Marketing Choices and Determinants of Profit Margins of Artisanal Fishers in Ghana

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Abstract

The study examined the determinants of profit margins earned by artisanal fishermen in Ghana using the concept of percentage contribution margin. The effects of selected variables on margins were examined for two marketing agents - spouse and other agents. A system of equations were estimated separately for the major and minor fishing seasons and a combined season for the agents. The percentage of fish sold through the spouse is found to negatively impact contribution margins, suggesting that spouses are perhaps the last resort fishermen use to sell fish. This is a departure from traditional culture where spouses handled fish sales and revenues. Self-financing of fishing activities and boat size are found to positively impact margins and the percentage of fish sold through the spouse. Self-financing and boat size have relatively large impacts on margins. The positive impact of self-financing may be attributed to lower transactions costs while the impact of boat size may result from cost efficiencies, higher catches, and higher revenues. The effects of gear used, i.e., nets and hook-and-line on profit margins are positive. Nets can be targeted at shoals of fish and could result in large quantities of harvest, especially in the major fishing season. The use of hook-and-line is only significant in the minor season for margins earned from selling through other agents. Overall, the study reveals that economic considerations appear to be driving fishermen's choice of marketing agents. As price takers, fishermen can improve profitability through minimizing costs, and improving cost and operational efficiencies.

Introduction

Ghana is an advanced fishing country relative to other African countries with very experienced fishermen, which has been attributed to long traditions from the colonial era. Law (1989) suggested that marine fishing in Ghana developed mainly with the arrival of European traders when the Europeans hired fishermen as canoe men to transport people and goods from their ships to the beaches, and vice-versa. The marine capture fishery in Ghana is the major source of local fish production, accounting for over 80% of the total supply (FAO, 2004). The sector consists of four subsectors: small scale or artisanal, semi-industrial or inshore, industrial or deep sea, and tuna fleets, which play a major role in poverty reduction and livelihoods of coastal communities. The fisheries sector is estimated to contribute about 3.9 percent of Ghana's gross domestic product (GDP) and 11 percent of the Agriculture GDP (Bank of Ghana, 2008). The small scale or artisanal subsector accounts for 70-80% of the total marine catch in Ghana (Amador et al., 2006).

The artisanal fishery involves the use of canoes or dug-out wooden boats with inboard or outboard engines. The fishing gears are diverse, including beach seine nets, purse seine nets, set nets, drifting

gillnets, and hook and line. The main target species are small pelagic such as anchovies, sardinellas and mackerels. Artisanal fishermen with large motorized canoes operate in deep waters and have storage facilities or compartments on board for storing ice to preserve their catch. The main fishes landed by artisanal fishemen include sardinellas (mainly *Sardinella aurita*), tuna (*Auxis thazard*), mackerels (mainly *Scomber japonicas*), burrito (*Brachydeuterus auritus*), and Atlantic bumper (*Chloroscombrus chrysurus*). Some of the minor fishes landed include red fish (mainly *Sparus caeruleostictus* and *Dentex angolensis*), anchovies (*Engraulis encrasicolus*), flat fish species, and the white grouper (*Epinephelus aeneus*). Most of the fishermen target high value species such as white grouper, tuna, and red fish because of the high demand and ensuing price premiums (Aheto et al., 2012; Antwi-Asare and Abbey, 2011).

The artisanal fishery plays an important role in coastal communities by providing employment, income, and a source of food. The major challenges they face are seasonality, small margins and low returns (Aheto et al., 2012; Gordon and Owusu-Adjei, 2011; Mensah and Antwi, 2002). The sector's performance is critical for the growth and economic development of the coastal communities. The low returns of artisanal fisheries might result from several factors including limited value addition, weak backward-forward market linkages, poor infrastructure, low bargaining power, as well as low catch.

Artisanal fishermen carry out their transactions through various marketing channels including spouses, middle-women, processors, small traders, food vendors, and direct to end users. Each channel provides some level of benefits and returns. It is assumed that fishermen would expect to derive higher benefits from the marketing channel they choose to use the most. The margins derived from artisanal fishery depend on a number of factors and tend to be highly variable (Mensah and Antwi, 2002). There may be occasions where fishermen operate at very low margins and are sometime willing to operate at a loss in the short-term just to stay in business. In the artisanal fishery value chain in Ghana, it is commonly perceived that middle-women and processors accrue a greater percentage of the profit margins generated along the fisheries value chain, followed by retail traders, and then the fishermen. This perceived outcome could be the result of a combination of factors such as entrepreneurial skills of middle-women/wholesalers as they usually trade diverse food products, which gives them more access to capital, providing them some leverage with both fishermen, processors and retail traders (Britwum, 2009).

This study examined the profit margins accruing to artisanal fishermen derived from utilizing spouses and other marketing agents. The profit margins were examined in the form of percentage contribution margins (PCM), which is the ratio of total sales revenue that covers total variable costs to total sales revenue (Garrison, Noreen and Brewer, 2003). In spite of the interest in the welfare of artisanal fishermen and the returns they receive from their fishing activities, little is known about the determinants of the margins. The literature on food and product markets in developing countries has overwhelmingly reported increasing power of middlemen, intermediaries and retailers, and their tendency to negotiate lower prices from producers (Pokhrel and Thapa, 2007; Chau, Goto, and Kanbur, 2009; Brooks et al., 2010). Nevertheless, for profit margins that accrue to artisanal fishermen, it is important to examine the factors that impact these margins. This study sought to fill this information gap by examining the impact of price, fish type, fishing gear used, boat size, and transaction factors on contribution margins. The empirical research questions examined were: What are the key determinants of percentage contribution margins from fish sold?

How do price, the gear type, boat size, fish type, and transaction factors affect the percentage contribution margins?

Fisheries and Gender
Women's participation in small-scale fisheries in developing countries include pre- and post-harvesting activities, and is estimated at about 48%; in Ghana, women participation is estimated at 40% (FAO, WorldFish, World Bank 2008). Women play a vital role in artisanal fisheries in Ghana, which includes informal financing (Gordon, Pulis, and Owusu-Adjei, 2011; Britwum, 2009). Wealthy middle women, often known as "fish mothers" tend to pre-finance fishing trips of fishermen who need credit with fuel and food to secure access to the catch from the fishermen. The fish mothers can support several fishermen and consequently have access to ample supply of fish. Such arrangements tend to place some power in the hands of the fish mothers at various landing sites (Gordon, Pulis, and Owusu-Adjei, 2011).

The marketing system and remuneration for artisanal fishing take a number of forms. A proportion of the catch goes to fish mothers to cover any pre-financing arrangements; a portion is sold or given to the boat owner to cover fixed costs (boat and fishing gear); hired laborers may receive a portion of the catch as wages; and smaller portions are shared for meals (Britwum, 2009). Thus, fish may be sold through fish mothers as well as other female fish value chain agents including fish processors, fish retailers, food vendors, relatives, and spouses.

The traditional cultural roles for women in the fishing industry in Ghana, which were structured through responsibilities and customs for accessing resources are gradually changing (Britwum, 2009). Traditionally, a fisherman is required to provide fresh fish from his catch to his spouse for retailing either as fresh or processed products to generate income to maintain the household as well as provide income for further investments in the fishing enterprise. However, with increasing capital costs associated with artisanal fisheries relating to the use of larger canoe sizes, high powered motors, and fishing equipment, fishermen are increasing taking control of the marketing and revenues from fish sales (Gordon, Pulis, and Owusu-Adjei, 2011; Britwum, 2009). It has been reported that financial institutions are refusing to offer credit to the fisheries sector due to poor loan repayment performance arising from poor loan management, low catches, and fishermen indebtedness (Acquah and Addo, 2011). With limited access to formal bank credit, it appears fishermen are increasingly taking control of their earnings to ensure capital is available to invest in the fishing business, thus taking away the traditional fish marketing role from their spouse.

Percentage Contribution Margin (PCM)
The PCM is calculated from total contribution margin (TCM). TCM is the amount by which total sales revenue (TSR) exceeds total variable costs (TVC), i.e., TCM = TSR – TVC (Garrison, Noreen and Brewer, 2003). Therefore, PCM=TCM/TSR. The contribution margin per unit is not necessarily the same as gross margin because, while contribution margin per unit is calculated as the selling price less the variable cost, unit gross margin is the selling price less the cost of production. Ailawadi and Harlam (2004) suggested that much of the marketing literature examine percentage margins because they can be readily compared across product categories instead of using just the value of margins. Much of the literature lies in examining margins between store brands and national brands in various product categories (e.g., Ailawadi and Harlam, 2004;

Pauwels and Srinivasan, 2003; Chintagunta et al., 2002; Corstjens and Lal, 2000; Kadiyali et al., 2000).

For artisanal fishermen, total contribution margin is obtained from total sales of all fish catch minus the total variable costs, which include expenses associated with fishing activities such as fuel, food, labor, taxes and other variable overheads. The profits obtained by fishermen from fish sales depend on the level of contribution margins. If the total contribution margin is low, a fisherman will not have enough returns to cover fixed costs and earn profits from his fishing activities. Therefore, understanding the determinants could help fishermen make informed decisions about where and how to sell their fish catches. Fishermen can improve total margins through reduced variable costs, reduced wastage, improved operational efficiencies, and obtaining higher market prices (with other costs remaining the same).

One major challenge facing small-scale fishery activities in Ghana relates to the seasonal nature and consequent variable economic activities and fluctuating incomes (Mensah and Antwi, 2002). As rational economic actors, fishermen would be expected to adopt marketing strategies that enhance income stability through their transactions. Chen and Dunn (1996) suggested that small-scale producers are both suppliers and consumers of their products and they make production and investment decisions within the context of their overall household economic portfolio like other micro-entrepreneurial households. They are mindful of the household economic portfolio and economic decisions and subsequent outcomes/returns from their activities flow back to the household pool of resources. This could probably justify why small-scale or artisanal fishermen would be expected to also sell fish through their spouses in addition to the fact that traditionally, they are required to provide their catch for sale through their spouses to generate income to maintain the household.

Data
The data used in the study was collected in 2013 from artisanal fishermen at major coastal fishing communities in Ghana, i.e., Chorkor, Jamestown, and Tema in the Greater Accra region, and Elmina, Cape Coast, and Moree in the Central region. The semi-structured questionnaire solicited information on the major activities and services of fishermen, costs and revenues associated with their activities, fish landed, prices, business transaction methods, marketing channels, types of fishing gear used, and demographic factors. The subjects were selected randomly and surveyed.

Data was collected from 202 artisanal fishermen but only 96 responses were used in this analysis because they represented the full responses provided for the relevant variables needed for the analysis. There are two major fishing seasons in Ghana: the major upwelling or bumper season, which is usually from the end of June or early July through late September or early October, and the minor upwelling season, which occurs from late December or early January through February (Cobblah and Jiagge, 2003). Respondents reported the composition of fish landed in the past three fishing seasons. The respondents also reported the prices received for the various species in both major and minor seasons. The price of the fish landed depended on demand and supply, costs, and grade. A weighted average price was calculated for the analysis based on the season and perceived value of fish. Based on multiple responses, 30.63% of fishermen reported landing Sardinella spp, 16.07% tuna, 15.4% mackerels, 13.54% burrito, 12.35% Atlantic bumper, 5.58% red fish, 2.71% anchovies, 2.54% *Soleidae* spp., and 1.18% white grouper. Low catch that fishermen landed

included shrimps (mainly *Parapenaeopsis atlantica* and *Penaeus kerathurusthat*), Atlantic bigeye (*Priacanthus arenathus*), European barracuda (*Sphyraena sphyraena*), Trigger fish (*Balistes punctatus / capriscus*), and Bigeye Scad (*Selar crumenophthalmus*), The white grouper, tuna, and red fish are considered high value.

Information on the method of transaction was also collected from fishermen, i.e., cash, credit, etc., and whether they self-financed fishing operations. Information on the percentage of fish sold through the spouse or other marketing agents was also collected. Other agents consist mainly of middle-women who are also known as fish mothers, and operate as wholesalers (Britwum, 2009). Information was also collected on the size of fishing boat as well as types of fishing gear used. A description of the variables used in the analysis and the summary statistics are presented in Table 1.

Table 1: Description and Summary Statistics of Variables

Variable	Definition	Mean	Min	Max
PCM_1	[(Total fish sales – Total variable costs) / Total fish sales] attributed to spouse (%)	0.28	0	1
PCM_2	[(Total fish sales – Total variable costs) / Total fish sales] attributed to other agents (%)	0.67	0	1
PSS	Percentage of fish sales through spouse (%)	22	0	100
PHV	Percentage of high value fish landed (%)	25	0	100
WAP	Weighted average price of all fishes from peak and low seasons (US$)	4.1	1.5	22.6
SLF	Funding sources for fishing activities (1=self-financing, 0 otherwise)	0.55	0	1
BOT	Boat size (meters)	16.41	8.0	27.0
NET	Fishing gear used is net (1=Yes, 0 otherwise)	0.58	0	1
HKL	Fishing gear used is Hook and Line (1=Yes, 0 otherwise)	0.07	0	1
CST	Method of fish sales transaction (1=cash, 0 otherwise)	0.72	0	1
EXP	Number of years fishing	19	3	41

Empirical Specifications

The artisanal fisherman's marketing choices with a view of investments in the fishing business and household economic portfolio appear to be chosen jointly as part of the same decision problem. This suggests some simultaneity or endogeneity problem and that the percentage of fish sales through the spouse might not be necessarily exogenous in an empirical model when used as an explanatory variable. A Hausman test confirmed the endogenous nature of the PSS variable therefore, an empirical model for percentage contribution margins (PCM) as well as percentage of fish sold through the spouse (PSS) was specified and estimated in a simultaneous system using a

three-stage least squares (3SLS) procedure. The percentage contribution margins (PCM) were specified for margins obtained through the spouse and for margins obtained through other marketing agents. The explanatory variables chosen included percentage of fish sold through the spouse (PSS), weighted average price (WAP), weighted average price (WAP), percentage of high value fish landed (PHV), self-financing (SLF), boat size (BOT), use of nets (NET), use of hook and line (HKL), cash transaction (CST) and fishing experience (EXP)

Based on the preceding discussions, the resulting simultaneous system estimated was:

$$PCM_k = \gamma_{1k}PSS + \gamma_{2k}WAP + \gamma_{3k}PHV + \gamma_{4k}SLF + \gamma_{5k}BOT + \gamma_{6k}NET + \gamma_{7k}HKL + \gamma_{8k}EXP + \varepsilon_k \qquad (Eq.\ 1)$$

$$PSS = + \gamma_9 WAP + \gamma_{10}SLF + \gamma_{11}BOT + \gamma_{12}CST + \varepsilon \qquad (Eq.\ 2)$$

where $k = 1,2$ respectively, represent the percentage contribution margins from fish sold through the spouse and other marketing agents. The equation system is identified because the percentage contribution margin equation (PCM_k) has four variables that do not appear in the percentage of fish sold through the spouse equation (PSS), which in turn has one variable that do not appear in the contributing margin equations.

As mentioned earlier, the seasonal nature of Ghana's artisanal fishing activities presents some challenges relating to income variability. The major season is characterized by increase in fish catches and low market prices leading to suggestions that the margins obtained by artisanal fishermen are low. During the minor season when prices are high, margins could be relatively high if there is enough catch (Aheto et al., 2012; Gordon and Owusu-Adjei, 2011). To compare the effects of the determinants by season, equations (1) and (2) were first estimated for a combined season as Model 1 and also estimated by major and minor seasons as Model 2.

There are no strong theoretical basis for *a priori* expectations about the effects of the selected explanatory variables. Interpretation of their impact on profit margins therefore borders on economic reasoning. The percentage of fish sold through the spouse may have a positive impact on contributing margins ($+\gamma_{1k}$) due to reduced transactions costs and probably higher market prices. In that situation, the coefficient of the price variable in equation 2 (γ_9) may be positive. The percentage of fish sold through the spouse could also have a negative impact on margins ($-\gamma_{1k}$) because fishermen tend to control the marketing and the revenues from fish sales and not necessarily the spouses.

Fishermen can improve total margins through obtaining higher market prices ($+\gamma_{2k}$ and $+\gamma_9$) assuming constant or reduced costs. However, Mensah and Antwi (2002) found that in the minor fishing season, the incomes can be low because of low catch in spite of the high prices. The revenue derived from fish sales during the minor season may not be enough to cover variable costs therefore margins can be low in the minor season. In such situations, higher prices may not necessarily impact contributing margins positively, i.e., $-\gamma_{2k}$ and $-\gamma_9$ may be realized. Aheto et al. (2012) also found that the risks of higher investments by fishermen in the Central region of Ghana do not necessarily lead to higher incomes.

High value fish are considered high grade and are usually sold fresh, attracting relatively higher prices. Assuming constant or reduced costs, the sale of high value fish can positively impact the contribution margins ($+\gamma_{3k}$). However, it may not have an impact if there are low catches as is often the case for high value fishes (Aheto et al. (2012). Aheto et al. (2012) reported a weak negative correlation between investments and incomes for some select high value fish, and concluded that there are challenges to the sustainability of high value species because of targeting by most fishermen. Therefore, γ_{3k} in equation 1 can be negative when there are low returns but high capital outlays towards fishing for high value species.

If a fisherman finances the fishing trip or activities from his own resources and under no obligation to sell fish to fish mothers, the effect of self-financing on contribution margins would be positive ($+\gamma_{4k}$ and $+\gamma_{10}$). The impact of boat size (γ_{5k} and γ_{11}) and fishing gear (γ_{6k} and γ_{7k}) on profit margins can be positive or negative depending on the underlying economic factors.

Model Results and Discussion

The results of a Hausman test of exogeneity of the PSS variable was performed, which confirmed that PSS is indeed not exogenous in both Models 1 and 2. The estimated parameters from the 3SLS system of equations for artisanal fishermen are provided in Tables 2 and 3. Table 2 reports the results of the system of equations for a combined season (Model 1) while Table 3 reports the results by season (Model 2).

Table 2: Determinants of Percentage Contribution Margins (Model 1)

Variable	PCM_1		PCM_2		PSS	
	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
PSS	-0.126***	(0.022)	-0.146***	(0.024)		
WAP	-0.203	(0.124)	-0.0182	(0.127)	-1.538	(1.305)
PHV	-0.002	(0.001)	-0.002	(0.002)		
SLF	2.165***	(0.816)	2.531***	(0.841)	17.955***	(8.064)
BOT	2.469***	(0.812)	2.845***	(0.841)	17.751***	(7.772)
NET	0.231	(0.159)	0.345**	(0.175)		
HKL	0.154	(0.182)	0.193	(0.201)		
EXP	-0.021	(0.065)	0.057	(0.072)		
CST					-0.488	(0.432)

*** represents $\alpha = 0.01$ and ** $\alpha = 0.05$.

The percentage of fish sold through the spouse (PSS) has a consistently negative impact on the profit margins in all the estimated equations (Tables 2 and 3). This finding appears to support the belief that fishermen control the marketing and revenues from fish sales and that the spouses are perhaps the last resort used to sell fish. Gordon, Pulis, and Owusu-Adjei (2011) and Britwum (2009) observed that Ghanaian artisanal fishermen are increasingly taking control of sales and revenues because of increasing capital costs involved in the fishing business. Aheto et al. (2012) also reported increased investment cost in fishing in relation to fishing gear and other equipment

being used by artisanal fishermen in Ghana. Artisanal fishing in Ghana seems to have become a capital-intensive industry requiring high outlays for the purchase and maintenance of the boat, outboard motor and nets as well as cater for operational costs. These developments may be influencing the marketing of fish catch, and fishermen are giving more business considerations over the sale of fish catches than the traditional norms where spouses had more control.

Table 3: Determinants of Percentage Contribution Margins by Season (Model 2)[1]

-	Major Season		Minor Season		PSS
Variable	PCM$_1$	PCM$_2$	PCM$_1$	PCM$_2$	
PSS	-0.113***	-0.121***	-0.115***	-0.244***	
	(0.022)	(0.023)	(0.022)	(0.042)	
WAP	-0.184	-0.142	-0.183	-0.373*	-1.537
	(0.114)	(0.106)	(0.115)	(0.220)	(1.305)
PHV	-0.001	-0.002	-0.001	-0.005	
	(0.001)	(0.002)	(0.001)	(0.002)	
SLF	1.949***	2.097***	2.016***	4.242***	17.972***
	(0.753)	(0.713)	(0.765)	(1.458)	(8.064)
BOT	2.246***	2.422***	2.157***	4.520***	17.853***
	(0.752)	(0.720)	(0.764)	(1.457)	(7.771)
NET	0.203	0.303*	0.238	0.488	
	(0.154)	(0.166)	(0.1578	(0.299)	
HKL	0.126	0.166	0.133	0.601*	
	(0.176)	(0.190)	(0.181)	(0.343)	
EXP	-0.011	0.062	0.025	0.084	
	(0.071)	(0.069)	(0.065)	(0.123)	
CST					-0.659
					(0.427)

*** represents α = 0.01 and * α = 0.10.
[1] Standard error in parenthesis.

The impacts of price (WAP) and high value fishes (PHV) is mostly insignificant in the models except in the minor season equation for percentage margins accruing from sales through other marketing agents (Table 3). The estimated coefficients are -0.373 for price and -0.005 is statistically significant at the 10% level. The negative impact of price on profit margin aligns with what Mensah and Antwi (2002) reported and that is, in spite of the higher prices in the minor fishing season, incomes can be low because of low catch. Given the high sunken costs and operational costs associated with fishing, any potential positive effects of high prices are probably offset by low quantities and high variable costs thereby reducing the margins that can be realized

in the minor season. Similar interpretation could also apply to the negative impact of high value fishes on profit margins in the minor season. Aheto et al (2012) reported that stock depletion of high value fish is shared among all resources and could eventually result in the tragedy of the commons. Acquah and Addo (2011) also reported that fishermen consistently had low catch of high value fishes.

Self-financing (SLF) relative to other forms of financing fishing activities positively impact margins and the percentage of fish sold through the spouse (Tables 2 and 3). The magnitude of the estimated coefficients in all the specifications suggests that it is an important variable, and the strong impact is probably due to lower transactions costs. Acquah and Addo (2011) reported that financial institutions hardly provided credit to the fisheries sector because of poor record of loan repayment. In addition, the authors also reported that many fishermen applicants could not provide the required collateral needed to secure the loans, and even when collaterals were provided, about 70% of the fishermen had to wait from between $1 - 6$ months for the disbursement of the loan. The challenges to accessing formal bank credit and the finding of a strong impact of self-financing on profit margins should provide some motivation for fishermen to rely on own earnings from household resources and savings.

The boat size (BOT) is also found to be an important variable and positively impact margins (Tables 2 and 3). The magnitude of the estimated coefficients are as strong as that of self-financing (SLF) in all the specifications. Larger boats can operate in a wider area from close to landing sites to relatively more open waters and as such exploit more catches compared to smaller boats (FAO, 2005a). Larger boats can also handle and store fish in good condition on board as they are motorized, and most can be equipped with hydraulic hauling machinery, fish finding electronics, and storage facilities, which improves the efficiency of fishing (FAO, 2005b). Thus, the positive impact of the use of larger boats on profit margins and the percentage of fish sold through spouses results from cost efficiencies, higher catches, and higher revenues.

The effects of gear used, i.e., nets (NET) and hook-and-line (HKL) on profit margins are mixed. The use of nets is statistically significant at the 10% level in the combined season model for margins obtained from selling fish though other agents, 0.345 (Table 2) while the estimated coefficient in the major season is 0.303 (Table 3). This finding aligns with Aheto et al. (2012) who reported that investments made using purse seining nets correlated positively with incomes. The positive impact could be attributed to the mode of fishing, because nets can be targeted at shoals of fish and result in large quantities of harvest, especially in the major fishing season. The use of hook-and-line is found to be only significant in the minor season for margins obtained from selling fish through other agents (Table 3)

Conclusions
This study estimated an econometric model of the percentage contribution margins that artisanal fishermen in Ghana earn from selling their fish through their spouses and other marketing agents. The study provides insights into the impact of how much fish sold through the spouse, price, fish type, boat size, gear type, and transaction factors have on the profit margins of fishermen. The empirical model was estimated as a system of equations using a 3SLS estimation procedure because the percentage of fish sold through the spouse was found to be endogenous.

The impact of percentage of fish sold through the spouse on margins is found to be significantly and consistently negative. This appears to support the belief that the spouses are perhaps the last resort used to sell fish as the fishermen generally control the marketing and revenues from fish sales. Price and high value fish also had a negative impact on profit margin in the minor season model for margins obtained from selling through other marketing agents. Any potential positive effects of high fish prices generally in the minor season are probably offset by low catch quantities coupled with high sunken costs and operational costs.

Self-financing relative to other forms of financing fishing activities and boat size are found to positively impact margins and the percentage of fish sold through the spouse. The magnitude of the estimated coefficients of these variables suggests that they have a very strong impact on margins. The effects of gear used on profit margins are mixed.

Overall, the study reveals that economic and investment considerations are driving the fishermen's choice of marketing agents. As price takers, fishermen appear to be exploring ways to minimize costs and improve cost and operational efficiencies associated with their fishing enterprise to enhance profitability.

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