Tourism Flows and Marine Biodiversity in Small Island Developing States (SIDS): Evidence from Panel Data

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Outline

- Introduction and Background

- Research Objectives

- Methodology and Challenges

- Empirical Results

- Conclusions

We Can End Poverty, Millennium Development Goals, 2015: UN Summit, 20-22 September 2010, New Yo - Wind...

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WE CAN END POVERTY 2015
MILLENNIUM DEVELOPMENT GOALS

UN SUMMIT • 20-22 September 2010 • New York
High-Level Plenary Meeting of the General Assembly

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UN secures $40 billion for women's and children's health

Secretary-General Ban Ki-moon and Heads of

What's Going On?

A new matrix provides an overview of the commitments and initiatives announced during the Summit.

See the summaries and outcomes of more than 80 partnership events.

The outcome

Internet

GLOBAL

REGIONAL

LOCAL

← short-term →
← long-term →

**Human well-being
and poverty reduction**
- BASIC MATERIAL FOR A GOOD LIFE
- HEALTH
- GOOD SOCIAL RELATIONS
- SECURITY
- FREEDOM OF CHOICE AND ACTION

Indirect drivers of change
- DEMOGRAPHIC
- ECONOMIC (e.g., globalization, trade, market, and policy framework)
- SOCIOPOLITICAL (e.g., governance, institutional and legal framework)
- SCIENCE AND TECHNOLOGY
- CULTURAL AND RELIGIOUS (e.g., beliefs, consumption choices)

Ecosystem services
- PROVISIONING (e.g., food, water, fiber, and fuel)
- REGULATING (e.g., climate regulation, water, and disease)
- CULTURAL (e.g., spiritual, aesthetic, recreation, and education)
- SUPPORTING (e.g., primary production, and soil formation)

LIFE ON EARTH – BIODIVERSITY

Direct drivers of change
- CHANGES IN LOCAL LAND USE AND COVER
- SPECIES INTRODUCTION OR REMOVAL
- TECHNOLOGY ADAPTATION AND USE
- EXTERNAL INPUTS (e.g., fertilizer use, pest control, and irrigation)
- HARVEST AND RESOURCE CONSUMPTION
- CLIMATE CHANGE
- NATURAL, PHYSICAL, AND BIOLOGICAL DRIVERS (e.g., evolution, volcanoes)

>< Strategies and interventions

Source: Millennium Ecosystem Assessment

What is Biodiversity?

"Biodiversity is the foundation of ecosystem services to which human well-being is intimately linked. No feature of Earth is more complex, dynamic, and varied than the layer of living organisms that occupy its surfaces and its seas, and no feature is experiencing more dramatic change at the hands of humans than this extraordinary, singularly unique feature of Earth" (MEA 2005)

Biodiversity

- "the variability among living organisms from all sources including…terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems."

- provides a wide range of direct and indirect benefits to mankind, which occur on both local and global scales

- many human activities contribute to unprecedented rates of biodiversity loss

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2010

2010 International Year of Biodiversity

Biodiversity is life
Biodiversity is our life

Welcome   **About**   **Celebrations**   **Partners**   **Resources**   **Participate**

Welcome to 2010   **Why 2010?**   **Celebrating 2010**   **2010 Partners**

Welcome!

Welcome

The United Nations declared 2010 to be the International Year of Biodiversity. It is a celebration of life on earth and of the value of biodiversity for our lives. The world is invited to take action in 2010 to safeguard the variety of life on earth: biodiversity

UNITED NATIONS
International Year of Biodiversity

Welcome Messages

Mr. Norbert Röttgen
Minister of the Environment
COP 9 President
Germany

Mr. Ryu Matsumoto
Minister of the Environment
Incoming President COP 10
Japan

H.E. Dr. Ali Abdussalam Treki
President
64th United Nations
General Assembly

United Nations Decade on Biodiversity 2011-2020

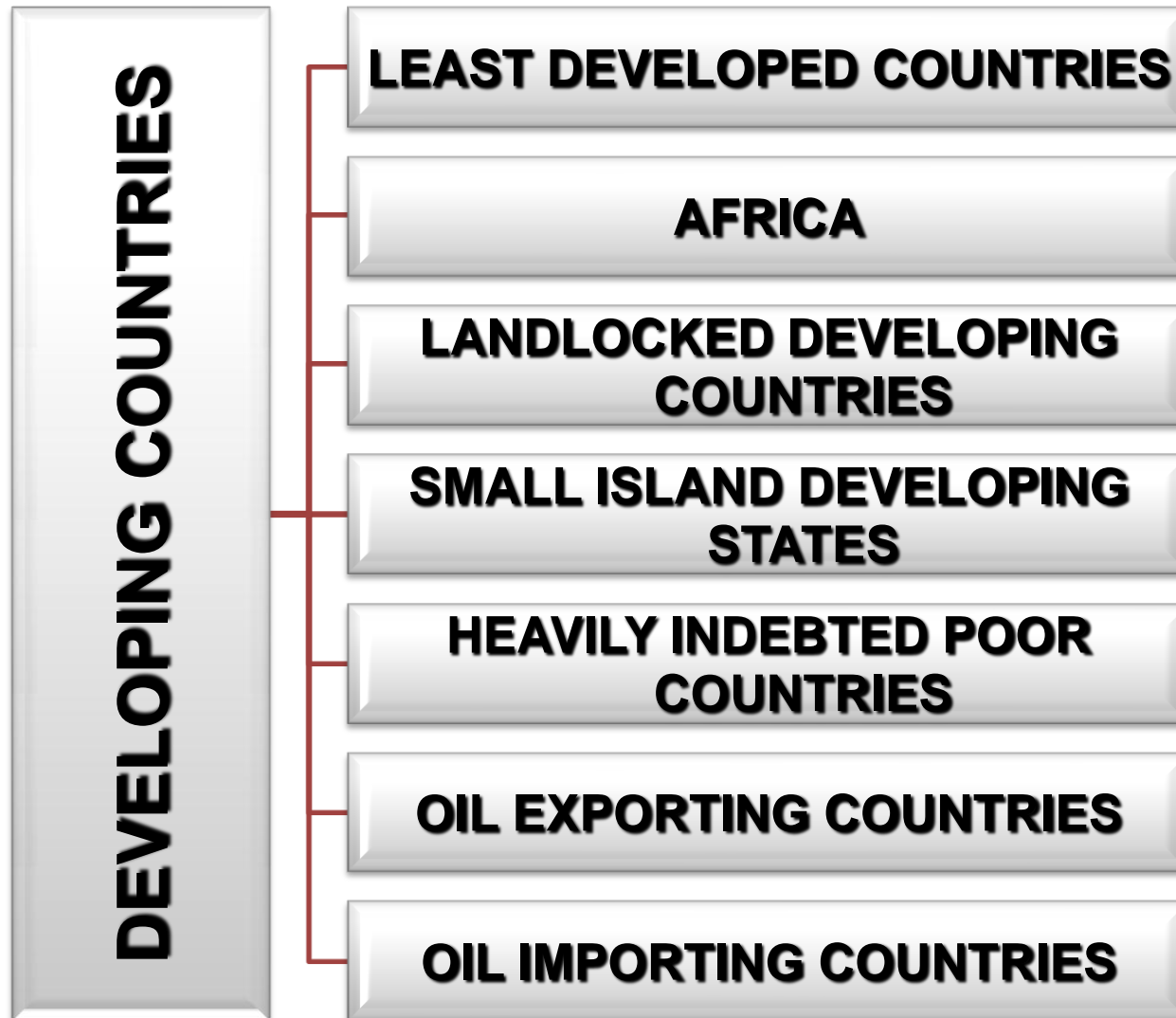**Convention on Biological Diversity**

Life in harmony, into the future
いのちの共生を、未来へ
COP 10 / MOP 5

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Small Island Developing States (SIDS)

VULNERABILITY

- HIGH RATIO OF COASTAL TO LAND AREA
- HIGHLY LINKED TERRESTRIAL / MARINE ECOSYSTEMS
- HEAVY RELIANCE ON NATURAL RESOURCES
- MONOCROP SUBSISTENCE ECONOMIES
- HIGH DEPENDENCE ON DEVELOPED WORLD
- SMALL POPULATIONS HIGH POPULATION DENSITY

Biodiversity in SIDS

- Identified as an area where global biodiversity is most at risk

- Coral reefs have the highest biodiversity of any marine ecosystem

- Marine and coastal habitats play an important role in human livelihoods through tourism and fisheries sectors

- Tourism and eco-tourism play an increasingly significant role in island economies

- The CBD recognises tourism and eco-tourism as important tools for biodiversity conservation

- Notwithstanding this, the literature does not pay much attention to biodiversity and human welfare in SIDS

Research Objectives

- WHAT? Using panel data techniques to investigate the relationship between marine biodiversity and tourism demand in SIDS

- WHY? Allowing an assessment of the relative magnitude of marine biodiversity to the welfare of SIDS, which can impact policy-makers to make a stronger push for biodiversity conservation in SIDS, an item which at the moment is not high on the agenda

- HOW? Applying the Hausman-Taylor estimator to estimate a FE model in the presence of time-invariant and rarely changing variables, and extrapolating to GDP the tourism impacts of biodiversity changes via a second-stage panel regression

Methodology

- Panel Data Regressions: 51 SIDS over 3 continents

- Database assemblage on 4 fronts: tourism, economic, climate change, and biodiversity

- Two step Methodology:
  1) Capturing biodiversity-related variables in a model of tourism demand
  2) linking tourism demand to GDP

Challenge 1: The Data

- Using secondary data only; data issues plague developing countries and act as a severe limitation to empirical work

- Missing data was the obvious issue

- Level of aggregation of the data: no distinction as to country of origin of the tourist arrivals, analysis done at the annual level therefore not able to account for seasonal variations

Challenge 2: Measuring Marine Biodiversity

- How to measure Marine Biodiversity? Some data being collected routinely in the developed but not the developing world

- Using the composite indicators of the Biodiversity Indicators Partnership; many indicators in formative stages

- Final Biodiversity dataset
  - Acreage of coral reefs
  - Marine protected areas
  - Terrestrial protected areas
  - Marine Trophic Index and related indices
  - Biodiversity species indicators
  - number of AZE sites
  - Number of KBA sites

Challenge 3: Time Invariant Variables

- Some environmental data may be only available for a snapshot of time or for fixed, non continuous points through a period of time

- Environmental datasets have many variables that are either time-invariant or may be considered time-invariant for the period under analysis (rarely-changing variables)

- We can use such data in Random Effects models but not in the more rigorous Fixed Effects models

- Two techniques that correct for this: The Fixed Effects Vector Decomposition (FEVD) Estimator, and the Hausmann-Taylor Estimator

Empirical Results: General to Specific Modelling

Explanatory Variable	Estimated Coefficients
mml	*0.255****
mpa	0.118***
gdp	1.601***
coral	-0.981**
end	1.911***
kba	1.232***
Constant	-7.443**

- ***significant at the 1% level, ** significant at the 5% level
- Wald Chi^2 = 406.7 (p-value=0.000)
- All a-priori expectations met apart from "coral": why a negative sign?

Quantifying Welfare Changes

- How to quantify the effects of these biodiversity variables on GDP via their impacts on the tourism sector?

  ➢ Estimating $gdp_{i,t} = f + g\ ta_{i,\ t} + e_{i,t}$

- Tourism impacts on GDP estimated at 0.195%; we can extrapolate to the percentage impact of each biodiversity variable on GDP

  ➢ a 1% increase in KBA will lead to a 0.34% increase in GDP; a 1% increase in MPA will cause a 0.035% increase in GDP

Example: Regional Welfare Impacts

- We can quantify into dollars and cents by applying such percentages to actual or forecasted GDP or GDP per capita for any individual island (even those missing from the original estimation), for a subset of islands or for total SIDS

- Let us look at the impact of Marine Protected Areas (percentage of territorial waters) on GDP per capita (2008) in SIDS, USD constant prices

	MPA Impact
AFRICA	506.351
CARIBBEAN	2213.161
ASIA / PACIFIC	1747.425
TOTAL SIDS	4466.937

Conclusions

- Biodiversity is the basis of human livelihoods, in particular in developing countries

- Marine biodiversity is crucial to key sectors of small island developing states, in particular fisheries and tourism

- Modelling tourism dependence on biodiversity has its challenges

- Notwithstanding these, the economic consequences of marine biodiversity loss through its impact on the tourism sector can be quantified

- These impacts can be scaled up to regional levels

- Empirical results such as these demonstrate that SIDS need to act now to minimise biodiversity loss, in order to protect future economic livelihoods

Thank You!

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