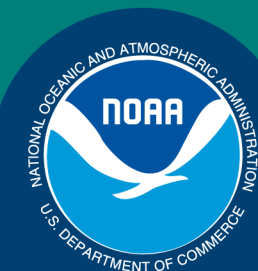


Science, Service, Stewardship



Evaluating Changes in Total Factor Productivity in the Amendment 80 Catcher-Processor Fishery

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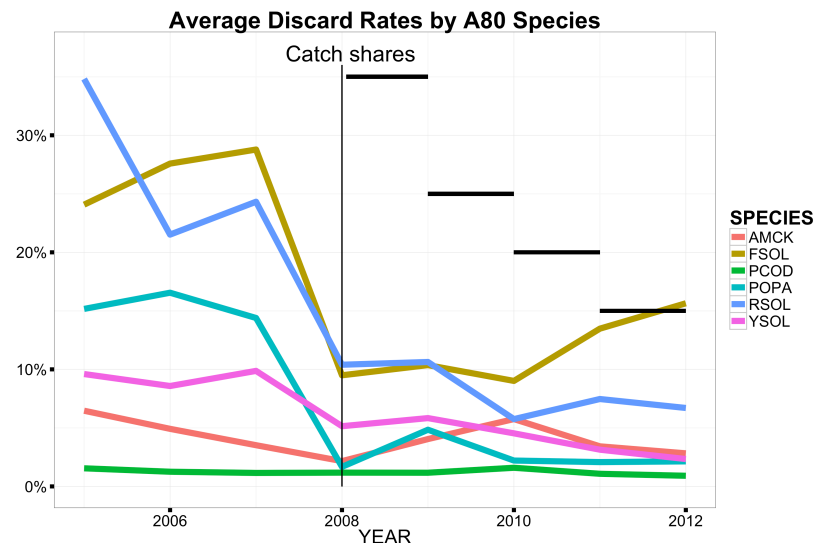
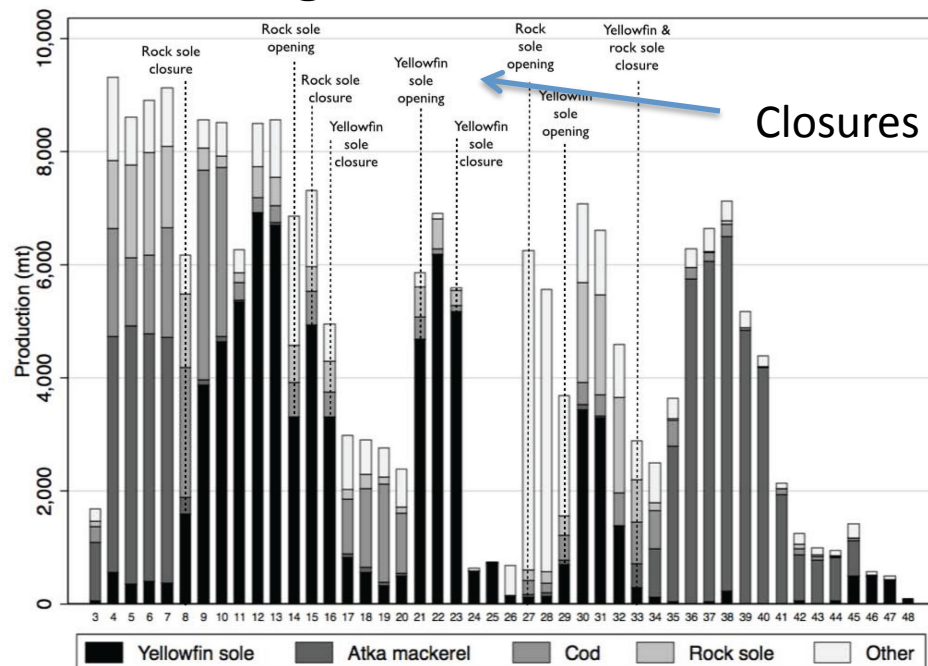
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The Amendment 80 Story

- The BSAI non-pollock trawl fleet is a multispecies fishery where by-catch historically constrained productivity
 - Limits on catch of prohibited species routinely closed fisheries for target species
 - High discard rates for non-target A80 species



--- Groundfish Retention Standard

Abbott, Haynie and Reimer (2014), HIDDEN FLEXIBILITY: INSTITUTIONS, INCENTIVES AND THE MARGINS OF SELECTIVITY IN FISHING

The Amendment 80 Story

- The BSAI non-pollock trawl fleet is a multispecies fishery where by-catch historically constrained productivity
 - Limits on catch of prohibited species routinely closed fisheries for target species
 - High discard rates for non-target A80 species
- In 2008 the regulations governing the fleet were restructured:
 - Tiered increase in groundfish retention standards (GRS)
 - Increased flexibility over prohibited species catch (PSC) within cooperative framework
 - Total allowable catch (TAC) allocated as catch shares (rights based system allocating a portion of the catch) and facilitated formation of cooperatives.

What can we learn from the A80 fleet?

Catch shares in a Multispecies Setting

- Rigidities in ex-ante allocation may distort quota markets and impact potential productivity
(e.g. Squires et al. 1998; Pascoe et al. 2007; Holland 2013)
 - Difficulty in matching catch composition to the portfolio of quota allocated
 - Over-priced “choke” species and/or under-priced “slack” species
- Quota balancing schemes may mitigate impacts
(Sanchirico et al. 2006)
- Incentives to increase selectivity not present in common pool could mitigate distortions.
(Abbott et al. 2014)
 - Selectivity may increase input costs

Productivity and Selectivity

- Abbott et al. (2014) find significant changes in A80 fleet PSC selectivity behavior post-rationalization through:
 - Adjustments of fishing grounds
 - Timing of fishing activities
- This research addresses A80 productivity and costs showing:
 - Increases in total factor productivity driven by technical change
 - Consistent with relaxation of output constraints (PSC closures)
 - Increases in output and marginal increase in vessel concentration in target species
 - Catch below TAC for key species indicating fleet may be undercapitalized
 - Little change in aggregate input use
 - Labor increased slightly while fuel use dropped slightly
 - Efficient inputs use post-rationalization offsets any additional selectivity

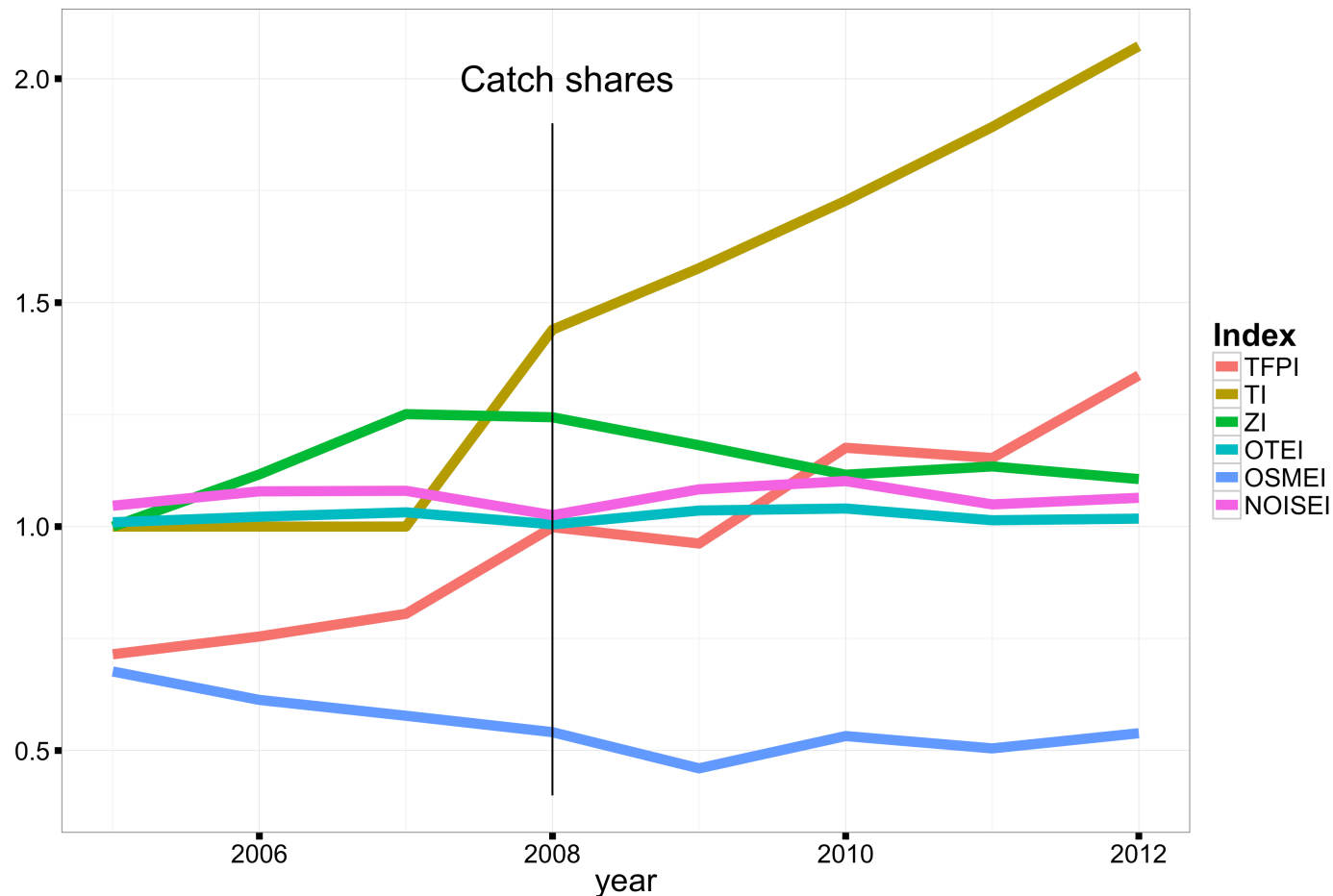
Decomposing Productivity Indices

O'Donnell (2012)

$$TFPI_{st} = TI_{st} \times ZI_{st} \times OTEI_{st} \times OSMEI_{st} \times NOISEI_{st}$$

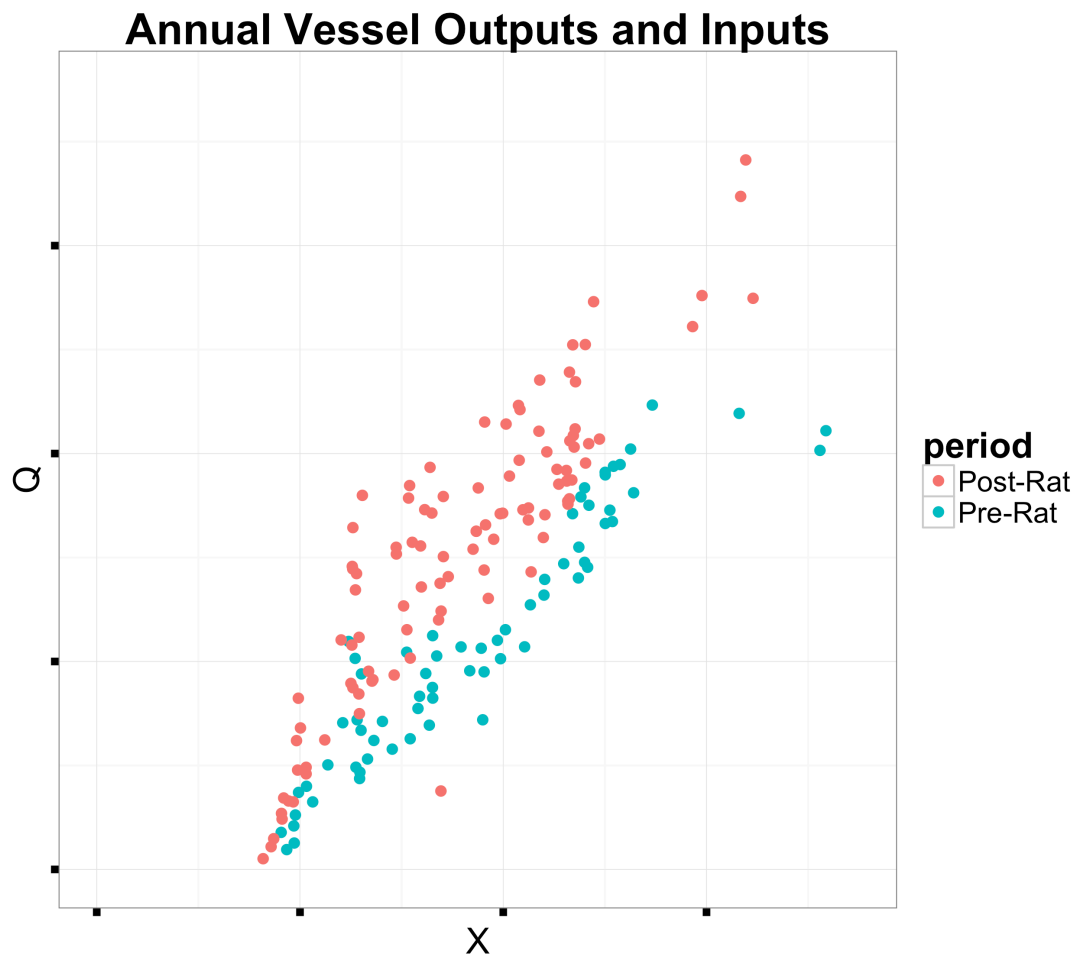
- TFPI: Total factor productivity change
- TI: Technical change
- ZI: Environmental efficiency change
- OTEI: Output technical efficiency change
- OSMEI: Output scale-mix efficiency change
- NOISEI: Random noise

A80 Fleet Productivity Indices

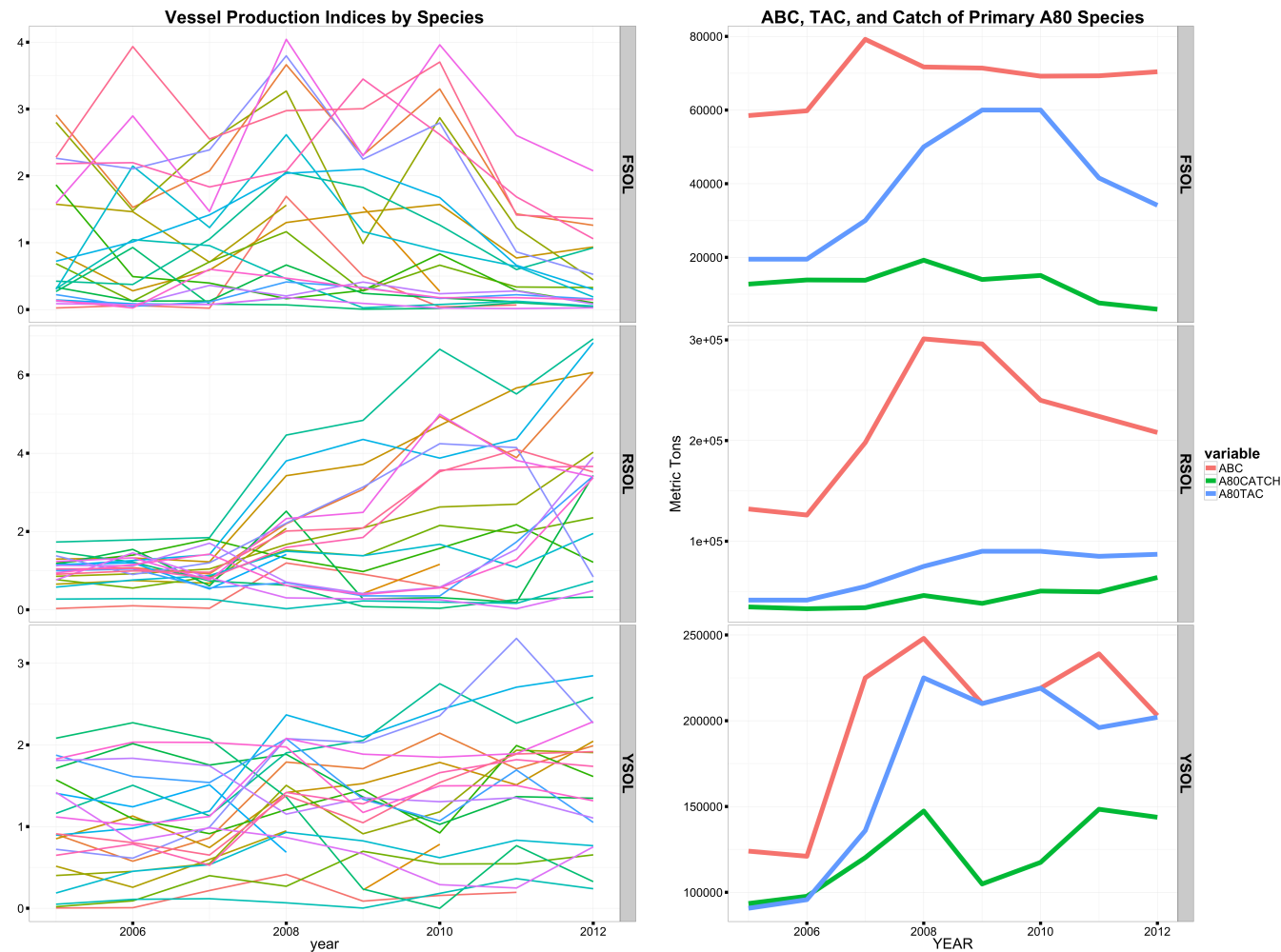


- Post-rationalization total factor productivity (2008) grew by 34%

- Increase in technical change
 - Technical efficiency remained constant

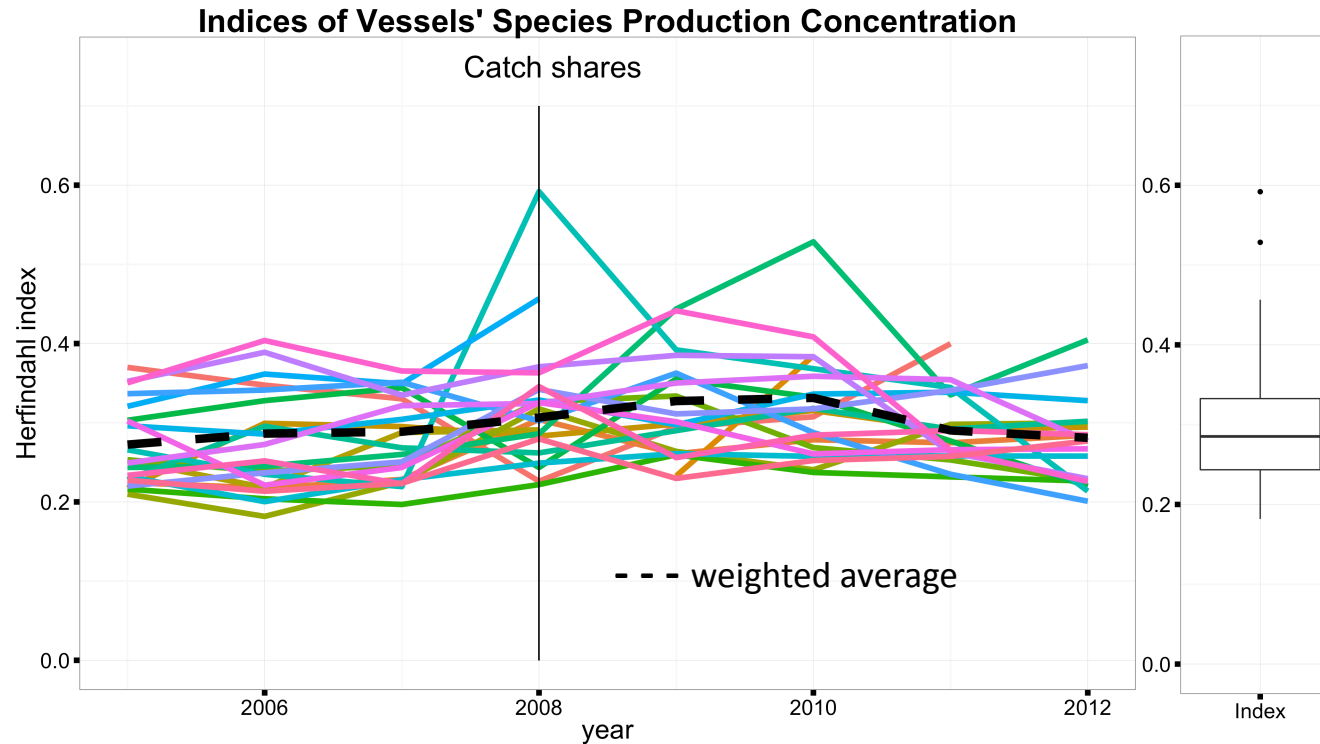


Technical Efficiency	
2005	0.86
2006	0.87
2007	0.88
2008	0.86
2009	0.88
2010	0.89
2011	0.86
2012	0.87



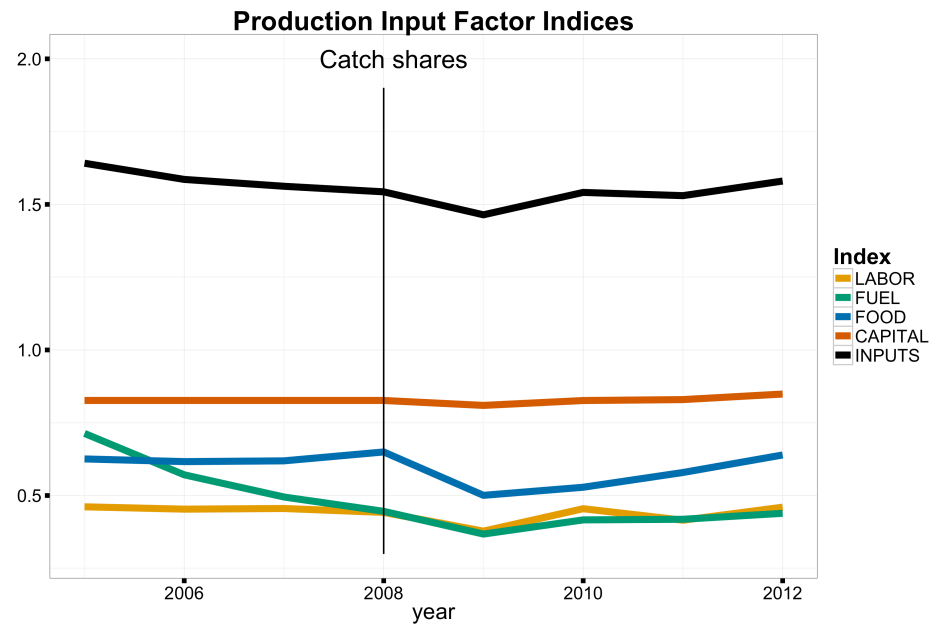
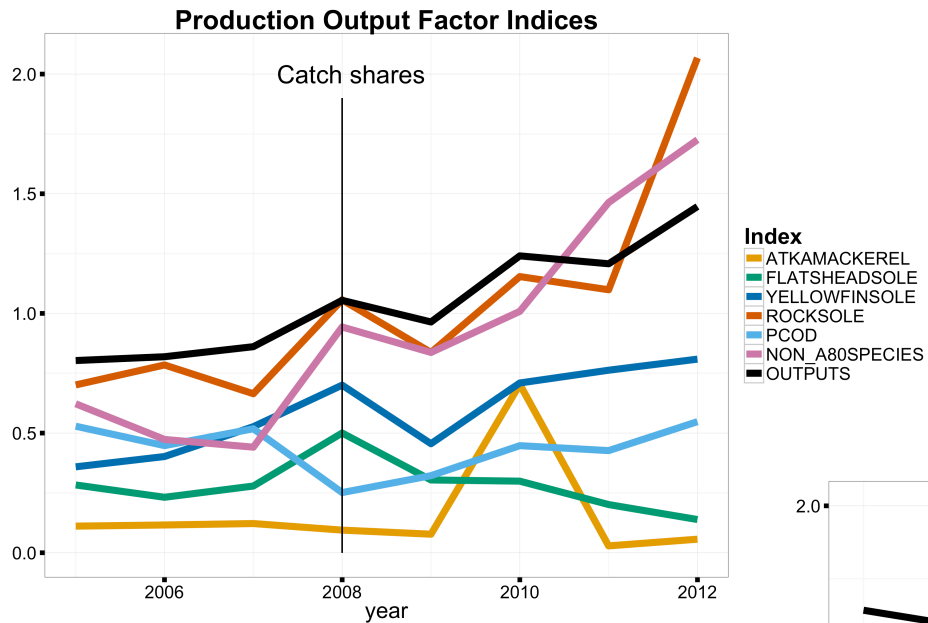
- Substantial room for increased production under allowable biological catch (ABC) and total allowable catch
 - Fleet may be capacity constrained
- Low exploitation -> mitigate impact of density dependence in production
 - biological factors contribute little to TFP changes

Species Output Composition



- Herfindahl indices over species production
 - Typical range [0.24,0.33] indicates vessel production is concentrated
 - Little change in composition of species produced by vessels
 - Vessels targeting the same mix of species

- Scale and mix efficiencies decreased slightly



Discard Rates and Production Inputs

Regression of Input Factors and Trends on Discard Rate

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	0.718	0.025	28.30	0.000	
log(labor)	-0.024	0.028	-0.860	0.391	
log(fuel)	-0.059	0.031	-1.870	0.063	*
log(food)	0.037	0.027	1.370	0.173	
log(capital)	-0.087	0.031	-2.800	0.006	***
Post-rat dum.	-6.746	25.804	-0.260	0.794	
time trend	-0.017	0.012	-1.450	0.149	
Post-rat trend	0.003	0.013	0.260	0.798	

Adjusted R-squared: 0.641

- Only capital (vessel value) and fuel are significantly associated with changes in groundfish discard rates
 - Vessel with more capital have lower discard rates
 - More fuel is used by vessel with lower discard rates

Concluding Observations

- Pre-catch share mechanism for managing PSC acted as an output constraint.
 - Catch shares + PSC flexibility within a cooperative relaxed the constraint => technical change
- PSC avoidance (selectivity) was achieved
 - Without drastically changing the target species mix
 - Without increases in input use (possibly offset by optimizing input use as a result of rationalization)
- Under coops and catch shares reduced groundfish discards appears to be an optimal decision:
 - Non-binding GRS - Reduced input use - Slack under TAC
- Catch below TAC for key species indicating fleet may be undercapitalized