.8	14	96.7	3	189.1	17	224.0	5	280.7	21
Means	71.5		115.3		172.5		170.2		308.7	

Source: Stations and Lays Data Set.

Notes: The table excludes crewmen who signed on in more than one capacity, and those who signed on after the beginning of the voyage. The averages in this table are comparable to those in the “All Grounds” column of table 5.2.

^aMiscellaneous artisan includes second coopers, second carpenters, sailmakers, boatbuilders, second blacksmiths, painters, caulkers, and coppersmiths.

The shortening in officers’ lays is remarkable and probably reflects the increased supervisory responsibilities of officers associated with the new technological configuration.

5.2 The Wages of Whalemen

The lay was only a means to an end: the real wage. A crewman’s interest centered on the money his lay commanded. An attempt to estimate the wage raises two sets of problems—neither trivial. First, although the main component of a whaleman’s compensation package came from the sale of his share of the catch, the value of the lay was not identical to his total income. There were both charges and supplements. Also, significant issues are raised by questions of the timing of the payment and of income in kind. Second, even if adjustments can be made to compensate for these aspects of the bargain, there remain questions about the appropriate definition of the wage.

Table 5.4 Average Lays by Occupation, All Grounds, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866

Occupation	Average Lay	% of Value of Catch	Relative Share ^a	% Change in Lay, 1840–43 to 1855–58 ^b
Officer				
Captain	15.2	6.58	1,219	-17.6
First mate	22.9	4.37	809	-23.5
Second mate	38.0	2.63	487	-21.0
Third mate	56.7	1.76	326	-20.0
Fourth mate	71.5	1.40	259	-10.3
Skilled maritime				
Boatsteerer	87.1	1.15	213	-0.6
Shipkeeper	115.3	.87	161	-11.5
Artisan				
Cooper	56.8	1.76	326	-9.2
Carpenter	165.1	.61	113	13.4
Blacksmith	172.5	.58	107	14.5
Miscellaneous	170.2	.59	109	10.5
Service personnel				
Cook	140.7	.71	131	5.2
Steward	135.4	.74	137	-0.7
Seaman				
Skilled seaman	151.0	.66	122	14.1
Semi-skilled seaman	166.9	.60	111	8.0
Unskilled seaman	186.0	.54	100	7.7
Boy	308.7	.32	59	-12.9

Source: Stations and Lays Data Set.

Note: The table excludes crewmen who signed on in more than one capacity, and those who did not sail with the vessel.

^aUnskilled seaman equals 100.

^bA shortening lay is indicated here by a negative sign. A shorter lay means a smaller denominator in the lay fraction, and thus a larger portion of the catch.

In terms of charges, aside from the repayment of cash and the value of clothing advanced before and during the voyage and a small charge for the "doctor's box," a crewman's wages, as previously noted, were routinely docked for his share of certain expenses incurred by the vessel. Before midcentury these charges were small; Hohman to the contrary notwithstanding, they did not significantly affect the final settlement. For example, on nine voyages made by four vessels between 1827 and 1850, standard charges reduced the average crewman's final payment by less than 0.6 percent.²³

By the 1850s the industry's structure had become more complex. Destina-

23. The average encompasses two voyages of the *Stephania* (1828–29 and 1829–30), two voyages of the *Midas* (1827–29 and 1829–30), one voyage of the *William Rotch* (1830–31), and four voyages of the *George Howland* (1834–38, 1838–41, 1842–45, and 1846–50). See Account Book of the *Stephania*, 1828–30, Account Book of the *Midas*, and Account Book of the *William Rotch*, 1830–31, in the Coggeshall Collection; *George Howland* Account Book.



The outfits of whaling vessels included barrel staves, heads, and hoops, from which the cooper built barrels and casks as needed to hold the oil tried out by the crew. These drawings come from the sketchbook of a crew member on the *Orray Taft*.

Reproduced courtesy of The Kendall Whaling Museum, Sharon, Massachusetts, U.S.A.

tions were farther from New Bedford, and the time spent reaching and returning from them was costly. In order to overcome their vessels' capacity constraints and to use their capital more efficiently, agents began to order their captains to transship a part of the catch through ports such as Lahaina and, if the vessel was not full when it began the homeward trek, to purchase or arrange to transport additional cargo. Transshipments involved commissions and freight charges, and crewmen were required to bear their share. On the other hand, they were credited with the interest earned on the income generated by the sale of transshipped products from the date of their sale to the date of the vessel's return. Similarly, oil and bone purchased to top off a cargo were not costless, but they were expected to produce a net gain for both owner and crew. As a result of these institutional changes, by the 1850s the charges against gross revenues had increased. On four voyages returning after 1850, for example, such charges were about 3 percent of the average crewman's gross earnings.²⁴

During the Civil War, the threat of Confederate raiders drove insurance and freight charges to new heights. On a voyage of the *George Howland* that departed New Bedford in 1862 and returned in 1866, the charges totaled \$28,316 (including \$13,263 for freight, \$9,143 for insurance, and \$5,032 in commis-

24. The average encompasses one voyage of the *Benjamin Tucker* (1849–51) and three voyages of the *George Howland* (1850–52, 1852–57, and 1857–61). See *Benjamin Tucker, 1849–51; George Howland Account Book*.

Table 5.5 Relative Lays by Occupation and Ground, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866 (Atlantic = 100)

Occupation	1840–58 and 1866		1849–58 and 1866		
	Indian	Pacific	Indian	Pacific	Western Arctic ^a
Officer					
Captain	109	109	105	107	107
First mate	113	115	107	110	110
Second mate	113	118	111	114	114
Third mate	110	112	104	107	107
Skilled maritime					
Boatsteerer	117	128	115	124	128
Artisan					
Cooper	95	93	94	90	92
Carpenter	110	114	108	112	113
Service personnel					
Cook	109	114	105	109	112
Steward	110	113	110	113	116
Seaman					
Skilled seaman	106	116	106	112	115
Semi-skilled seaman	108	116	109	113	116
Unskilled seaman	112	119	110	116	119
Means ^b	109	114	107	111	112

Source: Stations and Lays Data Set.

Notes: The table excludes crewmen who signed on in more than one capacity, and those who did not sail with the vessel. Higher index numbers mean longer relative lays (and therefore smaller percentages of the value of the catch).

^aThe Western Arctic was opened for whaling in 1848.

^bThese are unweighted averages.

sions), or more than 15 percent of gross revenues—but the voyage was still a financial success. Despite the record charges, the monthly net revenues (in constant dollars) were more than one-half again as high as the average earned on the ship's previous seven voyages and almost 10 percent greater than on the most successful of the seven (*George Howland Account Book*). Not all vessels that put to sea during the war incurred such heavy charges. On the bark *Callao*'s 1,093-day voyage from September 1862 to August 1865, after adjustments for the interest accrued on transshipped products, the net charges amounted to only about 1.6 percent of revenues.

After the war, charges settled back into the range of the 1850s. On one voyage of the bark *Callao* and four of the ship *Milton*, such offsets against wages averaged 4.4 percent. They rose significantly above that level only when a misadventure near the end of a voyage forced the owners to pay freight charges on cargo that would otherwise have been brought back by the vessel itself. On the last voyage of the *Callao*—condemned in Mauritius in 1877—the charges totaled 28.6 percent; on the last voyage of the *Milton*—“arrived Panama in

distress" in 1889—they amounted to 12.9 percent. In the latter case, if the Panama freight charges had not been incurred, the total would have been only 5.1 percent (*Milton and Callao Account Books*).

In partial offset to these charges, some whalemens earned supplements to their contracted lays. A captain usually received a fraction of the profits from the sales of clothing and tobacco from the slop chest, and sometimes a share of the slush fund; he also often carried on subsidiary commercial enterprises on his own account.²⁵ The cook was normally entitled to some fraction of the slush.²⁶ From time to time seamen received not insubstantial bonuses for particularly good performances in sighting and catching whales. On the 1834 voyage of the *George Howland*, for example, four seamen received cash bonuses ranging from \$30 to \$50—sums equal to between 7.5 and 12.5 percent of their lay incomes.²⁷ Also, a crew member might be the recipient of some of the traditional charges that provided the wedge between gross and net value. He might add to his earnings by helping load the vessel before it set out to sea, helping unload or clean it when it returned to port, or forgoing shore leave on an exotic South Sea island to remain aboard ship as a watchman.

Finally, although it is impossible to assess the extent of the practice, lays were sometimes renegotiated during a voyage. In 1860 the agent Matthew Howland wrote to Captain Valentine Lewis (18 July, Howland Collection), who had reported that his crew were asking to have their lays increased. Howland told Lewis to resist if he could, but to accede if necessary, "because we are satisfied that a good crew is cheaper at high lays than a miserable crew is for nothing." On the *George Howland's* eighth voyage (1862–66), seven crewmen (the third mate, the cooper, the steward, three boatsteerers, and a seaman) received increases in lays whose value ranged from \$140.39 to \$1,936.90 and totaled \$5,557.98 (*George Howland Account Book*).

Two other characteristics of the wage bargain tempered the amount of risk transferred from owner to seaman. First, the seaman received room (or at least a bunk or a place to hang his hammock) and board (such as it was). In 1880 dollars the value of a crewman's food probably ranged between \$3.90 and \$6.70 a month.²⁸

25. On seven of the eight voyages made by the *George Howland* between 1834 and 1866—voyages for which we have information (the relevant page on the 1857–61 voyage is missing)—the captain's extra income was, in order, \$600.62, \$168.45, \$1,222.65, \$0.00, \$621.75, \$2,686.10, and \$775.02. These amounts average \$867.80 per voyage, or \$20.91 per month. See *George Howland Account Book*.

26. Hohman 1928, 231. In sixty-three cook's contracts out of the 1,250 voyages represented in the Stations and Lays Data Set, the cook's entitlement to some portion of the slush fund (usually one-half) was spelled out.

27. *George Howland Account Book*. Hohman (1928, 219) mentions bonuses "for sighting whales which were subsequently captured" but characterizes all payments other than the value of the lay as "scanty."

28. See appendix 5C. The subsistence estimates described therein have been converted to 1880 dollars using the Warren and Pearson food price index (U.S. Department of Commerce 1975, series E-54).

Second, with the exception of the captain and sometimes a mate or two, crewmen normally received advances before their vessels left port. Usually the advance was between one-quarter and one-third of projected earnings. The funds were used, and were usually sufficient, to support wives, children, or parents during the voyage; they occasionally were supplemented by further advances if the voyage proved unusually long or an emergency arose. Crewmen were charged interest on advances (usually 6 percent), but advances were almost never repaid if the ship sank or returned clean (that is, without oil or bone). Moreover, if at the end of a successful voyage a seaman's account was still in deficit, the agent had little recourse but to try to convince him to sign on for another of the agent's voyages. Since the seaman could sign elsewhere and have a clean slate, such attempts were seldom successful.

Over eight voyages of the *George Howland* (1834–66), five of the *Milton* (1869–85), and two of the *Callao* (1871–77), advances were taken by 413 of the 459 newly signed crewmen. They ranged (in 1880 dollars) from \$1,003.25 (\$1,043.38 nominal) for the second mate of the *George Howland* in 1862 to \$1.32 (\$1.45 nominal) for Joseph Howland—a Howland family member sailing as an able seaman—of the same ship in 1838. The average advance was \$121.66. Over these fifteen voyages, the advances amounted to just less than 10 percent of net revenues (gross returns less charges) or about 30 percent of the crew's share. On the three voyages that yielded their owners less than \$700 per month, advances averaged 25 percent of *total revenue*. Finally, the sketchy evidence suggests that in the postbellum period individual advances were somewhat smaller (\$115 as opposed to \$127), but, as a fraction of net revenues, the proportion was probably higher (*George Howland Account Book; Milton and Callao Account Books*).

Advances were a cause of concern among agents and seamen. Agents were prepared to accept the losses associated with truly disastrous voyages, but less willing to accept those resulting from desertion. In September 1834 Charles Morgan warned one of his captains, Cornelius Howland Jr. (24 September, Morgan Collection), "The crew are generally indebted to the Owners about \$110 to \$120 each you will therefore be especially careful of them till you get Oil enough to secure that and over it." Five weeks later in a letter to another captain (Reuben Russell, 1 November), he was even more explicit: "I think you have a good crew, but they mostly all are in debt to the Ship from \$70 to \$100—So please take care they dont run away before you get some Sperm Oil."

On the outbound voyage crewmen had a strong incentive to desert; some managed to run even before their vessels left New Bedford. On the return voyage the incentive shifted. It was then that the captain, and perhaps the agent, found it in his interest to convince a crewman to make an early departure. In November 1836, eleven months after the *Condor* left New Bedford and three months before she was scheduled to return, Morgan wrote Captain George H. Dexter (21 November, Morgan Collection), "The carpenter too has come and

tells a queer story of his being left purposely of the whole crew being without bread nine days and some other things equally probable. I did not pay much attention to him.”

That captains and agents tended to ease the path to desertion when a crewman's account stood in surplus was the view of U.S. Navy lieutenant Charles Wilkes, who commanded an expedition to the Pacific in the late 1830s and early 1840s. “Many Americans are found on the different islands, who have been turned ashore from whale-ships, or left because they have broken their liberty a single time, near the end of a voyage. Such treatment leaves too much ground [not] to believe that they are purposely left, in order to increase the profits of the ship-master or owners” (Wilkes 1845, 5:498). For example, during the *Montreal's* third voyage (1857–62), the vessel left five crewmen, and “the evidence seems to imply clearly that . . . the ship deserted the men, rather than vice versa!” (Hohman 1928, 67).

The historian A. B. C. Whipple charges that obstreperous men were often marooned on uninhabited islands and left to die. He describes in some detail the problems U.S. consuls faced in adjudicating between captain and men—did the men desert or were they marooned? In one case the consul found an obvious answer. In the early 1830s Captain Brown of the Warren, Rhode Island, brig *Magnet* wrote to the consul at Callao, Peru, concerning crewmen whom he wanted the consul to return to the vessel: “I should be happy if you will have the goodness to git the men down as soon as convenient. . . . I have no one I can trust out of my ship or I would send someone up” (Whipple 1954, 132). It is interesting that Brown remained captain on the next voyage of the *Magnet*. Clearly the agent, Joseph Smith Jr. (his father had been the agent for the previous voyage), was not displeased with the captain's contribution to his crew's desertion. In the same vein, on the 1855–59 voyage of the *Alice Frazier*, Captain C. M. Newell twice (in January 1857 and November 1857) reported that his crew had mutinied. The first time he had the entire crew imprisoned in Paita and shipped a new crew; the second time, one mutineer was killed and his accomplices were put ashore (WSL 17 February 1857, 19 January 1858).

It is impossible to be sure who won this game, but it was probably the crewmen. Support for this view can be found in the eight voyages of the *George Howland* between December 1834 and April 1886. In 1880 dollars the average advances ranged from \$77 to \$157 per crewman over these voyages (the mean was \$112). Over the same voyages the average total income that accrued to the agents and owners from crewmen who deserted or were discharged for cause (i.e., the income represented by these crewmen's lay shares less their advances) ranged from a loss of \$3,732 to a gain of \$7,966 and averaged a gain of \$747—just less than one-fourth of the average total amount advanced. That the average is a gain depends, however, entirely on the seventh voyage (October 1857 to July 1861). Over the other seven the average *loss* to the agents and owners was \$284, or about 8 percent of the average amount advanced. The seventh voyage began during the depression of 1857 and was marked by an average

advance of only \$77—well below the overall mean of \$112, and \$21 less than the average for the most parsimonious of the seven other voyages.

Since there is no systematic evidence on supplements, charges, advances, or renegotiations, the unadjusted lay payment (the initial lay times the value of the catch) has been taken as an approximation to, and an index of, the earnings of the mid-nineteenth-century whaler. For certain wage comparisons an estimate of the value of board has been added to that figure. Questions remain, nonetheless, about an appropriate definition of the wage. Voyages in the Stations and Lays Data Set were not short. They ranged in length from a three-month venture into the Atlantic by the *Petrel* in 1866 to the sixty-nine-month voyages to the Pacific by the *George* in 1847 and the *Courier* in 1850. Contracts were signed before voyages began, and payment was not due until vessels returned to New Bedford. Often a substantial fraction of the original crew did not return with the vessel.

Table 5.6 provides one wage schedule, reporting the earnings that whalers would have received from lays had they returned on the vessels on which they departed. This is probably the best available ex post measure. It omits charges against and supplements to lay income, but lay income was the bulk of earnings in any case.²⁹

5.3 The Relative Wages of Whalers

The absolute level of wages was certainly a concern of whalers, and remains of interest to social historians looking into questions of welfare, but relative wages dictated career choices and governed the flow of men into the industry. It is the latter measure that is of greater interest to economic historians analyzing the efficiency of nineteenth-century labor markets. Wages ashore are one standard against which to measure whalers' earnings; the merchant marine, at least at first glance, would seem to provide more relevant compari-

29. Wage estimates based on the earnings that the crewman would have received from his lay share, had he returned on the vessel on which he departed, can be called an Own Vessel measure. An alternate measure, Own Ground, is based on the average eventual value of the catch of all vessels sailing to a particular ground in the year that the crewman put to sea. Although orders were sometimes changed, most agents had chosen the general area to be hunted before the crew was signed. To the extent that agents possessed good intelligence, the Own Ground figure would be the agent's estimate of the potential labor cost of a voyage.

There is good reason to believe that New Bedford residents knew something about the current productivity of each of the various grounds, but, if these wage estimates are to be viewed as relevant to ex ante decisions, one must assume that agents and crewmen believed they could assess grounds' future productivity. For agents, who appear to have been continually in contact with their captains and with merchants throughout the world, this assumption may not overly distort reality. For crewmen the assumption is much less obviously plausible. In an attempt to capture the information that would have been available to a seaman or agent before a contract was signed, a third estimate, Own Year, was calculated. It is based on the average catch of vessels returning to New Bedford from a ground in the year the crewman sailed to it. It seems reasonable to assume that the expectations of crewmen and agents were largely based on this evidence, and, therefore, a wage estimate based on it is the best ex ante estimate available. The interground wage regressions reported in table 5.11 are based on the Own Year estimates.

Table 5.6

Average Monthly Earnings by Occupation, All Grounds, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866 (current dollars)

Year	Captain	First Mate	Second Mate	Third Mate	Boatsteerer	Cooper
1840	88.75	53.10	32.40	24.19	17.24	25.96
1841	70.05	44.47	28.61	20.30	13.92	21.54
1842	78.18	51.23	30.78	24.28	16.32	23.55
1843	83.19	52.70	32.14	22.36	15.74	23.25
1844	70.43	43.12	27.85	18.97	13.38	19.69
1845	66.63	43.17	26.13	19.72	12.59	20.45
1846	85.77	55.13	33.75	25.67	16.27	24.18
1847	83.38	49.94	31.81	23.56	15.78	24.27
1848	106.09	66.75	43.19	28.60	19.30	30.88
1849	112.60	74.41	45.32	31.10	21.03	31.17
1850	114.12	76.67	45.97	30.56	19.63	34.42
1851	119.93	83.81	49.73	35.46	21.02	35.94
1852	113.11	77.05	46.02	33.85	20.50	32.23
1853	121.31	86.35	49.65	36.29	22.29	34.30
1854	116.07	85.36	49.18	35.21	21.54	32.35
1855	97.72	68.95	39.76	27.99	16.21	25.89
1856	108.68	73.53	43.23	30.15	17.32	29.64
1857	90.48	65.84	38.86	26.66	14.58	22.60
1858	104.48	70.92	42.52	27.32	16.87	27.29
1866	133.01	88.66	57.59	37.47	22.54	30.05
Means ^a	98.20	65.56	39.72	27.98	17.70	27.48

Year	Carpenter	Cook	Steward	Skilled Seaman	Semi-skilled Seaman	Unskilled Seaman
1840	10.35	10.59	11.13	10.44	9.14	8.66
1841	8.03	8.71	9.00	8.38	7.40	6.83
1842	8.43	9.67	9.73	9.65	8.50	7.75
1843	9.05	9.79	10.05	9.93	8.74	7.92
1844	6.79	8.13	8.31	8.00	7.32	6.32
1845	7.03	7.67	7.88	7.18	6.06	6.20
1846	8.39	9.80	10.02	9.92	8.50	7.76
1847	7.98	9.43	10.01	8.76	8.11	7.49
1848	11.16	12.03	11.88	11.74	9.09	9.43
1849	12.16	13.27	12.82	12.50	10.99	9.92
1850	10.57	11.88	11.96	11.87	9.55	9.19
1851	11.16	12.92	13.69	11.67	10.42	9.85
1852	10.32	12.39	14.91	11.51	8.96	9.29
1853	12.30	12.73	13.88	11.38	11.19	9.83
1854	10.98	12.21	13.17	14.24	9.92	9.36
1855	8.67	9.34	10.95	9.40	8.12	7.33
1856	8.64	10.23	10.98	10.23	8.07	7.62
1857	7.52	9.02	9.80	7.42	7.67	6.74
1858	8.77	10.18	10.31	9.42	9.24	7.49
1866	11.20	12.16	15.85	11.22	10.69	9.43
Means ^a	9.47	10.61	11.31	10.24	8.88	8.22

Table 5.6 (continued)

Sources: Catch data and the durations of voyages came from the Voyages Data Set, prices from the Prices Data Set, lays from the Stations and Lays Data Set.

Notes: Lays were set when a vessel sailed, but the value of its catch (and the length of its voyage) couldn't be determined until it returned. The voyages whose crews' earnings are reported in this table began in the years 1840–58 and 1866; they ended in the years 1840–63 and 1866–71.

The average monthly value of the catch of a voyage was computed by dividing the value of its catch by the number of months it was at sea. Monthly earnings were computed by multiplying this value by the lay fraction.

These wages assume crewmen returned on the vessels on which they sailed. A crewman who left a voyage before its end often received his lay fraction of the catch to that date (not its value).

The number of observations averaged to produce each figure in this table is equal to or less than the number of lays averaged to produce the figures in table 5.2. When the value of the catch of a voyage could not be determined, the wages of its crewmen could not be calculated.

*These are unweighted averages.

sons. Maritime data are spotty, but the work of Stanley Lebergott (1964, 531–38, tables A-22A, A-22B) provides bases for comparison for six of the twelve major whaling occupations.³⁰

During the 1840s and 1850s officers in the whaling fleet were well rewarded, if their alternative was service in the merchant marine. Over comparable years, whaling captains received, on average, \$90.33 per month, captains in the merchant service, only \$29.54 (see table 5.7). First and second mates on whalers earned roughly twice as much as those on merchantmen. A part of the whaling premium almost certainly reflected the uncertainty of rewards. For merchant captains the range of salaries was from \$20 to \$35 per month; the lucky whaling captains who returned with some catch earned monthly salaries that ranged from \$0.66 to \$345.34. For first mates the mercantile range was \$45 (\$15 to \$60) in contrast to \$234 for whalemens, and for second mates the ranges were \$36 and \$121, respectively.³¹

In whaling, officers were required not only to assume larger risks, but also to bear heavier responsibilities. Since they often hunted in uncharted waters, it was necessary that they possess maritime skills greater than those of officers in the merchant fleet. The extent of the navigational hazards is acknowledged by the *WSL*. Of the loss of twelve whalers in the North Pacific in 1851, it reported, "The losses are attributed to the incorrectness of the charts of the Northern Seas, unknown currents, ice, and an unusual prevalence of severe gales and foggy weather through the summer of 1851" (13 January 1852). The

30. Lebergott's data are drawn from the manuscript collections of Baker Library, Graduate School of Business Administration, Harvard University, and of the Essex Institute in Salem, Massachusetts. His evidence does not include complete enumerations of the wages of all crewmen. Thus, for the years 1840–58 and 1866, there are records of eighty-three voyages, wage data for able seamen for eighty-two, captains' wages for only thirty-four, first mates' wages for fifty-nine, and cooks' wages for sixty-three.

31. The fact that the highest first mate's wage in the merchant marine was \$60 while the best-paid merchant captain received only \$35 does not mean that on a given voyage the first mate earned more than the captain. The ostensible anomaly comes from the spotty nature of the data. The voyage data that yielded the highly paid mate does not include the wage of his captain.

Table 5.7 Ratio of Average Monthly Wages on New Bedford Whalers to Wages on U.S. Merchantmen, by Occupation, Sailing Years 1840–58 and 1866 (current dollars)

Year	Captain	First Mate	Second Mate	Cook	Skilled Seaman	Semi-skilled Seaman
1840	2.96	2.04	1.68	0.77	0.73	—
1841	2.34	2.08	—	0.89	0.60	—
1842	2.61	2.44	—	0.97	0.67	—
1843	2.77	2.82	—	1.18	0.76	—
1844	2.56	2.31	—	0.96	0.60	—
1845	2.50	2.24	—	0.69	0.53	—
1846	3.06	2.88	1.78	0.79	0.69	0.85
1847	3.34	1.63	1.51	0.47	0.56	—
1848	3.54	3.03	2.16	0.99	0.77	0.91
1849	—	2.48	—	0.88	1.04	—
1850	4.18	4.38	—	0.91	0.77	—
1851	—	2.62	2.49	0.78	0.82	1.04
1852	—	2.75	2.30	0.72	0.79	0.90
1853	3.47	3.36	2.48	0.85	0.76	1.12
1854	3.32	1.85	1.48	0.45	0.79	0.75
1855	—	—	1.06	0.36	0.63	0.68
1856	—	—	—	—	0.51	—
1857	—	1.32	1.11	0.36	0.49	—
1858	—	—	—	—	—	—
1866	—	1.61	1.60	0.41	0.42	0.53
Means ^a	3.05	2.46	1.79	0.75	0.68	0.85

Sources: For the wages of whaling crewmen, see table 5.2 and table 5.6 notes. For the wages of merchant seamen, see Lebergott 1964, 531–38, tables A-22A, A-22B.

Notes: Blank cells are missing data for wages of merchant seamen. The wage rates on merchantmen are unweighted averages of all of the observations available in Lebergott 1964, tables A-22A, A-22B. There are very few observations, so that small differences in the ratios in this table should not be regarded as meaningful. “Skilled” merchant seamen are those described by Lebergott as “able seamen”; “semi-skilled” merchant seamen are those described as “ordinary seamen.”

^aThese are unweighted averages.

same point is made by Captain Dunn of the *Dragon*, commenting on the loss of the ship *Logan* together with one of its boatsteerers and three men: “Sandy Island Reef is laid down about 40 miles too far to the Eastward in all the charts previous to 1850.”³²

In addition, a whaling captain had to understand the whale’s habits and migration patterns and to be prepared to command a Nantucket sleigh—as the whaleboats were sometimes called. The other officers were also required to possess skills beyond those asked of a mate in the merchant marine. On 27

32. *WSL* 6 November 1855. See also Sanger 1991a, 85: “It is obvious . . . that, while certain elements either promoted or hindered the whaling operation, a whaling-master’s detailed knowledge of both long-term and short-term effects of currents, temperatures and winds on the Greenland Sea pack ice greatly enhanced his chances of procuring a paying cargo of oil and bone.”

August 1834 (Morgan Collection) Charles W. Morgan wrote one of his captains, "I have also been thinking about Officers, who are however plenty— There is Mr. Plaskitt who was 3[@] Mate on the *Russell*—if you went a sperm whale voyage I don't think you could get a better man. I don't know how he would answer for right whaling."

It is clear from their letters that agents believed the choice of the captain (and probably of the first and second mates, as well) was immensely important to the success of a voyage. Evidence that they were not mistaken can be found in a quantitative analysis of the returns of voyages. A comprehensive multiple regression model—the dependent variable is a Caves-Christensen-Diewert superlative productivity index, and the independent variables are designed to capture decision, technological, and environmental factors that theory or contemporary accounts suggest may have been determinants of productivity—fit to the data on individual voyages shows that productivity was positively associated (large coefficient, high significance level) with the captain's share of output (see chapters 8 and 10). In addition, the large lays awarded captains and other officers certainly support the imputation of high productivity to them.

If greater risk and increased knowledge and skill requirements led to the relatively high wages earned by officers, what explains the wages of cooks and seamen? Wages in whaling were not higher than those in the merchant service; they were lower. Over comparable periods the ratio of earnings in whaling to earnings in the merchant marine ranged from 0.68 for skilled seamen to 0.75 for cooks to 0.85 for semi-skilled seamen. In only four of the forty-five occupation years for which there are comparable data was the ratio equal to or greater than 1.0.

These relatively low wages were coupled with great variation. The ranges in the merchant marine fell between 1 to 3 and 1 to 4 (\$10 to \$30 for skilled seamen, and \$7 to \$30 for cooks); the ranges for the comparable whalemens were many times as wide. For cooks, monthly wages ranged from \$0.55 to \$35.14 (1 to 53), for semi-skilled seamen from \$0.48 to \$29.95 (1 to 62), and for skilled seamen from \$0.16 to \$49.24 (1 to 308).

Merchant seamen "professed great contempt for 'spouters' and 'blubber-hunters'; and a real whalman never thought of shifting his allegiance." Each industry drew from its own pool of labor, and only when both were working to capacity was there "competition for those hands who were willing to ship in either service" (Hohman 1928, 239 n. 12). Also, both whaling and merchant marine agents were able to draw from an international labor pool. According to Stanley Lebergott (1964, 26), "in the mid-1840s many believed that two-thirds of our sailors were not native." In November 1864 the *Honolulu Friend* reported: "In our visits among the [whale] shipping, we see there has been a great change in the character of the crews. Formerly there was a majority of American and European seamen, while now the crews are largely made up of Hawaiians, and other Polynesians. Not a few are from Guam. Portuguese seamen still abound. It is rare, indeed, to meet with a full crew of Americans. It

is not always that the officers are all Americans. The war, and the demand for labor, have drawn away a large proportion of American seamen" (WSL 17 January 1865).

The makeup of the typical whaling crew (and the difficulty of determining a yardstick against which to measure their wages) is neatly captured in Charles Nordhoff's account (1895, 46–47) of the crew of the whaler on which he shipped:

The captain, two mates, and three of the boatsteerers were Americans. The third mate, and one of the boatsteerers were Portuguese, natives of Fayal, as were also four of our crew. . . . The rest of the crew I find enumerated in my log, as follows: two lawyer's clerks, one professional gambler, one runaway from his father's counting house in New York, (this was also an amateur gambler), one New York "butcher-boy"—his name was *Mose*—six factory hands, from some small New England towns, one Boston school boy, one canal-boat man, six farm boys—from various parts of New England, and western New York,—the four Portuguese before mentioned, who were whalemens, and the writer hereof, who wrote himself *seaman*.

Nordhoff describes a time when the whaling industry had shrunk substantially. In the 1840s and 1850s, when the industry was at its peak, the fraction of foreigners in a typical crew would have been larger.

The comparison of the wages of whalemens (excluding officers) with those of merchant seamen produces results that, if they do not confirm the view that there were two separate labor markets, imply behavior outside the normal bounds of economists' assumptions. If the positions in whaling and in the merchant service were really comparable, and if both industries had access to the same workers, the whalemens' willingness to accept both lower average and much more variable returns would suggest either that whalemens were drawn from an unusual group—people who believed that a small probability of a big win was a goal worth sacrificing for—or that they were paying apprenticeship dues on the way to more remunerative positions as boatsteerers or officers. It is more likely that the two groups were being hired for different jobs: merchant seamen as seamen, whalemens as oarsmen. It is also possible that the two groups were doing the same job, but that the whalemens were not very good at it. The evidence indicates that there is an element of truth in each of the four explanations; it is not possible to assign them relative weights.

The merchant marine may have been the closest maritime alternative for a whalerman, but it was shore-based opportunities that forced captains and agents to look to foreign ports for crews. Table 5.8 shows the trend in relative whaling-to-onshore wage rates for nine professional and skilled classes of whalemens and for the three classes of seamen. The relative positions of all officers vis-à-vis shore-based artisans improved by 19 percent or more between 1840–43 and 1853–56. For the other skilled whalemens the story is less favorable. Their relative positions did not deteriorate (in fact, they may have improved somewhat), but carpenters, cooks, and stewards all earned less than one-half, boat-

Table 5.8 **Relative Average Monthly Wages, Ashore and on New Bedford Whalers, by Occupation, Sailing Years 1840–56 (current dollars)**

A. Ratio to Northeastern Artisans (= 100)									
Year	Captain	First Mate	Second Mate	Third Mate	Boatsteerer	Cooper	Carpenter	Cook	Steward
1840	248	153	97	76	57	80	39	39	41
1841	197	128	86	64	47	67	31	33	34
1842	238	159	99	80	57	78	34	38	38
1843	236	153	97	70	52	72	33	35	36
1844	226	142	95	67	50	70	30	34	35
1845	181	120	76	60	41	62	27	29	29
1846	239	157	100	78	53	74	32	35	36
1847	230	142	94	72	52	74	31	35	37
1848	307	197	131	90	64	96	41	43	43
1849	323	217	136	96	68	96	44	47	46
1850	324	221	136	94	64	104	39	42	42
1851	345	244	149	109	68	110	41	46	48
1852	316	219	135	102	66	98	38	44	51
1853	328	236	140	105	69	100	43	44	47
1854	295	220	132	97	64	90	38	41	44
1855	238	171	104	77	49	72	32	33	37
1856	235	162	99	72	46	71	28	31	33
Means	265	179	112	83	57	83	35	38	40
Ratios of relative wages, 1853–56 to 1840–43	1.19	1.33	1.25	1.20	1.08	1.12	1.03	1.03	1.08

(continued)

Table 5.8 (continued)

Year	B. Ratio of Skilled Seamen to			
	Unskilled Northeast (= 100)	New England Textile (= 100)	Unskilled Factory (= 100)	Common Laborers (= 100)
1840	81	102	91	67
1841	54	85	76	59
1842	57	89	75	62
1843	52	96	80	68
1844	44	77	68	48
1845	42	73	68	47
1846	52	89	80	62
1847	60	82	75	61
1848	66	96	87	72
1849	63	104	86	71
1850	59	95	76	66
1851	61	96	80	65
1852	56	99	81	65
1853	57	97	80	65
1854	67	121	97	77
1855	50	92	73	59
1856	49	94	70	60
Means	57	93	79	63
Ratios of relative wages, 1853–56 to 1840–43	.92	1.09	.99	1.02

Year	C. Ratio of Semi-skilled Seamen to			
	Unskilled Northeast (= 100)	New England Textile (= 100)	Unskilled Factory (= 100)	Common Laborers (= 100)
1840	74	93	83	61
1841	50	78	70	55

1842	52	81	68	57
1843	47	87	73	62
1844	41	72	64	45
1845	38	65	61	42
1846	47	80	71	55
1847	56	78	71	58
1848	54	79	72	59
1849	57	95	78	64
1850	50	81	65	56
1851	56	88	74	59
1852	47	82	68	55
1853	56	96	79	64
1854	52	93	75	60
1855	45	84	67	54
1856	42	80	60	52
Means	51	83	71	56
Ratios of relative wages, 1853–56 to 1840–43	.88	1.04	.95	.98

D. Ratio of Unskilled Seamen to

Year	Unskilled Northeast (= 100)	New England Textile (= 100)	Unskilled Factory (= 100)	Common Laborers (= 100)
1840	71	89	80	58
1841	47	74	67	52
1842	48	76	64	53
1843	44	81	68	57
1844	37	65	58	41
1845	38	66	62	43
1846	44	75	67	52

(continued)

Table 5.8 (continued)

Year	Unskilled Northeast (= 100)	New England Textile (= 100)	Unskilled Factory (= 100)	Common Laborers (= 100)
1847	54	74	67	55
1848	56	81	74	61
1849	53	88	72	60
1850	48	79	63	55
1851	54	85	71	57
1852	48	85	70	56
1853	51	87	72	58
1854	50	90	72	58
1855	42	79	63	51
1856	40	77	58	50
Means	49	79	68	54
Ratios of relative wages, 1853–56 to 1840–43	.87	1.05	.95	.99

Sources: Panel A “Northeastern Artisans”: Margo and Villaflor 1987, 893, table 5. Panels B, C, and D “Unskilled Northeast”: Margo and Villaflor 1987, 894, table 6; “New England Textile”: Layer 1955, 24–26, table 6, col. a; “Unskilled Factory”: Abbott 1905, 363, table 8; “Common Laborers”: Abbott 1905, 364, table 11.

Notes: The average monthly value of the catch of a voyage was computed by dividing the value of its catch by the number of months it was at sea. Monthly earnings were computed by multiplying this value by the lay fraction. The estimates assume the crewman returned on the vessel on which he sailed. Catch data and the durations of voyages came from the Voyages Data Set, prices from the Prices Data Set, lays from the Stations and Lays Data Set.

In this table the wages of crewmen incorporate estimates of subsistence. We used the lower-bound estimate described in appendix 5C.

All of the other wage series underlying this table are given, in their sources, in the form of daily wage rates. We converted them to estimates of monthly wages by multiplying them by 25, a rough estimate of the average number of work days in a month, across the year. Whether this conversion results in figures fully comparable to the crewmen’s incomes is an open question. While afloat, whaling crewmen were always on call, but, since the whalers contained many more men than were needed to sail them, seamen often had nothing to do; boredom was apparently a big problem. In the presence of whales, however, crews worked long hours filled with intense labor.

Table 5.9 Percentage Changes in Average Monthly Wages of New Bedford Whaling Crewmen, by Occupation, 1840–43 to 1855–58 (current and real dollars)

Occupation	Current Dollars ^a	Real Dollars	
		Variant 1 ^b	Variant 2 ^c
Captain	28.7	4.2	25.2
First mate	40.4	15.9	36.9
Second mate	33.8	9.3	30.3
Third mate	25.0	0.5	21.5
Boatsteerer	4.4	-20.1	0.9
Cooper	13.1	-11.4	9.6
Carpenter	-3.3	-27.8	-6.8
Cook	1.8	-22.7	-1.7
Steward	8.1	-16.4	4.6
Skilled seaman	-5.6	-30.1	-9.1
Semi-skilled seaman	0.1	-24.4	-3.4
Unskilled seaman	-3.8	-28.3	-7.3

Note: The periods 1840–43 and 1855–58 are spans of sailing years.

^aSee table 5.6 notes.

^bThe price index used to derive variant 1 is drawn from Williamson and Lindert 1980, 319. Very similar results are obtained with the Warren and Pearson "All Commodities" wholesale price index (U.S. Department of Commerce 1975, series E-52).

^cThe index used to derive variant 2 comes from David and Solar 1977, 19.

steerers only three-fifths, and even coopers less than nine-tenths as much as Margo and Villafior's artisans.

The situation of seamen was no better. The wages of skilled, semi-skilled, and unskilled seamen were less than 60 percent of the wages of workers ashore. If the basis of comparison is shifted either to Edith Abbott's estimates for skilled factory workers or to her estimates for common laborers, the relative position of whalemens improves; but even skilled seamen received less than shore-based workers. All three classes of seamen earned about as much as Massachusetts textile workers.³³ It is unfortunate that the estimates of whaling earnings cannot be extended back to the 1820s and 1830s. The secondary literature indicates that, in those early decades, whaling's workforce was largely American (i.e., men whose fathers had been born on this side of the Atlantic—including not insubstantial numbers of blacks and Native Americans), and the majority were trained seamen.³⁴ The relative circumstances of these workers may have been better.

Table 5.9 compares changes in nominal and real wages for whalemens between the beginning of the 1840s and the end of the 1850s. Between 1840–43 and 1855–58 the real wages of unskilled workers in the United States may have

33. Most textile workers were women, but it appears that women did not receive substantially lower wages than men in this industry (Layer 1955, 51).

34. Hohman 1928, 51–52. See also the discussion of relative wages in chapter 8 below.

risen by as much as 29 percent or fallen by as much as 7 percent; a precise answer depends on the wage series and price deflator chosen. No matter what price index is chosen, the real wages of enlisted whalers declined by more than any of the onshore estimates.³⁵ Officers, on the other hand, clearly gained. It is difficult to see how, given these wage differentials, the whaling industry could have continued to recruit trained Americans for enlisted jobs over the two antebellum decades. The probable explanation is that it did not. Instead, agents turned more and more to unskilled Americans and to both skilled and unskilled foreigners. Even black sailors—whose onshore opportunities must have been severely constrained—seem to have deserted the whaling fleet. At least it appears that the proportion of native blacks in the typical crew declined.³⁶

Other interpretations are possible. The industry might have been such an unusual opportunity for risk lovers that wages shrank as gamblers competed for a limited number of jobs. The presence of both professional and amateur gamblers among Nordhoff's shipmates (1895, 46–47) may indicate something about the degree of risk aversion shared by at least the American component of that crew. As Hohman (1928, 239 n. 12) argues, "The device of the lay, with its tantalizing possibility of a lucky voyage, served to obscure the average earnings."

The data on wages indicate that within the industry the labor market worked as well as could be expected (see table 5.10): higher wages were paid in expanding hunting grounds. Its efficiency may be judged from an analysis of the contracts of 12,646 greenhands who departed New Bedford over the twenty years 1840–58 and 1866 (greenhands because perceived quality differences were probably smaller among them than among seamen with more experience). For the neophytes the real monthly wage averaged \$8.34 in 1880 dollars, but there were interground differentials. Lays in the Atlantic averaged 1/159 (.00633), those in the Indian 1/178 (.00562), those in the Pacific 1/189 (.00529), and those in the Western Arctic 1/195 (.00513). Differences in productivity reversed this ranking. Greenhands who signed on for the Atlantic earned, on average, only \$6.17 a month—less than the \$7.31 average for the Indian Ocean, the \$8.59 for the Pacific, and the \$9.87 for the Western Arctic.³⁷

35. The change in real unskilled wages using the Warren and Pearson "All Commodities" wholesale price index as a deflator was 6.8 percent for Margo and Villafior's unskilled workers (1987, 894) and -5.3 percent for Abbott's "All Unskilled" (1905, 363). The changes for the same two series using the Williamson and Lindert consumer price deflator (1980) were 3.3 percent and -7.3 percent, respectively. Using the implied David and Solar deflator (1977) the changes were 29.2 percent and 11.2 percent.

36. Hohman 1928, 50–51. Martha Putney's survey (1987, 125) of crew lists indicates that there were, on average, 2.8 blacks on each New Bedford vessel sailing between 1803 and 1840, but only 1.9 in the years 1841–43 and 1.1 in 1846–60. Unfortunately, it is impossible to tell from her account whether the vessels involved are only whalers, or both whalers and merchant vessels. Putney's definitions of her numerator and denominator may also have differed from period to period.

37. These averages are the estimated earnings of a greenhand who returned on the vessel on which he sailed (Own Vessel). They are not comparable to the dependent means in the regressions

Table 5.10 **Relative Average Monthly Wages of New Bedford Whaling Crewmen, by Occupation and Ground, Sailing Years 1840–58 and 1866 (Atlantic = 100)**

Occupation	Indian	Pacific	Western Arctic
Captain	124	149	196
First mate	114	139	188
Second mate	106	127	171
Third mate	95	111	143
Boatsteerer	107	120	145
Cooper	139	165	210
Carpenter	103	125	149
Cook	132	152	189
Steward	91	106	130
Skilled seaman	109	126	161
Semi-skilled seaman	125	137	173
Unskilled seaman	118	139	160
Means ^a	114	133	168

Sources: Stations and Lays, Voyages, and Prices data sets. For the computation of wages, see table 5.6 notes. The calculations omit crew members with second occupations and those who signed on after the start of the voyage.

^aThese are unweighted averages.

To aid in understanding the workings of the whaling labor market, we modeled the wage bargain. Each agent and potential crewman was assumed to be aware of (1) the ground to which the voyage was primarily directed (external evidence indicates that the choice of ground was one of the agent's first decisions, and he recruited labor in light of that choice;³⁸ also, the labor contract usually spelled out the projected ground); (2) the average catch and length of voyage of vessels returning to New Bedford from the chosen ground during the previous year, as well as the variability of each of these measures (information readily available in the *WSL*); and (3) the average probability of a vessel's returning safely from the ground over the previous five years (again, information documented in the local press). The model rests on the assumption that, although the lay was the focus of the negotiation between agent and prospective crewman, the expected real wage (or real cost) was at the heart of the bargain.

reported in table 5.11. Those figures are based on the year of sailing (Own Year). See note 29 for a discussion of these measures.

38. Morgan's letter book (Morgan Collection) contains a broad sample of such instructions to his captains. For example, he wrote to George H. Dexter (26 August 1834), "The ship Condor being now ready for Sea, the owners wish you to proceed at once for Sea and as the Season is late, make the best of your way to the False Bank off the coast of Brazil, where we dispatch the Ship for a cargo of Right Whale oil." The following month (24 September) he wrote to Cornelius Howland Jr.: "The Ship Magnolia under your Command being now ready for Sea—I proceed to give such general instructions for the voyage as are required. The Ship is bound for the Pacific Ocean for a Cargo of Sperm Oil, and is amply fitted for a Cruise of four years."

Table 5.11 Labor Market Efficiency, New Bedford Whaling Vessels, Sailing Years 1840–58

	Dependent Variables	
	Expected Monthly Wage, Unskilled Seaman	Expected Monthly Wage, Unskilled Seaman, Risk Adjusted
Statistical properties		
<i>F</i>	964.3	868.0
Adjusted <i>R</i> ²	.381	.357
Dependent mean (\$)	8.69	7.99
Observations	9,387	9,387
Parameter estimates		
Intercept	8.294*	8.556*
Financial risk	0.00070*	0.00003
Voyage length (months squared)	-0.136*	-0.141*
“Time at sea” risk	0.417*	0.392*
<i>Ground (compared to Pacific)</i>		
Atlantic	-3.008*	-3.134*
Indian	-0.526*	-0.595*
Western Arctic	6.378*	5.427*

Sources: Voyages, Productivity, and Stations and Lays data sets.

Note: Although greenhand lays are available for 1866, we omitted the year from the calculations in order to eliminate from the regressions the persisting effects of the extraordinary events of the Civil War.

*Significant at the 1 percent level.

Table 5.11 reports the results of two alternative specifications of the model. The dependent variable in model 1 is the average monthly real value of the catch of vessels that had returned from the designated ground in the previous year, multiplied by the average lay negotiated by greenhands in the present year—it is, in short, a proxy for the expected real monthly wage.³⁹ The dependent variable in model 2 is the expected real wage variable of model 1 multiplied by the average probability (calculated over the previous five years) that a vessel setting out for the designated ground would return safely to New Bedford.

There are six independent variables. Three relate to the factors that, theoretically, influenced the relative real wage rates in the four grounds: financial risk, time at sea, and the risk of spending more time at sea than expected.⁴⁰ The second set are the three ground dummies—the Pacific was chosen as the base,

39. The deflator employed was the David and Solar index of consumer prices (David and Solar 1977, 16–17). The wage is Own Year.

40. The financial risk variable is the standard deviation of the value of the catch of vessels returning from the designated ground in year $(t - 1)$. The measure of voyage length is the average interval for vessels returning from the designated ground in $(t - 1)$. The measure of “time at sea” risk is the standard deviation of the voyage length.

and is the implicit fourth ground. If the model captures the essence of the wage bargain, the coefficients on the ground dummies should be close to zero.

The results are decidedly mixed. The adjusted R^2 are good, given the element of luck in the industry, and the F values are both very high and significant. If attention is focused on the first set of variables, the model seems to have captured the principal elements of the wage negotiation that both theory and the qualitative literature suggest dominated the bargain. The ground coefficients indicate, however, that, after the effects of the first set of variables have been factored out, there remain even larger differences among the expected earnings in the four grounds.

Theory suggests that workers usually prefer lesser to greater financial risk; this conjecture is borne out by the analysis. The coefficient on “financial risk”—measured by the standard deviation of the returns—is positive in both models and highly significant in one, but the coefficients on this variable are very small.

The variable “time at sea” is intended to be an index of the expected duration of the voyage. It is the average duration of the voyages—by hunting ground—of vessels returning to New Bedford in the previous year. The industry’s historians point out that the desertion rate rose as the length of the voyage increased, and infer that whalers preferred short voyages. It is likely that the association reflects, not a preference for short voyages, but a perfectly reasonable preference for successful ones. Exceptionally long voyages tended to be unsuccessful. Strong-minded captains who were unwilling to return with empty cargo space would remain at sea, despite the grumblings of the crew. Leaving these cases aside, many men must have preferred the security of employment offered by planned longer voyages. On the one hand, if men with these preferences dominated the market, one could expect the sign on the coefficient of the variable “time at sea” to be negative, as it is: men required a premium for a short voyage. On the other hand, the sign on the variable “time at sea” risk, that is, the risk of spending more time at sea than anticipated—a measure of the standard deviation of the “time at sea” variable—might well be positive, since the variable is intended to pick up anticipations of chances of success. It is positive, and the coefficients are quite large and highly significant.

The first set of variables seems to capture the essence of the negotiation, and indicates that the market was working.⁴¹ The ground dummies are much less successful. If the model were correct and complete, one would expect the coefficients on the dummies to be insignificantly different from zero, but this is not the case.

After adjusting for “physical,” “financial,” and “at sea” risk and for the length of the voyage, a prospective hand appears to have been willing to sacri-

41. The relationships however, are unstable. For example, if the variance is substituted for the standard deviation (“financial risk” and “risk of spending more time at sea than anticipated”), the signs on the financial risk and voyage duration variables shift. But the results with respect to the dummies change little.

fice \$0.59 a month to serve in the Indian Ocean and \$3.13 a month to serve in the Atlantic, rather than the Pacific; he required a premium of \$5.43 to sail to the Western Arctic. The differences probably reflect, in part, very strong tastes and biases; the Arctic was an unpleasant place to be. It is also true that the model is incomplete. The dummies may be picking up the effects of missing variables. For example, the model leaves out of account the behavior of people and institutions on the other side of the labor market. Despite its shortcomings, the model provides helpful hints about the nature of the market.

5.4 Deterioration in Productivity and Crew Quality

The years 1840–58 were characterized by a decline in vessel productivity, on the one hand, and gradually increasing proportions of unskilled and illiterate workers among crews, on the other (see table 5.12). Between 1840–43 and 1856–58, for example, the average productivity index declined by more than one-third, illiteracy rose by nearly 30 percent, and the proportion of unskilled seamen in the crew rose by more than one-quarter. In the early 1840s just over one-fifth of the crew were illiterate and fewer than three-tenths had no maritime experience. On the eve of the Civil War, more than one-quarter of the crew were illiterate, and more than six-tenths had never before been to sea.

The declines in crew quality and average voyage productivity need not bespeak causal connections. In order to pursue that topic further, a model designed to explain productivity change in general is required. The effects of changes in crew quality and the movements of other relevant independent variables can then be systematically assessed. To complete the explanation it is, of course, also necessary to consider how and why crew quality declined and how the managers of whaling voyages dealt with the decline. The place to begin is with the model.

The same model used to examine the contributions of the captain to a voyage's productivity can be employed in the effort to understand the changing quality of labor (see chapter 8 for a fuller discussion). It has been argued in the whaling literature that, as time passed, the quality of labor available to the industry declined because of improving opportunities ashore. To capture this development, indexes of real wage rates ashore are introduced as independent variables. Increases in wages ashore would bid the best whalers away from the fleet, we assumed, and lead to a deterioration in the quality of the whaling labor force, thus reducing productivity.⁴² The model and data appear strongly to support the conclusion that rising wages bid the best labor away from whal-

42. It may appear that the wage rates of other seagoing occupations would be preferable; in fact, they are not. As the evidence has indicated, merchant seamen and whalers were different breeds of cat, and the markets for the two were quite different. In any case it is opportunities ashore, not opportunities elsewhere afloat, that figure in the hypothesis in the literature. It may also appear that the proper variable should be, not the real wage rate ashore, but the ratio of the wage rate ashore to the wage rate in whaling. We could not use this ratio because we do not have the necessary data on the wage rate in whaling for all years.

Table 5.12

**Crew and Voyage Characteristics, All Grounds, New Bedford
Whaling Voyages, Sailing Years 1840–58 and 1866**

A. Crew Characteristics				
Year	% of Crew Who Are Illiterate	% of Crew Who Are Unskilled	% of Seamen Who Are Unskilled	
1840	21.6	30.0	55.8	
1841	19.9	28.2	52.6	
1842	20.6	31.1	59.4	
1843	20.9	28.5	54.3	
1844	23.0	34.8	64.7	
1845	25.6	34.6	65.1	
1846	24.0	35.1	66.3	
1847	25.5	34.7	64.1	
1848	27.0	33.5	64.6	
1849	25.4	35.7	67.2	
1850	24.2	38.7	72.2	
1851	25.1	38.8	70.5	
1852	23.4	39.3	72.1	
1853	27.1	39.9	73.8	
1854	28.6	40.4	74.9	
1855	26.5	42.0	76.6	
1856	27.9	42.5	77.1	
1857	29.1	35.5	66.3	
1858	24.1	38.4	69.5	
1866	28.3	30.4	54.8	
Means				
All years	24.9	35.6	66.1	
1840–43	20.8	29.5	55.5	
1855–58	26.9	39.6	72.4	
% changes, 1840–43 to 1855–58	29.3	34.2	30.5	
B. Index Numbers on the Base 1840 (= 100)				
Year	Productivity ^a	% of Crew Who Are Illiterate	% of Crew Who Are Unskilled	% of Seamen Who Are Unskilled
1840	1.000	1.000	1.000	1.000
1841	1.060	0.921	0.940	0.943
1842	1.228	0.953	1.038	1.066
1843	1.138	0.969	0.953	0.973
1844	0.862	1.067	1.163	1.160
1845	0.914	1.186	1.157	1.167
1846	0.977	1.113	1.171	1.190
1847	0.744	1.179	1.160	1.150
1848	0.971	1.251	1.120	1.158
1849	0.889	1.175	1.192	1.204

(continued)

Table 5.12 (continued)

Year	Productivity ^a	% of Crew Who Are Illiterate	% of Crew Who Are Unskilled	% of Seamen Who Are Unskilled
1850	0.919	1.120	1.293	1.294
1851	0.865	1.162	1.295	1.263
1852	0.462	1.085	1.312	1.292
1853	0.751	1.255	1.333	1.323
1854	0.820	1.323	1.349	1.343
1855	0.557	1.226	1.401	1.374
1856	0.690	1.292	1.420	1.383
1857	0.693	1.349	1.185	1.189
1858	0.479	1.117	1.282	1.246
1866	0.558	1.311	1.016	0.983
Means				
All years	0.829	1.153	1.189	1.185
1840–43	1.107	0.961	0.983	0.996
1855–58	0.605	1.246	1.322	1.298
% changes,				
1840–43 to				
1855–58	-45.3	29.7	34.5	30.3

Source: Stations and Lays and Productivity data sets.

Note: This table excludes crewmen who did not sail with the voyage. It includes those who signed on with more than one occupation, using the first occupation mentioned.

^aThe productivity estimates underlying this column were computed from data for the voyages represented in the remaining columns of the table.

ing. If direct measures of labor quality (fraction illiterate; fraction greenhands) are substituted for the indexes of real wage rates ashore, however, the results do not support the conclusion that labor-quality changes were directly related to productivity (see chapter 8).

It is probable that the contradiction is only apparent. First, the pull of on-shore wages—taken together with agents' attempts to lessen labor turnover by substituting unskilled for skilled crewmen—tended to reduce the quality of workers and, therefore, productivity. Second, new techniques were introduced that permitted seamen of lower quality to function acceptably. Agents who made these technical changes could employ such seamen with significant success. Across time, then, one might expect to find that the quality factor forced productivity down; but, in the cross section (once allowance is made for cross-time deterioration), the vessels that adopted the new technology could employ lower-quality crews and were, therefore, more productive than the vessels that did not. The evidence suggests that the argument is correct; whether it is persuasive depends on the nature of the decline in labor quality and the kinds of adjustments to it that were made by agents and captains. (See chapters 7 and 8 for further treatment of this topic.)

The rise in the proportions of illiterate and unskilled crewmen on a typical vessel may also have been a product of agents' attempts to recruit crew members who would be less likely to desert. Contemporary sources suggest that agents, concerned with the very high rates of labor turnover, sought to employ workers who, because of their lack of information and skills, would find it difficult to leave their vessels and sign on others. Nordhoff (1895, 12), for example, reports that, despite the almost constant demand for whaling crews, "To a sailor this avenue to a whaleship is hermetically sealed. Neither here [New York] nor in New Bedford is he at all likely to be shipped—for experience has taught the captains and owners of whaling vessels that your real tar is too uneasy a creature to be kept in good order for so long a cruise as whalers now-a-days generally make." The policy was also noted by Hohman (1928, 62): "The shipping-agent preferred to deal with men ignorant of the actual conditions of the industry because they were more easily imposed upon, and also because they were more dependable in observing their contracts."⁴³

As voyage length increased, so did desertions—Herman Melville managed to desert twice during his brief whaling career—and, if agents' letters and the surviving account books are to be believed, labor turnover emerged as an increasingly important problem. The difficult life aside, there are a number of explanations for the problem of desertion. The role of the advance as an inducement to desert has been discussed; the inducement was certainly reinforced when the crewman found himself on a vessel that was performing poorly. Thus, the fact that the *Gratitude* arrived at Talcahuano "clean" may explain the loss of seven or eight men and a whaleboat; that the captain of the *James Allen*, because of a poor catch, attempted to extend the voyage by thirty months could account for the furtive departure of seven crewmen; that the Newport vessel *Helen Augusta* had taken "no oil" may have convinced seven men to desert in Java and another six to take a whaleboat and depart in the middle of the North Atlantic (*WSL* 6 April 1852, 28 March 1854, 9 October 1855).

An increase in opportunity cost also appears to have played role in the decision to break the labor contract; gold fever turned crewmen's minds to alluring alternatives. In 1850 a traveler noted: "The harbor of Honolulu was full of whalers, and officers and crews were deserting every opportunity [in order to go to California]. The mountains are said to be full of runaway sailors" (*WSL* 12 February 1850).

Even so, the captain of the *Bramin* must have been surprised to discover upon his return from a trip ashore on Maui that his ship had disappeared; "it is supposed that the crew rose, took the vessel from the officers, and started for California." Similarly, Captain Hamblin of the *New Bedford* probably did not

43. "The question was even injected into the original shipping of a crew in the home port; for one of the reasons for preferring green hands lay in the fact that they were less resourceful in matters relating to desertion" (Hohman 1928, 66).

expect that his entire crew would desert when he docked in Paita in April of 1850 (WSL 12 March, 21 May 1850). The previous month, at Hilo, the second mate, a boatsteerer, the carpenter, the blacksmith, and a seaman from the *Caroline* stole a boat and navigation equipment and set out for California, while in Guam the fourth mate, two boatsteerers, two seamen, and the carpenter stole a boat from the *Mount Vernon* and headed for California by way of Manila (WSL 2 July, 16 July 1850). Nor was it only California gold that lured whalers away from their ships. When in 1853 the *Montezuma* dropped anchor in Auckland, New Zealand, the entire crew deserted and went to the mines (WSL 14 June, 4 July 1853).

So great was the problem that the Board of Underwriters of Marine Insurance in New York adopted a resolution "upon receiving reliable information of the voluntary desertion of a ship by a shipmaster for more lucrative employment, to place the name of such master on the list of suspended shipmasters . . . until his conduct is satisfactorily explained," and to refuse insurance to any vessel employing such a captain (WSL 28 August 1849).

The inducements must have been strong or the life very unpleasant, since desertion was not without cost. The five seamen who deserted the *Eleanor* and the *Liverpool* off Patagonia in 1848 suffered from hunger and cold for ten months, and two died, before a New London vessel discovered the survivors. When gold fever swept the *Minerva*, the crew deserted en masse; three drowned attempting to swim ashore. Of the six men who left the *Gratitude*, four drowned while attempting to land their boat (WSL 10 October 1848, 20 February 1849, 6 April 1852, 1 June 1852).

Desertion could reduce profits not only directly, by the loss of unrepaid advances, but also indirectly, by its effects on productivity. A vessel's complement usually consisted of only a few more men (the shipkeepers) than the number required to provide six for each whaleboat; an unreplaced crewman could mean the loss of an entire boat. Probably more important was the effect on productivity of the replacement of a member of one of the "closely-linked whaleboat crews, where the loss of a single cool and expert oarsman often cut down materially the captures made by a certain boat" (Hohman 1928, 65).

Because of the costs incurred in these desertions, captains spent considerable time and money attempting to recapture their wayward charges and, if that effort failed, to see that they were severely punished under local or Massachusetts law. In 1852 the industry was shocked by the punishment handed the fourteen seamen of the *Champion* who, while sailing off the coast of Chile, "after confining the officers and remainder of the crew below . . . took two boats and made for the land." Upon their return to New Bedford three of the deserters were arrested and transferred to Boston for trial, where, in the U.S. district court, they were convicted of larceny of the whaleboats. Their sentence: six days' imprisonment. "Judges must have very confused notions of the depth of guilt involved in the offense which these men committed," commented the WSL (3 June, 1 July 1851).

By relaxing certain production constraints, technological change permitted captains and agents to adjust their workforce in a way that they thought would reduce turnover. Before 1850 improvements aloft—in rigging, winches, sail plan, and sails—and after 1850 improvements in vessel design made it possible to alter dramatically the skill profile of the crew (see chapter 7). The changes aloft, by greatly easing and simplifying the tasks of setting, changing, and furling the sails, made it possible for unskilled crewmen to handle most of the above-deck work that had previously required trained hands. The new designs also made it easier to steer and maneuver a vessel. Thus, both sets of technical innovations made it possible to substitute greenhands for able and ordinary seamen.

The evidence, both quantitative and qualitative, conclusively demonstrates that, by a traditional definition, the quality of whaling crews deteriorated over at least two decades preceding the Civil War. Qualitative sources suggest that the decline was the result of a conscious decision by agents, aimed at reducing labor turnover and thus increasing profits. It is impossible to *prove* that this was so; it may have been instead (or in addition) a reaction to the increasing difficulty of recruiting native Yankee whalers—a difficulty rooted in the rising competition for onshore labor.

It may be only coincidental, but the developing manufacturing sector underwent a similar substitution of unskilled for skilled labor at about the same time. Although it is unlikely that labor turnover played a significant role in that case, labor historians have recognized that the development of new technologies made it possible for managers to substitute less-skilled for more-skilled labor. Goldin and Sokoloff (1982, 755), for example, note, “The relationship between firm size and the employment of women and children within industries indicates that the diffusion of new, large-scale technologies was associated with the substitution of women and children for men.”⁴⁴

In whaling the policy was not costless to either agent or crewman. It greatly increased the twin problems of supervision and discipline, and the direct cost of the necessary discipline was borne in the first instance by the crew. As one chronicler reports, “Examination of the crews’ account books gives an insight into the changes taking place in the kind of men who shipped aboard whalers and the measures taken by the agents and captains to compensate for the increasingly poor quality of the crews. Whether the decrease in quality of personnel led to the harsh measures, or whether the methods of the captains, agents, and landsharks led to the poor quality was a question probably debated endlessly by the owners and agents” (Moment 1957, 274). There is general agreement that “the owners were content to ship such [untrained] hands . . . because capable and brutally aggressive mates could train them during the long months at sea” (Hohman 1928, 62).

44. For a complete discussion of the evidence, see Goldin and Sokoloff 1982, 741–44; 1984, 461–68.

As the composition of the crew changed, and perhaps in response to the increased levels of brutality (although causality may have gone the other way), sailors' behavior began to exceed the normal bounds of conduct. Murder, at least of officers, remained uncommon, but mutinies increased; there were five in 1857 alone. Sometimes, as in the case of the *Marcella* (upon the death of the captain the crew refused to sail anywhere but home), the mutiny was peaceful. Sometimes it wasn't. After a crewman on the *Morning Star* stabbed the mate, "the rest of the crew who sympathized with their comrade, drew pistols, knives, and other weapons." The mutiny was put down only with the assistance of the British frigate *Monarch*. A bloodier fate befell the officers of the *Junior* cruising off New Zealand. Five mutineers beheaded the captain, shot the first and second mates, stabbed the third mate to death, and took over the vessel (WSL 12 October 1852, 15 September 1857, 6 April 1858).

Usually mutineers were captured and hanged or imprisoned, but occasionally they were successful. The *Marcella*, for example, did return to New Bedford. In 1857 the officers and crew of the *James and Edward*, then cruising near Mauritius, mutinied against the captain. The American consul placed the mutineers in irons, but after hearing the case against the captain he refused to prosecute and chose to "discharge the whole, officers and crew, claiming three months extra pay for each man" (WSL 28 April 1857).

Desertions and mutinies were both aimed at breaking the labor contract; at times crewmen took even more direct—and probably more risky—action. There are numerous instances of attempts by crewmen to end a voyage by sinking the vessel, often while at sea. The preferred method was arson, but boring holes in the bottom of the vessel was a clear second choice. The captain of the *Hector*, for example, suddenly discovered eleven feet of water in the hold. Arson was sometimes discovered before serious damage had been done, but frequently the saboteurs were at least partially successful. The *Emma*, the *George Washington*, and the *Pantheon* were burned to the waterline and declared total losses. The captains of the *Canton Packet*, the *Tobacco Plant*, and the *Addison* scuttled their vessels, put out the fires, and salvaged something. For the *Pantheon*, the arson attempt was the second on the voyage; for the *William Thompson* (damage \$6,000), the attempt was the third.⁴⁵

The officers, of course, responded that the men had to be trained, and behavior that flew in the face of good order and discipline had to be modified. The stories of brutality on whaling vessels are legion. In 1848 a judge held that the captain of the *James Murray* had slightly exceeded his authority when he ordered a crewman tied to the rigging and "gave him seventeen blows on the back with a piece of tow-line, about three feet long and from two to two and a quarter inches in circumference." The problem wasn't the flogging itself, according to the judge; it was the rope, which "in the hands of an athletic man

45. WSL 7 February 1854, 15 November 1853, 20 May, 17 June, 24 June 1856, 16 February 1847, 12 February 1850, 5 December 1854, 2 November 1847.

... might inflict permanent injury to one not of a robust frame." Since the seaman had been able to perform his duties after the incident and was thus clearly not permanently injured, the judge awarded him "a very small amount only in damages" (*WSL* 1 August 1848).

The United States outlawed whipping seamen for punishment in 1850, but the law was not always obeyed. In 1854 the captain of the *Gratitude* was arrested for flogging a crewman in an "unjustifiable" manner. Nine years later, awarding a crewman who had been flogged \$60 and costs, the judge of the U.S. district court in Boston "remarked, that the masters of whaleships manifested a disposition to defy the law and the court, and distinctly announced that . . . this law against flogging, while it remained on the statute book, should be enforced, and that the penalty of its violation would be increased in form and severity until obedience is yielded."⁴⁶

Flogging was not the only form of physical abuse. The captain of the *Globe* was indicted for assaulting a sailor with a handspike, the captain of the *Emma* was arraigned for assaulting two crewmen with "a dangerous weapon" (a gunstock), and the captain of the *Callao* was tried for assaulting a seaman with a bung-knocker. The charge against the *Emma*'s captain was dismissed in one case because the crewman had disobeyed an order. The *Callao*'s captain was acquitted because "the bung-knocker was discreetly used" (*WSL* 17 September 1850, 30 September 1851, 28 September 1858).

The essence of these stories is contained in the report of the U.S. revenue cutter *Thetes* on its return from a trip to the Arctic whaling fleet in September 1906. On board were fourteen sick whalers, thirty victims of shipwreck, and two whaling captains, H. E. Bodfish of the *William Bayless* and E. W. Newth of the *Jeannette*, in irons. Both captains were charged with manslaughter in the deaths of seamen—Bodfish, with kicking a seaman to death (Williams 1988, 32, 46–48).

The need for increased supervision and discipline meant that a vessel required more "capable and brutally aggressive mates," and additional mates were not costless. The new labor policy rid the industry of some of those skilled seamen who knew when and how to desert, but it forced the agents to hire more supervisory personnel. The result was a change in the size and composition of the crew that led directly to a significant increase in total direct labor costs.

Tables 5.13 and 5.14 compare average crews in the two four-year periods 1840–43 and 1855–58. Between those dates, despite the substitution of smaller barks for larger ships—a substitution that should have reduced crew size by 3 percent—the size of a typical crew actually increased by 2.4 men or about 9 percent (from just over 26.6 to just over 29 men). Of equal interest are the

46. *WSL* 1 August 1854, 27 January 1863. In the last case the judge commented, however, "that it was not for the Court to decide whether the legislation was wise or unwise; that in his opinion, the law was passed by men who knew nothing of the practical management of seamen, and were influenced entirely by sentiment."

Table 5.13

Average Numbers of Crewmen per Voyage, by Occupation, New Bedford Whaling Voyages, Sailing Years 1840–43 and 1855–58

A. Professionals						
Year	Officers ^a	Skilled Maritime ^b	Artisans ^c	Service ^d	Total	
1840	4.00	3.47	1.97	1.97	11.40	
1841	3.85	3.38	2.12	1.89	11.24	
1842	3.85	3.44	2.29	1.98	11.56	
1843	4.08	3.66	2.40	2.01	12.15	
Means	3.95	3.49	2.20	1.96	11.59	
1855	4.27	3.82	2.44	1.92	12.45	
1856	4.34	3.78	2.27	2.07	12.47	
1857	4.42	4.01	2.50	2.03	12.97	
1858	4.37	4.03	2.15	2.01	12.56	
Means	4.35	3.91	2.34	2.01	12.61	
Change	0.40	0.42	0.14	0.05	1.02	
% change	10.1	12.0	6.4	2.6	8.8	
B. Nonprofessionals						
Year	Skilled Seamen ^e	Semi-skilled Seamen ^f	Unskilled Seamen ^g	Boys ^h	Unknown	Total
1840	3.07	3.77	8.17	0.80	0.07	27.27
1841	2.40	3.70	7.98	0.59	0.02	25.93
1842	2.87	2.57	8.35	0.55	0.08	25.98
1843	3.17	3.42	7.84	0.68	0.00	27.26
Means	2.88	3.37	8.09	0.66	0.04	26.61
1855	1.63	1.99	12.03	0.58	0.00	28.67
1856	1.89	1.61	12.33	0.68	0.00	28.99
1857	2.45	2.82	10.34	0.55	0.01	29.14
1858	1.72	3.15	11.13	0.68	0.00	29.24
Means	1.92	2.39	11.46	0.62	0.00	29.01
Change	-0.96	-0.98	3.37	-0.04	-0.04	2.40
% change	-33.3	-29.1	41.7	-6.1	-100.0	9.0

Source: Stations and Lays Data Set.

Notes: The table excludes crewmen who signed on after the voyage sailed. It includes crewmen who reported more than one occupation, counting them as one-half of a man for each.

^aCaptains and first through fourth mates.

^bBoatsteerers, fifth mates, second boatsteerers, preventive boatsteerers, head-a-boats, extra prepared boatsteerers, shipkeepers, and assistant boatsteerers.

^cCoopers, blacksmiths, carpenters, sailmakers, second coopers, second carpenters, boatbuilders, second blacksmiths, painters, mechanics/machinists, caulkers, and coppersmiths.

^dCooks, stewards, and second stewards.

^eSeamen, able seamen, and lookouts.

^fOrdinary seamen, oarsmen, mariners, and "one-voyage" men.

^gGreenhands, landsmen, green oarsmen, and other crewmen designated as green.

^hBoys, cabin boys, and greenhand boys.

Table 5.14 Skill Composition of a Typical Crew, New Bedford Whaling Voyages, Sailing Years 1840–43 and 1855–58 (percentage of crew)

A. Professionals					
Year	Officers	Skilled Maritime	Artisans	Service	Total
1840	14.8	12.7	7.2	7.3	41.9
1841	14.8	13.1	8.1	7.4	43.5
1842	14.9	13.2	8.8	7.8	44.6
1843	15.0	13.3	8.7	7.5	44.6
Means	14.9	13.1	8.2	7.5	43.7
1855	15.0	13.4	8.4	6.8	43.7
1856	15.1	13.1	7.8	7.2	43.2
1857	15.3	13.9	8.6	7.1	44.8
1858	15.0	13.8	7.3	6.9	43.1
Means	15.1	13.6	8.0	7.0	43.7
Change	0.2	0.5	-0.2	-0.5	0.0
% change	1.3	3.8	-2.4	-6.7	0.0
B. Nonprofessionals					
Year	Skilled Seamen	Semi-skilled Seamen	Unskilled Seamen	Boys	Unknown
1840	11.5	14.2	29.3	2.8	0.3
1841	9.2	14.4	30.7	2.1	0.1
1842	11.3	10.0	31.7	2.1	0.3
1843	11.5	12.8	28.6	2.5	0.0
Means	10.9	12.9	30.1	2.4	0.2
1855	5.7	7.0	41.7	2.0	0.0
1856	6.7	5.7	42.3	2.2	0.0
1857	8.6	9.7	35.1	1.8	0.1
1858	5.9	10.7	38.0	2.2	0.0
Means	6.7	8.3	39.3	2.1	0.0
Change	-4.2	-4.6	9.2	-0.3	-0.2
% change	-38.5	-35.7	30.6	-12.5	-100.0

Source: Stations and Lays Data Set.

Note: See table 5.13 notes.

changes that occurred within the crew. The increase of 2.4 was the result of an increase of 3.4 in the number of unskilled seamen, a decrease of about 2.0 in the number of skilled and semi-skilled seamen, and an *increase* of 1.0 in the number of “professionals.” Not surprisingly, the number of artisans and service personnel changed little. By the end of the period a typical vessel carried an extra 0.4 of an officer and 0.4 of a skilled maritime professional. Those additions constitute 10 percent and 12 percent increases in the number of crewmen in the two job categories.

Assuming that the extra officers were most likely third mates and that skilled maritime workers were paid as much as boatsteerers, the substitution of greenhands, officers, and skilled maritime professionals for skilled and semi-skilled seamen meant that labor costs would have risen on average by about \$24.50 a month or about \$1,054 for a typical forty-three-month voyage. That estimate does not reflect the increases in the wages of officers, at least some of which can be attributed to their greater supervisory duties. An anonymous shipowner in a letter published in the *WSL* on 16 June 1857 objected to rising lays for captains: "The high rates that are paid to whaling masters, appears to me to be a subject demanding something more than a passing notice. I am glad the matter has been introduced to the attention of ship owners . . . like every other business, a reasonable lay should only be demanded and given."

The effects of the change can be seen in table 5.15. It displays, by year, the fraction of the catch that accrued to labor through lay shares (i.e., excluding charges, supplements, and the value of room and board). The view of Hohman and others before him was that on every voyage the sum of all lays was very close to 30 percent of the value of the catch, and that the total was invariant over time. These figures tell a different story.⁴⁷ Between 1840–43 and 1855–58 the average lay share rose from about 31 to about 36 percent, an increase of about one-seventh, but it fell back to about 34 percent in 1866.

Changes in labor policies, whether initially innovative or merely reactive, did apparently result in higher total factor productivity. Two questions remain: Did the increase in productivity offset the transfer of 4.5 percent of output from owners to workers? What was the effect of the agents' "labor market innovation" on profits?

5.5 Conclusions

The lay system of labor payments has some near relatives, such as the agricultural sharecrop system, and has been at least as damned as they. Both Samuel Morison (1961, 320–21) and Elmo Hohman (1928, 224), for example, complain about the negative impact that the institution had on the wages of seamen.

Labor historian Gerald Williams (1988, 39–40) argues that, toward the end of the nineteenth century, agents and owners reaped another boon from the

47. According to Hohman (1926, 669), "These figures were first given in an article by J. R. Williams . . . in the *North American Review* for January, 1834, vol. xxxviii, p. 105. They were corroborated by Joseph Grinnell, *Speech on the Tariff, with Statistical Tables of the Whale Fishery*, p. 9, published in 1844." Hohman himself found a similar figure (30.3 percent) in his compilation of "a chance sampling of seven voyages for which suitable and accurate figures were available. . . . These voyages were scattered over the period 1805–50."

It should be noted that neither Hohman nor others who have argued for the 30 percent figure have included the value of room and board in their determination of the labor share. The estimates we have made suggest that an adjustment for board alone would have increased individual earnings by between \$3.50 and \$6.00 a month in 1840–43 and between \$4.70 and \$8.00 a month in 1855–58. These figures represent substantial values, compared with the average monthly earnings of whalemens (see table 5.6).

Table 5.15 Labor's Share of the Net Value of the Catch, All Grounds, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866

Year	%			Relative (1840 = 100)		
	Average	Maximum	Minimum	Average	Maximum	Minimum
1840	30.8	34.0	28.1	1.000	1.000	1.000
1841	31.0	38.0	26.9	1.006	1.118	0.957
1842	31.3	37.5	26.1	1.016	1.103	0.929
1843	31.0	34.3	28.1	1.006	1.009	1.000
1844	31.6	36.1	26.5	1.026	1.062	0.943
1845	31.3	36.0	28.3	1.016	1.059	1.007
1846	31.8	37.1	28.2	1.032	1.091	1.004
1847	31.5	35.6	27.0	1.023	1.047	0.961
1848	31.5	35.2	26.3	1.023	1.035	0.936
1849	31.6	36.3	26.6	1.026	1.068	0.947
1850	33.2	38.3	29.0	1.078	1.126	1.032
1851	34.2	39.2	28.7	1.110	1.153	1.021
1852	34.3	38.6	29.5	1.114	1.135	1.050
1853	34.4	41.9	28.6	1.117	1.232	1.018
1854	34.6	42.7	29.6	1.123	1.256	1.053
1855	35.8	41.8	30.1	1.162	1.229	1.071
1856	36.0	43.3	30.9	1.169	1.274	1.100
1857	36.4	41.1	30.6	1.182	1.209	1.089
1858	34.9	38.3	29.5	1.133	1.126	1.050
1866	33.8	45.5	28.2	1.097	1.338	1.004
Means	33.1	38.5	28.3	1.075	1.132	1.007
Maximum	36.4	45.5	30.9	1.182	1.338	1.100
Minimum	30.8	34.0	26.1	1.000	1.000	0.929
Means:						
1840–43	31.0	36.0	27.3	1.006	1.059	0.972
1855–58	35.8	41.1	30.3	1.162	1.209	1.078
Change	4.8	5.1	3.0	0.156	0.150	0.106
% change	15.5	14.2	11.0	15.5	14.2	11.0

Source: Stations and Lays Data Set.

Note: This table omits crew members who did not sail with the vessel.

system—a boon that could not have been anticipated at the industry's peak. Because of the judicial interpretation of the lay contract, owners found themselves almost entirely exempt from the federal laws designed to improve the life of American seamen. These laws included the Shipping Commissioners' Act (1872) that, together with its amendments, made it more difficult to shanghai sailors and guaranteed mariners a minimum level of rations, space, and medical treatment; the White Act (1898) that abolished both criminal penalties for desertion and corporal punishment; and the Seamen's Act of 1915 that provided for minimum safety standards (e.g., lifeboats).⁴⁸

48. An Act to Authorize the Appointment of Shipping-Commissioners . . . , 1872, *Stats. at Large of USA* 17:262–80; An Act to Amend the Laws relating to American Seamen, for the Protection of Such Seamen, and to Promote Commerce, 1898, *U.S. Statutes at Large* 30:755–64; An Act to Promote the Welfare of American Seamen . . . , 1915, *U.S. Statutes at Large* 38:1164–85. Whaling

Despite its shortcomings, the system had many interesting, and some undoubtedly useful, attributes. Most importantly it should be noted that these were voluntary contracts, and knowledge about the hardships that were likely to be encountered was seldom lacking.⁴⁹ Crewmen signed on because they wanted to. Certainly owners benefitted from transferring a portion of the risk of the voyage to the crew, although, given the regularized system of advances, the payment of room and board, and the occasional renegotiations of lays, the transfer was not complete. Even critics of the lay contract (Hohman, for example) admit that at least some crew members revelled in a chance to participate in the “big lottery.”

Without question, the lay contract provided an incentive system that rewarded cooperation—an important matter whose virtues were as evident to the seamen as to the agents and owners. Every contemporary account of the hunt and the subsequent rendering of oil underscores the level of cooperation required among crewmen.⁵⁰ Finally, the system appears to have been flexible enough to permit agents to adjust rapidly to emerging interground differences in productivity and to the reduced skill demands of the new sailing technologies.

Appendix 5A

Numbers of Voyages, Numbers of Crew Contracts, Value of Catch, and Voyage Duration Data

Tables 5A.1 and 5A.2 compare the subset of New Bedford whaling voyages for which crew contracts have been obtained to the Voyages Data Set as a whole. Table 5A.3 outlines the coverage of the Stations and Lays Data Set, which underlies most of the calculations in this chapter.

seamen would still be excluded from many protections. See *U.S. Code Annotated*, vol. 46, sec. 544: “None of the provisions of [the Shipping Commissioners’ Act] . . . shall apply . . . in any case where the seamen are by custom or agreement entitled to participate in the profits or result of a cruise, or voyage” (interpreted in *Johnson v. Standard Oil Co. of New Jersey* [D.C. Md. 1940], *Federal Supplement* 33:982–84).

49. Some of those signing were so young that one may doubt they truly knew what they were getting into, but their numbers were probably not large. For example, in a sample of 285 crew lists in the years 1842–58 (chiefly 1843–49), 145 crewmen were 15 years old or younger (the youngest was 9), but this group accounted for only 2.5 percent of all the crewmen on these voyages. The median age of all crewmen was just over 22 years; the voyage mean ages ranged between 18.8 and 29.4.

50. “I noticed throughout this arduous day’s work, the general alacrity of the crew in striving to do their utmost, and . . . the advantages of giving each man a proportion of the vessel’s earnings, instead of monthly wages; in our case all felt themselves personally interested, and conducted themselves accordingly” (Whitecar 1864, 96).

Table 5A.1 **Numbers of New Bedford Whaling Voyages in the Stations and Lays Data Set and the Voyages Data Set, by Ground, Sailing Years 1840–58 and 1866**

Year	All Grounds		Atlantic		Indian	
	With Contracts	Total	With Contracts	Total	With Contracts	Total
1840	15	75	2	19	1	19
1841	56	74	4	8	17	21
1842	59	80	8	11	24	29
1843	50	77	0	3	7	14
1844	72	98	3	5	15	18
1845	52	91	5	6	5	13
1846	61	71	4	4	11	14
1847	56	76	0	0	10	13
1848	56	73	1	1	4	8
1849	53	65	1	3	13	14
1850	68	83	2	3	7	9
1851	115	137	10	13	10	10
1852	62	76	9	10	7	11
1853	85	106	6	8	7	12
1854	84	102	5	6	11	17
1855	73	96	6	8	12	15
1856	74	95	3	4	6	8
1857	73	97	2	4	10	13
1858	50	65	2	3	8	10
1866	36	56	15	20	2	5
Total	1,250	1,693	88	139	187	273
Means	62.5	84.7	4.4	7.0	9.4	13.7

Year	Pacific		Western Arctic		Mixed	
	With Contracts	Total	With Contracts	Total	With Contracts	Total
1840	11	35	0	0	1	2
1841	35	44	0	0	0	1
1842	23	35	0	0	4	5
1843	27	41	0	0	16	19
1844	42	62	0	0	12	13
1845	26	44	0	0	16	28
1846	33	39	0	0	13	14
1847	31	45	0	0	15	18
1848	46	58	0	0	5	6
1849	35	40	2	4	2	4
1850	41	49	17	21	1	1
1851	59	70	31	36	5	8
1852	39	47	6	7	1	1
1853	54	63	17	21	1	2
1854	46	56	19	20	3	3

(continued)

Table 5A.1 (continued)

Year	Pacific		Western Arctic		Mixed	
	With Contracts	Total	With Contracts	Total	With Contracts	Total
1855	41	51	9	14	5	8
1856	43	55	13	17	9	11
1857	41	59	16	17	4	4
1858	26	32	12	16	2	4
1866	13	21	5	8	1	2
Total	712	946	147	181	116	154
Means	35.6	47.3	13.4 ^a	16.5 ^a	5.8	7.7

Note: Although there are no voyages in the Stations and Lays Data Set for which ground is missing, there are two voyages in the Voyages Data Set in these years for which ground is missing. They are omitted from this table.

^aThese are means across the eleven years in which there were Western Arctic voyages.

Table 5A.2 Two Comparisons of the Stations and Lays Data Set to the Voyages Data Set, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866

Year	Ratios, Stations and Lays Data Set to Voyages Data Set	
	Average Value of Catch (current prices)	Average Length of Voyage (months)
1840	1.36	1.09
1841	1.06	1.02
1842	0.97	1.02
1843	1.04	1.01
1844	0.99	1.01
1845	0.94	0.96
1846	1.00	1.02
1847	1.04	1.04
1848	1.00	1.03
1849	1.07	1.06
1850	1.01	1.00
1851	1.01	1.01
1852	1.03	1.02
1853	1.04	1.03
1854	1.05	1.00
1855	1.02	1.04
1856	1.02	1.02
1857	1.05	1.04
1858	1.02	1.03
1866	1.01	1.01
Means	1.04	1.02

Sources: Stations and Lays, Productivity, and Voyages data sets.

Table 5A.3 Numbers of Contracts in the Stations and Lays Data Set, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866

Year	All Grounds	Atlantic	Indian	Pacific	Western Arctic	Mixed
1840	409	44	29	305	0	31
1841	1,452	76	449	927	0	0
1842	1,533	168	623	622	0	120
1843	1,363	0	171	737	0	455
1844	1,940	67	368	1,196	0	309
1845	1,439	104	142	730	0	463
1846	1,646	90	264	948	0	344
1847	1,539	0	242	910	0	387
1848	1,551	24	100	1,296	0	131
1849	1,414	24	339	941	60	50
1850	1,881	38	159	1,171	490	23
1851	3,323	237	254	1,765	943	124
1852	1,721	196	187	1,135	180	23
1853	2,361	132	177	1,523	499	30
1854	2,305	111	263	1,290	561	80
1855	2,093	147	331	1,188	279	148
1856	2,145	69	167	1,270	404	235
1857	2,127	43	274	1,222	476	112
1858	1,462	54	210	765	373	60
1866	1,049	401	54	398	164	32
Total	34,753	2,025	4,803	20,339	4,429	3,157
Means	1,738	101	240	1,017	403 ^a	158

Note: This table reports only contracts for crewmen who sailed with their vessels from New Bedford.

^aThis is the mean over the eleven years in which there were Western Arctic voyages.

Appendix 5B

Crewmen with Two Occupations

A little more than 8 percent (2,706) of the crewmen for whom we have found contracts and who sailed with their vessels from New Bedford were recorded in the ships' papers as having two occupations. The largest numbers (summing to 2,320, or about 86 percent of the total of 2,706) appeared in the groups listed in table 5B.1. Further details are given in table 5B.2.

Reasons for the double occupations are readily imagined. For example, on a four-boat vessel (three-boat vessel) on which the captain headed a boat, the fourth mate (third mate) would probably not have his own boat and might, instead, serve as boatsteerer for the captain or one of the other mates. (In fact, most of the mates with second occupations served as boatsteerers.) Artisans (coopers, blacksmiths, and carpenters) typically practiced their trades only when whales were not being killed. When the whaleboats were on the water,

Table 5B.1 Principal Groups of Crewmen with Two Occupations, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866

Occupation	Total Number	Number with One Occupation	Number with Two Occupations	% with Two Occupations
Third mate	1,167	1,024	143	12.3
Fourth mate	522	323	199	38.1
Boatsteerer	4,590	4,108	482	10.5
Cooper	1,242	989	253	20.4
Blacksmith	779	586	193	24.8
Carpenter	1,148	811	337	29.4
Shipkeeper	391	87	304	77.7
Seaman	2,815	2,630	185	6.6
Greenhand	12,658	12,434	224	1.8

Source: Stations and Lays Data Set.

Note: Crewmen with two occupations appear twice herein, once for each occupation (assuming that both occupations are among those selected for this table).

some artisans pulled oars, and some served as shipkeepers or in the crew run by the shipkeeper. Indeed, the surprising aspect of the table is not that some artisans were recorded with second occupations, but that some were not.

Mates with second occupations typically drew roughly the same lays as all other mates (see table 5B.3). Since the second occupation of a mate was bound to be inferior to his first occupation, it may seem puzzling that single-occupation mates did not receive a premium. The explanation that comes to mind is that the second occupation of a mate was usually boatsteerer. It may be that boatsteerers and mates were regarded as equally important in the boats, and that mates received shorter lays than boatsteerers because of the greater importance of their work aboard ship. If that were the case, one would expect to find mates and mate-boatsteerers receiving the same lays.

In all other instances, crewmen with two occupations drew shorter lays. In the case of boatsteerers, this is easy enough to understand: those with two occupations were often mates, and, as demonstrated immediately above, boatsteerer-mates received roughly the same lays as mates, which means that they received shorter lays than boatsteerers.

The cases of seamen and greenhands are also easy enough to understand. If these crewmen held second occupations, they were very likely to be occupations superior to seaman or greenhand. (Only a boy is inferior to a greenhand.) If the lay of a crewman with two occupations was something approximating an average of the lays usually paid to each of the two occupations (which seems plausible), then seamen or greenhands with second occupations would almost necessarily have shorter lays than single-occupation seamen or greenhands.

Why double-occupation artisans could successfully bargain for shorter lays than those of single-occupation artisans is not clear, but it is possible that there is a computational explanation. Suppose the lays of double-occupation artisans

Table 5B.2

Crew Members with Second Occupations, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866

First Occupation Listed	Second Occupation Listed
5 second mate	5 boatsteerer
140 third mate	2 head-a-boat
	118 boatsteerer
	14 cooper
	2 blacksmith
	4 carpenter
191 fourth mate	1 head-a-boat
	170 boatsteerer
	13 cooper
	2 carpenter
	1 steward
	4 shipkeeper
2 fifth mate	2 boatsteerer
120 boatsteerer	3 third mate
	14 fourth mate
	1 fifth mate
	15 head-a-boat
	13 cooper
	21 blacksmith
	43 carpenter
	1 second cooper
	1 cook
	1 steward
	6 shipkeeper
	1 seaman
208 cooper	1 third mate
	2 fourth mate
	34 boatsteerer
	1 blacksmith
	25 carpenter
	141 shipkeeper
	1 ordinary seaman
	2 greenhand
	1 assistant boatsteerer
52 blacksmith	5 carpenter
	8 shipkeeper
	19 seaman
	6 ordinary seaman
	14 greenhand
110 carpenter	4 boatsteerer
	6 blacksmith
	1 second cooper
	28 shipkeeper
	41 seaman
	13 ordinary seaman
	14 greenhand

(continued)

Table 5B.2

(continued)

First Occupation Listed	Second Occupation Listed
12 second cooper	2 mariner 1 green something 1 blacksmith 6 seaman 1 ordinary seaman 4 greenhand
1 second carpenter 21 cook	1 past greenhand 1 second boatsteerer 1 boatsteerer 3 blacksmith 2 carpenter 2 steward 10 shipkeeper 1 mariner
66 steward	1 assistant boatsteerer 2 boatsteerer 1 second carpenter 58 shipkeeper 2 seaman 1 greenhand 1 assistant boatsteerer
31 shipkeeper	1 navigator 7 boatsteerer 2 cooper 4 blacksmith 7 carpenter 1 painter 5 steward 5 seaman
1 second cook 112 seaman	1 steerage master 1 head-a-boat 31 boatsteerer 18 blacksmith 16 carpenter 5 second cooper 2 steward 15 shipkeeper 3 lookout 2 green something
41 ordinary seaman	19 assistant boatsteerer 2 boatsteerer 1 cooper 6 blacksmith 16 carpenter 1 sailmaker 6 second cooper 2 second carpenter 2 painter 1 shipkeeper

Table 5B.2 (continued)

First Occupation Listed	Second Occupation Listed
195 greenhand	1 greenhand
	3 boy
	3 cooper
	57 blacksmith
	89 carpenter
	1 sailmaker
	22 second cooper
	5 second carpenter
	5 painter
	2 steward
	1 shipkeeper
	1 second cook
	6 ordinary seaman
	1 boy
1 has been coasting	
7 boy	1 mechanic
	1 steward
	4 ordinary seaman
58 mariner	2 greenhand
	24 blacksmith
	28 carpenter
	1 cook
1 landsman	5 shipkeeper
	1 painter
1 bow hand	1 assistant boatsteerer
13 green something	10 seaman
	3 ordinary seaman

Source: Stations and Lays Data Set.

Table 5B.3 Average Lays of Whaling Crewmen with One and Two Occupations, Sailing from New Bedford, Sailing Years 1840–58 and 1866

Occupation	One Occupation	Two Occupations
Third mate	56.7	55.9
Fourth mate	71.5	72.6
Boatsteerer	87.1	73.4
Cooper	56.8	51.7
Blacksmith	172.5	149.1
Carpenter	165.1	136.5
Shipkeeper	115.3	84.4
Seaman	151.1	141.0
Greenhand	185.8	173.9

Source: Stations and Lays Data Set.

Notes: Crewmen with two occupations appear twice, once for each occupation. The occupations included in this table are those that occur most often for double-occupation crewmen.

Table 5B.4 Average Lays of One- and Two-Occupation Crewmen, by Vessel Size, New Bedford Whaling Voyages, Sailing Years 1840–58 and 1866

	Large Vessels		Small Vessels	
	Lay	<i>N</i>	Lay	<i>N</i>
One-occupation crewmen	153.8	9,366	114.8	2,127
Two-occupation crewmen	117.3	301	81.7	109

Sources: Stations and Lays and Voyages data sets.

Notes: Large vessels have values for the variable CREW greater than 30, small have values less than or equal to 22. See chapter 3 for a description of the construction of the variable CREW.

were typically some average of the lays obtainable for each of the two occupations. Then artisan-greenhands would earn longer lays than plain artisans, and artisan-boatsteerers (or mates) would earn shorter lays than plain artisans. The relationship between the lays of one- and two-occupation artisans of a particular type—say, carpenters—would depend upon the relative lays of the two types of two-occupation carpenters, and the weights attached to each of them. If, for example, the lays of carpenters were closer to the lays of greenhands than to the lays of boatsteerers (which they were), or if carpenter-boatsteerers were more common than carpenter-greenhands, then the average lays of two-occupation carpenters would be shorter than the average lays of one-occupation carpenters. (*Greenhand* and *boatsteerer* are used above to refer to inferior and superior occupations.)

These explanations are plausible, but they are not the only explanations possible. We know that lays were shorter on small vessels than on big ones. It seems reasonable to suppose that there might be more two-occupation crewmen on small than on large vessels, for reasons of scale. Before the fact it seemed possible to us that the two-occupation crewmen got short lays because they were concentrated on small vessels. We tested this proposition and found that it did not hold up. If the seeming advantages of two-occupation crewmen were due simply to the concentration of two-occupation crewmen on small vessels, one would expect to find few two-occupation crewmen on large vessels, and one would also expect to find that, once vessel size had been factored in, there was no longer any advantage for two-occupation crewmen. In fact, neither of these statements proved true, as table 5B.4 shows. Two-occupation crewmen were a little more common on small than on large vessels, but the difference was not great; shorter lays went to two-occupation crewmen on both large and small vessels.

Finally, it is possible that two-occupation crewmen did not get simply the average lay of their two occupations. Perhaps they also received a premium for their versatility. That would be a difficult matter to detect in the data, but it could be another explanation for the short lays obtained by two-occupation crewmen.

In the text and the tables of this chapter, we used all crewmen when we computed aggregates, such as crew size. The analysis of lays, however, depends exclusively on data for one-occupation crewmen. In view of the ambiguities attached to the two-occupation data, that seemed to be the safest thing to do. The number of two-occupation crewmen, bear in mind, was small, compared with the total number of crewmen, so that little was lost by excluding them from the analysis of lays.

Appendix 5C

Subsistence on Whalers

Estimates of subsistence costs were required to make the productivity estimates reported in chapter 8 and to draw comparisons between the earnings of whalers and the earnings of workers ashore. We made use of data from Hohman, which he says he took from a pamphlet compiled by Joseph Grinnell, "Speech on the Tariff, with Statistical Tables of the Whale Fishery," published in 1844 (Hohman 1928, 325). (The speech mentioned in the title was given by Grinnell [member from New Bedford] to Congress on 1 May 1844.) The data consist of detailed outfitting lists (including quantities and prices) for a sperm whaler and for a right whaler. There is a question about Grinnell's intentions in preparing these lists. Was he compiling only the items in the original outfitting of the vessels, or did he intend to indicate the requirements of their entire voyages?

Consider how adequate the supplies Grinnell listed were, given the probable durations of the voyages and the numbers of men in the crews. According to his data, sperm whalers carried an average of twenty-seven men and right whalers, twenty-eight men. Voyage durations of twenty-nine months for sperm whalers, and twenty-three months for right whalers, can be derived from Hohman's report of ship-arrival data for 1843 (1928, 323, 327). All of these figures (provisions, prices, crew numbers, voyage lengths) imply that it took about \$60 a year (approximately \$57 for a right whaler and \$63 for a sperm whaler) to feed a crewman (prices of 1844), given that Grinnell meant to estimate subsistence for the full voyage. But did he?

First we need some standards. The typical basic allowance for an adult male slave in the American South at this time was one-half pound of meat and a quart or more of cornmeal a day, with other items thrown in as they were available—sometimes as supplements, and sometimes as substitutes (Gallman 1970, 9). Adult slaves appear to have been pretty well fed, in the sense that they got plenty of calories and protein. Washington's army received a somewhat more abundant basic allowance of a pound of meat and a pound of bread a day during the Revolutionary War (U.S. Department of Commerce 1975, series Z-203, 204, 205). What kind of a basic diet does Grinnell's table allow?

Grinnell outfits a sperm whaler with 240 barrels of beef and pork, a right whaler with 163 barrels. This is the entire meat allowance. Arthur Harrison Cole (1938, x) says that barrels of beef and pork after 1789 contained 200 pounds of meat. Therefore,

Sperm whaler: $240 \text{ bbl.} \times 200 \text{ lb.} = 48,000 \text{ lb.}$, or 1,655.17 lb. per month, if the voyage took 29 months. This gives 61.30 lb. per man per month, with a crew of 27, or 2.04 lb. per man per day. Even with substantial losses to rats and mold, the meat allowance seems more than adequate.

Right whaler: $163 \text{ bbl.} \times 200 \text{ lb.} = 32,600 \text{ lb.}$, or 1,417.39 lb. per month (voyage of 23 months), 50.62 lb. per man-month, and 1.69 lb. per man-day; again, more than adequate. (Remember that whalers spent a substantial fraction of their time in idleness.)

Grinnell lists 240 barrels of flour for a sperm whaler and 155 barrels for a right whaler. A barrel of flour contained 196 pounds of flour, from which 284.2 pounds of hard bread could be made (Cole 1938, x; U.S. Department of Agriculture 1952, 38).

Sperm whaler: $240 \text{ bbl.} \times 284.2 \text{ lb.} = 68,208 \text{ lb.}$ of bread, or 2,352.00 lb. per month, 87.11 lb. per man-month, and 2.90 lb. per man-day. No doubt some was lost or wasted, and no doubt some of the bread was duff, rather than hard bread (flour probably produced less duff, per pound, than it did bread). Nonetheless, nobody wanted for bread on Mr. Grinnell's whalers.

Right whaler: $155 \text{ bbl.} \times 284.2 \text{ lb.} = 44,051 \text{ lb.}$, or 1,915.26 lb. per month, 68.40 lb. per man-month, and 2.28 lb. per man-day: still plenty.

That is not the end of the list. Grinnell identifies a long array of additional provisions. On a sperm whaler, for example, he lists

75 bu. of corn \times 56 lb. per bushel (U.S.D.A., 50) = 4,200 lb., or 144.83 lb. per month, and 5.36 lb. per man-month

5 bbl. of corn meal \times 200 lb. = 1000 lb., or 34.48 lb. per month, and 1.28 lb. per man-month

1,200 lb. of rice, or 41.38 lb. per month, and 1.53 lb. per man-month

150 bu. of potatoes \times 60 lb. = 9,000 lb., or 310.34 lb. per month, and 11.49 lb. per man-month

14 bu. of peas and beans \times 60 lb. = 840 lb., or 28.97 lb. per month, and 1.07 lb. per man-month

Add all that together and you get almost 21 pounds per man-month of corn, rice, potatoes, and peas and beans, or almost 0.70 pounds per man per day.

In addition, he lists 800 pounds of cheese, 900 pounds of butter, 600 pounds of dried apples, 10 barrels of vinegar, 800 pounds of cod, 1,600 gallons of molasses, 200 pounds of raisins, 1,000 pounds of sugar, plus coffee and tea (and crewmen caught dolphins, etc.).

Given these computations, there is a strong suggestion that Grinnell intended his tables of allowances to show the total subsistence for a voyage. True, he left out oranges, limes, lemons, and so forth, but they would have added

only minutely to the bill. Since Grinnell's figures are almost certainly an unrealistically high appraisal of the true costs of providing whalers with bread, meat, and drink, we did not add anything to the \$60 allowance in order to provide for fresh produce. The \$60 seems truly an upper-bound estimate.

A lower-bound estimate was derived from a table printed in Hohman (1928, 315) showing, among other things, the annual expenses of the U.S. whaling fleet. This table was originally appended to a report dated 1858 from the U.S. Consulate in Paita to an assistant secretary of state. According to the table, masters each spent about \$1,200 per year for "fresh supplies." Since the consular report implies that in 1858 the typical crew was 24.77 men (it reports the U.S. whaling fleet as employing 16,370 crewmen on 661 vessels), the total comes to \$48.45 per man per year, in prices of 1858. Deflating by the Warren and Pearson food price index (U.S. Department of Commerce 1975, series E-54) yields an 1844 value of \$35.96. We rounded this downward to \$35.

The \$60 upper-bound estimate and the \$35 lower-bound estimate are in 1844 dollars. We assumed that subsistence requirements in real terms did not change over time. We estimated current-price subsistence requirements by multiplying real values by the Warren and Pearson food price index shifted to the base 1844 without reweighting, and expressed in decimal form.