

# Measuring Relationship Marketing Effect in Small-Scale Fishing in Oman and Enhancing Efficiency and Economic Gains for Traditional Fishermen

OMAR al-JABRI, RAY COLLINS, XIMING SUN, SHEKAR BOSE,  
and RAKESH BELWAL

## Introduction

Although Oman's fisheries sector contributes just 0.6% to its national GDP (2011 estimate at 2000 constant prices), its importance in social, economic, and cultural fabrics goes well beyond the statistics. Indeed it plays a pivotal role in Oman's efforts to achieve food security, besides being a cornerstone in its traditional way of life. Under the recent economic diversification efforts, the Sultanate of Oman has devoted significant efforts

Omar Al-Jabri (Corresponding Author) is Assistant Professor, Department of Natural Resource Economics, Sultan Qaboos University, P.O. Box 34, Al Khoudh, P.C. 123, Sultanate of Oman (email: omar@squ.edu.om). Ray Collins is Emeritus Professor of Agribusiness, University of Queensland, Gatton Campus, Building 8117a, Gatton, QLD 4343, Australia. Ximing Sun is Research Fellow, University of Queensland, Gatton Campus, Building 8117a, Gatton, QLD 4343, Australia. Shekar Bose is Associate Professor, Department of Natural Resource Economics, Sultan Qaboos University, P.O. Box 34, Al Khoudh, P.C. 123, Sultanate of Oman. Rakesh Belwal is Associate Professor, Faculty of Business, Sohar University, P.O. Box 44, P.C. 311, Sultanate of Oman.

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to devise mechanisms to increase the sector's contribution to the country's GDP, in order to create employment opportunities for Omanis, achieve food security, and sustain community welfare, amongst others (MNE, 2007).

The fisheries sector is comprised of two distinct segments, namely, traditional (or artisanal) and industrial. Fishing activities are carried out exclusively by males. There are seven coastal Governorates in Oman: Musandam, Batinah (North and South), Muscat, Sharqiyah South, Wusta, and Dhofar. This study focuses on the small-scale fisheries in the Batinah Governorate.

Total fisheries landings in Oman were estimated at 192,000 t in 2012, of which the traditional sector contributed more than 95% (MAF, 2012). In 2012, the traditional sector alone provided direct employment to 42,553 fishermen, full-time as well as part-time (MAF, 2012)<sup>1</sup>. The traditional sector is comprised predominantly

<sup>1</sup>Further details on the socio-economic contributions of the sector can be found in Bose et al. (2010).

## Acronyms used in this paper.

MAF	Ministry of Agriculture and Fisheries
MNE	Ministry of National Economy
R&D	Research and Development
FDC	Fisheries Development Centre
OMR	Omani Rial (\$1USD = OMR 0.384, fixed exchange rate)

of small-scale fishermen who are engaged in labor-intensive fishing activities with a low level of capital input and technology, and use traditional fishing gears, such as small nets, traps, spears, lines, and hand-collection methods.

## Research Objectives and Justification

Under the notions of supply chain management (SCM) and relationship marketing (discussed in the next section) the main focus of this study is on the post-harvest activities involved in the small-scale fisheries sector of the Batinah Governorate. This is because the existing literature points to several economic inefficiencies in the post-harvest sector that affects the performance of small-scale or traditional fishermen. These

**ABSTRACT**—This paper aims to measure the effect of relationship marketing and supply chain management practices on small-scale fishermen's incomes on the Batinah coast of the Sultanate of Oman. The study also assesses the potential effects of relevant socio-economic, demographic, and fishing operation related factors on the competitiveness of small-scale fishermen. A field survey was conducted to elicit views of fishermen using two types of questionnaires—one for those fishermen who were engaged in relationship marketing with a preferred buyer, and the other for those fishermen who were not engaged in relationship marketing.

Two factor analyses were conducted with respect to relationship marketing between

the fishermen and their preferred buyer and with respect to the supply chain management practices. Further empirical analyses were conducted that involved three main steps. First, the residual from the logistic regression model carried out in a recently published study was computed, where this residual represents the unpredictable component of the fishermen's income. Second, an independent sample t-test was performed to determine any significant differences between the two groups with regard to some relevant variables. Third, the two-stage Heckman procedure was conducted, in which during the first stage the Inverse Mills Ratio (IMR) was computed using the probit model. In the second stage of the

Heckman procedure, the residual of the logistic regression (obtained in the first step) was regressed on the IMR and other predictors of relationship marketing related to the fishermen who were engaged in relationship marketing.

Our key finding is that the fishermen who are engaged in relationship marketing and adopt practices of supply chain management have a comparatively higher income and competitive advantage over those who are not engaged in relationship marketing. Therefore, there is a need for strengthening relationships between fishermen and supply chain actors. We hope that the finding will be useful for future planning of the small-scale fisheries in the Batinah Governorates.

inefficiencies may arise from sources including a) market failure, b) lack of control over market supply, c) lack of promotion in developing small-scale fisheries enterprises, d) competition among small-scale fishermen, e) lack of adequate infrastructure and facilities, and f) insufficient attention to product quality (Omezzine, 1998; Al-Jabri, 1999; Al-Oufi et al., 2000; Omezzine et al., 2003). The focus of this study is influenced by the existing claim that effective supply chain management can improve the competitiveness and profitability of actors (Schotzko and Hinson, 2000; Fearné et al., 2001).

The role of supply chain management is crucial for fisheries in Oman as the harvested fish changes hands multiple times before it reaches the end-users. The middlemen (generally truckers) play a significant role in the post-harvest handling and distribution of fish. For example, the middlemen are engaged in transporting and selling fish to local and foreign (neighboring countries) markets. Therefore, a clear understanding of the existing supply chain relationship between fishermen and traders is vital to improve operational efficiency and thereby economic returns to fishermen.

The existing opportunity for enhancing efficiency and economic gains from the post-harvest sector is reflected in the strategic approach stipulated in the government's 5-year plan for the fisheries sector (MNE, 2007). With the establishment of a central wholesale fish market in Barka in the South Batinah Governorate and the development of an action plan for establishing a fisheries industrial estate at Duqm in Wusta Governorate, the Ministry of Agriculture and Fisheries has attempted to address inefficiencies in the supply chain.

The primary objective of this research is to investigate whether engagement in relationship marketing could provide a competitive advantage to fishermen. The published work by Al-Jabri et al. (2013) investigated factors determining income of the small-scale fishermen on Oman's Ba-

tinah Coast. It found that fishing inputs, catch, relations with extension services, and other socioeconomic and demographic factors exert positive influence on fishermen's income. All explanatory variables were able to explain 76.4% of the variation in the fishermen's income level. This study furthers the study by Al-Jabri et al. (2013) by investigating whether practices related to SCM and relationship marketing could have additional influence on fishermen's income. Therefore, to address the primary research objective of our study, the analyses are primarily based on the work by Al-Jabri et al. (2013) and investigates to what extent the unexplained variation can be explained by practices related to supply chain management and relationship marketing.

Understanding obstacles affecting supply chains in Oman's fisheries sector and improving their competitiveness is important to this research. This understanding will help in designing solutions to overcome these obstacles and that will lead to improving revenue of the stakeholder and sustainability of the sector.

### **A Brief Note on Supply Chain Management and Relationship Marketing**

Mentzer (2001) argues that the term "supply chain management" (SCM) causes confusion among researchers because it can be viewed as an operational term, a management process, or a management philosophy. He concludes that there should be more effort to identify an exact definition of SCM. Thus, the concept of SCM can be interpreted in different ways, depending on the objectives being addressed by the researcher or the manager, as well as the surrounding circumstances (Mentzer, 2001).

Supply chain management is often defined in terms of managing the flows of products and services—starting from the producer of raw material and ending with the delivery of products to the final customer—through different phases of production and distributional channels using efficient and effec-

tive transport, handling, and storage (Schotzko and Hinson, 2000; Dunne, 2001; Collins et al., 2002; Zuckerman, 2002). Food supply and distribution typically requires efficient functioning of a complex set of interrelated activities and services along the supply chain (Shepherd, 1997).

Firms cannot avoid being members of supply chains, and alliances, partnerships, and networks have always existed, though they have only recently been conceptualized as an important part of organized whole-of-chain strategies (Collins et al., 2002). To achieve customer satisfaction in food-business chains, it is necessary to coordinate and form partnerships along the chain so that food products can reach consumers in time as well as in the best quality.

As an integral part of supply chain strategy, relationship marketing plays an important role in managing food supply chains, whether in developed or developing economies. Kurtz (2012:308) defined relationship marketing as "the development, growth, and maintenance of cost-effective, high-value relationships with individual customers, suppliers, distributors, retailers, and other partners for mutual benefit over time". Relationship marketing is based on assuring delivering customer requirements such as low prices, high quality, prompt delivery, and superior service (Kurtz, 2012). Morgan and Hunt (1994:34) refer to relationship marketing as "all marketing activities directed towards establishing, developing, and maintaining successful relational exchanges."

### **Study Area Profile**

The coastline of the Batinah Governorates extends about 270 km along the Sea of Oman and is characterized by a sandy beach with the continental shelf extending up to 30 nmi (Al-Oufi et al., 2000) offshore. In 2012, the Batinah fisheries contributed 16.4% and 25.6% of the total national landings in volume and value, respectively. There were 11,943 registered fishermen in Batinah representing 28% of all registered fishermen in Oman, re-

vealing fisheries as a vital source of income and employment to thousands of families (MAF, 2012). In 2012, the small-scale fishery of the Batinah Governorates represented about 26% of the total number small-scale fishing boats in Oman (MAF, 2012). The Batinah fisheries' share in the country's fish export was about 6% and 4% in volume and value, respectively (MAF, 2011). Overall, the Batinah fisheries provide sustenance to 128 coastal villages in the Governorates.

In terms of landings of species within the Batinah coast, the small pelagic species represented the highest fish landings (about 32.44%) followed by the large pelagic species (about 29.29%) (MAF, 2011). The value of large pelagic species represented about 37% of the total value of landings followed by demersal species (about 32%) in 2011.

Variations in values are influenced by the demand pattern and consumers' taste (MAF, 2011). Most consumers favored large pelagic species such as kingfish, *Scomberomorus commerson*, and tuna, Scombridae, to the extent that they do not like to substitute with other species. While various fishing gears such as gill-net, trolling lines, hand lines, beach seine, and traps are used by fishermen in Oman, gillnets are the most frequently used gear (Al-Oufi et al., 2000).

Local fish markets are characterised by poor infrastructure. In some areas, the fish market is an open area next to the beach where the fishermen land their catch. In the coastal towns, these markets are generally located where fish are landed. Fishermen are automatically linked with markets on the landing sites. Fish markets usually are close to residential areas along with vegetable shops and other markets. Fish landings and selling usually takes place in the morning, however, in some coastal towns, fish markets operate in the afternoon. In these markets, the traders sell what is caught in the afternoon or what is unsold in the morning market.

Common problems such as low prices, inefficient marketing, poor quality

control, and poor catch handling exist in the Batinah fishery. Therefore, there is a legitimate concern that if these problems go unresolved, the small-scale fishery might fail to achieve long run sustainability (MAF, 2003).

## Methodology

### Data Collection

Sample representation is one of the aspects the researchers have taken into account in order to make inferences about the population of small-scale fishermen in the Batinah coast. The sample's representation is determined by the type of data required (Bernard, 2005). Furthermore, the subject matter, the unit of analysis (the fisherman), and scale of the survey govern the choice of the data collection method, while the objective of the survey should determine the methods to be used (Moser and Kalton, 1985). For their sampling process, Masuku and Kirsten (2003) revealed that rather than just ensuring that the sample represented the population, selection criteria should aim to increase the validity of the collected data.

Furthermore, data collected using random sampling for a high number of geographically dispersed and heterogeneous villages may result in high sampling errors and may not be reliable (Al-Oufi, 1999). Without due care, a random sample can be unrepresentative and, together with a population that is not homogeneous, can produce errors; and using a simple random sample may produce high random errors (Al-Oufi, 1999). However, when the population is distributed randomly, randomisation is possible even when using non-probability sampling (Kish, 1995).

Although this research will produce individual data, the objective is to investigate the nature of the relationships between buyers and sellers and to understand the strengths of, and common factors among, fishermen who earn higher incomes. It also seeks an understanding of the commercial behavior of the producers and buyers. With careful attention

to the nature of this research and the associated circumstances, it has been judged that probability-sampling techniques would not be appropriate. Non-probability sampling was found to be more suitable for this research to ensure data validity. Therefore, the use of non-probability-judgment sampling is a justified procedure for this research. Based on the research objective, the type of data, and from whom the data should be collected, the procedure will fulfill the requirements of the research.

A field survey was conducted to elicit views of fishermen using two types of questionnaires—one for those fishermen who were engaged in relationship marketing with a preferred buyer, i.e., traders (identified as Group A), and the other for those fishermen who were not engaged in relationship marketing (identified as Group B). As there was no a priori knowledge about individual fishermen's marketing relationships, the interviewers asked the respondents, prior to commencing the interview, if they were involved in any sort of relationship with the traders.

Questionnaires for both the groups (A and B) contained three different sets of questions. The first and second sets, which were common to both groups, sought information on the backgrounds of the respondents, the nature of their participation in the sector, and the nature of their relationship with the Extension Services Department of the Ministry of Agriculture and Fisheries. The third set of questions, which was administered solely to Group A, was designed to collect information on the nature of the relationship between the fishermen and their preferred traders and the current practices in the area of supply chain management. Altogether, the questionnaire contained 64 questions for Group A and 29 questions for Group B respondents.

The majority of questions were dichotomous in nature. To reduce interviewer bias, 53 research assistants (data collectors) were trained to interview 510 fishermen from 110 villages along the Batinah coast. The respondents from both groups were

kept anonymous following the code of conduct by the Ministry of Agriculture and Fisheries, mainly to avoid any inappropriate use of survey information.

There are two major reasons in this research for deciding to use a large number of volunteer data collectors from various villages along the Batinah coast. First is accessibility to fishermen, and second, cost and time constraints. Having over 120 villages scattered along 270 km long coast, with different social and cultural differences, access to fishermen was a major concern to obtain reliable information. Therefore, data collectors were selected from the local area who were enrolled in Sultan Qaboos University. The selected data collectors had the advantage of knowing the region and the fishermen. To ensure data quality, the data collectors were under close supervision and were required to provide day to day feedback at designated control rooms.

#### Data and Dimension Reduction

A higher number of “non-response” was observed in variables related to income and catch. This was not unusual as it has been commonly observed in socio-economic surveys (Groves et al., 2004). Furthermore, it is noted that these small-scale fishermen were not maintaining records of their income and catch on a regular basis. Finally, following the recommendation by Beale and Little (1975), 39 questionnaires with missing data were eliminated from the analysis to reduce the potential bias.

In an attempt to deal with quantitative measurements of multiple variables, Field’s (2005) suggestion was followed and accordingly factor analysis was used as the “dimensionality reducing” technique in this multivariate context. The factor analysis technique has been widely used to overcome the problems of multicollinearity in regression analysis (Batt, 2003). Factor analysis also helped understanding the structure of the dataset as the investigation of relationship marketing involves many components, such as opportunistic behavior, cooperation,

Table 1.—Independent Sample *t*-test.

Variable	Mean A	Mean B	<i>t</i>	Sig.
Are you a partner in another fishing boat?	0.373	0.373	0.002	0.998
Is it difficult to obtain ice?	0.147	0.133	-0.255	0.799
Is it difficult to obtain fuel?	0.240	0.241	0.014	0.989
Fisherman's age	38.893	40.277	0.569	0.570
Can you read and write?	0.773	0.687	-1.250	0.222
Is the boat made of fiberglass?	0.773	0.843	1.110	0.269
Do you have another job or source of income?	0.320	0.337	0.230	0.818
Are you the owner of the boat?	0.787	0.747	-0.585	0.559
Do you keep income in-house instead of sharing with the crew (if they are relatives)?	0.093	0.024	-1.831	0.070
Are the crew your relatives?	0.747	0.795	0.723	0.471
Engine power	55.347	50.157	-1.160	0.248
Number of crew	2.267	2.349	0.620	0.536
Average weekly catch	471.467	308.373	-1.354	0.178
Approximately, what is the average annual income from fishing activity?	1895.00	1237.00	-2.655	0.009
Exchange of information and cooperation with MAF (Factor A1)	0.017	0.157	0.922	0.358
Strongly involved with MAF (Factor A2)	0.059	-0.205	-1.684	0.094
Trips per week	7.707	6.964	-1.182	0.239
Total weekly fishing cost	61.75	69.41	0.659	0.511
Boat length	21.13	20.66	-0.958	0.339

information and knowledge, propensity to leave, and power and acquiescence (Morgan and Hunt, 1994).

Two factor analyses were conducted with respect to 1) relationship marketing between the fishermen and their preferred buyer and 2) the supply chain management practices. In the first factor analysis, which was applied to Group A fishermen, 23 variables related to relationship marketing were included. However, the second factor analysis, which was applied to Group A as well, included a set of 15 variables, derived from the supply chain management principles focusing on customers and the right delivery (Collins et al., 2002). These variables were recorded against questions that were asked to assess whether the fishermen were handling their catch in a proper manner and meeting buyers’ needs. The factors and their loadings on each variable were determined using the default criteria and the “varimax” method of the SPSS<sup>2</sup> program, respectively.

#### Econometric Modelling on Relationship Marketing and Its Effect on Fishermen’s Income

To conclude whether engaging in relationship marketing could have an

<sup>2</sup>Mention of trade names or commercial firms does not imply endorsement by the National Marine Fisheries Service, NOAA.

impact of fishermen income, several quantitative techniques were adopted. These were done in three steps mentioned below.

#### Step 1 Computation of Unpredictable Component: Based on an Earlier Study

In this step, we used the study by Al-Jabri et al. (2013) as a basis of further empirical investigation and accordingly the residual is obtained from their estimated logistic regression model. The residual series represents the extent of the unpredictable component (23.6%) and following the objective of this paper, the series is used for subsequent empirical analysis to examine whether the engagement in relationship marketing and adoption of supply chain management practices could explain some of the unexplained (23.6%) variation in fishermen’s income.

#### Step 2 Group Comparison: Independent Sample *t*-test

An independent sample *t*-test involving Groups A and B was performed based on the average score of relevant variables (including income) that was common to both the groups and was likely to affect the fishermen’s economic performance (Table 1 lists these variables) to determine any significant differences between the groups with respect to the variables.

**Table 2.—Probit model coefficients.<sup>1</sup>**

Predictor	b	S.E.	Z	P[ Z < z]	Effect size r
Trips per week	0.055	0.020	2.799	0.003	0.167
Strongly involved with MAF (Factor A2)	0.175	0.086	2.046	0.021	0.122
Engine Power	0.004	0.005	0.770	0.221	0.046
Boat Length	0.028	0.035	0.816	0.209	0.049
Fisherman age	-0.002	0.007	-0.281	0.390	-0.017
Fisherman thinks of investing in another boat	0.223	0.178	1.251	0.106	0.074
Difficulty getting fuel	-0.146	0.193	-0.754	0.227	-0.045
Difficulty getting Ice	0.203	0.214	0.947	0.174	0.056
Fisherman owns boat	0.271	0.216	1.255	0.105	0.075
Barka	1.647	0.370	4.456	0.000	0.265
Masana'a	1.499	0.353	4.243	0.000	0.253
Suwaiq	1.209	0.318	3.808	0.000	0.227
Khabora	1.017	0.316	3.222	0.001	0.192
Saham	1.364	0.344	3.969	0.000	0.236
Shinas	0.924	0.356	2.596	0.005	0.155
Other sources of income	-0.059	0.188	-0.314	0.378	-0.019
Fisherman can read and write	0.347	0.228	1.521	0.063	0.091
Constant	-2.634	0.717	-3.676	0.000	-0.219

<sup>1</sup>N = 282; Pearson Goodness-of-Fit Chi Square = 286.300; DF = 264; p = 0.165.

### Step 3 The Heckman Two-stage Procedure

*Stage 1: Computing Inverse Mills Ratio* It is important to note that when analyzing a subset of the population, censored sampling bias may occur. Therefore, the Heckman procedure was used to construct a selection bias control factor known as the Inverse Mills Ratio (IMR) (Warning and Key, 2002; D'Haese et al., 2005). To compute the IMR, first a dependent (dummy) variable of a relationship group was created where a fisherman in Group A was given a value of "1", and "0" otherwise. A probit model was used and the dependent variable was regressed on potential variables that could determine the probability of a fisherman being from Group A or B (Table 2 lists the variables).<sup>3</sup>

The computed IMR was then used in the second stage of the regression

<sup>3</sup>There is neither theoretical background nor previous research on which variables can predict whether or not a fisherman was engaged in relationship marketing, that is, being a fisherman in Group A or B. In probit models, the independent variables are presumed to affect the choice or category or the choice maker and represent a priori beliefs about the causal or associative elements important in the choice or classification process, the independent variables in this analysis were chosen based on the researcher's presumption that they could predict the dependent variable. The variables entered in the model are the regions, number of weekly trips, engine power, boat length, difficulty of getting ice, difficulty of getting fuel, willingness to invest in another boat, other sources of income, age, ownership of the boat, ability to read and write, and a strong relation with the MAF.

analysis (as discussed below) when estimating the effects of the relationship and supply chain management practices to produce unbiased parameter estimates. The computed IMR was a summary measure that reflected the effects of all unmeasured characteristics related to engagements in relationship marketing. The value of this ratio for each of the respondents was recorded and added, at the same time, to the data file as an additional variable for further analysis (Smits<sup>4</sup>).

*Stage 2: Regression Involving Residuals from Step 1 and Relationship Marketing Variables* The concluding stage involved linear regression analysis to examine the impact of relationship marketing on fishermen income. This was achieved by using the residuals from the logistic regression, as determined in Step 1, as a dependent variable against the potential factors associated with the relationship marketing and supply chain management.<sup>5</sup> The potential independent vari-

<sup>4</sup>Smits, J. 2003. Estimating the Heckman two-step procedure to control for selection bias with SPSS. Dept. Economics of Nijmegen School of Management, Nijmegen Univ. (Online at <http://home.planet.nl/~smit9354/selbias/Heckman-SPSS.doc>) (retrieved 8 April 2007)).

<sup>5</sup>Questions relating to supply chain management and relationship marketing were derived from Morgan and Hunt (1994) on relationship marketing, Batt (2003) on trust, Collins et al. (2002) on the principles of supply chain management, and Warning and Key (2002) and D'Haese et al. (2005) on the contribution of being in a relationship to the fishermen's income.

ables were grouped before conducting the regression analysis. The purpose of this grouping was to learn what proportion of total variation a set of variables could explain independently.

## Results and Discussion

### Factor Analysis

The factor analysis involving 23 variables resulted in five factors (B1, B2, B3, B4, and B5) with eigenvalues greater than 1. Factor B1 explained 24.27% of the variance, Factor B2 explained 12.41% of the variance, Factor B3 explained 7.99% of the variance, Factor B4 explained 7.34% of the variance, and Factor B5 explained 6.73% of the variance. Added together, all factors explained 58.74% of the total variance. The grouping of these factors with their underlying items is presented in Table 3. Having Factors B1 and B2 explaining about 37% of the variance indicated the importance of satisfaction and behavior in explaining the phenomena of relationship marketing between the fisherman and the preferred trader.

The second factor analysis, which involved 15 variables, resulted in three factors (C1, C2, and C3). The factor C1, "overall buyer satisfaction with product" explained 29.5% of the variance; factor C2, "adding value" explained 22.2% of the variance; and factor C3, "product differentiation and satisfaction with delivery" explained 14.9% of the variance. Altogether, these factors explained 66.6% of the total variance. The grouping of these factors with their underlying items is presented in Table 4. The results of the factor analysis revealed the importance of factors A1, B1, B2, C1, C2, and C3 in terms of their contribution to the study, as measured by the percentage of variance explained by these factors.

### Econometric Modelling

#### Step 1

We gathered from the results of the logistic model used by Al Jabri et al. (2013) that the model explained 76.4% of variation in the fishermen's income

**Table 3.—Factor analysis of relationship marketing and trust.**

Factor	Factor loading	Total	Initial eigenvalues	
			% of variance	Cumulative %
Factor B1: Relational satisfaction and cooperation		3.641	24.271	24.271
Do you think that your preferred buyer cheats you?	-0.372			
Have you complained (at least once) to your preferred buyer about his commercial behavior toward you?	-0.402			
Is there continuous cooperation between your preferred buyer and yourself?	0.782			
Are you always friendly toward your preferred buyer?	0.633			
Does your preferred buyer always keep his promises?	0.574			
Are you convinced that dealing with this buyer is of benefit to you?	0.731			
Factor B2: Opportunism and commercial behavior		1.862	12.411	36.682
Do you think that your preferred buyer cheats you?	0.511			
Are there frequent disagreements between you and your preferred buyer?	0.714			
Have you complained (at least once) to your preferred buyer about his commercial behavior toward you?	0.387			
Do you agree that you are getting more benefit out of this relationship than if you sold to other buyers?	-0.581			
Do you think that your preferred buyer would not abandon your interests even if there were advantages to him in doing so (that is, is he an opportunist)?	0.586			
Factor B3: Power, dependence, and acquiescence		1.198	7.985	44.667
Have you complained (at least once) to your preferred buyer about his commercial behavior toward you?	0.491			
Must you always do what your preferred buyer tells you?	0.816			
Do you think that if you change and deal with another buyer, you will lose?	0.335			
Do you agree that you are getting more benefit out of this relationship than if you sold to other buyers?	0.446			
Are you highly dependent on this buyer?	0.585			
Factor B4: Sharing value and information		1.101	7.342	52.009
Do you think that your preferred buyer keeps back some useful information for himself?	0.754			
Do you think that the profits of your preferred buyer are much higher than yours?	0.782			
Do you think that your preferred buyer would not abandon your interests even if there were advantages to him in doing so (that is, is he an opportunist)?	0.425			
Factor B5: Propensity to leave and change buyer		1.010	6.732	58.742
Do you think that your preferred buyer cheats you?	0.355			
Do you think that if you change to deal with another buyer, you will lose?	0.531			
Are you highly dependent on this buyer?	0.332			
Do you think that it is not to your benefit to stop dealing with this buyer?	0.826			

levels, and 23.6% of the variation remained unexplained. As mentioned earlier, the residual from the logistic model was computed and used subsequently to investigate how much of the unexplained variation in fishermen's income could be predicted by factors such as "relationship marketing" and "supply chain management practices."

**Step 2**

Based on 5% significance level (Table 1), out of 19 variables, only the "income" variable indicated a significant difference between the two groups.

On average, Group A fishermen (who were engaged in relationship marketing with buyers) experienced higher (about 53.2%) annual incomes than that of Group B. This may suggest group homogeneity with respect to all other variables but income. It led to the conclusion that fishermen in Group A were more competitive than the fishermen in Group B, because they got a better value for their catch due to relationship marketing.

This finding raised a question about the influence of "fisherman-agent" relationship on income. To gain an initial

insight on this subject a closed-ended question with the following four potential responses was administered to Group A fishermen to know the type of benefits they gained from their relationship with the preferred trader: 1) a secure income, 2) increased quantity of fish sold, 3) improvement in the quality of catch to meet traders' preference, and 4) better prices.

"Better prices" secured the highest response rate (97.1%), followed by "a secure income," and "an improvement in the quality of catch." Less than one-third of the respondents mentioned

**Table 4.—Factor analysis of focusing on customers, adding value, and getting the product right.**

Factor	Factor loading	Total	Initial eigenvalues	
			% of variance	Cumulative %
Factor C1: Buyer dissatisfaction with product		2.066	29.510	29.510
Did your preferred buyer complain (at least once) that you did not provide him with enough fish (that is, buyer satisfied with quantity)?	0.815			
Did your preferred buyer complain (at least once) that he did not get the species he wanted (that is, buyer satisfied with species)?	0.804			
Did your preferred buyer complain (at least once) about the quality of your catch (that is, buyer satisfied with quality)?	0.740			
Factor C2: Adding value and quality maintenance		1.555	22.209	51.719
Do you use ice when fishing?	0.857			
Do you have an icebox to keep the catch in your boat or at the landing site?	0.846			
Factor C3: Product differentiation and satisfaction with delivery		1.041	14.866	66.585
Do you grade your fish by size and species before delivery to your preferred buyer (do you provide the buyer with a bulk catch)?	0.893			
Did your preferred buyer show disapproval (at least once) while receiving catch?	0.603			

**Table 5.—Group description of predictors of multiple regression with diagnostics.**

Model and variable		Cumulative R <sup>2</sup>	Successive F-value (d.f.)
Model 1: Maintain product quality and buyer satisfaction	Do you have problems associated with transportation and storage to satisfy the requirements of your preferred buyer? Buyer dissatisfaction with product (Factor C1). Adding value and quality maintenance (Factor C2). Product differentiation and satisfaction with delivery (Factor C3) Does the buyer always accept your catch (that is, never rejected)? If your preferred buyer rejects the catch do you bring it to the market immediately or call another buyer?	0.420	5.28 (7, 51)
Model 2: Trust	How confident are you that your preferred buyer is trustworthy? Opportunism and commercial behavior (Factor B2). Power, dependence, and acquiescence (Factor B3). Propensity to leave and change buyer (Factor B5).	0.543	3.17 (4, 47)
Model 3: Sharing value and information	Do you often discuss future demand for fish with your preferred buyer? Do you have minimum knowledge of the customers and selling prices of your preferred buyer? In your opinion, do you agree that sharing information is the reason for the success of this relationship? Sharing value and information (Factor B4).	0.643	2.98 (4, 43)
Model 4: Familiarity and association with buyer	Is this buyer a trucker/agent? Do you deal with this preferred buyer because he is a friend and a known person? How long have you been selling to the preferred buyer named above? How often, per week, do you sell your catch to this named buyer?	0.725	2.93 (4, 39)
Model 5: Agreement and trading	Do you have an agreement that the catch is only for him? Approximately, what is the percentage of your sales to this buyer?	0.773	3.87 (2, 37)
Overall summary statistics	Durbin-Watson: 2.83		

that they experienced a gain in the quantity of fish sold. These findings indicated that the fishermen in Group A gained competitive advantage because of the high prices they received.

### Step 3

*Computing of the IMR* From the probit model (Table 2), the Inverse Mills Ratio (IMR) was calculated. There were some unobserved factors that could increase the probability of engaging in a relationship with a buyer, which could be indicated by the concluded significance of the IMR. The model shows that the IMR turned out to be statistically insignificant at the 5% level. The non-significance of the Inverse Mills Ratio ruled out the possibility of any censored sampling bias in estimating the parameters (Warning and Key, 2002; D’Haese et al., 2005).

### Linear Regression of the Residual

Accordingly, five groups of predictors were proposed and entered as blocks to the model (Table 5). These five blocks included maintain product quality and buyer satisfaction, trust, agreement and trading, sharing value and information, and familiarity and association with buyers. As shown in Table 5, variables under the

“maintain product quality and buyer satisfaction” categories included the predictors on product quality and storage, which produces R<sup>2</sup> value of 0.420 and the corresponding F-ratio of 5.278 was significant at the 5% level. Model 1 therefore, explained 42% of the variance in the dependent variable.

Because the residual counted for 23.6% of the unexplained variance, so the predictors of quality, product, and storage counted for 9.9% (0.42 × 23.6) of the variance in fishermen’s income levels. This result indicated the importance of delivering products that buyers expect. It also indicated the importance of maintaining quality through the use of ice and iceboxes during storage and transportation.

The variables representing trust in Model 2 caused R<sup>2</sup> to change from 0.420 to 0.543, with a significant F-ratio of 3.169, at the 5% level. The predictors in Block 2 explained 12.3% of the variance in the dependent variable, which accounted for (0.123 × 23.6) 2.9% of the variance in fishermen’s income levels. This indicated that mutual trust between the fisherman and his preferred trader can affect fishermen’s income. Adding “sharing value and information” as a predictor further caused R<sup>2</sup> to change from 0.543 to 0.643. This addition changed the F-ratio to 2.984, which was signifi-

cant at the 5% level. The predictors in Model 3 explained almost 10% of the variance in the dependent variable. Therefore, “sharing value and information” accounted for approximately 2% (0.099 × 23.6) of the variance in fishermen’s income.

Model 4 caused an increase in R<sup>2</sup> value to 0.725. The change was significant at the 5% level with an F-ratio of 2.927. Being familiar with the buyer and the social capital built through the relationship explained 8.3% of the variance in the dependent variable, which accounted for (0.083 × 23.6) about 2% of variance in the fishermen’s income.

Finally, Model 5 on the type of agreement and trading caused R<sup>2</sup> to change from 0.725 to 0.773, with a significant F-ratio of 3.870, at the 5% level. The predictors of Block 5 explained 4.8% of the variance in the residual. Therefore, the nature of the agreement and the amount of catch sold to the buyer accounted for 1.1% of variance in the fishermen’s income level.

Therefore, regression analysis of variables on the nature of relationship between the fisherman and practices of supply chain management was able to explain 77.3% (R<sup>2</sup>) of the unexplained variance (the residual) of logistic regression analysis on the fishermen’s income level. This indicated

**Table 6.—Results of the multiple regression model.**

Variable	B	S.E	Beta	t	Sig.
(Constant)	-0.604	0.143		-4.219	0.000
Inverse Mills Ratio (LAMBDA)	0.043	0.075	0.055	0.577	0.567
Do you have problems associated with transportation and storage to satisfy the requirements of your preferred buyer? Q13	0.043	0.043	0.111	0.992	0.328
Adding value and quality maintenance (Factor C2)	0.176	0.022	0.892	7.870	0.000
Buyer dissatisfaction with product (Factor C1)	-0.036	0.020	-0.209	-1.831	0.075
Product differentiation and satisfaction with delivery (Factor C3)	0.015	0.021	0.077	0.723	0.474
Does the buyer always accepts your catch (that is, never rejected) (Q8)	0.172	0.130	0.200	1.324	0.194
If your preferred buyer rejects the catch do you bring it to the market immediately or call another buyer? (Q7)	0.240	0.104	0.354	2.311	0.026
How confident are you that your preferred buyer is trustworthy? (Q23)	0.083	0.041	0.212	2.022	0.050
Opportunism and commercial behavior (Factor B2)	-0.040	0.017	-0.220	-2.333	0.025
Power, dependence, and acquiescence (Factor B3)	-0.011	0.019	-0.063	-0.596	0.555
Propensity to leave and change buyer (Factor B5)	0.017	0.025	0.077	0.691	0.494
Do you have an agreement that the catch is only for him? (Q6)	0.094	0.041	0.211	2.277	0.029
Approximately, what is the percentage of your sales to this buyer? (Q10)	0.002	0.001	0.188	1.897	0.066
Do you often discuss future demand for fish with your preferred buyer? (Q19)	0.065	0.054	0.133	1.194	0.240
Do you have minimum knowledge of the customers and selling prices of your preferred buyer? (Q21)	0.126	0.038	0.394	3.331	0.002
In your opinion, do you agree that sharing information is the reason for the success of this relationship? (Q37)	0.061	0.044	0.126	1.387	0.174
Sharing value and information (Factor B4)	-0.019	0.022	-0.099	-0.894	0.377
Is this buyer a trucker/agent? (Q3)	0.079	0.045	0.178	1.738	0.090
Do you deal with this preferred buyer because he is a friend and a known person? (Q5)	0.076	0.045	0.200	1.711	0.096
How long have you been selling to the preferred buyer named above? (Q4)	-0.009	0.004	-0.255	-2.483	0.018
How often, per week, do you sell your catch to this named buyer? (Q9)	-0.008	0.014	-0.066	-0.550	0.586

N = 59 (Group A).

that 18.2% ( $23.6 \times 0.773$ ) of the variance in the income level of fishermen from Group A was explained by these variables.

From the above analysis we concluded that the overall contribution of engaging in supply chain management practices and maintaining a good relationship with traders, associated with trust and good manners, explained 18.2% of the variance in income of the fishermen. This indicated that fishermen's engagement in relationship marketing and supply chain management practices could improve their income by 18.2%.

The regression model results, as shown in Table 6, highlight the important factors in each block that contributed significantly to the final model. The significance of Factor C2 (even at 1% level) indicates the importance of quality in the determination of small-scale fishermen's income in the Batinah coast, particularly in the area of supply chain management. The data also reveal that despite being statistically insignificant, buyer dissatisfaction makes a negative impact on fishermen's income. These two findings altogether indicate that focusing on customers and final consumers, in addition to delivering the right products, is important for the income of

the small-scale fishermen in the Batinah Governorates. Furthermore, maintaining good relations with more than one buyer is important, especially when a single buyer refuses to accept the entire catch. As a result, a fisherman would not be forced to discard his catch.

Trusting the preferred buyer was found to have a positive relationship with income. Building trust between both the fisherman and the buyer improved mutual understanding and led to a higher number of deals between them. On the contrary, opportunistic behavior was found to be negatively related to income. Opportunistic behavior reduced trust and caused parties to rethink before the deals, and decreased the number or amount of transactions in the long run.

Holding relationships with different buyers provided more opportunities for outlets for the product. Having some knowledge of the downstream customers of the preferred buyer and the deals (prices) was found to be highly significant in predicting income level. This knowledge provided fishermen an opportunity to avoid selling below market price.

Results revealed that sharing information, which was also a reason for successful relationships, showed pos-

itive relationships with income. These findings showed that sharing information between the partners in the supply chain was important in relationships and could improve income. It was also found that over a period of time, as the relationship with the buyer increased, social capital was established and relations became stronger, which in turn, induced discounts and prevented bargaining on prices.

Fishermen's income was found to be higher in cases where they agreed to sell their entire catch to a single buyer. Alternatively, the proportion of a fisherman's catch sold to the buyer was found to be positively related to income, i.e., a higher percentage meant higher income. This implied the importance of maintaining a good relationship to guarantee better income.

### Conclusion and Recommendations

One of the strategic objectives of the fisheries sector in Oman is to enhance the income of the traditional fishermen (MNE, 2007). Giving primary consideration to this strategic objective, our study ascertains the important role that the fishermen-trader arrangements can play on the income of the traditional fishermen in the study area. However, the study does not claim that the end results are ideal. This is be-

cause the existing fishermen-trader marketing relationship is not mature and lacks transparency in the determination of price, quality, and quantity as the results of these activities failed to show up in national statistics. These factors are likely to cause market imperfections, and thereby lead to inefficient results. Therefore, appropriate strategic actions seem desirable to improve fishermen's share in output price and improve marketing systems.

There are various approaches that can be followed to attend to market imperfections. One approach to addressing market imperfections is through institutionalizing the fishermen-trader arrangements in a collaborative manner and shaping up the arrangements through regulatory measures and incentives (such as providing infrastructures, access to improved technology, etc.) so that such arrangements can generate the most economic value to society, and fishermen can negotiate the price of their products with a greater degree of transparency.

Another approach is to create opportunities for fishermen to access markets and obtain competitive price for their harvests. This option was adopted by the Ministry of Agriculture and Fisheries in April 2014, when it formally established the central wholesale fish market in Al-Batinah Governorate with a goal of improving the fish marketing system in Oman.

The main reasons for the establishment of the wholesale market include, among others, boosting fishermen's income by giving them access to the market to get fair price for their products through competitive bidding and ensuring product quality to protect consumers' health and well-being. This strategic action is certainly a significant step in the right direction as the initiative has the potential for correcting the extent of existing imperfections in the post-harvest sector.

However, to reap the benefits of such strategic action and achieve the intended objectives of the sector stipulated in the 5-year plan appropriate regulatory measures need to be taken to improve its operational efficiency so

that the market can meet its economic objectives, and the effort needs to be intensified by including other coastal governorates. The authorities should play an active role in raising awareness among fishermen regarding the potential of the wholesale establishment to improve their economic situation in the long run. Furthermore, it is envisaged that improvement in transportation and storage facilities will play a significant role in improving fishermen's income through preserving product quality.

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