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Assessing the Contribution of Marine Fisheries to the Indonesian Economy

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ABSTRACT

Marine fisheries significantly contribute to the economy of many regions and countries. This study aims to analyze the contribution of marine fisheries to economic growth in Indonesia. Johansen cointegration (JC) test and Fully Modified Ordinary Least Squares (FMOLS) are applied to investigate the contribution of the marine fisheries sector to economic growth. This study uses time series data from Statistics Indonesia (BPS) and the Ministry of Maritime Affairs and Fisheries (KKP) from 2010 to 2022. The findings indicated a long-term equilibrium among the measured variables. Marine fisheries have a significant and contributing effect on long-term economic development. The data demonstrate that the fisheries sector has become a source of food, job creation, and welfare for fishermen.

Keywords: Marine Fisheries, Economic Growth, FMOLS Method, Marine Economy

1. INTRODUCTION

The fisheries sector plays a crucial role in the economies of many countries, especially coastal countries. Indonesia, one of the archipelagic countries with the longest coastline, has enormous fisheries potential. The fisheries sector is a food provider vital to employment and economic growth (Martahadi, 2017; Rochwulaningsih et al., 2019).

According to the Food and Agriculture Organization (FAO), aquaculture and fisheries contribute to the Gross Domestic Product (GDP) (Cai et al., 2019). Findings from various studies show that it influences the economic growth of various countries. Sugiawan et al. (2017) study of 70 countries involved in fishing activities between 1961 and 2010 revealed that economic progress was initially associated with marine habitat degradation. However, when income levels were higher, economic expansion benefitted the long-term viability of marine fisheries.

The correlation between fisheries productivity and economic development in Turkey has been analyzed using an Auto Regressive Distributed Lag (ARDL) model. The research identified a positive long-run relationship, indicating that fisheries production significantly contributes to economic growth (Eyüboğlu & Akmermer, 2023). Fishery production also affects the export of fisheries commodities.

Studies in Small Island Developing States (SIDS) between 1989 to 2002 showed a continuous correlation between fish exports and economic growth. The results indicate a reciprocal relationship, creating a positive development cycle (Jaunky, 2011). In Pakistan, a study of the correlation between fish exports and economic growth using annual data from 1974 to 2013 was conducted using the lag-distributed autoregressive model. The results confirmed a bidirectional causal link between fish exports and economic growth (Jawaid et al., 2019). Developing Indonesia's fisheries sector, maritime industry, marine infrastructure, and marine services is highly recommended, as these sectors have considerable potential (Nurkholis et al., 2016).

Against this background, this study aims to elucidate the contribution of Indonesia's fishing industry to economic growth. The structure of this paper is as follows: section 2 outlines the methodology, section 3 presents the results and discussion, and the conclusion is provided in the final section.

2. RESEARCH METHOD

Data and Model Specification

This study uses statistical data from

Statistics Indonesia (BPS) and the Ministry of Maritime Affairs and Fisheries (KKP). Table 1 provides a summary of the data.

The modelling to assess the contribution of marine fisheries to economic growth was adapted from previous studies (Rehman et al., 2019; Elzaki, 2024). This modelling will enrich the research on the fisheries-led growth hypothesis. The basic modelling of fisheries-led economic growth is written in Equation (1). The variables in this model are transformed to natural logarithms.

$$\ln GDP_t = \alpha + \beta_1 \ln PVMF_t + \beta_2 \ln PVIF_t + \varepsilon_t$$

Table 1. Variables descriptions

Variable	Description	Period	Source
ln*GDP*	Natural logarithmic of GDP, constant price 2010 IDR	2010-2022	BPS
ln*PVMF*	Natural logarithmic of production value of marine capture fisheries	2010-2022	KKP
ln*PVIF*	Natural logarithmic of production value of inland capture fisheries	2010-2022	KKP

Where ln*GDP* represents the natural logarithmic of real GDP, ln*PVMF* denotes the natural logarithmic of the production value of marine capture fisheries, and ln*PVIF* denotes the natural logarithmic of the production value of inland capture fisheries. α is the constant β_1 and β_2 denote the coefficients of the estimated variables, and ε_t is the error term.

Econometric Methodology

To test the modelling in Equation (1), we use the econometric method of cointegrating regression using the FMOLS approach, which has been used to assess long-run relationships (Jaunky, 2011; Jawaid et al., 2019; Mardhani et al., 2021). The FMOLS model was introduced by Phillips & Hansen (1990). Before testing the long-run relationship through FMOLS, conduct a pre-estimation test consisting of a unit root test to ensure stationary data using Augmented Dickey-Fuller (ADF) (Dickey & Fuller, 1979; Dickey & Fuller, 1981). Furthermore, the JC test assesses the long-term equilibrium relationship (Johansen, 1991; Johansen, 1995).

Socio-economic data collection was conducted through interviews and distribution of research questionnaires to respondents. The number of respondents was selected based on the Slovin formula, with 111 people.

3. RESULT AND DISCUSSION

Summary Statistics

The following section interprets the summary statistics of the variables used in this investigation. The maximum value is ln*GDP*, while the minimum is ln*PVIF*. The average values of ln*GDP*, ln*PVMF*, and ln*PVIF* are 34.90, 32.95, and 30.70, respectively. The comprehensive statistics summaries are shown in Table 2.

Table 2. Summary statistics

Variable	Mean	Std. Dev.	Min	Max	Obs.
ln*GDP*	34.72045	0.136314	34.49390	34.90054	13
lnPVMF	32.43135	0.446594	31.71835	32.95019	13
lnPVIF	30.00304	0.439320	29.23423	30.70464	13

Unit Root Test

The first step, following the research framework, is to evaluate the stationarity of the data. The ADF test is used to assess the stationarity of the data. The results of the stationarity test shown in Table 3 demonstrate that, at the level and constant, only the ln*GDP* stationary at the 5% significant level. For the first difference level, ln*PVMF* and ln*PVIF* showed stationarity at 10% and 5% significant levels, respectively.

Cointegration Test

The following step is to identify a long-run equilibrium, for which the Johansen cointegration test is used (see Table 4). The findings of the cointegration test show a long-term equilibrium relationship among the investigated variables. The FMOLS cointegration regression test was then performed to examine the long-term relationship.

Table 3. Results of unit root tests

Variables	No constant trend		Constant	
	Level	First difference	Level	First difference
ln*GDP*	0.605759	-0.944523	-4.293295	-0.823556
	(0.8312)	(0.2862)	(0.0076)**	(0.7713)
ln*PVMF*	2.111976	-2.340520**	-1.329259	-2.956151
	(0.9857)	(0.0246)	(0.5793)	(0.0704)*
ln*PVIF*	1.863866	-3.089283**	-1.644754	-3.911241
	(0.9775)	(0.0055)	(0.4316)	(0.0157)**

Table 4. Johansen cointegration test results

Trace value					
Hypothesis		Eigenvalue	Trace	Critical Value	Probability
H_0	H_1		Statistic	(0.05)	
$r \leq 0$	$r > 1$	0.959877	62.64441	29.79707	0.0000
$r \leq 1$	$r > 2$	0.828031	27.27061	15.49471	0.0006
$r \leq 2$	$r > 3$	0.512616	7.905737	3.841466	0.0049
Maximum Eigenvalue					
Hypothesis		Eigenvalue	Max-Eigen	Critical Value	Probability
H_0	H_1		Statistic	-0,05	
$r \leq 0$	$r > 1$	0.959877	35.37379	21.13162	0.0003
$r \leq 1$	$r > 2$	0.828031	19.36488	14.26460	0.0072
$r \leq 2$	$r > 3$	0.512616	7.905737	3.841466	0.0049

Table 5. Result of FMOLS long-run relationship

	Coefficient	Std. Error	*t*-Statistic	*p*-Value
ln*PVMF*	0.145646	0.070309	2.071510	0.0682
ln*PVIF*	0.157064	0.073728	2.130311	0.0620
C	25.29384	0.831787	30.40904	0.0000
Adj. R^2	0.908			

FMOLS Result

This section illustrates the long-run relationship between the value of marine capture fisheries production and inland capture fisheries production (see Table 5). FMOLS calculations provide comparable findings that validate the reliability of the investigation. The research findings indicate that ln*PVMF* and ln*PVIF* are two significant elements influencing Indonesia's economic growth. This research confirms that the fishing sector, including both marine and inland capture fisheries, has significantly contributed to economic growth.

The long-run FMOLS estimation for the marine fisheries sector indicates a positive effect on economic growth at the 10% significance level. The findings show that the correlation between marine fisheries and economic growth is consistent with previous studies (Eyüboğlu & Akmermer, 2023; Elzaki, 2024; Wei & Wu, 2019).

The finding aligns with research conducted in Pakistan, which indicates that the fishing industry significantly contributes to economic development (Rehman et al., 2019; Kaczan & Patil, 2020). Moreover, research concerning fish exports indicates that fisheries exports substantially contribute to economic development (Jaunky, 2011; Jawaid et al., 2019). Consequently, the fisheries industry has contributed to national economic development by promoting economic growth.

4. CONCLUSION

The fisheries sector has significantly impacted economic growth in every country, especially in maritime countries such as Indonesia. As a maritime country, Indonesia has abundant marine fisheries resources for domestic consumption and export commodities. In the long run, marine fisheries are not only a food source but can also create extensive job opportunities and enhance community welfare, especially for fishermen. The findings of this

research are anticipated to serve as a foundation for further development of management strategies in the fisheries industry.

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