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Fishermen Willingness to Participate in an Insurance Program in Oman

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Abstract *This study is based on a survey of 210 fishermen in Oman to investigate their willingness to pay (WTP) for and enroll in an insurance scheme. The survey was designed to evaluate fishermen's willingness to adopt a safety measures program. Most fishermen showed a low level of prudence except for community controlled measures. Actually, 82% of fishermen fish in groups rather than individually, 98% inform their families about the site where they are going to fish, and 76% listen to the weather forecast before leaving. A linear and a Logit model were used in this study. Results from the linear model show that virtually all the socioeconomic, boat characteristics, attitudinal, and wealth variables are important in explaining the amount of the insurance premium the fishermen are willing to pay for; however, only a few variables were significant in the Logit model. Overall, 52% of the respondents indicated WTP for insurance, which is a clear indication that the demand for insurance is substantial. The estimated annual insurance premium varies between Rials Omani (RO) 23.13 and RO 29.25, depending on whether it is a voluntary or legally required. WTP is estimated at RO 18.7.*

Key words Small-scale fishery, safety equipment, econometric modeling, insurance premium.

JEL Classification Codes Q22, H41.

Introduction

This study is based on a 2006 survey of small-scale fishermen from Al-Athaibah and As Sib in the vicinity of Muscat, the capital of Oman. Oman is a country in the Middle East, with 3,240 kilometers of coastline (figure 1) and a huge variety of fish, some of which are not yet exploited. The fishing industry is one of the most important sectors of Oman's economy in terms of employment, export earnings, and food security.

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Currently the fisheries sector represents close to 1% of the total GDP and employs 32,000 fishermen (Ministry of National Economy 2005). Commercial or industrial fishing methods account for only 19% of the fish caught. Eighty-one percent of fishing in Oman is carried out by small-scale fishing units often made up of 2 to 4 family members using 7 to 8 m low-powered vessels fitted with outboard motors. Most fishermen in Oman have access to information through radio and TV, and 85% operate mobile phones.

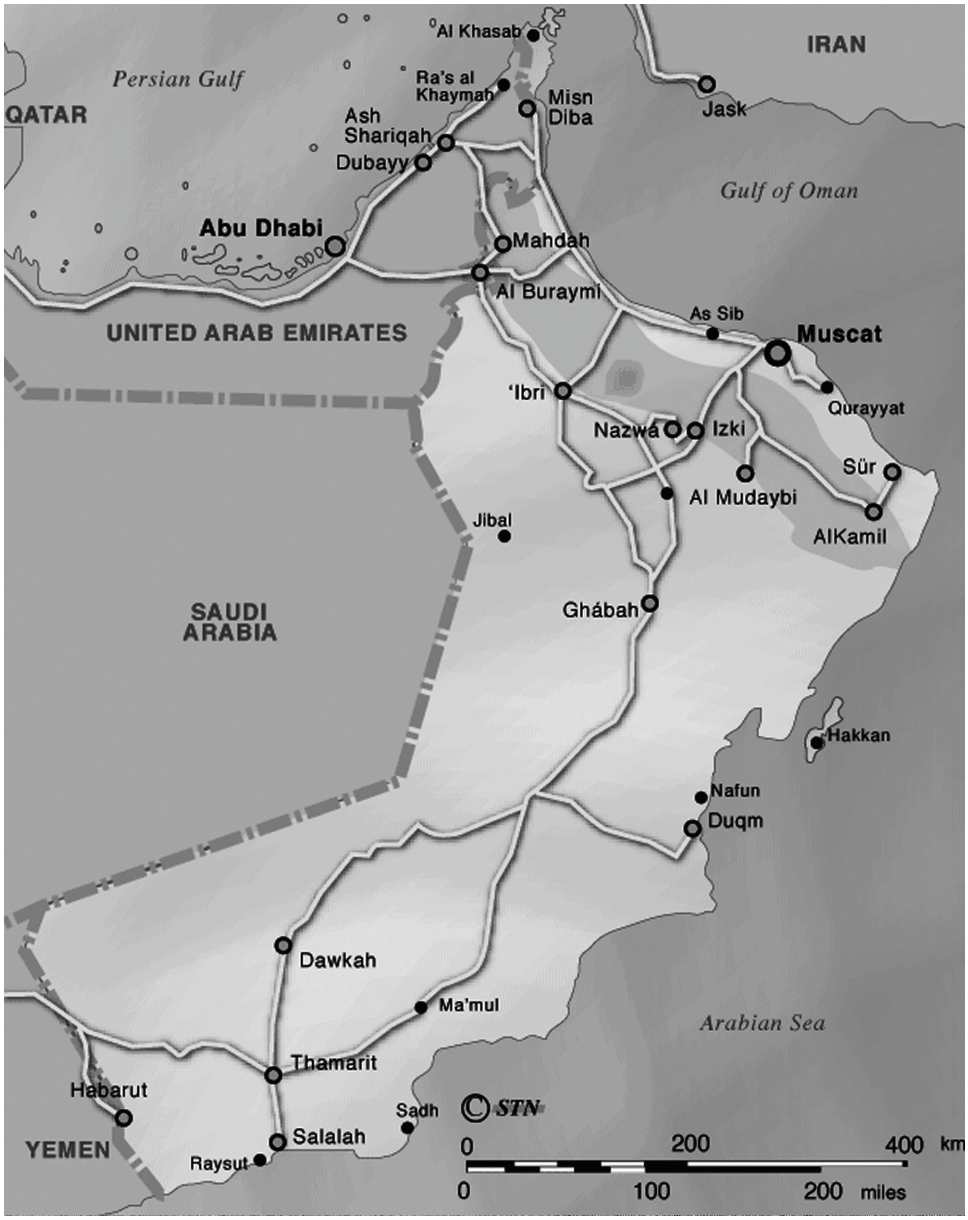

Figure 1. Map of Oman
Source: www.supertravelnet.com/maps/index.php?country=230_0_4&language=1

The main risks and dangers faced by Omani fishermen at sea include: engine failure at sea, rough sea and winds, injuries and poisoning from fish, low visibility, and collision with other vessels or rocks, and capsizing. Safety precautions are very important in marine fishing; otherwise, it can be the most dangerous of all civilian occupations. Statistics from the Oman Coast Guard show that 371 fishermen lost their lives at sea from 1998 to 2002, which is an average of 74 fishermen per year. The highest number lost in a single year was 83 in 1999 and the lowest was 65 in year 2001. These fatal accidents occurred largely because of a lack of sea safety equipment (Oman Coast Guard 2003).

The objective of this study is to investigate the willingness of fishermen in the Muscat region of Oman to pay for crew insurance and the probability of WTP for an insurance program. Insurance is one of the risk management tools that enhance fishermen's safety. The economic literature indicates that the WTP for insurance generally depends on socio-economic and demographic factors, such as number of employees, income, family size, fisherman's age, safety measures, and experience. Some of these variables will be evaluated to determine their influence on the WTP for safety by small-scale fishermen. The identification and quantification of the influence of socio-economic variables on the fishermen's WTP is important because it will furnish policy makers and stakeholders with the information they need to set appropriate policies for the industry. The paper then analyzes the financial viability of an insurance program by estimating the insurance premium and comparing it to the WTP for insurance.

Conceptual Framework

Small-scale fishermen in the Muscat area are assumed to be rational, cost-minimizing agents subject to constraints. Consider the following minimization problem:

$$MinC = C(I, Z) = P_I.I + P_z Z \quad (1)$$

$$s.t$$

$$U = U(I, Z),$$

where I is the amount of insurance services, Z is a composite good, P_I is the price of insurance, and P_z is the price of the composite good Z.

The solution to this problem can be used to determine the expenditure function $E = E(P_I, P_z, U)$, which is the minimum income necessary to reach the level of utility, U, at given prices. Since the price of insurance is not observed, and fishermen are offered a level of insurance to take or leave, the price of insurance is replaced by the level of insurance to obtain the restricted expenditure function:

$$E^* = E(I, P_z, U). \quad (2)$$

The compensating variation (CV), which is a measure of WTP, can be easily derived as the difference between two expenditure functions with two different levels of insurance services, I^0 and I^1:

$$CV(I^0, I^1) = E(I^0, P_z, U^0) - E(I^1, P_z, U^1). \quad (3)$$

The WTP can also be thought of as a function of the socio-economic, demographic, and attitude characteristics of the fishermen, in addition to the cost of the insurance service.

Empirically, two models were used in this study. The first is a Logit model where the WTP is assumed to be dichotomous; that is, whether or not the fishermen are willing to pay for the insurance. The objective of the Logit model is to estimate the probability of participating in an insurance program. The second model is linear where the WTP is a continuous variable. The objective of the linear model is to estimate the insurance premium for which fishermen are willing to pay.

The Logit Model

The Logit model belongs to the general class of binary choice models, where the dependent variable is dichotomous (see Islam, Loehman, and Sinha 2001; Maddala 1983, 1987; Greene 2002, 2003; and Magnac 2002). The Logit model is an extension and improvement of the linear probability model, which in the context of insurance WTP takes the following regression form:

$$Y_i = X_i' \beta + \varepsilon_i, \tag{4}$$

where X_i' is a vector of independent variables representing a number of socio-economic and attitude characteristics related to the ith fisherman. The dependent variable, Y_i, is equal to 1 if the fisherman is willing to pay for insurance and zero otherwise. Since $E(Y_i)$, the expected value of Y_i, is equal to $P(Y_i = 1)$, the regression above can be interpreted as describing the probability that a fisherman is willing to obtain insurance. The value of the parameters, β, measures the marginal impact of a unit change in the fishermen's socio-economic profiles and attributes on the probability of WTP for insurance.

To avoid the serious weakness of having predicted values, Y_i falling outside the $(0,1)$ range, which is not possible if they are to be interpreted as probabilities, the linear model is transformed into a cumulative probability function that may be presented as:

$$P_i = F(X_i' \beta). \tag{5}$$

If the cumulative probability function, $F(.)$, is logistic, then we have the Logit model, which takes the following form:

$$P_i = \frac{1}{1 + e^{-X_i' \beta}}. \tag{6}$$

The Logit model is fundamentally non-linear; therefore, estimating the parameters using Ordinary Least Squares (OLS) is inappropriate. Indeed the use of OLS leads to unbiased but inefficient estimators. Logit models are usually estimated using a maximum likelihood estimation technique, which is a routine in most modern econometric packages, such as SHAZAM, a package that was used here.

The marginal effect of a particular variable x_k on the probability that a particular fisherman is willing to pay for insurance is given by:

$$\frac{\partial P_i}{\partial x_k} = f(X'\beta)\beta_k, \tag{7}$$

where $f(.)$ is the logistic probability density function given by:

$$f(X'\beta) = \frac{e^{-X'\beta}}{(1 + e^{-X'\beta})^2}. \quad (8)$$

The Linear Model

The linear model as applied recently in Casey, Kahn, and Rivas (2006) is assumed to take the following form:

$$WTP_i = \alpha + \beta ECON_i + \delta DEMO_i + \lambda ASSET_i + \gamma ATTD_i + \varepsilon_i, \quad (9)$$

where: ECON: Economic variables related to income, credit use, and availability for the *i*th fisherman; DEMO: Demographic variables including the age of the fisherman and family size; ASSET: Asset variables related to whether the fisherman owns a car and/or a house, and the characteristics of the engine boat (*i.e.*, age and horse power); ATTD: Attitude variables towards precaution and safety measures (wearing a lifebelt, listening to the weather forecast, informing family before going off shore, *etc.*).

The Data Set

The fisheries sector in Oman is dominated by small-scale fishing where groups of two to four relatives operate a fiberglass vessel. Commercial fishing, on the other hand, is comprised of fishermen working in large vessels that operate on the high seas and in specifically designated zones. Small-scale fishing is larger and employs a significant number of people in Oman. It is estimated that more than 32,000 small-scale fishermen are active in Oman (MAF 2004)

The current study is based on a 2006 survey of small-scale fishermen in Al-Athaibah and As Sib near the capital, Muscat. Al-Athaibah and As Sib were chosen for the survey because they are among the leading landing sites in the Sultanate and are popular for both fishermen and fish traders. Around 3,847 fishermen were contacted for the survey in the Muscat area.

A total of 210 fishermen were interviewed from the two sites to solicit information on their willingness to pay for insurance and on other related socio-economic variables. Only 148 surveys were retained for the analysis, and the remaining surveys were dropped because of incomplete information. Table 1 presents the summary statistics for the key variables included in the survey.

On average, a fisherman made 337 RO[1]/month as income, with a standard deviation of RO 85. Only 22% of the fishermen sampled currently had obtained credit; the remainder did not have any on-going credit. Credit level ranged from RO 0 to RO 2,760, with a mean of RO 211. The reasons behind the low credit uptake were not investigated and are beyond the scope of this paper. Fishermen's ages ranged from 18 years to 75 years. Finally, engine age ranged from 1 year to 15 years.

Regarding safety precautions at sea, it is only in a few areas that fishermen demonstrated some level of prudence. According to the sample, 82% of the respondents indicated that their fishing vessels always go in groups, and 98% indicated

[1] 1Rial Omani ≈ US$2.6.

Table 1
Summary Statistics of Key Survey Variables

	Variable	Min.	Max.	Mean	Std. Dev.	Variance
Socio-Economic Variables	Average Monthly Income*	300	900	337.68	85	7,210
	Credit Availability (%)	0	1	0.22	0.42	0.17
	Credit Repayment in Years	0	16	0.73	2.04	4.18
	Credit Amount Per Year*	0	2,760	211	484	234,450
	Age of Fisherman	18	75	40	15	235
	Family Size	2	16	9	11	11
Boat Characteristics	Engine Age	0.08	15	4	3	11
	Engine HP Single	35	150	61	19	349
	Travel Time (hrs.)	0.17	3	1.10	0.57	0.33
	Average People on Boat	1	4	2.4	0.56	0.31
Attitude Variables	Vessel Going in Groups (%)	0	1	0.82	0.38	0.15
	Informing Family Before Going (%)	0	1	0.98	0.14	0.02
	Listen to Weather Forecast (%)	0	1	0.76	0.43	0.19
	Wear Life Belt/Lifejacket (%)	0	1	0.19	0.39	0.15
	Willingness to pay for Insurance (%)	0	1	0.52	0.50	0.25
Wealth Variables	Own a House (%)	0	1	0.51	0.5	0.25
	Own a Car (%)	0	1	0.51	0.5	0.25

Sample size = 148 fishermen.
*RO 1 ≈ 2.6 $US.

that before leaving they let a family member know the ground where they are going to and when they are expected to return. In addition, 76% of fishermen indicated that they listen to the weather forecast before leaving. To some extent, these actions indicate a level of precaution with respect to safety at sea.

On other preventive safety measures, respondents did not demonstrate serious concern. For example, when asked whether they have lifebelts or lifejackets available on board, only 19% responded positively. From the responses highlighted above, two conclusions are apparent; only very few fishermen take the necessary precautions to improve their safety; and fishermen still rely more heavily on their communities and relatives for their safety at sea than on safety equipment.

The Insurance Market in Oman

The insurance market in Oman is considered among the oldest and fastest growing in the Gulf Region. Currently there are 15 insurance companies operating in various areas of the economy. The type of insurance contracted concerned mostly motor vehicle insurance (88.7%), life insurance (3.3%), property (1.7%), transport (2.9%), and others (3.4%). Overall, the insurance sector is financially viable as indicated by the insurance premiums received (103 million Omani Rials) compared to the claims paid (49.5 millions Rials) (Ministry of National Economy 2005).

Despite the increasing growth of insurance coverage, private insurance compa-

nies have not expanded their coverage to include small-scale fishermen, which are predominant in the Omani fishing sector. Large fishing enterprises may be covered by regular commercial insurance (property and life insurance), but there has been no attempt by the government to introduce a "fisheries insurance scheme" as a public policy tool to provide assistance to small fishermen. The relatively high risk associated with the small-scale fishery sector and the lack of understanding by fishermen of the possible benefits associated with an insurance program have probably discouraged the development of risk management institutions that provide insurance coverage at an affordable premium.

From the supply side, factors inherent to the complex nature of marine fisheries can explain the lack of provision of fisheries insurance. Hazell (1992) argues that four conditions should be met for a risk to be insurable and profitably covered by the private sector: (1) the likelihood of the risk must be readily quantifiable; (2) the damage it causes must be easy to attribute and value; (3) the probability of the occurrence should not be too high to make the insurance unaffordable; and (4) the risk should be free of moral hazard behavior; that is, neither the occurrence of the event nor the damage it causes should be affected by the insured's behavior.

Some risks associated with the fisheries activities (vessel and gear loss, health and personal security, security of the crew) have some of the characteristics listed above and are covered by commercial insurance in many countries (Japan, India, Malaysia, Republic of Korea). However, fisheries insurance in these countries is part of a nation-wide program that involves the government, fishermen's associations, rural credit institutions, and private insurance companies (FAO 1999). In some countries insurance for specific activities is mandatory and is linked to the country's agricultural and fish credit system. The lack of the development of an insurance program for fisheries in Oman is probably due to the (1) broad range of social and economic situations that prevail among the fishermen; (2) small-scale, low profile business nature of fishermen who may find in their social and cultural institutions a substitute for market institutions to manage risk; and finally (3) lack of incentives for both private and government agencies to initiate an insurance scheme adapted to the specific conditions of small-scale fishermen in Oman.

However, the development of small-scale fisheries under the pressure of declining resources and increasing demand for fish may help the emergence of government-sponsored and market-based fisheries insurance programs. Further exploitation of fish resources would entail longer hours of work at sea and traveling greater distances to find fish compared to the existing situation. An insurance program would help reduce the risk for fishermen and enable them to invest their own resources in the adoption of new technologies. It will also help reduce the risk to financial institutions against default payment and therefore help stabilize the contribution of the fisheries sector in the national economy (FAO 1999).

Government involvement in an insurance program is necessary in order to correct the market failure and to ensure the provision of an affordable insurance program for small-scale fishermen. The market failure results primarily from the presence of moral hazard and adverse selection situations, which prevent the emergence of insurance markets. Moral hazard arises when an agent who obtains insurance has incentives to take fewer precautions to avoid the occurrence of the risky event that gives rise to an insurance claim; while adverse selection occurs when the insurance company is unable to distinguish between agents and therefore the insurance contract will appeal mostly to the high-risk category (Newberry 1989). The role of government is also important in building awareness among fishermen of the need to procure an insurance program as the conditions of adherence (and coverage) may entail further expenditures by fishermen, such as the obligation to carry safety equipment on board.

Econometric Results and Discussion

Our sample was comprised of 148 small-scale fishermen in the Athaibah and As Sib areas, Muscat capital of the Sultanate of Oman. Of the 148 fishermen, more than half (52%) indicated their WTP for insurance. On average, fishermen were willing to pay an insurance premium of RO 18.7, with 45% willing to pay RO 20 or more. The low number of fishermen responding positively to the prospect of an insurance program could be explained by: (1) the absence of regulations requiring any kind of insurance; (2) the presence of basic social programs offered free by the government in case of death of the family head; (3) fishermen's attitude that their boats are safe enough; (4) fishermen's reliance on solidarity within their community in case of problems; (5) the illegal employment of expatriates from neighboring countries.

Econometric results from running the Logit and linear models are as reported in tables 2 and 3, respectively.

Results of the Logit Model

The Logit model econometric results are as presented in table 2. From the table it is evident that only few coefficients are individually significant. The majority of the coefficients are individually insignificant.

Table 2
Estimated Coefficients from the Logit Model

	Variable[1]	Estimated Coefficients	Std. Error	T-ratio	Weighted Aggregate Elasticity	Marginal Effects
Socio-economic Variables	Average Monthly Income	0.014	0.005	2.61**	1.445	0.0033
	Credit Availability	1.563	0.923	1.69***	0.116	0.5646
	Credit Repayment in Year	0.274	0.189	1.44	0.067	0.0653
	Credit Amount Per Year	–0.003	0.001	–2.40**	–0.177	–0.0007
	Age of Fisherman	0.016	0.023	0.69	0.18	0.0038
	Family Size	–0.02	0.042	–0.46	–0.036	–0.0047
Boat Characteristics	Engine Age	–0.079	0.064	–1.22	–0.124	–0.0188
	Engine HP Single	0.012	0.012	0.99	0.193	0.0028
	Average People on Boat	1.221	0.426	2.86**	1.033	0.291
	Travel Time Hours	–0.125	0.379	–0.32	–0.121	–0.0297
Attitude Variables	Vessel Going in Groups	0.032	0.557	0.05	0.003	0.0091
	Informing Family Before Going	0.66	1.418	0.46	0.211	0.2278
	Listening to Weather Forecast	1.067	0.549	1.94***	0.287	0.3891
	Wear Lifebelt/Lifejacket	–0.497	0.535	–0.92	–0.026	–0.1095
Wealth Variables	Owns a House	–0.791	0.63	–1.25	–0.136	–0.1486
	Owns a Car	0.052	0.43	0.12	0.033	0.0148
	Constant	–9.35	3.002	–3.11	–3.081	

[1] Dependent Variable = Willingness to pay Yes/No (WTPYN).
**Coefficients significant at 5%; ***Coefficient significant at 10%.
DW = 2.05.
Log-Likelihood Ratio test stat = 48.48 with 17 df. Critical $\underline{c}^2$. stat = 27.59.

However, when the overall significance and goodness of fit of the Logit model is tested using the Log-Likelihood Ratio test, results obtained from the model show that at the 10% level of significance, the null hypothesis that all slope coefficients are equal to zero is rejected. Consequently, the included variables are jointly significant in explaining the observed variation in the probability of fishermen WTP for insurance. At the 10% level of significance, average monthly income, credit availability, and credit amount per year are statistically significant. These socio-economic variables explain the probability of fishermen to enroll in an insurance program.

Most of the boat characteristic variables (represented by engine age, engine HP, average number of people on the boat, and travel hours) were statistically insignificant, except the number of people on the boat.

Listening to weather forecasts indicates that fishermen are conscious and concerned about weather changes because their safety at sea is a function of weather conditions. Fishermen who listen to weather forecasts are 0.389 times more likely to be willing to pay for insurance than those fishermen who do not. However, carrying a lifebelt/lifejacket, although not significant, is negatively correlated with the probability of being willing to pay for insurance. This is explained by the general feeling by some fishermen that the availability of safety equipment on the boat (*e.g.*, lifejacket, lifebelt, *etc.*) is sufficient to secure their lives, and thus there is no need to pay for insurance. This implies that government-run extension programs should be much more focused on educating fishermen about fishing safety and the importance of insurance even if safety equipment is on board. If possible, fishing laws need to be revised to incorporate clauses that will make insurance for both crew and fishing vessels mandatory.

Wealth variables weakly explain the probability of WTP for insurance in the model, and the coefficients are not significant even at 10%. For instance "car owners" are more willing to insure their boats than those who don't have vehicles, assuming that they are more familiar with insurance regulations and benefits. However, since the percentage of fishermen responding positively to the concept of insurance is 52%, this is a clear indication that the demand for insurance is tangible even without implementing any extension program for this issue and without any law compelling fishermen to enroll in it. This figure also indicates that fishermen would like to go beyond the coverage and services currently offered by their communities. However, unlike third-party car insurance, insurance of fishing vessels is not currently a legal requirement in Oman. The reluctance of the government to make insurance an obligation for fishermen might be explained by the absence of third-party effects caused by sea accidents. Indeed most of the accidents are not collisions between vessels but fishermen lost at sea and consequent deaths, which do not usually create conflicts among people, like in car accidents. Besides, currently the government intervenes in the case of death of the family head by providing a subsistence allowance to the family without the need for an insurance subscription. Such an intervention mechanism could be better implemented via the introduction of an insurance institution, which will make the intervention mechanism sustainable in the future and less dependent on oil income. Indeed, 45% of the fishermen are ready to pay RO 20 per year for insurance, on average. The RO 20 per year premium represents less than 0.6% of the fishermen's lowest annual income.

Results from the Linear Model

The simple regression relating the amount paid as insurance premium with four classes of variables shows that most of the independent variables are significant at a 10% level (see table 3). Among the socio-economic variables, "credit availability" is

Table 3
Estimated Coefficients from the Linear Model

	Variable*	Estimated Coefficients	Std. Error	T-ratio
Socio-economic Variables	Average Monthly Income	0.026	0.006	4.66
	Credit Availability	7.316	1.514	4.83
	Credit Repayment in Year	–0.176	0.074	–2.37
	Credit Amount Per Year	–0.004	0.001	–4.39
	Age of Fisherman	0.049	0.02	2.52
	Family Size	0.238	0.037	6.43
Boat Characteristics	Engine Age	0.013	0.044	0.29
	Engine HP Single	0.061	0.011	5.66
	Travel Time (hrs.)	1.527	0.317	4.81
	Average People on Boat	3.168	0.589	5.38
Attitude Variables	Vessel Going in Groups	2.892	0.351	8.23
	Informing Family Before Going	1.102	0.981	1.12
	Listening to Weather Forecast	1.044	0.348	3
	Wear Lifebelt/Lifejacket	4.987	1.231	4.05
	Prefer Insurance	3.986	0.404	9.87
Wealth Variables	Owns a House	–3.633	0.546	–6.66
	Owns a Car	2.988	0.372	8.03
	Constant	–24.285	2.7	–9

* Dependent Variable = Amount willing to pay = WTP.
DW = 1.97. R-square = 0.93. Adjusted R-square = 0.73.

the most influential variable with the "amount of credit" being negatively correlated with the amount of the insurance premium. For the "boat characteristics" class, the number of "people on boat" is the most important variable, and it is positively related to the insurance premium. In fact for one more person on a boat, the amount of insurance premium boat owners are willing to pay increases by more than RO 0.33. Fishermen's attitudes, such as the use of safety equipment, information about weather conditions, as well as fishing in groups, reflect the risk awareness and explain the willingness to pay for insurance.

Regarding the socio-economic variables, the "amount of credit" has a negative sign as expected, and indicates that the more indebted the fishermen the less they are willing to pay for insurance. In this case the priority goes to refunding the credit. "Age" has a positive coefficient. The older the agent the more likely he is willing to enroll in an insurance program. This seems to imply that the older the fisherman, the more he values his life and feels more responsible towards family members who in case of death will benefit from the insurance claim. "Family size" also has a positive sign and the second highest socioeconomic variables' coefficient.

"Engine age" has a positive sign as expected. In fact, the older the engine, the less reliable it becomes and the higher the amount of insurance premium the fishermen will be willing to pay. However the variable "engine age" is not statistically significant in explaining the observed variation in the amount of insurance premium.

As expected "travel time" has a positive sign. In fact, the longer the travel time

and the further the distance traveled from the shore, the more the fishermen are exposed to risks. As a result, the amount of premium the fishermen are willing to pay is higher. "Engine HP" has a positive sign, too, and is consistent with expectations. In fact, the higher the engine HP the longer the travel time and travel distance from shore, the more likely the fishermen are to pay more to enroll in an insurance program.

Financial Viability of the Insurance Program

Given the high percentage of fishermen willing to subscribe to an insurance program, in this section we estimate the financial viability of such a program. Two scenarios will be evaluated. In the first scenario, we assume that fishermen will be legally required to subscribe into an insurance program. In the second scenario, we assume that only those fishermen who are willing to pay for insurance will subscribe to an insurance program.

The insurance program will cover only cases of death and cases where a fisherman is lost at sea. The program does not cover any other types of accidents, such as collision between vessels and gear loss or damage. The difference between the two scenarios comes mainly from the death risk rate. In scenario 1 the death risk rate is estimated using data from the Oman Coast Guard (2003) related to the number of fishermen and the number of people dying per year while fishing. This rate is equal to 0.231% for the entire fishermen population. The rate of death risk for the second scenario considers only those fishermen willing to pay for insurance.

To estimate the death risk, we base our estimation on the available information regarding the fishermen WTP for insurance compared to the total interviewed population. Table 4 shows the comparison in terms of the different risks captured in the survey. The estimated risk index for fishermen willing to pay for insurance is 117% compared to a risk index of only 86% for the total interviewed population. This means that the fishermen willing to pay for insurance have 26% higher risk of accidents than the total interviewed population. This rate is used to estimate the new death risk rate, which is assumed to be 26% higher than the death risk for the total population of fishermen. Accordingly, the death risk for the fishermen willing to pay for insurance is 0.293%. On the other hand, the percentage of fishermen willing to pay for insurance is 52%. The total number of fishermen willing to pay for insurance is shown in table 5 and is estimated at 16,640 against 32,000 for the first scenario. The pure premium will be RO 16.190 per year in the first scenario and RO

Table 4
Risks and Death Risk Rate for WTP for Insurance

Risk Information	Fishermen WTP for Insurance (%)		Total Interviewed
Population (%)			
Collision with Other Vessels	17		14
Run onto Rocks	0		1
Sinking Vessels	2		3
Experienced Bad Weather at Sea	98		68
Total Risk Index	117		86
Risk Index Difference		26	
Death Risk Rate	0.293		0.231

Table 5
Estimation of Insurance Premium

	Scenario 1: Insurance is Compulsory	Scenario 2: Insurance is Optional
Death Compensation (RO Per Insured)	7,000	7,000
Average Death Accidents Per Year	74	48.68
Total Number of Fishermen Subscribing to Insurance	32,000	16,640
Death Risk Rate	0.231%	0.293%
Fishermen Willing to Pay Insurance	52%	16,640
Claims Per Year (RO)	518,000	340,729
Pure Premium (RO Per Year)	16.19	20.48
Total Expense Ratio	30%	30%
Gross Premium (RO Per Year)	23.13	29.25
Percentage of Premium to Income	0.57%	0.68%
Fishing License Fee (RO Per Year)	20	
Fishermen Average WTP for Insurance	19	

20.480 per year for the second scenario given the higher risk (Vaughan and Vaughan 2003). We assume that the total expense ratio (*i.e.*, commissions, general administrative expenses, allowance for contingencies and profit, and other acquisition expenses) amounts to 30% of the pure premium. Thus the estimated gross premium is RO 23.110 in the case where insurance is legally required for all fishermen against RO 29.250 per year in the case where the insurance program is voluntary. The insurance premium represents 0.57% and 0.68% of the fishermen's average income, respectively, for scenarios 1 and 2. Currently all fishermen are required to pay an annual fishing license fee of RO 20. The insurance premium estimated is thus quite close to the fishing license fee. The estimated insurance premium is 19% higher than the average WTP revealed by the fishermen at RO 18.7. These results show that offering insurance coverage for fishermen can be profitable and affordable.

Conclusions

Econometric results show that socio-economics, attitude, and behavioral variables are all important in explaining the willingness to pay for insurance. Specifically, while house ownership, credit repayment time, and credit amount are negatively correlated with the amount of premium, the rest of the variables are positively correlated with the amount of premium. For instance, fisherman age is positively correlated with the amount of premium, implying that the older the fisherman the more likely he will be willing to pay for insurance. This seems to imply that the older the fisherman, the more he values his life and feels more responsible towards family members who, in case of death, will benefit from the insurance claim.

The analysis of safety precautions undertaken by fishermen shows clearly that the level of prudence is not enough, except for the safety measures controlled by the local community or relatives. In fact, less than 20% of fishermen are currently using safety equipment such as lifebelts, lifejackets, distress flares, and first aid kits. This partly explains the high risk any market-based insurance company could be exposed

to in providing insurance programs for small-scale fishermen. However, given the absence of insurance programs, fishermen clearly showed that they rely on solidarity within their own communities and on relatives. Actually, more than 80% of fishermen indicated that they avoid the risks by going fishing in groups, 98% inform their families about the site where they are going to fish, and 76% get informed about weather conditions before leaving. Data shows clearly that more than half of the fishermen (52%) are interested in enrolling in an insurance scheme to protect their vessels and crews. Finally, the high percentage of fishermen (48%) unwilling to pay even a low insurance premium calls for further investigation of the reasons behind such a refusal and the policy measures to correct it. The final objective will be to increase the number of fishermen willing to pay an insurance premium for their safety and the protection of their families in case of death.

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