

Does international finance promote the development of the blue economy in emerging countries? The case of SIDS and coastal countries in Africa

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Abstract— This study empirically assesses whether international funding for the development of the blue economy promotes measurable growth in recipient countries, and through which mechanisms. The sample consists of small island developing states (SIDS) and African coastal countries. Drawing on research on the effectiveness of development aid and an institutional and theory-of-change approach to blue finance, the explanatory variable related to blue finance received is derived from disbursements reported in the OECD Creditor Reporting System, lagged by one period. The dependent variables are fisheries production, marine protected areas, and a maritime governance index for each country derived from the literature. Based on a dynamic-system GMM panel analysis covering the period from 2010 to 2024, the results indicate that lagged blue finance has no effect on fish production but does have a positive effect on marine protected areas. This effect operates through a chain of mediation: Blue finance improves maritime governance, which in turn improves marine protected areas. International blue finance thus appears to support marine conservation primarily by strengthening governance, rather than by directly affecting production or conservation, thereby offering a distinct, mechanism-based contribution to the debate on the effectiveness of blue finance.

Keywords— blue economy, blue finance, maritime governance, marine conservation, fisheries production.

I. INTRODUCTION

Over the past decade, the blue economy has emerged as a framework for reconciling economic development and sustainability as they relate to the oceans [1]. This rise in prominence has been accompanied by the rapid development of dedicated financing mechanisms, notably bilateral and multilateral aid, blue bonds, and concessional funds, mobilized both by small island developing states (SIDS) considered pioneers in this field—and by coastal countries in Africa, where it represents a more recent public policy focus that is still taking shape [2]. The existing literature extensively documents the financing instruments themselves, blue bonds [2], [3], and innovative mechanisms for island states [4], without, however, examining the possibility of establishing a causal link between the volume of funding received and concrete development or conservation outcomes. This study specifically focuses, among these three forms, on official development assistance (ODA), measured based on official disbursements reported to the OECD under the fisheries and biodiversity codes, while blue bonds and concessional funds, although documented in the literature, are not directly measured in this study due to a lack of systematic and comparable data at the level of the sample under study. Consequently, the main question guiding this study is: Does international financing actually lead to measurable development of the blue economy in recipient countries? To answer this central question, several complementary sub-questions arise:

- Does the impact of blue financing differ depending on the aspect of development under consideration: direct economic output or marine conservation?
- Does blue financing have a direct impact on the measured dimensions, or does it act through a prior strengthening of maritime governance in recipient countries?
- Are there differences in this effect between SIDS and coastal African countries?

The objective of this study is to measure the impact of international blue finance on two dimensions of blue economy development: fisheries production and marine protected areas, and to determine whether maritime

governance serves as a channel through which this financing operates by testing it via a mediation chain. The paper follows this structure: Section 2 situates this study within the literature on the blue economy, blue finance, and maritime governance, specifying the theoretical framework used and deriving the hypotheses and model to be tested. Section 3 presents the data and the research methodology adopted. Section 4 presents the results, and Section 5 discusses them.

II. LITERATURE REVIEW

This section situates this study within the literature on the blue economy, blue finance, and maritime governance, before outlining the resulting theoretical framework and conceptual model that underpin the hypotheses being tested.

A. *The Blue Economy: Definitions and Challenges*

This concept emerged in the early 21st century and is rooted in the need to reconcile economic development with the environmental sustainability of the oceans. It refers to the responsible use of marine resources to stimulate growth while preserving the health of ocean ecosystems [1], [5], according to these authors, the blue economy's promise to reconcile growth, social inclusion, and sustainability faces operational challenges when these dimensions are not explicitly balanced in public policies. This study adopts an operational definition inspired by these two works: the development of the blue economy is considered "real" when it simultaneously results in sustainable economic production and the preservation of the ecosystems that make it possible. The literature also emphasizes the origin of this concept, which has its roots in the globalization of sustainability issues. International conferences such as the 1992 Rio Conference and the 2002 World Summit laid the groundwork for integrated ocean management, stressing the need for global cooperation to sustainably utilize these rich marine areas. Furthermore, some researchers note that the commitment of institutions such as the UN and the World Bank has helped establish the blue economy as a global strategy for achieving the Sustainable Development Goals [6].

B. *Blue financing*

concessional funds, mobilized to support the transition to and development of the blue economy. Bosmans and De Mariz [3] document the growth of the blue bond market since the Seychelles pioneering issuance in 2018, as well as its concentration in a limited number of pioneering countries. March et al. [2] explore this case in greater depth and draw lessons regarding the conditions for replication. Similarly, Bennett et al. [4] demonstrate, using the Caribbean as a case study, that the effectiveness of this financing depends heavily on the institutional capacity of recipient countries to absorb it, a finding that aligns with the literature on the conditional effectiveness of development aid.

C. *Maritime Governance*

Maritime governance, or blue economy governance, is a cornerstone for the effective implementation of the blue economy. It encompasses the stakeholders, institutions, public policies, and strategies that govern the use of this sector's resources. Soma et al. [7] emphasize that good governance requires coordination between public and private stakeholders, transparency in decision-making, and compliance with international sustainability standards. This concept, distinct from a country's general governance, refers to the capacity of states to formulate and implement institutional frameworks dedicated to ocean affairs. Wuwung et al. [8] propose the benchmark methodology in this field: they categorize 193 countries according to three observable criteria: political will, legal framework and action plan, which are considered more specific than general governance indicators such as the Worldwide Governance Indicators. Nagy and Nene [9] show that most African countries still struggle to identify their priority sectors within the blue economy and to formalize an integrated strategy despite the impetus provided by the African Union's Agenda 2063, while Popoola and Olajuyigbe [10] document, for the Gulf of Guinea, the institutional obstacles that hinder this momentum.

financing mechanisms and their degree of innovation); the score is calculated by aggregating the criteria met as of each date. Next, the explanatory variables are shifted by one period, following Burnside and Dollar [6], to limit the risk of reverse causality. All models are estimated using Blundell and Bond's System GMM [12], with endogenous instrumentation of the dependent variable; the number of instruments is limited by the Roodman procedure [13] to avoid instrument proliferation. Each model is validated using the Sargan test and the Arellano-Bond test for second-order autocorrelation. Two robustness checks complete the analysis: extending the explanatory variable "blue financing" to include the "maritime transport" and "coastal tourism" codes from the CRS classification, and a test of the stability of the results after removing outliers from the sample.

IV. RESULTS

A. Estimated models

In accordance with the methodology outlined in Section 3, two direct relationships and one mediation chain are estimated using the generalized method of moments in a dynamic system (System GMM, Blundell and Bond [12]). The general model is expressed as follows:

Model 1: Direct effect of blue financing on blue economy development indicators (H1, H1a)

$$(1) Y_{it} = \beta_0 + \beta_1 Y_{i,t-1} + \beta_2 \ln(\text{Financing}_{i,t-1} + 1) + \eta_i + \varepsilon_{it}$$

Where:

- Y_{it} : denotes the dependent variable, which is either the fishery production or the area of marine protected areas (MPAs) in country i in year t
- $Y_{i,t-1}$: its lagged value (persistence)
- $\text{Funding}_{i,t-1}$: blue funding lagged by one period (CRS codes for fisheries and marine biodiversity, OECD)
- η_i : country-specific fixed effects,
- ε_{it} : the error term.

Model 2: Mediation Chain via Maritime Governance (H2)

$$(2) \text{Gov}_{it} = \gamma_0 + \gamma_1 \text{Gov}_{i,t-1} + \gamma_2 \ln(\text{Funding}_{i,t-1} + 1) + \eta_i + \varepsilon_{it} \quad (2a)$$

$$(3) \text{AMP}_{it} = \delta_0 + \delta_1 \text{AMP}_{i,t-1} + \delta_2 \text{Gouv}_{i,t-1} + \eta_i + \varepsilon_{it} \quad (2b)$$

Where:

- Gouv_{it} : is the maritime governance score constructed through literature review.
- Equation (2) tests whether funding explains maritime governance
- Equation (3) tests whether this lagged governance, in turn, explains MPAs; the combination of the two constitutes the test of the mediation chain postulated by H2.

Each model is estimated using individual effects and a system transformation (forward orthogonal deviations), and validated using the Sargan test (instrument validity) and the Arellano-Bond test for second-order autocorrelation.

B. Direct Effects of Blue Finance (H1, H1a)

TABLE 1. EFFECT OF DELAYED BLUE FINANCE ON BLUE ECONOMY DEVELOPMENT INDICATORS

Dependent variable	Coefficient (β_2)	Standard error	P-value	Sargan (p)	AR(2) (p)
Fishery production (log)	-0,001	0,017	0,955	0,779	0,348
Marine protected areas	0,101	0,042	0,160	0,227	0,260

According to the results, deferred blue financing has no statistically detectable effect on the fish production variable ($p = 0.955$); hypothesis H1 is therefore not confirmed for this dimension. However, there is a marked positive effect on marine protected areas, although it does not reach the conventional significance threshold ($p = 0.160$). This discrepancy between the two results is consistent with H1a: the effect of funding is more pronounced on marine conservation than on direct economic output. The specification tests (Sargan, AR (2)) are satisfactory for both models.

TABLE 2. TEST OF THE MEDIATION CHAIN THROUGH MARITIME GOVERNANCE

Relation	Coefficient	p-value	Sargan (p)	AR (2) (p)
Funding (t-1) → Maritime governance	0,038	< 0,001	0,076	0,304
Maritime Governance (t-1) → MPAs	0,101	0,017	0,227	0,260

Conversely, while the direct effect of funding on MPAs observed in Table 1 is not significant, the mediation chain reveals a clear and robust mechanism. Lagged blue financing significantly explains changes in the marine governance score ($p < 0.001$), and this score, in turn, significantly explains changes in marine protected areas ($p = 0.017$), with satisfactory diagnostic results across all models. This result confirms Hypothesis H2, according to which the effect of blue finance on marine conservation is mediated, at least in part, by the maritime governance mechanism rather than through a direct effect.

To ensure the robustness of the results, extending the blue financing variable to include the maritime transport and coastal tourism codes (OECD CRS) does not alter the conclusions regarding the measured effect on fishery production and marine protected areas. The effect of the maritime governance score on MPAs also remains stable after removing outliers from the sample.

V. DISCUSSION

The results obtained, within the specific field of the blue economy, complement the principle of institutional conditionality of aid already documented in the literature [14]. Contrary to the expected direct effect of blue funding received on all the indicators used to measure the development of the blue economy, this study documents a difference in effect between economic production and marine conservation, consistent with H1a. This difference can be explained by the very nature of the projects funded under the CRS codes for fisheries and marine biodiversity: naturally oriented toward institutional strengthening and conservation rather than direct support for production, this funding acts on elements upstream in the fisheries value chain rather than on production itself. The most significant finding of this study concerns the mediation chain identified in H2. Rather than having a direct effect, blue financing appears to operate through a two-step causal chain, consistent with the theory of change approach documented by Bosmans and De Mariz [3]: it first strengthens the institutional commitment of recipient countries—as measured by the maritime governance score—before this commitment translates into concrete marine conservation actions. This result empirically confirms the premise of North's institutional theory [11] according to which institutions are the channel through which external resources may or may not translate into sustainable outcomes. It also aligns with the field observations of Nagy and Nene [9] and Wuwung et al. [8], who document that countries recognized as pioneers of the blue economy (Seychelles, Mauritius) stand out precisely because of the early nature of their institutional commitment rather than solely because of the volume of funding mobilized. These results also align with the finding by Bennett et al. [14], according to which the effectiveness of blue financing depends less on its availability than on the institutional capacity of recipient countries to absorb and direct it. This study makes a complementary contribution to this finding by statistically isolating the mechanism through which this institutional capacity is built over time, rather than treating it as a fixed prerequisite. This analysis ties into the broader debate on the effectiveness of international financing for the blue economy [1], [3]: the absence of a direct effect on production does not imply that the funding is ineffective, but reveals a different channel of action than that generally expected by donors—a finding relevant to the design of future blue financing mechanisms, which could benefit from explicitly incorporating a component for institutional capacity-building rather than targeting only immediate productive outcomes.

VI. CONCLUSION

In conclusion, this study shows that international blue finance, measured here by official development assistance (ODA)—has no direct effect on fish production but promotes marine conservation through institutional mediation: it first strengthens the maritime governance of recipient countries, which then translates into conservation outcomes. This result, obtained using System GMM on a panel of coastal countries, reveals a transmission channel rather than simply the presence or absence of an effect. These conclusions are limited to ODA, their extension to blue bonds and concessional funds remains to be verified, as does the validation of the maritime governance score by other sources.

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