

The Economic Value of Biodiversity in India

Running Notes

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Project Description

This project aims to produce the first measure of willingness to pay (WTP) for biodiversity. This provides a monetary measure to value biodiversity which can be applied to a wide variety of applications in environmental economics and natural capital accounting. The data relies on E-bird observations of diverse bird species observations. The sample is limited to local, long-time users who are residents (not tourists) in India. The methodology to calculate WTP relies on a revealed preference through the random utility model (RUM). The RUM determines the value of seeking out diverse species of birds by comparing the value of alternative counterfactual bird siting locations and the cost to go to these counterfactuals. Monetary value is determined through the RUM by estimating the travel cost of the reveal preference compared to counterfactual locations.

Notes

For notes, we present the most recent first so that notes are chronologically most recent.

i 3/31/2025

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Sample Selection Discussion

- We want to ensure that the sample of ebird observers is representative
 - Remove tourists
 - Remove infrequent users
- Potential strategies
 - Limit to users that log at least a certain number of times per month
 - Exclude users that post outside of protected areas
 - Exclude users that include tourism tags in text variable(e.g. “ecolodge”)

Tasks

- Matt/Jovin: descriptive analysis on data to determine distributions of frequent users
 - Complete by 4/18

i 3/21/2025

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Action Items:

- Everyone confirms that we can run the first 3 basic scripts
- Starting the annotated bibliography with 10 most important papers:
 - WTP for environmental quality
 - WTP in developing countries using travel cost
 - Review of mixed logit methodology
- Next week we need to talk about sample selection in depth next week

Division of Tasks:

- Review mixed logit method
- (Matt) Review of WTP in developing countries using travel cost methods
- (Ryan) Review of WTP methods for environmental quality
- (Ryan) Method to estimate welfare effects (some exogenous shock)
- (Raahil + Jovin + Matt) Determining the sample population criteria – important early step
- (Raahil) Gathering data for population demographics (SHRUG, DHS, etc.)
- Ways to annoate bibliography:
 - paper title + journal, research question, research design (e.g. stated preference), data/sample size, result (i.e. WTP estimate)
- We need to think about how we contribute.
- We need to think about sample selection.
 - Criteria based on usage, overlap with protected areas, etc.
 - How do we remove tourists?
 - Who is the average person? Estimates will be sensitive
- Need to gridded map of ebird observations

Next scripts

4. Merge attributes of the counterfactual sites. Need to collect site level data and/or individual level data
 - Site attributes: biodiversity, accessibility, ruggedness, congestion, temperature, rainfall, regional developmemnt
 - For first run, just do biodiversity.
 - Biodiversity comes from either diversity of birds or other attributes of ecosystem diversity
 - Expected biodiversity is why you go. So we can use historical measures of biodiversity
5. Run the mixed logit to estimate the WTP values
6. Welfare analysis of WTP values

i 02/28/25

Raahil, Matt, Ryan

Action Items:

- Ryan: Get the correct e-bird file from Matt (DONE)

- Ryan: Merge code files into scripts folder. (DONE)
- Ryan: Initiate a document for literature review with template example (DONE)
- We need to specialize and define tasks. Volunteer over email. Tasks: Lit review, sample selection, characterize the sample, theory person (DONE)
- And set up a recurring meeting time. Need a poll. Try for next two weeks from now. (DONE)
- Jovin: Provide your github username so Ryan can make you a collaborator on the github repo. (DONE)

Funding:

- No longer pursue IonE funding

Coding:

- Matt was able to replicate everything
 - Created a YAML to process file names
 - No longer needs new file paths
- Ryan stuck on loading data
- Need to all use the same exact file download for e-bird
- script 1: processes e-bird data, determines user homes, and calculates home for those who don't report it.
- script 2: Creates the hotspot observations. Measures distance from home to hotspot.
- script 3: Most important. 12,000 hotspots so too many counterfactuals. This script reduces the counterfactual set by clustering hotspots nearby (likely parks) and only consider hotspots within a distance of home.
- The final data set is a panel of person (user) ID by trip ID appended to all counterfactual trips for this user.
- When we actually estimate this, we will need to plan for a no-trip counterfactual.
- One of the main things we need to do is make the computation easier for us. Otherwise it becomes too computationally intensive.
- Keep all the scripts in scripts folder.

Data:

- We will need to bring in site attribute data
- So data on landscape measurements.
- Matt says that not all intermediate files are being save
- Specifically, the master file is not saving
- Need to identify our sample population

- Need a careful (defensible) data-driven criteria for sample
- Needs to be regular, local users (not temporary or tourists)
- Determine this based on usage frequency and mobility patterns
- Consider overlaying protected areas polygons on top of the observations/hotspots
- Buffers may create a censoring problem. So we would just test this against larger and larger buffers
- Need to find ways to characterize the users (demographics) without having any information about them.
 - Important for welfare calculations.
 - Try to match with DHS data
 - Or overlap home location with SHRUG data set
 - Econometrically, take attributes about where they live against the average for the country, how do high and low WTP birders fall within the distribution
 - Potentially use this as weights for welfare calculations.

Methods:

- If we get a random shock to bird population, then we can think about the causal effect of increasing biodiversity

Paper/Writing:

- For the ML cluster, will want to read up later to find out if there is a better way or more common practice in economics.
- Create a lit review. Three groups:
 1. estimates of WTP in developing countries generally using the discrete choice travel cost method (Ted Miguel water quality paper).
 2. WTP for environmental quality papers and what design they are using to estimate (e.g., contingent valuation, stated preferences – something from ecology)
 3. Review of any updated versions of the mixed logit model – new adaptations of the model from class
- For this: question, data used, design, and finding (dollar estimates would be great).
- Create a document in the docs folder