Effective effort as a basis for an industry-funded buyback in New England

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What's going on?

NE groundfish industry:

- Capacity reduction ctte formed
- Seeking a non-Magnuson buyback of groundfish permits

How to best configure a buyback to meet industry objectives?

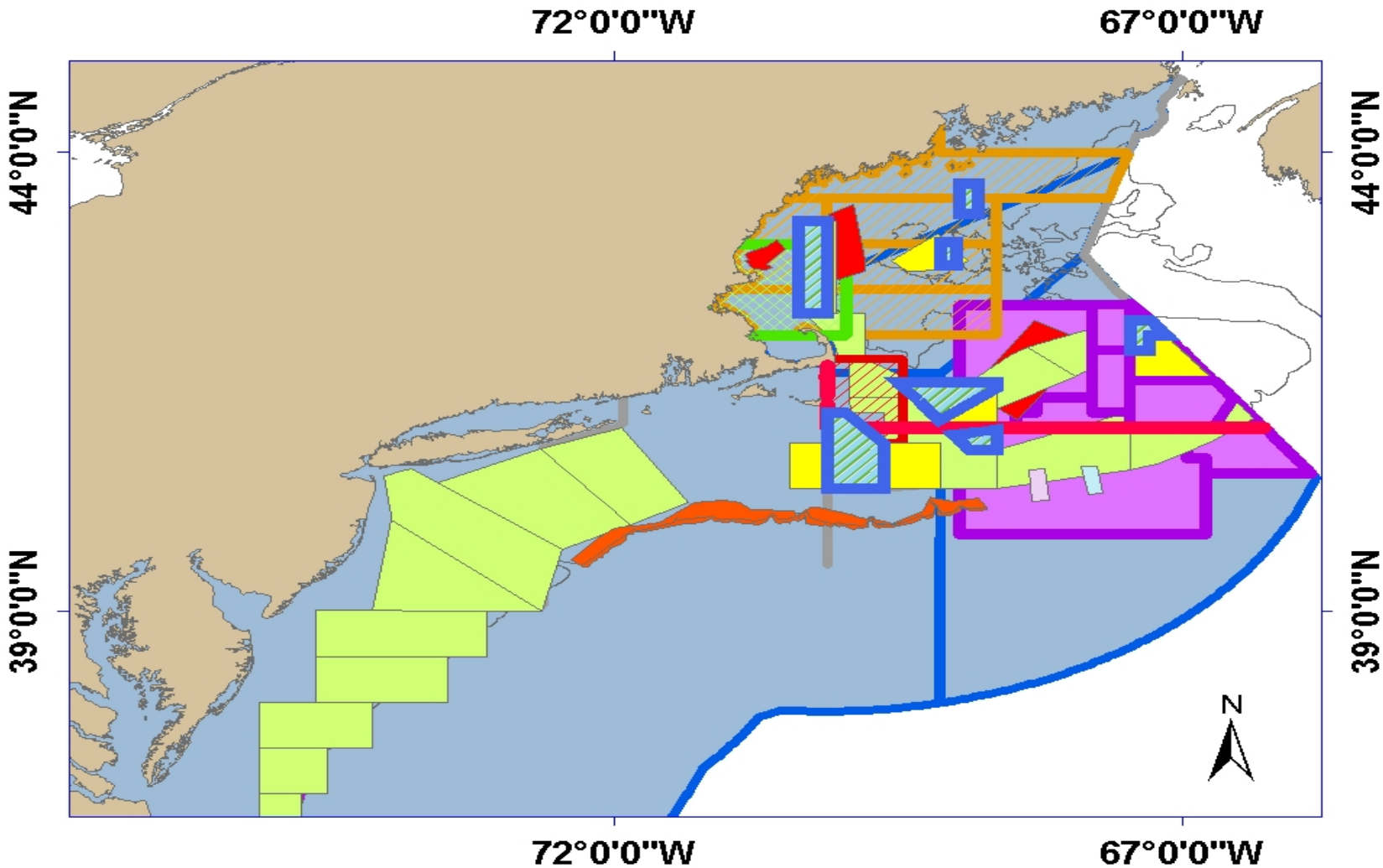
This presentation

- Background
  - NE's groundfish industry
  - Buybacks in NE
- The proposed buyback
  - Salient technical issues
  - Potential for capacity reduction
  - Repayment ability
- Parting thoughts

New England's groundfish fishery

- Prosecuted by three primary gear types
  - Otter trawl, gillnet and hook (longline)
- Regulatory complexity increasing
- Landings/revenues declining over short term
- Number of active participants decreasing, esp. since 2003

Fishing regulations in New England are a complicated matter...



A Gloucester bumpersticker

"Give a man a fish and feed him for a day.
Give a man a groundfish permit and watch him starve."

Buybacks in New England

First focused on active permits.

- Enacted 1997-1998
- $25 million allocated
- 79 permits/vessels retired (approx 350 met participation req's)
- Bids evaluated based on ratio of reported revenue : bid amount
- Result: ...not much

Buybacks in New England

Second focused on latent permits.

- Enacted 1996
- $17 million allocated
- 322 permits bought from 501 bids (approx 2900 total permits)
- Bids evaluated based on ratio of estimated capacity : bid amount
- Result: ...not much more

The proposed buyback

- Objectives
- Computing effective effort
- Capacity and overcapacity
- What might a buyback accomplish?
- Repayment ability

Objectives

- Decrease capacity in the fishery
  - Capacity defined as combination of vsl inputs (LEN, VHP) and fishery access (DAS)
- Buyback will not target any particular segment of the industry
- Benefits must be sufficient to justify repayment

Targeting capacity

Effective effort as an approximation of capacity

- Ability to convert inputs into outputs
- Using technical efficiency methodology as basis
- Stochastic production frontier computed
  - Total revenue on groundfish trips
  - Fixed inputs only: LEN and VHP
  - 2001-2005 years

Stochastic production frontier

- Parametric approach (vice DEA) favored due to analytic solution (eases public comprehension)
- SPF model is:

$$y\$ / e_n = qK + \varepsilon$$

$$y\$ / e_n = f(VHP, GTONS, LEN, AGE, CREW) + \varepsilon$$

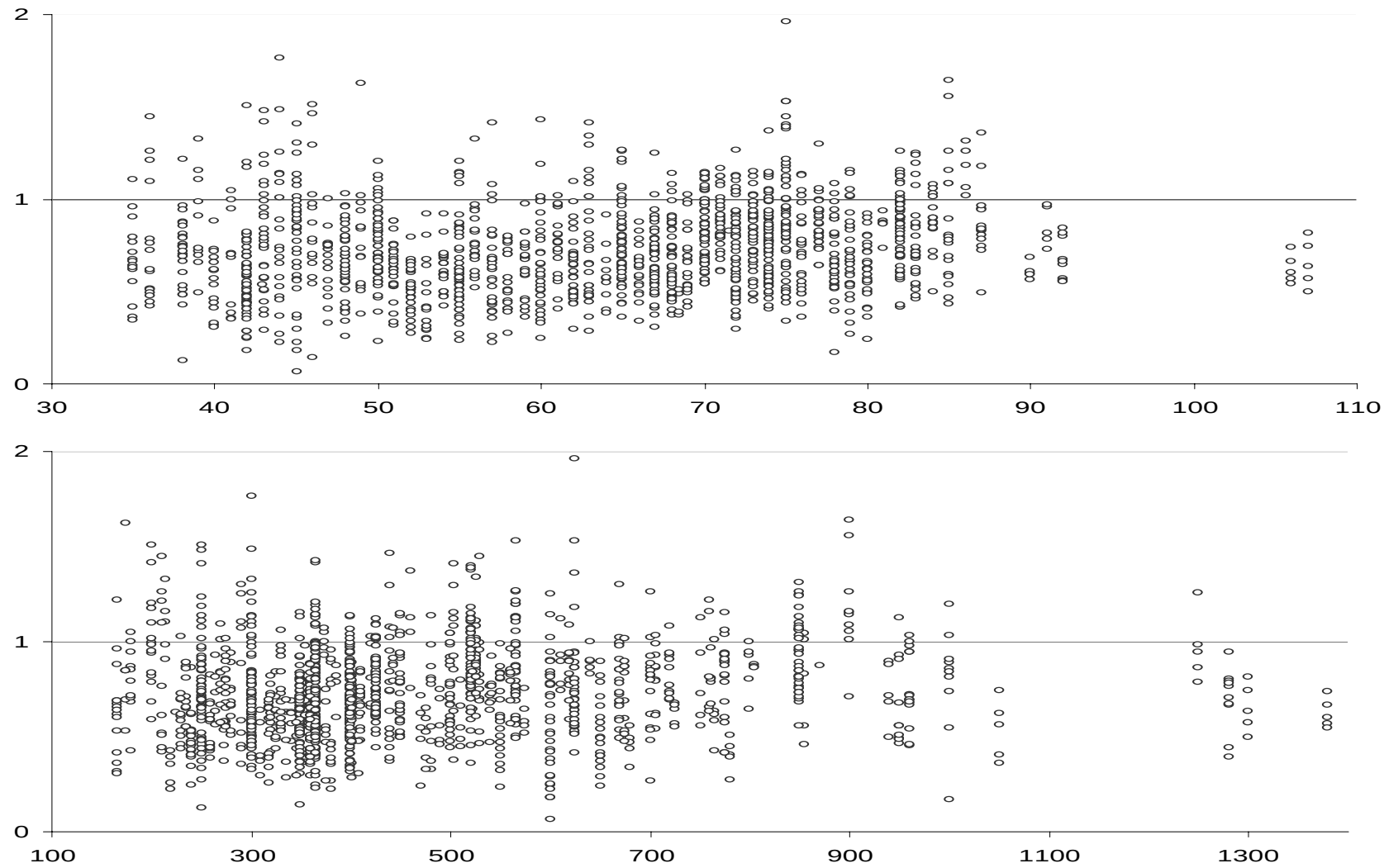
$$y\$ / e_n = f(VHP, LEN) + \varepsilon$$

Stochastic production frontier

2001-2005 panel ($n = 1500$):

	coefficient	standard-error
Intercept	-60.13	217.62
VHP	4.09	0.36
LEN	45.20	5.17
gamma	0.69	0.01

Stochastic production frontier



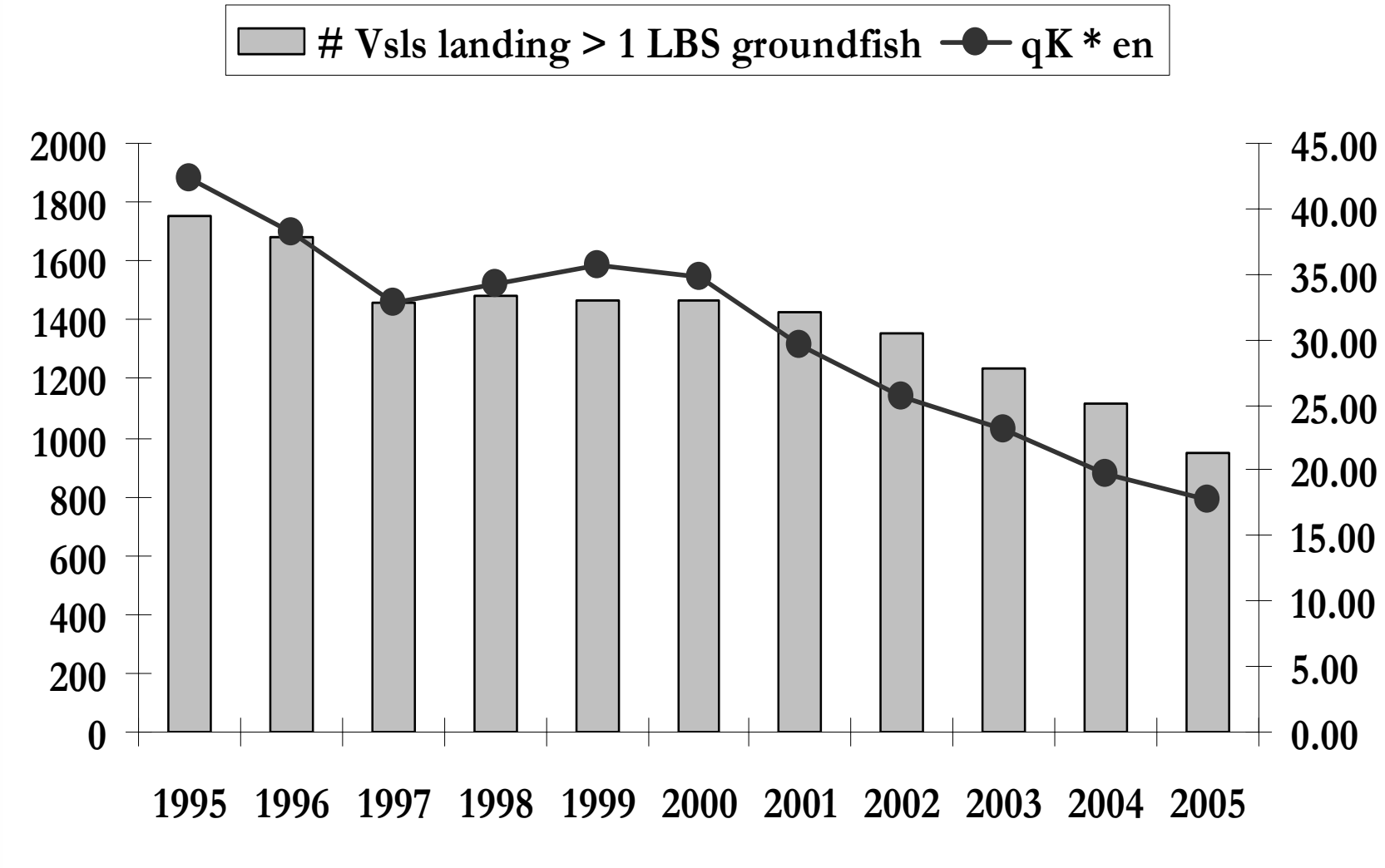
Stochastic production frontier

SPF has known difficulties:

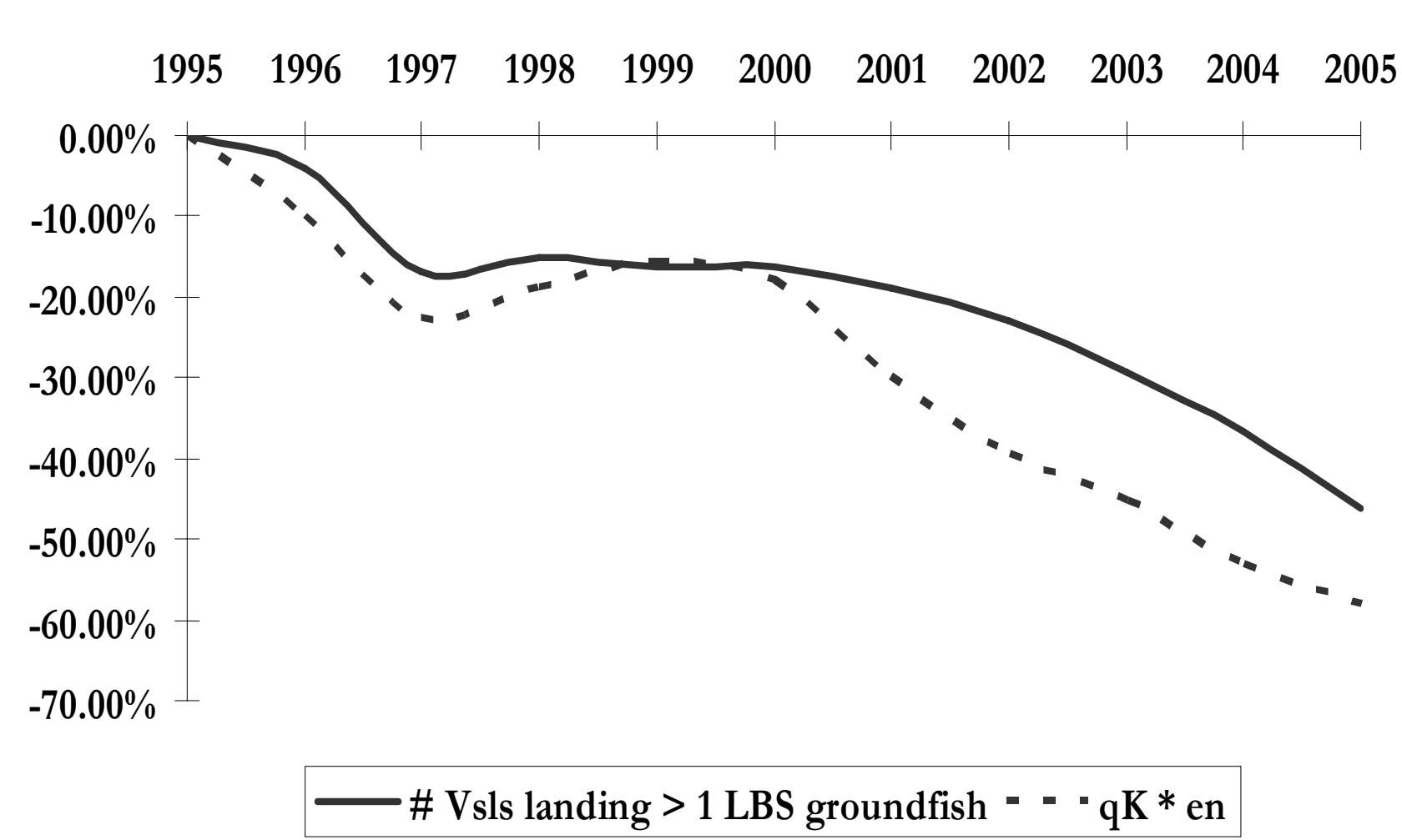
- Accommodating multiple outputs (assumes revenues are homogeneously composed)
- Accommodating 'good' and 'bad' products
- Frontier is distorted by:
  - Regulatory conditions
  - Super-producers

Difficulties = deficiencies

Effective effort over time



Effective effort over time



Overcapacity

- Prior assessments:
  - Walden and Kirkley (2000) estimated vsls catching roughly 43% of their groundfish capacity (DEA model)
  - Subsequent report (similar data) estimated an ideal fleet size ≈ 350 vessels
- Using this model somewhat inappropriately
  - SPF model total capacity = 276 million units (≈ $'s)
  - Last year's total landings (>1Lbs groundfish) were $177 million

= 57% of capacity

Constructing a buyback

- Objective : buy back effective effort
- Bid evaluation:

(1) Effective effort (EE) = $qK * e_n$

(2) Score = EE / Bid amount

...with one twist.

Effective effort twist

Mitigating against permit history-based allocation in the future:

(1) EE_{ph} =

EE * Catch History Multiplier (CHM)

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(2) CHM = f(avg. 4 highest landings btwn 1999- 2003)

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(3) CHM = [1.0 » 1.3] based on landing quartiles

Bid evaluation

Score = EE * CHM / Bid amount

...sort all Score's in descending order and accept bids 'til the money runs out.

Ex:

```
1.291 --- $331.5K
1.267 --- $212.2K
1.212 --- $950.9K
1.197 --- $812.6K
1.185 --- $  80.4K
------- out of money line -------
1.172 --- $643.2K
1.165 --- $121.8K
```

Who will participate?

How much money might it take?

- Based on capacity estimation, we'll need to remove btwn 43% and 57% of the fishing capacity

- Hedonic price model estimated

  Vessels for sale March-April 2006

How much money might it take?

Bid amount model ($n = 31$):

Bid = f(AGE, DAS, VHP, LEN) + ε

	coefficient	standard error
Intercept	9.378	87.517
AGE*	-7.434	2.144
DAS*	2.521	0.949
VHP	0.434	0.218
LEN	3.855	2.213

How much money?

- Model applied to entire fleet yields an approximated fleet value of:

  $282.04 million

- Total revenues on groundfish trips last year were $171 million. This indicates a forward-revenue valuation of approx 1.69 times annual revenue
- Previous buyback had a 1.06 ratio of bid amount to prior year's annual revenues

How much money?

Removing 50% of the effective effort will cost approximately...

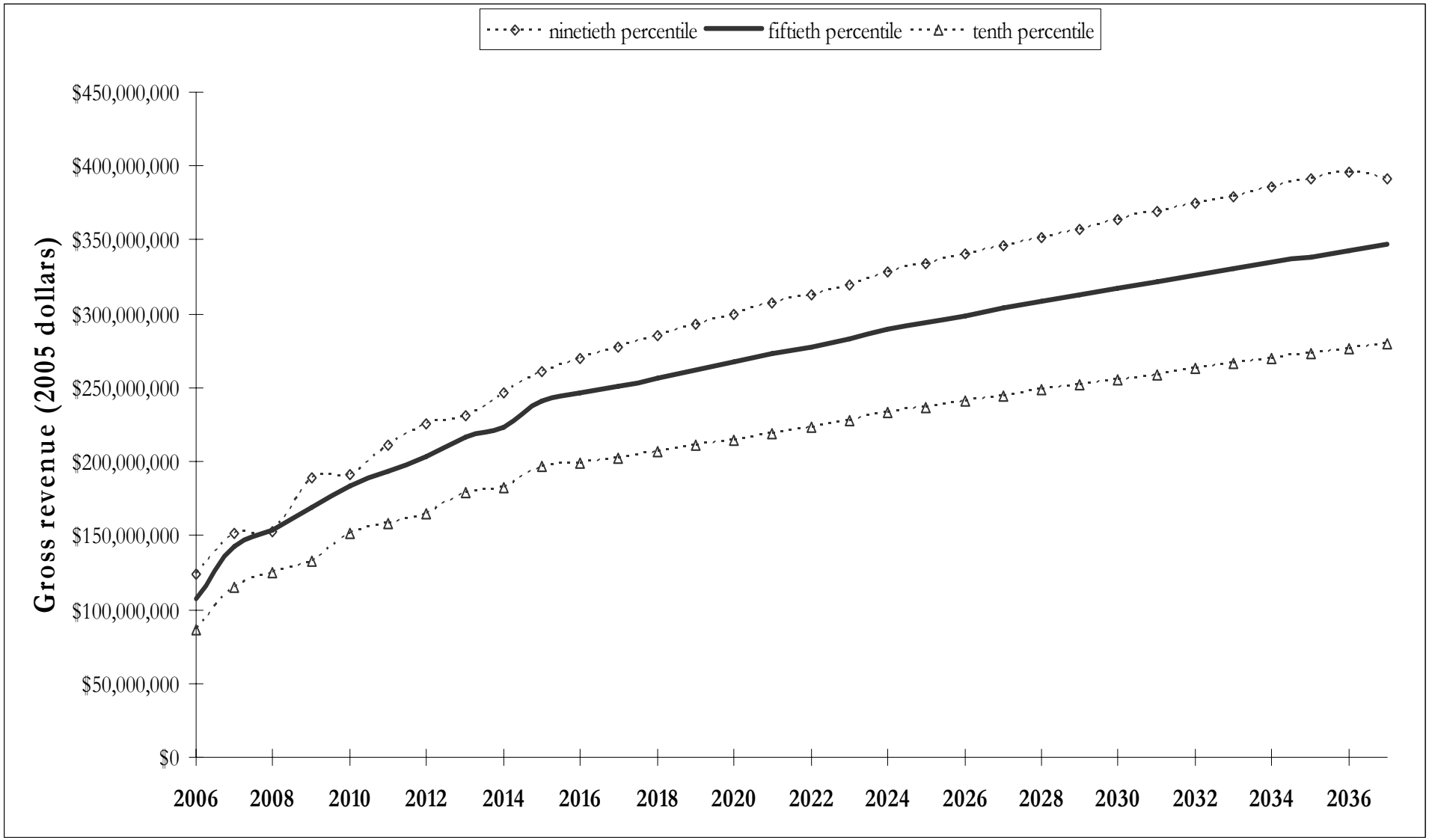
$141 million

...or thereabouts.

Can they afford it?

- Landings projections generated by NEFSC for all groundfish stocks
- Revenue projections generated based on price model and adjusted for several considerations…

Can they afford it?



interest rate assessed	6.50%
repayment rate	5.00%
starting value of loan	$141,000,000

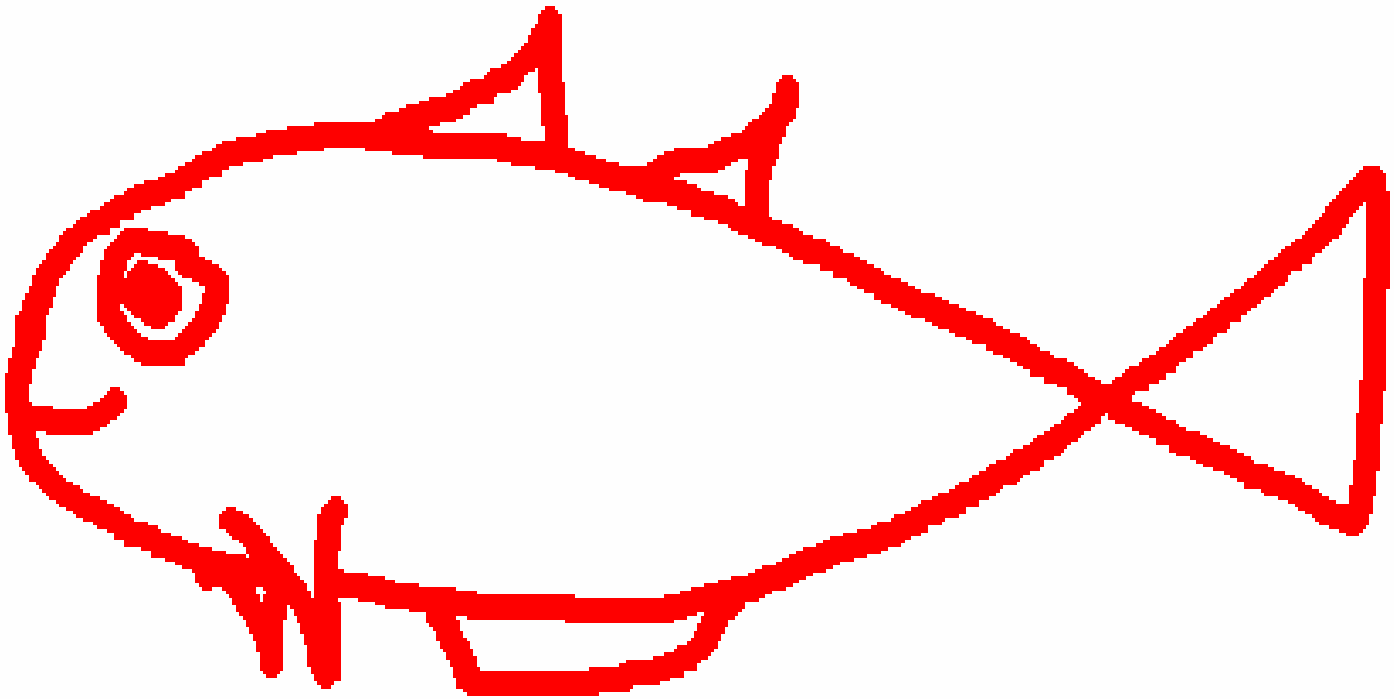
1.065

Repayment with tax on landed revenues

	10_%	50_%	90_%
2006	$144,032,203	$142,569,041	$141,344,320
2007	$145,104,969	$141,512,678	$139,552,759
2008	$145,457,365	$139,571,612	$137,543,063
2009	$145,311,122	$136,433,841	$132,770,825
2010	$143,819,300	$131,979,653	$127,540,163
2011	$141,724,723	$126,519,139	$120,582,839
2012	$138,973,171	$120,020,130	$112,133,825
2013	$135,074,941	$112,165,828	$102,657,954
2014	$130,614,665	$103,290,177	$91,458,264
2015	$124,897,260	$92,530,292	$78,482,453
2016	$118,587,230	$80,721,411	$64,067,707
2017	$111,612,177	$67,774,418	$48,159,389
2018	$103,882,141	$53,591,646	$30,636,776
2019	$95,372,855	$38,095,615	$11,432,553
2020	$86,012,217	$21,205,633	-$9,536,534
2021	$75,745,130	$2,839,743	-$32,367,387
2022	$64,500,700	-$17,098,010	-$57,155,994
2023	$52,229,189	-$38,707,133	-$84,034,635
2024	$38,756,747	-$62,186,384	-$113,264,734
2025	$24,125,504	-$87,529,921	-$144,827,029
2026	$8,268,584	-$114,861,670	-$178,865,391
2027	-$8,897,670	-$144,306,960	-$215,542,919
2028	-$27,448,529	-$176,002,263	-$255,018,210
2029	-$47,475,860	-$210,082,752	-$297,480,704
2030	-$69,066,734	-$246,701,451	-$343,106,188
2031	-$92,316,221	-$286,020,752	-$392,099,967
2032	-$117,324,543	-$328,213,896	-$444,676,914
2033	-$144,217,914	-$373,462,601	-$501,059,181
2034	-$173,099,119	-$421,956,928	-$561,521,771
2035	-$204,103,848	-$473,905,400	-$626,319,131
2036	-$237,366,962	-$529,526,919	-$695,710,569
2037	-$273,039,321	-$589,057,263	-$769,278,796

Parting thoughts

- Many issues unaddressed here
  - Latency (C-DAS)
  - Treatment of other fishery permits
  - Voting mechanisms (weighting of votes)
  - Political ramifications
- Future work
  - Incorporate discards into frontier estimation
  - Develop participation model



Questions?