

# Ethan Holdahl

☎ +1 952-250-8018 | ✉ eholdahl@uoregon.edu | 🏠 EthanHoldahl.com | 📷 ethanholdahl

## Education

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### University of Oregon

#### PHD ECONOMICS

Fields: Game Theory, Experimental, Behavioral, Environmental  
Advisor: Jiabin Wu

*Eugene, Oregon*

*Expected June 2023*

### St. Olaf College

#### B.A. MATH, ECONOMICS

- Minor in Statistics

*Northfield, Minnesota*

*June 2018*

## Research

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### JOB MARKET PAPER

#### Testing the Efficacy of Stepping Stone Equilibria in Coordination Games

Games with multiple equilibria introduce the potential for populations to get stuck in inefficient outcomes. In theory, the introduction of additional equilibria, "stepping stones", could pave the way for a smoother and less risky transition. I run a lab experiment to test if the introduction of these "stepping stones", can facilitate transitions from an inefficient but safe equilibrium to a risky, payoff dominant equilibrium. I employ different payoffs for the transition strategy and examine the effects that different degrees of information about the game have on group's play. I find evidence that adding "stepping stones" does help populations transition to the efficient equilibria. I also find that when groups have more information about each other's payoffs they are able to transition to the efficient equilibria faster and are less prone to cyclical behavior.

### PUBLICATIONS

Binder, S., Holdahl, E., Trinh, L., Smith, J. H. (2020). Humanity's Fundamental Environmental Limits. *Human Ecology*, 48(2), 235-244.

Models and estimates of Earth's human carrying capacity vary widely and assume, rather than solve for, binding environmental constraints (the process or resource in shortest supply relative to human biological needs). The binding constraint, and therefore the true upper bound on the number of humans that Earth could sustain indefinitely, remains unknown. We seek to resolve this uncertainty by considering a full range of technological possibilities and incorporating a potential stoichiometric constraint not previously explored. We find that limits to photosynthesis constrain population before micronutrients become limiting unless technological capabilities for utilizing nutrient resources lag far behind other technologies. With ideal technology, human carrying capacity runs into the tens of trillions, while with currently demonstrated technology Earth could support more than 200 billion humans. These numbers reflect neither a desirable nor a natural equilibrium population level, but represent a rough estimate of the maximum number of humans Earth could sustain.

### WORKING PAPERS

#### Conflicts, Assortative Matching, and the Evolution of Signaling Norms (with Jiabin Wu)

Under R&R at *Journal of Economic Interaction and Coordination*

This paper proposes a model to explain the potential role of inter-group conflicts in determining the rise and fall of signaling norms. Individuals in a population are characterized by different types and they are matched in pairs to form social relationships such as mating or foraging relationships. In

each relationship, an individual's payoff is increasing in its own type and its partner's type. Hence, the payoff structure of a relationship does not resemble a dilemma situation. Assume that types are not observable. In one population, assortative matching according to types is sustained by signaling. In the other population, individuals do not signal and they are randomly matched. Types evolve within each population. At the same time, the two populations may engage in conflicts. Due to assortative matching, high types grow faster in the population with signaling, yet they bear the cost of signaling, which lowers their population's fitness in the long run. Through simulations, we show that the survival of the signaling population depends crucially on the timing and the efficiency of weapon used in inter-group conflicts.

### Convergence to a Convention in a 2x2 Coordination Game with Adaptive Learning

With over 1000 citations, Young [1993] is a seminal paper in the field of evolutionary game theory. In it, Young introduces a model of learning called adaptive play in which players best respond to the sampled history of play. Through adaptive play, Young establishes that under certain conditions, a convention, a self-enforcing pattern of play, will emerge. Theorem 1 proved that in weakly acyclic n-person games, if the information gathered in the available history by the players is sufficiently incomplete, that play will eventually converge to a convention. The rest of the paper builds upon this theorem and defines which conventions are stochastically stable. In Young [1998], Young weakened the incomplete sampling requirement in coordination games to being less than 1/2 of the available history. Here, I show that in games where players have no more than 2 strategies, any degree of incomplete information is sufficient for the results in Young [1993]. Furthermore, I show that in all but certain formulations of the 2x2 game, no condition on the degree of incomplete information is necessary for conventions to emerge in adaptive play.

### WORKS IN PROGRESS

Institutional Screening and the Demise of Cooperation (with Jiabin Wu)

Mistake Driven Cycles (with Jiabin Wu)

### Teaching Experience

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#### PRIMARY INSTRUCTOR

EC 327: Introduction to Game Theory Fall 2020, Winter 2022

EC 427/527: Games and Decisions Summer 2021, Summer 2022

EC 311: Intermediate Microeconomic Theory Spring 2022

EC 333: Resource and Environmental Economic Issues Fall 2022

#### TEACHING ASSISTANT

EC 101: Contemporary Economic Issues Fall 2019

EC 201: Introduction to Economic Analysis: Microeconomics Winter 2020

EC 202: Introduction to Economic Analysis: Macroeconomics Winter 2020

### Honors, Awards, Fellowships

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Graduate Teaching Award, Department of Economics, University of Oregon 2022

First-Year Graduate Fellowship, Department of Economics, University of Oregon 2018 - 2019

## Conference Presentations

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2022 ESA North America, UC Santa Barbara. *Stepping Stones*.

2021 Evolution, Virtual. *Group Selection of Handicap Signaling*.

## Skills

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R, Python, Matlab, JavaScript, oTree, Shiny, HTML, JavaScript

## Citizenship

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USA

## References

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### **Jiabin Wu**

Associate Professor of Economics

jwu5@uoregon.edu

### **Anne van den Nouweland**

Professor of Economics

annev@uoregon.edu

### **Van Kolpin**

Professor of Economics

vkolpin@uoregon.edu