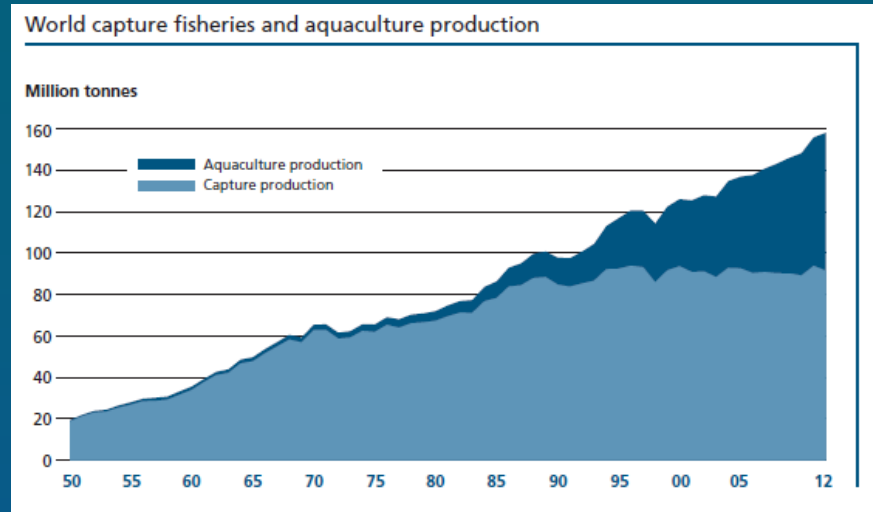# Employment Effects of Volatility in Global Fisheries Production

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VIMS | WILLIAM & MARY

VIRGINIA INSTITUTE OF MARINE SCIENCE

1940-2015 75 YEARS

- 17% of animal protein

- US $130 billion in trade

- 60 million employed

- Assure livelihoods for 10-12% of world population

World capture fisheries and aquaculture production

Million tonnes

Aquaculture production
Capture production

FAO 2014

Apichart Weerawong

VIMS | WILLIAM & MARY
VIRGINIA INSTITUTE OF MARINE SCIENCE

1940-2015
75 YEARS

What affects fishing sector employment?

- History, culture, geography

- Economic development, supply chain, alternative employment, demand
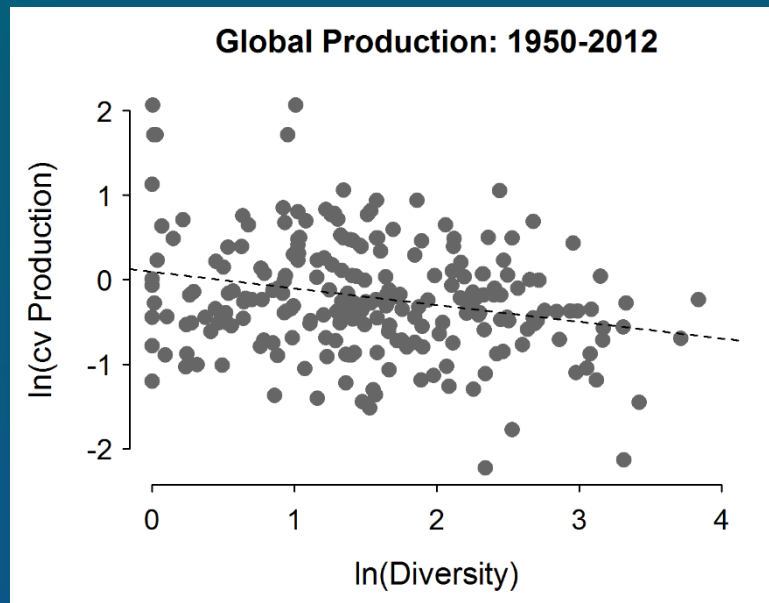
- Species abundance and availability

Biological diversity found to stabilize ecological communities, leading to enhanced provision of ecosystem services
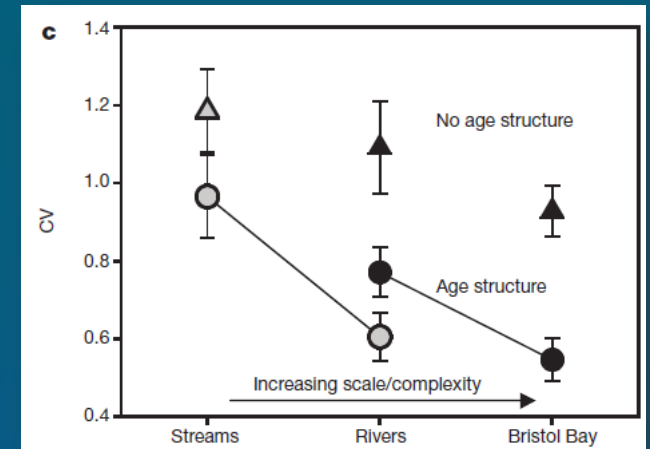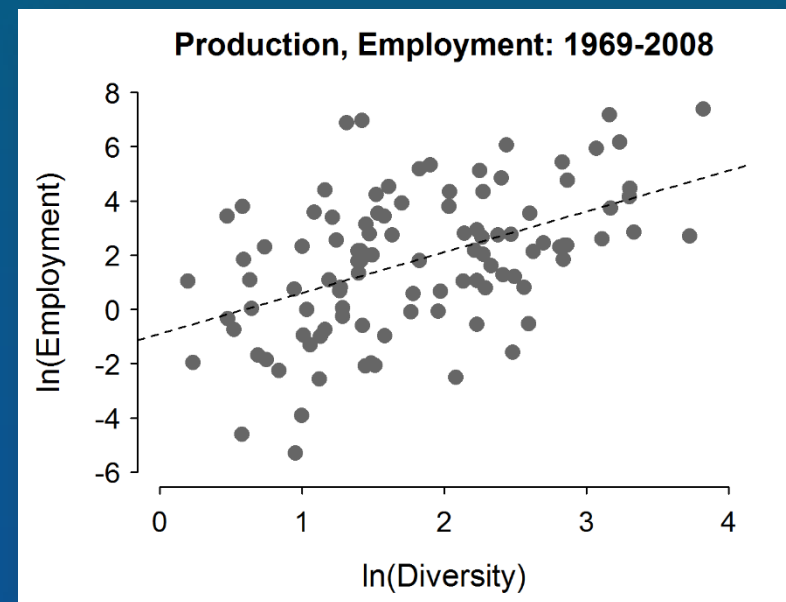

Schindler et al. 2010
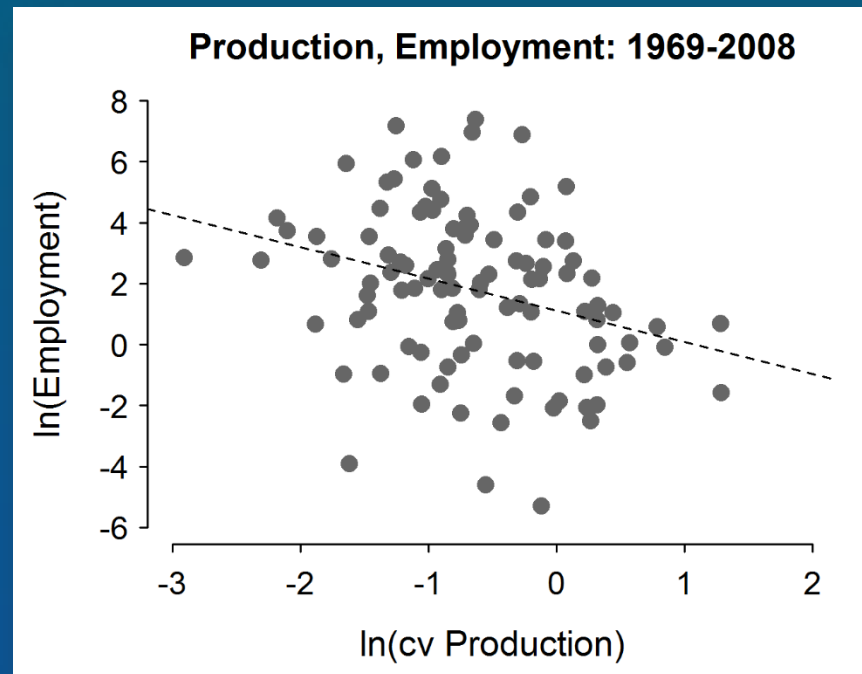

Are similar patterns seen in human systems?

Global Production: 1950-2012

Product diversity and employment positively correlated

Product diversity and inter-annual variability negatively correlated

Production, Employment: 1969-2008

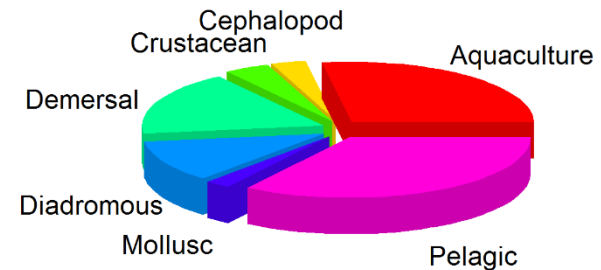# What are the effects of volatility in production on fishing sector employment?

Production Volatility:

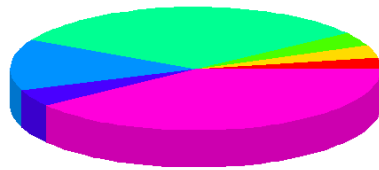"Assets" → commercially produced species groups

"Returns" → annual production from assets
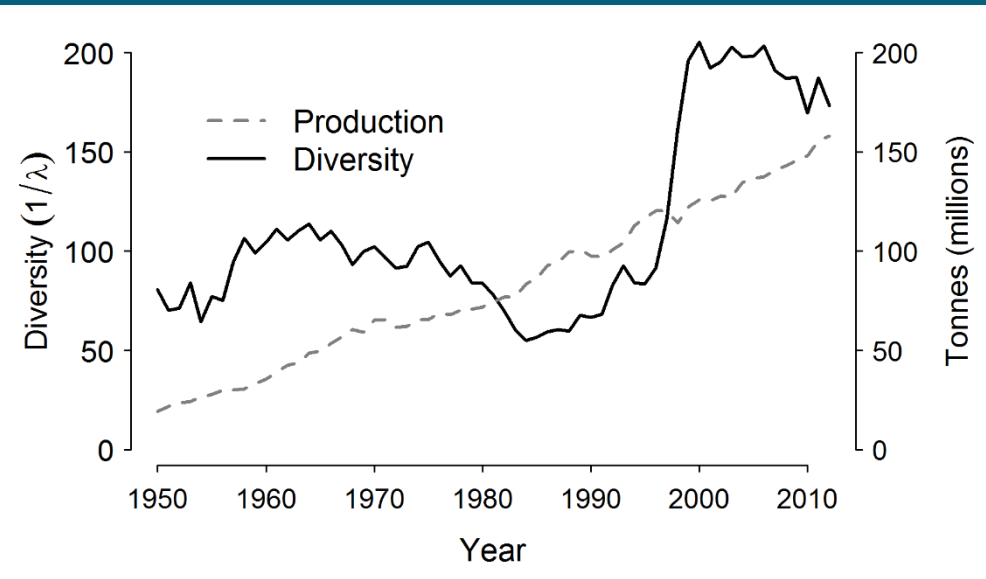
"Volatility" → standard deviation of returns
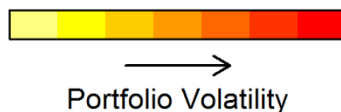

$$V_{it} = \sqrt{w^T \Sigma_{it} w}$$

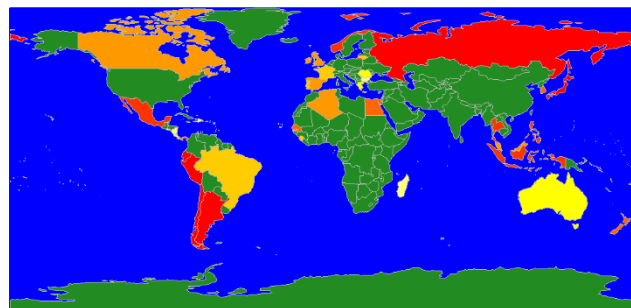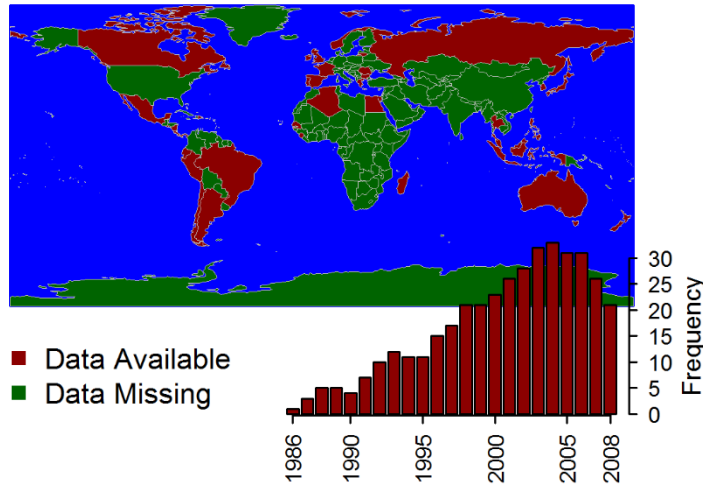- Composition of production has changed somewhat over the last 60 years (demersal ↓ ; aquaculture ↑)

- Diversity increased recently (Pacific/Asia fisheries ↑)

Datasets

- ILO fishing sector employment

- FAO production by country and year

- Other country-specific datasets

Expected returns and volatility for a country's production "portfolio" were calculated based on production in the previous three years

Empirical Model

Covariate	Estimate
Intercept	-11.47*** (1.08)
Coastline	0.19** (0.06)
Latitude	-0.39*** (0.08)
Rural Pop.	0.55*** (0.10)
UNHDI (2000)	-3.38*** (0.86)
Capture	0.38*** (0.09)
Aquaculture	0.15* (0.07)
Volatility	-0.18** (0.06)

N = 394 R^2 = 0.8649
*** p<0.001; ** p<0.01; * p<0.05
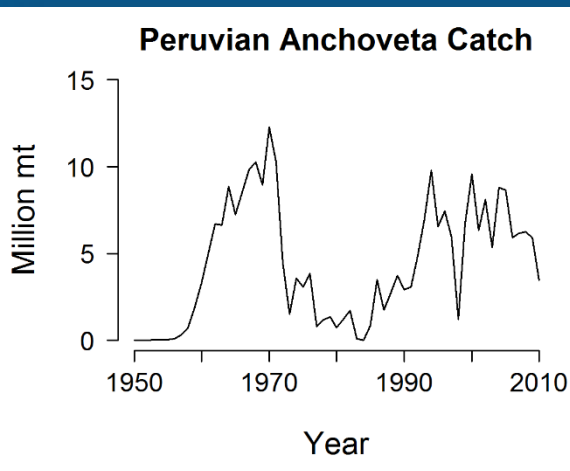
- Log-log specification → parameter estimates are % effects on employment

- Standard errors adjusted for country and year clustering:

$$V\left(\hat{\beta}\right)=\left(X'X\right)^{-1}X'\Sigma X\left(X'X\right)^{-1}$$
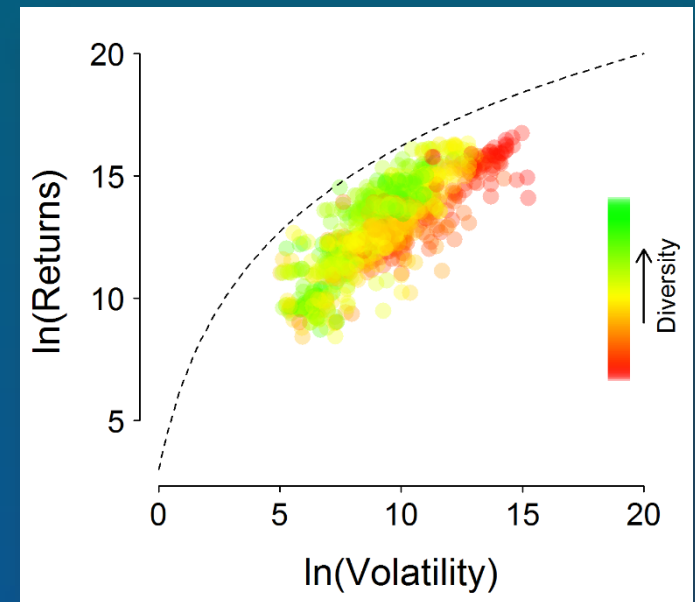
Hsieh et al. 2006
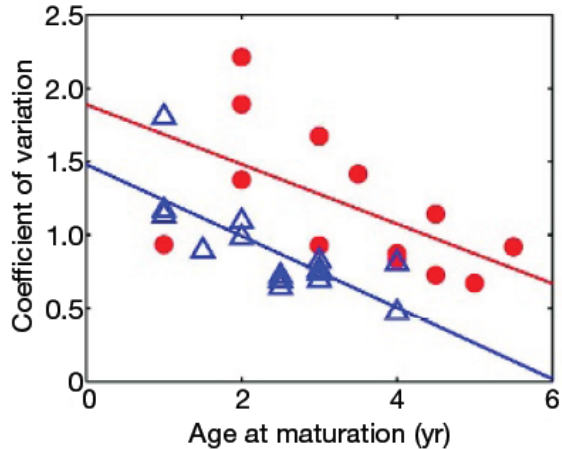
Fishing has been found to increase variability in population recruitment

Many stocks are thought to be influenced by climatic and environmental factors

Conclusions

- Volatility appears to have a negative effect on fishing sector employment → Why?

  - Uncertainty, risky to invest
  - Large integrated firms better able to manage risk

- Policies/management which stabilize production?

Thanks!

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