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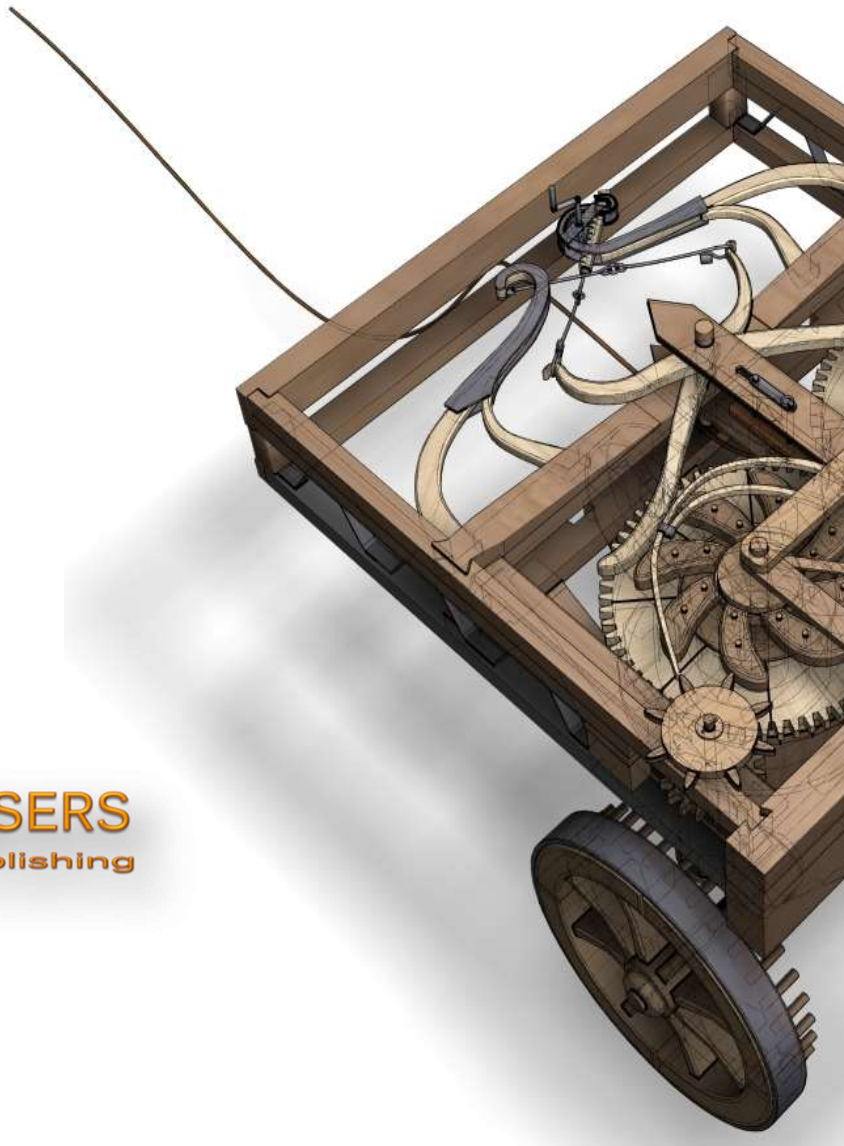

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Do Fishers Need Enough Insurance to Guarantee Their Business Continuity? Evidence from Vulnerable Small-Scale Fishers

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Abstract:

Small-scale fisheries have a profound effect on providing food and employment for millions of the world's population. Small-scale fisheries contribute more than 90 percent of the global catch. Unfortunately, small-scale fishers still live in poverty, and small-scale fisheries more than 95 percent were found in low-income countries. Average productivity that is inefficient, low levels of education, lack of opportunities to access capital, and lack of guarantees and limitations in obtaining social, economic, and political rights result in fishers' vulnerability in all aspects. Efforts to guarantee social, economic rights and subsidies for fishers are critical. This study examines the factors that influence the decision to participate in fisher's insurance, such as income as collateral for fishers during fishing activities, some trips, catch skill, and fishing gear coefficient. Participating in insurance is one form of business-facing uncertainty (season, fish stocks) while hoping for an increase in the sense of security for fishers compared to those who do not participate in insurance. Data processing results using logistic regression analysis showed that the variable income, some trips, catches, and skills had a positive and significant effect, while the fishing gear coefficient variable had no significant effect. This study recommends that local governments pay more/ attention and supervise small fishers' skills in using fishing gear, the number of trips made, and the number of catches that were focusing on adding their income because these four factors determine fishers' insurance continuity.

Keywords: small-scale fishers; fishing gear; number of trips; catch; insurance; income.

JEL Classification: C49; D13; D91; Q12.

Introduction

Indonesia is an archipelagic country, so many of its inhabitants' life activities are around the coast, a livelihood as fishers (Mulyadi 2007; Suharno *et al.* 2016; Teniwut 2016). Indonesia is a maritime country which has an area of 3.25 million Km or about 63 percent of the total area of Indonesia, and the length of the Indonesia coastline is 95,181 Km (Roza 2017).

Small-scale fisheries significantly influence food and employment supply for millions of people (FAO 2012; Suharno *et al.* 2017a; Suharno *et al.* 2019). Small-scale fisheries contribute 90 percent of global capture fisheries, cover more than half of the global catch, and employ more than 115.5 million people (FAO 2012). Fisher is identical with poverty and problems inherent in the lives of fisher, such as low levels of education, lack of

opportunity to access capital, and lack of guarantees and limitations in obtaining social, economic, and political rights make the vulnerability of fisher in all aspects (Mulyadi 2007, 51). Small-scale fisheries, more than 95 percent, were found in low-income countries (FAO 2009). The average productivity of small-scale capture fishers and cultivation has not been efficient (Suharno *et al.* 2017b).

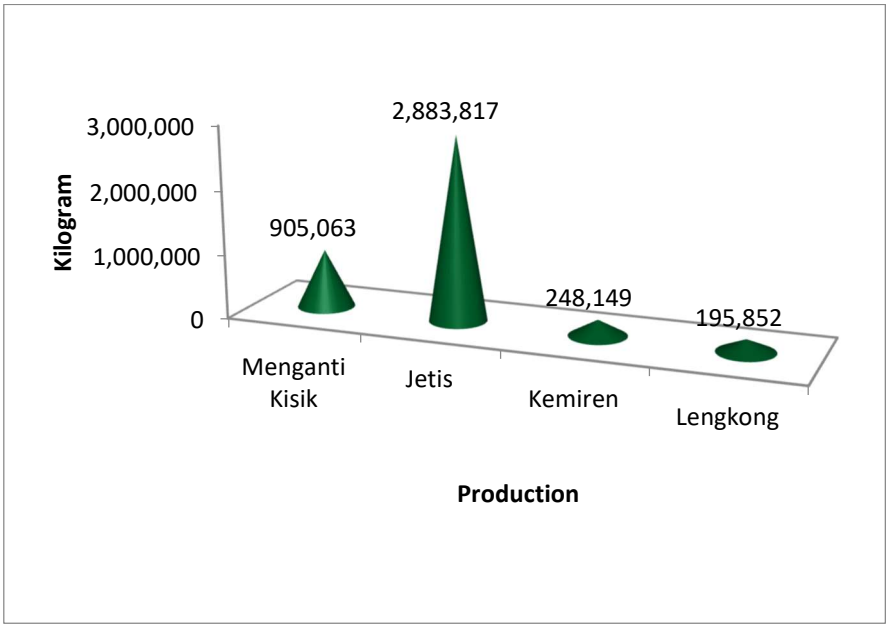
Table 1. Capture Fishery Production by Province (Tons)

Province	Year				
	2010	2011	2012	2013	2014
DKI Jakarta	172,422	180,198	219,836	209,733	226,06
West Java	190,79	196,993	211,711	218,609	219,004
Central Java	231,119	270,619	275,559	243,942	261,017
DI Yogyakarta	5.101	5,002	5,629	4,998	6,996
East Java	352,779	375,827	381,805	386,895	399,371
Banten	60,219	60,859	60,809	59,004	60,816
Total	1,012.43	1,089.50	1,155.349	1,123.18	1,173.26

Source: Central Bureau of Statistics, 2016.

Based on Table 1, six provinces on the island of Java have captured fisheries potential, namely DKI Jakarta, West Java, Central Java, Yogyakarta, East Java, and Banten Province. From the six provinces, provinces with stable fisheries production are Central Java Province, increasing from year to year. Central Java Province has two coastal areas, namely the south coast and north coast. In 2017, fish production caught on the north coast was 87.75 percent higher than the south coast capture fisheries production, which was only 12.25 percent. The five regencies/cities in the South Coast region, which has the most massive fish catch production, are Cilacap Regency. In 2017 Cilacap contributed 20 percent to the total fish catch of Central Java Province or as many as 25,665.80 tons.

Figure 1. Capture fishery production from the fish auction in East Cilacap



Source: Central Bureau of Statistics, Cilacap Regency, 2019.

Based on Figure 1, there are ten fish auction sites in the Eastern Cilacap Regency, four of which are Kemiren fish auction place, Lengkong fish auction place, Menganti Kisik fish auction place, and Jetis fish auction place. The total fish catch in Eastern Cilacap in 2019 was 4,232.881 Kilograms, and the largest number of fisheries labor households was 5,887 RTBP. The number of sizes when less than five gross ton was the highest, namely 800 ships.

Based on the Agency for Regional Development Public Relations publication of Central Java Province, two phenomena occur in Cilacap Regency. Firstly Cilacap regency is one of the highest rice producers in Central Java Province, but they have a high number of needy rice recipients in Central Java. Secondly, Cilacap is the highest capture fisheries producer in South Central Java Province, but mostly fisheries in Cilacap Regency life

below the poverty line. According to the results of Prihatin (2019) research, fishers in Cilacap Regency, especially in the Eastern Cilacap, are in moderate welfare.

In the agriculture sector, the insurance mechanism has succeeded in reducing behavior that influences risk with reduction practice codes' contractual compliance. For fisheries, insurance can provide tools to address some uncertainty elements in ways that will help the fishing industry and regulators achieve sustainability goals, income security, and productivity (Mumford *et al.* 2009). Some risks have been and continue to be guaranteed by insurance, such as ships, equipment, and crew safety. However, insurance for catches, prices, and income variations are more problematic because of the lack of information that forms the basis for risk assessments related to production variables in capture fisheries (Mumford *et al.* 2009). In Japan, several types of marine fishery catches have been guaranteed in reciprocal insurance schemes supported by the government (Fisheries Agency, 2005). Meanwhile, the Indonesian insurance market's maritime insurance market is still relatively low, especially fisher's insurance (Rani 2016). Uncertainty conditions faced in the fisheries sector are often more challenging to predict than in the agricultural sector (Hermann *et al.* 2004).

The purpose of this research was to analyze the effect of income, fishing gear, number of trips, number of catches, and skills for enough insurance to guarantee their business fishers' continuity. The novelty in this research was to analyze how much insurance contribution is sufficient for vulnerable small-scale fishers in Indonesia.

1. Methodology

Research conducted by Teniwut (2016), using an analytical tool of vector Auto Regression (VAR) with Forecast Error Variance Decomposition (FEVD) and Impulse Response Function (IRF) as one of the tools of VAR is to examine the trend from a response on each shock of those independent variables in short and long run to dependent variables. This research indicated that catching ships and catching household fisheries have a significant and positive effect on fisher production.

In the meantime, the analytical tool used in this study was logistic regression. The regression analysis is to determine the effect of the independent variable on the dependent variable. The dependent variable was the decision to participate in fisher's insurance or not, while the independent variable is are income, fishing gear, number of trips, number of catches, and skills. The following equation formulation for logistic regression analysis:

$$L(x) = ln\left(\frac{\pi(x)}{1-\pi(x)}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_p x_p \quad 1.1$$

Based on the initial mathematical model, then the econometric model can be modeled as follows:

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 \text{lnincome} + \beta_2 \text{trip} + \beta_3 \text{catch} + \beta_4 \text{labor} + \beta_5 \text{gear} + e \quad 1.2$$

Dependent variable:

P = fishers criteria => P = 1; fishers participate insurance
P = 0; fishers not participate insurance

Independent variable:

Lnincome (x1) => percentage
Trip (x2) => times
Catch (x3) => kg
Labor (x4) => 1: fishers participate in training
0: fishers did not participate in training
Gear (x5) => coefficient

In logistic regression analysis, four criteria the overall fit of the model to the data must be fulfilled: model fit the data, qualification test Hosmer and Lemeshow's goodness of fit test, qualification test with classification table, and parameter estimation (Gujarati 2009).

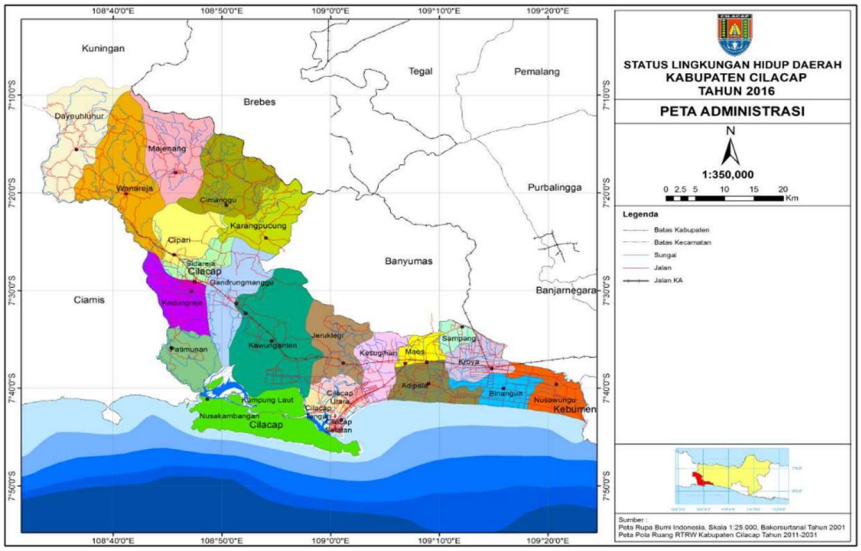
This research using all data that tested for logistic regression assumptions. Logistic Regression Assumptions include a) Logistic regression does not require a linear relationship between the independent and dependent variables. b) The independent variable does not require the assumption of multivariate normality. c) Homoscedasticity assumption is not required. d) Independent variables do not need to be converted into metric form (interval or ratio scale). e) The dependent variable must be dichotomous (2 categories, for example: high and low or good and bad). f) Independent variables do not have to have the same diversity between groups of variables. g) Categories in independent variables must be separate from each other or be exclusive. h) The sample required is relatively large; a minimum of up to 50 data samples is required for an (independent) predictor

variable. i) Can select the relationship because it uses a non-linear log transformation approach to predict the odds ratio. Odd in logistic regression is often expressed as a probability (Gujarati 2009).

2. Result and Discussion

Description of the study sites. This research is conducted in four fish auction places directly adjacent to the coastline, all of which are located in the Eastern end of the Cilacap Regency. The southern Cilacap Regency is directly linked to the South Java Sea. Topographically, the Cilacap Regency is generally low land with a slope of 1-3 percent, and high land is approximately 3-12 meters above sea level. Images from the research location were presented in Figure 2.

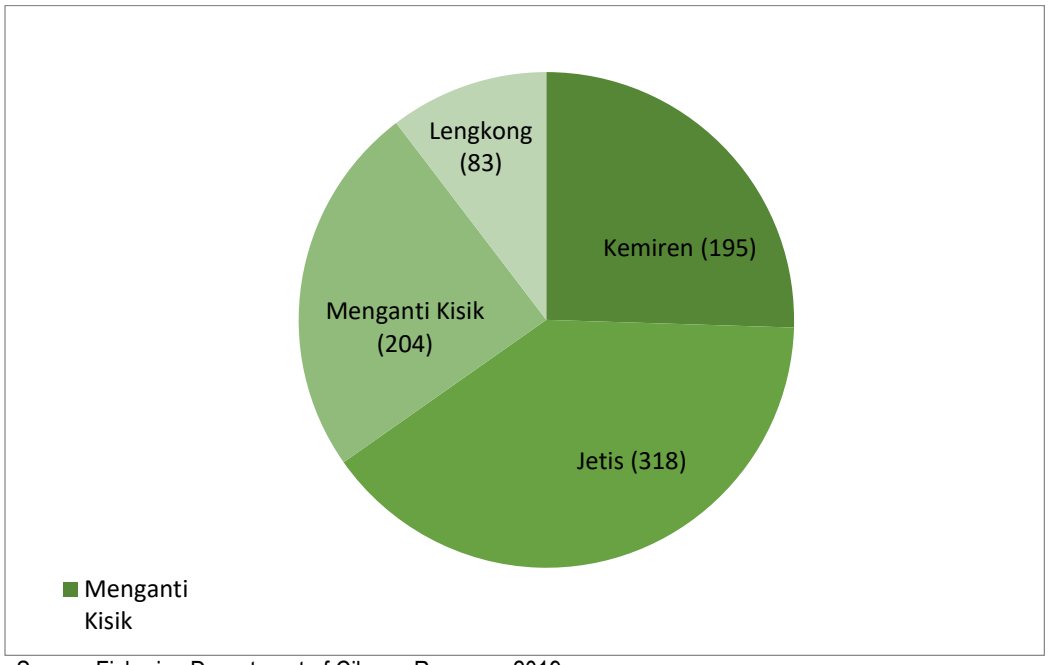
Figure 2. The map of East Cilacap.



Source: Central Bureau of Statistics, Cilacap Regency, 2019.

This study's object is small-scale fishers who use vessels with a size of less than 5 gross tons. This research population is the total number of fishers who fall into the category of small-scale fishers.

Figure 3. The number of ships using a size of less than five gross ton.



Source: Fisheries Department of Cilacap Regency, 2019.

Figure 3 shows the number of fishers with a boat size of less than five Grosston based on East Cilacap. It can be seen that fishers with a boat size of less than five Grosston in East Cilacap, totally are 800 boats. The sample size is 80 fishers.

Respondents in this research are fishers in East Cilacap. Based on the level of education, 52.5 percent of fisher who did not complete primary school education. The portrait respondents had already started fishing from 10 years old. About 48.75 percent of respondents were over 40 years old. The average income earned by fishers is Rp166,997 per trip, as only 46.52 percent of respondents participating in insurance programs prove to have a fishing insurance card.

The statistical tests carried out are the odds ratio and pseudo R Square. Measure the simultaneous influence of several independent variables on the dependent variable. In logistic regression, Pseudo R Square is known, which is the Pseudo R Square value, which means the same or identical to R Square on OLS. Pseudo R Square test used to see the ability of independent variables of income, fishing gear, number of trips, number of catches, skills, and gear together to take insurance from fishers in the regression equation to explain variations that occur in the dependent variable.

Table 2. Qualification test with Nagelkerke's R square

Value of -2 Log-likelihood	Value of Cox & Snell R Square	Value of Nagelkerke R Square
34.287	.492	.690

In table 2, Nagelkerke's R^2 value is 0.690. It means that the variability of the dependent variable can be explained by the variability of the independent variable of 69.0 percent.

Table 3. Qualification test with Hosmer and Lemeshow's goodness of fit test

Value of Chi-square	Degree of Freedom (Df)	Significance
2.623	8	.955

Table 3, the statistical value of Hosmer and Lemeshow's Goodness of Fit is 2,623, with a significant probability of 0.955. This value is far above 0.05, so it can be concluded that the model can predict the value of observations.

Logistic Regression. From the primary data obtained, then data analysis is done using logistic regression analysis. This condition to see the relationship between dependent variables and independent variables. The following is the summary of the results of data analysis:

Table 4. Result Summary of Logistic Regression Analysis

Independent Variables	Coefficient (B)	Std. Error	Z-Statistic	Prob.	Exp(B)
Income (LnX1)	3.0138	1.490440	2.022106	0.0432	20.365
Number of the trip (X2)	0.3092	0.115429	2.679118	0.0074	1.362
Amount of catch (X3)	0.0104	0.005106	2.055319	0.0398	1.011
Labor (X4)	4.2335	1.327247	3.189735	0.0014	68.963
Gear (X5)	-0.0014	0.002475	-0.600443	0.5482	.999
Constant	-47.949	20.01513	-2.395649	0.0166	.000

Source: the result of the analysis data, 2020.

Based on the summary of the results of data analysis, the equation of logistic regression models can be formed as follows:

$$\ln\left(\frac{p}{1-p}\right) = -47.949 + 3.0138\ \text{lnincome} + 0.3092\ \text{trip} + 0.0104\ \text{catch} + 4.2335\ \text{labor} - 0.0014\text{gear}$$

Table 4 shows that the independent variable income is significant at probability 0.0432, the significant trip variable at probability 0.0074, significant catch variable at probability 0.0398, and significant labor variable at probability 0.0014 while the gear variable is not significant the significance value is 0.5482. From the logistic regression equation, it can be seen that the log of odds for fishers to be insured is positively related to income, trips, catch, and labor. Meanwhile, the log of odds for fishers to be insured is negatively related to gear.

Table 4 shows every increase in the value of one unit of income, while constant other variables will increase the log of odds of fishers for insurance by 3.0138. If income and other variables are considered constant, an increase in one unit's value on the trip will increase the log of odds for a fisher to be insured by

0.3092. Furthermore, if income and other variables are considered constant, the increase in the value of each one unit of the catch will increase the log of odds for fishers to be insured by 0.0104. Furthermore, if income and other variables are considered constant, the increase in the value of every one unit in labor will increase the log of odds for fishers for insurance by 4.2335. The gear variable is not significant because it is considered not to influence fishers' behavior to carry out insurance.

The explanation between the odds and the independent variable will be explained below. Odds can also be said that risk compares the probability of an event occurring with the probability that the event does not occur. The explanation of the coefficients in the regression model means that each increase in the independent variable units results in the risk of Y = 1 being exp (B) times higher.

The income variable has a positive and significant effect of 3.0138, which means that high-income fishers have a higher probability of carrying out business insurance. With an Exp (B) value of 20,365, the insurance carried out by fishers with a higher income is 20,365 times compared to fishers with low income. From the income side, it can be concluded that the fishers who carry out insurance are dominated by fishers with an income of > IDR166,000 per trip. The main reason fisher not to have insurance is that they do not have an electronic identity card (*E-KTP*). This study's result follows the objectives of the insurance program that is held insurance to reduce the risk of uncertainty in the fishing business so that it can maintain the sustainability of the fishing business, income security, and productivity assurance of fishers (Mumford *et al.* 2009), Suharno *et al.* (2018).

The variable number of trips has a positive and significant effect of 0.3092, which means that high-finned fishers have a higher probability of doing business insurance. With an Exp (B) value of 1,362, it means that the guarantee made by fishers with a higher number of trips is 1,362 times compared to fishers with short trips. In terms of the number of trips, it can be concluded that fishers dominate fishers who carry out insurance with trips> 20 per month. This research follows the result of Jabri *et al.* (2013) research: an increasing number of trips will affect the income of small scale fishers. Empirically, the research results are in line with the previous research conducted by Retnowati *et al.* (2017), which concluded that the number of trips significantly influences fisher's income. This research is also in line with researches by Dhian (2012), Halim *et al.* (2012), and Shaw (2016) that trip has a significant positive effect on fisher's insurance.

The variable amount of catch has a positive and significant effect of 0.0104, which means that fishers with dominant catch have a higher probability of carrying out business insurance. With an Exp (B) value of 1,011, it means that the guarantee made by fishers with a higher dominant catch is 1,011 times compared to fishers with a small catch. In terms of the number of catch, it can be concluded that fishers dominate fishers who carry out insurance with a total catch of> 477 kg per trip. This is also stated in the study of Jabri *et al.* (2013), that catch has a positive effect on small-scale fisher's income. This research is also in line with the results of research by Tenawut (2016). That number of catching has a significant and positive effect. Moreover, this research is consistent with Ridha (2017) research, which proved that the catch has a positive and significant effect on fishers' income. This research is also in line with the result of research conducted by Suroya *et al.* (2017), which catches affect income fisher. Ultimately, this research is also in line with the research conducted by Rahim (2011), Shaw (2016) that productivity has a positive effect on fisher's insurance.

The labor variable has a positive and significant effect of 4.2335, which means that fishers with training-labor criteria have a higher probability of doing business insurance. With an Exp (B) value of 68,963, it means that the guarantee carried out by fishers with higher labor-training is 68,963 times compared to non-labor-training fishers. In terms of the number of labor, it can be concluded that fishers dominate fishers who carry out insurance with only 21 workers. The finding research same as previous research by Romdhon (2016), who found that labor has a significant influence on fisher's income. The finding of the current study is not in line with the result of the previous study by Gaol (2015), Shaw (2016), which concluded that labor experience and fishing did not significantly influence fisher's insurance.

Fishing gear, this finding is different from the four previous variables. The gear variable does not have a significant effect on a negative sign on the choice of insurance. The fishers' condition is that traditional fishers dominate the use of gear coefficient, so they do not understand insurance's existence. The results not in line from research conducted by Jabri *et al.* (2013), Yulianto *et al.* (2021) also showed that the variables of fishing inputs/gear and catch positively affect small-scale fisher's income. This study's results are also not in line with the findings of previous studies conducted by Retnowati *et al.* (2017), Shaw (2016), which proved that the Fishing gear variable has a significant influence on fisher's insurance.

Conclusion

Income, number of trips, catch, labor, and skills have a positive and significant effect on fishers' insurance options in the eastern Cilacap. From the income side, it can be concluded that fishers who carry out insurance are dominated by fishers with an income of > IDR166,000 per trip. From the trip, fishers dominated who carry out insurance with trips > 20 per month. From the catch, fishers dominated who carry out insurance with a catch of > 477 kg per trip. From the labor criteria, fishers not dominated, who carry out insurance with only 21 workers. This study recommends that local governments pay more attention to and monitor compliance and improve the skills of small-scale fishers in using fishing gear, the number of trips made, and the number of catches, all of which focus on increasing income. These four factors are the main key to the sustainability of fishers' insurance sustainably.

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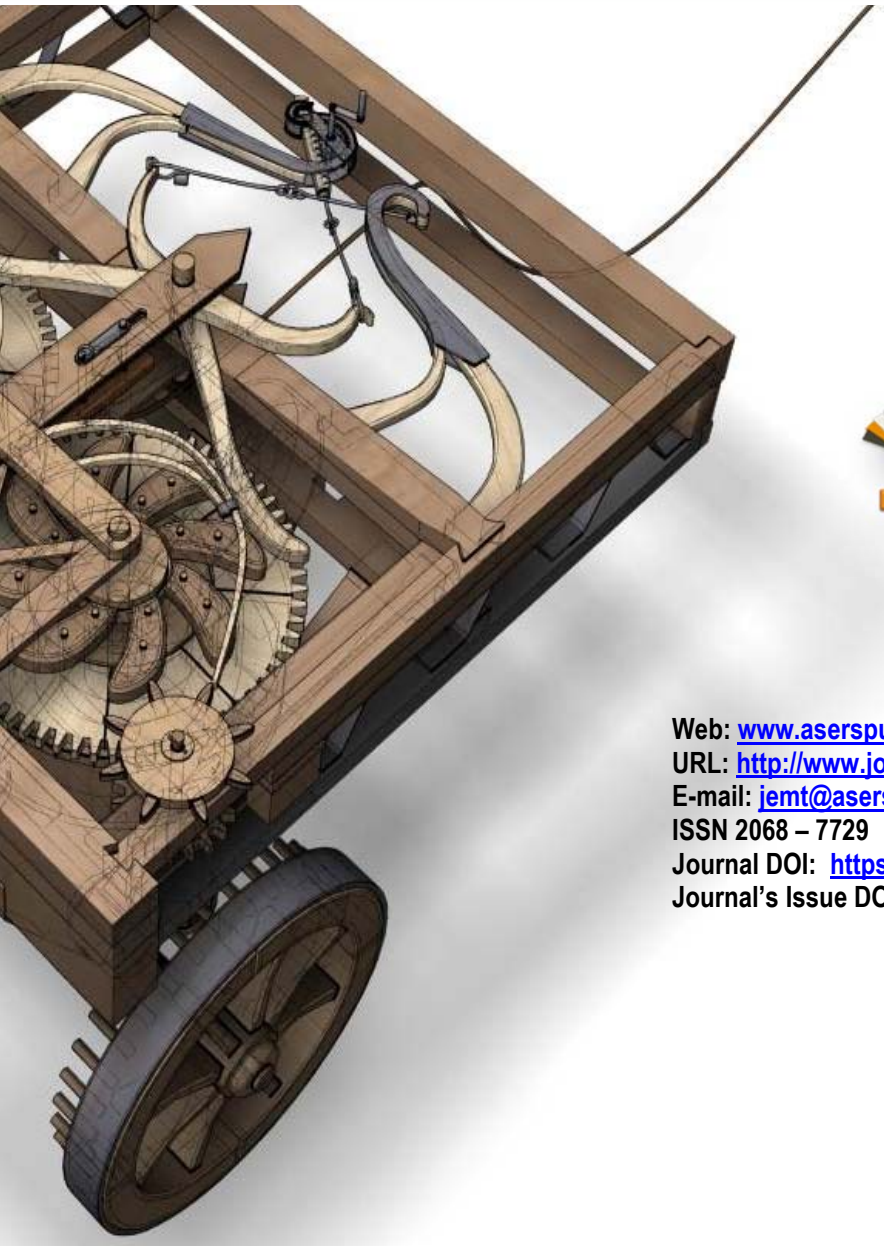

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