Economic Trade-Offs of ABC Control Rules for Summer Flounder and Implications for Scup and Butterfish

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Outline

- ❑ Project Background
- ❑ Control Rule Economic Results
- ❑ Risk Policy Discussion
- ❑ Supplemental Material on Butterfish and Scup

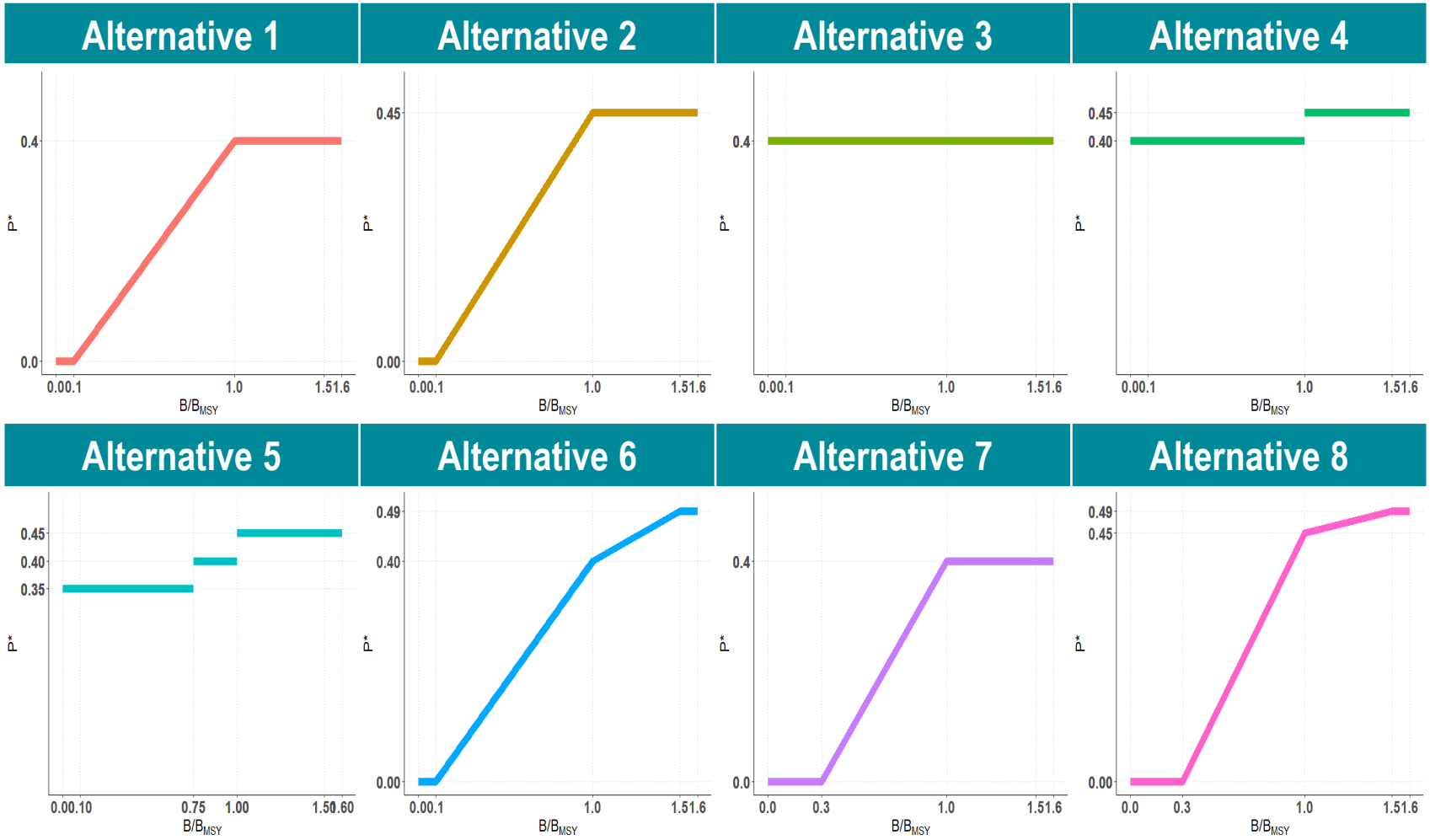
Background

- Dec 2018 MAFMC meeting
  - "Economic Trade-Offs of Alternative ABC Control Rules for Summer Flounder"
  - Economic welfare comparison under 5 alternative harvest control rules
- New developments
  - 3 additional control rules identified for evaluation
  - Benchmark stock assessment
  - Revised and recalibrated MRIP
  - Wiedenmann: new MSE using all 8 control rules
  - Corresponding economic welfare analysis

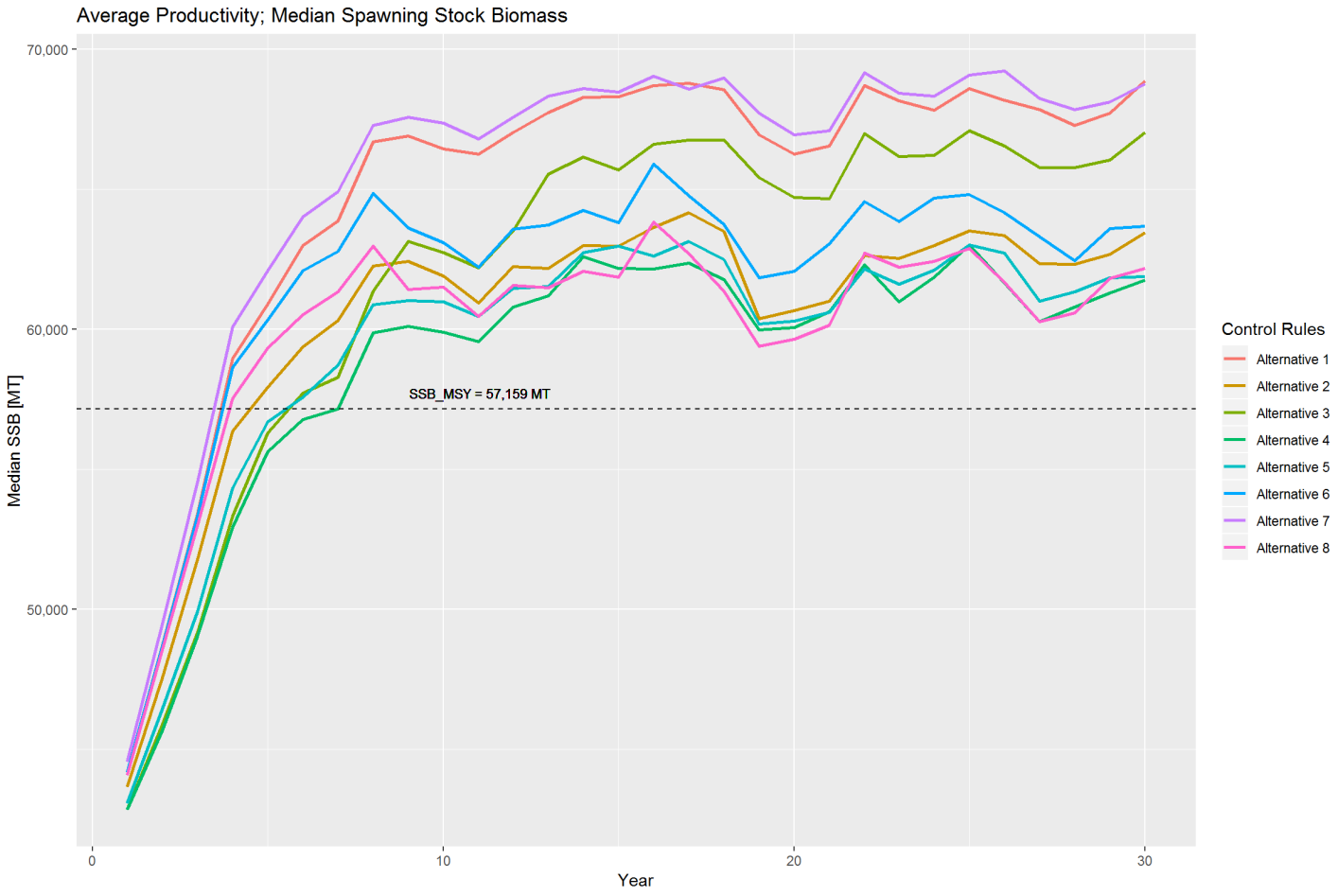
Methods

- Wiedenmann
  - Management Strategy Evaluation
  - 500 biological simulation results per control rule
- Hutniczak et al. 2018
  - Consumer surplus: synthetic inverse demand system
  - Producer net revenue: first-difference equation
  - Recreational benefit: nested logit

Control Rules



Median SSB

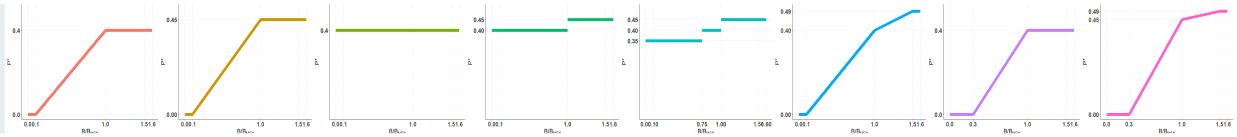

Average Productivity; Median Spawning Stock Biomass
70,000
60,000
50,000
Median SSB [MT]
SSB_MSY = 57,159 MT
0
10
20
30
Year
Control Rules
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5
Alternative 6
Alternative 7
Alternative 8

Economic Results

- Evaluated under average, good, and poor fishery conditions
- Expected value of cumulative benefits over 30 years of simulation discounted at a 3% rate
- Cumulative benefits ≈ asset value of summer flounder

Mean Total Economic Benefits

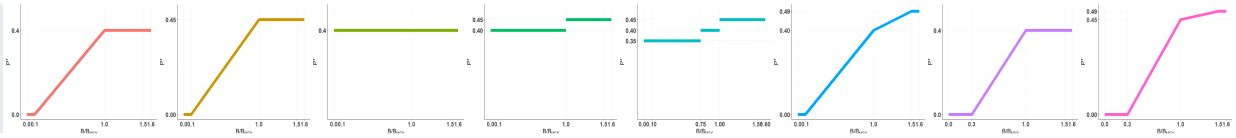
Cumulative over 30 years, 3% discount rate (in millions USD)

Control Rule									
Average	Benefit	4,312	4,390	4,380	4,427	4,414	4,352	4,295	4,379
	Change	0	78	68	115	102	40	-17	67
	Rank	7	3	4	1	2	6	8	5
Good	Benefit	7,434	7,670	7,476	7,693	7,685	7,723	7,423	7,768
	Change	0	236	42	259	251	289	-11	334
	Rank	7	5	6	3	4	2	8	1
Poor	Benefit	2,515	2,544	2,632	2,632	2,606	2,513	2,478	2,503
	Change	0	29	117	117	91	-2	-37	-12
	Rank	5	4	1	1	3	6	8	7

Components of Total Economic Benefits

Cumulative over 30 years, 3% discount rate (in millions USD)

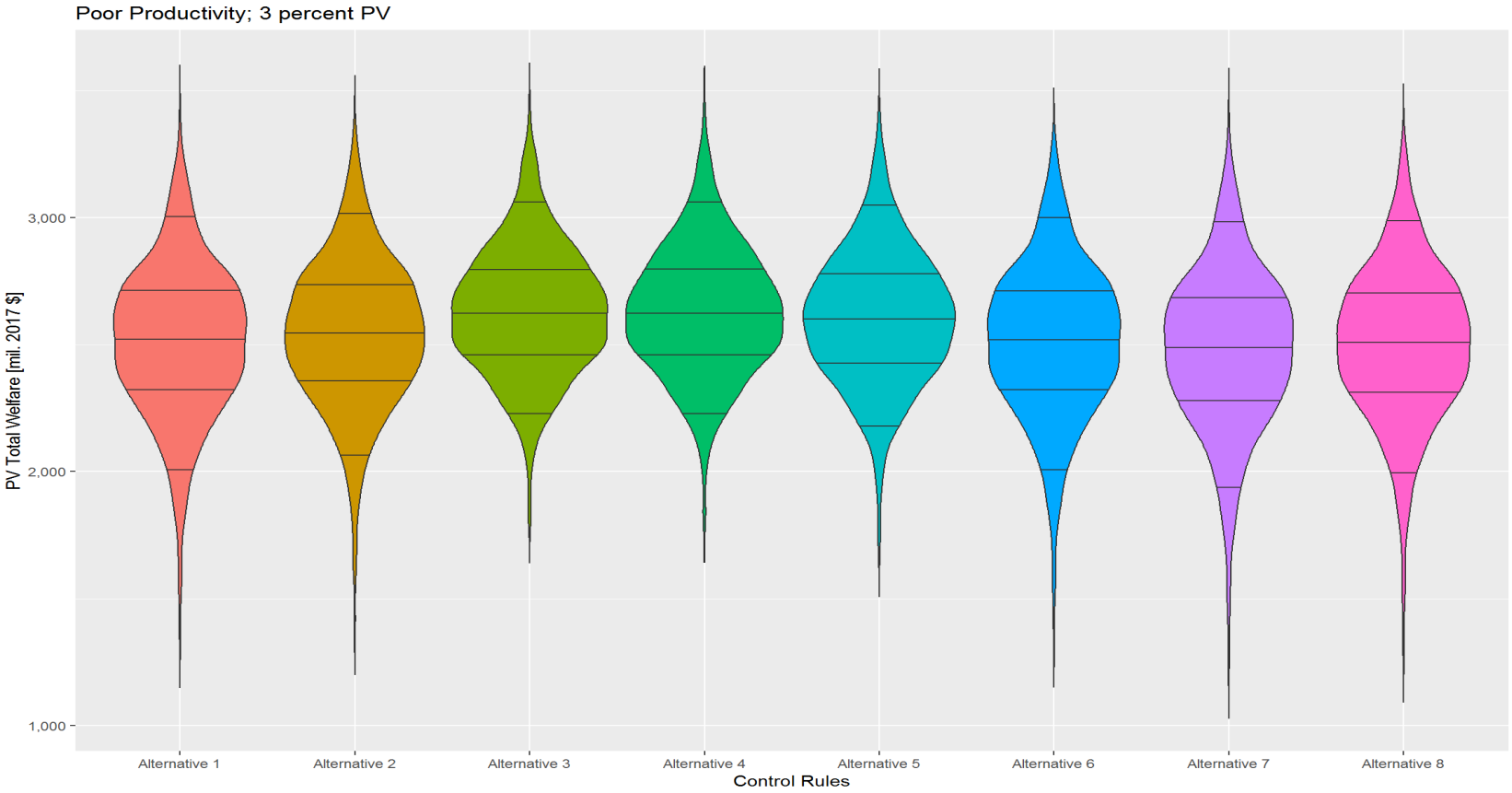
- Negative correlation between producer and consumer/recreational benefits

Control Rule									
Producer	Benefit	421	399	410	392	395	403	423	393
	Change	0	-22	-11	-29	-26	-18	2	-28
	Rank	2	5	3	8	6	4	1	7
Consumer	Benefit	1,044	1,075	1,076	1,096	1,089	1,059	1,036	1,068
	Change	0	31	32	52	45	15	-8	24
	Rank	7	4	3	1	2	6	8	5
Recreational	Benefit	2,846	2,916	2,894	2,939	2,930	2,891	2,836	2,918
	Change	0	70	48	93	84	45	-10	72
	Rank	7	4	5	1	2	6	8	3

Mean Total Economic Benefits

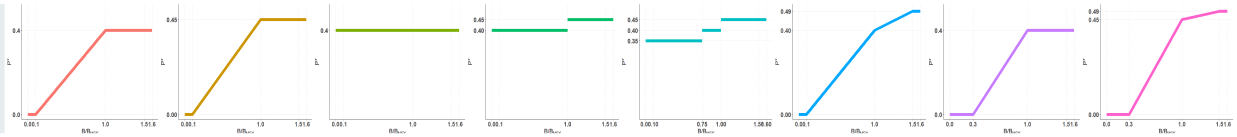
Cumulative over 30 years, 3% discount rate (in millions USD)

- Piecewise constant P* control rules have lower variability under poor productivity conditions



Mean Total Economic Benefits

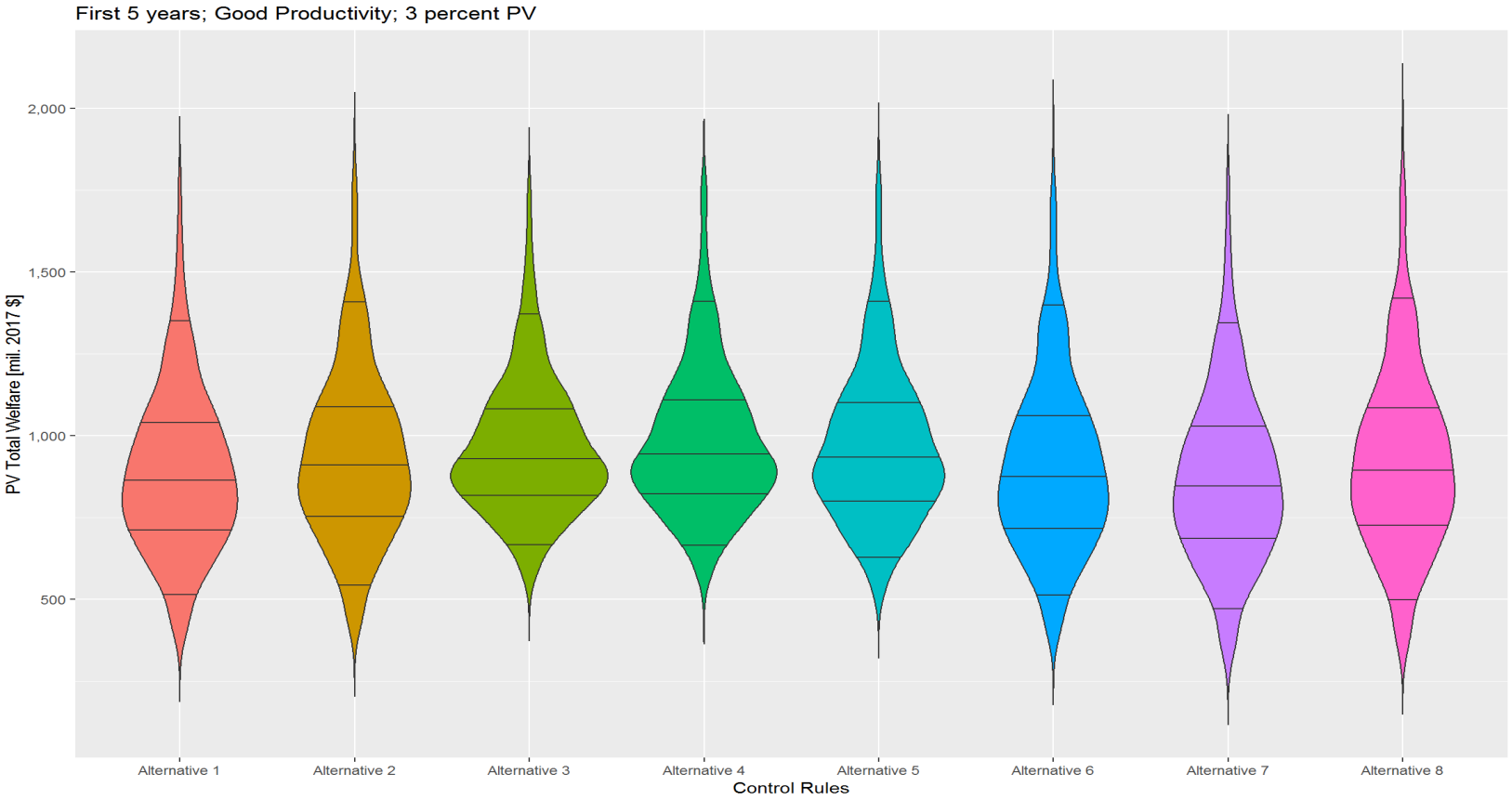
Cumulative over initial 5 years, 3% discount rate (in millions USD)

Control Rule									
Average	Benefit	758	794	830	840	825	765	738	774
	Change	0	36	72	82	67	7	-20	16
	Rank	7	4	2	1	3	6	8	5
Good	Benefit	892	937	966	983	968	908	872	922
	Change	0	45	74	91	76	16	-20	30
	Rank	7	4	3	1	2	6	8	5
Poor	Benefit	638	665	706	711	696	641	619	644
	Change	0	27	68	73	58	3	-19	6
	Rank	7	4	2	1	3	6	8	5

Mean Total Economic Benefits

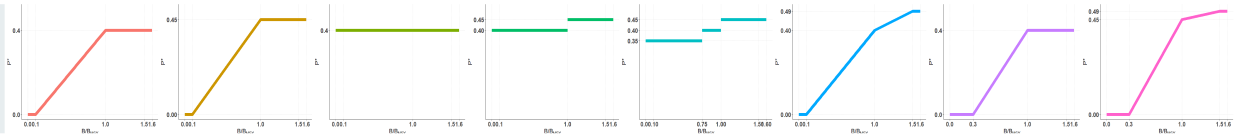
Cumulative over initial 5 years, 3% discount rate (in millions USD)

- Piecewise constant P* control rules have lower variability under good productivity conditions



Mean Total Economic Benefits

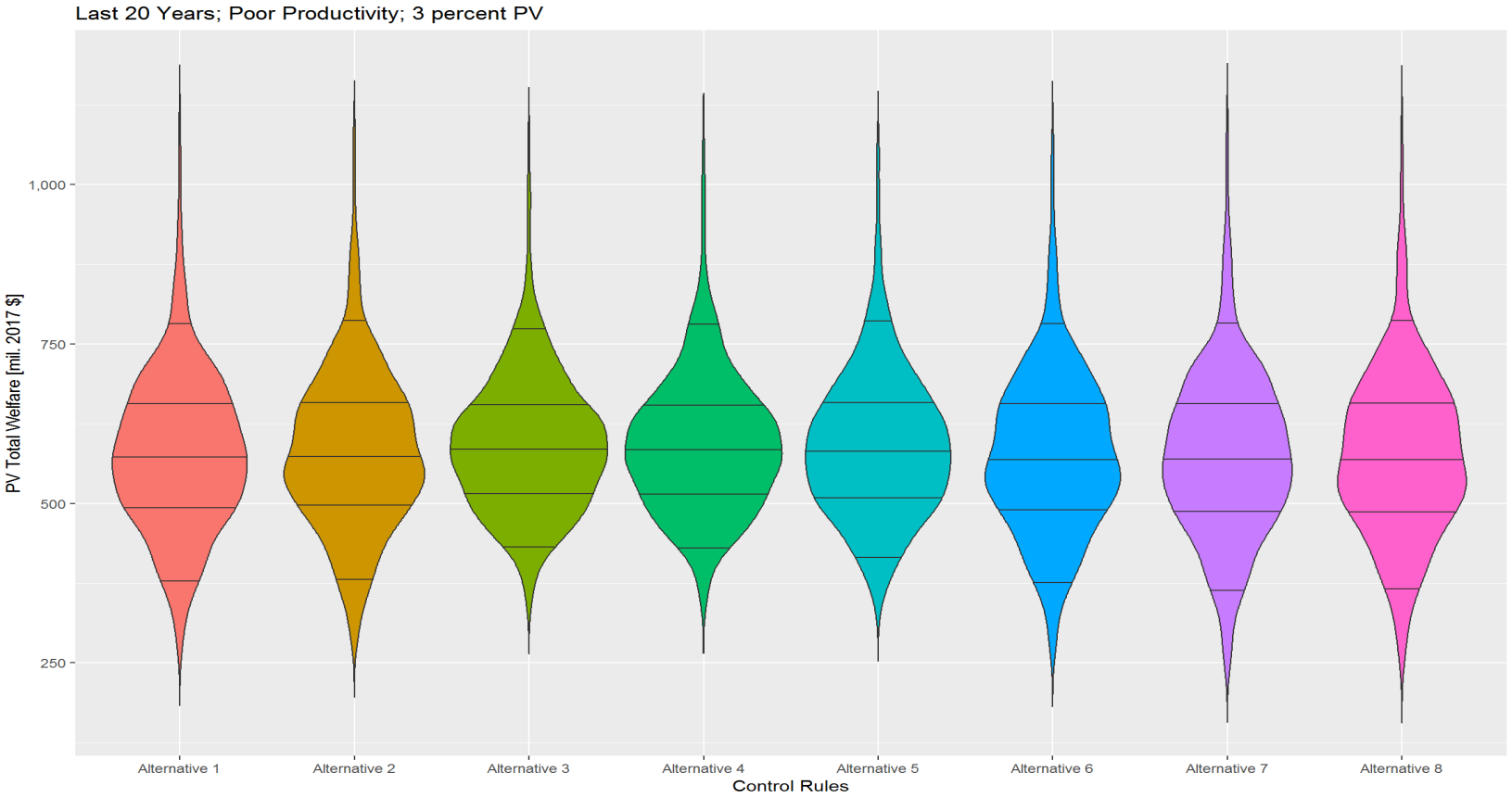
Cumulative over final 20 years, 3% discount rate (in millions USD)

		Control Rule							
Average	Benefit	1,147	1,154	1,153	1,158	1,156	1,147	1,146	1,150
	Change	0	7	6	11	9	0	-1	3
	Rank	6	3	4	1	2	6	8	5
Good	Benefit	2,265	2,315	2,265	2,314	2,315	2,308	2,266	2,324
	Change	0	50	0	49	50	43	1	59
	Rank	7	2	7	4	2	5	6	1
Poor	Benefit	578	581	592	591	590	576	574	575
	Change	0	3	14	13	12	-2	-4	-3
	Rank	5	4	1	2	3	6	8	7

Mean Total Economic Benefits

Cumulative over final 20 years, 3% discount rate (in millions USD)

- Piecewise constant P* control rules have lower variability under poor productivity conditions



Discussion

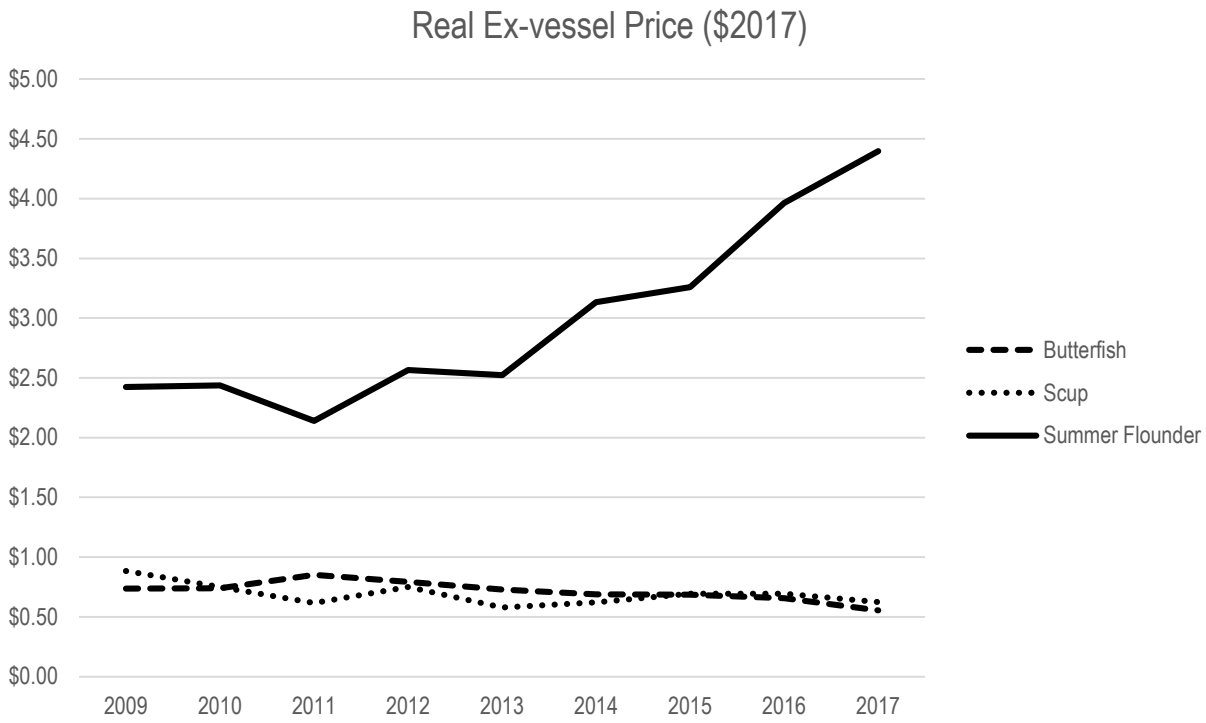
- Economic benefits driven by biological outcomes: high catch produces high economic benefits
- Alternatives 4 and 5 are the least conservative and produce the highest economic benefits
- Alternatives 1 and 7 are the most conservative and produce the lowest economic benefits
- Initial state matters: little difference in final 20 years; overall results driven by fact current summer flounder SSB is below SSB_{MSY}

Discussion

- Maximum difference under average condition of $115 millions over 30 years for Alternative 4, $82 millions of it accrued in initial 5 years
- Piecewise constant control rules have lower variability
- Negative correlation between producer welfare and consumer/recreational welfare
- Result likely to depend on species

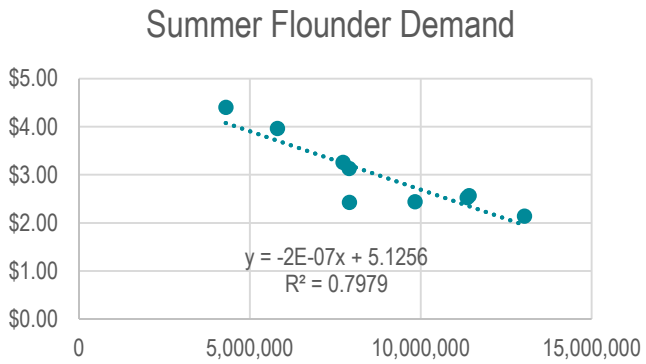
Supplemental Material on Butterfish and Scup

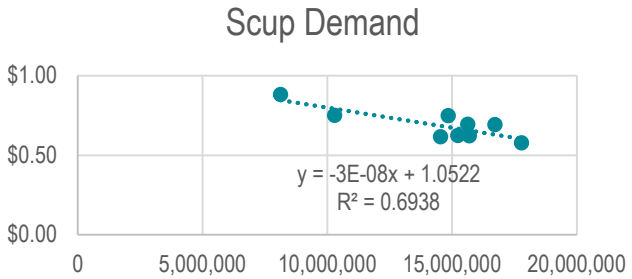
Absolute magnitude of commercial impacts of different harvest control rules will be significantly lower for scup and butterfish compared with summer flounder

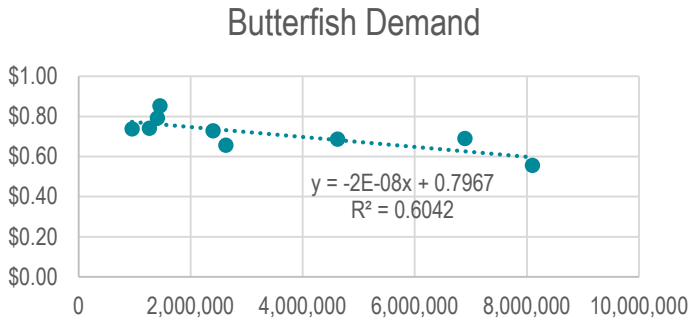


Price flexibilities as represented in these simple demand relationships suggest:

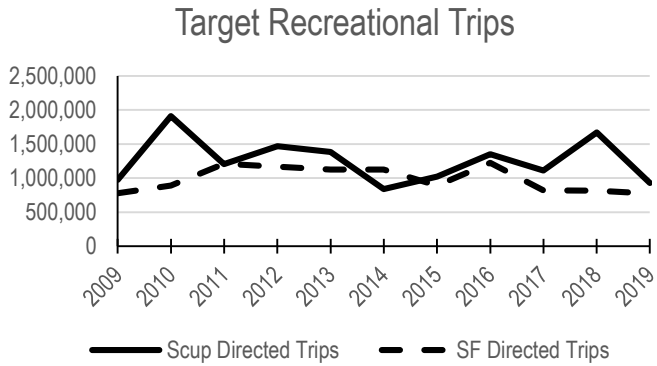
- For commercial revenues, summer flounder and scup are similar
  - At very high catches, prices start to decline at a greater rate than catch, reducing revenues and limiting the commercial benefit of higher P*
  - At the low end of scup catch, slight increases in quota lead to only a small drop in price, and thus stronger revenue gains
  - In contrast, butterfish prices don't decline as much at high catches, leading to higher revenues
- Consumer and downstream benefits are much smaller for scup and butterfish, limiting that source of benefits from differential performance of harvest control rules



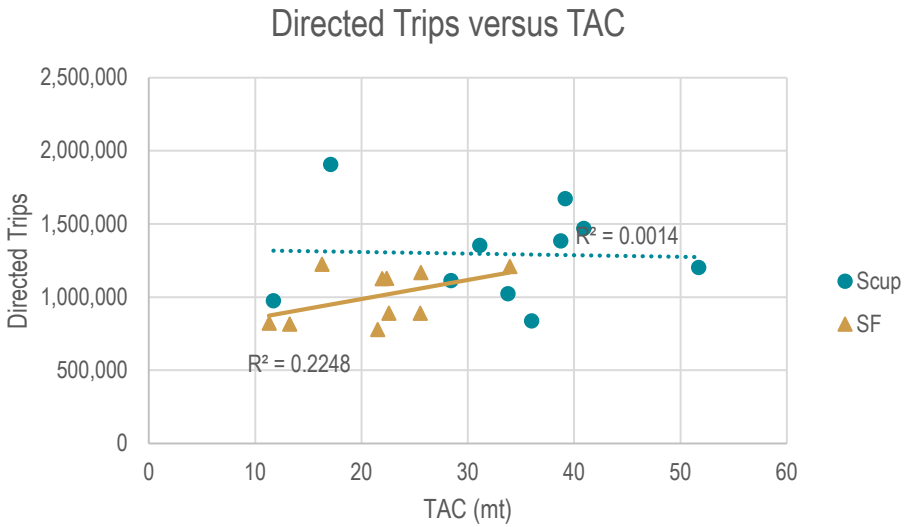




Number of targeted recreational trips for scup are similar to summer flounder, although we don't know the value of those trips



But, unlike summer flounder, scup trips are independent of the quota, limiting the recreational benefits from different control rules



Summary of Harvest Control Rule Performance for Scup and Butterfish

- Scup
  - Direction of impacts of harvest control rule economic performance would be similar to summer flounder
  - Magnitude of impacts would be much lower than summer flounder due to:
    - Significantly lower commercial value
    - Lack of impact of quota on recreational fishing trips
- Butterfish
  - No recreational fishery, therefore lower impacts
  - Lower price flexibility than summer flounder and scup
    - Higher quotas have less a negative impact on price, thus preserving revenue benefits (favoring harvest control rules that allow higher quotas)

Questions/Comments?

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