Discussion of Bahrami, Gustafson, and Steiner (2025)

"When Locking In Biodiversity Locks Up Land"

Discussant: Sangmin Simon Oh (Columbia Business School)

AFA Annual Meeting 2026

Weitzman (1998)

Question: How should society allocate scarce resources across many endangered species when preservation is costly and budgets are limited?

- Conservation is a portfolio choice under severe budget constraints – saving everything is infeasible, and choices inevitably involve trade-offs
- Forces clarity about objectives in conservation policy and highlights the tension between moral intuitions ("save them all") and constrained optimization

Econometrica, Vol. 66, No. 6 (November, 1998), 1279–1298

THE NOAH'S ARK PROBLEM

BY MARTIN L. WEITZMAN

This paper is about the economic theory of biodiversity preservation. A cost-effectiveness methodology is constructed, which results in a particular formula that can be used as a criterion to rank projects. The ranking criterion is sufficiently operational to be useful in suggesting what to look at when determining actual conservation priorities among endangered species. At the same time, the formula is firmly rooted in a mathematically rigorous optimization framework, so that its theoretical underpinnings are clear. The underlying model, called the "Noah's Ark Problem," is intended to be a kind of canonical form that hones down to its analytical essence the problem of best preserving diversity under a limited budget constraint.

Giglio, Kuchler, Stroebel, and Wang (2024)

Question: How can the complex ecological interactions driving biodiversity loss be integrated into a macroeconomic framework?

- Ecosystem services as inputs for economic production with two layers: complementary functions (e.g. pest control and soil fertilization) and imperfectly substitutable species (e.g. different pollinators work at different times of day)

THE ECONOMICS OF BIODIVERSITY LOSS*

STEFANO GIGLIO† THERESA KUCHLER‡ JOHANNES STROEBEL§ OLIVIER WANG¶

Abstract

We explore the economic effects of biodiversity loss by developing an ecologically-founded model of how different species interact to deliver the ecosystem services that contribute to economic production. Ecosystem services are produced by combining several complementary ecosystem functions such as pollination and water filtration, which are each provided by several substitutable species. It follows that economic output is an increasing but concave function of species richness, and the economic cost of losing a species depends on: (i) how many redundant species remain within its ecosystem function, and (ii) how critical the affected function is for ecosystem productivity. We derive an expression for the fragility of ecosystems and economic output to further biodiversity loss, and show that it increases with both mean species losses as well as the imbalance of species losses across ecosystem functions. Consistent with the model, we illustrate that empirical measures of these components of ecosystem fragility are reflected in market assessments of risk in the cross-section of countries, which we extract from the prices of sovereign credit default swaps. We conclude by embedding our model of ecosystem services production in an intertemporal planning problem and study optimal land use when allocating land to production raises output at the cost of reducing biodiversity.

Recap

Question: What are the economic consequences of U.S. biodiversity protections for land markets and development?

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Methodology:

- Nationwide parcel-level panel matching biodiversity protections (PAD-US) to land values (CoreLogic) and land cover (NLCD), Conservation easements established since 2010
- Focus on Spatial boundary design + Difference-in-Differences estimator (comparing parcels just inside vs. just outside borders)

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Main Findings:

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  - Mechanism: Foregone development option
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+ Lots to like about this paper! (cool data, important topic, convincing estimates)

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Plan for Discussion

1. Empirical Design
2. Understanding Spillover Effects (or the lack thereof)

Comment 1. Empirical Design

Setting: Voluntary Conservation Easements

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Identification Challenge: "Endogenous Borders"

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- Because borders are not random here, a landowner may be incentivized to protect their least productive acres (e.g., wetlands, steep terrain) and leave the prime developable land unprotected.

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Implementation Details

- Main LHS variable: Corelogic's estimate of parcels' fair market value (FMV)
- Restrict sample to parcels within 500m of the border
- Track the same parcels before and after protection

Beaverdam Creek Holdings, LLC v. Commissioner

The property was a vacant site in Oglethorpe County, Georgia, which formerly operated as a granite quarry. The owners (Beaverdam Creek Holdings) claimed its "highest and best use" was to re-open and operate a massive granite mine.

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Summary

- Acquires 85 acres of dormant Georgia quarry land for ~$225,000 in December 2017.
- Days later, donated a conservation easement and claimed a $22 million charitable deduction based on DCF projecting 25 years of hypothetical quarrying income.
- Tax Court finds the easement's fair market value was $193,250

Question 1: Fair Market Value (FMV)

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Concern: Suppose it's the case that

- Pre-easement FMV is sometimes inflated by speculative highest-and-best-use assumptions
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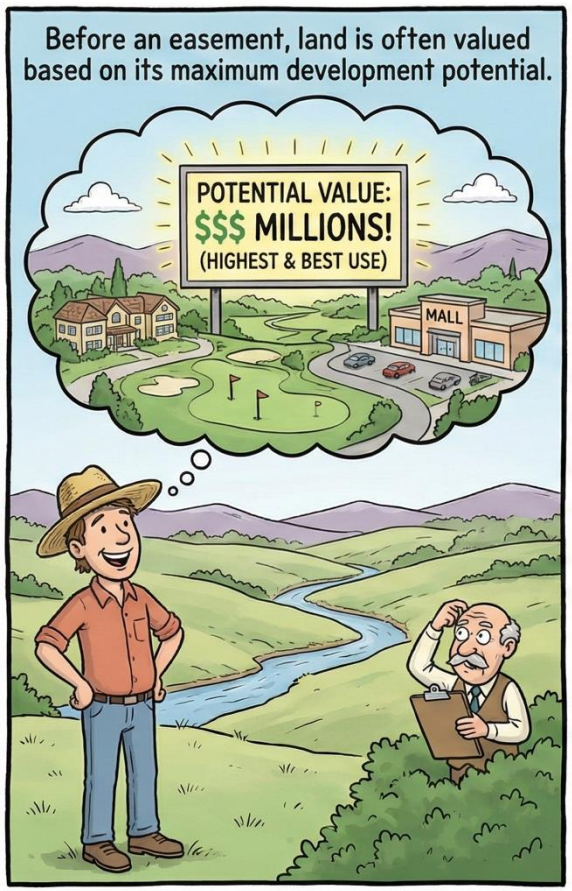
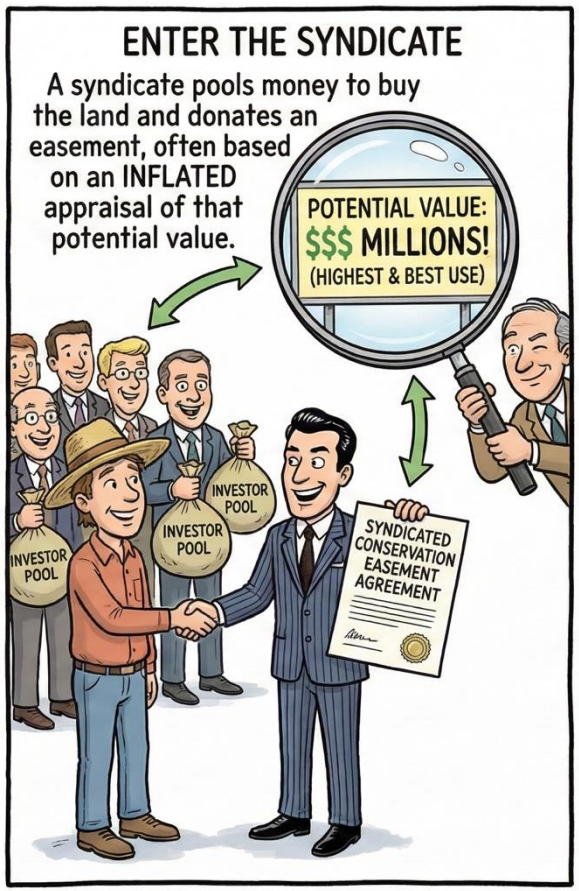
Suggestion 1. Heterogeneity Tests

- Tax-assessment-based or appraisal-based FMVs vs. comparable-transaction-based FMVs
- States with high syndicated easement activity vs. low syndicated easement activity

Syndicated Easement



THE "PRE-ASSESSMENT" DREAM



ENTER THE SYNDICATE

THE "POST-EASEMENT" REALITY

Question 2: Endogenous Timing

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A landowner learns their land has low development potential (maybe a rezoning failed, a planned highway was cancelled, or local demand softened) and donates the easement to harvest tax benefits from a restriction that wouldn't have bound anyway.

⇒ The measured value drop reflects the bad news, not the easement itself.

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- Landowner-initiated vs. government-initiated protections

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Suggestion 2b. Instrument for timing

- Find plausible exogenous variation in when easements are formed – e.g., changes in federal or state tax incentives for conservation donations

Comment 2. Spillover Effects

How should protection affect neighbors?

This Paper: ≈0 Spillovers

Unprotected neighbors show no price appreciation relative to parcels further away

+ SUTVA assumption is not violated.

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A. Supply Channel (+)

Conserving land reduces the available stock of developable lots, so if demand is constant and supply falls, prices of remaining buildable parcels should rise.

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C. Risk Channel (-)

Endangered species on conserved land will migrate to neighbor's land (triggering regulation), or physical nuisances (fire risk, unmanaged brush, pests) reduce value.

⇒ Maybe offset by opposing forces

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Suggestion 2. **Deeper discussion of the economics behind zero spillovers**

Finding no effect implies that the positive forces (supply + amenity effects) are either non-existent or perfectly cancelled out by negative forces

- If neighbors don't value the conservation, the "local public good" argument for these easements is weak. It suggests the benefits are purely global (biodiversity existence) rather than local (aesthetics/recreation).
- I think this discussion would make the overall narrative much richer

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Some questions to explore:

(1) Do we see a premium for Forest easements but zero for Swamps?

(2) Do publicly accessible easements generate positive spillovers?

(3) Does the supply effect appear only in land-constrained counties?

Final Thoughts

- Novel evidence quantifying the role of biodiversity protection in U.S. land markets using impressively granular data

- **Punchline:** Biodiversity protections act as a massive shock to development option value (~50% value drop), but the costs are hyper-localized with surprisingly zero positive externalities for neighbors

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- **A few suggestions for future iterations:**
  - Tighten identification on timing and measurement error
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- **A few questions prompted by the paper for the future:**
  - Is biodiversity-driven regulation fundamentally different from other land-use constraints (e.g., zoning or flood risk)?
  - Is there room for the non-pecuniary preferences (if any) of real estate developers or landowners to be factored into land values? (e.g., the "warm glow" of conservation)

- **Very much looking forward to the next version!**