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Measuring Maine's Marine Economy

by Brian Roach, Jonathan Rubin & Charles Morris

Even though Maine's new license plate no longer features the lobster, the ocean remains central to Maine's identity and to its economy. As the authors point out, Maine has more than 4,500 miles of coastline and more than 4,600 islands over one acre in size. For many who live here, their way of life is tied to the sea; for many who visit Maine, their stay is tied to the sea. Despite such prominence, it has been difficult to accurately assess the importance of Maine's marine economy. In part, this is because we lack a clear definition of a marine economy and lack a method for measuring its total size. In this article, the authors present a definition of Maine's marine economy and offer a consistent method for measuring its size relative to other sectors of Maine's economy. In doing so, they provide the first consistent measurement of Maine's marine economy as a whole. They conclude that Maine's marine economy is not in decline, and further suggest that the potential exists for growth in key areas such as tourism and biotechnology.

INTRODUCTION

The state of Maine has over 4,500 miles of coastline and over 4,600 offshore islands over one acre in size. The sea attracts millions of tourists to Maine, provides jobs for thousands of commercial anglers, and is used to transport goods to market. The sea has always been an important part of Maine's identity. For many people, the Maine way of life is closely tied to the ocean. However, recent media stories suggest that Maine's relationship with the sea is changing. Some people are concerned that Mainers making a traditional living from the sea, such as small-scale fishermen, are a dying breed. On the other hand, service industries, such as tourism and marine research, are growing. Many components make up the Maine marine economy. Unfortunately, there are no published data that describe the Maine marine economy as a whole. Some of the data that are available, such as commercial fishery and tourist spending statistics, are often difficult to compare because the data are presented in different units. Moreover, just what is the marine economy? Ask yourself, your neighbor, and your legislator and you will get different answers.

Often, public resources are allocated based on the perceived significance of an industry. However, data on the significance of different sectors of the economy are often incomplete or inconsistent to allow comparisons across sectors. In this article we present a definition of the Maine marine economy, offer a consistent method of measuring its economic significance to allow comparisons across sectors, and draw some conclusions for policymakers. We would like to stress that our analysis is based on data that are often aggregated or estimated so the results should be read with caution.

Estimating the size and significance of the Maine marine economy requires two important decisions. First, the marine economy must be defined by differentiating between marine and non-marine activity. Second, appropriate measurement units must be chosen that allow consistent comparisons across sectors of the economy. If these issues are not resolved, a meaningful understanding of the marine economy, as well as comparisons across sectors of the economy, are not valid.

DEFINING THE MAINE MARINE ECONOMY

Since there is no universally accepted definition of the Maine marine economy, our definition requires that the marine economy encompass economic activities in Maine's coastal communities that occur primarily because of the proximity of the sea. Some activities, such as commercial fishing and ferry transportation, are clearly dependent on the sea. Other activities are much more difficult to classify. For example, Maine tourism activity is only partially dependent on the sea since some tourism would still occur without the ocean.

The most inclusive definition we use includes economic activity that occurs in Maine's coastal counties—Cumberland, Hancock, Knox, Lincoln, Sagadahoc, Waldo, Washington, and York—in the following six sectors:

- Commercial fishing—including dockside sales, processing of fish products, wholesale activity, aquaculture, and fishery services;
- Recreation and tourism—including tourism to Maine's coastal counties from in-state and out-of-state visitors;
- Water shipping and transportation—including transportation of freight and passengers, marinas, and dock activity;
- Boat and ship building—including building and repairing ships and boats by private enterprises for either the consumer market or under government contracts, including military contracts;
- Military activity—including naval bases and ship yards, and coast guard operations;
- Miscellaneous marine activity—including scientific marine research, marine education, and marine administration.

This definition counts economic activity that is measurable and occurs through markets. We make no attempt to measure the non-market benefits that the marine environment provides the state. Non-market benefits are those which are not captured in traditional market transactions. For example, individuals normally do not have to pay a fee to enjoy the scenic beauty of the Maine coast. Accordingly, visiting the Maine coast provides tourists with benefits in excess of their direct costs (gas, lodging, etc.). Although people would normally be willing to pay more than their direct costs to visit the Maine coast, this additional value is not collected in market transactions, and is not otherwise reflected in our analysis. Similarly, many of us who live in Maine feel that the quality of our lives is enriched by the marine environment. Again, we do not take these

quality of life benefits into account in our analysis. However, these benefits are very important from a policymaking perspective and may even be greater than the market benefits discussed in this article. Presently, very little data are available on the non-market benefits of Maine's marine environment. This would represent an important direction for future research.

MEASUREMENT OF ECONOMIC SIGNIFICANCE

Different measures are commonly used to describe economic significance, including jobs, spending, wages, and taxes. Since there is often considerable confusion over the interpretation of these estimates, we discuss the advantages and disadvantages of various metrics.

While employment data are useful in measuring economic significance, these data may not present a complete picture of the economy. Employment data normally combine full- and part-time jobs without differentiation. Also, many self-employed individuals are not included in employment figures. In addition, employment data, without supplemental wage data, counts a low-paying job the same as a high-paying job. Supplemental wage data also tends to omit self-employed individuals. These limitations are particularly relevant to the marine economy since the commercial fishery and tourism industries include many self-employed individuals and seasonal employees.

While gross spending (i.e., retail sales) is a commonly used measure of economic significance, several limitations of this type of data restrict its usefulness. First, money spent within a region is subject to leakages. While some money stays within the region in the form of profits, wages, and taxes, some leaves the region to pay for production inputs. For example, a ship builder will require inputs of steel, wood, and so forth, some of which will be purchased outside the region under study. Thus, spending is not an accurate measure of regional economic activity. Another limitation of spending as an economic metric is that it can lead to double counting, such as counting both the input costs of a ship builder and the price of the ship. While one can avoid double counting by including only final (not intermediate) goods and services, such detailed sector data are not generally available. As it is commonly used, reporting spending data by a sector overstates that sector's importance and can lead to misleading policy conclusions about its relative importance.

A better way to measure the economic impact of a sector is by using the concept of value-added, which is defined as the increase in value for each step in the production process of a good or service. There are four components to value-added: wages, profits, rental income, and business taxes. Value-added can also be viewed as the market price less any input costs. Using our ship building example again, a company that builds a ship increases the value of the ship's constituent parts equal to the difference between the selling price of the ship and the purchased inputs. Another advantage of value-added is that Gross State Product (GSP) data are

Table 1: Economic Activity in the Maine Marine Economy, 1996 (Millions of Dollars)

	Value-Added (Contribution to GSP)				
Sector	Wages	Profits	Property Income	Business Taxes	Total Value-Added
Commercial fishing:					
• *Landings/harvesting*	15.10	99.99	76.03	6.52	197.64
• *Canned/cured processing*	16.16	-0.08	3.12	0.42	19.62
• *Fresh/frozen processing*	14.49	-0.05	2.90	0.66	18.00
• *Fishery services*	4.26	14.53	2.89	0.95	22.63
• *Fishery wholesale trade*	29.40	1.13	9.89	11.58	52.00
Total	79.41	115.52	94.83	20.13	309.89
Recreation and tourism	447.92	54.05	119.28	166.25	787.50
Water shipping/transportation	22.51	-2.54	5.91	2.61	28.49
Boat and ship building:					
• *Boat building*	34.42	0.94	-0.63	1.04	35.77
• *Military ship building*	370.01	14.76	-3.47	7.84	389.14
• *Non-military ship building*	11.14	0.66	-0.01	0.26	12.05
Total	415.57	16.36	-4.11	9.14	436.96
Military activity	299.62	0.00	201.88	0.00	501.50
Miscellaneous marine activity	18.00	0.50	1.00	0.50	20.00
GRAND TOTAL	1,283.03	183.89	418.79	198.63	2,084.34

. . . the value-added from fish processing is relatively low, perhaps indicating that much fish processing occurs out-of-state.

measured in value-added. Thus, using value-added allows meaningful comparisons with other sectors and the state economy as a whole. A disadvantage of value-added is that many state, local, and business sources measure economic activity using other units—such as wholesale lobster sales or ferry revenues.

A final and crucial consideration in choosing a metric for measuring economic activity is the availability of high-quality, consistent data. Our results are based primarily on value-added data that are available from IMPLAN (Impact Analysis for Planning), a computer program and database of national, state, and regional data published by the Minnesota IMPLAN Group, Inc. IMPLAN is one of the most widely used economic analysis programs. Detailed sector data, for all U.S. states and counties, are presented for 528 sectors that were assembled using data from the U.S. Bureau of Economic Analysis, the U.S. Bureau of Labor Statistics, the U.S. Census Bureau, and other sources. Gaps in the database, due to lack of sector detail or non-disclosure rules, are filled using assumptions or statistical models. The IMPLAN data reported here are from 1996 (the most recent year for which much of the data is available).

Below we present data on the contribution of the six components of the Maine marine economy to GSP. By choosing to include or not include certain components, the reader can define a broad or narrow definition of the marine economy.

ECONOMIC ACTIVITY IN THE MAINE MARINE ECONOMY

Commercial Fishing

As shown in Table 1, commercial fishing is divided into five categories. Landings/harvesting includes dockside sales (either to a wholesaler or to a final consumer) and aquaculture. Fishery wholesale trade includes other intermediate wholesale activity. The total contribution to GSP from the commercial fishing sector is nearly $300 million, with about two-thirds of this value from initial dockside sales. Note that the value-added from fish processing is relatively low, perhaps indicating that much fish processing occurs out-of-state.

Recreation and Tourism

Recreation and tourism is not identified as a separate sector in the IMPLAN database or in other economic sector data. Rather, tourism activity is spread across several sectors, including lodging, retail trade, recreation services, and eating and drinking establishments; currently, no data are available to divide these sectors into tourism and non-tourism components. Due to this limitation, the value-added from recreation and tourism was estimated from the 1992 report "The Economic Impact of Expenditures by Tourists on Maine" (Davidson-Peterson Associates, Inc). In 1991, total tourist expenditures were estimated as $2.75 billion. The value-added amount was estimated to be about $900 million in 1991 dollars ($710 million in wages and other income, and $190 million in taxes), with about 75% of tourist expenditures occurring in coastal regions, especially the south coast region. Applying the same percentage to value-added, it is estimated that the 1991 value-added component of tourism attributable to the coastal region is $675 million. This value is updated to 1996 by noting that the Maine Office of Tourism estimated 1996 tourist expenditures in Maine as $3.2 billion, or 16% higher than in 1991. Assuming that value-added also increased by 16%, it is estimated that the 1996 value-added to the state economy from tourism was $1.05 billion, with $788 million occurring in the coastal region.

Several caveats must be stated in applying this value to the marine economy. While the marine environment is likely the primary reason most tourists visit the Maine coast, some tourist activities are not dependent on the sea. The Davidson-Peterson report notes that nearly 30% of tourist spending is general shopping, such as clothes and household items. Maine's major outlet shopping areas—Kittery and Freeport—attract many tourists who likely consider shopping the primary reason for their trip. Expenditures by such visitors probably should not be attributed to the marine economy. In addition, visitors may also visit the coastal region for other reasons, such as inland hiking or lake fishing. In

The only marine sector that is declining is shipbuilding and boatbuilding, with a decline of about 40% since 1990.

this analysis, no attempt is made to identify tourists who would visit the coastal region in absence of the ocean.

Water Shipping and Transportation

The IMPLAN data base defines a water transportation sector to include freight transport, ferries, passenger transportation, marinas, cargo handling, and water transportation services. The 1996 GSP contribution from the water transportation sector was summed over the eight coastal counties. Employee wages totaled $22.51 million, proprietor income was a loss of $2.54 million, property income was $5.91 million, and taxes were $2.61 million. In 1996, total GSP contribution by water transportation was $28.49 million.

Boat and Ship Building

IMPLAN defines separate boat building and ship building sectors. The boat building and repair sector includes the building and repair of motorboats, plastic boats, dinghies, fishing boats, life boats, houseboats, and hydrofoils. The ship building and repair sector includes barges, cargo vessels, naval ships, tankers, tugboats, trawlers, and passenger vessels. The ship building sector also includes drydocks, lighthouse tending and maintenance, marine rigging, and offshore drilling equipment. Data were summed across the eight coastal counties for both sectors. Total GSP contribution in 1996 for these sectors was $436.86 million.

Current data on the ship building sector are not divided into military and non-military activity. However, 89% ($389 million) of Maine's shipbuilding and boatbuilding is generated in Sagadahoc County, the location of Bath Iron Works. Bath Iron Works is a private ship building facility operating mostly under military contracts. We estimate that $389 million of the $436.87 million in shipbuilding and boatbuilding (GSP value-added) in 1996 is due to military contracts at Bath Iron Works.

Military Operations

Several military sites are located along the Maine coast. The Portsmouth Naval Shipyard, located in Kittery, repairs, overhauls, and maintains Navy ships, including nuclear-powered submarines. The Brunswick Naval Air Station is the largest military employer along the Maine coast. The U.S. Coast Guard operates several stations along the coast including the Marine Safety Office in Portland and stations in Boothbay Harbor, Eastport, Jonesport, Rockland, South Portland, and Southwest Harbor. Since most military operations in Maine's coastal counties are closely linked to the marine environment, the value of these activities can be attributed to the marine economy.

In 1996, the GSP contribution from military activity in the eight Maine coastal counties was $299.62 million in wages and $201.88 million in property income for a total of $501.50 million.

Biotechnology, Education, and Other Marine Activities

Maine's marine environment supports a growing biotechnology industry. Also, several of Maine's educational institutions are dependent on the marine environment for programs in marine science, aquaculture, and oceanography. Maine colleges with marine-based programs include the University of Maine, the College of the Atlantic, and the Maine Maritime Academy. Several laboratory centers conduct marine research including the Bigelow Laboratory for Ocean Sciences and the Mount Desert Island Biological Laboratory. Maine also has several aquariums, including the Marine Resources Aquarium and the Gulf of Maine Aquarium. The Maine Department of Marine Resources is also dependent on the marine venue. Although the IMPLAN sector divisions cannot be used to estimate the GSP contributions of these institutions and their activities, we include a rough estimate in this analysis.

The marine biotechnology industry is estimated as a $3 million industry, according to the Center for Innovation in Biotechnology (1999). The Maine Department of Marine Resources employs about one hundred fifty individuals. Maine Maritime Academy, devoted solely to marine programs, has about sixty faculty members. The School of Marine Science at the University of Maine has over forty faculty members. In addition to faculty, students in marine majors also contribute to the economy. An approximation of $20 million appears conservative in accounting for these institutions and their activities.

Comparison to Past Data

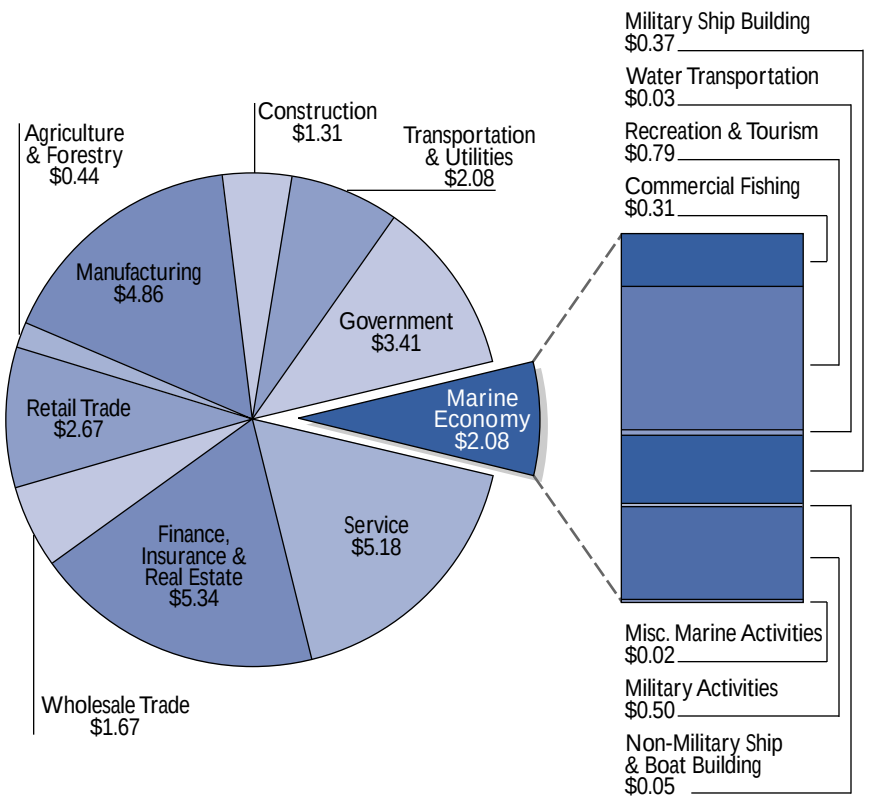
Comparing the data in Table 1 to consistent historic data is difficult. However, we did find some trends suggesting the Maine marine economy, as a whole, is healthy. In the last few years, annual values of commercial fishery landings have been higher than at any time in the past fifty years (previous data were not available). Tourism spending is up about 20% over the past decade. The contribution to GSP by the water transportation sector has been relatively constant over the past twenty years. According to IMPLAN data, the value-added from water transportation is up by about 20% since 1990, while the value-added from seafood processing is up about 5%. The only marine sector that is declining is shipbuilding and boatbuilding, with a decline of about 40% since 1990. Overall, the gains in tourism and other sectors make up for the loss in the shipbuilding and boatbuilding sectors. While the GSP contribution by the marine economy is steady in dollar terms, it appears to be slightly declining as the size of other sectors, such as health services and technology, has increased.

Comparison to the Maine State Economy

The estimated total 1996 GSP contribution to the state economy by our most inclusive definition of the marine economy is estimated to be $2.084 billion (Table 1). Based on data from the U.S. Bureau of Economic Analysis, the GSP for Maine in 1996 was $28.89 billion. Thus, our most inclusive definition places the marine economy at about 7% of the state economy. If military activities and military ship building are excluded, then the marine economy represents about 4.2% of the state economy. Further, if tourism is also excluded, then a narrow definition of the Maine marine economy, including commercial fishing, water shipping and transportation, non-military boat and ship building, is 1.4% of GSP. Thus, our inclusive definition of the Maine marine economy indicates the importance of Bath Iron Works and tourism. Military contracts at Bath Iron Works are a potentially unstable, but critical, component of the marine economy.

So, to address our initial question on the significance of the marine economy, we know that the marine economy comprises at most 7% of the state's economy. What makes up the rest? Although Maine is unique and we are proud of the maritime heritage, we must remember that the service sector makes up the largest part of our nation's economy. The largest sectors of the Maine economy include the finance, insurance, and real estate sector, the services sector and the manufacturing sector. These account for over half of Maine GSP. Figure 1 shows the inclusive view of Maine's marine economy in relation to Maine GSP. Still, the sectors are related and interdependent. For example, some financial and manufacturing activity is, to some degree, dependent on the marine economy. This article does not try to trace such complex linkages.

Figure 1:
The Marine Economy Compared to the Maine State Economy
1996 Gross State Product Data (Billions of Dollars)



What about the future? Will the marine economy continue to be as important tomorrow as it is today? Further growth in the commercial fishing sector may be difficult. Concerns exists about the sustainability of the current lobster catch, which comprises nearly half the value of commercial landings. However, fish and seafood processing is a sector that could become more important in the future. While tourism has been increasing recently, the growth appears concentrated in Southern Maine and the Acadia region. Tourism in other coastal areas, such as Washington County, may actually be declining and needs to be addressed. Of course, these differences relate to the larger issue about differences in economic development for rural and urban areas of the state. The "One Maine" initiative, published by the Maine Department of Economic and Community Development, specifically targets an increase in tourism to Washington County. Scientific marine research and aquaculture are small but growing sectors of the marine economy. Aquaculture is currently involved in debates over property rights and environmental issues. Other biotechnology, specifically medicinal research, may be a promising area for growth.

Our analysis provides policymakers with some evidence of the significance of the Maine marine economy. Comparisons are made between segments of the marine economy, and the marine economy is compared to total GSP. Our data also can be used as a benchmark for future studies. The reader should be aware that our analysis does not consider linkages or multiplier effects. Also, some of our sectors were difficult to differentiate into marine and non-marine activities and we do not include non-market benefits. Still, our data represent the first consistent measurement of the entire Maine marine economy. Finally, we believe that the Maine marine economy is not on a decline and that potential does exist for further growth, particularly for tourism and biotechnology.

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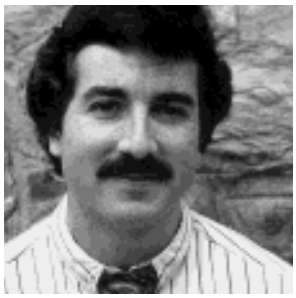

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