

The Gulf Headboat Collaborative: A Socioeconomic Review

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8/16/16

A personal introduction

- Associate professor at Arizona State University
 - Ph.D. in Resource Economics from UC Davis
- 11 years of research experience in fisheries economics and policy and over 20 peer-reviewed journal publications
 - Fisheries research in Gulf of Mexico, Alaska, Pacific Northwest, US and Canadian Great Lakes, etc.
- Joint research with a number of NMFS colleagues in multiple regions and science centers
- Research program focused on evaluation of policy impacts in fisheries and recreational fishery management (including for-hire sector)
 - Papers on for-hire sector management published in 2009
- Listed in the EFP as the researcher of record for the socioeconomic portion of the research

Data

1. 2003-2015 logbook data for vessels owned by GHC members
2. Aggregated and censored 2003-2014 logbook data by region/year and region/week
 - Regions: TX, LA/MS, AL, NWFL, SWFL
3. Economic surveys of GHC vessel owners (2014, 2015, 2016)
 - Pricing by trip type, costs by input category for a typical trip in the previous year
 - Questions about economic decision making and performance under the EFP
4. Economic valuation survey of GHC passengers
 - 2 page survey of GHC customers (2014-2015)
 - Follow up online economic valuation survey

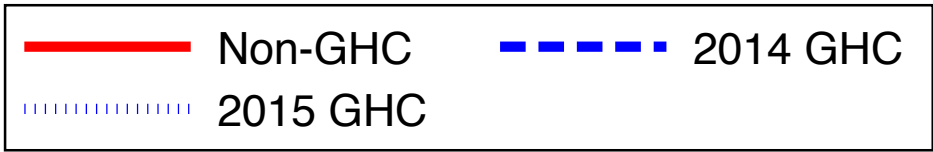
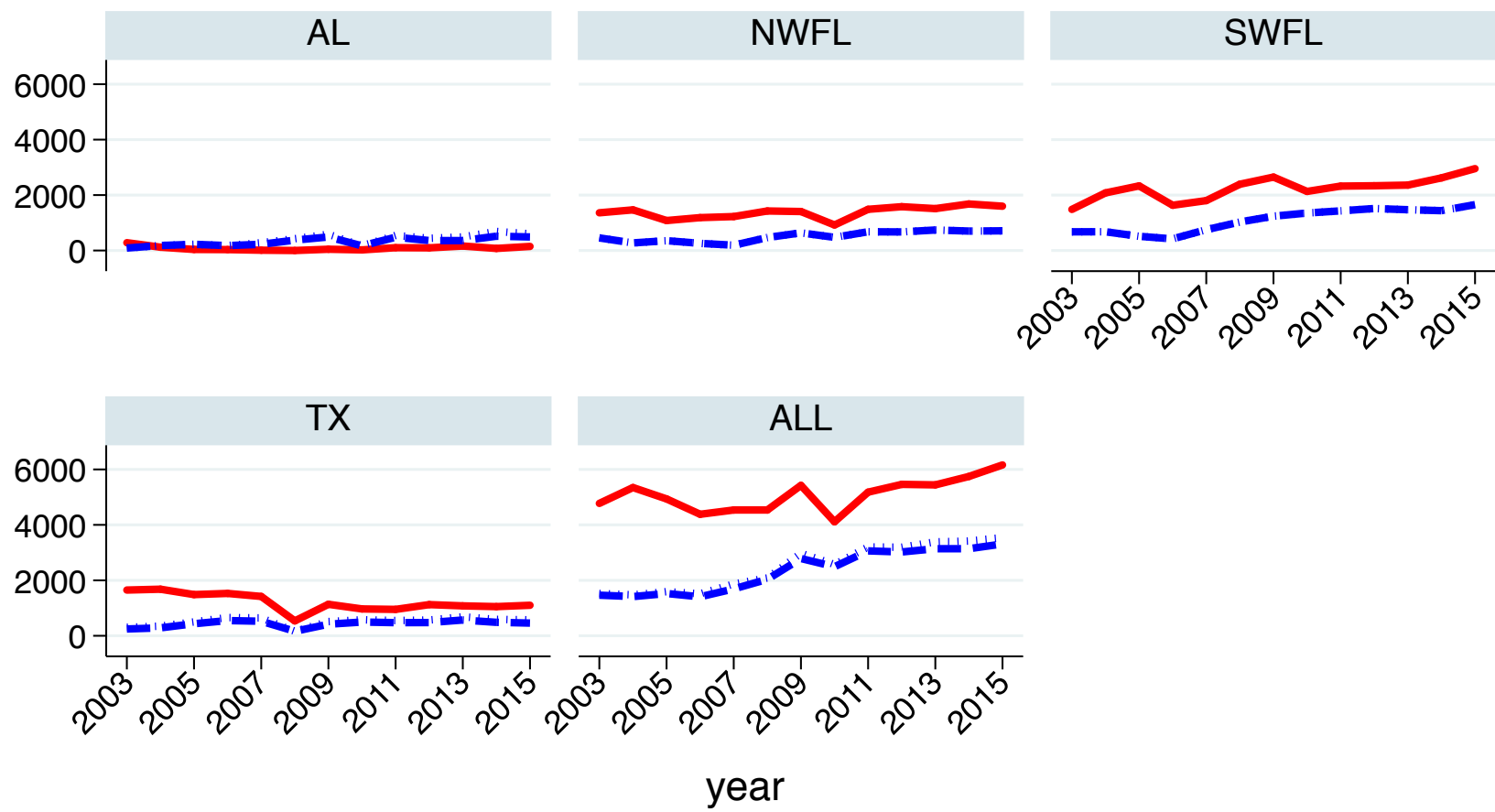
In a nutshell

Under the EFP:

1. Angler access to trips landing EFP species dramatically increased, especially in the spring and late summer.
2. Vessels reduced red snapper landings per customer on red snapper trips, while maintaining overall landings and dramatically reducing discards of EFP species.
3. Economic returns grew from 2013 levels, driven by increased profits from additional customer demand, shifts of customers to higher-profit trips, and modest increases in trip prices for EFP trips.

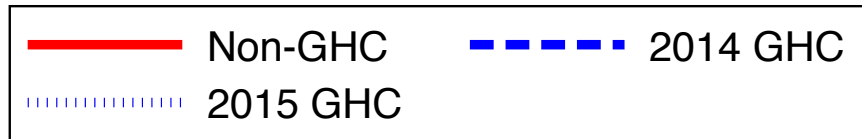
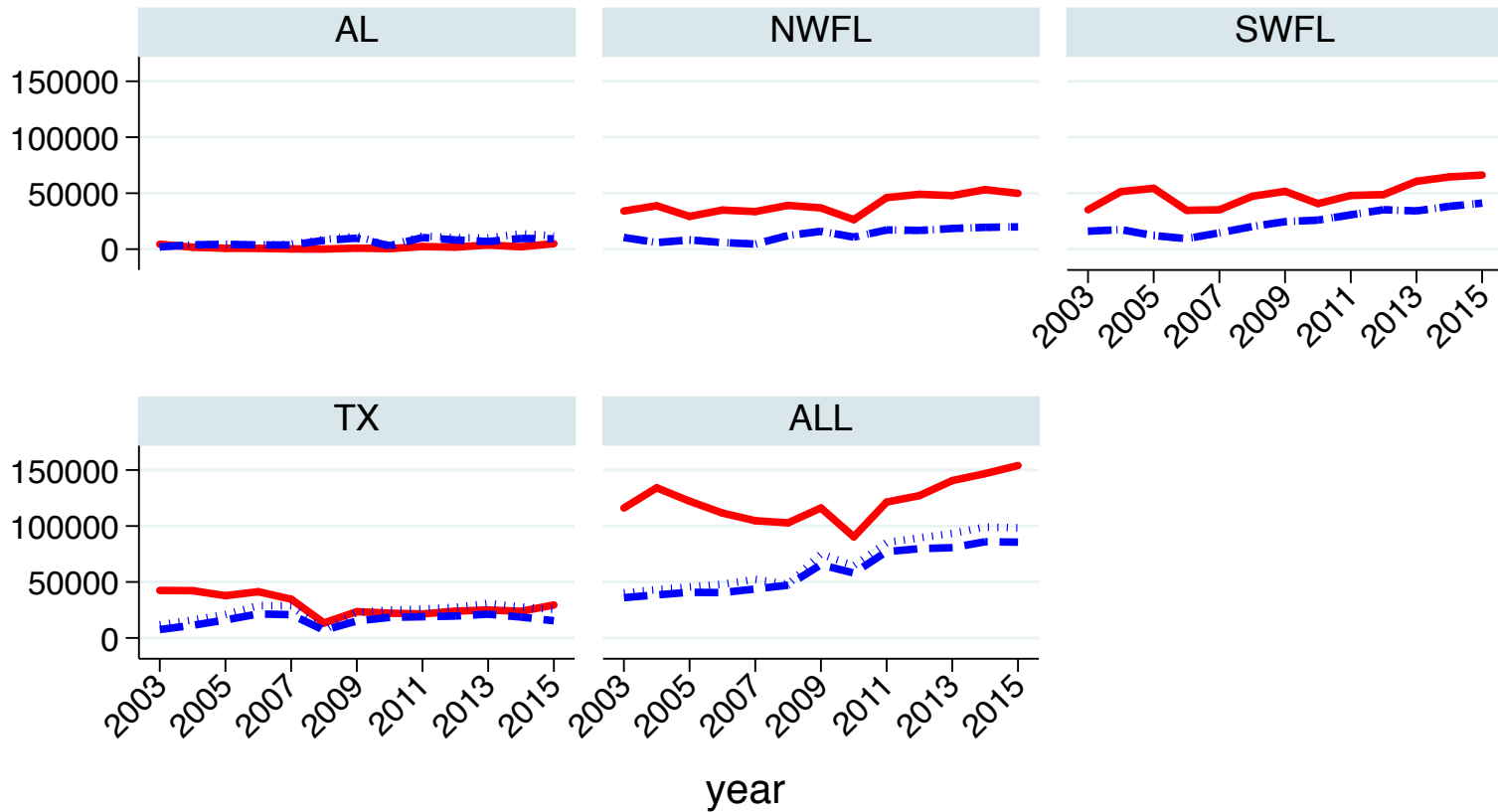
I. GHC vs. non-GHC:
some coarse comparisons

Number of Total Trips



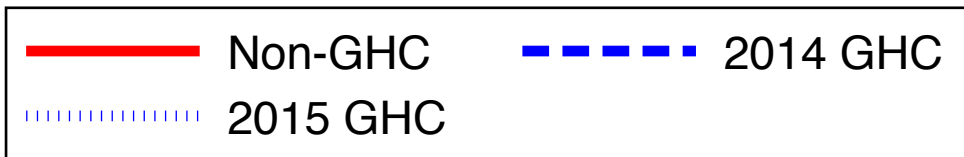
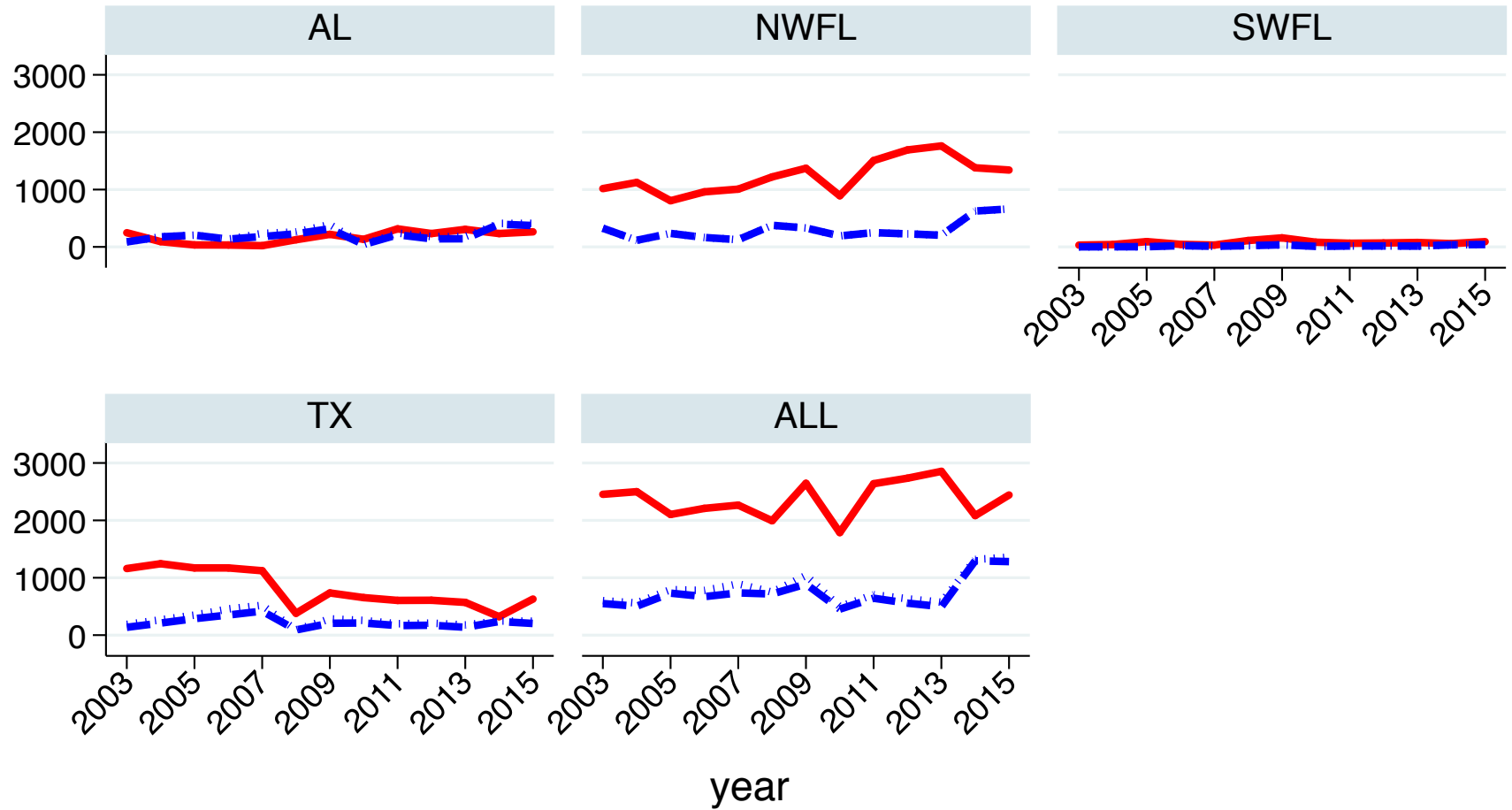
Graphs by HP_State

Number of Total Angler-Days

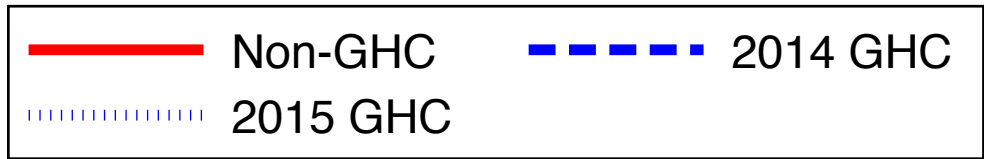
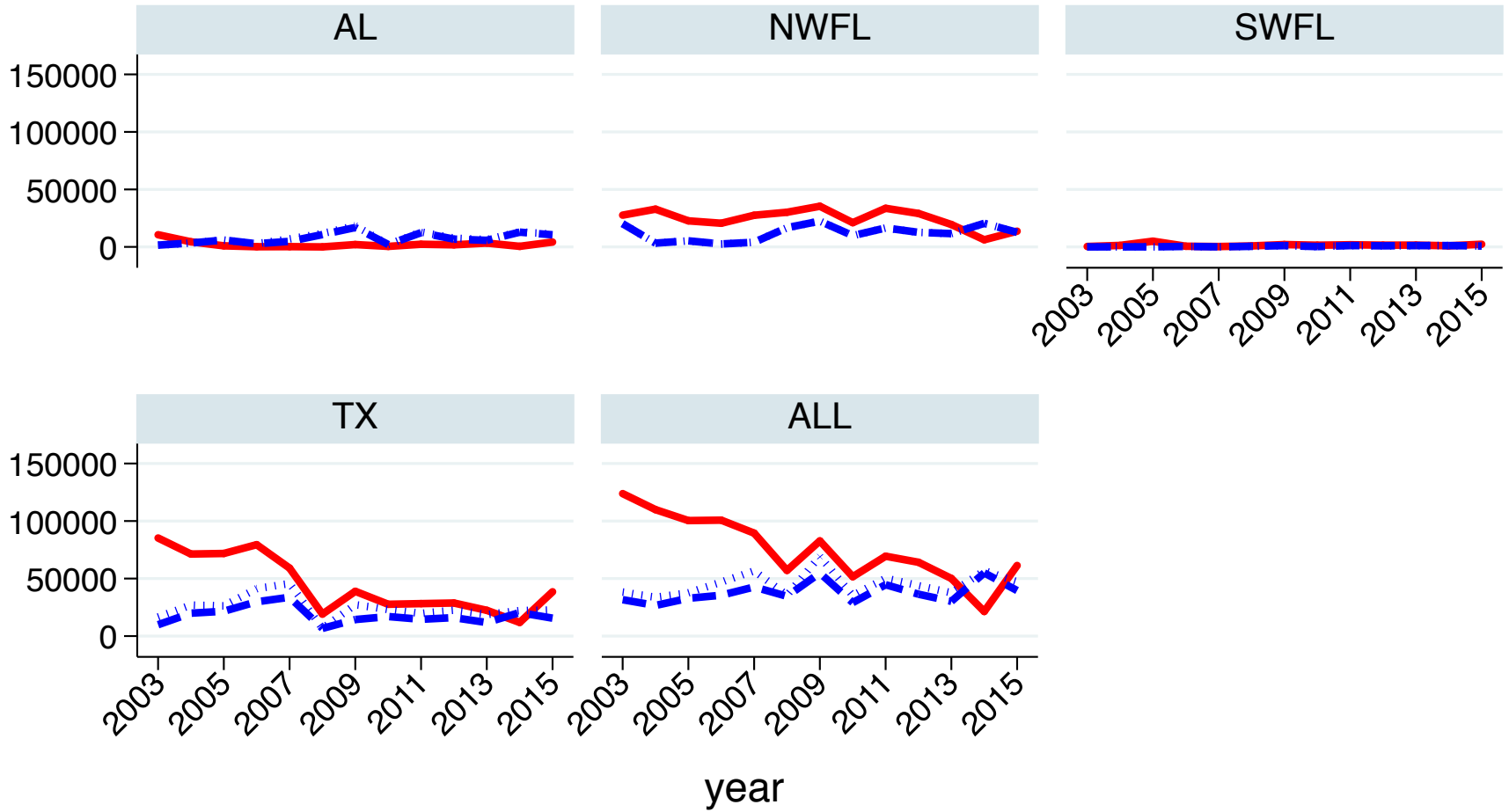


Graphs by HP_State

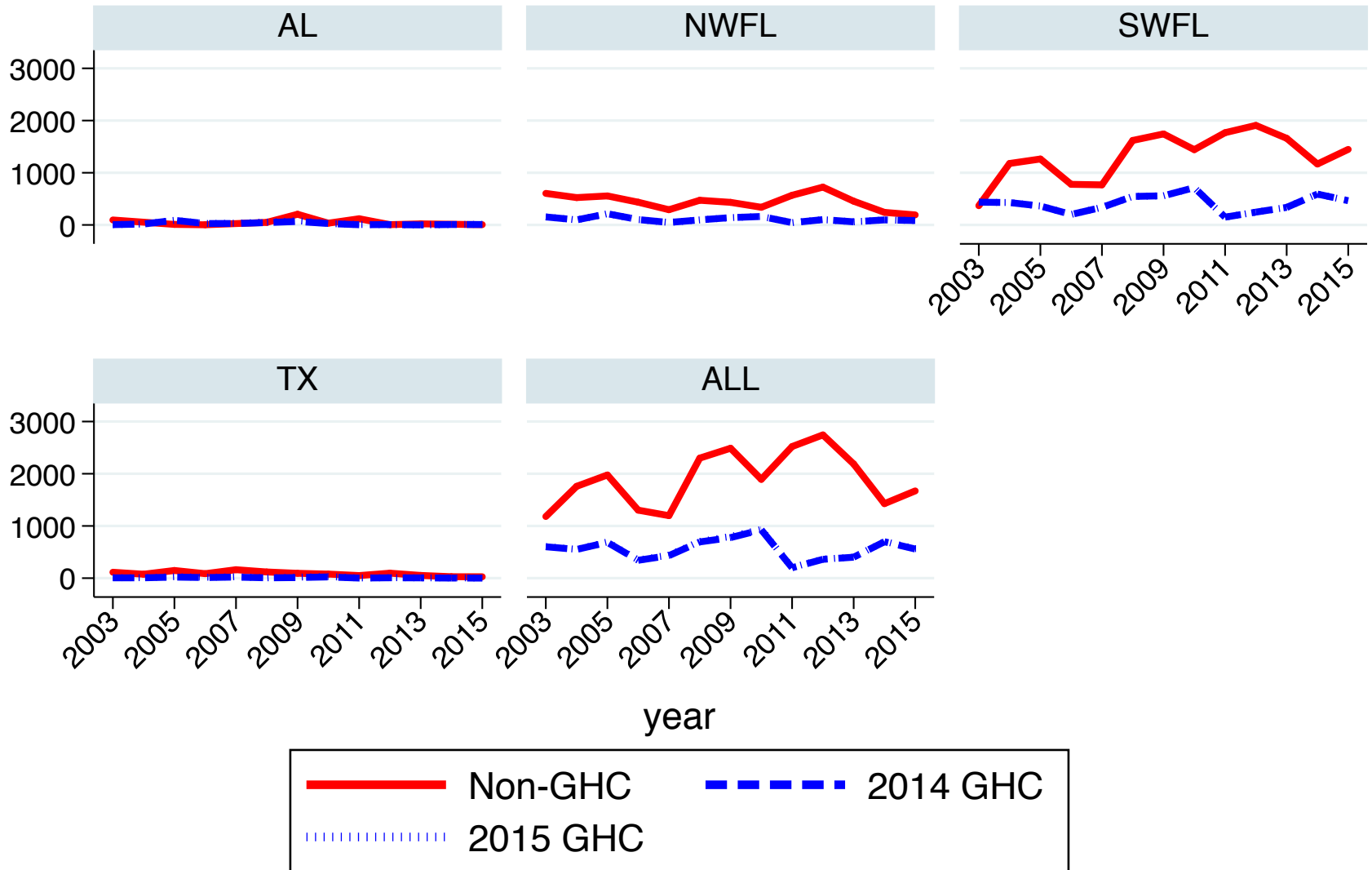
Number of Red Snapper Trips



Red Snapper Landings

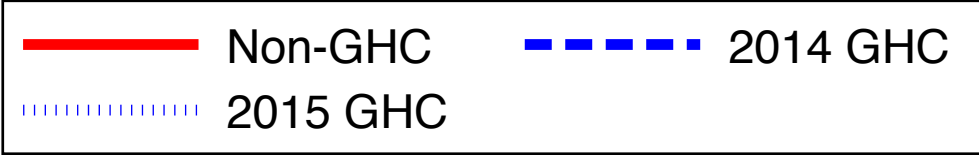
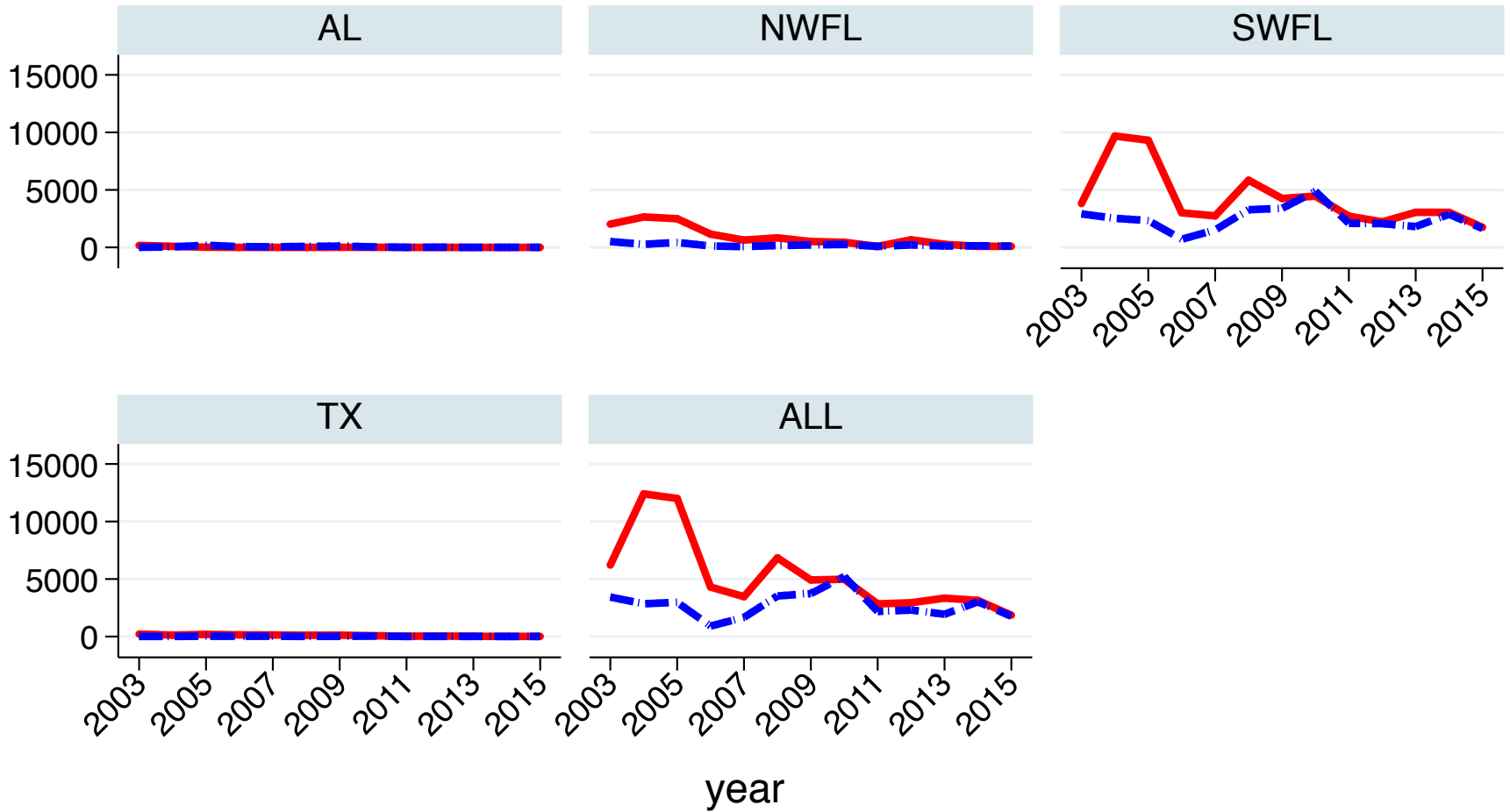


Number of Gag Trips



Graphs by HP_State

Gag Landings



Graphs by HP_State

Summary

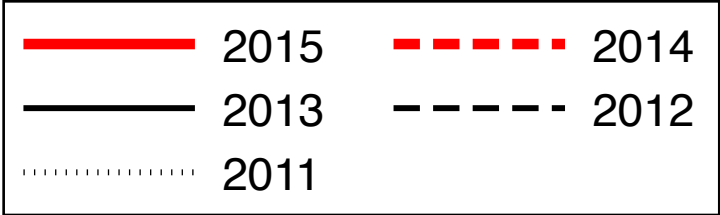
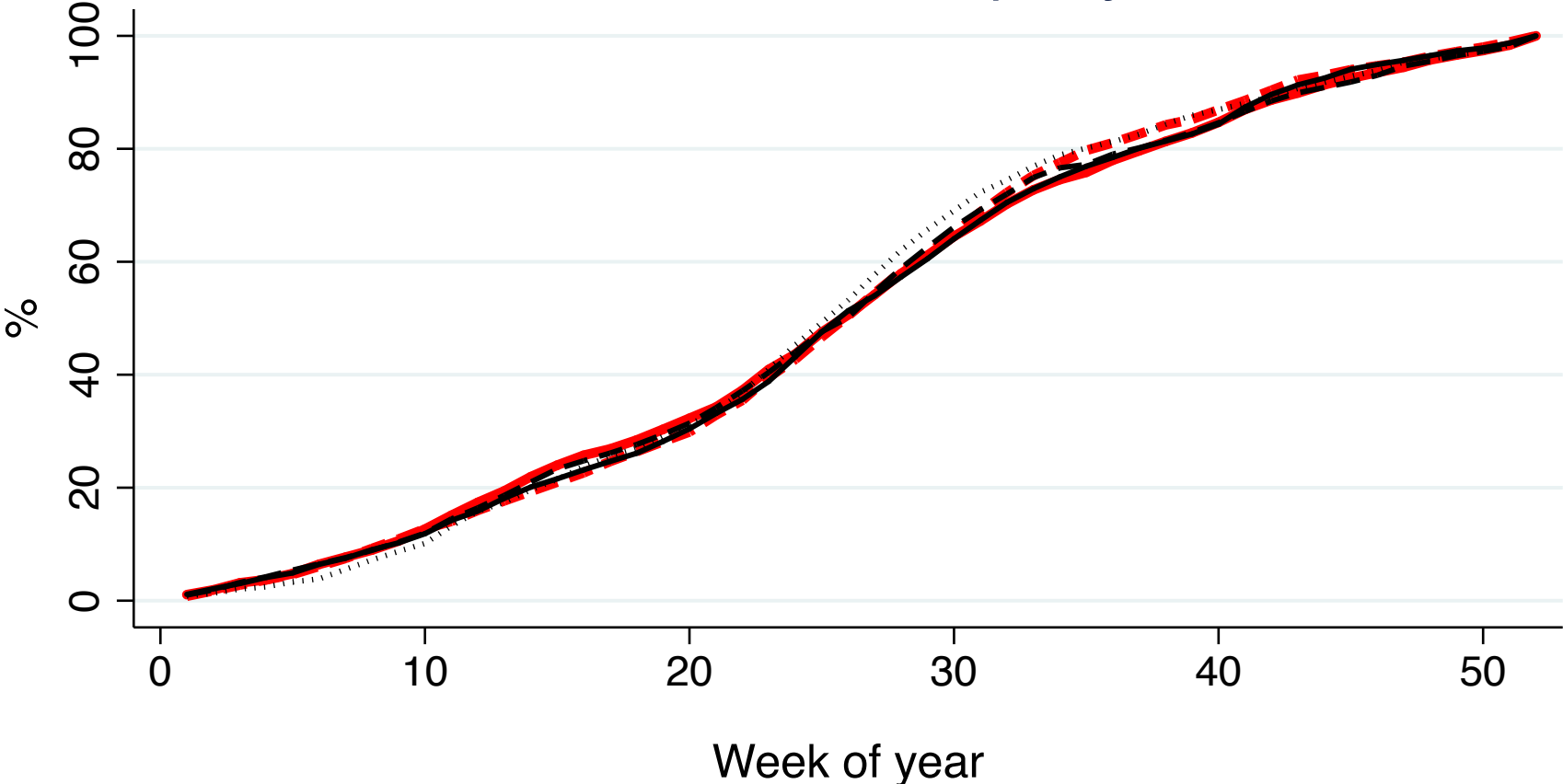
- 2013-2015: 5.5% increase in total trips for GHC vs. a 13% increase for non-GHC
 - Similar trends in angler-days across the 2 groups
- 2013-2014: *Large increases in red snapper or gag trips (114%) and landings (80%) for GHC vs. reductions in trips and landings for non-GHC*
- In 2015: *GHC red snapper trips stayed constant, despite a fall in allocation*
 - Non-GHC red snapper trips (and angler-days) increased relative to 2014, but by less than their effective increase in allocation
- Similar, but more muted patterns for gag

II. Changes to EFP vessel operations:

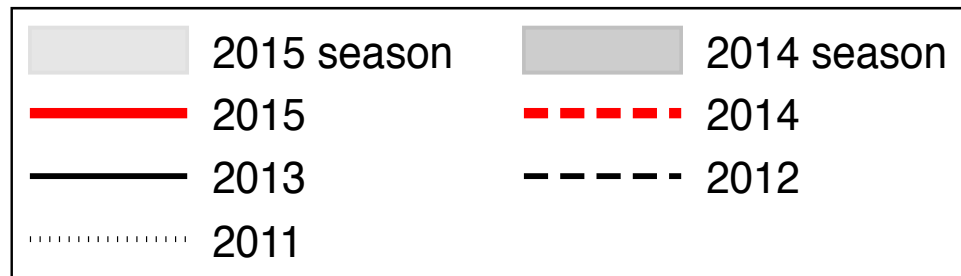
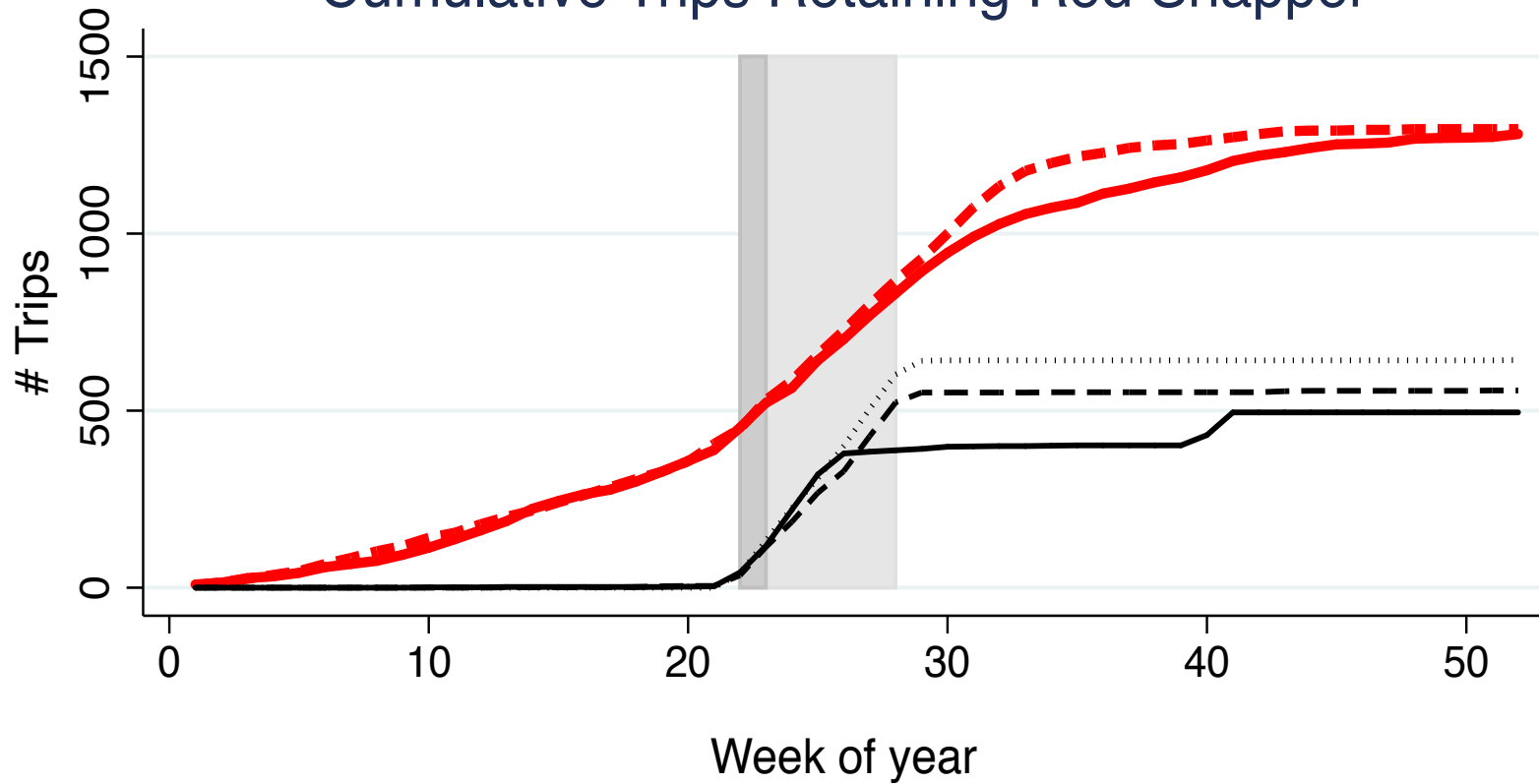
- A. Seasonal shifts in landings/trips
- B. Allocation of fish per customer
- C. Allocation of fish to trip durations
- D. Discards

EFP vessels:
Seasonal changes in landings & trips

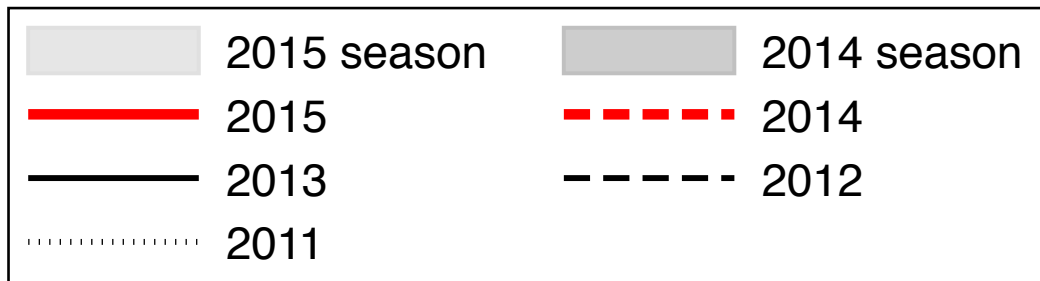
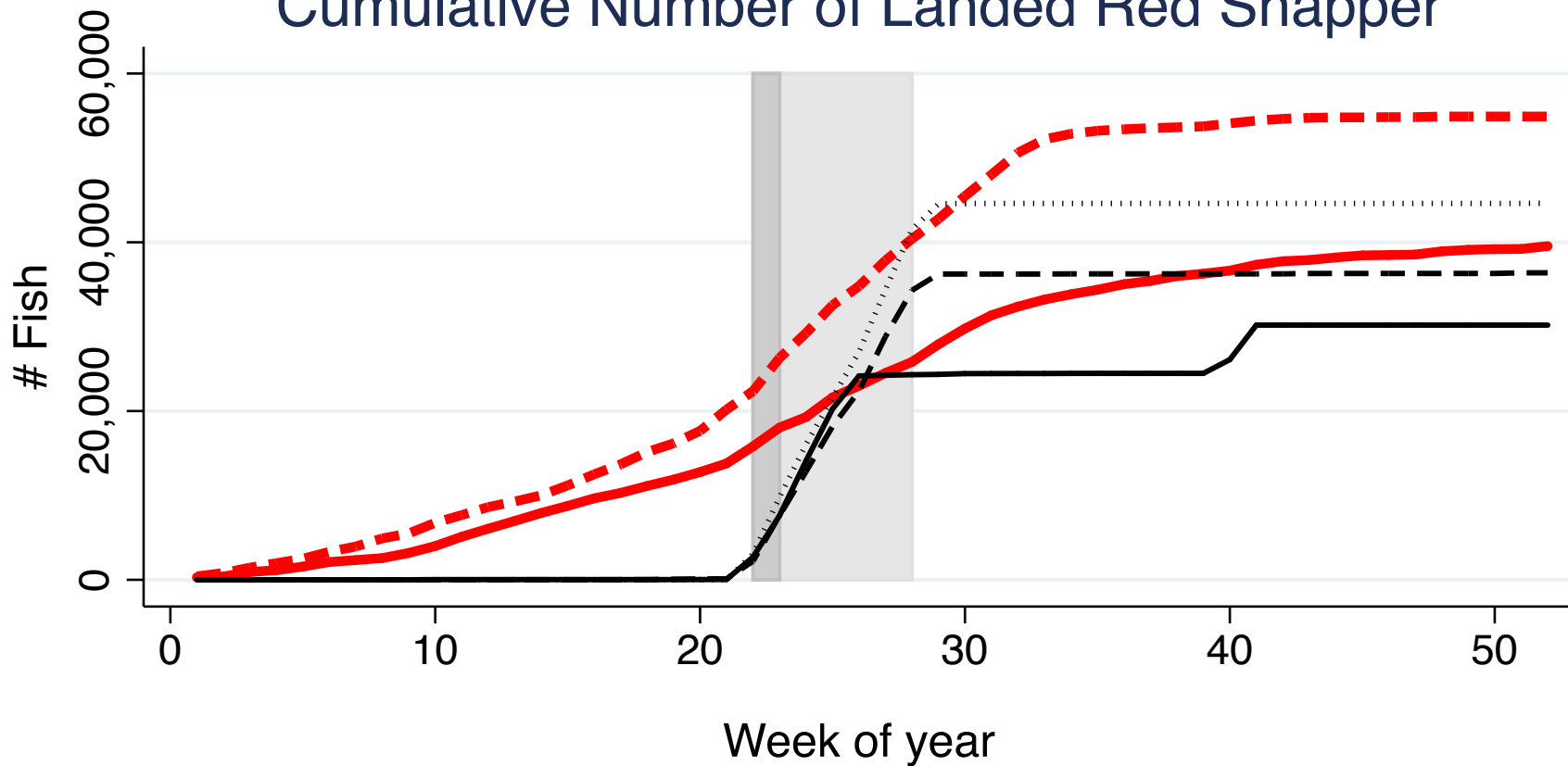
Cumulative % of Seasonal Trips by EFP Vessels



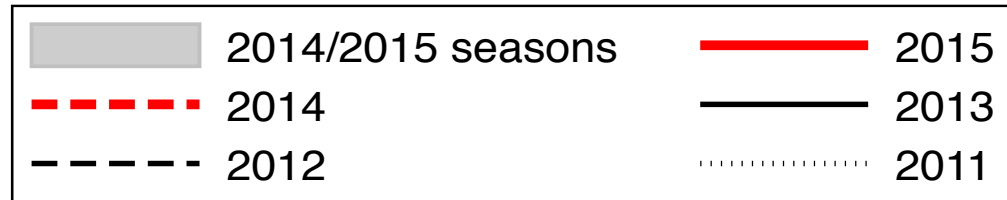
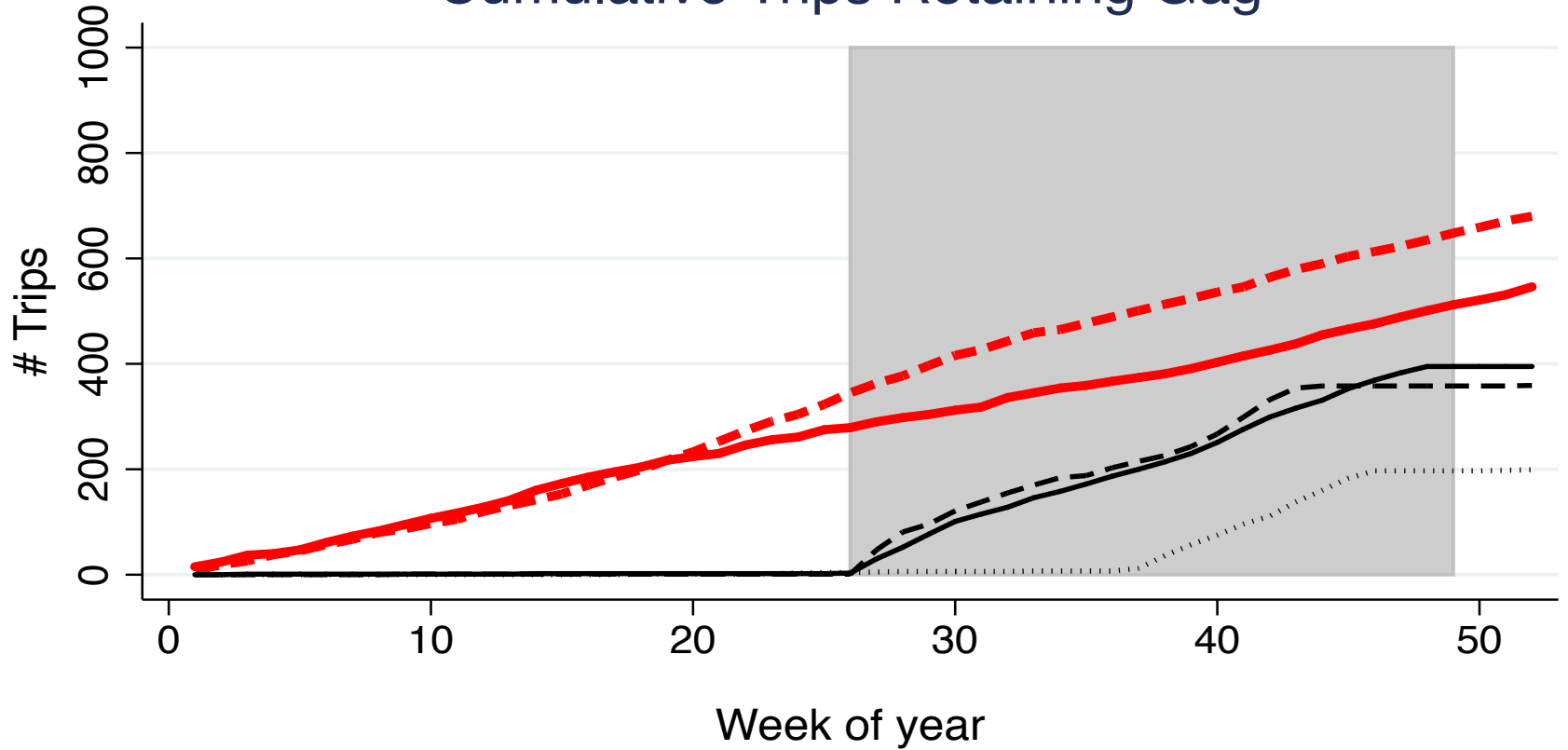
Cumulative Trips Retaining Red Snapper



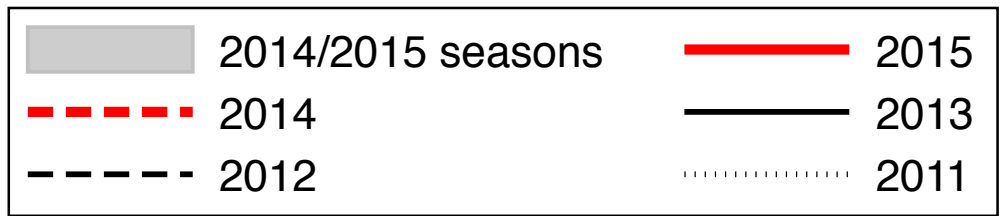
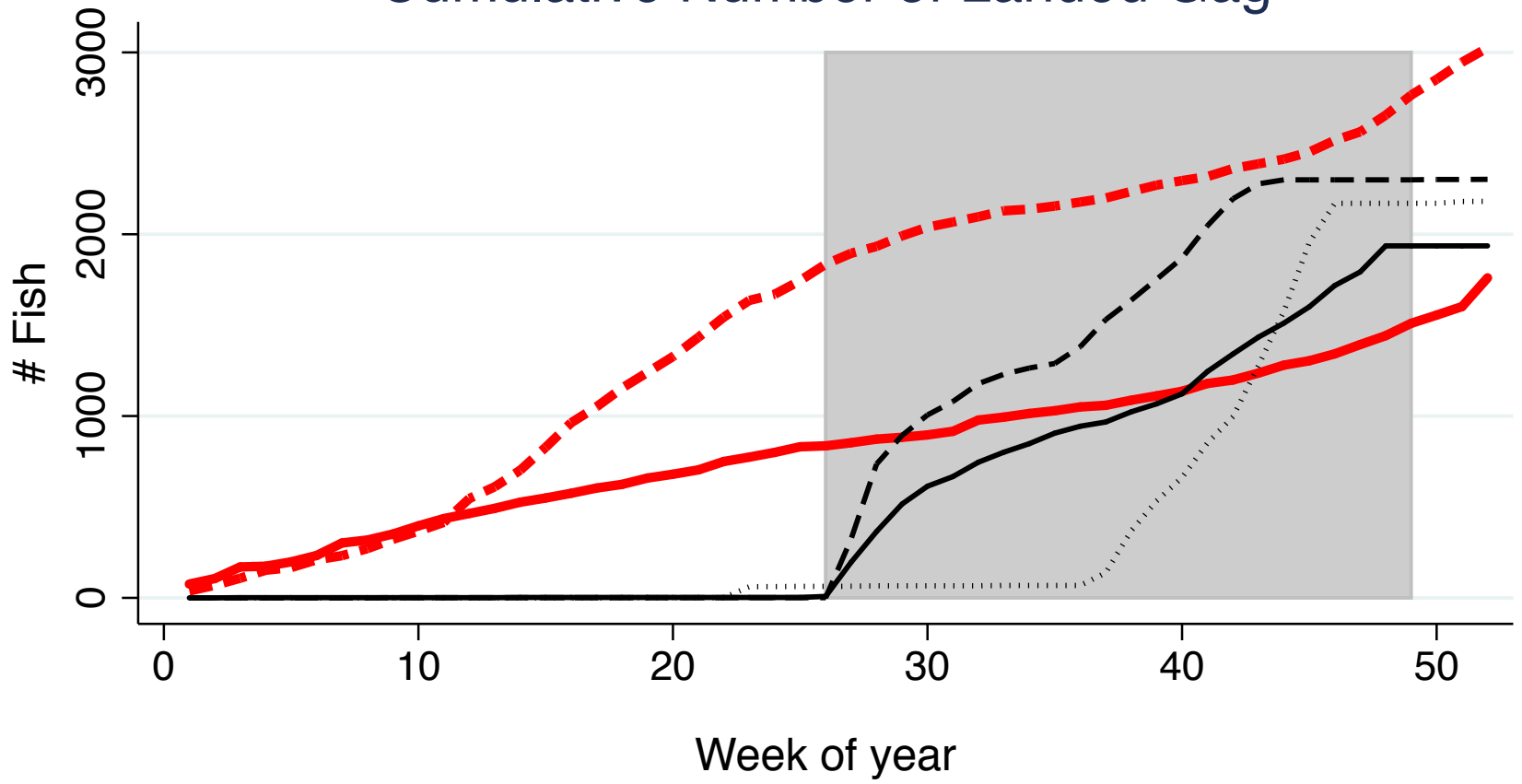
Cumulative Number of Landed Red Snapper



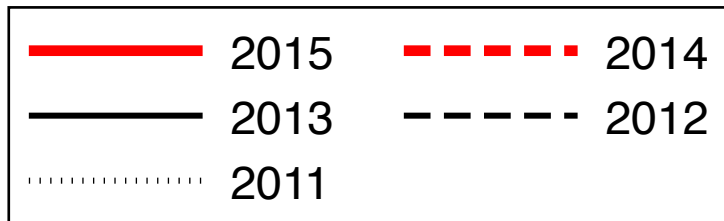
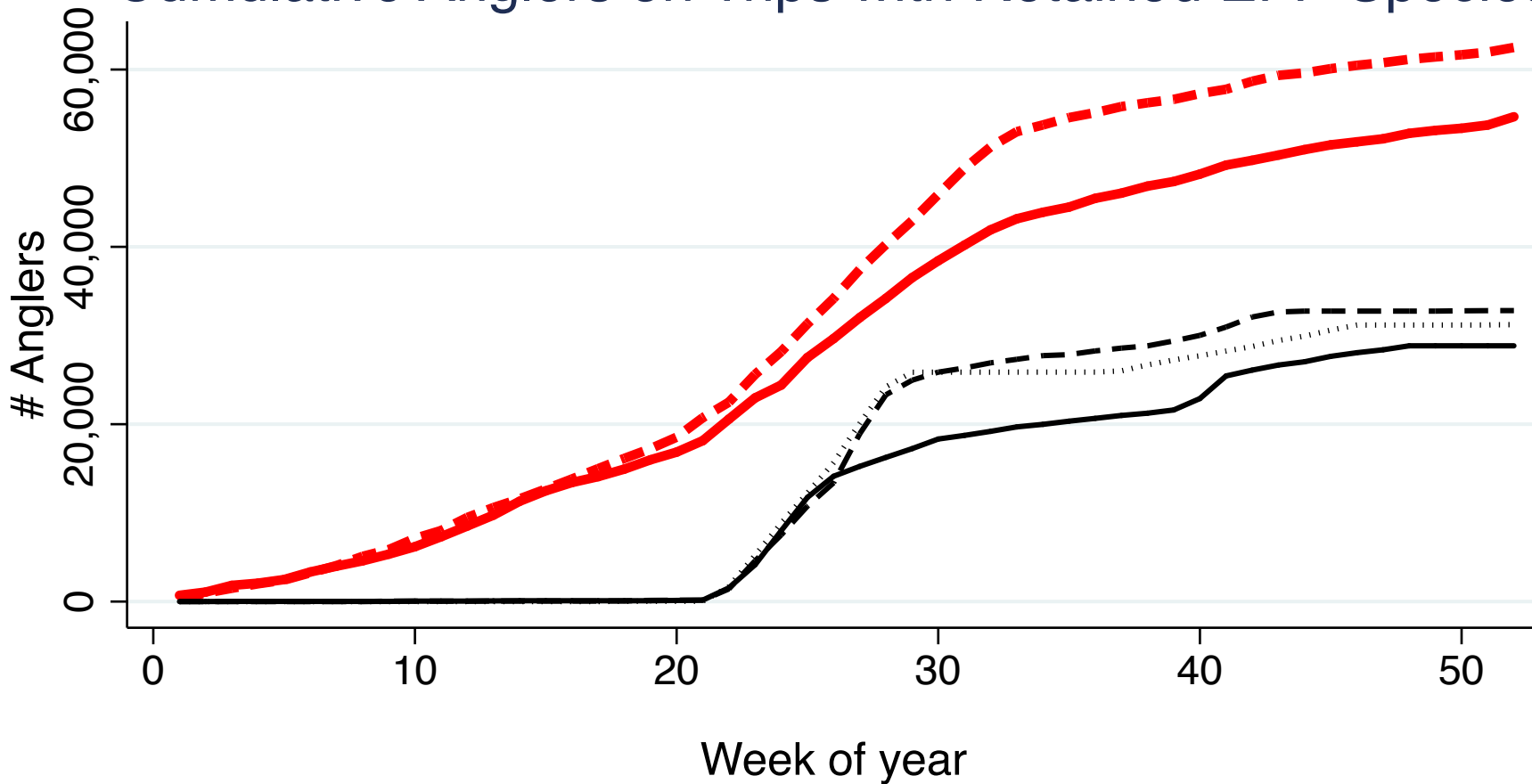
Cumulative Trips Retaining Gag



Cumulative Number of Landed Gag



Cumulative Anglers on Trips with Retained EFP Species



Summary

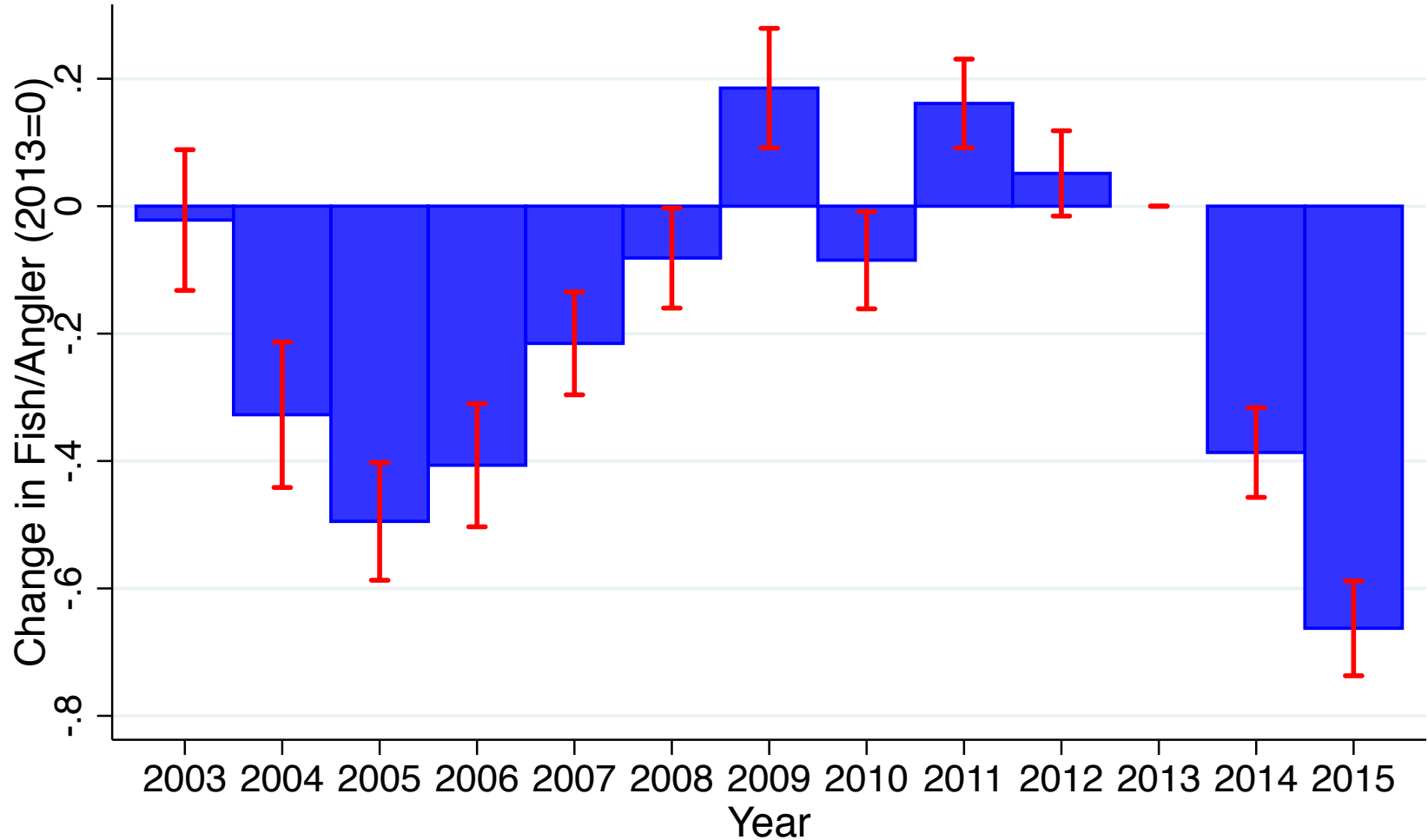
- The seasonal pattern of total trips did not change post-EFP, BUT
- Landings (and trips) of EFP species are much more evenly spread across the year
 - Substantial winter/spring fishing for both red snapper and gag
 - The fall fishery for red snapper expanded in 2015
- Substantial increases in the number of customers on EFP-retaining trips
 - This holds even with the fall in the allocation to GHC vessels in 2015.
 - The plurality of red snapper and gag trips/landings occurred outside of their respective open seasons

EFP vessels: Allocation of landings per customer

161% increase in trips with red snapper retention but with only 82% (2014) and 31% (2015) increases in total red snapper landings.

Red snapper/angler on red snapper trips

Red Snapper per Angler (base=2013)
All Red Snapper Trips

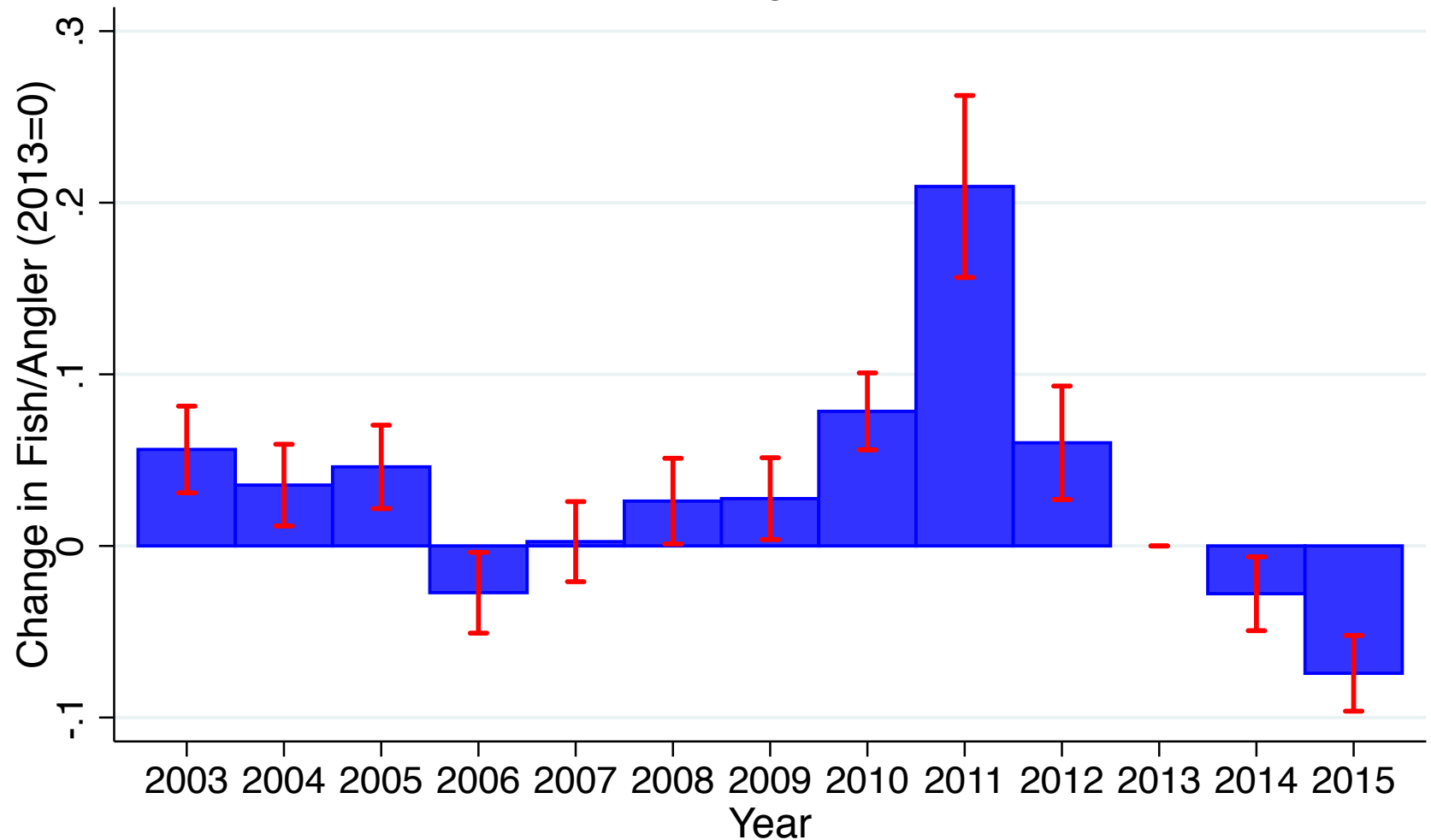


Estimates from regression model with vessel and month fixed effects. Weighted by anglers per trip

Gag/angler on gag trips

Gag per Angler (base=2013)

All Gag Trips

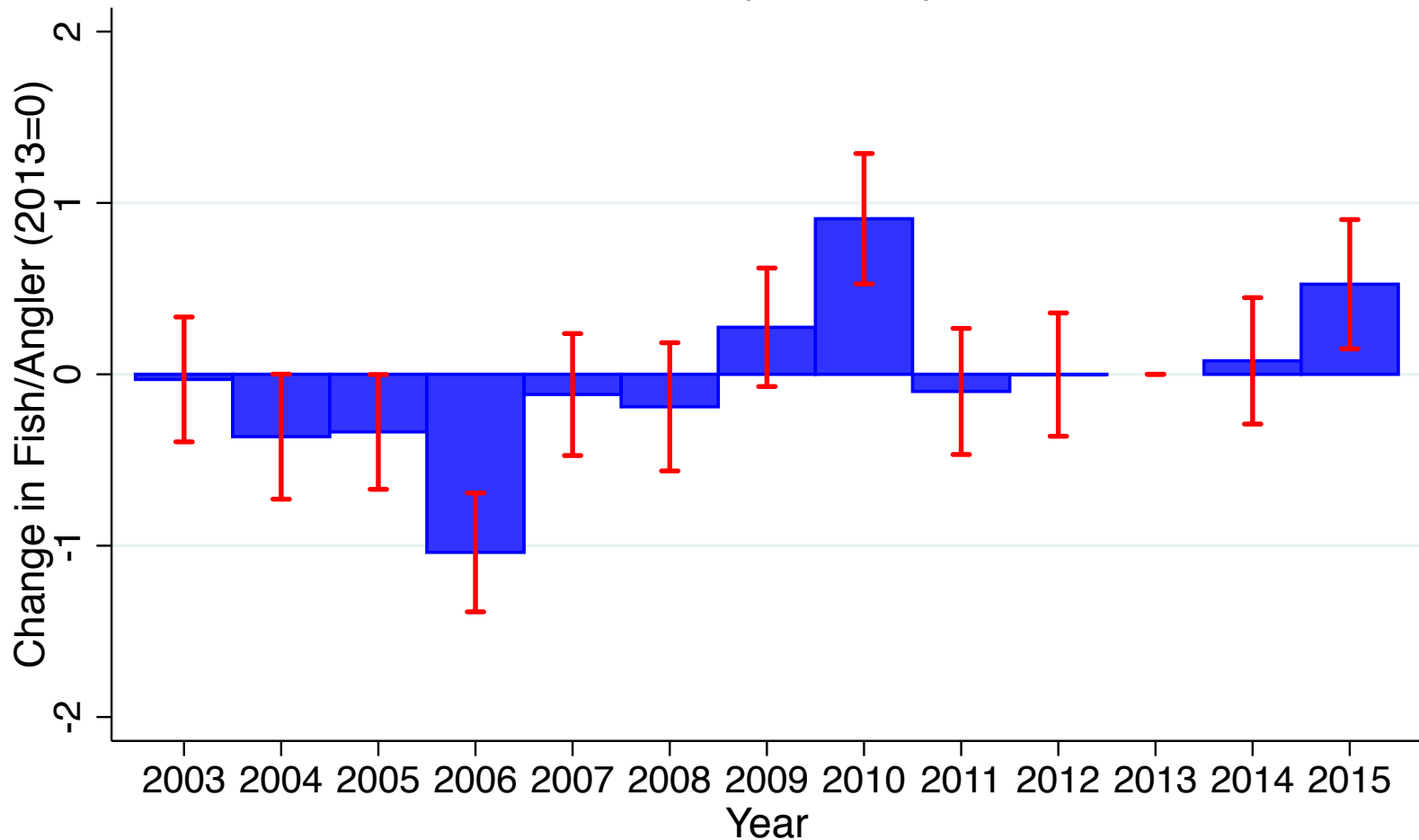


Estimates from regression model with vessel and month fixed effects. Weighted by anglers per trip

All landed fish/angler

All Landings per Angler (base=2013)

All EFP Species Trips



Estimates from regression model with vessel and month fixed effects. Weighted by anglers per trip

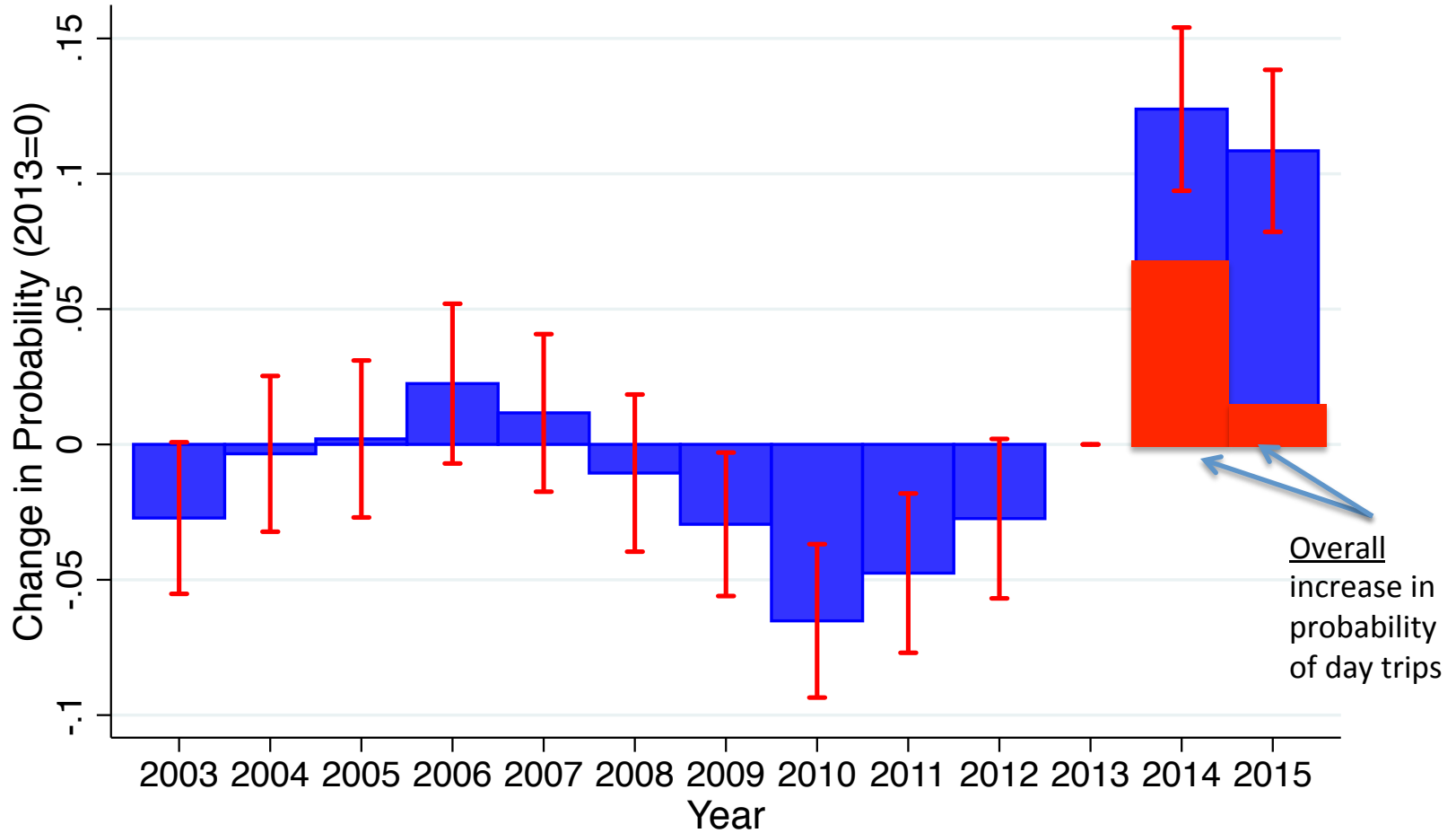
Summary

- Headboat owners have spread their allocations of red snapper over a larger number of anglers, often by voluntarily reducing angler bag limits on red snapper trips
 - Particularly on half-day trips
- But the overall number of fish (and reef fish) per angler on these trips has remained stable

EFP vessels:
Allocation of fish by trip duration

Change in Probability of a Full-Day Trip (base=2013)

EFP Species Trips Only




Conclusion: Most "new" EFP full-day trips occurred on existing trips previously without EFP species

More on full-day trips


- The legal bag limit for red snapper (2/angler-day) does not vary between full and partial-day trips
- But several vessels report bag limits for anglers on partial-day trips of 1 fish, allowing 2 fish on full-day trips
- In 2013: 0.16 more snapper/angler on a day trip than a partial day trip
 - Reflects that (in recent years) many catch the bag limit on partial day trips
- In 2014 & 2015: This wedge rose to 0.50 ($T=6.0$) & 0.44 ($T=4.79$) snapper/angler
 - Largest wedge since 2007, when the bag limit was 4 fish/angler
- *This supports the survey evidence that red snapper landings per angler were shifted from partial-day trips toward longer trips.*

EFP vessels: Discards of EFP species


$$\frac{\textit{Discards}}{\textit{AnglerXdays}} = \frac{\textit{Discards}}{\textit{Catch}} \times \frac{\textit{Catch}}{\textit{AnglerXdays}}$$



Discard per unit of
fishing effort, or
unit of
recreational
service provided



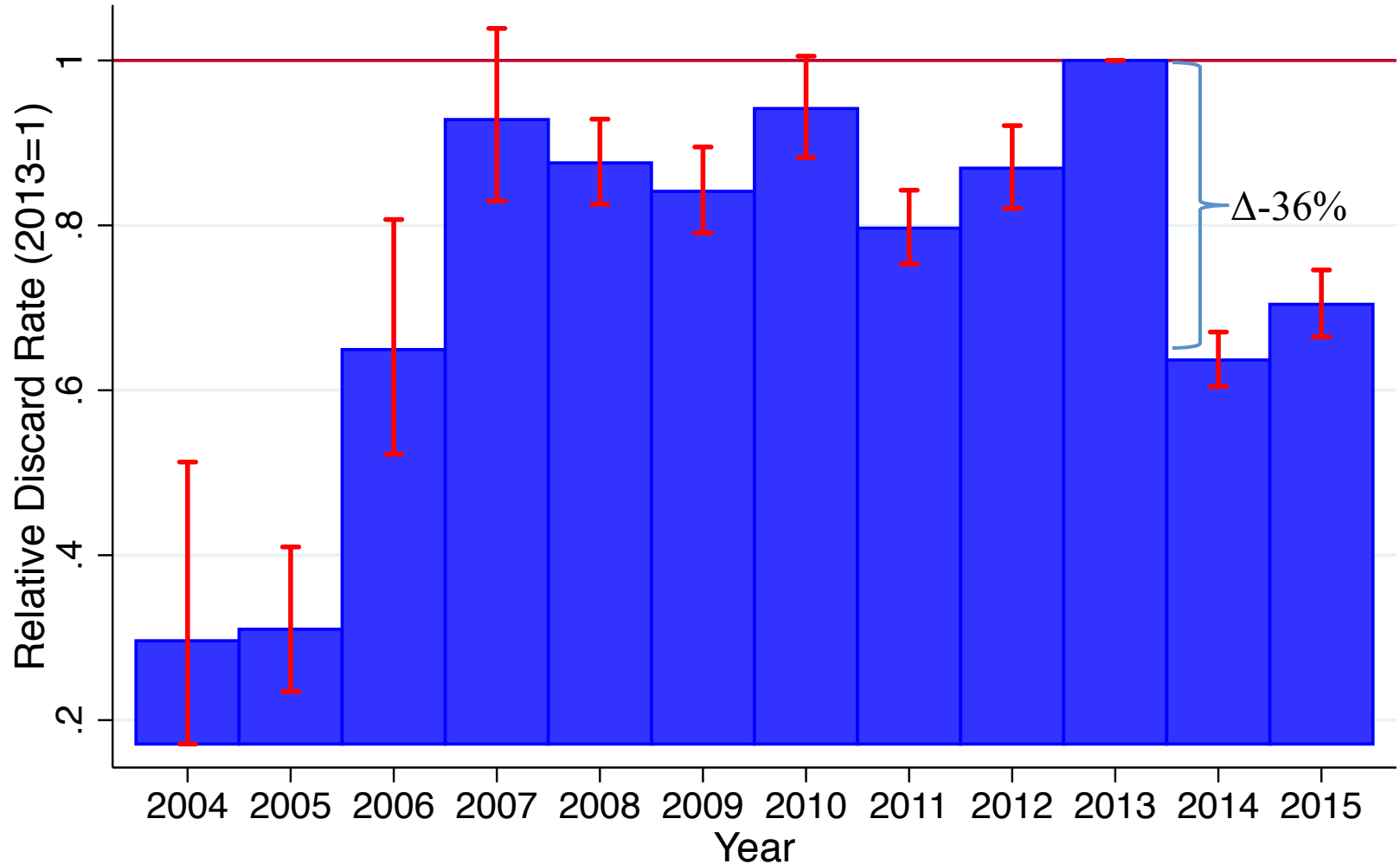
Discards per unit
of catch (the
discard rate)



Catch per unit
effort

Red snapper discard rates (discard/catch)

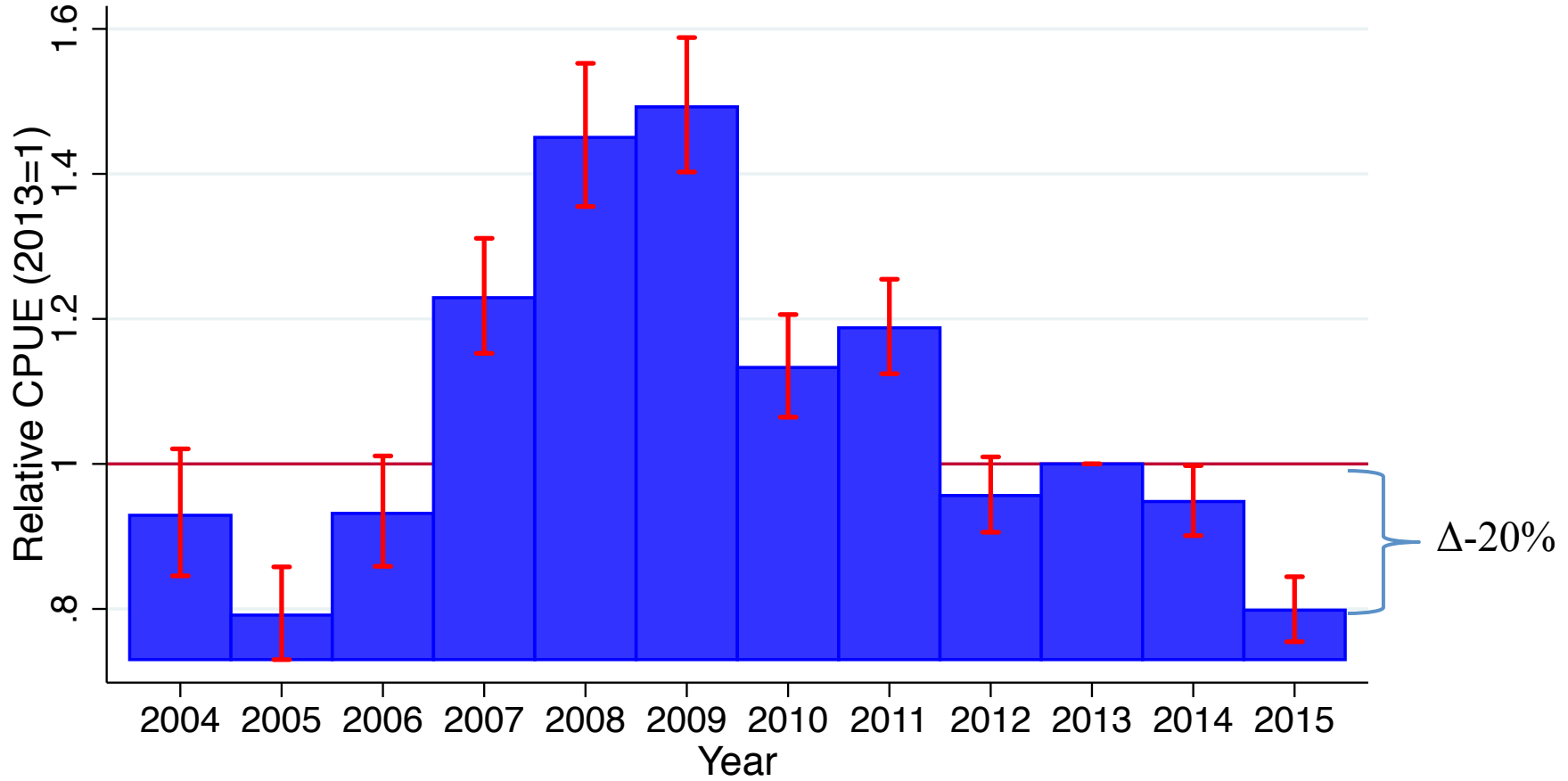
Relative Discard Rate of Red Snapper (Discard/Catch)
Trips with positive red snapper catch



Red snapper CPUE (catch/angler-day)

Relative Catch Rate of Red Snapper (Catch/Angler Day)

Trips with positive red snapper catch



Estimates derived from a Poisson regression model with vessel fixed effects and estimated angler-days as an exposure variable.

Red snapper (discards/angler-hours)

$$\frac{\text{Discards}}{\text{Angler} \times \text{days}} = \frac{\text{Discards}}{\text{Catch}} \times \frac{\text{Catch}}{\text{Angler} \times \text{days}}$$



2014
~60% of 2013
levels



2014
64% of 2013
levels



2014
94% of 2013
levels

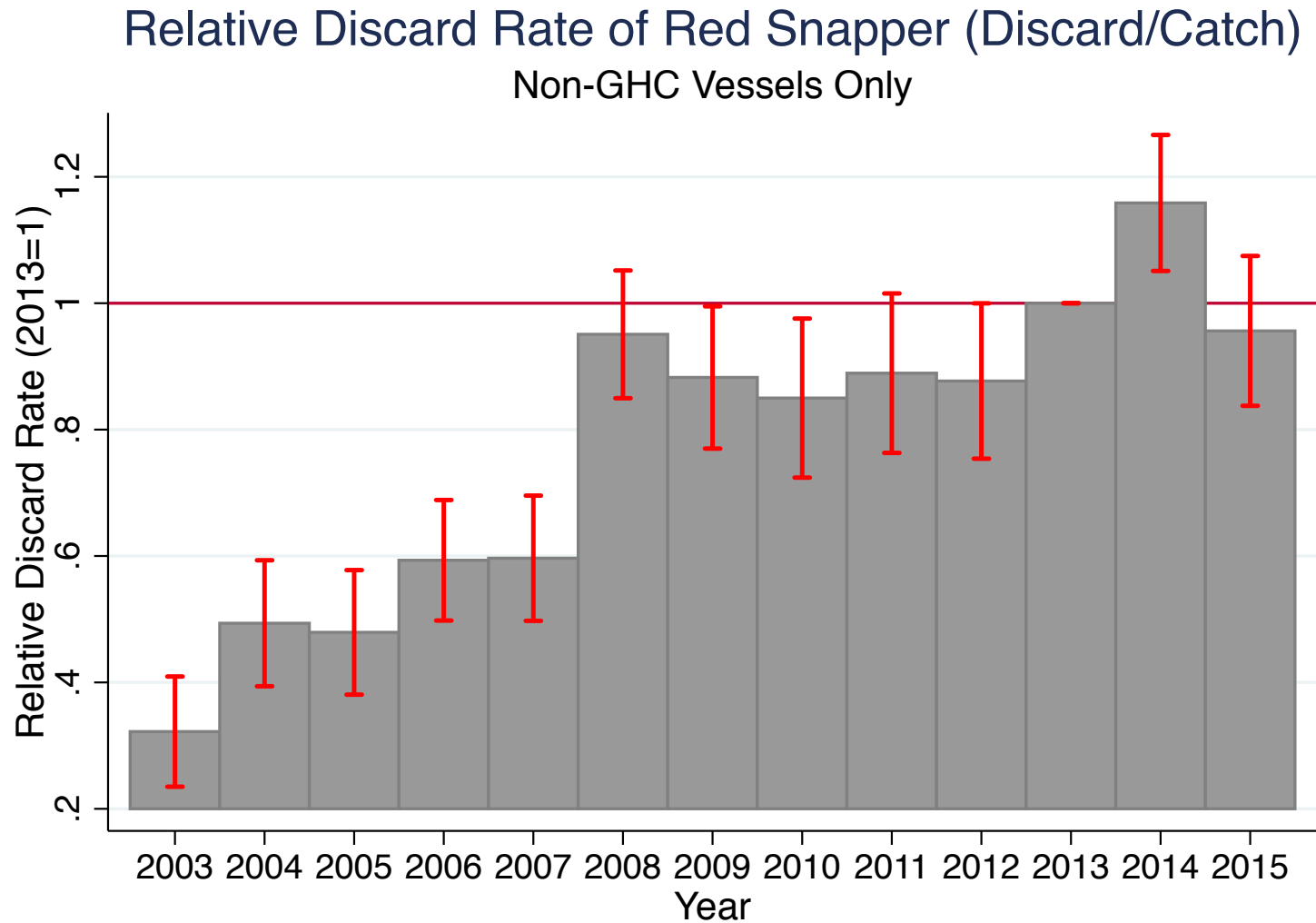
2015
~56% of 2013
levels

2015
70% of 2013
levels

2015
80% of 2013
levels

Results are very similar for gag

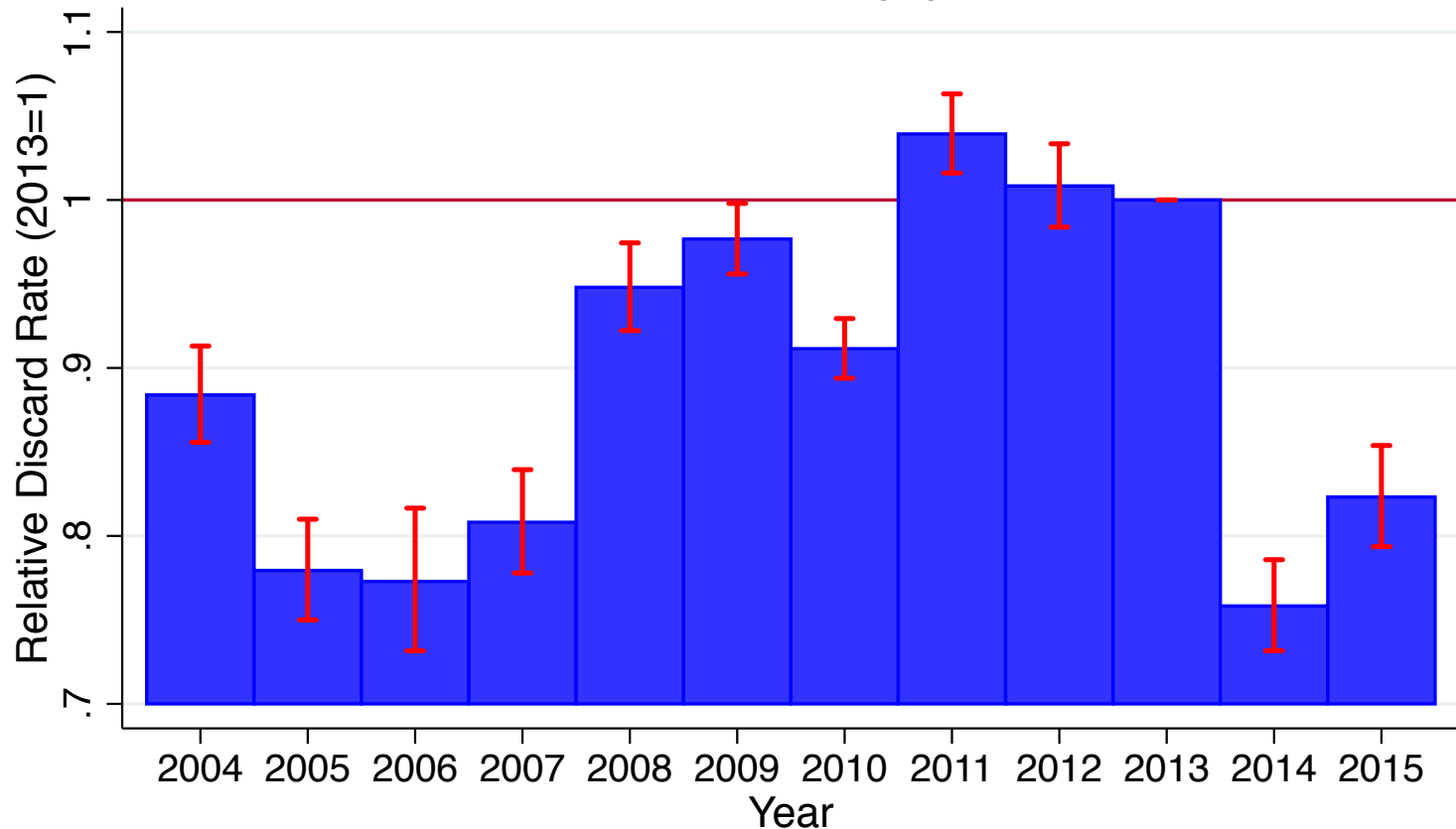
Non-GHC discards (red snapper)



Gag discard rates (discard/catch)

Relative Discard Rate of Gag (Discard/Catch)

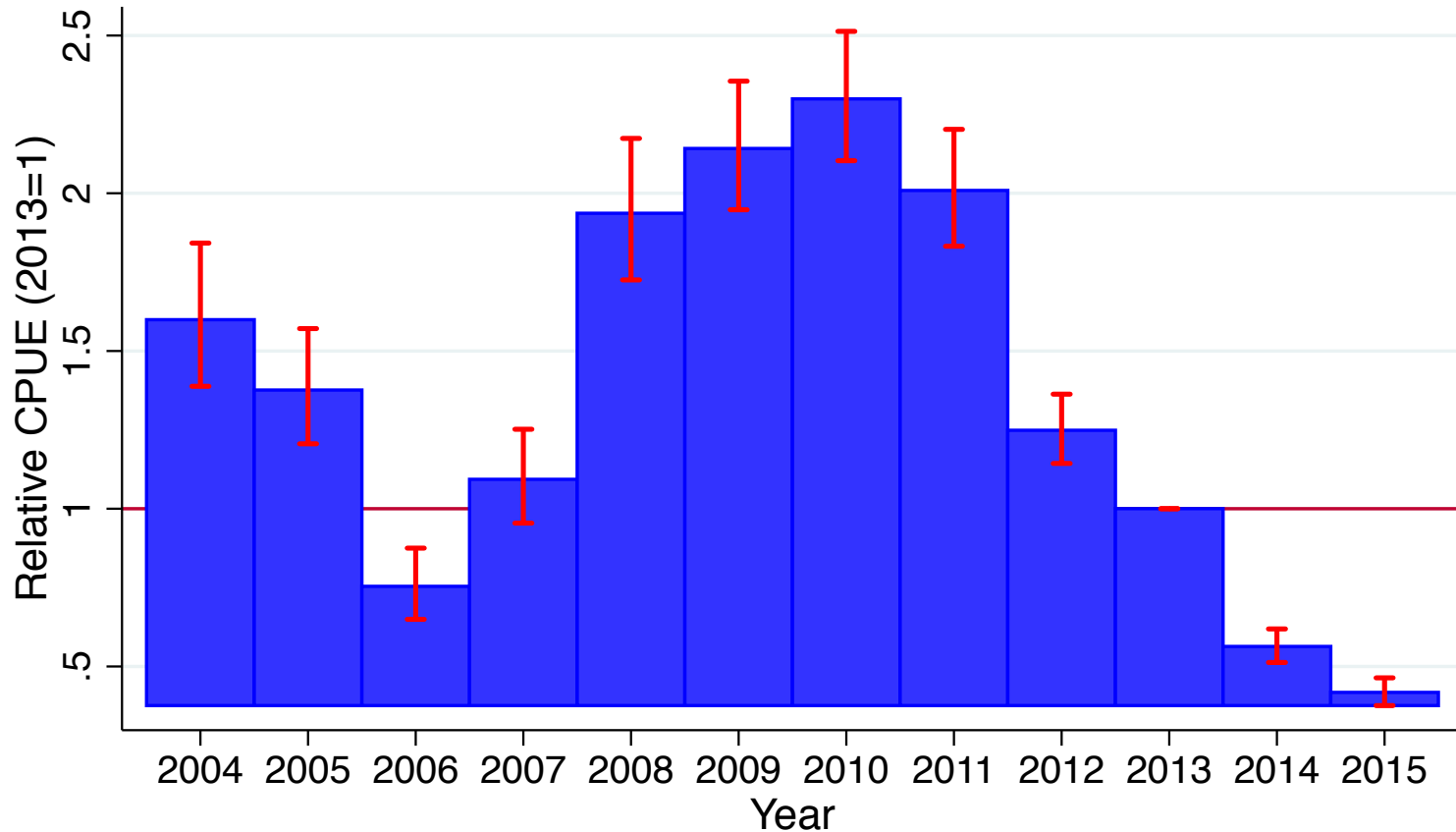
Trips with positive gag catch



Estimates derived from a Poisson regression model with vessel fixed effects and total gag catch as an exposure variable.

Gag CPUE (catch/angler-day)

Relative Catch Rate of Gag (Catch/Angler Day)
Trips with positive gag catch



Estimates derived from a Poisson regression model with vessel fixed effects and estimated angler-days as an exposure variable.

Gag (discards/angler-days)

$$\frac{\text{Discards}}{\text{Angler} \times \text{days}} = \frac{\text{Discards}}{\text{Catch}} \times \frac{\text{Catch}}{\text{Angler} \times \text{days}}$$



2014

~40% of 2013
levels



2014

76% of 2013
levels



2014

56% of 2013
levels

2015

~34% of 2013
levels

2015

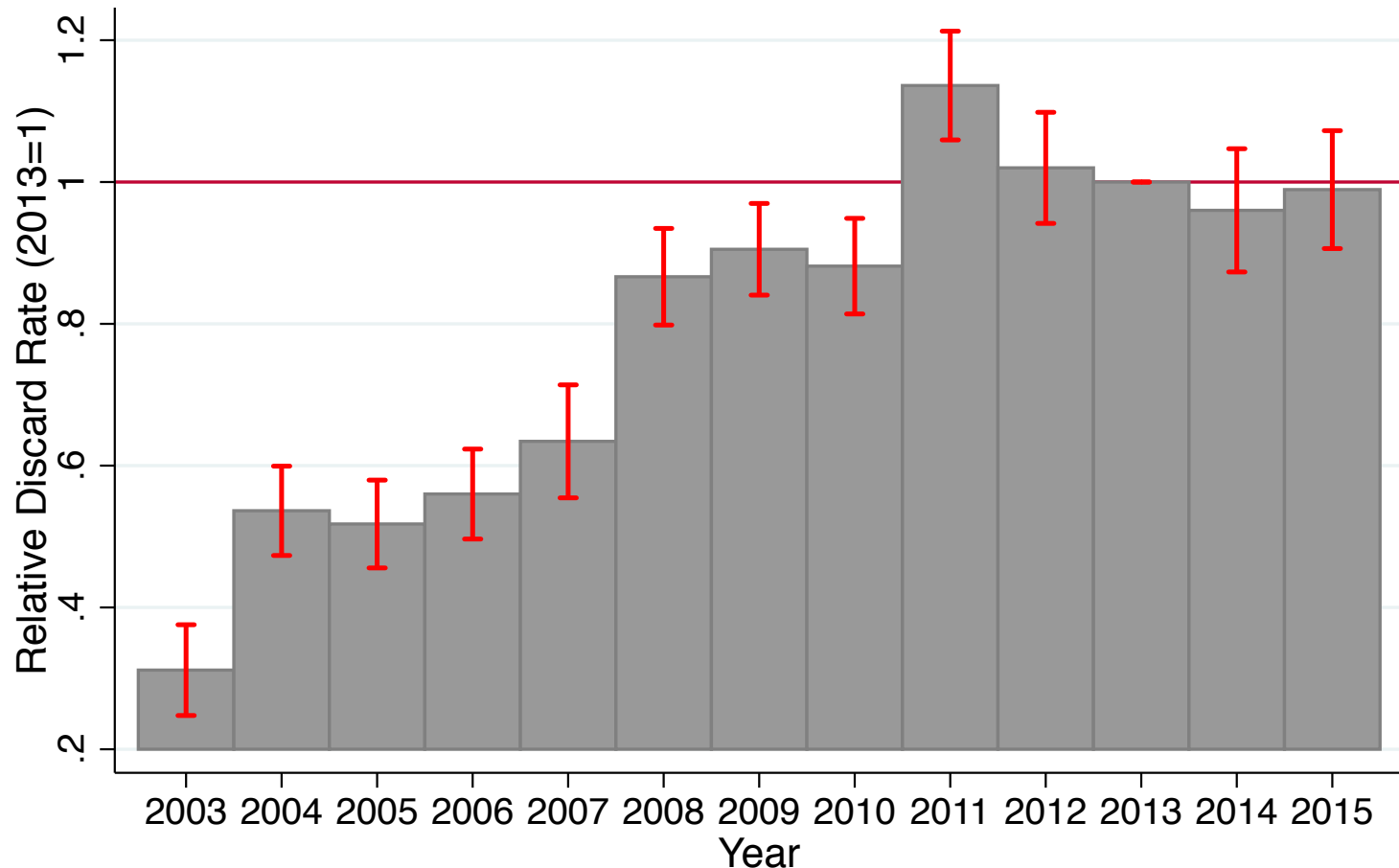
82% of 2013
levels

2015

42% of 2013
levels

Non-GHC discards (gag grouper)

Relative Discard Rate of Gag Grouper (Discard/Catch)
Non-GHC Vessels Only



III. Economic returns

Challenges

1. Measurement

- Revenues: Inability to separate charter and headboat trips in logbook data
- Variable costs: Estimated based on retrospective assessments for a representative trip of each type.

2. Compared to what alternative?

- The 2014-2015 fishery was *very* different from past seasons
- 9 day season in 2014 vs. 45 day season in 2015 (sector separation)
 - Allocation of 2015 red snapper to GHC was disproportionately low
 - Creates an unstable and atypical baseline for evaluation
- It's possible that non-GHC vessels were indirectly “treated” by the EFP
- Only aggregated and censored logbook data are available for the “untreated” vessels (NO economic data)

3. External validity: In-sample results may have limited validity for a permanent program

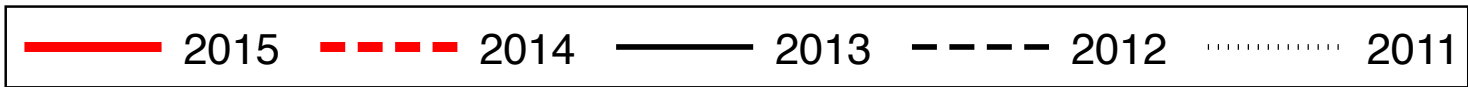
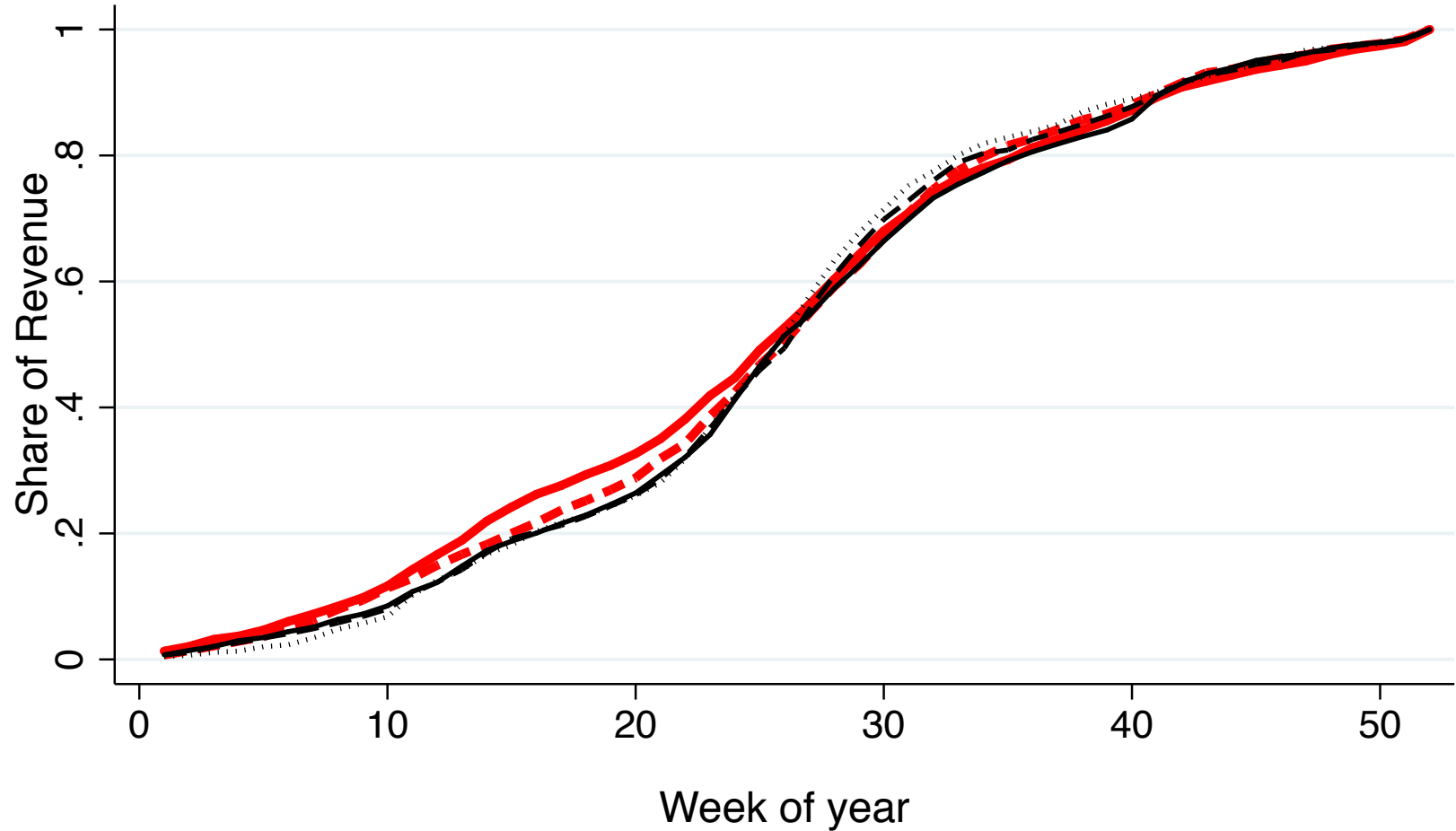
- Short-run “burn in” as owners/captains learn
- Rational postponement of investments
- Avoidance of pricing changes

Estimated (Net) revenues

	@2014 prices/costs (millions)		@2015 prices/costs (millions)	
	Revenue	Rev - fuel	Revenue	Rev - fuel
2009	6.91	5.98	6.78	6.14
2010	5.87	5.08	5.73	5.16
2011	8.28	7.27	8.11	7.41
2012	8.35	7.35	8.20	7.50
2013	8.45	7.32	8.30	7.51
2014	9.09	7.86	8.81	8.01
w/premium	9.20	7.97	8.92	8.12
2015	8.96	7.81	8.75	7.98
w/premium	9.05	7.89	8.84	8.07

- Calculated at constant prices to separate price and quantity changes
- Includes >99% of 2003-2014 trips

Share of Seasonal Revenue

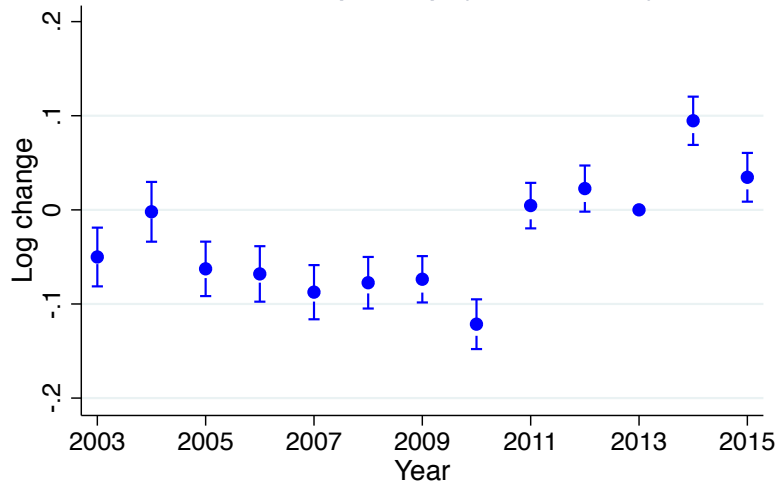


Drivers of net revenue increases

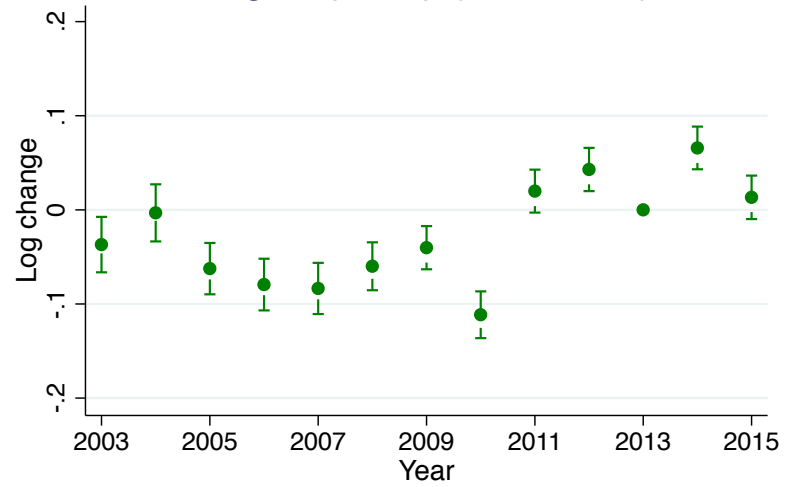
Ways for EFP to increase net revenues:

1. More customers (quantity response)
 - From increased customers/trip or more trips
 - In 2014: total GHC trips were the same as 2013
 - In 2015: total GHC trips increased by 5%
2. Shift customers to more profitable trips (product mix response)
3. Charge more (price premium)
 - ~1% effect on total post-EFP revenues/profits (~10% of overall Δ)

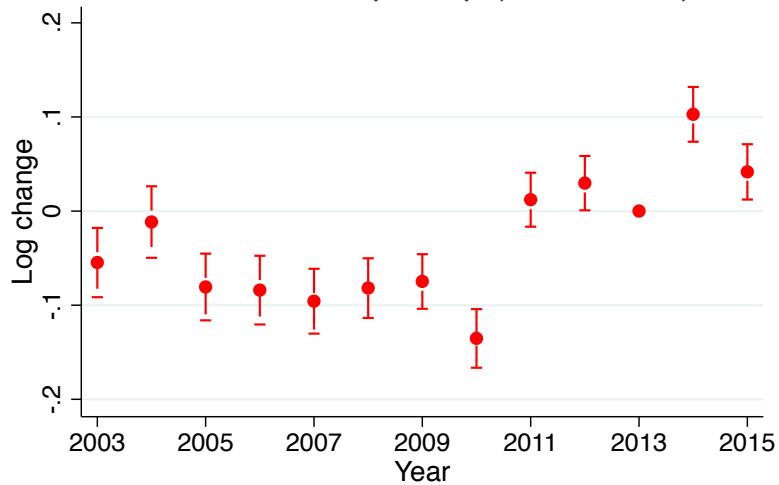
Revenue per trip (base=2013)



Anglers per trip (base=2013)

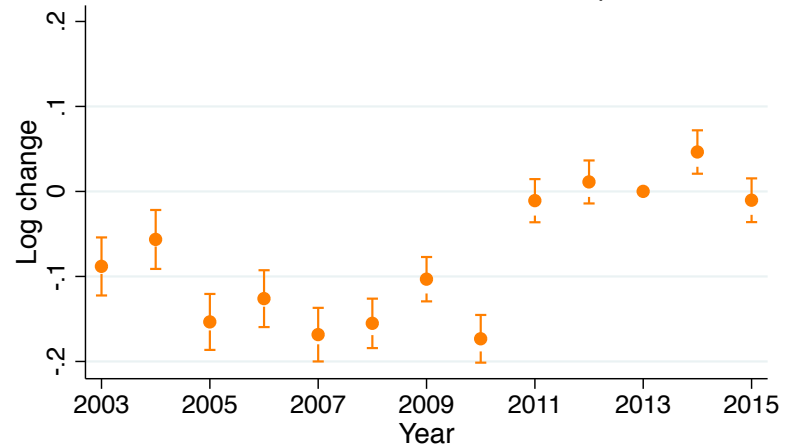


Revenue-fuel per trip (base=2013)

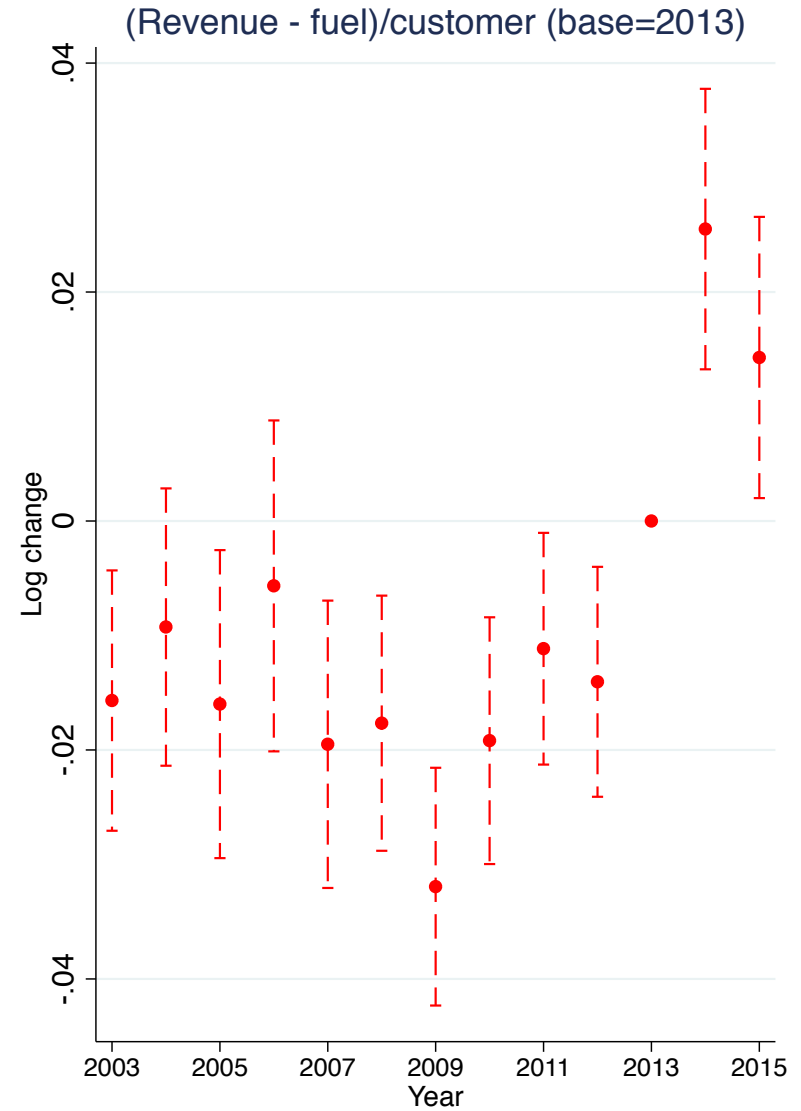
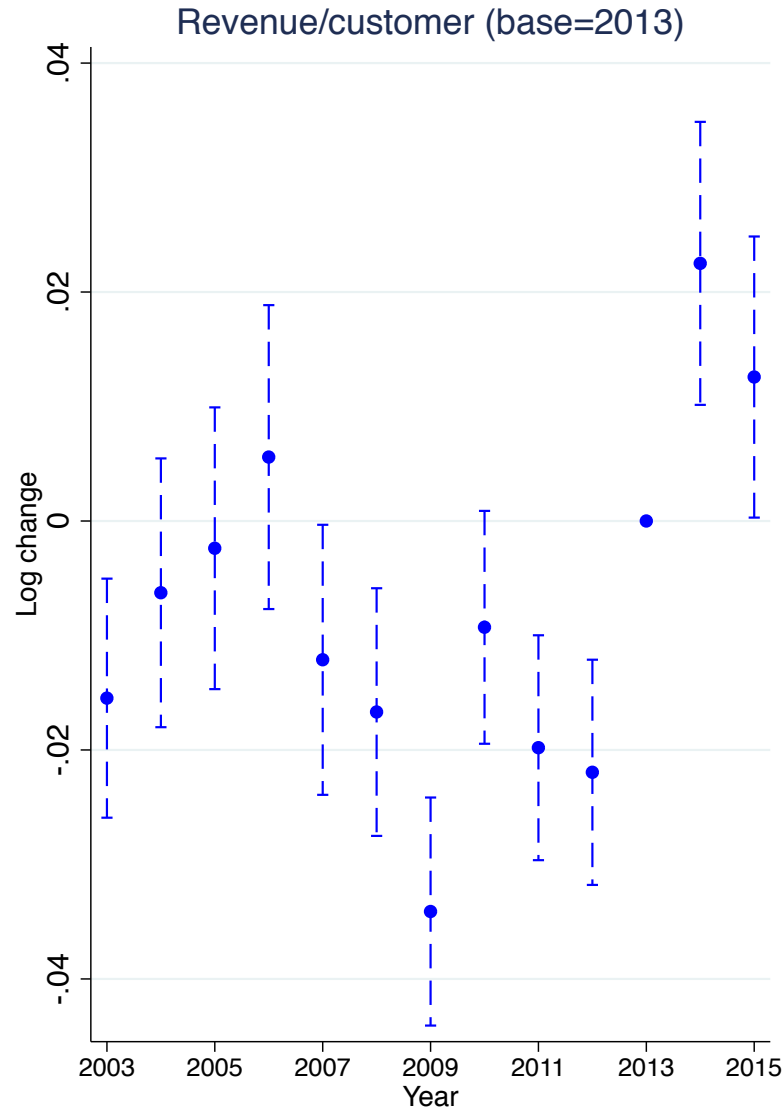


Revenue-fuel per trip (base=2013)

Ctrls for duration, season, EFP specs



Product mix



Pricing premium

- 5 vessels (2014) and 3 vessels (2015) charged a small premium for trips with EFP tags
 - Between \$5 and \$20 (13% average markup)
- What are the effects on # customers & trip revenues of an increase in trip premium?
 - Rationale for regression: compare these measures on trips with a premium (treatment) to similar trips without a premium in the same regions that also retain EFP species
 - Control for seasonality, red snapper season, vessels, and trip duration

Result 1: NO effect of premium on (log) anglers/trip

Beta = 0.004, T = 1.86

Result 2: \$39 (T=5.4) (1.4%) increase in trip revenues for every \$1 of premium increase

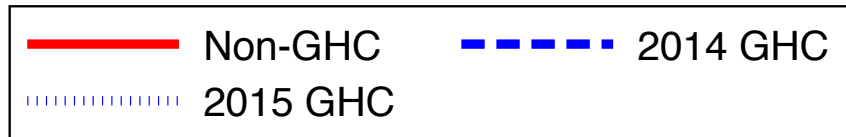
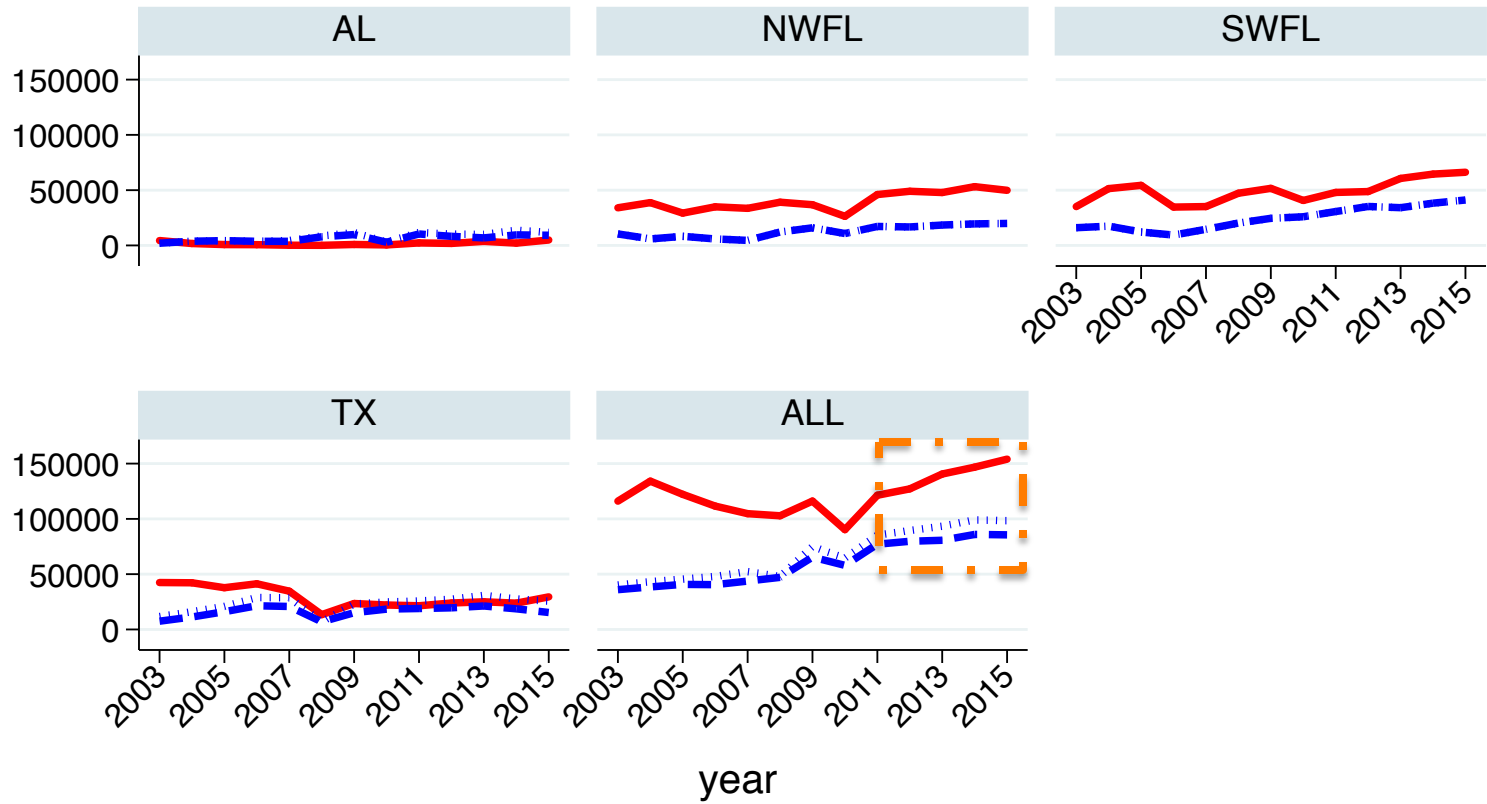
Summary

- 8.9% (2014) & 7.1% (increase) in total revenues and revenues minus fuel costs
 - Constant 2014 prices
- Most of this is from a quantity effect
 - ↑Anglers per trip in 2014, ↑Trips in 2015
- But there are also net revenue increases from premium pricing and reallocation of anglers to higher-value trips
- There is no evidence of customer demand reacting negatively to premium pricing

Caution

- The baseline for these comparisons has been GHC vessels in 2013
 - Comparisons are favorable for 2011 & 2012
- Alternative baseline: pre/post changes *relative* to changes observed by non-GHC vessels (difference-in-differences)
 - This comparison is made very difficult by censored & aggregated data for non-GHC
- But this alternative comparison would be of dubious value
 - 2014-2015 saw large, unprecedented management changes for non-GHC vessels
 - 2014: 9 day season; 2015: sector separation & 45 day season
 - GHC and non-GHC vessels don't trend together well before the EFP
 - 2014-2015 is a poor counterfactual for forward-looking policy making

Number of Total Angler-Days



Graphs by HP_State

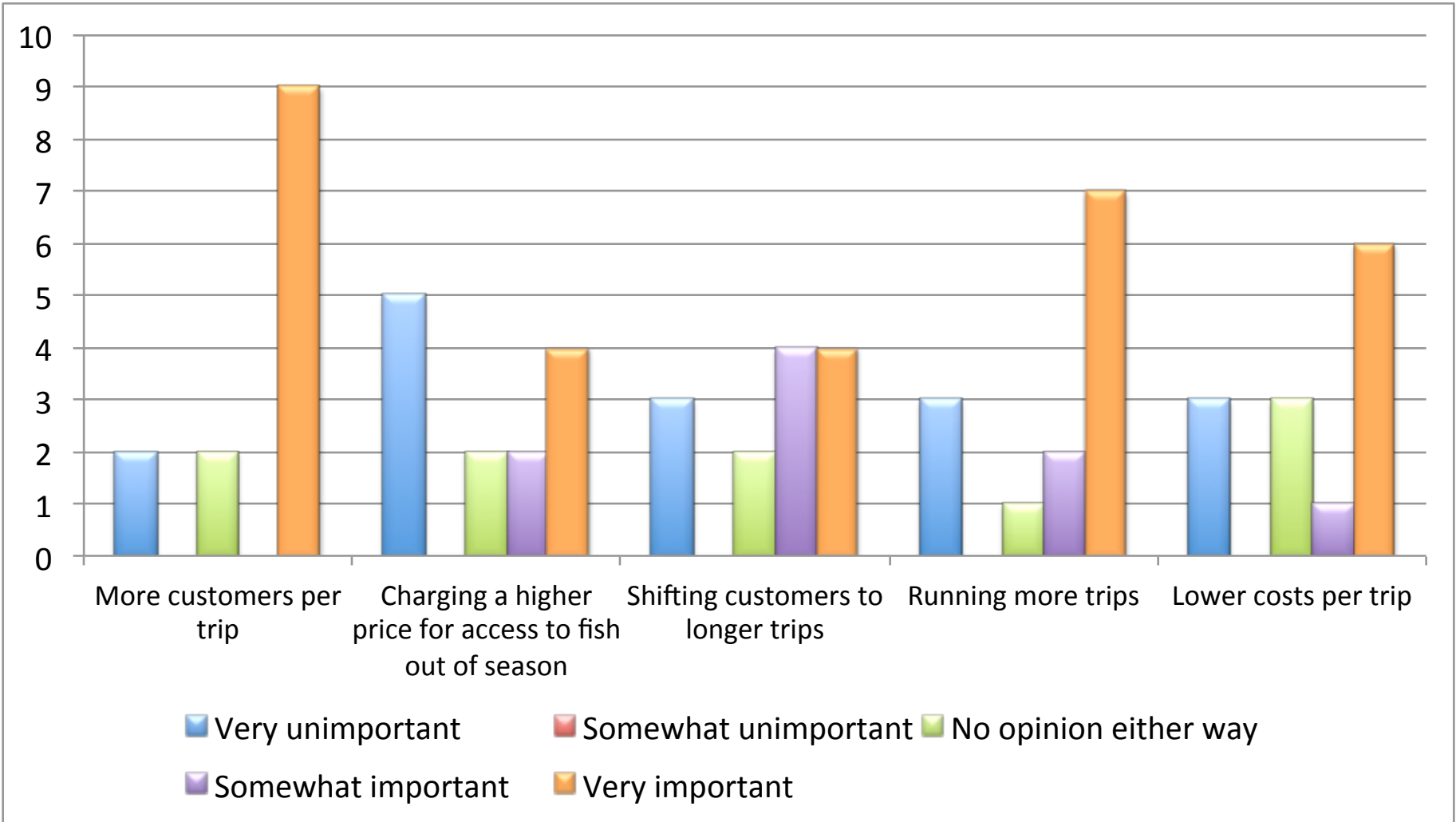
Qualitative data from survey

- Q: *“On the whole, do you think that participating in the GHC enhanced the profitability of your headboat business in 2015 relative to 2013 and other recent years?”*

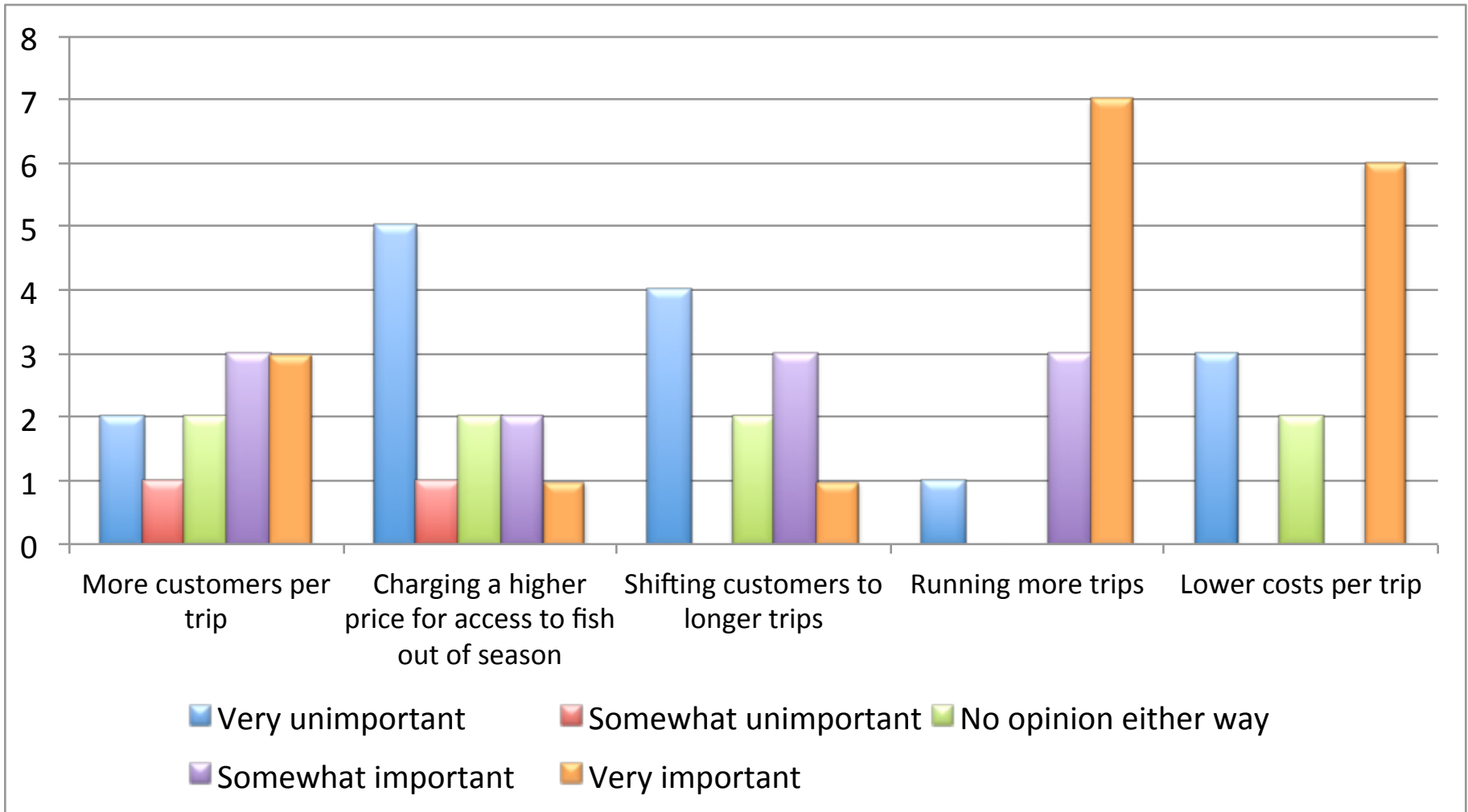
	YES	NO	ABOUT THE SAME
2014	11	1	2
	79%	7%	14%
2015	12	0	1
	92%	0%	8%

This pattern is robust to asking about profitability in 2015 in the GHC vs. fishing in 2015 outside the GHC (i.e. in the 45 day season)

- Q: *“Please rank the importance of the following potential sources of profits from fishing in the GHC for your business in 2014”*



- Q: *“Please rank the importance of the following potential sources of profits from fishing in the GHC for your business in 2015”*



In their own words..

- Q: *“Can you comment on how (if at all) participating in the GHC changed your way of doing business in 2014/2015?”*
- *“We ran a lot more early spring trips. Snowbirds don’t fish if they can’t keep.”*
- *“We were able to run 6 hour trips with minimal fuel consumption because we knew the snapper would be there to catch and we didn’t have to waste valuable time and fuel to try to locate other species.”*
- *“It did not affect the way we did business. It did affect the rate of repeat customers which helped revenue.”*
- *“The ability to offer red snapper trips year around was the most important source of increased profit. Those who would not typically fish because they could not catch red snapper were now willing to spend the money to go out fishing.”*

- *Q: “How (if at all) has participation in the Gulf Headboat Collaborative altered your decision making with respect to weather and rough seas. ”*
- 7 out of 14 (in both years) indicated that the EFP did not affect their decision to cancel or reschedule because of rough weather.
- “By being a participant in the GHC had a huge impact in the decision as to whether or not to fish on a rough weather day. In previous years, if you lost a day in the red snapper season that was a day that you could not make up.”
- “When you are given a 10 or 15 day season, you pretty much have to make a trip each day, unless the weather is so bad as to make it a safety issue...With the Collaborative program, you can reschedule a trip if the weather is less than desirable. The customer can choose another date...This provides a more enjoyable (and safe) experience for the customers. There are very few customers that enjoy fishing in rough seas.”

IV. Research on angler value

Angler survey

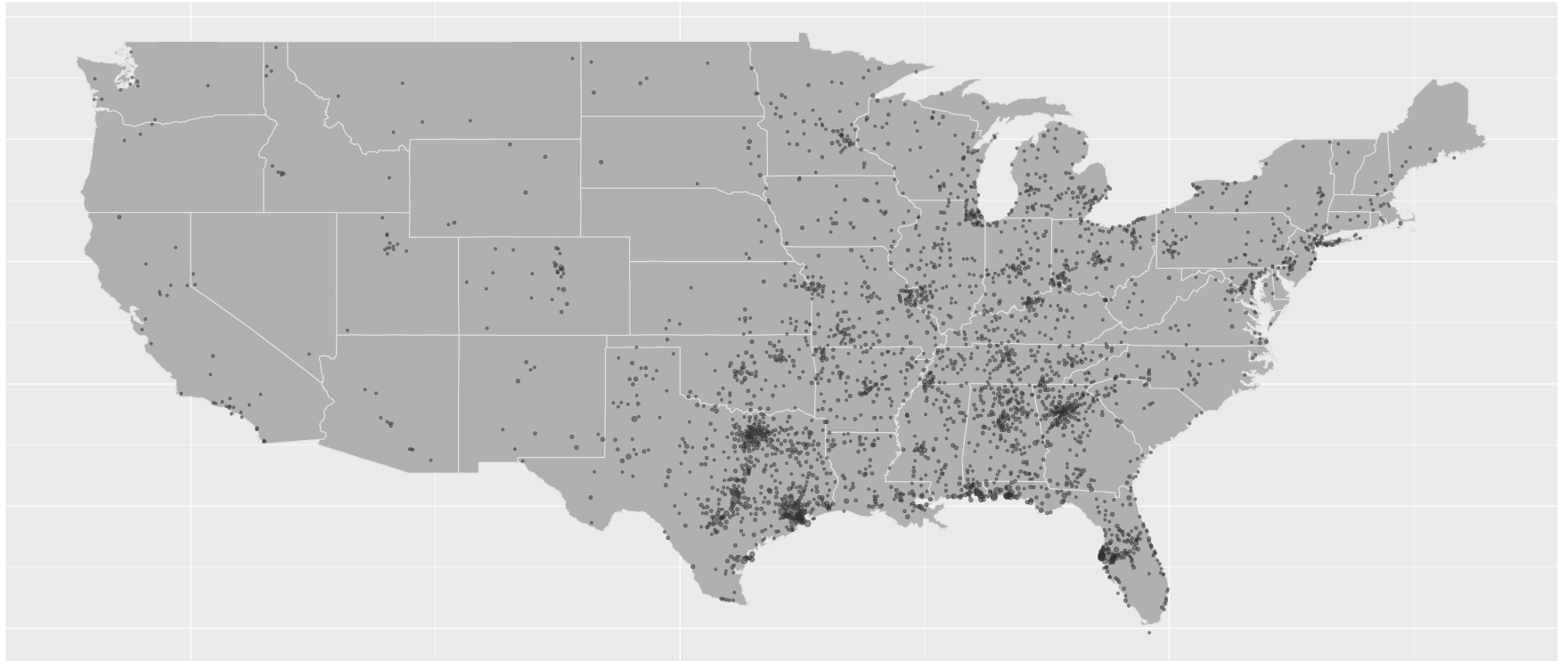
- Quick 2-page survey administered at the end of trip by GHC crew
 - Administered on both EFP trips and non-EFP trips as well as vessel not enrolled in the EFP
 - Returned by owners to me in pre-paid envelopes
- 10,718 total surveys returned, >66% with emails
 - 69% TX, 17% FL, 14% AL (fishing port)
 - 24 different vessels
 - Maximum share returned by one company: 13.6%.
Minimum: 1%

Summary stats

- Mean age: 34
- Mean fishing experience: 15 years
- % male: 77.5%
- % new customers: 51%
- Boat ownership: 14%
- Median GOM fishing: 1-2 times a year
 - 26% fished 3 or more times a year in GOM
- Mean trip duration: 8.7 hours
- State of residence: TX (37%), FL (14%), AL (8%)...

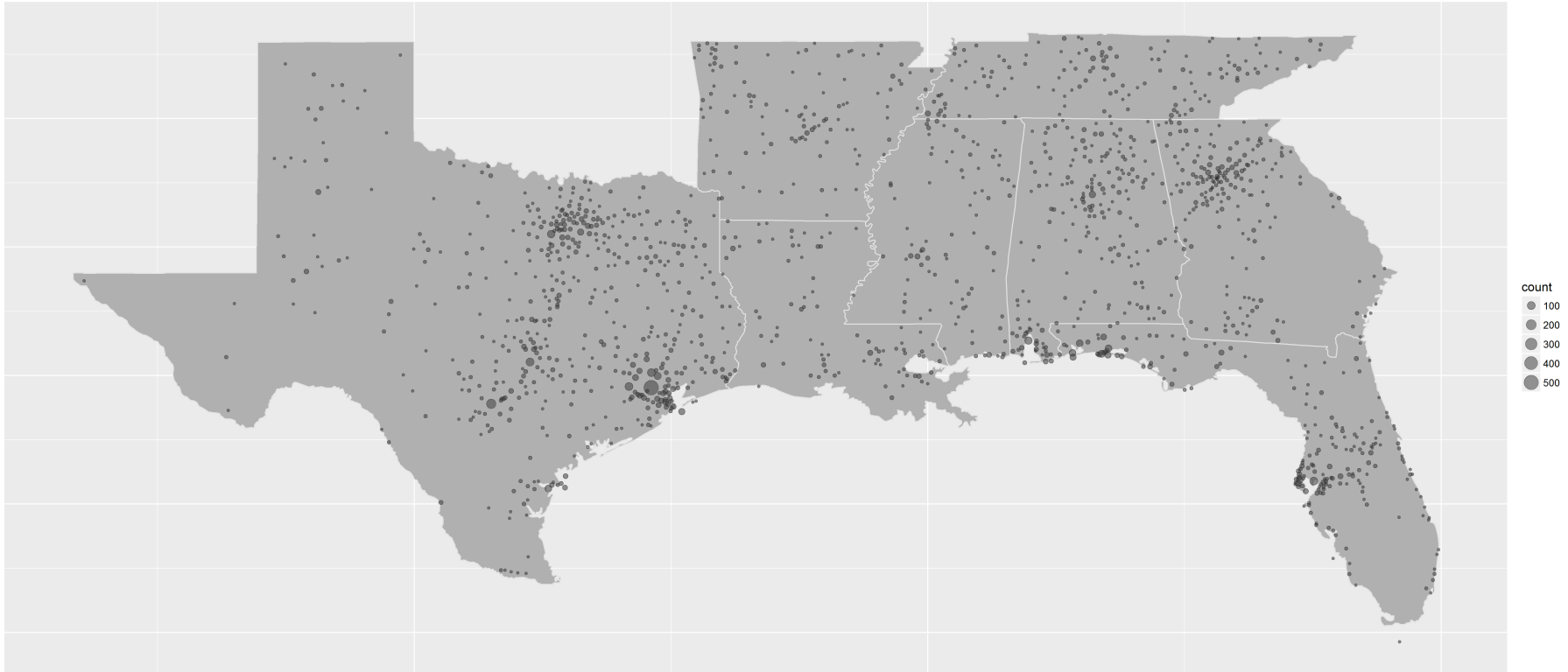
Survey sample

All individuals (n = 9,564)



Survey sample (detail)

All individuals (n = 7,236)



Follow-up Internet survey

- Designed and administered in Qualtrics web software
 - 2 waves: 2015 and 2016
- Contacted using email from 2 page survey with multiple email reminders
 - ~7100 provided emails
 - A significant share were illegible, invalid or were delivered but unopened
 - Ultimately received 813 complete responses

Outline of valuation survey

- Revealed preference
 - Recall data on previous season
- Stated preference
 - Contingent behavior and preference data for alternative management policies
 - Choice experiments on individual recreational trips
 - Value of time (VOT) questions

In recent years recreational anglers could only retain red snapper during a 1 to 1.5 month season starting June 1st. The season length and bag limit of a typical red snapper season in the recent past are presented in Policy A below.

Policy A

Season when red snapper can be retained	June
Red snapper bag limit	2
Price of one partial day (4-8 hrs) headboat trip	\$80
Price of one full day (8-15 hrs) headboat trip	\$130

If the Gulf of Mexico red snapper fishing policies were as described in Policy A, how many headboat trips would you have taken in 2015 in the different seasons? In considering your responses, please assume that any features about the fishing trips that are not mentioned such as sea conditions, the quality and size of the boat, the number of passengers, and bag limits and regulations for other species are the same as your 2015 experience.

2015 Gulf of Mexico Headboat Trips under Policy A

	January to end of May	June	July to end of August	September to end of December
	Holidays: New Year's, Spring break, Easter, Memorial day		Holidays: Independence Day	Holidays: Labor Day, Columbus Day, Thanksgiving, Christmas
Number of partial day (4-8 hrs) headboat trips in 2015 under Policy A	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Number of full day (8-15 hrs) headboat trips in 2015 under Policy A	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Please assume that any features about the fishing trips that are not mentioned such as sea conditions, the quality and size of the boat, the number of passengers, and bag limits and regulations for other species are the same as your 2015 experience.

Policy B

Season when red snapper can be retained	Any time of year
Red snapper bag limit	2
Price of one partial day (4-8 hrs) headboat trip	\$120
Price of one full day (8-15 hrs) headboat trip	\$200

If the Gulf of Mexico red snapper fishing policies were as described in Policy B, how many headboat trips would you have taken in 2015 in the different seasons?

2015 Gulf of Mexico Headboat Trips under Policy B

	January to end of May Holidays: New Year's, Spring break, Easter, Memorial day	June	July to end of August Holidays: Independence Day	September to end of December Holidays: Labor Day, Columbus Day, Thanksgiving, Christmas
Number of partial day (4-8 hrs) headboat trips in 2015 under Policy B	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Number of full day (8-15 hrs) headboat trips in 2015 under Policy B	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Modeling

- We develop a model of *seasonal* demand for headboat fishing
 - Policy influences the quality of trips through season limits for retention of red snapper or gag
 - We account for individuals' heterogeneous seasonal costs of fishing (e.g., “snowbirds” vs. locals vs. families on vacation)
- We can value *policy scenarios*, where retention for red snapper or gag is allowed year-round
 - The annual consumer surplus to headboat anglers from permanent management reform – economic benefits not captured by industry profits
- We are currently refining the model, but preliminary estimates are reasonable and suggest significant consumer surplus from moving to a year-round season for red snapper

Implications for a permanent program

- Altogether, our results suggest significant potential economic benefits to for-hire vessels (and customers) from a permanent program.
- A 2 year pilot can tell us only so much about a permanent program.
 - More costly/risky innovations were likely postponed during the EFP.
 - We can likely expect innovations in trip structures and pricing to better meet heterogeneous angler demand.
 - The finding of insensitivity to price and reduced bag limits for out of season landings may be a figment of a partial/pilot program.
 - Sensitivity would likely increase with enhanced competition under a permanent program.

Acknowledgements

- Susan Boggs and GHC owners and crew
- Andy Strelcheck, Jessica Stephen, Kelly Fitzpatrick
- Patrick Lloyd-Smith and Vic Adamowicz
- Bethany Steele

Thank you