

Factors that Affect Fishermen's Income with Fuel Cost as Moderating Variable

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Abstract: This research discusses factors influencing fishermen's income with fuel costs as a moderating variable. Sampling used a purposive sampling technique and obtained 52 research samples. Data collection was carried out by collecting primary data with interviews, surveys and observations. The statistical test used is Moderated Regression Analysis. The results of this research are (1) work experience simultaneously and partially influences fishermen's income, (2) consumption costs simultaneously and partially influence fishermen's income, (3) labour costs simultaneously and partially influence fishermen's income, (4) Fuel costs simultaneously and partially influence fishermen's income. (5) Fuel costs can moderate the influence of consumption costs on fishermen's income. (6) Fuel costs can moderate the influence of labour costs on fishermen's income. (7) Fuel costs cannot moderate the effect of work experience on fishermen's income. Our findings can provide insight into increasing fishermen's income.

1 INTRODUCTION

The total land area of the Bintan Regency is 88,038.54 km². The oceans surrounding Bintan cover an area equal to 86,092.41 km² of the island's total land area. It means that Bintan's water area is 98% of the total. The district of Bintan spans a total size of 88,038.54 km² in its entirety. However, its land area is only 2.21%, equivalent to 1,946.13 km². The remaining 86,092.41 km² is water. With the vastness of Bintan's waters, fishermen can catch more marine products.

According to Act No. 45/2009, fishermen are people whose livelihood is fishing. Fishermen play a crucial role in the community as they fulfil animal protein intake at all levels of society. It concerns the fulfilment of animal protein intake at all levels of society. In order to maximize the catch, the welfare of fishermen also needs to be considered. Fishermen's income depends on the potential exploitation of marine and fish resources in the ocean. Fishing is the main source of income for his family.

The income of fishing communities influences, directly or indirectly, the quality of life of fishermen. Fishermen's income level has a big impact on their lives. It is also related to environmental management

and coastal development based on existing local wisdom that has long been rooted in fishing communities.

Fishermen usually catch fish at night. Around 6 p.m., they went out to sea and waited for the fish. Then come home at dawn. So, morning and afternoon is the time for fishermen to rest. According to (Munthe et al., 2018), there are also certain days of fishing—only some days to catch fish. During the "dark moon", fishermen only go to sea to fish. If it is a "bright moon", fishermen will not go to sea. It also depends on the weather. If the weather is not good, the fishermen will also be unable to go to sea.

Fishermen can catch a variety of catches. The catches of fishermen in Bintan are as follows: various fish such as pomfret, mackerel, boren, red, worm trap, goli jebung kaci, coral, grouper, selar selikur, cob, and tamban. In addition, the catch is in the form of shrimp, crabs and barks. Some fishermen catch only one type of fish. Some fishermen catch more than one species. Fishermen who catch more than one species have a higher income than other fishermen. To carry out their work, some fishermen have subordinates. The catch and the money increase in proportion to the number of subordinates who assist. According to (Norlinda, 2022), those who have researched the influence of labour on the revenue of fishermen in the

hamlets of Ambahai, more labour and cooperation with each other, the greater the catch, so the income will also increase. Generally, fishermen sell their catch to Toke. Then, Toke will sell again to the merchant. Ship crew can be paid regularly per month or day. It is also possible for subordinates to get profit sharing from the sale of fish.

Experience in the sea will determine a fisherman's skill in getting fish catches. Fishermen with more experience can find it easier to determine where to catch and the most effective way to get more catches. According to (K. Cahyandi, 2021), having prior experience at sea has a major impact on whether or not one chooses to travel to sea again. Small-scale fishing activities rely only on work experience at sea and do not depend on guidelines or technology to determine fishing locations. The length of time fishermen go to work varies. In a month, fishermen can work 20 days or even every day. Fishermen are at sea for 4 to 5 hours. They usually go at night. Coming home from the sea is tomorrow afternoon. Some fishermen can spend 4 or 5 days at sea. Fishermen's fishing gear can be in the form of traps, handlines, nets, and trawls. If the fishing gear is damaged, new fishing gear must be purchased. Fishing lines should always be replaced when going out to sea.

Consumption will play an important role, especially for fishermen who go to sea. For fishermen to go to sea, they consume food, drinks, and even cigarettes. Fishermen go to sea after 6 p.m. until the next morning. From the results of (A. Widodo, 2019), each additional ransom (food) at sea will affect fishermen's catch in Medan Belawan District.

Fuel oil is a supporting factor in going to sea. Fishermen-used boats must be filled with fuel. The amount of fuel oil used depends on the size of the ship, which ranges from 15 to 1,000 litres per month. Based on the research results by (Lasut et., al, 2016), fuel significantly affects fishermen's income in the Tuminting sub-district of Manado.

Fishermen's catches have a significant impact on increasing their income and overall well-being. Various factors influence fishermen's income, encompassing both social and economic aspects.

These factors include consumption costs, the number of boats, the number of workers, the distance travelled, and experience (Sujarno, 2008). In alignment with this, the current research aims to observe and assess the factors affecting income of fishermen from a socioeconomic perspective, specifically focusing on consumption costs, work experience, labour costs, and fuel expenses and how these factors influence fishermen's income in Bintan Regency.

2 LITERATURE REVIEW

2.1 Production Theory

As outlined by Joesron and Fathorrozi (2003), production refers to the outcome of an economic process or activity that utilizes various inputs with the aim of enhancing the utility, or usage value, of a product. The utility of a product increases when it provides new or added benefits compared to its original form.

More precisely, production is an enterprise's activity that involves combining diverse inputs to generate output at the lowest possible cost. Hence, the production function is an equation that illustrates the maximum output achievable through a specific combination of inputs.

Each input has a distinct function and is interconnected with others, meaning that if one factor is unavailable, it can disrupt the production process.

Increased production will increase fishermen's income. Income fishermen is income earned by fishermen who have been reduced with costs (Sukirno, 2006). The factors that influence fishermen's income levels are as follows:

1. Work experience
Work experience is defined as an activity or the process that someone has experienced when earning a living to meet his life needs (Rofi, 2012).
2. Labour
Labour is everyone who can work to produce goods or services for their own needs and society (Mulyadi, 2003).
3. Consumption
Consumption is generally interpreted as using goods and services directly fulfilling human needs, such as cigarettes, rations, Etc. (James, 2001).
4. Fuel Oil Expenses
Fuel oil expenses are from fishermen catching fish/sea products (Sukirno, 2006).

3 RESEARCH METHOD

3.1 Sampling and Data Collection

Within the framework of sampling and data collection, the statistical population of the present study initially encompassed a total of 132 fishermen. Thus, the final sample became 52 fishermen.

3.2 Data Analysis

The current research uses content analysis techniques to explore the factors influencing fishermen's income levels. Data were collected using the questionnaire method, which fishermen have filled out.

The present study utilizes descriptive statistics for data analysis, wherein the acquired data is described without the aim of drawing overarching conclusions or generalizations. The results of the data tabulated in Excel are then processed in SPSS. The analysis model used is the Moderated Regression Analysis model (Ghozali et al., 2018).

4 RESULTS AND DISCUSS

4.1 Classic Assumption Test

Before conducting the regression analysis, this study first tested the classical assumptions. The testing of classical assumptions using the SPSS program in this research encompassed the following:

4.1.1 Normality Test

The purpose of the normality test in this investigation was to determine whether or not the regression model adheres to the normal distribution. The Kolmogorov-Smirnov test was employed for this purpose. According to the normality test results, the Kolmogorov-Smirnov significance value was discovered to be 0.200, which is higher than the 0.05 threshold required for statistical significance. Because of this, data of this study is normally distributed, indicating that the normality assumption is met.

4.1.2 Multicollinearity

The intent of the multicollinearity test undertaken in this study was to investigate the possibility of correlation among the independent variables within the regression model. Multicollinearity has not an impact on the desirability of a regression model. The existence of multicollinearity in the dataset was evaluated by employing the Variance Inflation Factor (VIF) and Tolerance values. The outcomes from the multicollinearity test revealed that the Variance Inflation Factor (VIF) value was below 10, reflecting a low level of multicollinearity. Furthermore, the tolerance value exceeded 0.1, further supporting the absence of significant multicollinearity. As a result, the data used in this study is free from

multicollinearity, indicating that the independent variables do not exhibit high correlations.

4.1.3 Autocorrelation

Examining for autocorrelation conducted in this research aimed to examine whether a regression model exhibits correlations between the error terms in period 't' and the error terms in the previous period, 't-1.' The Durbin-Watson test was employed for this autocorrelation analysis. Based on the results of the autocorrelation test, it was determined that the Durbin-Watson statistic falls within the range of ' $dU < DW < 4 - dU$,' which suggests that the proposed regression equation model does not suffer from autocorrelation.

4.1.4 Heteroscedasticity

The objective of the heteroscedasticity test performed in this study had been to detect the presence of unequal variance among residual data within the regression model. If the variance of residuals remains consistent across observations, it indicates homoscedasticity, whereas differing variances suggest Heteroscedasticity.

A desirable regression model does not exhibit Heteroscedasticity. Based on the outcomes of the heteroscedasticity test, it was noted that the p-value for each independent variable, specifically work experience, consumption, labour, and fuel oil costs, exceeded 0.05. Consequently, the regression model in this study does not suffer from Heteroscedasticity, indicating that the variances of residuals across observations are relatively consistent.

4.2 Descriptive Statistics

Table 1: Descriptive Statistics.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Work Experience (X1)	53	2.00	42.00	18.3774	7.48647
Consumption	53	5.59	144.00	11.8990	19.44745
Labor	53	24.00	672.00	55.5992	87.47906
Fuel Oil	53	6.27	48.00	16.7960	14.88554
Fishermen's Income	53	62.72	576.00	151.3125	72.06930
Valid N (listwise)	53				

Source: processed SPSS results, 2023.

Table 1 shows the summary descriptive statistics of the variables. The analysis shows that the average labour cost is 55.59, meaning that the costs influencing fishermen's income are generally labour costs. The standard deviation of labour costs is 87.47 above the average (55.59), meaning that labour costs have high data variations. The range of work

experience comprises a minimum value of 2 to a maximum value of 42, with a mean value of 18.37. This average exceeds the standard deviation of 7.48, indicating a significant degree of variability in the data pertaining to work experience. Consumption costs have the uppermost limit of 144 and a lower bound of 5.59 with an average value of 11.89, which is lower than the standard deviation (19.45), meaning that consumption costs have low data variation. Fuel oil costs have a maximum value of 48 and a minimum value of 6.27 with an average value of 16.79, which is higher than the standard deviation (14.85), meaning that fuel oil costs have high data variations. The income level of fishermen has a maximum of 576 and a lower of 62.72 with a middle value of 151.31, which is lower than the standard deviation (72.06), meaning that the income level of fishermen has low data variation.

4.3 Regression Analysis

The statistical model used to test the hypothesis is Moderated Regression Analysis (MRA). Moderated Regression Analysis (MRA) in this study is intended to see how work experience, consumption, labour, and fuel costs affect fishermen's income. In order to assess the viability of the regression model, various factors can be taken into consideration, as outlined below:

4.3.1 F Test

The F test shows whether all the independent variables included in the model can be explanatory or predictor variables.

Table 2: ANOVA Test Results (Simultaneous Test).

Model	Sum of Squares	Df	Mean Square	F	Sig.	Information
Regression	264860.343	4	66215.08	608.083	0.000 ^b	Significant
Residual	5226.796	48	108.892			
Total	270087.139	52				

Source: processed SPSS results, 2023.

Table 2 shows that the calculated F value of 608.083 has a probability (sig) of 0.000, which is less than 0.05. Work experience, consumption, labour, and fuel costs can become explanatory variables. Hence, the conclusion is that the regression model is feasible to predict fishermen's income. Thus, the regression model is a good fit for research.

4.3.2 Coefficient of Determination

The percentage of independent variables explaining fishermen's income in the research model is shown by the magnitude of the coefficient of determination.

Table 3: Results of Analysis of the Coefficient of Determination.

R	R Square	Adjusted R Square
0.990 ^a	0.981	0.979

Source: processed SPSS results, 2023.

Based on Table 4, it is known that the adjusted R² is 0.990. This value indicates that the variation in fisherman's income can be explained by 99% by variations in the independent variables, and the remaining 1.00% is explained by the causes of variables outside the model so that this model is considered capable of explaining the dependent variable.

4.3.3 T Test

Table 4: Results of Partial Analysis.

Variable	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Information
	B	Std. Error	Beta			
(Constant)	116.014	11.694		9.921	0.000	
Work experience	0.704	0.255	0.073	2.755	0.008	Significant
Consumption	-5.977	1.118	-1.613	-5.347	0.000	Significant
Labour	0.494	0.197	0.599	2.508	0.016	Significant
Fuel cost	1.898	0.494	0.392	3.842	0.000	Significant
Work Experience* Fuel cost	-0.014	0.008	-0.068	-1.622	0.112	No Significant
Consumption* Fuel cost	0.211	0.025	2.525	8.267	0.000	Significant
Labor * Fuel cost	-0.027	0.011	-0.664	-2.475	0.017	Significant

Source: processed SPSS results, 2023.

Based on table 3 it can be explained as follows:

1. The Effect of Work Experience on Fishermen's Income

According to the results obtained from SPSS calculations, a t-value of 2.755 was computed, and its associated significance value was determined to be 0.008, which is less than the threshold of 0.05. This result indicates that work experience has a statistically significant effect on fishermen's income.

2. The Effect of Consumption on Fishermen's Income

Based on the results obtained from calculations using SPSS (as shown in Table 3), a t-value of -5.347 was observed, and the associated significance value was determined to be 0.000, which is less than the significance threshold of 0.05. This result suggests that consumption has a statistically significant impact on fishermen's income.

3. The Influence of Labour on Fishermen's Income

Based on the results of calculations using SPSS (as presented in Table 3), a t-value of 2.508 was obtained, and the associated significance value was found to be 0.0016, which is less than the significance threshold of 0.05. This result implies that labour has a statistically significant impact on fishermen's income.

4. The Effect of The Fuel Cost on Fishermen's Income

Based on the calculations using SPSS, specifically from Table 3, a t-value of 3.842 was determined, with an associated significance value of 0.000, which is less than the significance threshold of 0.05. This result indicates that fuel costs have a statistically significant impact on fishermen's income.

5. The Interaction Effect of Working Experience with The Fuel Cost on Fishermen's Income

Based on the information presented in Table 3, it is evident that the interaction between work experience and fuel costs (Work Experience * Fuel Costs) on fishermen's income yields a t-value of -1.622, and the corresponding probability (sig) is 0.112. This probability value (sig) is greater than the significance level of 0.05 ($0.112 > 0.05$), indicating that the interaction between work experience and fuel costs does not have a statistically significant effect on fishermen's income.

6. The Interaction Effect of Work Experience with the Fuel Cost on Fishermen's Income

Based on the data provided in Table 3, it is evident that the interaction between consumption and fuel costs (Consumption * Fuel Cost) concerning fishermen's income yields a t-value of 8.267, and the corresponding probability (sig) is 0.000. This probability value (sig) is less than the significance level of 0.05 ($0.000 < 0.05$), signifying that the interaction between consumption and fuel costs has a statistically significant effect on fishermen's income.

7. The Effect of The Interaction of Labour with the Fuel Cost on Fishermen's Income

Based on the information provided in Table 3, it is evident that the interaction between labour and fuel costs (Labor * Fuel Costs) concerning fishermen's income yields a t-value of -2.475, and the corresponding probability (sig) is 0.017. This probability value (sig) is smaller than the significance level of 0.05 ($0.017 < 0.05$), indicating that the interaction of labour and fuel costs has a statistically significant effect on fishermen's income.

5 CONCLUSION

1. Work Experience Affects Fishermen's Income in Bintan

Experience is the best teacher. According to the study results, the experience of working fishermen ranged from 2 years to 55 years. The age range of fishermen ranges from 18 to 70 years. There are even fishermen who have gone to sea since they were small, i.e., around the age of 10. The right pattern has been formed for capturing the catch. This study is by research (Norlinda, 2022). With the experience they have, it can help fishermen know the right point to place fishing gear, such as fishing nets, to produce many catches. Also, experience is very important because, with experience, we can find out which locations have many results and which do not.

2. Consumption Costs Affect Fishermen's Income in Bintan

Fishermen usually spend a long time at sea. They need food, drink, and even cigarettes. Consuming much delicious food will make fishermen enthusiastic about looking for catches. As a result, the higher the consumption costs, the more powerful the fishermen should be at catching more fish. This will increase the income of fishermen. However, the consumption that is brought about could be better now. Fishermen may bring homemade dishes such as rice and side dishes cooked at home. So it does not taste good anymore. This study is by (Dahen et al., 2016), although it differs in its effect. The study's results (Dahen et al., 2016) show that working capital's homemade dishes (consumption costs) can increase fishermen's income. Meanwhile, the results of this study show that consumption costs harm income.

3. Labor Cost Affects Fishermen's Income in Bintan

The number of workers can make fishermen catch many fish. Reasonable and tempting wages will encourage workers to work harder. This study is by research (Norlinda, 2022). When they work together, they will both benefit, and the probability of getting a catch will increase, which in turn will generate income as well. In addition, some fishermen still have to lift their nets themselves or with manual labour. If more people help, the work will be faster, and the catch will be greater. This study is by (Sakti et al., nd). Labour is needed in catching fish, and for lifting nets, manual labour is needed directly from the labour itself to maximize the catch from businesses in Semidang Alas Maras District, Seluma Regency.

4. Fuel Costs Affect Fishermen's Income in Bintan

Ships need fuel. If the distance to the sea is close, then the catch is also a little. The farther the fishermen go to sea, the deeper the sea, so the catch is also higher. For this reason, fishermen need much fuel so they can go further out to sea. This result is by research (Sofiana et al., 2017). The wider the fish catch, the variety of fish caught and the size of the catch. The fishermen can expand their catch because fishermen can provide more fuel, and the ship's condition is well maintained. With a longer time at sea, fishermen can catch more fish.

5. Fuel Costs Cannot Moderate the Effect of Work Experience on Fishermen's Income in Bintan

The longer working experience will not affect fishermen's income, even if supported by adequate fuel. More experienced fishermen can estimate the exact time needed to go to sea. So fishermen can save fuel and will be bolder to go to sea. According to research (Ibrahim, et al., 2021), the more a fisherman understands the sea conditions and fish characteristics, the easier it is for him to catch fish. The longer the experience, the more sensitive fishermen are to the fish's position, making it easier for fishermen to catch fish in the sea so that the time they use becomes faster and saves fuel.

6. Fuel Cost Can Moderate the Effect of Consumption Cost on Fishermen's Income in Bintan

Much fuel will be able to increase consumption costs and increase fishermen's income. Fishermen may spend days at sea. Besides that, it is a long journey. For that, it takes much fuel and much consumption as

well. This study is by research (Sofiana et al., 2017). Fuel and consumption are fishermen's working capital. The amount of working capital used will increase the fishermen's income opportunities. Because of working capital, the fishermen's catch area will be expanded, and the time at sea will be longer.

7. Fuel Costs Can Moderate the Effect of Labour Costs on Fishermen's Income

Much fuel will reduce labour costs and increase fishermen's income. Fishermen use diesel and petalite for their boats. Some fishermen buy fuel oil at official Pertamina dealers. Some buy at wild stalls. When buying at an official kiosk, the price of diesel fuel is Rp. 6.800 per litre. However, if Fishermen buy it at an illegal kiosk, then the price of diesel is Rp. 10.000 per litre. The amount of fuel oil used depends on the size of the ship, which ranges from 15 to 1,000 litres per month. Fuel is an important factor in fishermen's activity. Fishermen very much need the availability of fuel by authorized dealers. When buying at illegal kiosks, the fuel price can be higher than it should be. The government, in this case, Pertamina, should provide more authorized dealers. Also, fishermen can avoid linger at sea if the fuel price is high. Expensive fuel will reduce labour costs. This study is by research (Lasut et al., 2016) that shows rising fuel prices have a major impact on fishermen's income. The government's active role as power holders and policymakers must pay greater attention to this problem. As the institution responsible for the division and distribution of fuel oil, the government must pay greater attention to the availability of fuel oil supplies and the ease of access to obtain them.

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