Consolidation in Alaskan Ports after the Introduction of Fishing Property Rights

Eric C. Edwards
Sara A. Sutherland

Utah State University

March 23, 2017

Motivation

- Benefits of ITQs
  - Catch shares can protect fishery health (Costello et al 2008)
  - Technical efficiency of fleet improves (Grafton et al 2000)
  - Reduced fixed cost and increased access to high-price fresh market (Homans and Wilen 2007)
- Ex-ante opposition (Sutherland 2017):
  - Reduced income to rural Alaskan communities
  - Consolidation of quota - loss of small owners
  - Loss of small vessel fleet
  - Reduction in opportunities for crew

Research Question

Ex-post examination of distribution and community effects of property right introduction.

Ex-Ante Fishery Effects (Homans and Wilen 2007)

	Regulated Open Access	Optimal	Percent Change	Ex-post measure
Fixed Costs	84.81	12.22	-86%	# of vessels
Variable Costs	8.72	8.29	-5%	
Total Costs	93.53	20.51	-78%	
Revenues	93.53	173.95	86%	Wholesale; Ex-vessel
Rents	0	153.44		

Ex-Ante Community Effects ("sociologists and anthropologists")

	Prediction	Ex-post measure
Port income	Decline	Sales tax revenue
Owners	Decline	# of vessel owners
Small fleet	Decline	Average boat length
Home-port deliveries	Decline	Percent Local Deliveries

Prior Literature

Ex-ante

- Contracting for Property Rights (Libecap 1989)
- Concern over consolidation and loss of jobs in local communities (Grainger and Parker 2013)
- Opposition strong among community members not owning vessels and crew (Sutherland 2017)

Ex-post

- New Zealand: small fleet exits (Stewart 2006)
- A 21% increase in number of processing firms after Halibut ITQs in BC (Casey et al 1995)
- Icelandic Cod Quota system saw consolidation...“Lords of the Sea” (Helgason 1996)

Empirical Approach

- Test for response in economic variables to introduction of ITQs
- Parallel trends assumption: Pacific Cod
- Unit of measurement is the city j at time t

$$log(Y_{j,t}) = \sigma + \sum_{q \in \{S,H\}} \gamma_q \cdot I_q + \sum_{q \in \{S,H\}} \delta_q \cdot I_q \times I_p + \tau_t + f_j + u_{j,t}$$

- Y - revenue
- S - sablefish; H - halibut
- I_q - fish indicator
- I_p - post-ITQ indicator

Data

- Processor data (1990-2000):
  - Commercial Operators Annual Report (COAR) processor ex-vessel and wholesale market data
- Harvester ownership data (1990-2000):
  - Alaska Department of Fish and Game fish ticket data
  - State of Alaska vessel registry
  - Catch matched with owner
  - Owner home city and delivery city matched with catch
- Three categorizations of catch:
  - Processor port
  - Vessel owner home city
  - Proportion delivered to home city
- Sales tax revenue from Alaska Office of the State Assessor (1991-1999)

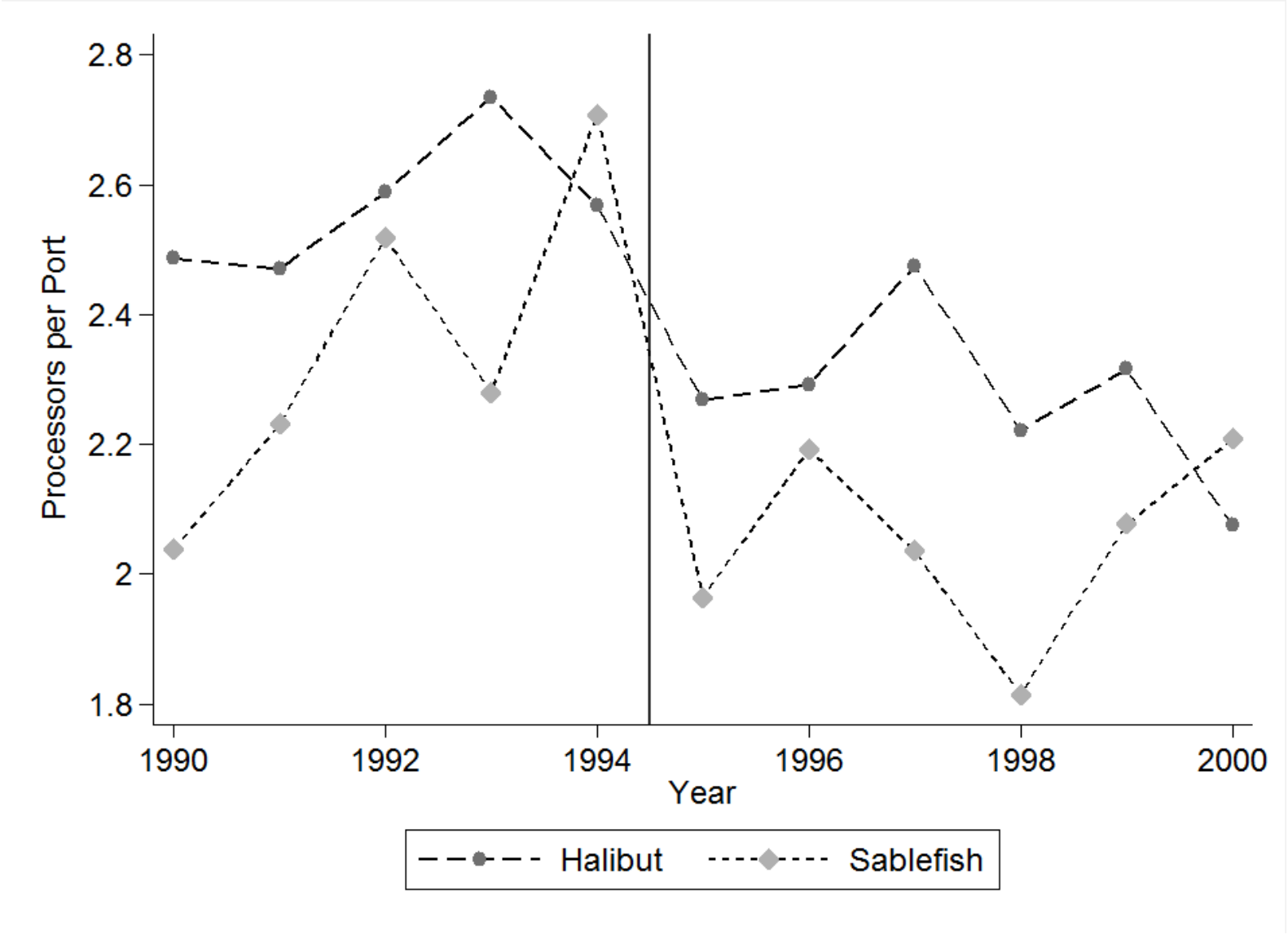
Summary Statistics

	Halibut	Sablefish	Pacific Cod
Ports with Vessel Owners	40	27	37
Wholesale Revenue	24,500,000	11,600,000	56,400,000
	(69,800,000)	(24,300,000)	(210,000,000)
Number of Processors	2.4	2.18	2.18
	(2.00)	(1.85)	(2.01)
Mean Owner Revenue	2,642,790	4,017,501	2,061,796
	(7,139,606)	(7,289,831)	(5,262,507)
Mean Average Owner Revenue	27,416	84,259	34,772
	(37,355)	(86,074)	(74,211)
Mean Number of Owners	61.75	32.03	30.28
	(85.26)	(43.68)	(46.78)
Mean Home-Port Deliveries	0.7	0.6	0.79
	(0.04)	(0.03)	(0.02)

Before/After Summary

	Halibut		Sablefish		Pacific Cod	
	Pre	Post	Pre	Post	Pre	Post
Wholesale Revenue (mils)	22.40	26.00	11.10	12.00	31.30	76.40
	(61.70)	(75.40)	(25.40)	(23.50)	(98.10)	(266.00)
Number of Processors	2.57	2.28	2.35	2.04	2.05	2.28
	(2.13)	(1.89)	(2.10)	(1.61)	(2.04)	(1.99)
Mean Owner Revenue (mils)	2.01	3.11	2.84	5.20	2.06	2.06
	(3.71)	(8.84)	(5.22)	(8.78)	(4.59)	(5.80)
Mean Average Owner Revenue	15,883	35,944	50,279	118,597	42,859	27,859
	(12,705)	(46,276)	(40,885)	(104,475)	(97,729)	(44,671)
Mean Number of Owners	84.20	45.14	34.88	29.15	30.25	30.30
	(102.91)	(64.86)	(46.72)	(40.43)	(40.40)	(51.78)
Mean Home-Port Deliveries	0.75	0.67	0.63	0.58	0.79	0.79
	(0.02)	(0.02)	(0.02)	(0.01)	(0.03)	(0.01)

Processors per Port

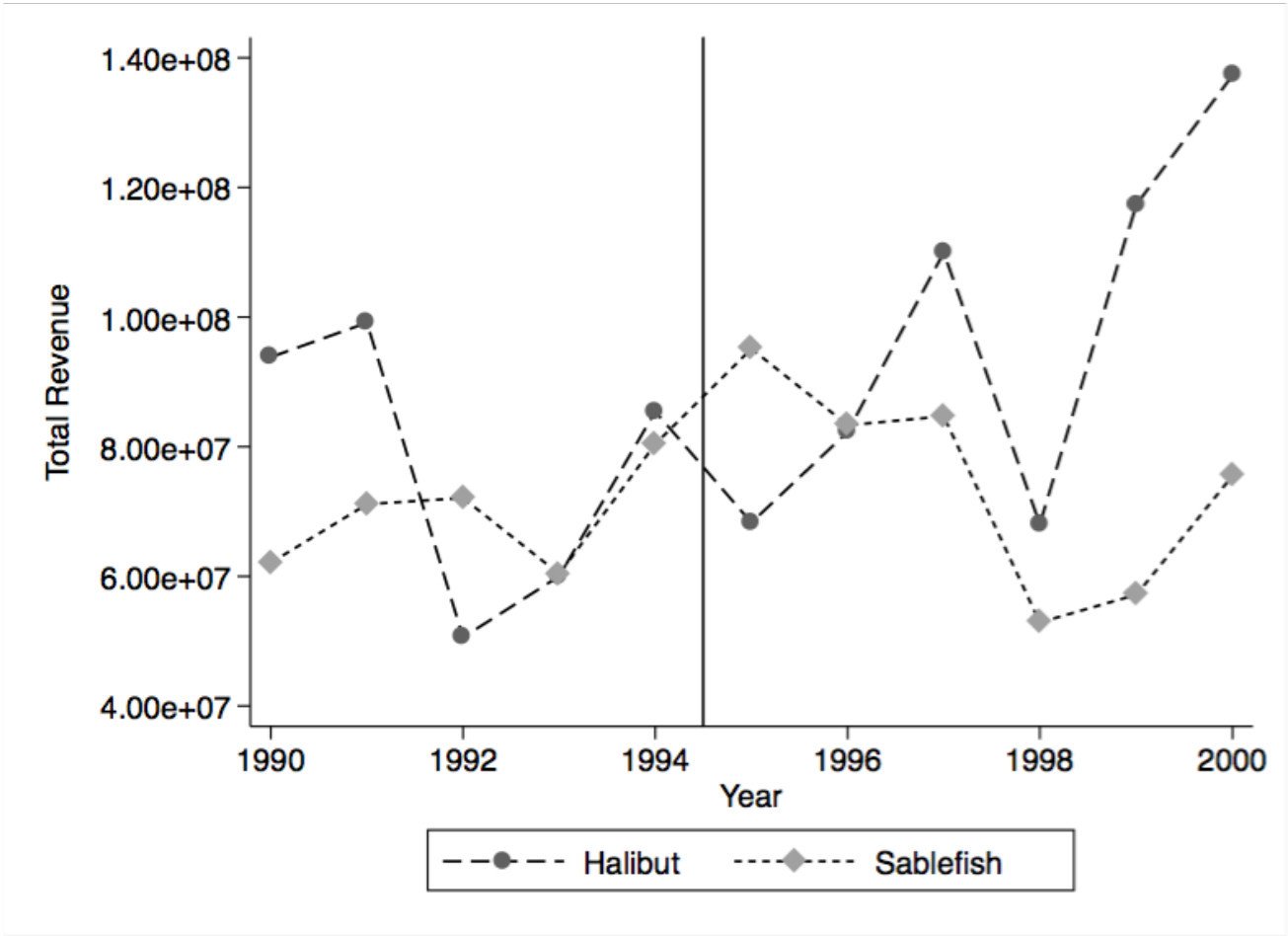


Processor Port Summary

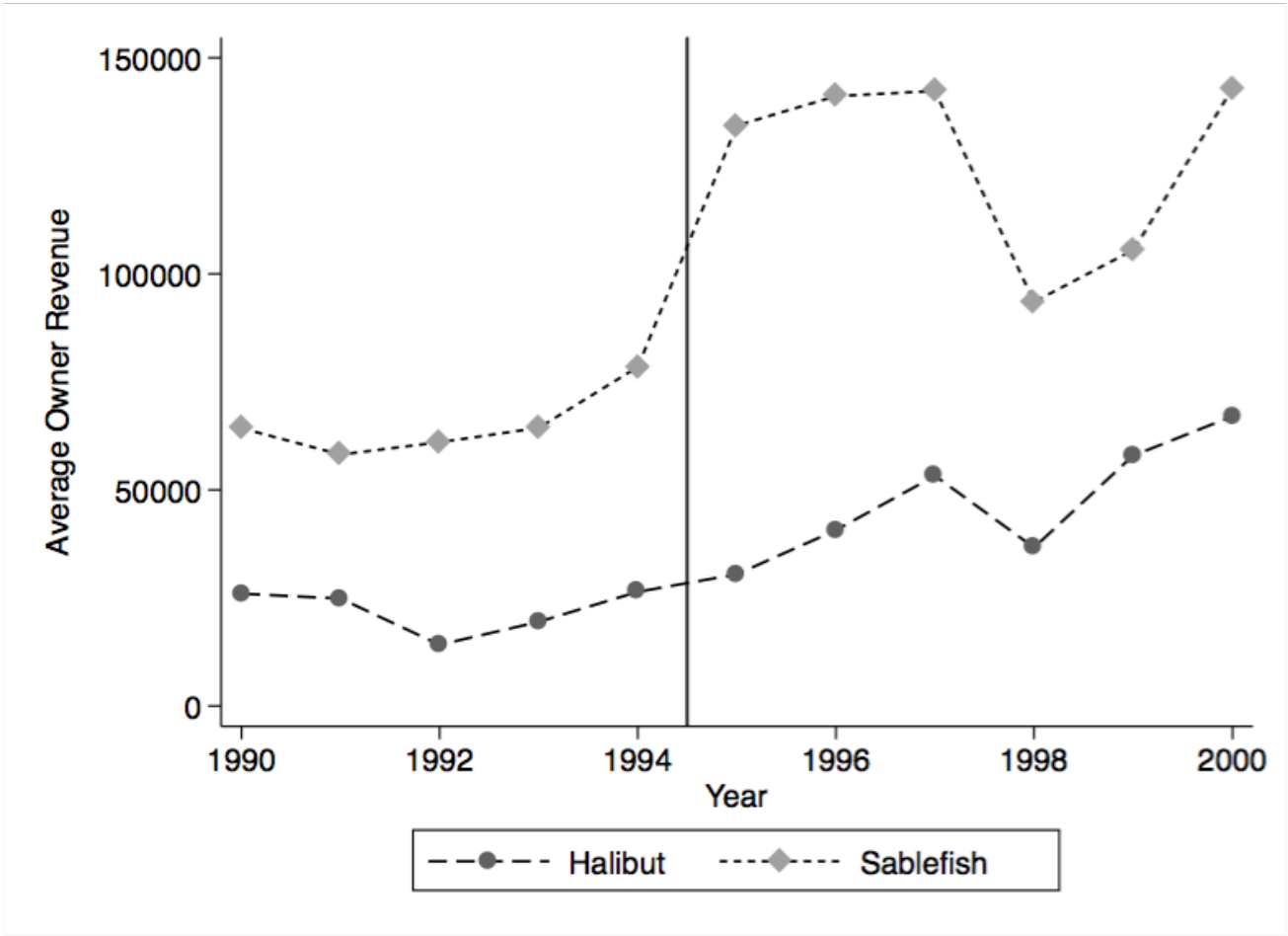
- Number of plants per city decreases
  - Halibut -0.137 $\rightarrow$ 12.8% decrease post-ITQ
  - Sablefish -0.174 $\rightarrow$ 16% decrease post-ITQ
- Revenue is positive but not statistically significant

Regression Table

Total Owner Revenue



Average Revenue per Vessel Owner

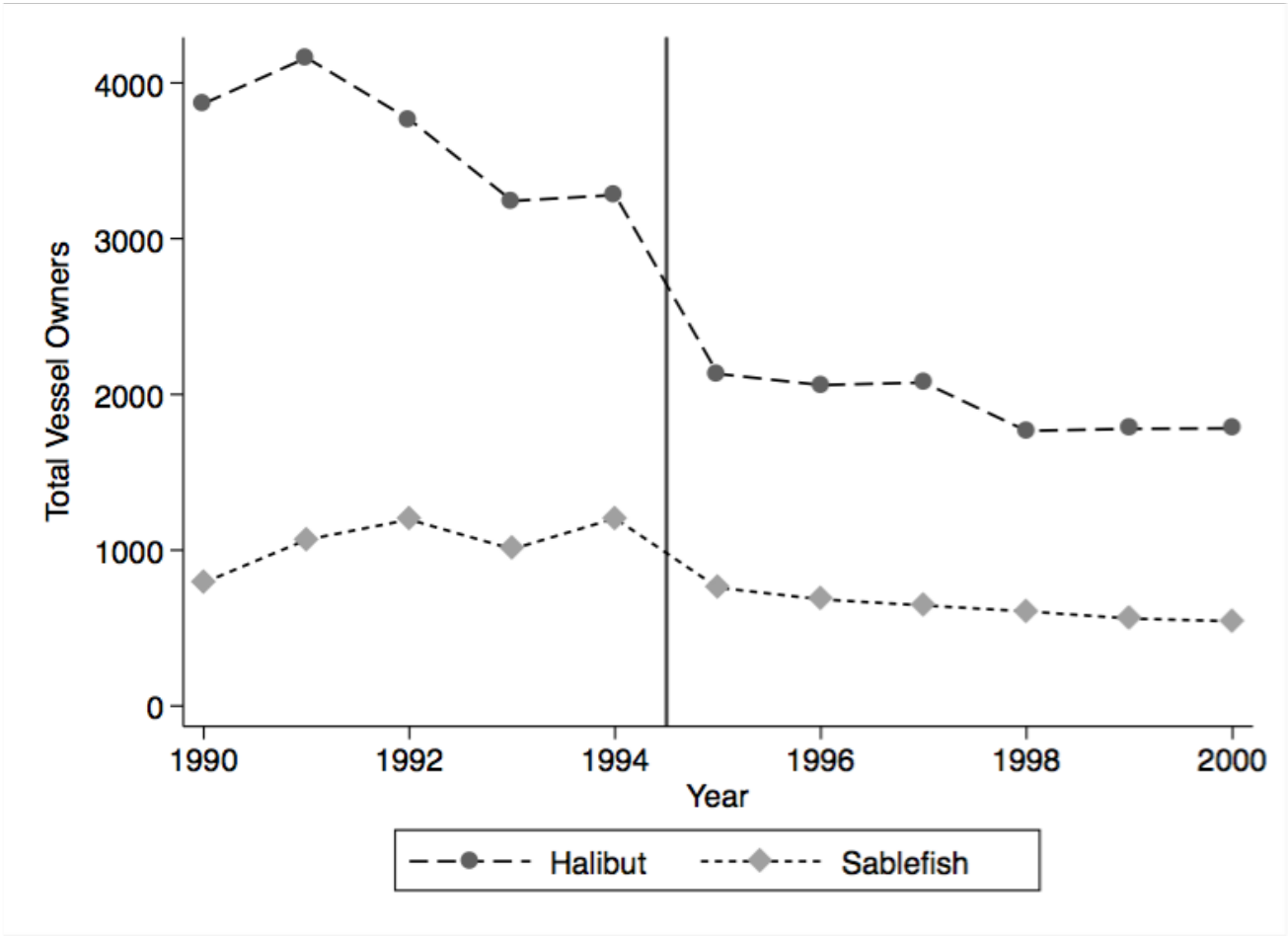


Owner City Revenue Summary

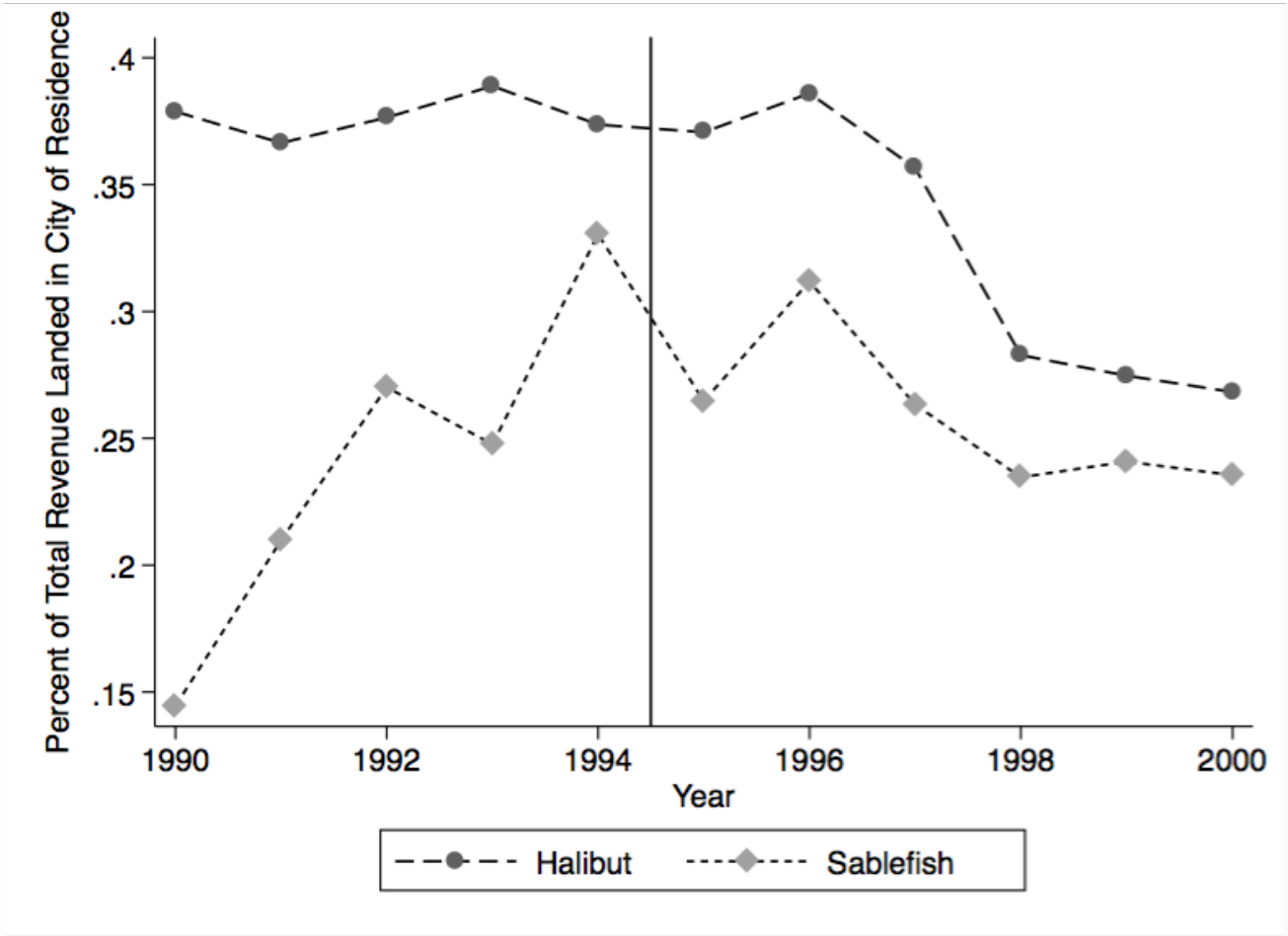
- Overall revenue is positive but not statistically significant
  - Cities on average are not receiving less revenue from owners and may be receiving more
- Revenue per owner increasing dramatically
  - Halibut 0.792 $\rightarrow$ 120% increase
  - Sablefish 0.665 $\rightarrow$ 94% increase

Regression Table

Active Participating Vessel Owners



Home Port Deliveries

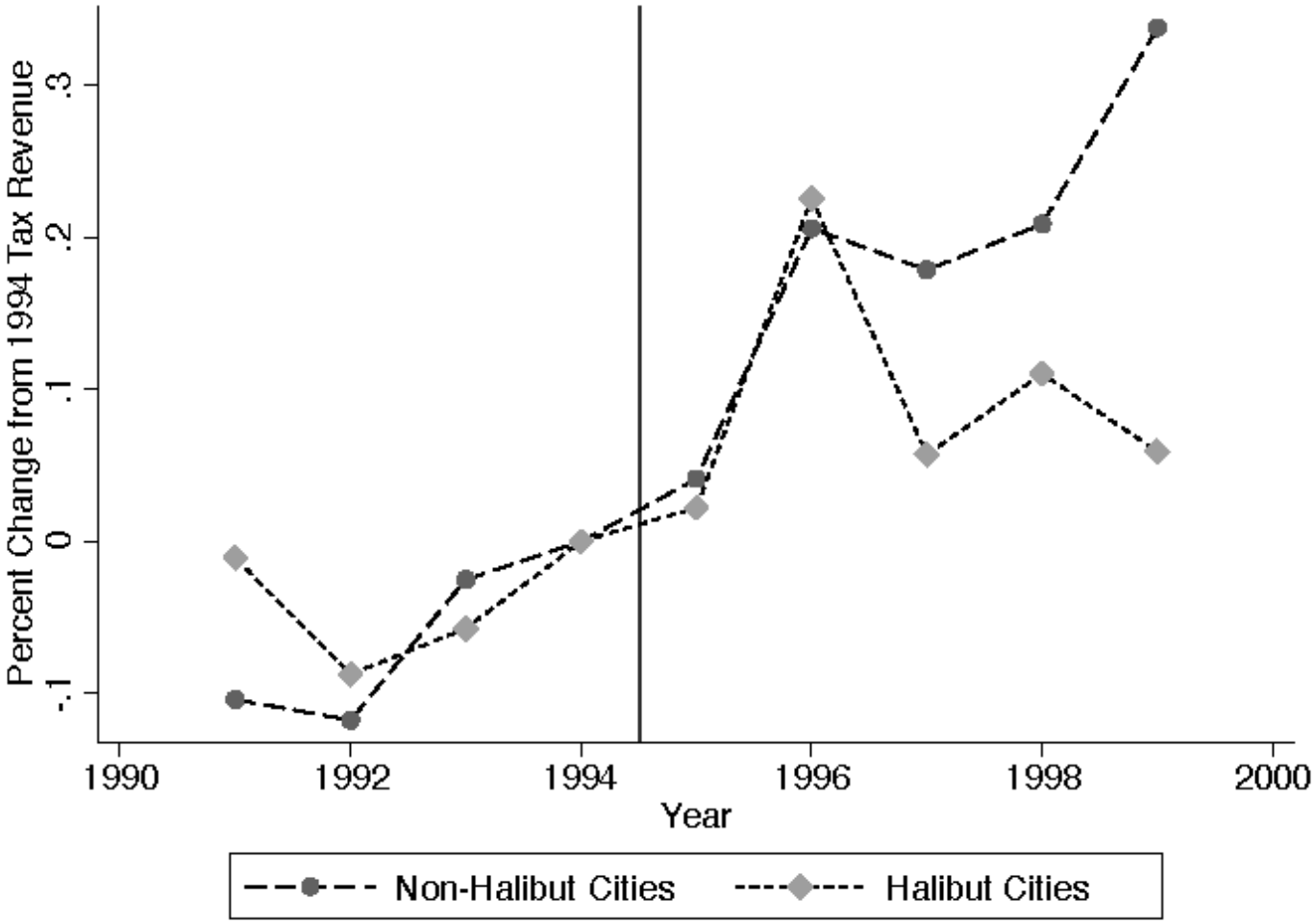


Owner City Revenue Summary

- Number of operating vessel owners per city decreases
  - Halibut -0.420 $\rightarrow$ 21.7% decrease in number of vessel owners
  - Sablefish -0.211 $\rightarrow$ 19% decrease in vessel owners but not significant at 10% level
- Percentage delivered to home port decreasing
  - Halibut 7.5 percentage point decrease (baseline 72%)
  - Sablefish 5 percentage point decrease (baseline 55%)

Regression Table

Sales Tax Revenue



Tax Revenue Summary

Sales tax revenue in halibut cities

- Halibut port: landed any halibut each year pre-ITQ
- Coefficient -0.224 $\rightarrow$ 20.0% decrease in revenues
- Halibut or Sablefish port: Laned either fish each year pre-ITQ
- Coefficient -0.153 $\rightarrow$ 14.2 % decrease in revenues

Regression Table

Conclusions

- ITQs lead to consolidation: fewer boats, fewer owners
- On average ports aren't worse off in terms of landings or aggregate fisher revenues
- But, with less capital and fewer local deliveries, sales tax revenues in these cities decline
- Changes in sablefish are much less significant than halibut
- An economist could argue, justifiably, that these "community effects" are positive, not negative

Thank you!

Processor Revenue and Consolidation

VARIABLES	(1) Log Count	(2) Log Count	(3) Log Count	(4) Log Count	(5) Log Revenue	(6) Log Revenue	(7) Log Revenue	(8) Log Revenue
Halibut	0.193**	0.331***	0.336***		1.213	2.577***	2.616***	
	(0.08)	(0.08)	(0.08)		(0.75)	(0.70)	(0.73)	
Sablefish	0.122**	0.131**	0.134**		1.297	1.383	1.325	
	(0.05)	(0.05)	(0.05)		(0.79)	(0.83)	(0.86)	
Both				0.239***				2.073***
				(0.06)				(0.74)
ITQxHalibut	-0.193***	-0.133**	-0.137**		0.141	0.3	0.284	
	(0.07)	(0.06)	(0.06)		(0.57)	(0.50)	(0.53)	
ITQxSablefish	-0.180**	-0.172***	-0.174***		-0.139	0.0389	0.105	
	(0.07)	(0.06)	(0.06)		(0.56)	(0.52)	(0.56)	
ITQxBoth				-0.151***				0.128
				(0.06)				(0.47)
Observations	979	979	979	979	907	907	907	907
R-squared	0.01	0.781	0.816	0.764	0.034	0.584	0.62	0.558
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Port FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Port Time Trend	No	No	Yes	No	No	No	Yes	No

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Owner Revenue (Avg and Tot) by Port

VARIABLES	(1) Log Revenue	(2) Log Revenue	(3) Log Revenue	(4) Log Revenue	(5) Log Avg Rev	(6) Log Avg Rev	(7) Log Avg Rev	(8) Log Avg Rev
Halibut	2.861***	3.510***	3.589***		1.978***	2.044***	2.078***	
	(0.639)	(0.606)	(0.624)		(0.499)	(0.477)	(0.497)	
Sablefish	2.922***	3.085***	3.102***		2.628***	2.824***	2.857***	
	(0.679)	(0.678)	(0.698)		(0.561)	(0.561)	(0.574)	
Both				3.328***				2.381***
				(0.613)				(0.514)
ITQxHalibut	0.222	0.448	0.385		0.592**	0.857***	0.792***	
	(0.445)	(0.382)	(0.356)		(0.279)	(0.249)	(0.246)	
ITQxSablefish	0.983*	0.608	0.585		0.866***	0.712**	0.665**	
	(0.521)	(0.390)	(0.431)		(0.315)	(0.281)	(0.309)	
ITQxBoth				0.534				0.746***
				(0.349)				(0.236)
Observations	810	810	810	810	810	810	810	810
R-squared	0.225	0.676	0.707	0.674	0.318	0.652	0.667	0.637
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Port FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Port Time Trend	No	No	Yes	No	No	No	Yes	No

Cluster robust standard errors in parentheses

$***p < 0.01, **p < 0.05, *p < 0.1$

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Owner Consolidation and Delivery Locations

VARIABLES	(1) Log Count	(2) Log Count	(3) Log Count	(4) Log Count	(5) Percent Home	(6) Percent Home
Halibut	0.947***	1.221***	1.282***		-0.0493***	
	(0.19)	(0.13)	(0.12)		(0.00)	
Sablefish	0.0154	-0.109	-0.114		-0.165***	
	(0.20)	(0.19)	(0.20)		(0.00)	
Both				0.643***		-0.0990***
				(0.13)		(0.00)
ITQxHalibut	-0.399*	-0.325*	-0.420***		-0.0751***	
	(0.20)	(0.18)	(0.15)		(0.00)	
ITQxSablefish	-0.119	-0.218*	-0.211		-0.0499***	
	(0.16)	(0.13)	(0.14)		(0.00)	
ITQxBoth				-0.178		-0.0580***
				(0.15)		(0.00)
Observations	748	748	748	748	810	810
R-squared	0.106	0.816	0.847	0.694	0.964	0.719
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Port FE	No	Yes	Yes	Yes	Yes	Yes
Port Time Trend	No	No	Yes	No	Yes	No

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Sales Tax Revenue

VARIABLES	(1) Log(tax revenue)	(2) Log(tax revenue)	(3) Log(tax revenue)	(4) Log(tax revenue)	(5) Log(tax revenue)	(6) Log(tax revenue)
Tax Rate	32.20***	16.07***	15.97***	30.36***	16.23***	16.12***
	(7.44)	(5.18)	(5.18)	(7.18)	(5.24)	(5.25)
Halibut Port	0.836***	-3.222***	-3.101***			
	(0.23)	(0.00)	(0.10)			
Halibut x Post-1994	-0.18	-0.227**	-0.224**			
	(0.15)	(0.11)	(0.11)			
Log(population)	1.301***		0.0496	1.292***		0.0516
	(0.09)		(0.04)	(0.09)		(0.04)
Halibut and Sablefish Ports				0.895***	-3.761***	-3.586***
				(0.22)	(0.06)	(0.14)
Both Ports x Post-1994				-0.0471	-0.156*	-0.153*
				(0.11)	(0.09)	(0.09)
Observations	686	686	686	686	686	686
R-squared	0.809	0.981	0.981	0.811	0.98	0.98
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	No	Yes	Yes	No	Yes	Yes

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