

# Efficiency mechanism of revenue sharing and social capital in fishery

Mihoko Tegawa

Hirotsugu Uchida

University of Rhode Island

Environmental and Natural Resource Economics

# Comanagement in fishery

- Difficulty of direct regulation and IFQ in fully addressing the externality in fishery (Arnason, 2012; Boyce 1992; Copes, 1986)
- Findings from CPR literature demonstrate importance of community-based management (Baland & Platteau, 1996; Ostrom, 1990, 2002; Wade, 1989)
- This is no exception in fishery (Deacon, 2012; Townsend et al., 2008; Pinkerton, 1994)
  - e.g. Sector management in groundfish fishery in the Northeast US

# Revenue sharing

- Harvesters share catch and/or revenue
- Induces fishermen conflicting incentives
  - free-riding on others' fishing effort and maximizing collective value
- It is important to bring synergies (Sherstyuk 1998)
- Cooperative fishing practices play important roles in bringing synergies.
  - e.g. rotation of fishing grounds, collective search for schools of fish, exchange of information, collective use of fishing boats and/or gears, and joint marketing (Platteau and Seki 2001; Uchida and Baba 2008)

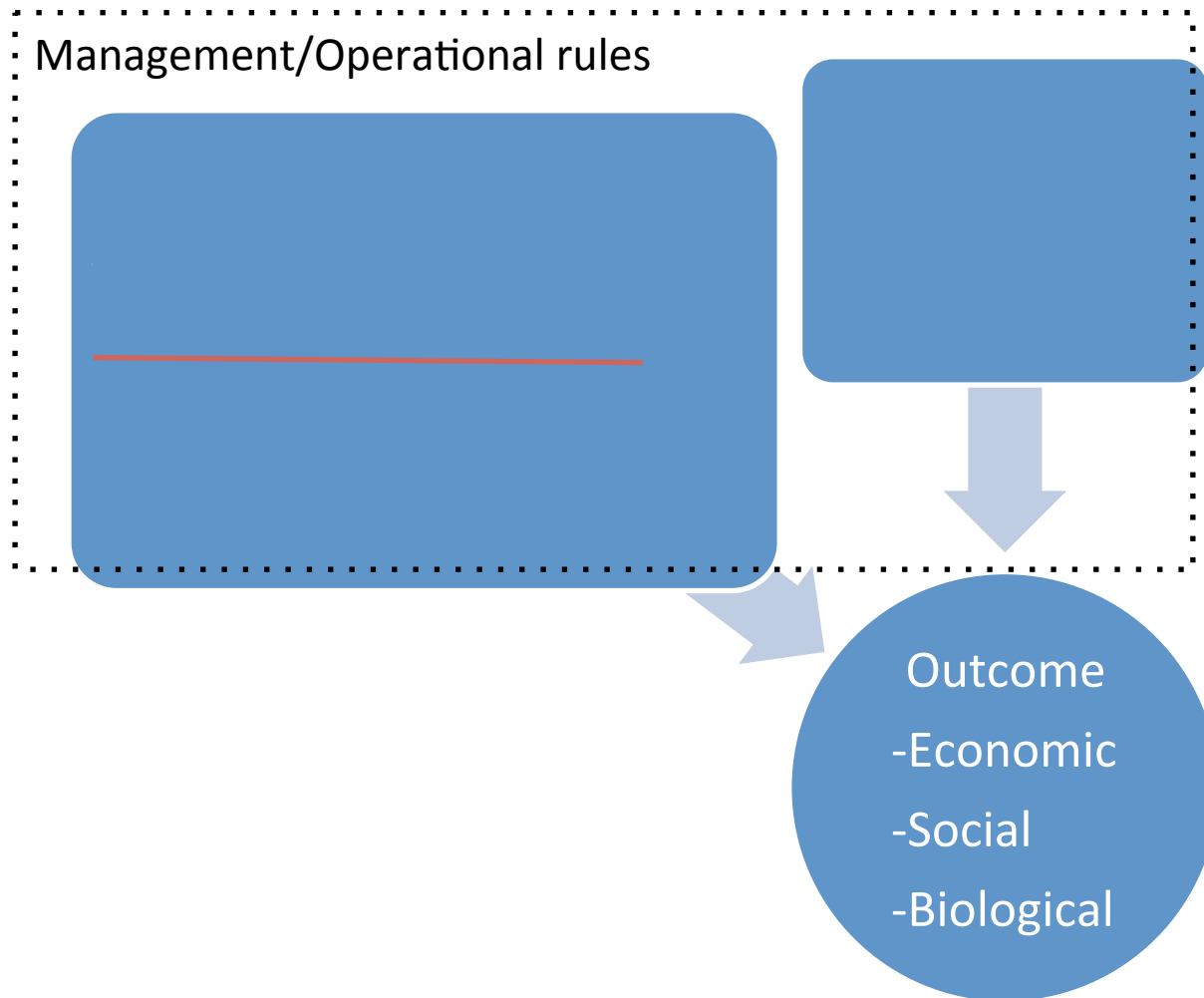
# Social capital

- Attributes such as trust, cooperation and reciprocity among people, and norms and networks in a community are important in improving economic life (Fukuyama 1996; Putnam 2001)
- Found empirical association with economic productivity in fishery (Carpenter & Seki, 2011) as well as other workplace (Barr & Serneels, 2009; Bouma et al., 2008; Carter & Castillo, 2002; Karlan, 2005; Knack & Keefer, 1997)

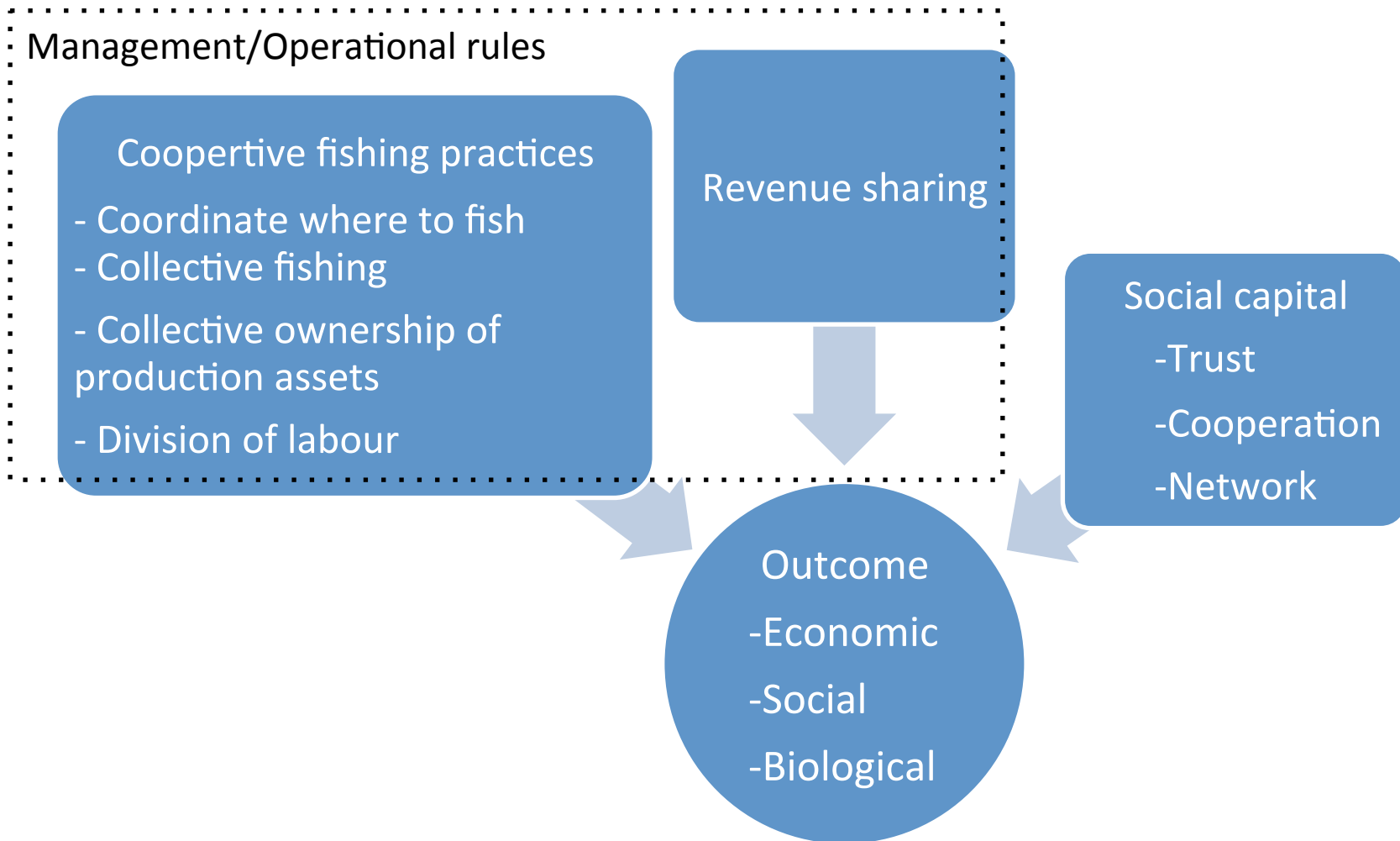
# Research goal

- To explain how revenue sharing achieves successful management of fishery.
  - We hypothesize social capital in a community and cooperative fishing practices play key roles in increasing efficiency in revenue sharing
- To accomplish the goal, we identify the interaction effect of management and social capital on the outcome of fishery.

# Conceptual framework

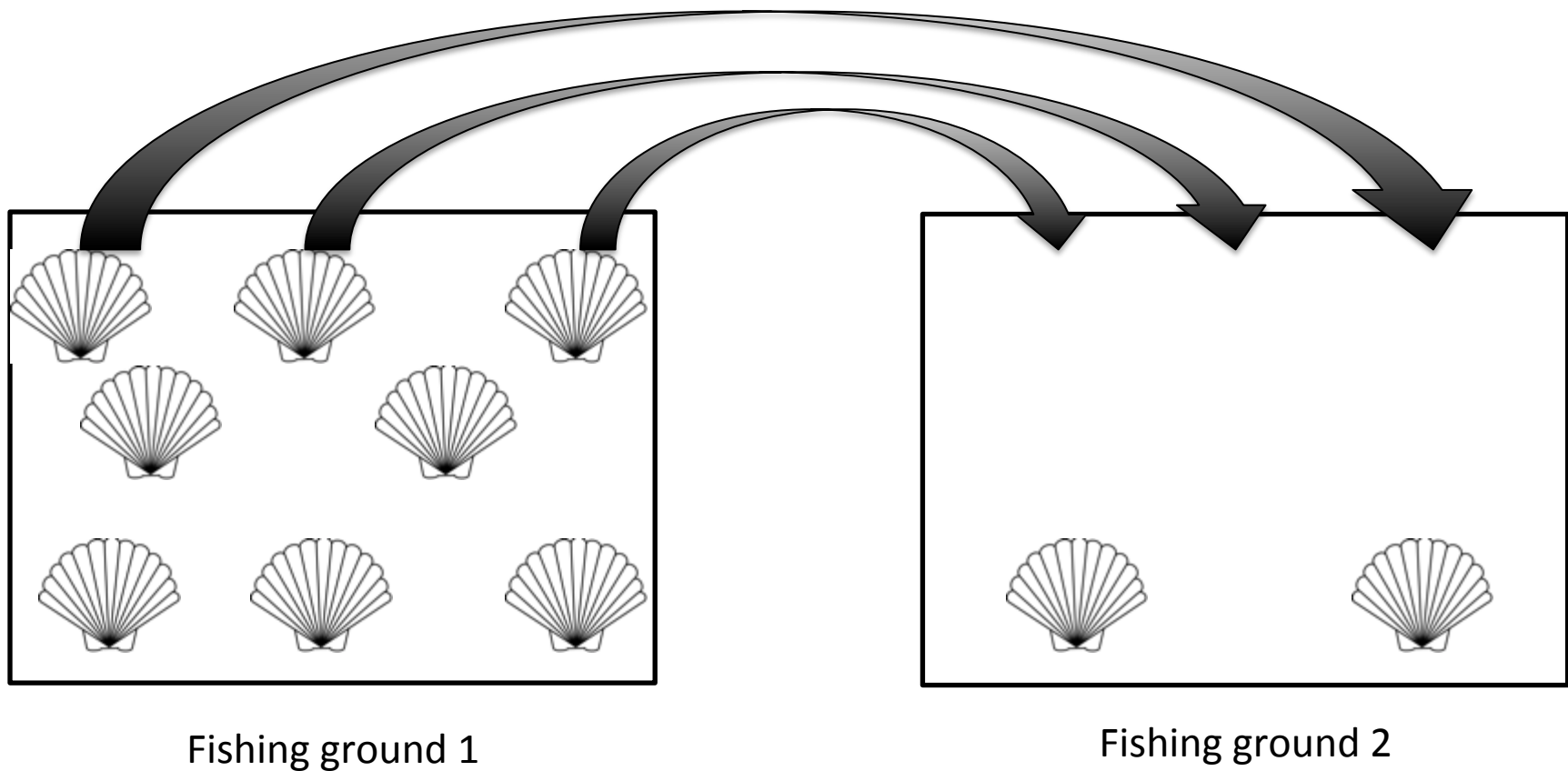


# Conceptual framework



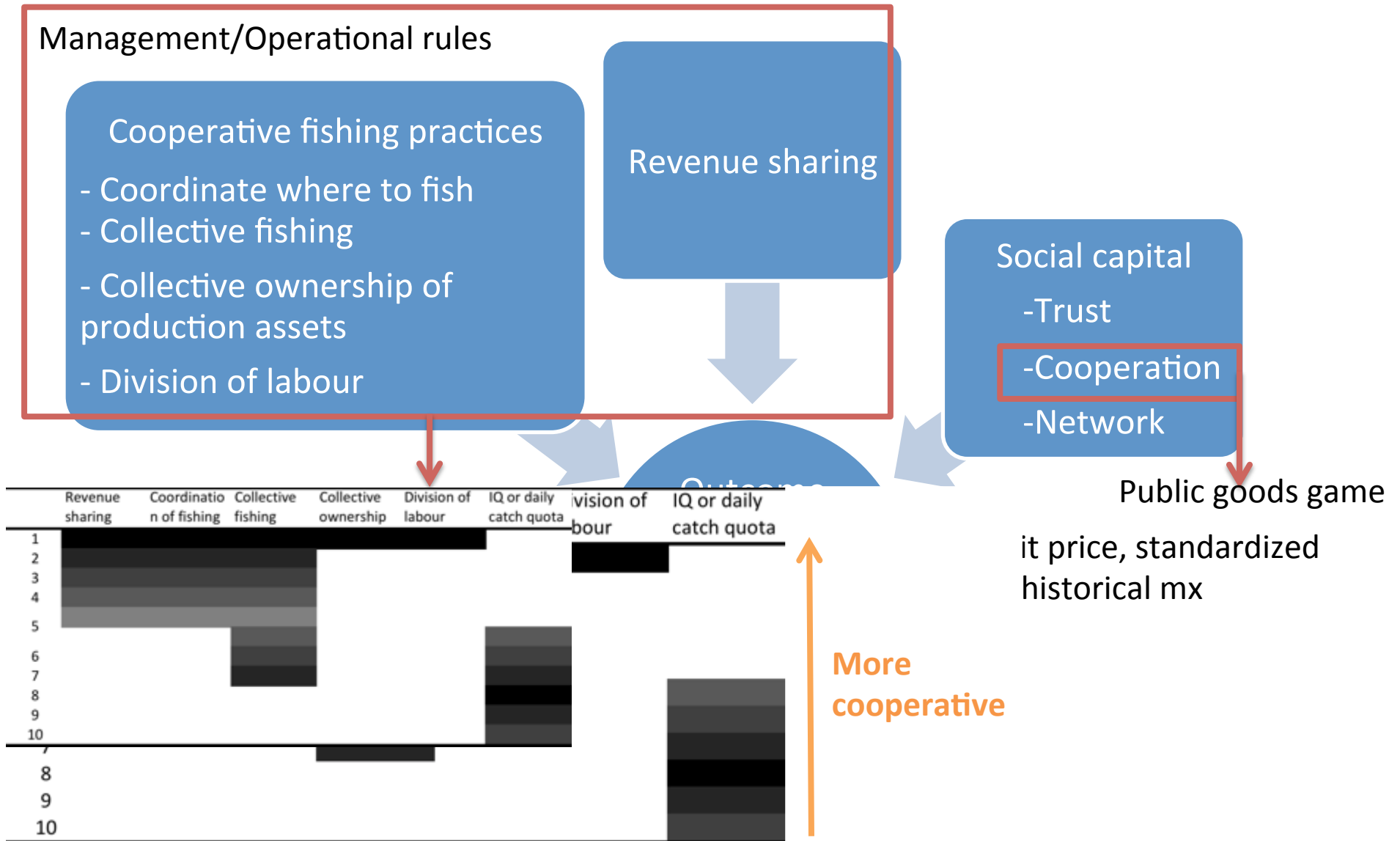
# How synergies are generated

- Example of transplanting





# Conceptual framework



# Sampling fisheries

- 10 FCAs engaging in small-scale trawl fishery
- Collected to construct a statistical comparison group
  - based on observed characteristics such as region (=Hokkaido, Pacific), targeting species (=Sakhalin surf clam), and types of fishing gear (=hydraulic jet dredges)



# Data

- Individual data from experiment and survey
  - 80 skippers
- Group data from survey
  - 10 FCAs
- Time-series data, 2003 to 2012
  - Yearly unit price
  - # of skippers
  - Stock, etc



# Public goods game

- Asked how much they want to contribute to a public good from their own endowment
- Allowed to send costly unhappy face to a whole group if dissatisfied with others' contribution  
(=incredible threat)  
(Carpenter & Seki, 2011)



# Estimate social capital parameters

- Multilevel Tobit model

$$\text{Contribute}_{ijt} = \beta_0 + \beta_1 \text{LagTotalCont}_{ij(t-1)} + u_{1j} + u_{2ij} + u_{3ij} \text{LagTotalCont}_{ij(t-1)} + \epsilon_{ijt}$$

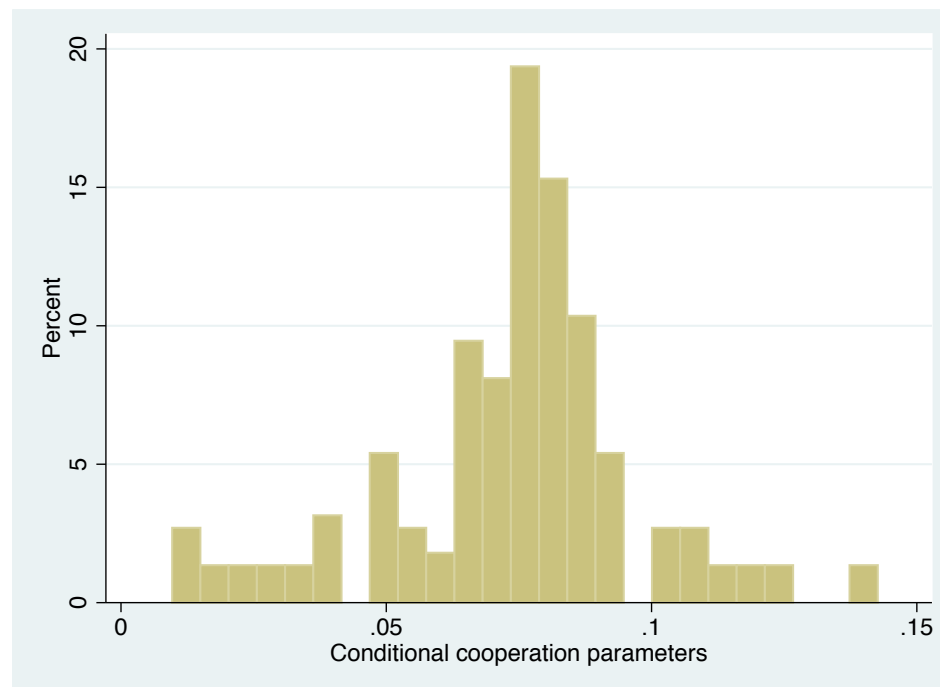
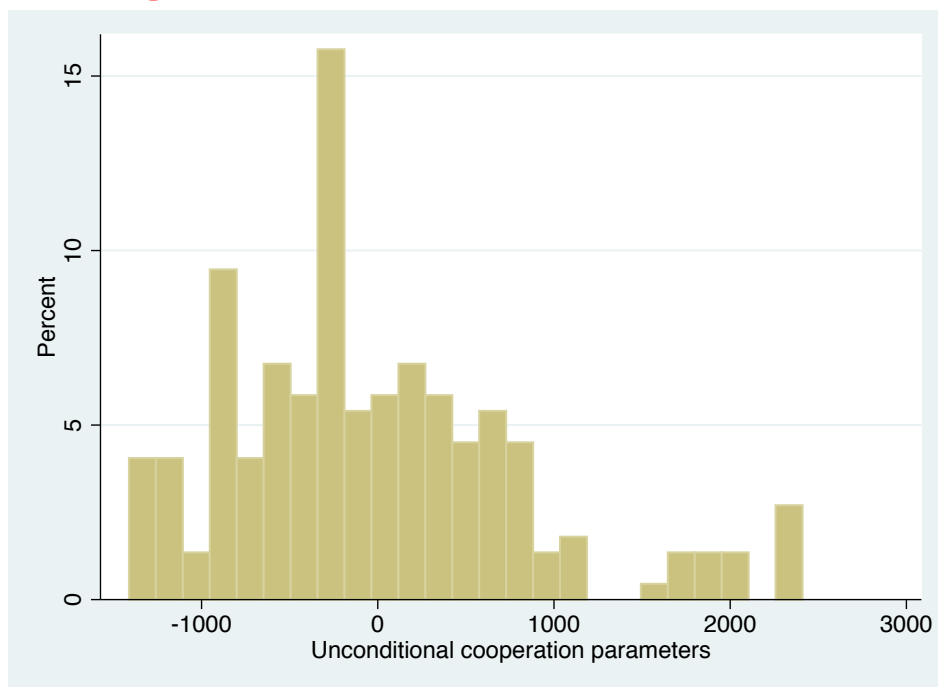
$i$ : subject id,  $j$ : session id,  $t$ : round

Unconditional cooperation  
parameter

The greater, the more altruistic/trust

Conditional cooperation  
parameter

The greater, the more reciprocal

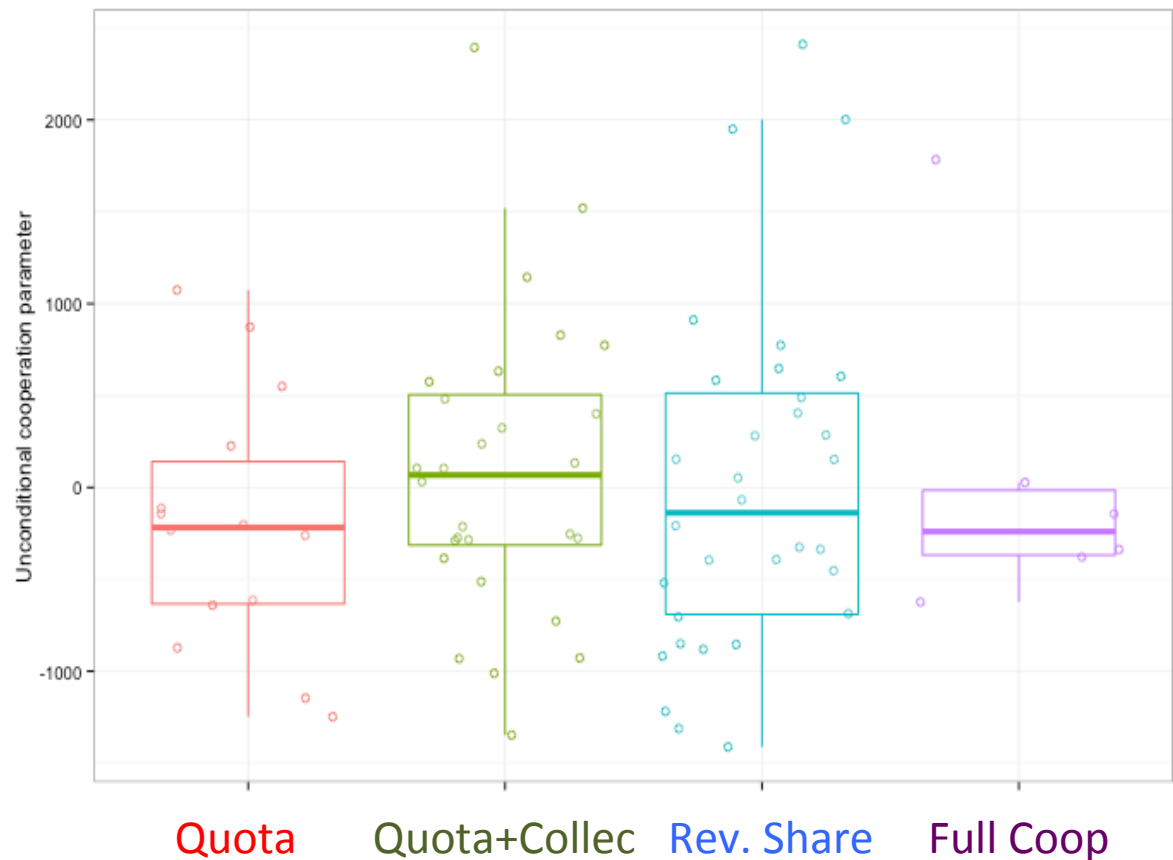




# Unconditional cooperation parameter

## Altruism/Trust

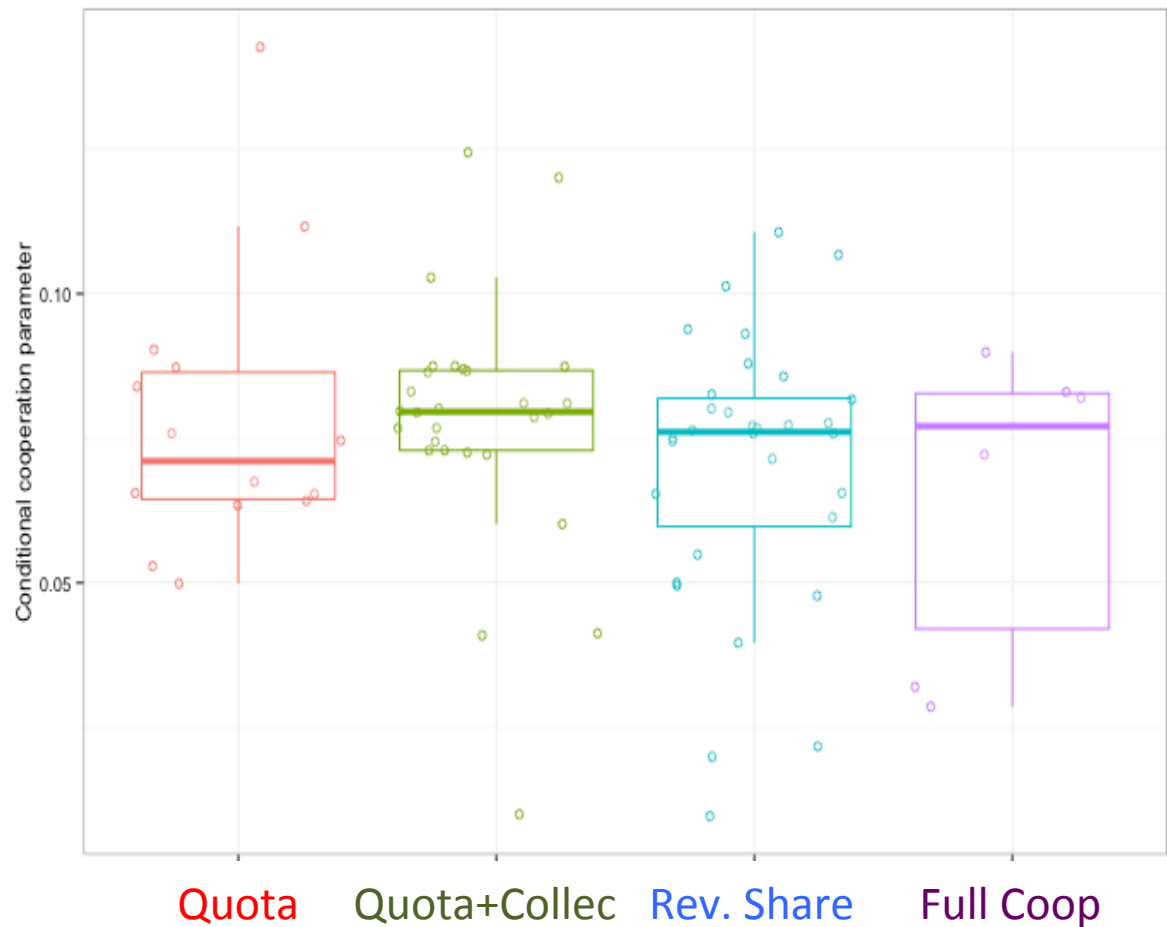
Quota	IQ
Quota + Collec	IQ + Collective fishing
Rev.Sharing	Revenue Sharing + Collective fishing + Coordination of where to fish
Full Coop	Revenue Sharing + Collective fishing + Coordination of where to fish + Collective ownership of fishing boats/gears + Division of labour



# Conditional cooperation parameter

## Reciprocity

Quota	IQ
Quota + Collec	IQ + Collective fishing
Rev.Sh aring	Revenue Sharing + Collective fishing + Coordination of where to fish
Full Coop	Revenue Sharing + Collective fishing + Coordination of where to fish + Collective ownership of fishing boats/gears + Division of labour



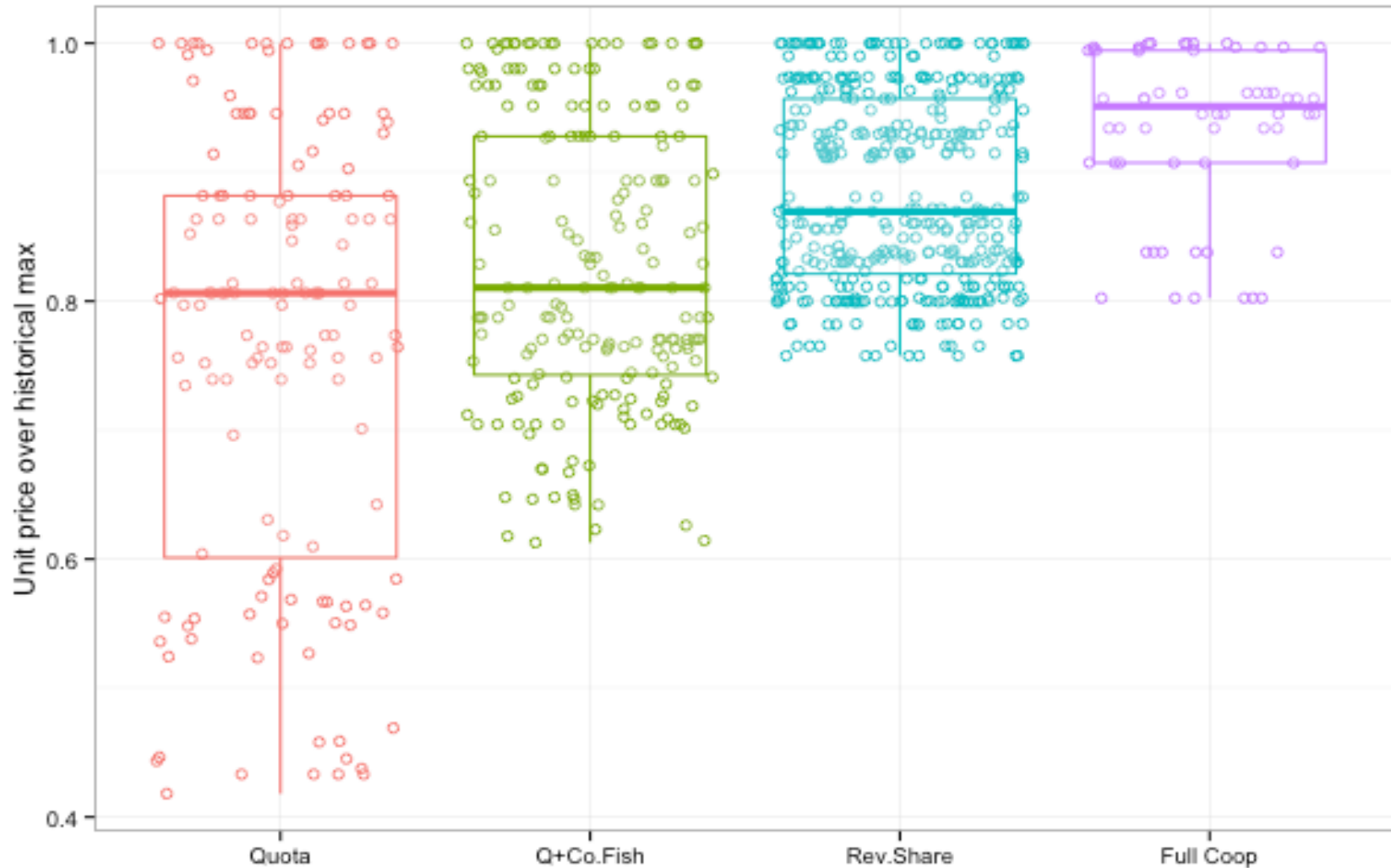
# Hypothesis

- Revenue sharing with more cooperative fishing practices and greater social capital results in a more successful outcome.

	Unit prices
Revenue sharing with cooperative practices	+
Social capital	+
Interaction of social capital & revenue sharing	+



# Unit prices and revenue sharing with cooperative practices



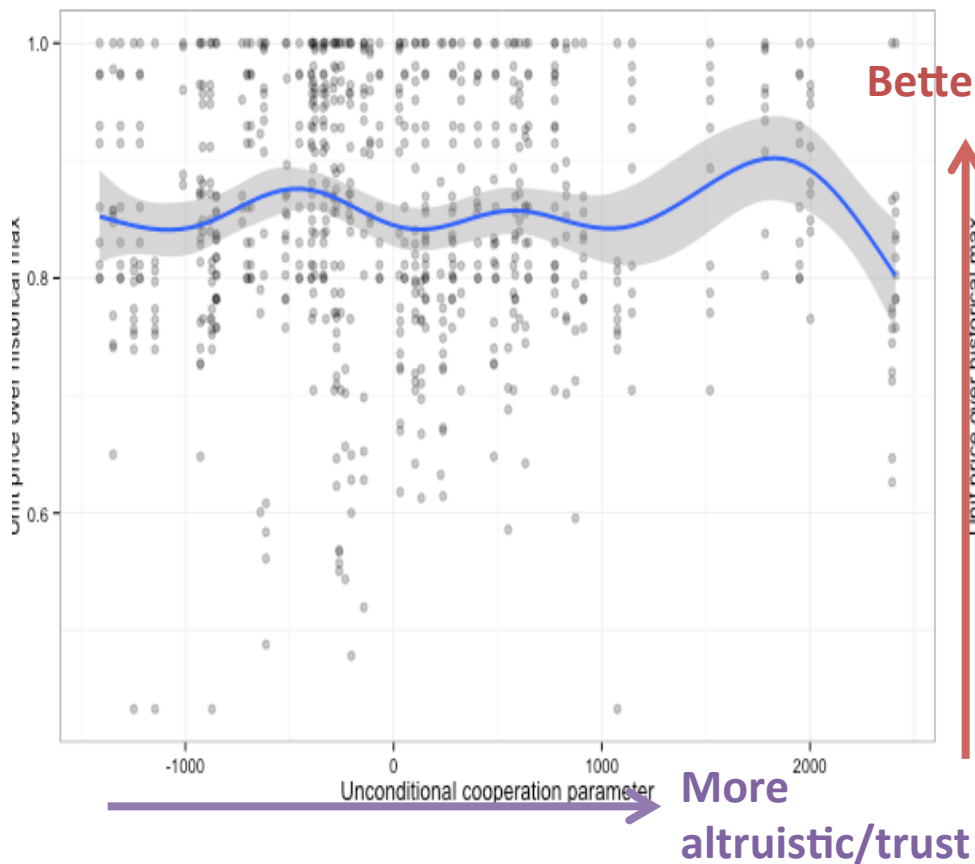
Less cooperative



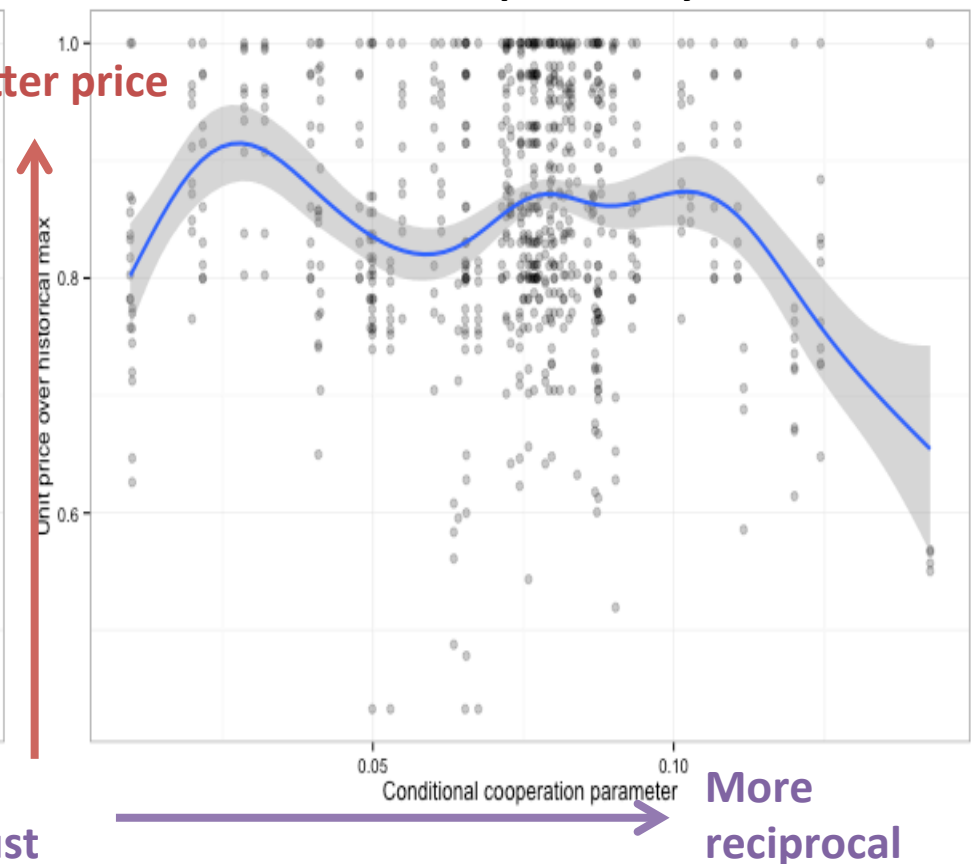
More cooperative

# Unit prices and social capital

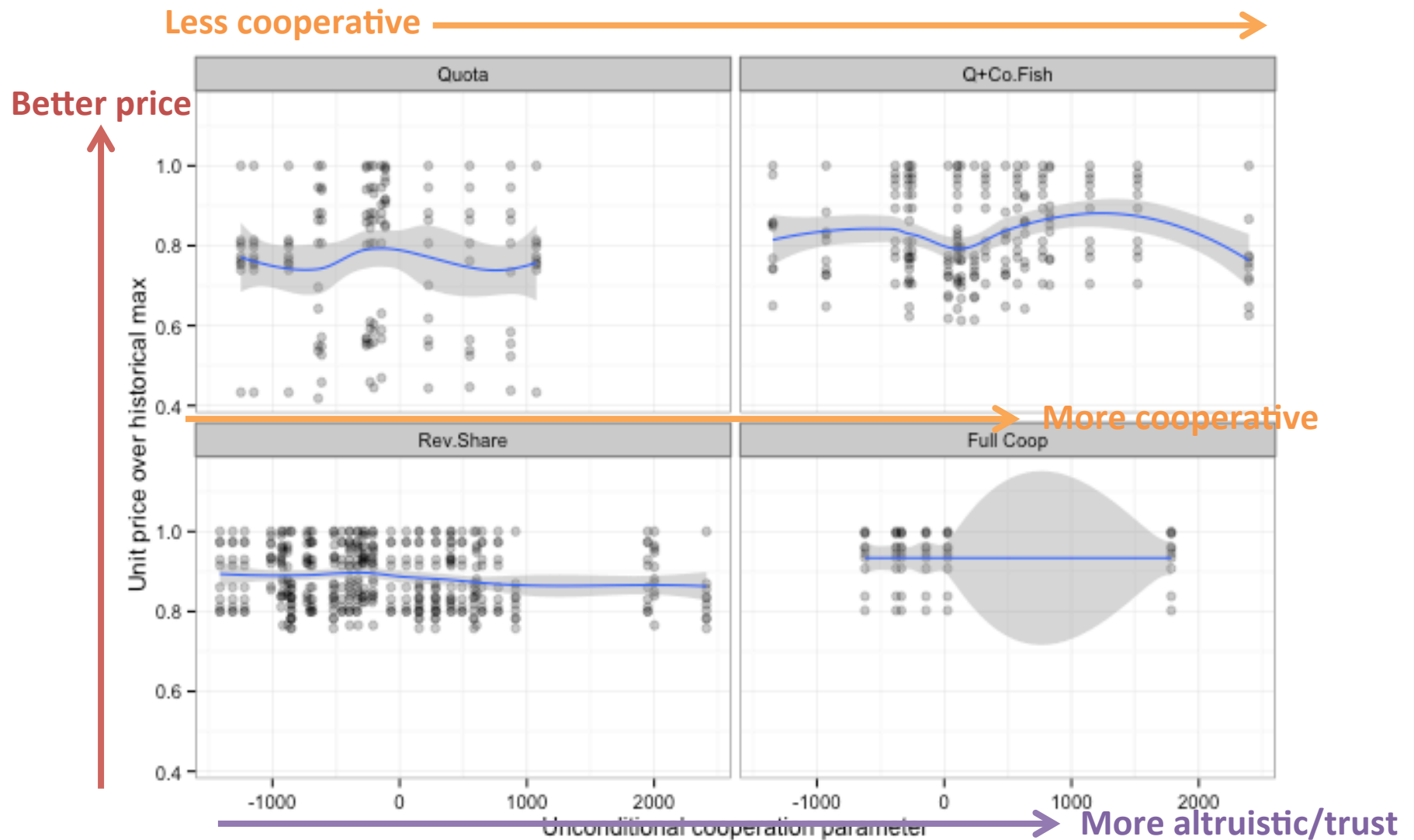
Unconditional cooperation  
Altruism/Trust



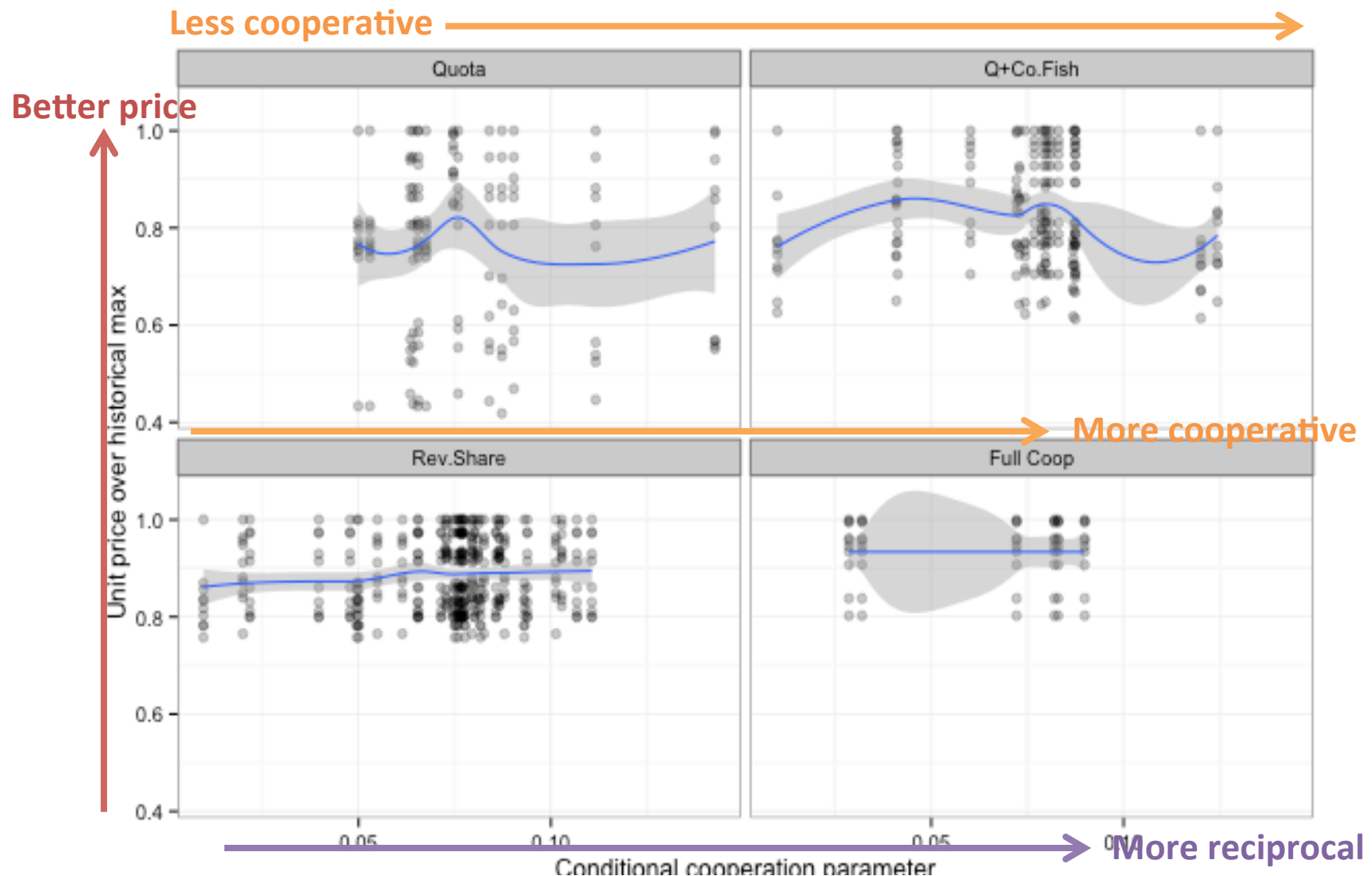
Conditional cooperation  
Reciprocity



# Unit prices and unconditional coop & revenue sharing with coop practices



# Unit prices and conditional coop & revenue sharing with coop practices



# Preliminary findings

- No significant difference in social capital across different management rules
- More cooperative management seems to result in better (stable) unit prices
- Higher social capital solely does not necessarily lead to better unit prices
- Higher social capital with revenue sharing seems to matter in a way that reciprocity in teamwork matters

# Thank you!



Acknowledgements: This research was supported in part by the NSF SBE Doctoral Dissertation Improvement Grant, the Konosuke Matsushita Memorial Foundation, University of Rhode Island's Coastal Institute.

We thank Professors K. Higashida, T. Matsui, E. Seki, O. Baba, N. Yagi, I. Sakurai for their advice and cooperation. Countless help was provided in the field by local FCAs in Hokkaido, Hokkaido Fisheries Experiment Stations, Fisheries Extension Offices, Hokkaido Federation of FCAs.