

Understanding the impacts of
sargassum on tourism:
An overview of
methods and some
preliminary results from
Barbados

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Overview

- How can economics, and the sub-discipline of economic valuation, contribute to sargassum management and mitigation?
- What are the challenges we face in operationalizing valuation research and ensuring uptake by policy makers?
- Some suggestions for advancing our (social) science and its impact



Contribution – what does economics bring to the table?

- Modeling & predicting the behavior of people
- Developing measures and indicators of well-being
- *Valuation of Ecosystem Services (ESV)* – measuring what things are *worth* (in monetary terms or otherwise)
- Advising policy design



Contribution – what does economics bring to the table?

(Too much) sargassum is an economic problem!

- Sargassum events impose real economic costs on society
 - Market-based costs (e.g., lost incomes & profits due to reductions in transactions)
 - Non-market costs (e.g., lost benefits from ecosystem services) due to adverse impacts on coastal and marine ecosystems.
- **Economic valuation** can help us understand the scope and magnitude of these costs to help policy makers formulate appropriate responses



Contribution – what does economics bring to the table?

(Too much) sargassum is an economic problem!

- Sargassum mitigation is expensive
- There are many ways to reduce impacts
- Economic analysis can help us understand which ways are most effective and/or efficient

- Understanding the economic consequences of sargassum influxes can assist policy makers in planning and budgeting



Estimating the economic impacts of sargassum is complicated

We need estimates of:

1. 'Lost' market transactions
2. Impacts of sargassum on ecosystem health and function
3. The related losses of ecosystem goods and services
4. The economic value of those "non-market" losses



Estimating the economic impacts of sargassum is complicated



We must account for:

1. Suppliers' ability to substitute to other forms of employment and income
2. Buyers' ability to substitute toward other goods and services that provide economic value



Estimating the economic impacts of sargassum is complicated

Constraints:

1. Lack of baseline data on market and non-market economic activity at relevant temporal and spatially explicit scales, against which to measure losses
2. Lack of behavioral and preference data from people who are impacted by sargassum
3. Limited systematic shoreline monitoring to measure and predict the *timing, scope and magnitude* of sargassum inundation events

Gaps in understanding the value of sargassum events

We currently know very little about the economic impacts of sargassum on human health and wellbeing, tourism, fisheries, and ecosystem services



Gaps related to impacts on tourism

- We do not know the impact of sargassum events on tourists' willingness to travel to destinations.
- We lack clear information on how visitors *perceive* sargassum and which aspects of sargassum visitors find the most offensive.
- We do not know the extent of cumulative or reputational impacts on visitation that may occur if visitors who are deterred by sargassum persist in their decisions to not return.



“Value” and “Valuation”

- Value is what something is *worth* to people.
- Economic value is not always revealed in markets.
- “Economic Valuation” is the process of estimating what something is worth





Valuation methods

Market-based Valuation Methods

- Market Price Method
- The Replacement Cost Method
- The Damage Avoidance Method

Non-Market Valuation Methods

- Hedonic Pricing Method
- Travel Cost Method
- Contingent Valuation Method
- Choice Modeling / Choice Experiments



How does
NMV work?

“Non-market” valuation methods require that a link be established between *changes* in the quantity or quality of the ecosystem goods and services and *changes* in the stated or observed behavior of people.

Suggestions for future research

1. Collection of detailed (pre-sargassum) baseline data.

We need a baseline against which to measure economic losses. Data pertaining to market and non-market economic activity *in the absence of sargassum* should be collected at relevant temporal and spatially explicit scales:

- Measures of market activity and transactions
- Measures of ecosystem extent, condition & provision of ecosystem services

Suggestions for future research

2. Collection of detailed cost and impact data during and after sargassum events.

- Costs & extent of cleanup efforts (spending on labor and equipment, volume of sargassum removed)
- Market and non-market economic activity over the duration of sargassum events and after events
- Patterns of resource substitution by stakeholders affected by sargassum events.

OBSTACLE: \$\$\$ Such assessments will likely require carefully crafted stakeholder surveys.

Suggestions for future research

3. Assessment of the impact of sargassum events on tourists' willingness to travel to Caribbean destinations

- Has sargassum tempered tourism growth in the region?
- Do sargassum events in one location affect demand for similar or proximate locations?

Suggestions for future research

4. Assessment of visitors' encounters with sargassum and perceptions of disamenities

- When, where & how much sargassum are visitors experiencing?
- Which aspects of sargassum events are most offensive?

Major obstacle: Data

- Baseline data
- Access to tourists to collect new data

A preliminary look at potential impacts to tourism in Barbados



We are investigating:

1. The relationship between tourists' willingness to return to Barbados (& San Andrés, Colombia) and encounters with sargassum, and
2. Tourist responses to (hypothetical) scenarios involving future increases in sargassum

Setting

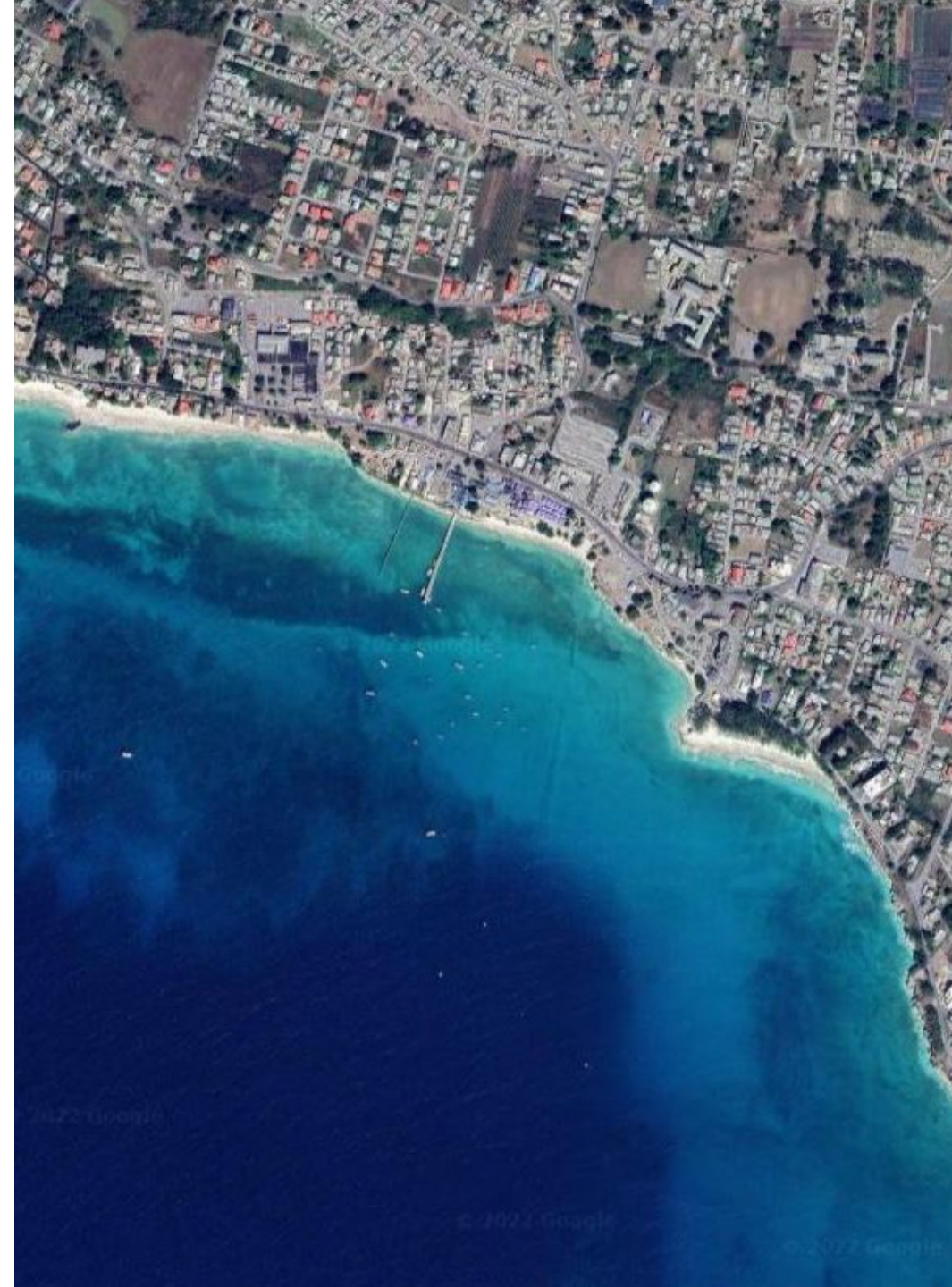
- Barbados
- Tourism is the leading economic sector, and has been the major foreign exchange earner since the 1970s
- More than 15% of annual GDP annually
- 29.5 % of GDP and 37.4 % of total employment in 2019



Data

Beach recreationist intercept survey (April/May 2022, n = 175):

- Aspects of respondents' trip to the beach & trip to Barbados
- Intention to revisit Barbados again in the future: "definitely yes" (1), "probably yes" (2), "unsure" (3), "probably not" (4), "definitely not" (5)
- Encounters with sargassum seaweed on beaches during their visit: "Yes, a lot of sargassum was on the beaches", "Yes, but only a little", "No" and "I don't know"
- *A contingent behavior* scenario: how would the decision to return to Barbados be affected if sargassum arriving on beaches and seawater were to increase by four different percentages (10%, 30%, 50% and 90%)
- Demographic information such as respondent age, gender, income, education and marital status





Richard Haynes Boardwalk

Oistins/Miami Beach

Survey sites are on the south coast of Barbados

- High tourist activity
- Affected by sargassum

	I will definitely return (1)	I will probably return (2)	I am unsure if I will return (3)	I will probably not return (4)	I will definitely not return (5)
If seaweed on beaches and seawater increases by 10%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If seaweed on beaches and seawater increases by 30%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If seaweed on beaches and seawater increases by 50%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If seaweed on beaches and seawater increases by 90%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Next, we want to ask you how your decision to return to Barbados in the future might be affected by changes in the coastal and marine environment.

If **Sargassum (brown-golden algae or seaweed) arriving on beaches and seawater in Barbados** were to increase by a percentage % (shown below), and all other conditions remain the same, would you return to Barbados in the future?

Methodology

Are tourists who encounter sargassum less likely to return?

- Probit regression analysis of the association between tourists' responses to initial willingness to return question and encounters with sargassum on beaches during their visit



Methodology

Are tourists who encounter sargassum more sensitive in their willingness to return under scenarios of higher sargassum in the future?

- Multivariate probit regression (simultaneous estimation) of responses to the willingness to return question under the four sargassum scenarios



Results

~ 73% of the sample viewed sargassum on beaches while in Barbados

~ 60% viewed “a little”

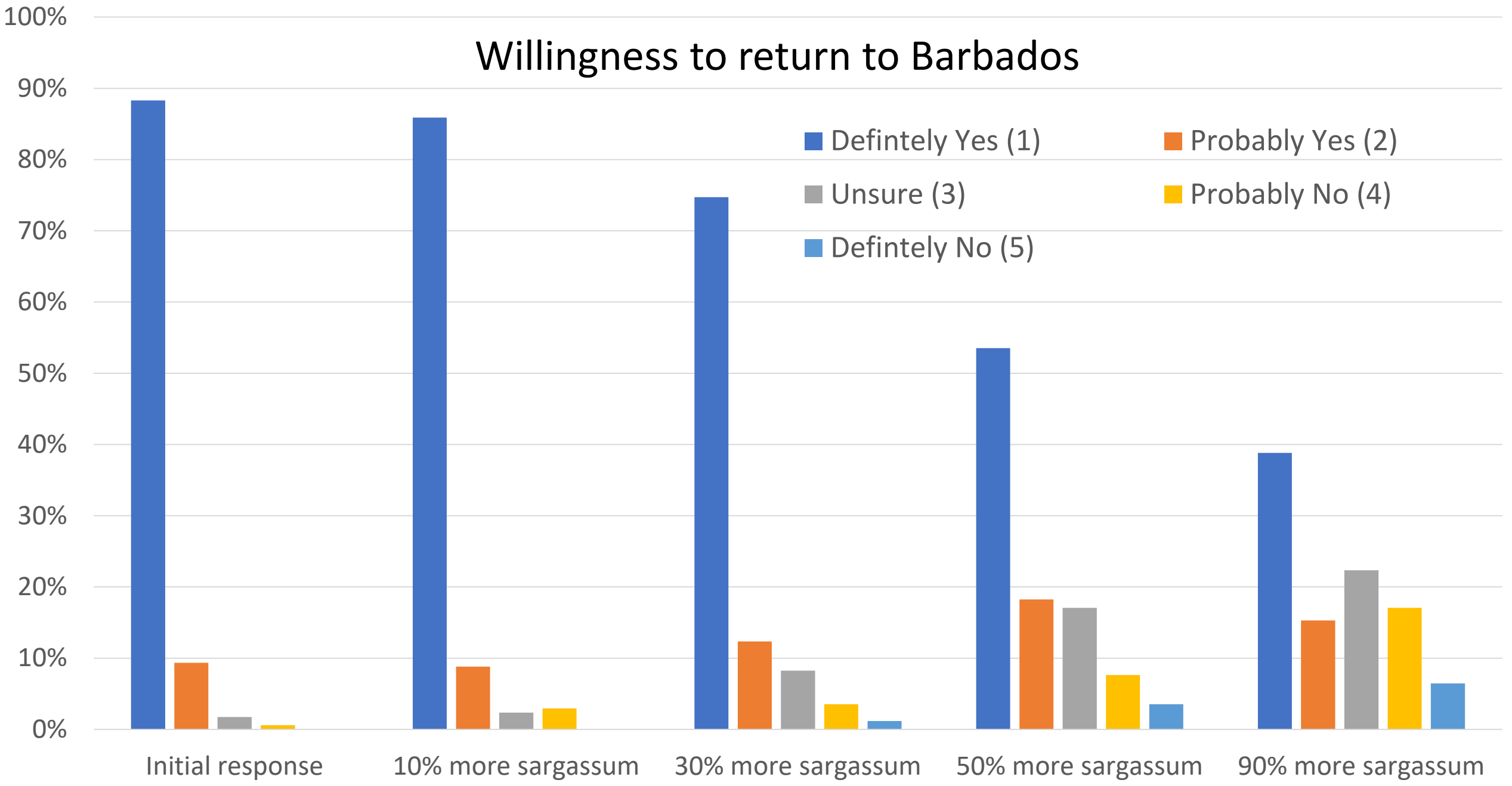
~ 13% viewed “a lot”

~ 25% of the sample did not view sargassum

< 3% did not know if they saw sargassum



Willingness to return to Barbados



Probit regression results

Initial stated willingness to return to Barbados

	Coefficient Estimates					
	Willingness to return (1-4)			Definitely will return (0,1)		
Parameter	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept 4	-2.17***	-2.71***	-4.12***			
Intercept 3	-1.75***	-2.18***	-3.52***			
Intercept 2	-0.82***	-1.35***	-2.29**			
Intercept				-0.81***	-1.36***	-2.44**
Saw sargassum	-0.57**			-0.59**		
Did not see sargassum		0.52**			0.55**	
Saw a lot of sargassum			-1.38**			-1.32**
Saw a little sargassum			-0.72**			-0.71**
First time visitor			1.04***			0.93***
US Resident			-0.93*			-0.81
UK Resident			-0.26			-0.15
Caribbean Resident			0.65			0.57
Canada Resident			-0.21			-0.23
Male			0.79**			0.85**
Times visited beach			-0.004			0.005
Intercepted at Oistins			0.34			0.51
Intercepted on Boardwalk			-0.17			0.15
Vacation Purpose			0.89*			0.82*
Travel Hours			0.01			-0.006
-2 Log L	133.88	143.83	99.62	113.48	118.96	82.38
AIC	141.88	151.83	131.62	117.48	122.96	110.38
Percent concordant	36.4	34.6	83.3	34.6	34.8	84.6



Marginal Effects

Results:

- Viewing any amount of sargassum decreases the probability of a “definitely will return” response by ~11%



Marginal Effects

Results:

- The effects of viewing a lot of sargassum are higher than those for viewing a little sargassum, and the negative impact of viewing sargassum is roughly proportional (marginally smaller) than the positive impact of not viewing sargassum.

Willingness to return under scenarios of increased sargassum on beaches and seawater

- The prospect of increased sargassum has a negative and highly significant impact on willingness to return
- Tourists who viewed sargassum during their stay are more sensitive in their willingness to return *only* under conditions involving the *highest* sargassum scenarios (50 and 90 percent increases)
- Impacts on willingness to return are larger for visitors who viewed a lot of sargassum relative to those who viewed a little

Potential impacts on tourism

- If current trends of sargassum influxes continue, adverse economic impacts related to decreased demand should be expected in Caribbean destinations.
- Yet, the negative impacts of sargassum on tourism are unlikely to affect entire visitor populations.
- Many Caribbean visitors will not encounter sargassum
 - Sargassum tends to arrive from March-October, when there is a lower volume of arrivals. In Barbados, roughly 60% of visitors arrive during “sargassum season”.
 - Sargassum influxes primarily affect windward coastlines, which support lower levels of tourism infrastructure and have fewer tourists.
 - Not all visitors spend time at the beach.

Potential impacts on tourism

- Data from previous studies of beach use by Barbados tourists suggest that 25-30% of stay-over visitors to Barbados (between 170,000 and 204,000 visitors) have the potential to encounter sargassum during their stay.
- Based on marginal effects: between 1 in 10 and 1 in 20 of visitors who encounter sargassum will be less likely to return to Barbados
- The net impact of sargassum encounters is expected to be on the order of 17,000 to 41,000 visitors who may not return.
- Return visitation = 50% of tourist arrivals in Barbados
 - => 2.5% - 6% of total visitors (or 5% - 12% of return visitation) may be lost due to encounters with sargassum.

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Thank you!

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