INKUBIS: Jurnal Ekonomi dan Bisnis
Volume 8, Issue 2, 1729-1747
e_ISSN: 2775-3913
https://inkubis.polteksci.ac.id/index.php/ink/index
DOI: doi.org/10.59261/inkubis.v8i2.314

The Impact of the Fishery Sector on Economic and Social Welfare in Indonesia: The Moderating Role of Cooperatives in Driving Economic and Social Welfare in Indonesia

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Article Info:

***Article history*:**
Received: May 19, 2026
Revised: July 13, 2026
Accepted: July 21, 2026
Available Online: September 10, 2026

***Keywords*:**
Cooperatives; Economic Growth; Fishery Sector; Income Inequality; Panel Regression

Abstract

Background: The fishery sector plays a strategic role in supporting economic growth and social welfare in Indonesia. However, empirical evidence regarding whether cooperatives strengthen the contribution of the fishery sector across regions with different economic structures remains limited.

Objective: This study analyzes the impact of the fishery sector on economic growth and income inequality in Indonesia and examines the moderating role of cooperatives while identifying regional heterogeneity between Java and Eastern Indonesia.

Methods: This study employs balanced panel data from 34 Indonesian provinces during 2010–2025, comprising 544 observations. The Fixed Effects Model (FEM) is applied to control for province-specific heterogeneity, while the Panel Autoregressive Distributed Lag (Panel ARDL) model and the Generalized Method of Moments (GMM) estimators, including the First-Difference GMM (FD-GMM) and System GMM (Sys-GMM), are used as robustness checks to address dynamic relationships and potential endogeneity issues.

Results: Fishery productivity significantly increases Regional Gross Domestic Product (Regional GDP) ($\beta = 0.108$, $p < 0.01$), with a stronger effect observed in Eastern Indonesia ($\beta = 0.173$, $p < 0.01$). Cooperatives significantly enhance the positive contribution of the fishery sector to regional economic performance and income distribution in Eastern Indonesia, whereas their moderating effect is limited in Java. Robustness analyses confirm the consistency and reliability of these findings.

Conclusion: The contribution of the fishery sector depends on regional economic structures and institutional support mechanisms. Strengthening cooperative governance, particularly in fishery-dependent regions, is essential for promoting inclusive economic growth and reducing regional inequality.

To cite this article: Barus, P. (2026). The impact of the fishery sector on economic and social welfare in Indonesia: The moderating role of cooperatives in driving economic and social welfare in Indonesia. INKUBIS: Jurnal Ekonomi dan Bisnis, 8(2), 1729-1747. https://doi.org/10.59261/inkubis.v8i2.314

INTRODUCTION

Sustainable economic and social welfare strongly emphasizes the quality of development, where the fishery sector has played a significant role, particularly in archipelagic countries such as Indonesia. The fishery sector is not only considered a component of food production but also an integral part of inclusive economic development, food security, job creation, and, more importantly, social welfare. In an emerging country with archipelagic characteristics, the fishery sector plays an important role in sustaining food security, adequate nutrition, and the welfare of coastal communities (García-de-la-Fuente et al., 2020; Hirokawa & Thompson, 2023). In the context of economic growth, governance and institutional quality can amplify the contribution of the fishery sector to overall economic output, employment, and value-chain development (Asche

et al., 2018; Costello et al., 2016). Nevertheless, these positive outcomes are not always evenly distributed across regions, as micro and small-scale fishery businesses are often more vulnerable due to limited capital, market access, and bargaining power (Fabinyi et al., 2015; Wamukota et al., 2014). These challenges persist and may contribute to higher income inequality among regions in Indonesia.

Referring to the Blue Economy conceptual framework, the fishery sector serves as a fundamental component of economic development in coastal and archipelagic regions. However, its contribution strongly depends on economic structures, governance systems, and institutional quality, which require not only high economic growth but also sustainable development, equitable income distribution, and inclusive governance (Bennett et al., 2021; Eikeset et al., 2018; Marwa et al., 2024; Pace et al., 2023; Qi, 2022). In the Indonesian context, this conceptual framework is particularly relevant for the Eastern Indonesia Region, where the contribution of the fishery sector to regional economies is relatively higher compared with other regions. Therefore, the impact of the fishery sector on economic and social welfare may vary across Indonesian provinces.

In Indonesia, fishery sector activities are dominated by micro and small-scale business actors, including fishers and supporting workers, making them highly vulnerable due to limited capital reserves. Therefore, cooperatives play an important role as collective financing institutions that can strengthen the bargaining position of micro and small-scale actors, expand market access, and increase income levels (Kvamsdal et al., 2023; Macusi et al., 2023; Ye et al., 2024). However, the role of cooperatives is not automatically inclusive if micro and small-scale actors do not have equal access to market integration, quality standards, and modern value chains (Amran et al., 2025; Macusi et al., 2022; Mogila et al., 2024). Therefore, this perspective highlights that cooperatives can serve as catalysts for inclusive growth in natural resource-based regions, but they may also reinforce income inequality without inclusive policies targeting micro and small-scale fishery enterprises (Axon & Collier, 2023; Ayilu et al., 2022).

Furthermore, the quality of human capital serves as a fundamental aspect of sustainable and inclusive economic growth. Generally, three important dimensions sustain human capital quality: health, education, and living standards (Harttgen & Klasen, 2012). Moreover, the recent global pandemic generated significant implications worldwide through complex distributional effects. On the one hand, COVID-19 reduced income inequality in certain contexts due to substantial declines in the cumulative assets of high-income groups; however, structurally, the pandemic generated long-term inequality through disruptions in labor markets, education, and digital access. More specifically, COVID-19 altered income distribution, demand structures, and the bargaining positions of micro and small enterprises within fishery sector value chains (Hirokawa & Thompson, 2023; Macusi et al., 2023). Therefore, this study empirically examines the implications of the fishery sector on economic and social welfare across provinces in Indonesia, incorporating the Human Development Index (HDI) and the COVID-19 pandemic as control variables in the empirical model.

Based on the conceptual framework and previous empirical evidence, this study formulates the following hypotheses. H1: Higher productivity in the fishery sector significantly improves regional economic performance and reduces income inequality. H2: Cooperatives moderate the relationship between the fishery sector and economic and social welfare by strengthening positive effects through improved market access and collective bargaining. H3: The impact of the fishery sector and the moderating role of cooperatives vary across regions, with stronger effects observed in regions where economies are more dependent on the fishery sector (regional heterogeneity effect).

Despite the growing body of literature on the fishery sector and economic development, several critical gaps remain unaddressed. First, most existing studies focus on household-level welfare or single-country aggregate analyses without systematically examining how the impact of the fishery sector varies across regions with fundamentally different economic structures within the same country. Second, although cooperatives have been extensively studied in agricultural contexts Fischer & Qaim (2012), their moderating role in translating fishery sector contributions into macroeconomic outcomes remains empirically underexplored. Third, previous methodological approaches often rely on single-estimation techniques without comprehensive robustness checks to address dynamic panel bias and endogeneity issues. Taniu et al. (2024) examined the effects of cooperative membership on fishery household welfare in Indonesia;

however, their study was limited to micro-level household data and did not consider regional heterogeneity or macroeconomic indicators such as Regional GDP and the Gini Ratio.

This study contributes to the existing literature in three important ways. First, it provides a comprehensive macro-level empirical analysis of the fishery sector's impact on both economic growth (Regional GDP) and social welfare (Gini Ratio) across all 34 provinces in Indonesia over a 16-year period (2010–2025). Second, it introduces cooperatives as a moderating variable to examine whether institutional capacity can strengthen the contribution of the fishery sector to economic and social welfare, which has not been empirically tested within a regional heterogeneity framework. Third, it applies a multi-method robustness strategy (FEM, Panel ARDL, FD-GMM, and Sys-GMM) to address potential dynamic panel bias, endogeneity, and temporal effects, thereby enhancing the reliability and validity of the empirical findings.

Therefore, this study aims to examine the impact of the fishery sector on economic growth and social welfare across Indonesian provinces, evaluate whether cooperatives strengthen the contribution of the fishery sector to regional economic performance and income distribution, and investigate regional heterogeneity between Java and Eastern Indonesia. The findings are expected to enrich the literature on the blue economy, institutional economics, and regional development while providing evidence-based policy recommendations for strengthening cooperative governance and sustainable fisheries development in Indonesia.

METHOD

To examine the impact of the fishery sector on economic and social welfare and the moderating role of cooperatives, this study employs secondary panel data obtained from official government databases. Economic and social welfare are proxied by Regional Gross Domestic Product (Regional GDP) and the Gini Ratio, respectively (Liu et al., 2024). The independent variable is fishery productivity, measured by production volume (Tigchelaar et al., 2022). The moderating variable is cooperative size, while the Human Development Index (HDI) and the COVID-19 pandemic are included as control variables to account for differences in human capital and external economic shocks (Han et al., 2025). The definitions, measurements, and data sources of all variables are presented in Table 1.

Table 1
Data and Variable

Variables		Descriptions	Source
Dependent	Regional GDP	Reflecting total productivity of a province expressed in constant trillion Rupiah.	Central Bureau of Statistics (2026)
	Gini Ratio	Reflecting income inequality among households in a province, expressed in index value.	
Independent	Fishery Productivity	Total annual productivity of the fishery sector expressed in thousand tons	Ministry of Marine Affairs and Fishery (2026)
Moderating	Cooperatives	Total size of cooperatives of a province expressed in trillion Rupiah	Ministry of Cooperatives (2026)
Control	Human Development Index	Reflecting quality of human capital of a province composed of education, healh, and income components	Central Bureau of Statistics (2026)
	COVID-19	Periods where COVID-19 pandemic occurs, with 1 = COVID-19 occurrence; 0 = otherwise	Ministry of Health (2024)

Source: Author's Tabulation (2026)

This study employs a balanced panel dataset covering all 34 provinces in Indonesia over the period 2010–2025, generating 544 total observations. It should be noted that Indonesia's administrative restructuring in 2022, which established new Papua provinces, is accounted for by merging the new provinces into their parent provinces to maintain panel balance and comparability. The 2025 Regional GDP and Gini Ratio data are based on the preliminary release

by BPS (March 2026 vintage). All variables are estimated in level forms rather than logarithmic transformations, following the precedent set by the Fixed Effect Model specification that directly captures the marginal impact of each variable in its original unit of measurement. All estimations are conducted using Stata 17.

In analyzing the impact of fishery sector on economic and social welfare, this study employs Fixed Effect Model (FEM) to control a constant unobserved individual heterogeneity in each cross section (Wooldridge, 2003). It is mathematically expressed as follows:

$$Y_{it} = \alpha_i + \sum_{j=1}^{N} \beta_j X_{it} + \varepsilon_{it} \quad \text{(Eq. 1)}$$

where y_{it} denotes dependent variable, x_{it} is independent variable, while u_{it} is the error-term. Moreover, α_i and β denote constant term and regression coefficient, respectively. Referring to the above conceptual framework, our model specification can be expressed as follows.

The Fixed Effect Model (FEM) is selected as the baseline estimator based on the Hausman specification test, which rejects the Random Effects Model at the 1% significance level. Panel unit root tests (Levin-Lin-Chu and Im-Pesaran-Shin) confirm that all variables are stationary at level. Furthermore, the Pesaran CD test indicates cross-sectional dependence across provinces, which is addressed through the inclusion of the COVID-19 dummy variable and robustness analyses using Panel ARDL and GMM estimators.

$$ecosos_{it} = \beta_0 + \beta_1 fishery_{it} + \beta_2 coop_{it} + \beta_3 (fishery \times coop)_{it} + \beta_4 hdi_{it} + \beta_5 covid_t + \varepsilon_{it} \quad \text{(Eq. 2)}$$

where $ecosos_{it}$ is economic and social indicators proxied by the Regional GDP (constant value expressed in USD trillion) and Gini Ratio respectively, $fishery$ denotes productivity of fishery sector expressed in tons, $coop$ denotes size of cooperatives expressed in IDR trillion, $fishery \times coop$ denotes the interaction between fishery productivity and cooperatives intended to identify whether cooperatives can amplify the impact of fishery sector on economic and social welfare, hdi is Human Development Index which reflects the quality of the human capital, while $covid$ is pandemic dummy where 1 is the occurrence of COVID-19 pandemic, while 0 is otherwise. The above empirical model is also extended to regional analysis, both with and without the interaction between the fishery productivity and cooperatives.

In performing the robustness check, this study employs Panel ARDL and GMM (both FD-GMM and System-GMM). The main objective is to anticipate technical weakness of Fixed Effect Model (FEM), where even it is technically able to control individual heterogeneity, Fixed Effect Model (FEM) cannot capture long-term temporal dynamics and potential bias in interpretation if the assumption of strict exogeneity is not fulfilled (Hill et al., 2020). In the context of panel data, the inclusion of lagged variable to anticipate temporal dynamics potentially leads to bias due to inconsistent coefficient when Fixed Effect Model (FEM) is implemented, especially in a data structure where time dimension is relatively shorter than unit dimensions (Baltagi, 2008). To capture short and long-term effects in simultaneous model, this study uses Panel Autoregressive Distributed Lag (Panel-ARDL) model mathematically expressed as follows (Caporale et al., 2023; Kripfganz & Schneider, 2023).

$$Y_{it} = \sum_{j=1}^{p} \phi_{ij} Y_{i,t-j} + \sum_{j=0}^{q} \beta_{ij} X_{i,t-j} + \mu_i + \varepsilon_{it} \quad \text{(Eq. 3)}$$

where Y_{it} is dependent variable, X_{it} is independent variable, p is lag dependent variable, q is lag independent variable, μ_i is individual effect, and ε_{it} is the error-term. Moreover, the Error Correction Model (ECM) specification is expressed as follows.

$$\triangle Y_{it} = \phi_i (Y_{i,t-1} - \theta_i X_{it}) + \sum \gtrsim_{ij} \triangle Y_{i,t-j} + \sum \delta_{ij} X_{i,t-j} + \mu_i + \varepsilon_{it} \quad \text{(Eq. 4)}$$

Moreover, the robustness check also involves GMM model that is used to address simultaneous endogeneity problems and dynamic panel bias through instrumentation of lagged levels and lagged differences from endogenous variables (Arellano & Bond, 1991; Arellano, 2003 Blundell & Bond, 1998). The First Difference-GMM model mathematically expressed as follows.

$$\triangle Y_{it} = \alpha \triangle Y_{i,t-1} + \beta \triangle X_{it} + \triangle \varepsilon_{it} \quad \text{(Eq. 5)}$$

Furthermore, the System-GMM provides a more efficient estimation for a higher persistent variable by incorporating the level equation with additional moments (Juuti, 2022; Wolde et al., 2022). In general, System-GMM is the extensions of FD-GMM where both difference equation and level equation are combined simultaneously. The level equation is mathematically expressed as follows.

$$Y_{it} = \alpha Y_{i,t-1} + \beta X_{it} + \mu_i + \varepsilon_{it} \quad \text{(Eq. 6)}$$

By incorporating these models, potential convergence in the outputs would reflect the real structural relationship between variables, therefore, the conclusions and policy recommendations could be well-targeted.

RESULTS AND DISCUSSION

Results

Descriptive Statistics

This section provides information about profile of data of each variable as well as the pairwise correlation among variables. This study employs data from 34 provinces in Indonesia with period of observation from 2010 to 2025 which generate 544 observations. The detail is exhibited on the following table.

Table 2
Descriptive Statistics

Variables	Obs	Mean	Stdev	Max	Min
Regional GDP (IDR Trillion)	544	297.15	430.40	2263.24	14.98
Gini Ratio	544	0.355	0.043	0.459	0.214
Fishery Productivity (Thousand Tons)	544	195,763	153,644	1,203,191	2,994
Cooperatives (IDR Trillion)	544	4.483	8.524	103.904	0.002
Human Development Index	544	69.63	4.61	83.08	54.45

Moreover, our pairwise correlation matrix shows that Fishery Productivity shows positive and significant correlation with the Regional GDP, while the correlation with Gini Ratio is significantly negative. It indicates that higher productivity in the fishery sector is accompanied by the increase in economic and social welfare. Furthermore, Cooperatives show a significant positive correlation with Regional GDP; however, the correlation with the Gini Ratio is also significantly positive, indicating a potential efficiency-equity trade-off. It indicates that higher total size of cooperatives is accompanied with higher regional economic performance, even though a challenge remains where income inequality increases as well. On the other hand, Human Development Index (HDI) shows a significantly positive correlation with the Regional GDP, while the correlation with Gini Ratio is significantly negative. It shows that the increase in quality of

human capital is accompanied by higher economic and social welfare. The pairwise correlation matrix is exhibited in the following Table 3.

Table 3
Correlation Matrix

Variables	(a)	(b)	(c)	(d)	(e)
Regional GDP (a)	1				
Gini Ratio (b)	0.1359***	1			
Fishery Productivity (c)	0.1760***	-0.1675***	1		
Cooperatives (d)	0.7584***	0.1126***	0.0433	1	
Human Development Index (e)	0.4648***	-0.0292	-0.2288***	0.3946***	1

The fishery sector has been playing important roles in sustaining Indonesia's economic and social welfare. As an archipelago, Indonesia has so many potentials from this sector as well as its derivative sectors including food and beverages, logistics, services, etc. The trend between productivity of the fishery sector on economic and social welfare is exhibited in the following Figure 1 and 2.

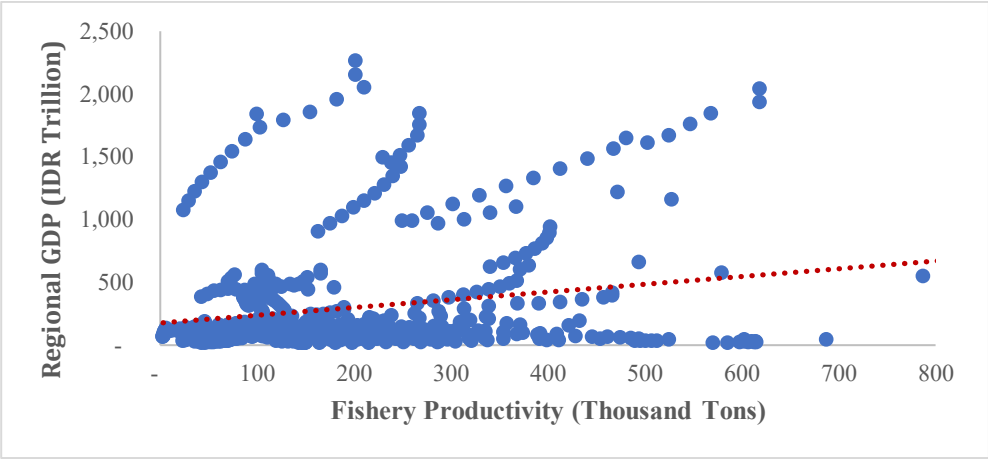

Figure 1. Fishery Productivity and Regional GDP in Indonesia (2010 – 2025)
Source: BPS (2026); Ministry of Marine Affairs and Fishery (2026) – processed by Authors

The above Figure 1 indicates that higher productivity in the fishery sector is accompanied by higher economic performance. This provides an opportunity for more sustainable economic performance in the long run. Nevertheless, economic performance alone is not enough to reflect welfare, therefore, it is also provided trend between fishery sector and Gini ratio. The result is exhibited as follows.

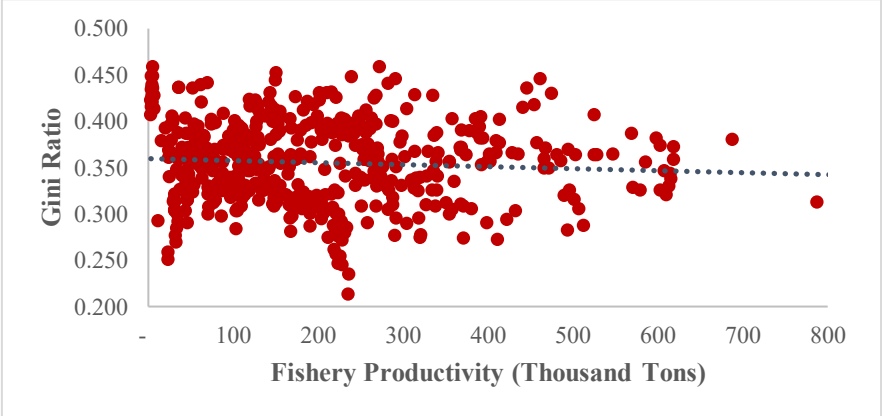

Figure 2. Fishery Productivity and Gini Ratio (2010 – 2025)
Source: BPS (2026); Ministry of Marine Affairs and Fishery (2026) – processed by Authors

The above Figure 2 exhibits that higher productivity in the fishery sector is accompanied

by lower Gini ratio, meaning that fishery sector offers the opportunity to address the problem of income inequality in Indonesia. Furthermore, the impact of the fishery sector on regional economic performance is exhibited in the following table.

Table 4
The Fishery Sector and Regional GDP

Variables	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Fishery Productivity	0.240***	0.220***	0.109***	0.108***
	(0.0228)	(0.0234)	(0.0139)	(0.0140)
Cooperatives		0.0577***	0.0101	0.00916
		(0.0174)	(0.0101)	(0.0101)
Human Development Index			6.547***	6.488***
			(0.223)	(0.228)
COVID-19				0.0200
				(0.0160)
Constant	29.76***	28.38***	26.45***	26.53***
	(0.270)	(0.493)	(0.285)	(0.291)
Province Fixed Effect	Yes	Yes	Yes	Yes
Observations	544	544	507	507
R-squared	0.179	0.196	0.722	0.723
Number of provinces	34	34	34	34

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Moreover, characteristics among regions are relatively different, including economic sectors that can be optimized to create economic and social welfare. Therefore, this study also provides regional-based outputs covering Java Region and Eastern Indonesia Region. These selections are taken upon consideration where Java is the central of Indonesia's economic activity, while Eastern Indonesia Region possesses higher potentials from the maritime sector. The result is exhibited in the following Table 5.

Table 5
Regional Analysis of The Fishery Sector and Regional GDP

Variables	(1) Java Region	(2) Eastern Indonesia Region
Fishery Productivity	0.108***	0.0365**
	(0.0146)	(0.0175)
Fishery Productivity × JR	-0.000786	
	(0.0401)	
Fishery Productivity × EIR		0.173***
		(0.0273)
Cooperatives	0.00916	0.0151
	(0.0101)	(0.00976)
Human Development Index	6.489***	6.849***
	(0.230)	(0.226)
COVID-19	0.0200	0.0238
	(0.0160)	(0.0153)
Constant	26.53***	26.27***
	(0.292)	(0.283)

Variables	(1) Java Region	(2) Eastern Indonesia Region
Province Fixed Effect	Yes	Yes
Observations	507	507
R-squared	0.723	0.745
Number of provinces	34	34

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The above Table 5 shows that the fishery sector performs positive and significant impact on the Regional GDP. However, when interacting with Java Region dummy, the coefficient turns out to be insignificant. The result is empirically different when it comes to the Eastern Indonesia Region, where a more significant positive impact occurs when interacting with the Eastern Indonesia Region dummy. Moreover, this study also interacts the fishery sector with cooperatives and region dummies to identify whether cooperatives in each region offer an opportunity to amplify the impact of the fishery sector on regional economic performance in each region. The result is exhibited in the following Table 6.

Table 6
Moderating Effect of Cooperatives Between the Fishery Sector and Regional GDP

Variable	(1) Java Region	(2) Eastern Indonesia Region
Fishery Productivity	0.374*	0.273
	(0.191)	(0.170)
Cooperatives	0.125	0.0764
	(0.0837)	(0.0746)
Fishery Productivity × Cooperatives	-0.00997	-0.00751
	(0.00710)	(0.00626)
Fishery Productivity × Cooperatives × JR	0.00101	
	(0.00113)	
Fishery Productivity × Cooperatives × EIR		0.00417***
		(0.000779)
Human Development Index	6.544***	6.780***
	(0.235)	(0.232)
COVID-19	0.0206	0.0242
	(0.0160)	(0.0155)
Constant	23.33***	24.54***
	(2.306)	(2.054)
Province Fixed Effect	Yes	Yes
Observations	507	507
R-squared	0.724	0.740
Number of provinces	34	34

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The above Table 6 suggests that cooperatives offer an opportunity to amplify the impact of the fishery sector on regional economic performance in the Eastern Indonesia Region. Furthermore, this study also analyzes the impact on the income inequality exhibited in the following Table 7.

Table 7
The Fishery Sector and Gini Ratio

Variables	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Fishery Productivity	-0.00857***	-0.00936***	-0.00341	-0.00314
	(0.00252)	(0.00260)	(0.00239)	(0.00238)
Cooperatives		0.00231	0.00486***	0.00514***
		(0.00194)	(0.00173)	(0.00173)
Human Development Index			-0.391***	-0.373***
			(0.0382)	(0.0389)
COVID-19				-0.00600**
				(0.00272)
Constant	0.457***	0.402***	0.534***	0.512***
	(0.0298)	(0.0550)	(0.0488)	(0.0497)
Province Fixed Effect	Yes	Yes	Yes	Yes
Observations	544	544	507	507
R-squared	0.022	0.025	0.204	0.212
Number of provinces	34	34	34	34

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The above Table 7 shows that productivity of the fishery sector does not perform significant impact on Gini ratio. Interestingly, our empirical analysis shows that cooperatives tend to increase Gini ratio, meaning that higher productivity of cooperatives leads to higher income inequality in Indonesia. Furthermore, our empirical analysis suggests different outputs on the income inequality when interacting with the region dummy. The result is exhibited in the following Table 8.

Table 8
Regional Analysis of The Fishery Sector and Gini Ratio

Variables	(1) Java Region	(2) Eastern Indonesia Region
Fishery Productivity	-0.00685***	0.00126
	(0.00242)	(0.00310)
Fishery Productivity × JR	0.0349***	
	(0.00664)	
Fishery Productivity × EIR		-0.0106**
		(0.00482)
Cooperatives	0.00477***	0.00478***
	(0.00168)	(0.00173)
Human Development Index	-0.395***	-0.395***
	(0.0381)	(0.0400)
COVID-19	-0.00605**	-0.00623**
	(0.00265)	(0.00271)
Constant	0.510***	0.528***
	(0.0483)	(0.0500)
Province Fixed Effect	Yes	Yes
Observations	507	507
R-squared	0.256	0.220
Number of provinces	34	34

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The above Table 8 shows that productivity in the fishery sector significantly reduces Gini ratio, however, the effect changes to be significantly positive when interacting with Java Region dummy. It remains a challenge in provinces located in Java Region considering income inequality increases due to higher productivity in the fishery sector. Moreover, our empirical analysis also reveals potential opportunity from cooperatives in amplifying the impact of the fishery sector on income inequality. The result is exhibited in the following Table 9.

Table 9
Moderating Effect of Cooperatives Between the Fishery Sector and Gini Ratio

Variables	**(1) Java Region**	**(2) Eastern Indonesia Region**
Fishery Productivity	0.0572*	-0.0189
	(0.0313)	(0.0296)
Cooperatives	0.0317**	-0.00136
	(0.0137)	(0.0130)
Fishery Productivity × Cooperatives	-0.00238**	0.000714
	(0.00116)	(0.00109)
Fishery Productivity × Cooperatives × JR	0.00118***	
	(0.000186)	
Fishery Productivity × Cooperatives × EIR		-0.000376***
		(0.000136)
Human Development Index	-0.386***	-0.400***
	(0.0385)	(0.0404)
COVID – 19	-0.00612**	-0.00638**
	(0.00262)	(0.00271)
Constant	-0.219	0.703*
	(0.378)	(0.358)
Province Fixed Effect	Yes	Yes
Observations	507	507
R-squared	0.275	0.226
Number of provinces	34	34

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Robustness Analysis

The robustness checks provide more insightful findings by incorporating the assumptions of dynamic and long-term effects.

Table 10
Panel Autoregressive Distributed Lag (Panel ARDL) – Regional GDP Output

Variables	Regional GDP									
	PMG	**MG**	**PMG**	**MG**	**PMG**	**MG**	**PMG**	**MG**	**PMG**	**MG**
PANEL A (Long-Run Coefficients)										
Fishery Productivity	0.133***	-0.060	0.070**	-0.076	0.032	-0.031	-4.263***	25.293	-4.628***	25.293
	(0.031)	(0.143)	(0.028)	(0.141)	(0.033)	(0.085)	(0.455)	(30.656)	(0.501)	(30.656)
Cooperative	0.373***	0.025	0.375***	0.025	0.395***	0.025	-1.470***	11.803	-1.609***	11.803
	(0.019)	(0.027)	(0.021)	(0.027)	(0.023)	(0.027)	(0.197)	(13.831)	(0.214)	(13.831)
Fishery × Cooperative							0.160***	-1.024	0.172***	-0.407
							(0.016)	(1.159)	(0.018)	(0.610)
Fishery Productivity × JR			0.045***	0.016						
			(0.008)	(0.011)						
Fishery Productivity × EIR					0.008	-0.029				
					(0.007)	(0.066)				
Fishery Productivity × Cooperative × JR							-0.000*	0.038		
							(0.000)	(0.028)		
Fishery Productivity × Cooperative × EIR									0.001***	-0.579
									(0.000)	(0.569)
Human Development Index	7.945***	5.724***	9.691***	5.724***	9.844***	5.724***	9.203***	5.859***	8.771***	5.859***
	(0.725)	(1.250)	(0.668)	(1.250)	(0.729)	(1.250)	(0.647)	(1.463)	(0.709)	(1.463)
COVID-19	-0.013	-0.059	-0.046	-0.059	-0.046	-0.059	-0.025	-0.084*	-0.017	-0.084*
	(0.091)	(0.039)	(0.083)	(0.039)	(0.089)	(0.039)	(0.080)	(0.048)	(0.086)	(0.048)
PANEL B (Error Correction Term & Diagnostics)										
ECT (speed of adjustment)	-0.040***	-0.546***	-0.043***	-0.546***	-0.040***	-0.546***	-0.061***	-0.704***	-0.058***	-0.704***
	(0.015)	(0.060)	(0.015)	(0.060)	(0.014)	(0.060)	(0.019)	(0.088)	(0.018)	(0.088)
Hausman χ^2 (PMG vs MG)	316.051		402.274		569.485		10.480		8.139	
Hausman p-value	0.000		0.000		0.000		0.106		0.228	
Preferred estimator	MG		MG		MG		PMG		PMG	
N (provinces)	34		34		34		34		34	
T (years)	16		16		16		16		16	
Observations	510		510		510		510		510	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11
Panel Autoregressive Distributed Lag (Panel ARDL) – Gini Ratio Output

Variables	Gini Ratio									
	PMG	**MG**	**PMG**	**MG**	**PMG**	**MG**	**PMG**	**MG**	**PMG**	**MG**
PANEL A (Long-Run Coefficients)										
Fishery Productivity	-0.010***	0.035	-0.010***	0.031	-0.017***	0.020	0.150***	8.803	0.028	8.803
	(0.002)	(0.038)	(0.002)	(0.034)	(0.002)	(0.034)	(0.027)	(13.749)	(0.029)	(13.749)
Cooperative	0.005***	0.003	-0.002**	0.003	0.012***	0.003	0.066***	3.374	0.030**	3.374
	(0.001)	(0.005)	(0.001)	(0.005)	(0.001)	(0.005)	(0.012)	(5.698)	(0.012)	(5.698)
Fishery × Cooperative							-0.006***	-0.289	-0.002	-0.388
							(0.001)	(0.486)	(0.001)	(0.463)
Fishery Productivity × JR			0.005***	0.004						
			(0.000)	(0.010)						
Fishery Productivity × EIR					0.004***	0.015				
					(0.000)	(0.010)				
Fishery Productivity × Cooperative × JR							0.000***	-0.003		
							(0.000)	(0.006)		
Fishery Productivity × Cooperative × EIR									0.000***	0.095
									(0.000)	(0.081)
Human Development Index	-0.144***	-0.876*	-0.207***	-0.876*	-0.048	-0.876*	-0.232***	-1.376**	-0.062	-1.376**
	(0.044)	(0.470)	(0.040)	(0.470)	(0.040)	(0.470)	(0.039)	(0.575)	(0.041)	(0.575)
COVID-19	-0.008	-0.003	-0.006	-0.003	-0.009*	-0.003	-0.005	-0.009	-0.009*	-0.009
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)
PANEL B (Error Correction Term & Diagnostics)										
ECT (speed of adjustment)	-0.635***	-0.969***	-0.637***	-0.969***	-0.578***	-0.969***	-0.636***	-1.100***	-0.606***	-1.100***
	(0.048)	(0.049)	(0.046)	(0.049)	(0.047)	(0.049)	(0.045)	(0.066)	(0.048)	(0.066)
Hausman χ^2 (PMG vs MG)	1.928		3.011		-1.432		6.208		8.095	
Hausman p-value	0.749		0.698		0.921		0.400		0.231	
Preferred estimator	PMG		PMG		PMG		PMG		PMG	
N (provinces)	34		34		34		34		34	

T (years)	16	16	16	16	16
Observations	510	510	510	510	510

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12
First Difference Generalized Method of Moments (FD-GMM) Output

Variable	**Regional GDP**					**Gini Ratio**				
Regional GDP (Lag 1)	0.958***	0.970***	0.994***	0.926***	0.957***	1.058***	0.981***	0.950**	0.894***	0.818**
	(0.147)	(0.145)	(0.136)	(0.114)	(0.115)	(0.329)	(0.292)	(0.395)	(0.277)	(0.321)
Fishery Productivity	0.169	0.169	0.160	2.139	1.736	-0.022	-0.016	-0.039	0.114	0.151
	(0.110)	(0.112)	(0.158)	(1.416)	(1.177)	(0.034)	(0.037)	(0.055)	(0.351)	(0.348)
Cooperative	-0.191	-0.184	-0.165	0.783	0.611	0.009	0.009	0.012	0.061	0.084
	(0.175)	(0.172)	(0.140)	(0.559)	(0.447)	(0.019)	(0.018)	(0.019)	(0.138)	(0.134)
Fishery × Cooperative				-0.075	-0.057				-0.004	-0.007
				(0.053)	(0.043)				(0.012)	(0.012)
Fishery Productivity × JR		-0.084					-0.037			
		(0.288)					(0.090)			
Fishery Productivity × EIR			-0.041					0.041		
			(0.281)					(0.070)		
Fishery Productivity × Cooperative × JR				0.003					-0.000	
				(0.009)					(0.002)	
Fishery Productivity × Cooperative × EIR					-0.005					0.001
					(0.007)					(0.002)
Human Development Index	-0.714	-0.705	-0.879	-0.238	-0.455	-0.105	-0.098	-0.063	-0.113	-0.077
	(0.621)	(0.596)	(0.557)	(0.665)	(0.547)	(0.114)	(0.116)	(0.120)	(0.124)	(0.115)
COVID-19	-0.039***	-0.039***	-0.040***	-0.039***	-0.041***	0.001	0.001	0.001	0.001	0.001
	(0.008)	(0.007)	(0.007)	(0.006)	(0.007)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Specification Tests										
AR (2) p-value	0.919	0.917	0.911	0.902	0.899	0.953	0.961	0.962	0.949	0.954
Hansen p-value	0.449	0.654	0.522	0.037	0.112	0.507	0.633	0.593	0.549	0.611
Observations	374	374	374	374	374	374	374	374	374	374

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 13
System Generalized Method of Moments (Sys-GMM) Output – Gini Ratio

Variable	**Regional GDP**					**Gini Ratio**				
Regional GDP (Lag 1)	0.996***	0.999***	1.006***	0.845***	0.981***	0.258	0.253	0.245	-0.020	-0.028
	(0.034)	(0.030)	(0.028)	(0.119)	(0.066)	(0.269)	(0.224)	(0.251)	(0.219)	(0.276)
Fishery Productivity	0.115*	0.090*	0.119**	0.439*	0.172	0.022	0.026	0.021	0.058***	0.060**
	(0.061)	(0.052)	(0.046)	(0.263)	(0.173)	(0.018)	(0.016)	(0.014)	(0.019)	(0.025)
Cooperative	-0.020	-0.022	-0.030	0.108	-0.011	0.015*	0.013*	0.015**	0.032***	0.031***
	(0.026)	(0.024)	(0.023)	(0.105)	(0.067)	(0.008)	(0.008)	(0.007)	(0.010)	(0.012)
Fishery × Cooperative				-0.012	-0.001				-0.002***	-0.002**
				(0.009)	(0.006)				(0.001)	(0.001)
Fishery Productivity × JR		0.014*					0.009*			
		(0.009)					(0.005)			
Fishery Productivity × EIR			-0.015					0.002		
			(0.011)					(0.003)		
Fishery Productivity × Cooperative × JR				0.001*					0.001*	
				(0.001)					(0.000)	
Fishery Productivity × Cooperative × EIR					-0.001					-0.000
					(0.001)					(0.000)
Human Development Index	-0.895***	-0.568**	-0.907***	1.073	-0.819***	-0.597**	-0.625***	-0.582**	-0.816***	-0.799***
	(0.225)	(0.256)	(0.225)	(1.177)	(0.286)	(0.255)	(0.226)	(0.228)	(0.219)	(0.275)
COVID-19	-0.042***	-0.041***	-0.043***	-0.035***	-0.042***	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Specification Tests										
AR (2) p-value	0.776	0.898	0.826	0.658	0.777	0.500	0.451	0.501	0.389	0.420
Hansen p-value	0.605	0.757	0.736	0.571	0.592	0.096	0.153	0.065	0.388	0.311
Observations	748	748	748	748	748	748	748	748	748	748

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Discussion

The empirical findings demonstrate that the fishery sector plays a significant role in promoting regional economic growth in Indonesia. Higher fishery productivity is associated with higher Regional GDP, indicating that the sector remains an important source of value creation despite the increasing diversification of the national economy. This finding supports the sector-led growth perspective, which argues that productive sectors stimulate regional development through production linkages, employment generation, and value-added activities across related industries. In the context of fisheries, productivity improvements not only increase output but also strengthen downstream activities, including processing, logistics, and trade, thereby generating broader economic multiplier effects (Golden et al., 2021). However, the insignificant aggregate effect of cooperatives suggests that cooperative institutions alone are insufficient to influence regional economic performance unless supported by favorable regional economic structures and effective governance.

Regional analysis reveals substantial heterogeneity in the contribution of the fishery sector to economic growth. The positive impact is considerably stronger in Eastern Indonesia, where fisheries constitute a major component of regional economic activity, whereas the effect becomes insignificant in Java, whose economy is dominated by manufacturing and service industries. These findings indicate that the economic contribution of fisheries depends on the relative importance of the sector within the regional production structure rather than on fishery productivity alone. This evidence is consistent with the Blue Economy perspective, which emphasizes that the developmental benefits of marine resources depend on their integration into local value chains and supporting institutions rather than merely on resource abundance (Asche et al., 2018; Voyer et al., 2020).

The moderating analysis further demonstrates that cooperatives generate different outcomes across regions. Although cooperative size does not significantly strengthen the fishery sector at the national level, its moderating effect becomes positive and statistically significant in Eastern Indonesia. This finding suggests that cooperative institutions are more effective when they operate in regions where fisheries constitute the dominant livelihood and economic base. Under such conditions, cooperatives facilitate access to financing, production inputs, marketing networks, and collective bargaining, thereby improving productivity and regional economic performance. Conversely, the insignificant interaction observed in Java indicates that fisheries represent only one component of a much broader economic structure, limiting the capacity of fishery-based cooperatives to influence aggregate regional output. Therefore, the effectiveness of cooperatives appears to be context-dependent, reflecting differences in regional economic specialization and institutional environments rather than the presence of cooperatives alone.

The findings further indicate that the contribution of the fishery sector to social welfare is more heterogeneous than its contribution to economic growth. At the aggregate level, higher fishery productivity does not consistently reduce income inequality across provinces. Regional estimates reveal contrasting outcomes, with fisheries contributing to lower income inequality in Eastern Indonesia but exhibiting the opposite effect in Java. These differences suggest that improvements in sectoral productivity do not automatically translate into more equitable income distribution. Instead, the distributive effects of fisheries depend on the underlying economic structure, labor market characteristics, and institutional arrangements within each region (Ayilu et al., 2022).

The contrasting regional outcomes can be explained by differences in economic dependence on the fishery sector. In Eastern Indonesia, fisheries constitute one of the primary sources of employment and household income; therefore, productivity gains are more broadly transmitted to local communities through higher labor demand, increased household earnings, and stronger local economic linkages. In contrast, Java possesses a highly diversified economy in which fisheries account for only a small share of regional output. Consequently, productivity improvements tend to benefit relatively concentrated groups of producers and enterprises rather than generating broad-based welfare gains, thereby limiting their contribution to reducing regional inequality. These findings reinforce the argument that the social benefits of the Blue Economy depend not only on resource utilization but also on inclusive institutional arrangements that enable wider participation in economic opportunities (Voyer et al., 2020).

The moderating analysis provides further evidence that the effectiveness of cooperatives is highly context dependent. While the interaction between fisheries and cooperatives is insignificant at the national level, cooperatives significantly strengthen the ability of the fishery

sector to reduce income inequality in Eastern Indonesia. This finding suggests that cooperatives function as institutional mechanisms that improve market access, strengthen collective bargaining, facilitate financial inclusion, and reduce transaction costs for small-scale fishers. Such institutional support enables productivity gains to be distributed more evenly across fishing communities. Conversely, the insignificant or adverse moderating effect observed in Java indicates that cooperative development alone is insufficient to address inequality in regions characterized by diversified production structures and multiple competing economic sectors. Therefore, strengthening cooperative governance should be accompanied by broader policies that improve institutional quality, market integration, and equitable access to productive resources.

The robustness analyses further strengthen the credibility of the baseline estimations. The System GMM results consistently confirm the positive contribution of the fishery sector to regional economic growth, particularly in Eastern Indonesia, while the Panel ARDL estimations indicate that the sector generates short-run adjustment costs but contributes to lower income inequality over the long run. In addition, the moderating role of cooperatives remains significant in Eastern Indonesia after controlling for dynamic relationships and potential endogeneity, indicating that the main conclusions are not sensitive to alternative estimation techniques. These findings demonstrate that the observed regional heterogeneity is robust across different econometric specifications.

Potential endogeneity arising from reverse causality between regional economic performance and cooperative development is addressed using FD-GMM and System GMM estimators. The AR(2) and Hansen test statistics support the validity of the selected instruments, suggesting that the empirical results are not driven by dynamic panel bias. Nevertheless, future studies may strengthen causal inference by employing external instrumental variables or natural experiments to further isolate exogenous variation in fisheries development and cooperative performance.

The control variables also provide additional insights into regional development. Human Development Index (HDI) consistently exhibits a positive association with Regional GDP and contributes to lower income inequality, highlighting the importance of human capital in supporting inclusive economic growth. Meanwhile, the COVID-19 pandemic shows no significant effect on regional economic growth but is associated with a temporary decline in income inequality, reflecting the unequal impact of the pandemic across income groups. Although this short-term compression effect reduced measured inequality, previous evidence suggests that long-term structural changes in labor markets and digital transformation may eventually widen income disparities.

The empirical evidence also provides important policy implications. Given the stronger contribution of fisheries in Eastern Indonesia, development strategies should prioritize productivity enhancement through investment in fisheries infrastructure, cold-chain logistics, post-harvest processing, and market integration. Strengthening cooperative governance remains equally important by improving transparency, managerial capacity, access to finance, and digitalization to ensure that productivity gains are distributed more equitably among fishing communities. In contrast, policies in Java should place greater emphasis on improving inclusiveness and expanding economic opportunities for small-scale fishers within its more diversified regional economy.

The findings consistently demonstrate that the economic and social contributions of the fishery sector cannot be generalized across regions. The effectiveness of fisheries development depends not only on resource endowment but also on regional economic structures and the quality of supporting institutions. Consequently, policies designed to strengthen the fishery sector should adopt a region-specific approach that simultaneously enhances productivity, institutional capacity, and equitable benefit distribution to achieve sustainable and inclusive regional development.

CONCLUSION

This study examines the impact of the fishery sector on economic and social welfare in Indonesia and investigates the moderating role of cooperatives while accounting for regional heterogeneity. The findings indicate that higher fishery productivity significantly promotes regional economic growth, although its effects vary across regions. The positive contribution of

the fishery sector is strongest in Eastern Indonesia, where regional economies are more dependent on fisheries, whereas its effect is less pronounced in the more diversified economy of Java. Likewise, fishery productivity contributes to reducing income inequality in Eastern Indonesia but is associated with higher inequality in Java. Cooperatives also exhibit heterogeneous effects by strengthening the contribution of the fishery sector to economic growth and income distribution primarily in fishery-dependent regions. These findings extend the Blue Economy and institutional economics perspectives by demonstrating that the developmental role of the fishery sector is conditioned by regional economic structures and institutional effectiveness rather than operating uniformly across regions.

These findings highlight the importance of region-specific fisheries development strategies and strengthening cooperative governance to promote inclusive growth, particularly in Eastern Indonesia. However, this study is subject to several limitations, including the use of aggregate provincial data, the measurement of cooperatives based solely on size, and the limited representation of pandemic intensity. Future studies are encouraged to employ more disaggregated spatial data, develop broader indicators of cooperative governance quality, and apply stronger causal identification approaches, such as external instrumental variables or natural experiments, to provide more comprehensive evidence on the role of the fishery sector in fostering sustainable and inclusive regional development.

ACKNOWLEDGEMENT

The author would like to express gratitude to Universitas Indonesia for academic support and to the relevant government and private institutions for supporting data. Finally, the author would like to also express gratitude to academic supervisors for valuable insights into the completion of this paper.

AUTHOR CONTRIBUTION STATEMENT

The author solely conceived and designed the study, collected and analyzed the data, interpreted the empirical findings, developed the research methodology, drafted and revised the manuscript, and approved the final version for publication. The author is responsible for the overall integrity and accuracy of the work.

REFERENCES

Amran, A., Khaw, T. Y., & Harymawan, I. (2025). Navigating the blue economy: Challenges, governance, and pathways for enterprises. In *Journal of Cleaner Production* (Vol. 523). https://doi.org/10.1016/j.jclepro.2025.146407

Asche, F., Garlock, T. M., Anderson, J. L., Bush, S. R., Smith, M. D., Anderson, C. M., Chu, J., Garrett, K. A., Lem, A., Lorenzen, K., Oglend, A., Tveteras, S., & Vannuccini, S. (2018). Three pillars of sustainability in fisheries. *Proceedings of the National Academy of Sciences of the United States of America*, *115*(44). https://doi.org/10.1073/pnas.1807677115

Axon, S., & Collier, S. (2023). Breaking Blue: Establishing comprehensive policy for a just and inclusive transition for the Blue Economy. *Marine Policy*, *147*. https://doi.org/10.1016/j.marpol.2022.105343

Ayilu, R. K., Fabinyi, M., & Barclay, K. (2022). Small-scale fisheries in the blue economy: Review of scholarly papers and multilateral documents. In *Ocean and Coastal Management* (Vol. 216). https://doi.org/10.1016/j.ocecoaman.2021.105982

Baltagi, B. H. (2008). Econometric analysis of panel data. *Rohn Wiley*. https://doi.org/10.1007/978-3-030-53953-5

Bennett, N. J., Blythe, J., White, C. S., & Campero, C. (2021). Blue growth and blue justice: Ten risks and solutions for the ocean economy. *Marine Policy*, *125*. https://doi.org/10.1016/j.marpol.2020.104387

Caporale, G. M., Sova, A. D., & Sova, R. (2023). The short-run and long-run effects of trade openness on financial development: Some panel evidence for Europe. *International Journal of Finance and Economics*, *28*(4). https://doi.org/10.1002/ijfe.2626

Costello, C., Ovando, D., Clavelle, T., Kent Strauss, C., Hilborn, R., Melnychuk, M. C., Branch, T. A., Gaines, S. D., Szuwalski, C. S., Cabral, R. B., Rader, D. N., & Leland, A. (2016). Global fishery

prospects under contrasting management regimes. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(18). https://doi.org/10.1073/pnas.1520420113

Eikeset, A. M., Mazzarella, A. B., Davíðsdóttir, B., Klinger, D. H., Levin, S. A., Rovenskaya, E., & Stenseth, N. C. (2018). What is blue growth? The semantics of "Sustainable Development" of marine environments. *Marine Policy*, *87*. https://doi.org/10.1016/j.marpol.2017.10.019

Fabinyi, M., Foale, S., & Macintyre, M. (2015). Managing inequality or managing stocks? An ethnographic perspective on the governance of small-scale fisheries. *Fish and Fisheries*, *16*(3). https://doi.org/10.1111/faf.12069

Fischer, E., & Qaim, M. (2012). Linking Smallholders to Markets: Determinants and Impacts of Farmer Collective Action in Kenya. *World Development*, *40*(6). https://doi.org/10.1016/j.worlddev.2011.11.018

García-de-la-Fuente, L., García-Flórez, L., Fernández-Rueda, M. P., Alcázar-Álvarez, J., Colina-Vuelta, A., Fernández-Vázquez, E., & Ramos-Carvajal, C. (2020). Comparing the contribution of commercial and recreational marine fishing to regional economies in Europe. An Input-Output approach applied to Asturias (Northwest Spain). *Marine Policy*, *118*. https://doi.org/10.1016/j.marpol.2020.104024

Golden, C. D., Koehn, J. Z., Shepon, A., Passarelli, S., Free, C. M., Viana, D. F., Matthey, H., Eurich, J. G., Gephart, J. A., Fluet-Chouinard, E., Nyboer, E. A., Lynch, A. J., Kjellevold, M., Bromage, S., Charlebois, P., Barange, M., Vannuccini, S., Cao, L., Kleisner, K. M., … Thilsted, S. H. (2021). Aquatic foods to nourish nations. *Nature*, *598*(7880). https://doi.org/10.1038/s41586-021-03917-1

Han, Y., Nie, Y., Lv, A., & Ye, L. (2025). Impact of the surplus distribution principle on the development of agricultural cooperatives in China. *PLoS ONE*, *20*(5 May). https://doi.org/10.1371/journal.pone.0323876

Harttgen, K., & Klasen, S. (2012). A Household-Based Human Development Index. *World Development*, *40*(5). https://doi.org/10.1016/j.worlddev.2011.09.011

Hill, T. D., Davis, A. P., Roos, J. M., & French, M. T. (2020). Limitations of Fixed-Effects Models for Panel Data. *Sociological Perspectives*, *63*(3). https://doi.org/10.1177/0731121419863785

Hirokawa, T., & Thompson, B. S. (2023). The influence of new sustainable fisheries policies on seafood company practices and consumer awareness in Japan. *Marine Policy*, *157*. https://doi.org/10.1016/j.marpol.2023.105819

Juuti, T. (2022). The role of financial development in the relationship between income inequality and economic growth: an empirical approach using cross-country panel data. *Quality and Quantity*, *56*(3). https://doi.org/10.1007/s11135-021-01163-1

Kripfganz, S., & Schneider, D. C. (2023). ardl: Estimating autoregressive distributed lag and equilibrium correction models. *Stata Journal*, *23*(4). https://doi.org/10.1177/1536867X231212434

Kvamsdal, S., Hopland, A. O., Li, Y., & Selle, S. (2023). Expert opinions on threats and impacts in the marine environment. *Marine Policy*, *147*. https://doi.org/10.1016/j.marpol.2022.105382

Liu, H., Wang, L., Wang, J., Ming, H., Wu, X., Xu, G., & Zhang, S. (2024). Multidimensional spatial inequality in China and its relationship with economic growth. *Humanities and Social Sciences Communications*, *11*(1). https://doi.org/10.1057/s41599-024-03961-y

Macusi, E. D., Maynawang, I. S., Katikiro, R. E., Suyo, J. G., & Macusi, E. S. (2023). Women lead small-scale fisheries to sustainability in Surigao del Sur, Philippines. *Marine Policy*, *155*. https://doi.org/10.1016/j.marpol.2023.105768

Macusi, E. D., Morales, I. D. G., Macusi, E. S., Pancho, A., & Digal, L. N. (2022). Impact of closed fishing season on supply, catch, price and the fisheries market chain. *Marine Policy*, *138*. https://doi.org/10.1016/j.marpol.2022.105008

Marwa, T., Muizzuddin, Bashir, A., Andaiyani, S., & Cahyadi, A. (2024). Determinants of the Blue Economy Growth in the Era of Sustainability: A Case Study of Indonesia. *Economies*, *12*(11). https://doi.org/10.3390/economies12110299

Mogila, Z., Ciolek, D., Toroj, A., & Zaucha, J. (2024). How important is the blue economy for regional development? – The case of Poland. *Marine Policy*, *168*. https://doi.org/10.1016/j.marpol.2024.106303

Pace, L. A., Saritas, O., & Deidun, A. (2023). Exploring future research and innovation directions for a sustainable blue economy. *Marine Policy*, *148*.

https://doi.org/10.1016/j.marpol.2022.105433
Qi, X. (2022). Building a bridge between economic complexity and the blue economy. *Ocean and Coastal Management*, *216*. https://doi.org/10.1016/j.ocecoaman.2021.105987
Taniu, S., Sari, D. W., Satria, D., Haryanto, T., & Wardana, W. W. (2024). Impact evaluation of cooperative membership on welfare: Evidence from captured fishery households in Indonesia. *Marine Policy*, *159*. https://doi.org/10.1016/j.marpol.2023.105923
Tigchelaar, M., Leape, J., Micheli, F., Allison, E. H., Basurto, X., Bennett, A., Bush, S. R., Cao, L., Cheung, W. W. L., Crona, B., DeClerck, F., Fanzo, J., Gelcich, S., Gephart, J. A., Golden, C. D., Halpern, B. S., Hicks, C. C., Jonell, M., Kishore, A., … Wabnitz, C. C. C. (2022). The vital roles of blue foods in the global food system. *Global Food Security*, *33*. https://doi.org/10.1016/j.gfs.2022.100637
Voyer, M., Farmery, A. K., Kajlich, L., Vachette, A., & Quirk, G. (2020). Assessing policy coherence and coordination in the sustainable development of a Blue Economy. A case study from Timor Leste. *Ocean and Coastal Management*, *192*. https://doi.org/10.1016/j.ocecoaman.2020.105187
Wamukota, A., Brewer, T. D., & Crona, B. (2014). Market integration and its relation to income distribution and inequality among fishers and traders: The case of two small-scale Kenyan reef fisheries. *Marine Policy*, *48*. https://doi.org/10.1016/j.marpol.2014.03.013
Wolde, M., Sera, L., & Merra, T. M. (2022). Causal relationship between income inequality and economic growth in Ethiopia. *Cogent Economics and Finance*, *10*(1). https://doi.org/10.1080/23322039.2022.2087299
Wooldridge, J. M. (2003). Introductory Econometrics: A Modern Approach. *Economic Analysis*, *2nd*. https://doi.org/10.1198/jasa.2006.s154
Ye, Z., Huang, X., & Xie, Z. (2024). Sustainable transformation of global ocean governance: Can a global public goods approach lead the way? *Marine Policy*, *165*. https://doi.org/10.1016/j.marpol.2024.106213