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 captial 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 throughh 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.

8/27/2025

Ryan, Jovin

TODO:

- **Matt**: We need to meet with you to discuss working on this with MSI
- **Jovin**: Responsible for Shift

- **Ryan**: Responsible for Share

Plan to Estimate Shift-Share

1. Merge the Species range data with the migratory species data
   - Species range data: base-data/species/BOTW_2024_2.gpkg
   - Migratory species data: base-data/species/species_list_categorized.csv
   - Merge by: scientific_name
   - Result: species level data with range map and classifier for migratory
2. For each country j, calculate γ_j

$$\gamma_j = \sum_{s=\text{total num of species in j}}^{S} \frac{\text{species range overlap India}_{sj}}{S_j}$$

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1. Count the number of species $s$ in $j$
    - Species range data: base-data/species/BOTW_2024_2.gpkg
    - India Borders: data/shp/district-2011
    - Need to make one shape (spatial union) so any intersection with India shape
    - Indicator for each species if any overlap of species with India borders
2. Spatial overlap of species $s$ range over the country border of India. This will create
    - Calculate sqkm for India shapefile one time (part 1)
    - Spatial inner join of range $s$ on India.
    - Calculate sqkm for the inner join (part 2)
    - Divide part 2 by part 1 to get the fraction of overlap for species range over India
3. Combine to make $\gamma_j$ using the weighted sum $\sum_s$
    - Spatial intersection of species range $s$ with countries in the flu dataset
    - Create the weight $S_j$ by counting the number of indicators for intersecting ranges
    - Create $\gamma_j$ for each $j$ by summing fractions in (2) divided by weight $S_j$
    - Country $j$ Shapefiles: TODO.
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3. Create the shift by merging γ_j with the flu data - Flu Data: data/clean/flu-data.csv - Result is time series by t

$$Shift_t = \sum_{j=country}^{J} flu_{jt} \times \gamma_j$$

4. Create the share for each hotspot d

$$Share_d = \sum_s \frac{\text{Indicator for migratory}_{sd}}{S_d}$$

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1. Start with e-bird data. For each hotspot $d$ get the number of unique species observed
    - e-bird data: Ask Matt what is the best way to do this given the current workflow.
2. Merge in the migratory data on these species for each hotspot $d$
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