Appendix A
Simulation Runs

Table A.1. Results of simulation for open access in the Gulf of Mexico shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Policy Description			Results in Year 2021					
Vessels w/License Moratorium	Shrimp Prices Received	Simulation Results In Year	FTEV**	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE***	Present Value Economic Profit (mil. $)
			----------Results for small vessels----------					
N		2004	6,481	130	48	373	607	
N	Low	2021	4,537	92	40	438	741	(36)
N	High	2021	7,403	148	50	338	805	164
			----------Results for large vessels----------					
N		2004	1,954	145	770	448	1,286	
N	Low	2021	1,357	118	73	614	1,704	(43)
N	High	2021	2,163	179	77	432	1,726	358

* N = N; L = Large vessels only; SL = Small and Large vessels
** Full time equivalent vessels (FTEV)
*** Revenue per unit effort (RPUE)

Table A.2. Results of simulation for open access in the South Atlantic shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Policies Description			Results in Year 2021					
Vessels w/License Moratorium	Shrimp Prices Received	Simulation Results In Year	FTEV**	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE***	Present Value Economic Profit (mil. $)
			----------Results for small vessels----------					
N		2004	1,579	24	7	302	9036	
N	Low	2021	1,277	19	7	379	1,149	(11)
N	High	2021	2,390	41	11	276	1,230	36
			----------Results for large vessels----------					
N		2004	705	13	9	696	2,148	
N	Low	2021	302	6	6	915	2,841	(30)
N	High	2021	604	12	8	632	2,840	20

* N = N; L = Large vessels only; SL = Small and Large vessels
** Full time equivalent vessels (FTEV)
*** Revenue per unit effort (RPUE)

Table A.3. Results of simulation for a permit/license moratorium in the Gulf of Mexico shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Policy Description		Results in Year 2021					
Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
		----------Results for small vessels----------					
L	Low	4,705	95	50	444	761	(38)
SL	Low	4,681	94	50	445	764	(37)
L	High	7,915	159	83	341	829	125
SL	High	5,942	119	63	394	977	194
		----------Results for large vessels----------					
L	Low	1,253	96	93	653	1,846	(153)
SL	Low	1,254	96	93	654	1,848	(153)
L	High	1,670	125	121	505	2,079	191
SL	High	1,696	126	122	538	2,220	249

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.4. Results of simulation for a permit/license moratorium in the South Atlantic shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Policy Description		Results in Year 2021					
Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
		----------Results for small vessels----------					
L	Low	1,274	19	19	375	1,135	(10)
SL	Low	1,246	18	18	377	1,138	(10)
L	High	2,472	42	42	277	1,236	45
SL	High	1,509	23	23	315	1,405	51
		----------Results for large vessels----------					
L	Low	308	6	6	889	2,777	(32)
SL	Low	309	6	6	897	2,802	(31)
L	High	575	11	11	632	2,840	3
SL	High	619	12	12	734	3,298	22

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.5. Results of simulation for a government buyback program in the Gulf of Mexico shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Results for Small Vessels

Policy Description				Results in Year 2021					
Percent License Bought	Vessels Bought Back	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
10	L	N	Low	4,623	93	50	440	753	(40)
30	L	N	Low	4,671	95	50	438	750	(38)
50	L	N	Low	4,767	97	51	435	745	(36)
10	SL	N	Low	4,623	93	50	440	753	(40)
30	SL	N	Low	4,637	94	50	439	752	(37)
50	SL	N	Low	4,456	90	47	444	759	(25)
10	L	N	High	7,496	150	79	338	811	98
30	L	N	High	7,561	151	80	336	808	110
50	L	N	High	7,723	155	81	332	797	131
10	SL	N	High	7,496	150	79	338	811	98
30	SL	N	High	7,379	147	77	338	812	112
50	SL	N	High	7,172	143	74	337	804	133
10	L	L	Low	4,673	94	50	441	758	(39)
30	L	L	Low	4,816	98	52	439	759	(34)
50	L	L	Low	5,177	106	57	437	767	(21)
10	SL	SL	Low	4,659	94	50	442	760	(38)
30	SL	SL	Low	4,787	97	51	441	762	(31)
50	SL	SL	Low	4,620	93	49	460	801	(3)
10	L	L	High	7,927	159	84	340	828	126
30	L	L	High	8,231	166	87	341	840	154
50	L	L	High	8,571	173	91	342	857	189
10	SL	SL	High	5,950	119	63	395	981	198
30	SL	SL	High	5,794	116	61	410	1,033	236
50	SL	SL	High	5,366	107	55	435	1,110	276

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.5 (Continued).

Results for Large Vessels

Policy Description				Results in Year 2021					
Percent License Bought	Vessels Bought Back	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
10	L	N	Low	1,395	106	103	629	1,751	(62)
30	L	N	Low	1,384	106	102	628	1,750	(18)
50	L	N	Low	1,362	104	101	628	1,751	32
10	SL	N	Low	1,395	106	103	629	1,751	(62)
30	SL	N	Low	1,394	106	103	629	1,752	(17)
50	SL	N	Low	1,426	109	106	629	1,748	46
10	L	N	High	2,243	170	165	437	1,745	110
30	L	N	High	2,226	169	164	437	1,746	207
50	L	N	High	2,206	168	163	435	1,740	329
10	SL	N	High	2,243	170	165	437	1,745	110
30	SL	N	High	2,282	173	167	438	1,749	222
50	SL	N	High	2,378	181	175	436	1,737	389
10	L	L	Low	1,326	99	96	647	1,815	(46)
30	L	L	Low	1,212	90	87	668	1,894	30
50	L	L	Low	901	67	65	737	2,148	146
10	SL	SL	Low	1,326	99	96	647	1,816	(46)
30	SL	SL	Low	1,213	90	87	670	1,899	36
50	SL	SL	Low	915	68	66	764	2,229	185
10	L	L	High	1,658	123	119	508	2,095	358
30	L	L	High	1,288	96	93	567	2,391	496
50	L	L	High	920	68	66	644	2,791	567
10	SL	SL	High	1,658	123	119	545	2,254	439
30	SL	SL	High	1,288	96	93	623	2,639	604
50	SL	SL	High	920	68	66	740	3,227	717

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.6. Results of simulation for the number of vessels purchased, price per vessels and total government costs for a vessel-buyback program in 2004 in the Gulf of Mexico shrimp fishery

				Number Purchased				Buyback Price		Cost to Gov't (mil. $)	
Percent Vessels Bought	Vessels Bought Back	Vessels w/License Moratorium	Year of Shrimp Prices	Small Vessel License	Large Vessel License	Small FTEV	Large FTEV	Small Vessels	Large Vessels	Small Vessels	Large Vessels
10	L	N	Low	-	185	-	142	-	99,946	-	18.5
30	L	N	Low	-	554	-	507	-	100,127	-	55.5
50	L	N	Low	-	924	-	875	-	100,054	-	92.5
10	SL	N	Low	-	-	-	-	-	-	-	-
30	SL	N	Low	3,656	554	433	507	6,327	100,127	23.1	55.5
50	SL	N	Low	6,096	924	849	875	6,324	100,054	38.6	92.5
10	L	N	High	-	185	-	137	-	128,187	-	23.7
30	L	N	High	-	554	-	507	-	128,419	-	71.1
50	L	N	High	-	924	-	875	-	128,326	-	118.6
10	SL	N	High	1,218	185	43	137	7,902	128,187	9.6	23.7
30	SL	N	High	3,656	554	199	507	7,898	128,419	28.9	71.1
50	SL	N	High	6,096	924	627	875	7,894	128,326	48.1	118.6
10	L	L	Low	-	185	-	142	-	99,946	-	18.5
30	L	L	Low	-	554	-	507	-	100,127	-	55.5
50	L	L	Low	-	924	-	875	-	100,054	-	92.5
10	SL	SL	Low	1,218	185	348	142	6,330	99,946	7.7	18.5
30	SL	SL	Low	3,656	554	433	507	6,327	100,127	23.1	55.5
50	SL	SL	Low	6,096	924	849	875	6,324	100,054	38.6	92.5
10	L	L	High	-	185	-	137	-	128,187	-	23.7
30	L	L	High	-	554	-	507	-	128,419	-	71.1
50	L	L	High	-	924	-	875	-	128,326	-	118.6
10	SL	SL	High	1,218	185	43	137	7,902	128,187	9.6	23.7
30	SL	SL	High	3,656	554	199	507	7,898	128,419	28.9	71.1
50	SL	SL	High	6,096	924	627	875	7,894	128,326	48.1	118.6

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.7. Results of simulation for a government buyback program in the South Atlantic shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Results for Small Vessels

Policy Description				Results in Year 2021					
Percent License Bought	Vessels Bought Back	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
10	L	N	Low	1,297	19	19	379	1,150	(9)
30	L	N	Low	1,395	20	20	379	1,154	(5)
50	L	N	Low	1,516	22	22	380	1,159	(1)
10	SL	N	Low	1,237	18	18	381	1,157	(7)
30	SL	N	Low	1,161	18	18	388	1,180	2
50	SL	N	Low	1,018	16	16	396	1,202	8
10	L	N	High	2,424	41	41	276	1,230	43
30	L	N	High	2,563	43	43	276	1,232	51
50	L	N	High	2,747	46	46	277	1,237	62
10	SL	N	High	2,264	39	39	278	1,240	43
30	SL	N	High	2,002	35	35	283	1,262	51
50	SL	N	High	1,681	29	29	293	1,308	59
10	L	L	Low	1,297	19	19	379	1,150	(9)
30	L	L	Low	1,395	20	20	379	1,154	(5)
50	L	L	Low	1,516	22	22	380	1,159	(1)
10	SL	SL	Low	1,193	17	17	383	1,159	(7)
30	SL	SL	Low	1,022	15	15	397	1,198	2
50	SL	SL	Low	756	12	12	433	1,303	10
10	L	L	High	2,528	43	43	278	1,241	48
30	L	L	High	2,745	46	46	281	1,258	60
50	L	L	High	2,975	49	49	286	1,282	74
10	SL	SL	High	1,366	21	21	329	1,466	55
30	SL	SL	High	1,063	16	16	372	1,662	65
50	SL	SL	High	759	12	12	430	1,915	68

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.7 (Continued).

Results for Large Vessels

Policy Description				Results in Year 2021					Present Value Economic Profit (mil. $)
Percent License Bought	Vessels Bought Back	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	
10	L	N	Low	294	6	6	915	2,841	(30)
30	L	N	Low	253	5	5	922	2,860	(20)
50	L	N	Low	203	4	4	929	2,885	(13)
10	SL	N	Low	304	6	6	921	2,859	(28)
30	SL	N	Low	294	6	6	937	2,909	(16)
50	SL	N	Low	294	6	6	955	2,968	(5)
10	L	N	High	592	12	12	633	2,843	3
30	L	N	High	547	11	11	637	2,858	9
50	L	N	High	473	9	9	643	2,888	15
10	SL	N	High	629	12	12	636	2,854	6
30	SL	N	High	666	13	13	645	2,896	21
50	SL	N	High	671	13	13	672	3,016	40
10	L	L	Low	294	6	6	915	2,841	(30)
30	L	L	Low	253	5	5	922	2,860	(20)
50	L	L	Low	203	4	4	929	2,885	(13)
10	SL	SL	Low	308	6	6	931	2,891	(28)
30	SL	SL	Low	307	6	6	960	2,983	(14)
50	SL	SL	Low	310	6	6	1,033	3,214	(2)
10	L	L	High	555	11	11	644	2,891	6
30	L	L	High	448	8	8	661	2,968	14
50	L	L	High	323	6	6	684	3,073	17
10	SL	SL	High	582	11	11	773	3,472	32
30	SL	SL	High	452	8	8	884	3,974	53
50	SL	SL	High	323	6	6	1,024	4,605	63

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.8. Results of simulation for the number of vessels purchased, price per vessels and total government costs for a vessel-buyback program in 2004 in the South Atlantic shrimp fishery

				Number Purchased				Buyback Price		Cost to Gov't (mil. $)	
Percent Vessels Bought	Vessels Bought Back	Vessels w/License Moratorium	Year of Shrimp Prices	Small Vessel License	Large Vessel License	Small FTEV	Large FTEV	Small Vessels	Large Vessels	Small Vessels	Large Vessels
10	L	N	Low	-	65	-	65	-	41,461	-	2.7
30	L	N	Low	-	195	-	195	-	41,461	-	8.1
50	L	N	Low	-	326	-	326	-	41,333	-	13.5
10	SL	N	Low	152	65	152	65	14,183	41,461	2.2	2.7
30	SL	N	Low	457	195	457	195	14,152	41,461	6.5	8.1
50	SL	N	Low	762	326	762	326	14,146	41,333	10.8	13.5
10	L	N	High	-	65	-	65	-	51,822	-	3.4
30	L	N	High	-	195	-	195	-	51,822	-	10.1
50	L	N	High	-	326	-	326	-	51,663	-	16.8
10	SL	N	High	152	65	152	65	17,948	51,822	2.7	3.4
30	SL	N	High	457	195	457	195	17,909	51,822	8.2	10.1
50	SL	N	High	762	326	762	326	17,901	51,663	13.6	16.8
10	L	L	Low	-	65	-	65	-	41,461	-	2.7
30	L	L	Low	-	195	-	195	-	41,461	-	8.1
50	L	L	Low	-	326	-	326	-	41,333	-	13.5
10	SL	SL	Low	152	65	152	65	14,183	41,461	2.2	2.7
30	SL	SL	Low	457	195	457	195	14,152	41,461	6.5	8.1
50	SL	SL	Low	762	326	762	326	14,146	41,333	10.8	13.5
10	L	L	High	-	65	-	65	-	51,822	-	3.4
30	L	L	High	-	195	-	195	-	51,822	-	10.1
50	L	L	High	-	326	-	326	-	51,663	-	16.8
10	SL	SL	High	152	65	152	65	17,948	51,822	2.7	3.4
30	SL	SL	High	457	195	457	195	17,909	51,822	8.2	10.1
50	SL	SL	High	762	326	762	326	17,901	51,663	13.6	16.8

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.9. Results of simulation for a buyback program with a loan government loan to shrimpers to be paid back in 10 years in the Gulf of Mexico shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Results for Small Vessels

Policy Description				Results in Year 2021					
Percent License Bought	Vessels Bought Back	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
10	L	N	Low	4,643	94	50	439	752	(40)
30	L	N	Low	4,756	96	51	435	745	(36)
50	L	N	Low	4,913	100	53	430	737	(33)
10	SL	N	Low	4,574	92	49	441	756	(43)
30	SL	N	Low	4,508	91	48	442	758	(43)
50	SL	N	Low	4,269	86	45	448	768	(39)
10	L	N	High	7,496	150	79	338	811	98
30	L	N	High	7,561	151	80	336	808	110
50	L	N	High	7,723	155	81	332	797	131
10	SL	N	High	7,464	149	78	339	813	94
30	SL	N	High	7,282	145	76	340	818	99
50	SL	N	High	6,997	140	73	340	814	111
10	L	L	Low	4,703	95	51	441	759	(38)
30	L	L	Low	4,881	99	53	439	760	(31)
50	L	L	Low	5,205	106	57	437	769	(19)
10	SL	SL	Low	4,612	93	49	444	766	(40)
30	SL	SL	Low	4,591	93	49	450	780	(36)
50	SL	SL	Low	4,399	88	46	469	823	(19)
10	L	L	High	7,927	159	84	340	828	126
30	L	L	High	8,231	166	87	341	840	154
50	L	L	High	8,571	173	91	342	857	189
10	SL	SL	High	5,950	119	63	395	981	191
30	SL	SL	High	5,794	116	61	410	1,033	214
50	SL	SL	High	5,366	107	55	435	1,110	240

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.9 (Continued).

Results for Large Vessels

Policy Description				Results in Year 2021					
Percent License Bought	Vessels Bought Back	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
10	L	N	Low	1,392	106	103	628	1,751	(67)
30	L	N	Low	1,369	105	102	626	1,746	(28)
50	L	N	Low	1,336	103	100	627	1,749	6
10	SL	N	Low	1,404	107	104	628	1,748	(66)
30	SL	N	Low	1,418	108	105	627	1,743	(24)
50	SL	N	Low	1,458	112	109	626	1,736	21
10	L	N	High	2,243	170	165	437	1,745	110
30	L	N	High	2,226	169	164	437	1,746	207
50	L	N	High	2,206	168	163	435	1,740	329
10	SL	N	High	2,252	170	165	437	1,745	102
30	SL	N	High	2,306	175	169	437	1,743	185
50	SL	N	High	2,412	184	178	436	1,732	314
10	L	L	Low	1,292	97	94	653	1,838	(48)
30	L	L	Low	1,147	86	83	680	1,937	12
50	L	L	Low	867	65	63	747	2,183	87
10	SL	SL	Low	1,295	97	94	655	1,844	(44)
30	SL	SL	Low	1,162	87	84	690	1,965	26
50	SL	SL	Low	874	65	63	785	2,304	137
10	L	L	High	1,658	123	119	508	2,095	341
30	L	L	High	1,288	96	93	567	2,391	443
50	L	L	High	920	68	66	644	2,791	479
10	SL	SL	High	1,658	123	119	545	2,254	422
30	SL	SL	High	1,288	96	93	623	2,639	551
50	SL	SL	High	920	68	66	740	3,227	629

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.10. Results of simulation for the number of vessels purchased, price per vessels and total government costs for a vessels buyback program in 2004 with a government in the Gulf of Mexico shrimp fishery

				Number Remaining				Total Annual Payment (mil. $)		Annual Payment Per Licensed Vessel	
Percent Vessels Bought	Vessels Bought Back	Vessels w/License Moratorium	Year of Shrimp Prices	Small Vessel License	Large Vessel License	Small FTEV	Large FTEV	Small Vessels	Large Vessels	Small Vessels	Large Vessels
10	L	N	Low	-	1,661	-	1,653	-	2.4		1,442
30	L	N	Low	-	1,291	-	1,288	-	7.2		5,564
50	L	N	Low	-	923	-	920	-	12.0		12,972
10	SL	N	Low	10,967	1,661	5,645	1,653	1.0	2.4	91	1,442
30	SL	N	Low	8,529	1,291	5,560	1,288	3.0	7.2	351	5,564
50	SL	N	Low	6,093	923	5,144	920	5.0	12.0	819	12,972
10	L	N	High	-	1,661	-	1,658	-	3.1		1,849
30	L	N	High	-	1,291	-	1,288	-	9.2		7,137
50	L	N	High	-	923	-	920	-	15.4		16,637
10	SL	N	High	10,967	1,661	5,950	1,658	1.2	3.1	114	1,849
30	SL	N	High	8,529	1,291	5,794	1,288	3.7	9.2	438	7,137
50	SL	N	High	6,093	923	5,366	920	6.2	15.4	1,023	16,637
10	L	L	Low	-	1,661	-	1,653	-	2.4		1,442
30	L	L	Low	-	1,291	-	1,288	-	7.2		5,564
50	L	L	Low	-	923	-	920	-	12.0		12,972
10	SL	SL	Low	10,967	1,661	5,645	1,653	1.0	2.4	91	1,442
30	SL	SL	Low	8,529	1,291	5,560	1,288	3.0	7.2	351	5,564
50	SL	SL	Low	6,093	923	5,144	920	5.0	12.0	819	12,972
10	L	L	High	-	1,661	-	1,658	-	5.5		3,298
30	L	L	High	-	1,291	-	1,288	-	9.2		7,137
50	L	L	High	-	923	-	920	-	15.4		16,637
10	SL	SL	High	10,967	1,661	5,950	1,658	1.2	3.1	114	1,849
30	SL	SL	High	8,529	1,291	5,794	1,288	3.7	9.2	438	7,137
50	SL	SL	High	6,093	923	5,366	920	6.2	15.4	1,023	16,637

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.11.Results of simulation for a buyback program with a loan government loan to shrimpers to be paid back in 10 years in the South Atlantic shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Results for Small Vessels

Policy Description				Results in Year 2021					
Percent License Bought	Vessels Bought Back	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
10	L	N	Low	1,305	19	19	379	1,151	(9)
30	L	N	Low	1,435	21	21	382	1,163	(5)
50	L	N	Low	1,586	23	23	384	1,173	(1)
10	SL	N	Low	1,227	18	18	383	1,162	(7)
30	SL	N	Low	1,110	17	17	396	1,204	2
50	SL	N	Low	941	15	15	417	1,271	8
10	L	N	High	2,446	42	42	276	1,233	43
30	L	N	High	2,635	44	44	277	1,239	51
50	L	N	High	2,877	48	48	280	1,254	62
10	SL	N	High	2,253	39	39	279	1,245	43
30	SL	N	High	1,972	34	34	285	1,273	51
50	SL	N	High	1,622	28	28	298	1,331	59
10	L	L	Low	1,305	19	19	379	1,151	(9)
30	L	L	Low	1,435	21	21	382	1,163	(5)
50	L	L	Low	1,586	23	23	384	1,174	(1)
10	SL	SL	Low	1,174	17	17	386	1,167	(7)
30	SL	SL	Low	978	15	15	407	1,233	2
50	SL	SL	Low	720	11	11	451	1,366	10
10	L	L	High	2,528	43	43	278	1,240	48
30	L	L	High	2,745	46	46	281	1,258	60
50	L	L	High	2,978	49	49	287	1,284	74
10	SL	SL	High	1,366	21	21	329	1,466	55
30	SL	SL	High	1,063	16	16	372	1,662	65
50	SL	SL	High	759	12	12	430	1,915	68

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A-11. (Continued)

Results for Large Vessels

Policy Description				Results in Year 2021					
Percent License Bought	Vessels Bought Back	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
10	L	N	Low	287	6	6	918	2,849	(30)
30	L	N	Low	226	5	5	931	2,890	(20)
50	L	N	Low	155	3	3	945	2,935	(13)
10	SL	N	Low	300	6	6	925	2,871	(28)
30	SL	N	Low	276	6	6	955	2,965	(16)
50	SL	N	Low	248	5	5	1,004	3,121	(5)
10	L	N	High	581	11	11	635	2,852	3
30	L	N	High	501	10	10	643	2,887	9
50	L	N	High	388	8	8	659	2,961	15
10	SL	N	High	624	12	12	640	2,873	6
30	SL	N	High	652	13	13	653	2,932	21
50	SL	N	High	636	13	13	687	3,085	40
10	L	L	Low	287	6	6	918	2,849	(30)
30	L	L	Low	226	5	5	931	2,890	(20)
50	L	L	Low	151	3	3	946	2,936	(13)
10	SL	SL	Low	303	6	6	937	2,909	(28)
30	SL	SL	Low	291	6	6	988	3,070	(14)
50	SL	SL	Low	227	5	5	1,090	3,394	(2)
10	L	L	High	551	11	11	643	2,888	6
30	L	L	High	448	8	8	661	2,968	14
50	L	L	High	313	6	6	686	3,079	17
10	SL	SL	High	582	11	11	773	3,472	32
30	SL	SL	High	452	8	8	884	3,974	53
50	SL	SL	High	323	6	6	1,024	4,605	63

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.12.Results of simulation for the number of vessels purchased, price per vessels and total government costs for a vessels buyback program in 2004 with a government in the South Atlantic shrimp fishery

				Number Remaining				Total Annual Payment (mil. $)		Annual Payment Per Licensed Vessel	
Percent Vessels Bought	Vessels Bought Back	Vessels w/License Moratorium	Year of Shrimp Prices	Small Vessel License	Large Vessel License	Small FTEV	Large FTEV	Small Vessels	Large Vessels	Small Vessels	Large Vessels
10	L	N	2002	-	584	-	582	-	0.3		598
20	L	N	2002	-	454	-	452	-	1.0		2,306
30	L	N	2002	-	324	-	323	-	1.7		5,386
10	SL	N	2002	1,366	584	1,366	582	0.3	0.3	204	598
20	SL	N	2002	1,063	454	1,063	452	0.8	1.0	788	2,306
30	SL	N	2002	759	324	759	323	1.4	1.7	1,839	5,386
10	L	N	2000	-	584	-	582	-	0.4		747
20	L	N	2000	-	454	-	452	-	1.3		2,883
30	L	N	2000	-	324	-	323	-	2.2		6,732
10	SL	N	2000	1,366	584	1,366	582	0.4	0.4	259	747
20	SL	N	2000	1,063	454	1,063	452	1.1	1.3	997	2,883
30	SL	N	2000	759	324	759	323	1.8	2.2	2,327	6,732
10	L	L	2002	-	584	-	582	-	0.3		598
20	L	L	2002	-	454	-	452	-	1.0		2,306
30	L	L	2002	-	324	-	323	-	1.7		5,386
10	SL	SL	2002	1,366	584	1,366	582	0.3	0.3	204	598
20	SL	SL	2002	1,063	454	1,063	452	0.8	1.0	788	2,306
30	SL	SL	2002	759	324	759	323	1.4	1.7	1,839	5,386
10	L	L	2000	-	584	-	582	-	0.4		747
20	L	L	2000	-	454	-	452	-	1.3		2,883
30	L	L	2000	-	324	-	323	-	2.2		6,732
10	SL	SL	2000	1,366	584	1,366	582	0.4	0.4	259	747
20	SL	SL	2000	1,063	454	1,063	452	1.1	1.3	997	2,883
30	SL	SL	2000	759	324	759	323	1.8	2.2	2,327	6,732

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.13.Results of simulation for a government price support program in the Gulf of Mexico shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Policy Description			Results in Year 2021					
Maximum Percent Increase In Average Price	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
			----------Results for small vessels----------					
5	N	Low	5,172	104	55	419	749	(28)
10	N	Low	5,664	114	60	401	759	(6)
20	N	Low	6268	125	66	379	775	25
5	N	High	7,404	148	78	338	805	95
10	N	High	7,416	148	78	337	805	97
20	N	High	7525	150	79	335	808	104
5	SL	Low	5,322	107	57	424	767	(21)
10	SL	Low	5,790	116	61	407	780	3
20	SL	Low	5952	119	63	397	826	53
5	SL	High	5,944	119	63	394	978	194
10	SL	High	5,955	119	63	394	978	196
20	SL	High	5,985	120	63	393	985	205
			----------Results for large vessels----------					
5	N	Low	1,377	120	116	588	1,693	(42)
10	N	Low	1,495	130	126	552	1,690	(10)
20	N	Low	1662	142	138	512	1,693	26
5	N	High	2,163	179	173	432	1,726	135
10	N	High	2,162	178	173	432	1,726	135
20	N	High	2155	178	172	430	1,724	135
5	SL	Low	1,295	99	96	623	1,823	(25)
10	SL	Low	1,432	109	105	584	1,813	7
20	SL	Low	1615	121	117	549	1,845	67
5	SL	High	1,696	126	122	538	2,220	424
10	SL	High	1,697	127	123	538	2,218	424
20	SL	High	1,703	127	123	536	2,215	425

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.14.Results of simulation for a government price support program in the South Atlantic shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Policy Description			Results in Year 2021					
Maximum Percent Increase In Average Price	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
			----------Results for small vessels----------					
5	N	Low	2,656	48	48	256	1,238	65
10	N	Low	2,945	53	53	239	1,265	89
20	N	Low	3,235	58	58	224	1,298	119
5	N	High	2,793	50	50	250	1,274	76
10	N	High	3,026	55	55	236	1,296	100
20	N	High	3,287	60	60	222	1,326	129
5	SL	Low	1,521	23	23	312	1,508	74
10	SL	Low	1,521	23	23	311	1,647	101
20	SL	Low	1,521	23	23	311	1,807	132
5	SL	High	1,521	23	23	312	1,571	86
10	SL	High	1,521	23	23	311	1,691	109
20	SL	High	1,521	23	23	311	1,842	138
			----------Results for large vessels----------					
5	N	Low	708	14	14	613	2,944	12
10	N	Low	851	16	16	567	2,983	28
20	N	Low	1,013	19	19	525	3,026	49
5	N	High	760	15	15	582	2,911	17
10	N	High	888	17	17	552	2,973	32
20	N	High	1,047	20	20	517	3,033	53
5	SL	Low	640	12	12	727	3,504	45
10	SL	Low	647	12	12	723	3,815	76
20	SL	Low	650	12	12	722	4,187	111
5	SL	High	641	12	12	727	3,633	56
10	SL	High	648	12	12	723	3,890	82
20	SL	High	650	12	12	722	4,243	116

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.15.Results of simulation for the average price per pound, target price per pound, annual cost to government and total discounted cost to government for a target price program beginning in 2004 in the Gulf of Mexico shrimp fishery

Percent increase in Average Price	Vessels w/License Moratorium	Year of Shrimp Prices	Average Price Per Pound	Target price Per Pound	Target Less Average Price Per Pound	Approximate Annual Cost to Government (mil. $)	Discounted Cost to Government (mil. $)
10	N	2002	2.27	2.39	0.12	13.9	119.0
20	N	2002	2.27	2.56	0.30	34.4	300.7
30	N	2002	2.27	2.80	0.54	62.3	554.8
10	N	2000	2.88	2.89	0.00	0.3	0.8
20	N	2000	2.88	2.89	0.03	3.0	5.2
30	N	2000	2.88	2.99	0.11	12.7	27.2
10	SL	2002	2.27	2.39	0.12	13.9	117.2
20	SL	2002	2.27	2.56	0.30	34.4	295.4
30	SL	2002	2.27	2.80	0.54	62.3	544.2
10	SL	2000	2.88	2.89	0.00	0.3	0.7
20	SL	2000	2.88	2.91	0.03	3.0	5.0
30	SL	2000	2.88	2.99	0.11	12.7	26.1

* N = N; SL = Small and Large vessels

Table A.16.Results of simulation for the average price per pound, target price per pound, annual cost to government and total discounted cost to government for a target price program beginning in 2004 in the South Atlantic shrimp fishery

Percent increase in Average Price	Vessels w/License Moratorium	Year of Shrimp Prices	Average Price Per Pound	Target price Per Pound	Target Less Average Price Per Pound	Approximate Annual Cost to Government (mil. $)	Discounted Cost to Government (mil. $)
10	N*	2002	2.27	2.39	0.12	13.9	119.0
20	N	2002	2.27	2.56	0.30	34.4	300.7
30	N	2002	2.27	2.80	0.54	62.3	554.8
10	N	2000	2.88	2.89	0.00	0.3	0.8
20	N	2000	2.88	2.91	0.03	3.0	5.2
30	N	2000	2.88	2.99	0.11	12.7	27.2
10	SL	2002	2.27	2.39	0.12	13.9	117.2
20	SL	2002	2.27	2.56	0.30	34.4	295.4
30	SL	2002	2.27	2.80	0.54	62.3	544.2
10	SL	2000	2.88	2.89	0.00	0.3	0.7
20	SL	2000	2.88	2.91	0.03	3.0	5.0
30	SL	2000	2.88	2.99	0.11	12.7	26.1

*N = none; SL = Small and Large vessels

Table A.17.Results of simulation for a marketing program where the program is paid for by a tax on per dollar of shrimp landed in the Gulf of Mexico shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Policy Description			Results in Year 2021					
Percent Increase in Shrimp Prices	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
			----------Results for small vessels----------					
5	N	Low	4,921	99	52	424	746	(33)
10	N	Low	5,312	107	57	410	751	(22)
15	N	Low	5,613	113	60	399	758	(7)
20	N	Low	5,909	119	63	389	766	8
5	N	High	7,785	155	81	327	812	120
10	N	High	8,156	162	85	317	818	146
15	N	High	8,509	169	88	308	825	173
20	N	High	8,863	176	92	299	831	201
5	SL	Low	5,063	102	54	431	769	(25)
10	SL	Low	5,437	109	58	418	775	(12)
15	SL	Low	5,717	115	61	407	784	5
20	SL	Low	5,908	118	63	400	798	25
5	SL	High	5,977	120	63	393	1,022	239
10	SL	High	5,993	120	63	392	1,068	285
15	SL	High	5,993	120	63	392	1,115	331
20	SL	High	5,993	120	63	391	1,161	377
			----------Results for large vessels----------					
5	N	Low	1,420	124	120	587	1,701	(31)
10	N	Low	1,481	129	125	564	1,701	(12)
15	N	Low	1,558	135	130	543	1,702	7
20	N	Low	1,637	140	136	524	1,704	25
5	N	High	2,285	187	181	414	1,728	172
10	N	High	2,411	196	190	397	1,729	213
15	N	High	2,538	205	199	382	1,733	255
20	N	High	2,665	214	207	368	1,737	299
5	SL	Low	1,325	101	98	625	1,842	(12)
10	SL	Low	1,394	106	102	600	1,839	8
15	SL	Low	1,474	111	108	577	1,837	31
20	SL	Low	1,559	117	114	558	1,841	54
5	SL	High	1,707	127	123	536	2,319	524
10	SL	High	1,720	128	124	534	2,417	626
15	SL	High	1,738	129	125	531	2,511	728
20	SL	High	1,762	131	127	527	2,599	827

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.18.Results of simulation for a marketing program where the program is paid for by a tax on per dollar of shrimp landed in the South Atlantic shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Policy Description			Results in Year 2021					
Percent Increase in Shrimp Prices	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
			----------Results for small vessels----------					
5	N	Low	1,383	21	21	361	1,146	(5)
10	N	Low	1,495	23	23	346	1,152	(0)
15	N	Low	1,609	25	25	334	1,159	4
20	N	Low	1,714	27	27	322	1,168	8
5	N	High	2,557	44	44	267	1,250	52
10	N	High	2,716	48	48	257	1,265	63
15	N	High	2,876	51	51	249	1,279	75
20	N	High	3,019	54	54	241	1,294	88
5	SL	Low	1,330	20	20	364	1,154	(5)
10	SL	Low	1,398	21	21	353	1,171	0
15	SL	Low	1,456	22	22	343	1,186	5
20	SL	Low	1,492	23	23	334	1,203	10
5	SL	High	1,520	23	23	314	1,472	63
10	SL	High	1,521	23	23	314	1,540	76
15	SL	High	1,521	23	23	313	1,607	89
20	SL	High	1,521	23	23	313	1,673	102
			----------Results for large vessels----------					
5	N	Low	337	7	7	855	2,800	(27)
10	N	Low	364	7	7	819	2,808	(22)
15	N	Low	393	8	8	787	2,815	(19)
20	N	Low	425	9	9	759	2,827	(15)
5	N	High	669	13	13	603	2,846	6
10	N	High	739	14	14	579	2,862	13
15	N	High	814	16	16	558	2,885	21
20	N	High	890	17	17	539	2,911	29
5	SL	Low	340	7	7	866	2,840	(26)
10	SL	Low	371	8	8	837	2,871	(22)
15	SL	Low	409	8	8	809	2,896	(17)
20	SL	Low	456	9	9	783	2,923	(12)
5	SL	High	623	12	12	732	3,451	36
10	SL	High	626	12	12	730	3,608	51
15	SL	High	630	12	12	729	3,764	65
20	SL	High	635	12	12	727	3,918	80

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.19.Results of simulation for cooperatives that operate for maximum profit in the Gulf of Mexico shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Policy Description		Results in Year 2021					
Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
		----------Results for small vessels----------					
L	Low	6,920	139	73	358	576	(141)
SL	Low	6,920	139	73	358	577	(3)
L	High	6,920	139	73	358	865	213
SL	High	6,920	139	73	358	865	235
		----------Results for large vessels----------					
L	Low	2,144	159	154	460	1,215	(98)
SL	Low	2,144	159	154	461	1,222	85
L	High	2,144	159	154	460	1,848	456
SL	High	2,144	159	154	461	1,858	722

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.20.Results of simulation for cooperatives that operate for maximum profit in the South Atlantic shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Policy Description		Results in Year 2021					
Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
		----------Results for small vessels----------					
L	Low	1,628	25	25	297	888	(23)
SL	Low	1,628	25	25	297	889	(4)
L	High	1,628	25	25	297	1,324	77
SL	High	1,628	25	25	297	1,326	58
		----------Results for large vessels----------					
L	Low	751	14	14	684	2,107	(40)
SL	Low	751	14	14	686	2,110	(24)
L	High	751	14	14	684	3,065	25
SL	High	751	14	14	686	3,070	49

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.21. Results of simulation for fractional permit/license program in the Gulf of Mexico shrimp fishery for the period 2002-2021 (moratorium assumed to go in place in 2004)

Policy Description			Results in Year 2021					
Percent License Bought	Vessels w/License Moratorium	Shrimp Prices Received	FTEV	Days Fished (1000)	Landings (mil. Lbs)	CPUE	RPUE	Present Value Economic Profit (mil. $)
			----------Results for small vessels----------					
10	L	Low	4,669	94	50	441	757	(39)
30	L	Low	4,933	100	53	438	759	(32)
50	L	Low	5,324	109	58	438	776	(10)
10	S L	Low	4,669	94	50	441	757	(39)
30	S L	Low	4,537	91	47	470	823	13
50	S L	Low	4,858	98	52	441	764	(28)
10	L	High	7,947	160	84	340	828	128
30	L	High	8,320	168	88	341	844	163
50	L	High	8,749	177	93	343	867	211
10	S L	High	7,991	161	85	340	827	127
30	S L	High	7,535	150	78	361	887	182
50	S L	High	5,144	102	53	448	1,150	296
			----------Results for large vessels----------					
10	L	Low	1,326	100	97	644	1,806	(42)
30	L	Low	1,117	84	82	683	1,948	68
50	L	Low	733	56	54	782	2,316	190
10	S L	Low	1,326	100	97	644	1,806	(42)
30	S L	Low	1,120	84	82	688	1,961	78
50	S L	Low	733	56	54	830	2,471	244
10	L	High	1,624	122	118	511	2,108	372
30	L	High	1,178	89	86	584	2,481	526
50	L	High	733	56	54	690	3,035	568
10	S L	High	1,624	122	118	506	2,085	354
30	S L	High	1,178	89	86	605	2,576	571
50	S L	High	733	56	54	810	3,589	727

* N = N; L = Large vessels only; SL = Small and Large vessels

Table A.22.Results of simulation for the number of licenses purchased, loan per licensed vessel and total government loans for a fractional license program in 2004 in the Gulf of Mexico shrimp fishery

Policy Description			Total Government Loans ($1000)	Loan per Vessel**	Annual Payment By Vessel	License Reduction	FTEV Reduction
Percent License Bought	Vessels w/License Moratorium	Shrimp Prices Received					
			----------Results for small vessels----------				
10	L	Low	-	-	-	-	-
30	L	Low	-	-	-	-	-
50	L	Low	-	-	-	-	-
10	S L	Low	2	157	20	1,411	348
30	S L	Low	7	176	23	4,229	503
50	S L	Low	1,2	177	23	7,045	1,023
10	L	High	-	-	-	-	-
30	L	High	-	-	-	-	-
50	L	High	-	-	-	-	-
10	S L	High	2	171	22	1,411	43
30	S L	High	1,0	241	31	4,229	269
50	S L	High	11,5	1,634	212	7,045	849
			----------Results for large vessels----------				
10	L	Low	-	-	-	223	618
30	L	Low	133,579	200	26	669	618
50	L	Low	31,8	28,607	3,705	1,114	618
10	S L	Low	-	-	-	223	175
30	S L	Low	1	200	26	669	618
50	S L	Low	34,7	31,171	4,037	1,114	1,063
10	L	High	3,1	13,965	1,809	223	618
30	L	High	40,3	60,371	7,818	669	618
50	L	High	145,6	130,762	16,934	1,114	618
10	S L	High	3,1	14,076	1,823	223	172
30	S L	High	40,8	61,056	7,907	669	618
50	S L	High	148,5	133,326	17,266	1,114	1,063

* N = N; L = Large vessels only; SL = Small and Large vessels

** Since it is assumed that the vessel owner will borrow from the government the full price of the license then the loan per vessel is equivalent to the cost of the vessel owner to purchase the amount of license needed to complete his license.

A.1 Results: Gulf of Mexico

A.1.1 Open Access

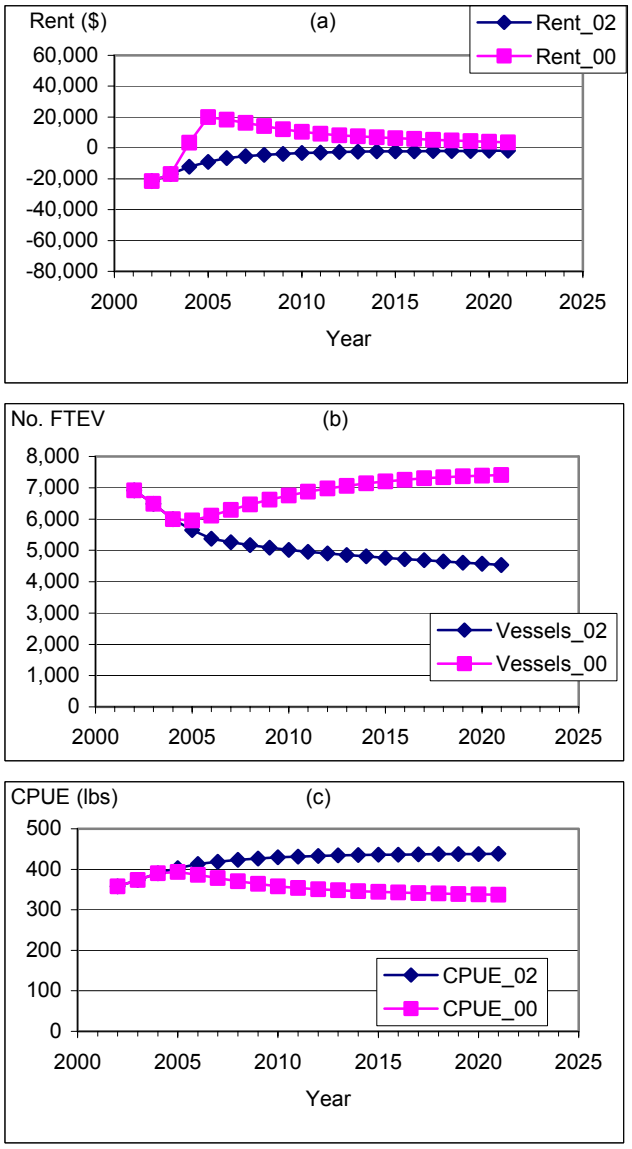


Figure A.1. Open Access Small Vessels: Simulated rent, number of FTEV, and CPUE for small vessels in the Gulf of Mexico, 2002-2021.

Summary: Before discussing the various policies we will briefly examine the Gulf of Mexico shrimp fishery under open access for the 20-year simulation at the two price levels. Figures A.2a and 2b show rent and number of full-time equivalent vessels[1] (FTEV), respectively, for the simulated period 2002 through 2021. Rent is defined as zero when the average vessel is making normal profit. If rent is greater then zero then the average vessel is making above normal profits and, given the open access nature of the fishery, additional vessels will enter the shrimp fishery. If rent is less then zero then the average vessel is making below normal profit and vessels will leave the shrimp fishery.

Bottom line: In the short term higher prices benefit the fishery, however, in the long run under open-access rents in the fishery tend to zero regardless of the price level.

Small Vessels

In Figure A.1a, when prices remain at the 2002 level the small vessels are making negative rents, therefore, small vessels will leave the industry (Figure A.1b). As vessels leave the industry rent approaches zero. When prices increase to the year-2000 price level by 2005, small vessels make positive rents and small vessels begin to enter the fishery. As small vessels enter the fishery, rent declines and approaches zero[2]. Thus, under 2002-year price level, the simulation period ends with about 4,500 small FTEV in the fleet, whereas with year-2000 price level the simulation period ends with about 7,400 small FTEV in the fleet. When vessels enter the fishery CPUE declines. Figure A.1c shows that catch per unit effort (CPUE) increases when vessels leave the fishery.

[1] FTEV is defined as the number of vessels needed to harvest the observed landings when the vessels work full time in the month with the greatest landings.

[2] The greater the positive rent the faster vessels will enter the fishery. As rent approaches zero the slower they enter the fishery. Likewise, the larger the negative rent the faster vessels will leave the fishery. Vessels can enter and leave the fishery at a maximum 8% per year or if vessels are not producing enough revenue to cover variable costs the vessels will double their exit rate.

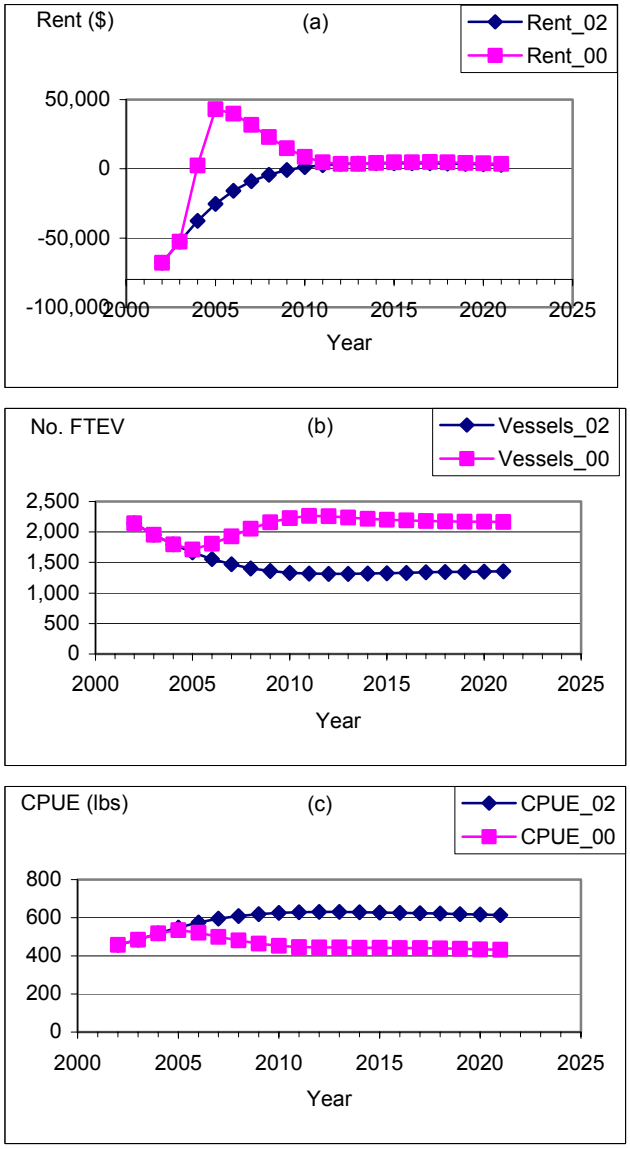


Figure A.2. Open Access Large Vessels: Simulated rent, number of FTEV, CPUE and RPUE in the Gulf of Mexico, 2002-2021.

Large Vessels

Figure A.2 shows the same information as Figure A.1 except for large vessels. Like small vessels, large vessels exit the fishery when the average vessel incurs negative rents and enters the fishery when rents are negative.

We can see that under open access, vessels will leave the fishery when negative rents are incurred and enter the fishery when positive rents are incurred. Open access causes rents to be dissipated.

A.1.2 Permit/License Moratorium

A.1.2.1 Low Prices (2002 Shrimp Prices)

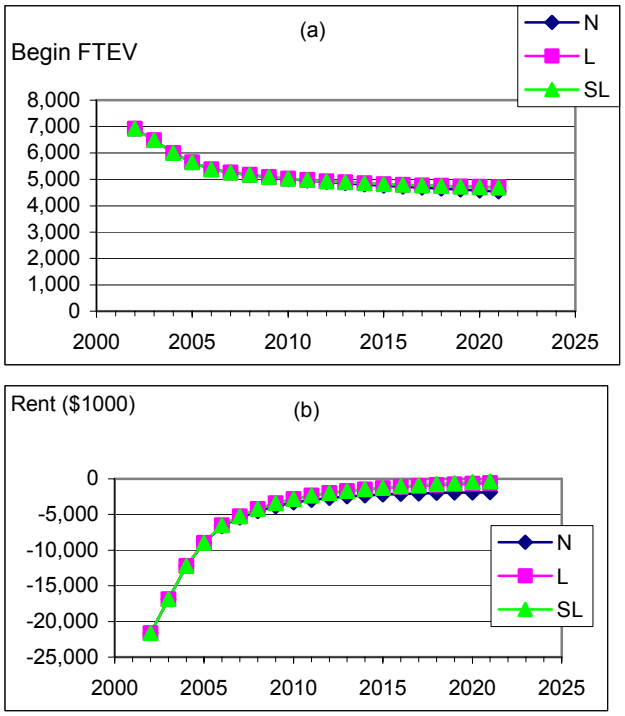


Figure A.3. Permit/License Moratorium Small Vessels: Simulation over the period 2002-2021 with year-**2002 shrimp prices** where N is no permit/license moratorium (except Texas small vessels), L is a permit/license moratorium on large vessels (>60ft) beginning in 2004, and SL is a permit/license moratorium on small (<60ft) and large vessels (>60ft) beginning in 2004 in the Gulf of Mexico.

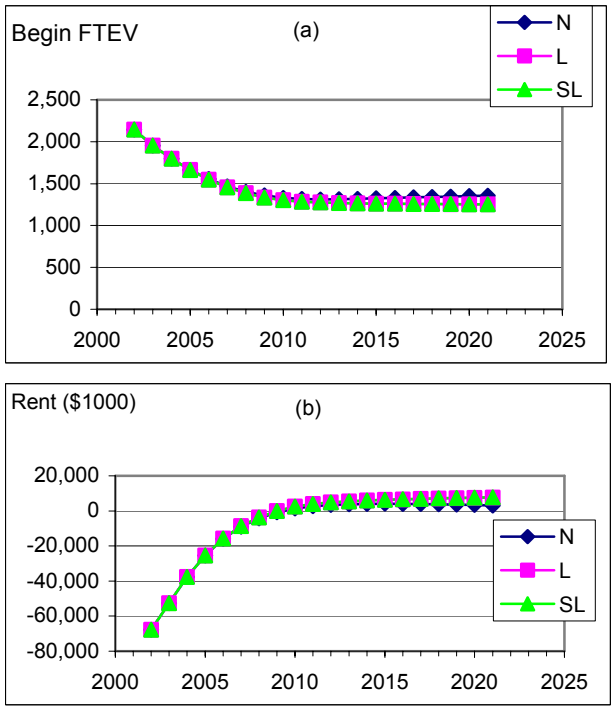


Figure A.4. Permit/License Moratorium Large Vessels: Simulation over the period 2002-2021 with year-**2002 shrimp prices** where N is no permit/license moratorium (except Texas small vessels), L is a permit/license moratorium on large vessels (>60ft) beginning in 2004, and SL is a permit/license moratorium on small (<60ft) and large vessels (>60ft) beginning in 2004 in the Gulf of Mexico.

Bottom line: When prices remain at their current low levels a license removal program has no significant impact on the economic state of the shrimp fishery.

Figures A.3 and A.4 show the results for the simulation of various types of permit/license moratoria with prices set at the 2002-year level. When vessels are incurring negative rents (Figures A.3b and A.4b) there is very little difference between no permit/license moratorium (N), a permit/license moratorium on large vessel only (L) and a permit/license moratorium on both small and large vessels (SL). This result is due to the large negative rents incurred such that many vessels will leave the fishery even without a moratorium (Figures A.3a and A.4a). Moratoriums are to keep vessels from entering the fleet when rent is positive rather than keeping vessels from leaving the fishery when rent is negative.

A.1.2.2 High Prices (2000 Shrimp Prices)

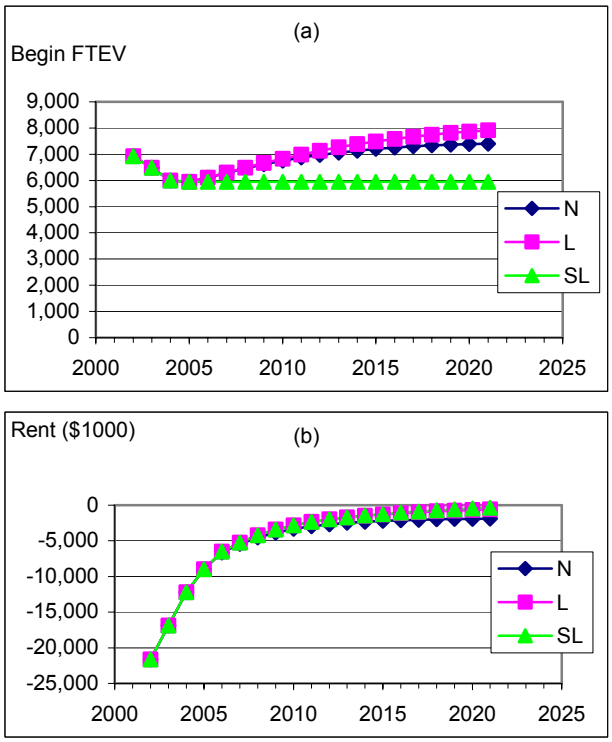


Figure A.5. Permit/License Moratorium Small Vessels: Simulation over the period 2002-2021 with year-**2000 shrimp prices** where N is no permit/license moratorium (except Texas small vessels), L is a permit/license moratorium on large vessels (>60ft) beginning in 2004, and SL is a permit/license moratorium on small and large vessels (>60ft) beginning in 2004 in the Gulf of Mexico.

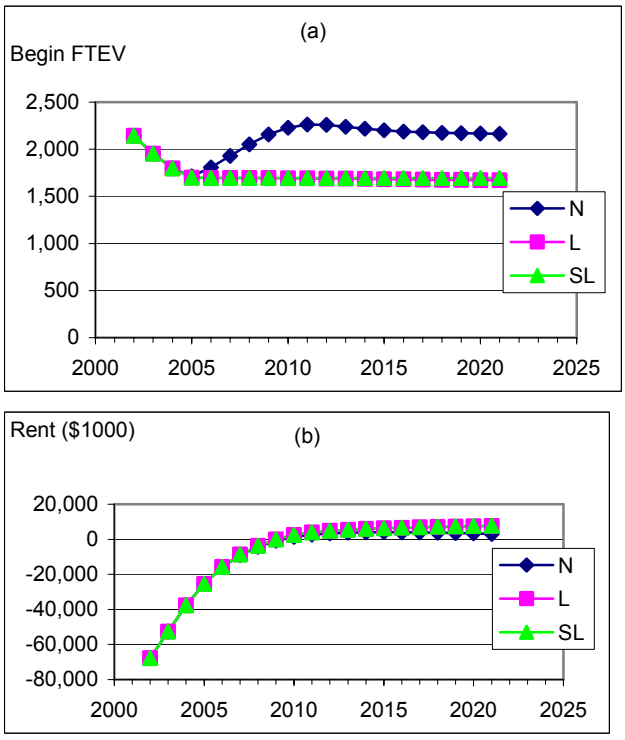


Figure A.6. Permit/License Moratorium Large Vessels: Simulation over the period 2002-2021 with year-**2000 shrimp prices** where N is no permit/license moratorium (except Texas small vessels), L is a permit/license moratorium on large vessels (>60ft) beginning in 2004, and SL is a permit/license moratorium on small and large vessels (>60ft) beginning in 2004 in the Gulf of Mexico.

Bottom line: With higher prices as in the year-2000 price level, if a permit/license moratorium is imposed in 2004 on both small and large vessels positive rents can be maintained by small and large vessels provided capital stuffing and effort creep is prevented. If only large vessels have a permit/license moratorium then large vessels will incur positive rents but it will be less the when both small and large vessels are under a moratorium.

Figures A.5 and A.6 show the results for the simulation at the year-2000 price level. Notice that rents are negative in 2002 and 2003 given they are at the 2002-year price level. In this simulation we assume that the price goes up to the 2001 price level in 2004 and the year-2000 price level in 2005 leading to positive rents. As we saw under open access (i.e., no permit/license moratorium), vessels will be added to the fleet and rents will approach zero over time for both the large and small vessels.

A.1.3 Government Buyback Program

A.1.3.1 Government Buyback w/ Grant for Large Vessels Only, Year-2002 Shrimp Prices, and No Permit/License Moratorium (Figures A.7 and A.8)

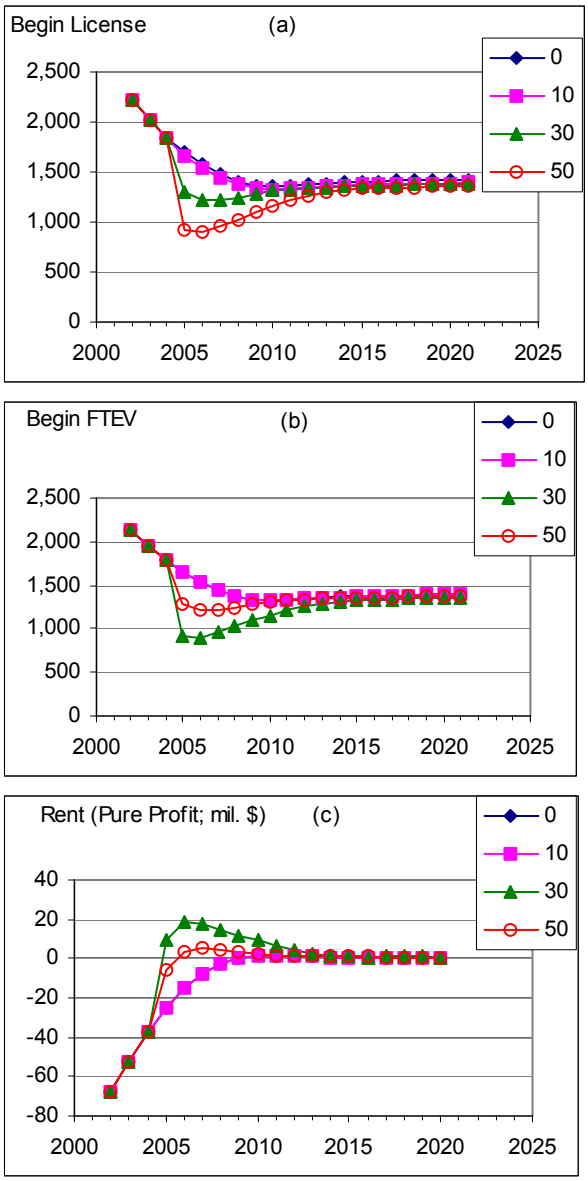


Figure A.7.Government Buyback w/Grant for Only Large Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **no permit/license moratorium**.

Bottom line: There are temporary benefits to a permit/license reduction program, but without a permit/license moratorium the benefits are short lived.

In Figure A.7, buying back 10% of the permits/license of large vessels is basically no different from the open access fishery. The reason is the number of excess permits/licenses in the large vessel fleet. Table A.5 shows that 185 licenses were purchased at a price of $99,946 per permits/license at a total government cost of $18.5M, however, no FTEV were removed from the large vessel fleet. Therefore, the simulations for the 10% buyback and the open access are equivalent except that some excess licenses are removed.

A purchase of 30% of the permits/license will remove enough FTEV such that the rent is only slightly negative in 2005 (Figure A.7c). Purchasing 50% of the large vessels yields positive rents of $10M in 2005. However, given there is no permit/license moratorium, vessels will begin entering the fishery in 2007[3] and continue to do so until rents are dissipated. Thus, for the long-run equilibrium, the number of FTEV remaining in the fishery with and without the vessels buyback is basically the same from 2012 and beyond (Figure A.7b).

[3] Rent goes up in 2006 because additional vessels leave the fishery. They leave the fishery because the entry/exit behavior is based on at 2-year lag of rent where 60% is based on the previous year and 40% is based on two years ago. Thus in 2004 they were making negative rents and in 2005 they were making positive rents but the weighted average was negative; therefore, vessels exited the fishery in 2006 causing rents to increase in 2006.

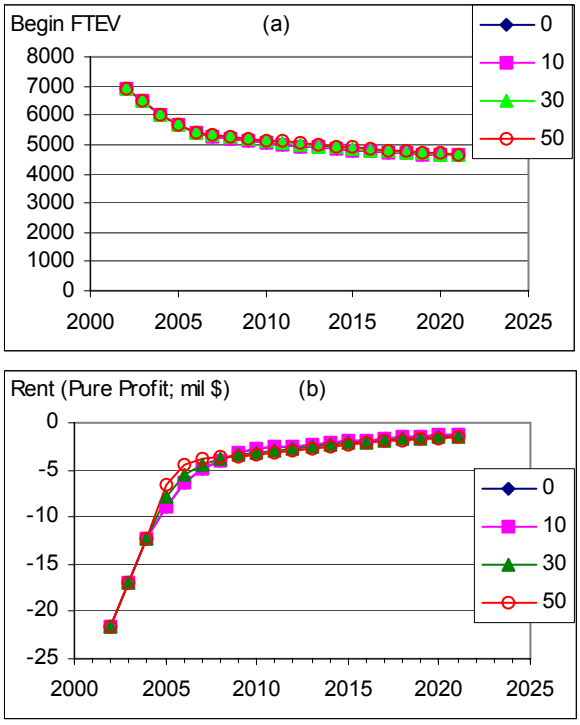


Figure A.8. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government grant at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **no permit/license moratorium**.

Bottom line: There are only minor temporary benefits for the small vessels, which remain under open access, from the government purchase of the large vessels' licenses (Figure A.8).

A.1.3.2 Government Buyback w/ Grant for Small & Large Vessels, Year-2002 Shrimp Prices, and No Permit/License Moratorium (Figures A.9 and A.10)

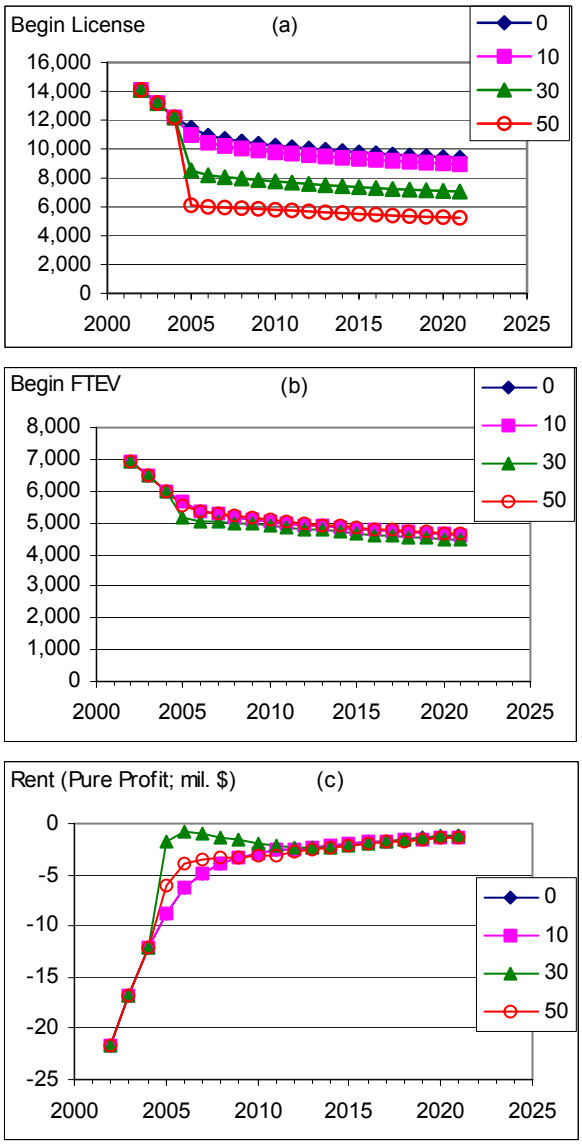


Figure A.9. Government Buyback w/Grant for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico **with year-2002 shrimp prices,** and **no permit/license moratorium on small or large vessels**.

Bottom line: Because of the excessive number of licenses relative to the number of FTEV needed to harvest the shrimp crop, there is little difference in the results of the small vessel open access and small vessel buyback when there is no permit/license moratorium except in the number of license removed from the small vessel fishery.

Small Vessels

Figure A.9 shows the simulation results for the small vessel for a government buyback with a grant. There is a significant number of excess licenses for the small vessels. As a result, buying back up to 50% of the licenses (Figure A.9a) does not reduce the FTEV (Figure A.9b). Therefore, comparing Figures A.9 and A.10, we see that there is little difference in the results of the small vessel open access and small vessel buyback when there is no permit/license moratorium except in the number of license removed from the small vessel fishery. The licenses are predicted to cost approximately $6,300, and the cost to the government ranged from $7.7M when purchasing 10% of the license to $38.6M when purchasing 50% of the license.

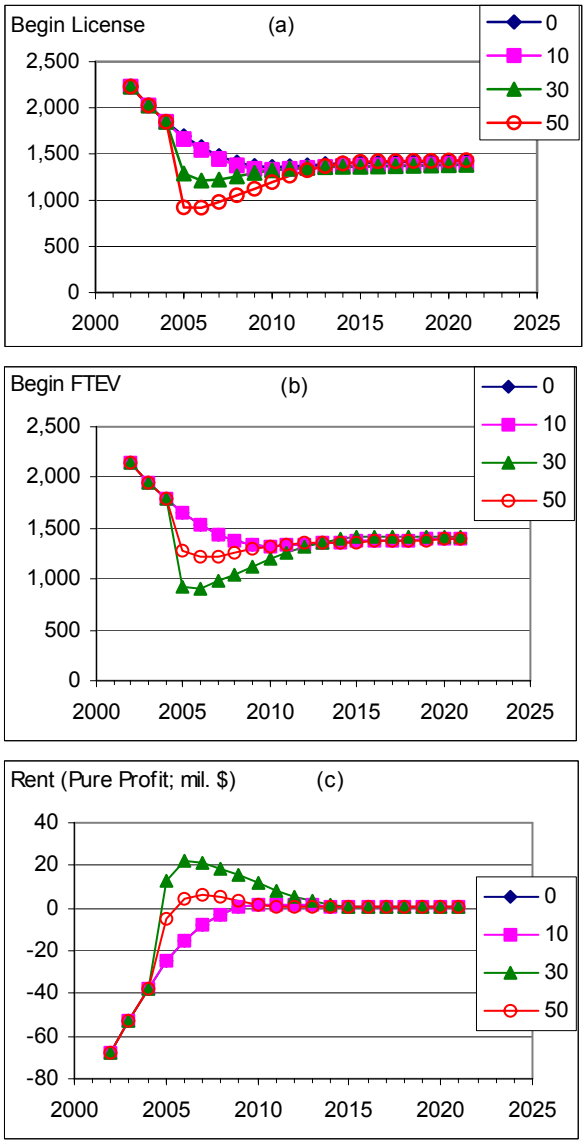


Figure A.10. Government Buyback w/Grant for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **no permit/license moratorium on small or large vessels**.

Bottom line: While rents to the large vessels are generated in the short run when there is at least a 30% permit/license buyback, the long run equilibrium is the same as open access because there is no permit/license moratorium.

Large Vessels

The results in Figure A.10 resemble the results in Figure A.7.

A.1.3.3 Government Buyback w/ Grant for Large Vessels Only, Year-2000 Shrimp Prices, and No Permit/License Moratorium (Figures A.11 and A.12)

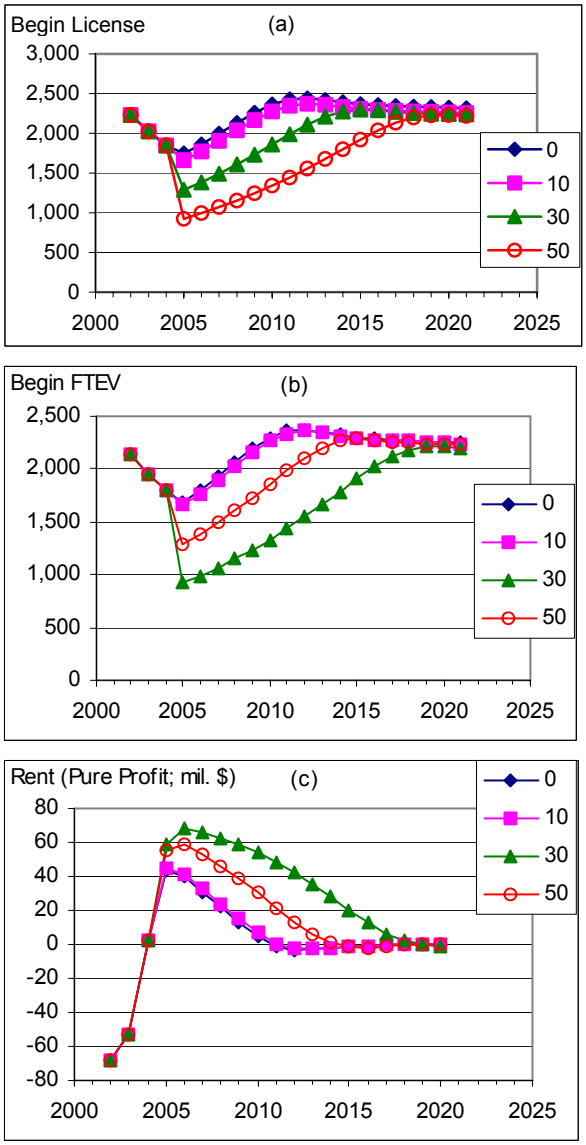


Figure A.11. Government Buyback w/Grant for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico **with year-2000 shrimp prices,** and **no permit/license moratorium**.

Bottom line: As a result of the higher shrimp prices there is a longer period of time where rents are positive than under the lower year 2002 prices. However, in the long run results are no different from the open access equilibrium; rents go to zero and the same number of vessels will be in the fishery.

Large Vessels

Figure A.11 shows that rent rises slightly above $40M when 10% of the permit/license are bought and shrimp price increase to the year-2000 price level by 2005. When comparing these results to Figure A.7 with year-2002 shrimp prices we see that profits are considerable higher. This higher shrimp price causes the price to buy back a large vessel permit/license to increase by almost $30,000, thereby increasing the total cost to the government.

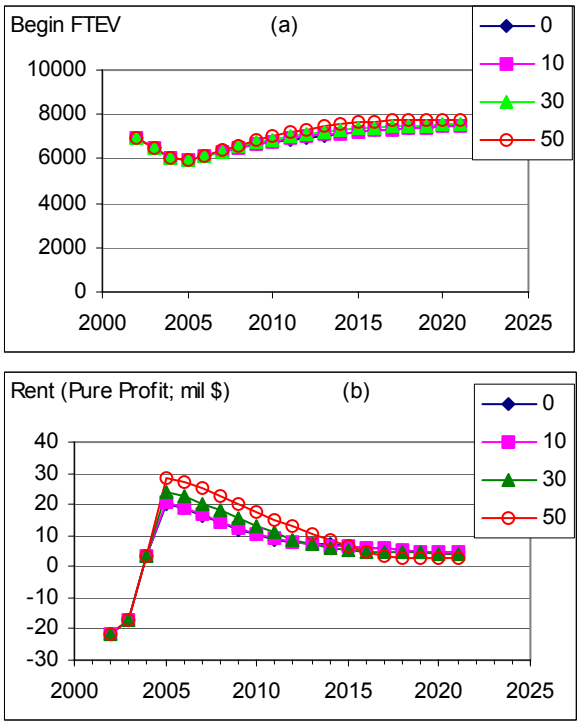


Figure A.12. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government grant at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **no permit/license moratorium**.

Bottom line: An increase in price to the 2000-year level will produce positive rents; however, these positive rents are dissipated because both small and large vessels are entering the fishery since there is no permit/license moratorium.

Small Vessels

Figure A.12 shows that small vessels move from negative to positive rents due to the increase in the price of shrimp to the 2000-year level by 2005. Also, their rent increased due to large vessels being removed from the fishery at the end of 2004. The greater the number of large vessels removed from the fishery the greater their rent. This occurs because there is less competition in the nearshore fishery for the small vessels due the removal of the large vessels.

A.1.3.4 Government Buyback w/Grant for Small & Large Vessels, Year-2000 Shrimp Prices, and No Permit/License Moratorium (Figures A.13 and A.14)

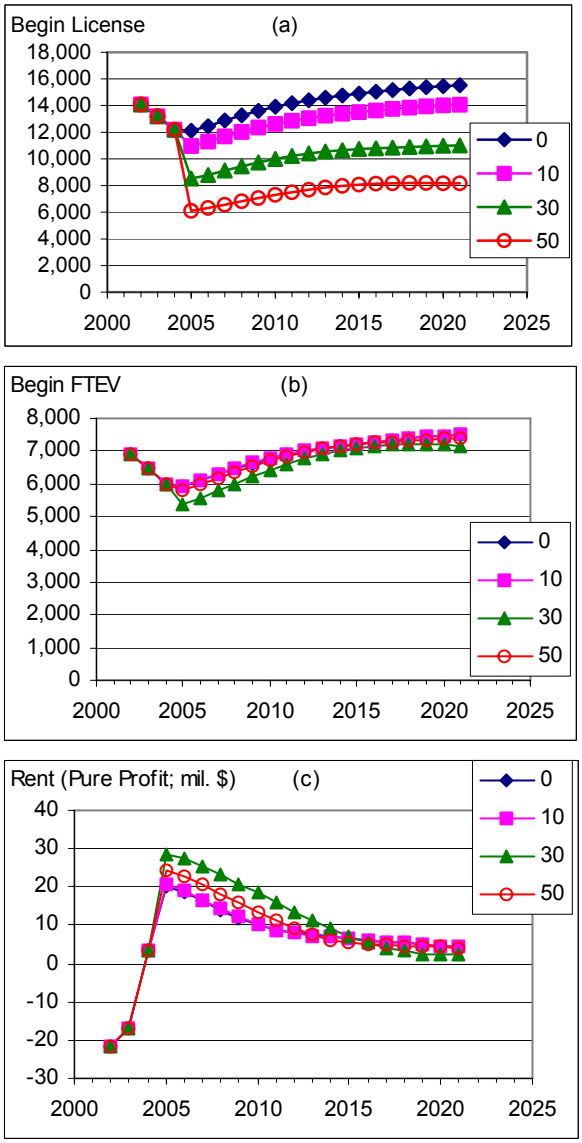


Figure A.13. Government Buyback w/Grant for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **no permit/license moratorium**.

Bottom line: A license buyback program of less than 50% will not reduce FTEV and without a license moratorium positive rents will cause the purchase of additional licenses and more small vessels will enter the fleet which will cause rents to dissipate.

Small Vessels

Figure A.13a shows the reduction in small boat license in 2004 with the government buyback program. Given the excess in licenses relative to the FTEV, the buyback program for small vessels is effective in reducing licenses; however, it does little to reduce FTEV and therefore fishing effort. With the shrimp price increasing to the 2000-year level, rent exceeds $20M and since there is no license moratorium, vessels will begin to enter the fishery until rents are dissipated.

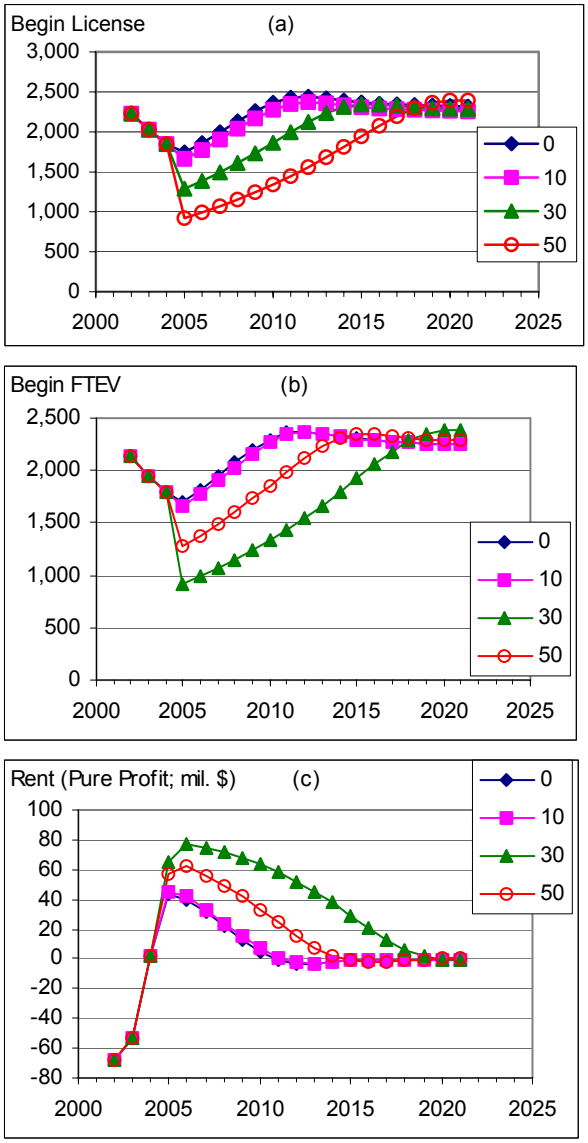


Figure A.14. Government Buyback w/Grant for Large Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **no permit/license moratorium**

Bottom line: A permit/license reduction program is ineffective in the long run when rents are positive and there is no permit/license moratorium program to keep vessels from entering the fishery.

Large Vessels

In Figure A.14 we see that rents are negative in 2002 and large vessels will leave the fishery. In this simulation shrimp prices increase to the 2000-year level by 2005 and the government buyback occurs at the end of 2004 causing large rents to occur in 2005. With the 50% buyback program large FTEV are reduced to about 1,000. However since there is no permit/license moratorium vessel are free to enter the open access fishery and there are as many FTEV in the fishery by the end of the simulation period as there were before the buyback occurred. Rents are dissipated by the entry of vessels into the fishery.

A.1.3.5 Government Buyback w/Grant for Large Vessels Only, Year-2002 Shrimp Prices, and With a Permit/License Moratorium (Figures A.15 and A.16)

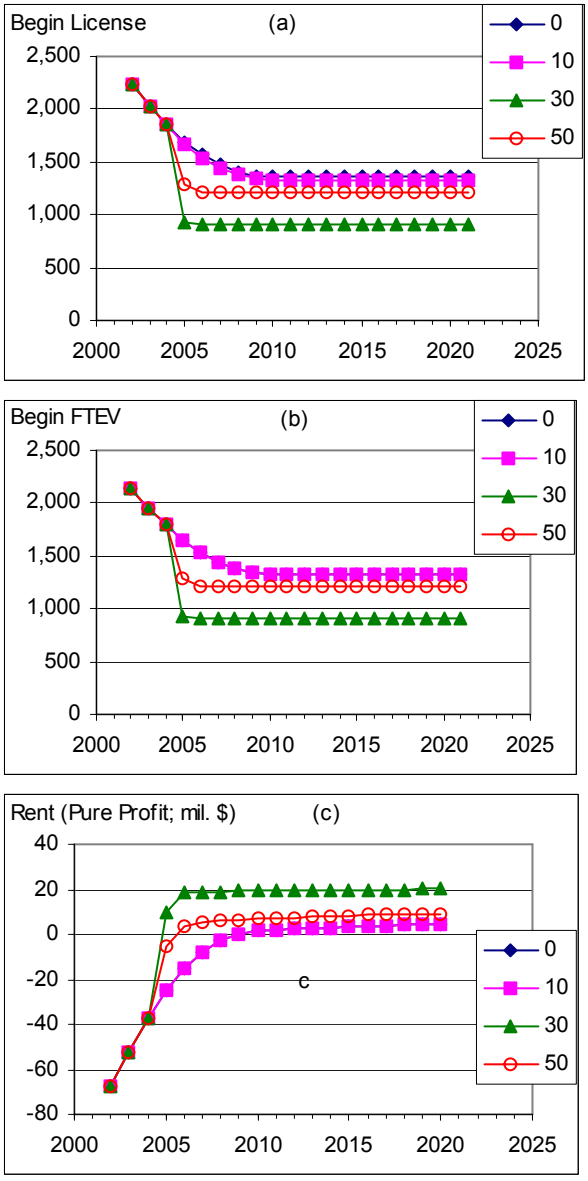


Figure A.15. Government Buyback w/Grant for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **with a permit/license moratorium on large vessels**.

Bottom line: A permit/license buyback program is effective in producing positive rents in the long run provided there is a moratorium on permits/ licenses and there is no capital stuffing or effort creep.

Large Vessels

Figure A.15 (with a permit/license moratorium on large vessels) should be compared with Figure A.7 (with no permit/license moratorium on large vessels). Notice in Figure A.7 that rents were generated due to the vessel buyback but were then dissipated because of vessels entering the fishery. Here, in Figure A.15 vessels are prevented from entering the fishery since there is a permit/license moratorium on large vessels. Hence, rents are maintained provided there is no capital stuffing or effort creep.

Notice that buying only 10% of the license does not make the vessels remaining in the fishery better off than with the natural departure of vessels due to negative rents. If 30% of the permits/ licenses are purchased, then vessels achieve a positive rent quicker but only slightly better than a 10% buyback. A 50% buyback will produce rents of $20M that will be maintained so long as there is no capital stuffing or effort creep.

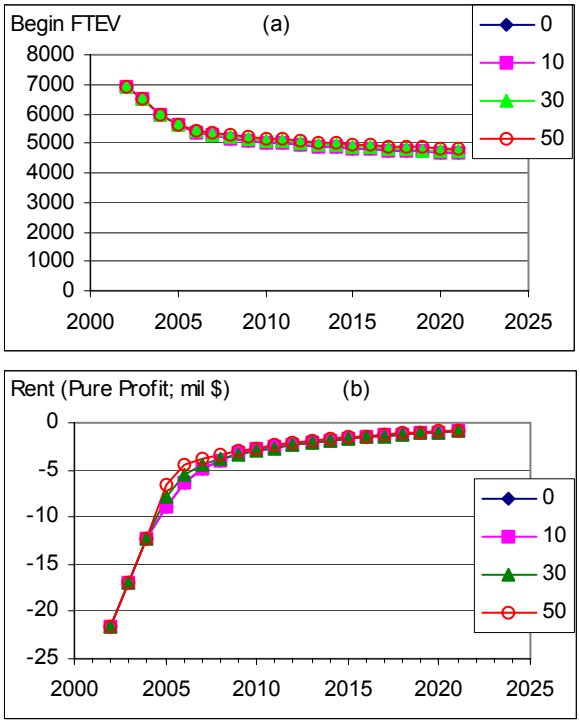


Figure A.16. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government grant at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico **with year-2002 shrimp prices,** and **with a permit/license moratorium on large vessels**.

Bottom line: There are only a minor temporary benefits for the small vessels, which remain under open access, from the government purchase of the large vessels' licenses.

Small Vessels

Figure A.16 should be compared with Figure A.8. Basically, since large vessels cannot reenter the fishery, the competition for shrimp in the near-shore area is lessened for the small vessels. However, this improved state is insufficient to generate positive rents for the small vessels. Small vessels continue to exit the fishery such that rent approaches zero.

A.1.3.5 Government Buyback w/Grant for Small & Large Vessels, Year-2002 Shrimp Prices, and With a Permit/License Moratorium (Figures A.17 and A.18)

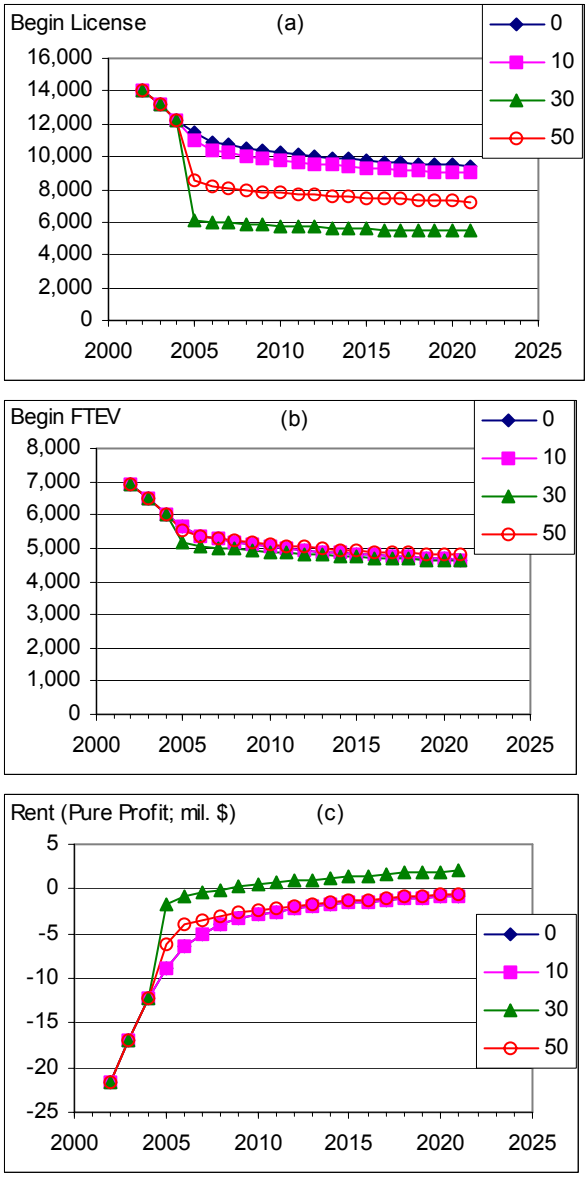


Figure A.17. Government Buyback w/Grant for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **with a permit/license moratorium on large and small vessels**.

Bottom line: The large excess number of small vessel licenses relative to the FTEV renders a buyback of less than 50% of the licenses for small vessels ineffective.

Small Vessels

Compare Figure A.17 to Figure A.16 and you will notice that they look very much the same for these small vessels. This is because of the excess licenses in the fishery. Figure A.16b and 17b reveal that FTEV are not reduced due to the buyback, and since rents are still negative after the buyback small vessels will continue to exit the fishery.

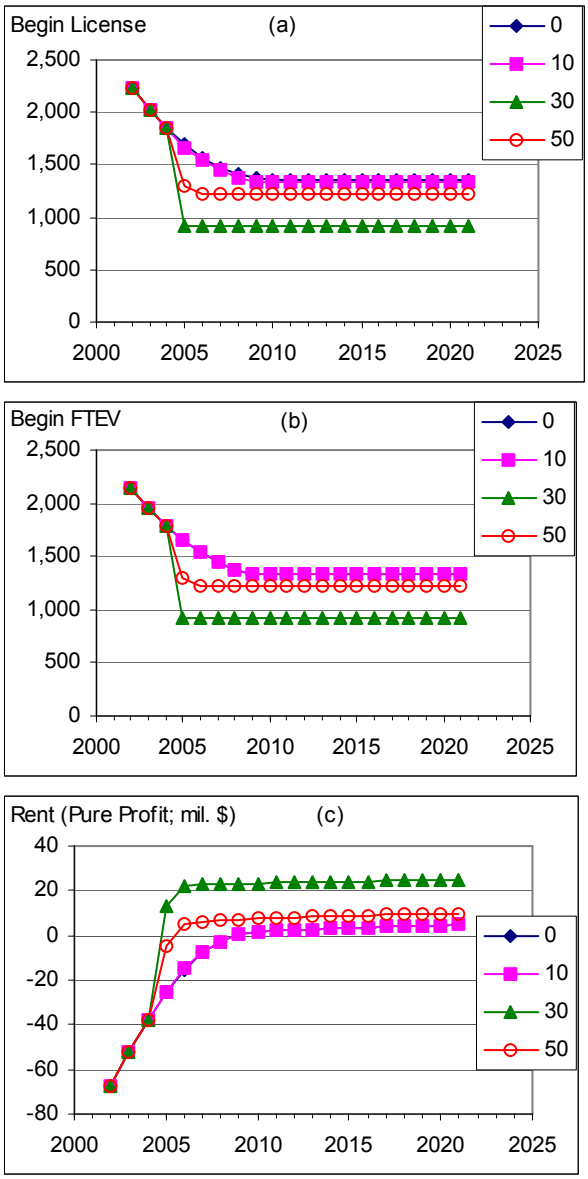


Figure A.18. Government Buyback w/Grant for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico **with year-2002 shrimp prices,** and **no permit/license moratorium on small and large vessels**.

Bottom line: When shrimp prices are low and large, negative rents are being incurred as they are in 2002, a buyback program with a permit/license moratorium for large vessels is effective with or without a buyback program for small vessels.

Large Vessels

Compare Figures A.15 and A.19 and you will see the results are basically identical. The reason is that the purchase of the small vessel licenses was ineffective; i.e., it did not reduce fishing effort by the small vessels.

A.1.3.6 Government Buyback w/Grant for Large Vessels Only, Year-2000 Shrimp Prices, and With a Permit/License Moratorium (Figures A.19 and A.20)

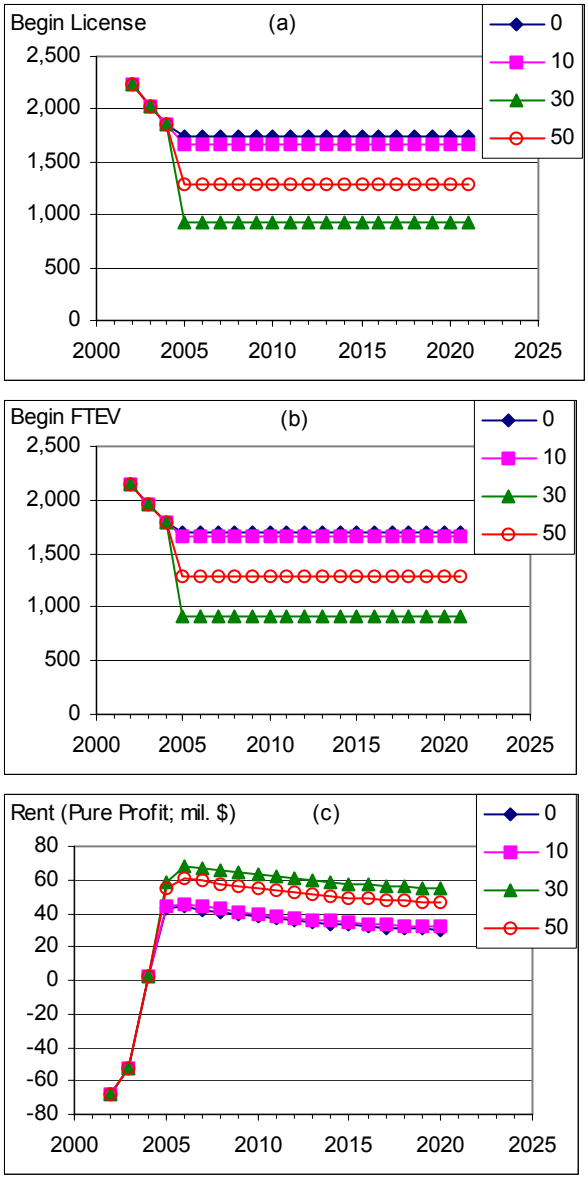


Figure A.19. Government Buyback w/Grant for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico **with year-2000 shrimp prices,** and **with a permit/license moratorium**.

Bottom line: When shrimp prices are high and positive rents are being incurred as they are in 2000, a buyback program with a permit/license moratorium for large vessels is effective without a buyback program for small vessels, although rents will decline slightly because small vessels are entering the fishery.

Large Vessels

Compare Figures A.11 (no permit/license moratorium on large vessels) and 19 (with a permit/license moratorium on large vessels). Both simulations are the same through 2004 when the buyback occurs. In Figure A.11 large vessels begin to enter the fishery and rents are dissipated. In Figure A.19 where there is a permit/license moratorium on large vessels, rents remain positive although they are declining gradually. The decline in the rents to large vessels is caused by small vessels entering the fishery (Figure A.20). The rents for large vessels decline about $17M from 2005 to 2021.

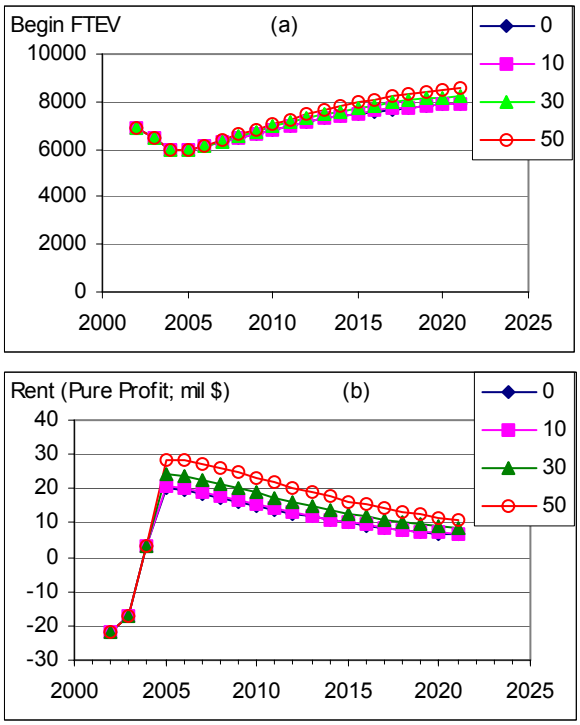


Figure A.20. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government grant at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **with a permit/license moratorium only on large vessels**.

Bottom line: When rents are positive, small vessels will enter the fishery until their rent is dissipated.

Small Vessels

Comparing Figures A.12 and A.20 for small vessels we see that the end result is the same. The main difference is that since large vessels cannot enter the fishery, it takes the small vessel longer to dissipate their rents. But the net results are the same; small vessels will enter the fishery until their rents are zero.

A.1.3.7 Government Buyback w/Grant for Small & Large Vessels, Year-2000 Shrimp Prices, and With a Permit/License Moratorium (Figures A.21 and A.22)

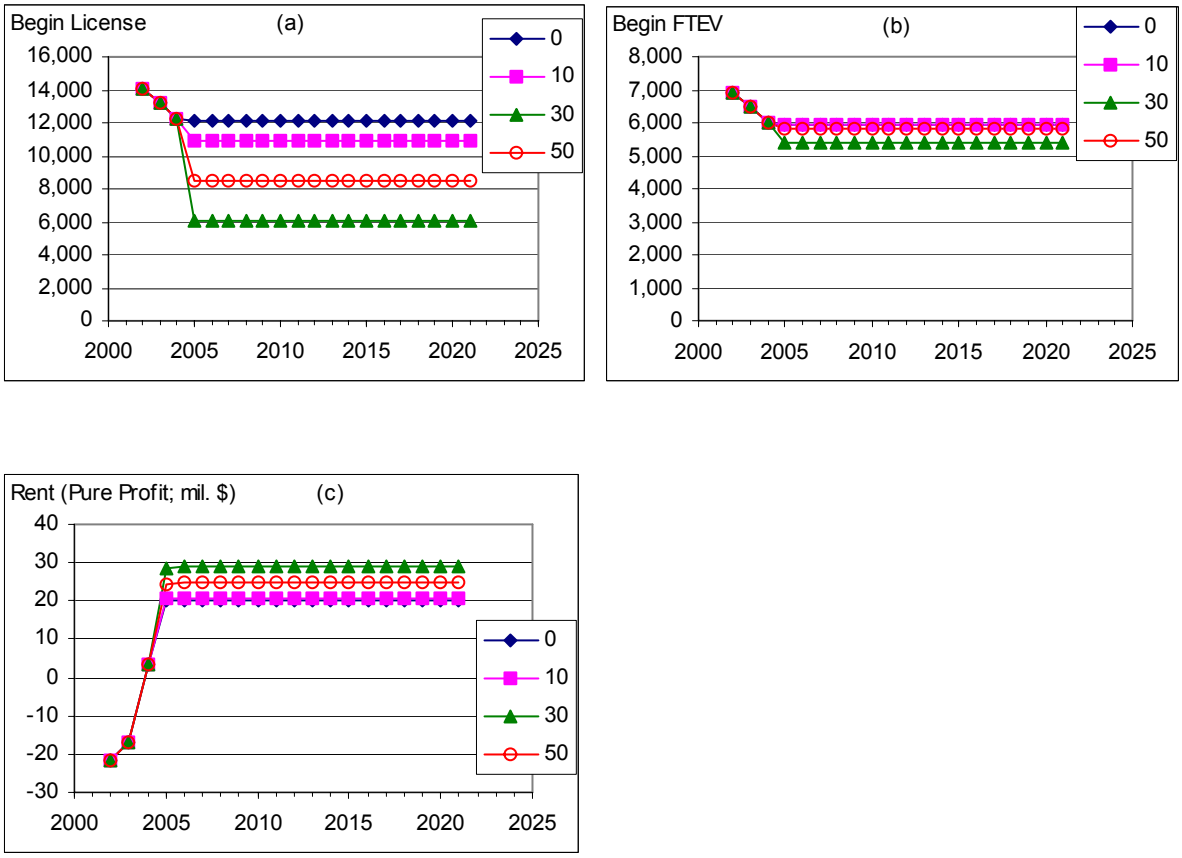


Figure A.21. Government Buyback w/Grant for Small Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **with a permit/license moratorium on small and large vessels**.

Bottom line: When shrimp prices are high and positive rents are being incurred as they are at year-2000 prices, a buyback program with a permit/license moratorium for small vessels is effective provided there is no capital stuffing or effort creep.

Small Vessels

Compare Figures A.20 and A.21 for the small vessels. Both simulations are the same through 2004 when the license buyback occurs. In Figure A.20 there was no license moratorium and small vessels were free to enter the fishery and their rents are dissipated. In Figure A.21 there is a license moratorium on small vessels and they cannot enter the shrimp fishery even though large rent sare being earned. Provided there is no capital stuffing or effort creep the rents will be maintained given the year-2000 shrimp price level.

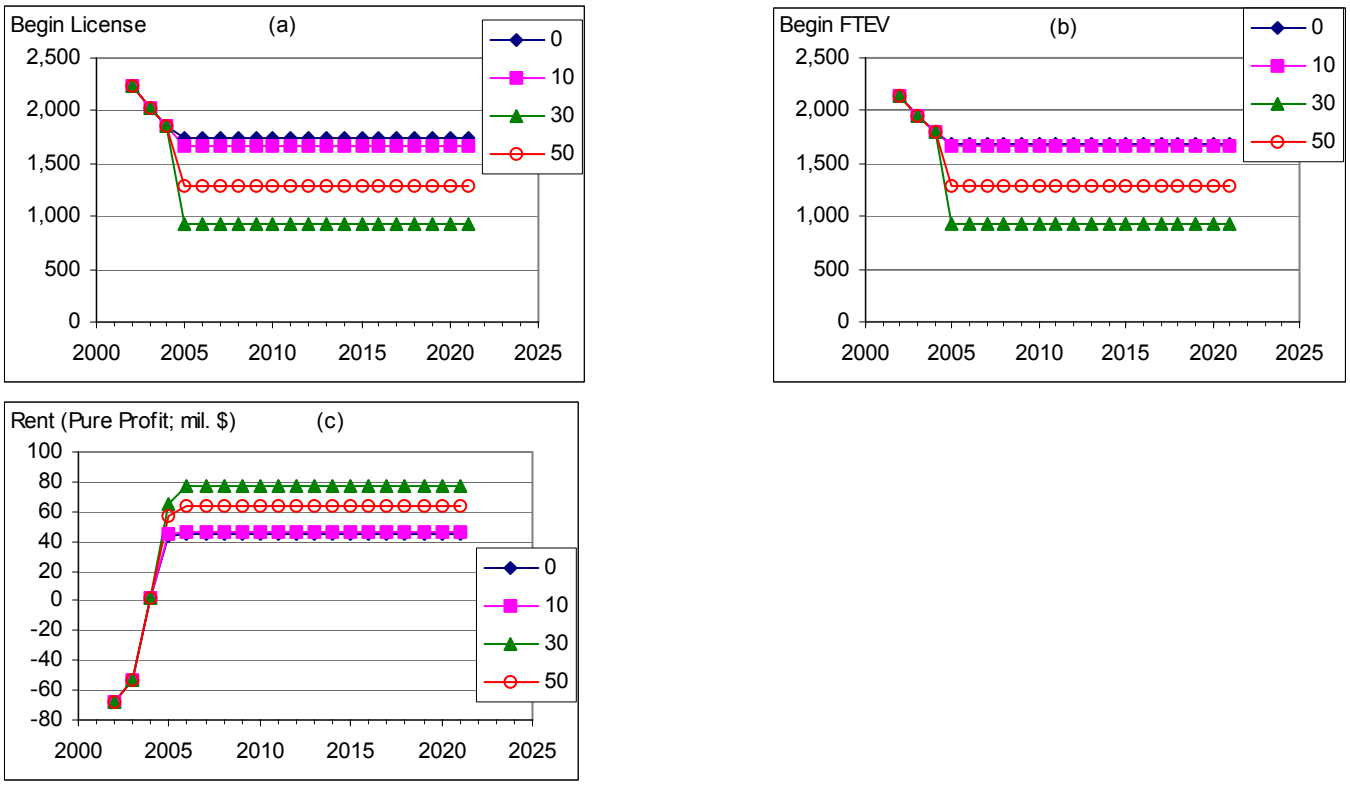


Figure A.22. Government Buyback w/Grant for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **with a permit/license moratorium on small and large vessels**.

Bottom line: When shrimp prices are high and large positive rents are being incurred as they are at year-2000 prices, a buyback program with a permit/license moratorium for large vessels is most effective when there is also a buyback program with a permit/license moratorium for small vessels.

Large Vessels

Compare Figures A.19 and A.22 where the difference is that in the latter simulation small vessels are under a license moratorium and cannot enter the fishery as they did in the Figure A.19 simulation. As a result, rents to the large vessels do not decline gradually because small vessels cannot enter the fishery. Both small and large fisheries are under a permit/license moratorium, which keeps rents from being dissipated. Provided there are effective measures to prevent capital stuffing or effort creep, these rents can be maintained given the year-2000 price level.

Figures A.23 through A.38 are government buyback with a loan that must be paid back by the fishermen remaining in the fishery. Figures A.23 through A.38 will be compared with Figures A.7 through A.22 above, which are for government buyback with a grant. The difference between the two sets of figures will be the 10-year loan repayment beginning in 2005. If only large vessels are in the buyback program, then only large vessels owners with a permit/license will pay back the loan. If both small and large vessels are in the buyback program, then both small and large vessels owners with a permit/license will pay back the loan for their respective vessel classes. The total payment per vessel is assumed to be equal across all participants within a given market; i.e., five state markets for small vessels and one market for large vessels. The payment is assumed to occur at the end of the year as a lump sum payment.

A.1.3.8 Government Buyback w/Loan for Large Vessels Only, Year-2002 Shrimp Prices, and No Permit/License Moratorium (Figures A.23 and A.24)

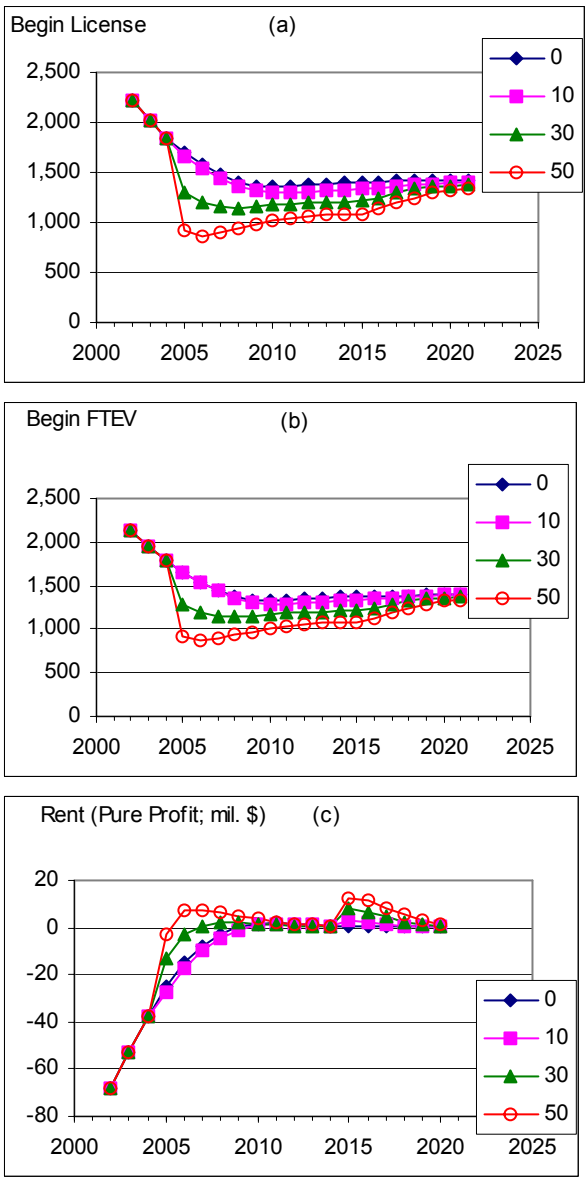


Figure A.23.Government Buyback w/Loan for Only Large Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **no permit/license moratorium**.

Bottom line: The loan repayment reduces the rent during the loan repayment period and keeps vessels from entering the fishery as quickly when compared to a government buyback with a grant. However, without a permit/license moratorium the same number of vessels will return to the fishery dissipating rents.

Large Vessels

The annual loan repayment per permit/license holder is $1,442, $5,564 and $12,972 for a 10%, 30% and 50% buyback (Table A.9). Comparing Figure A.23 with Figure A.5 we see that the loan repayment reduces rent during the 10-year loan repayment period. Notice that when rents are positive, vessels enter the fishery such that at the end of the 20-year simulation there is no difference between the policies in terms of the number of vessels that enter the fishery.

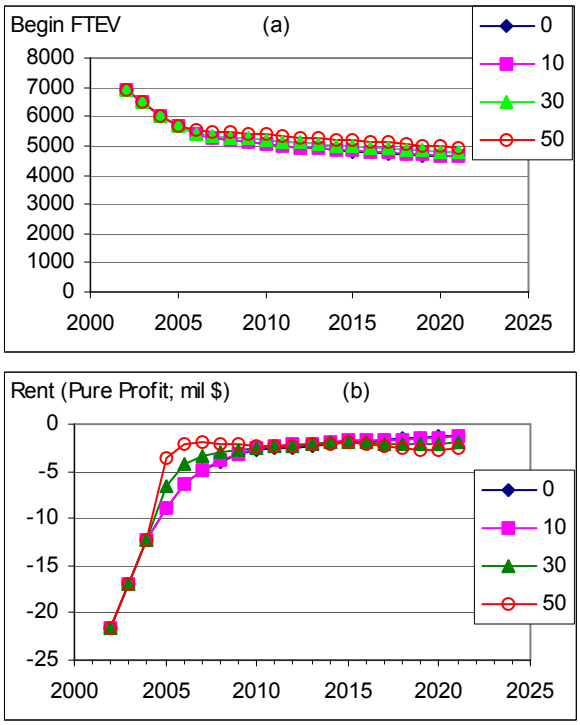


Figure A.24. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government loan at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **no permit/license moratorium**.

Bottom line: There are only minor temporary benefits for the small vessels, which remain under open access, from the government purchase of the large vessel licenses.

Small vessels

There is basically no difference between Figure A.24 and Figure A.8.

A.1.3.9 Government Buyback w/Loan for Small & Large Vessels, Year-2002 Shrimp Prices, and No Permit/License Moratorium (Figures A.25 and A.26)

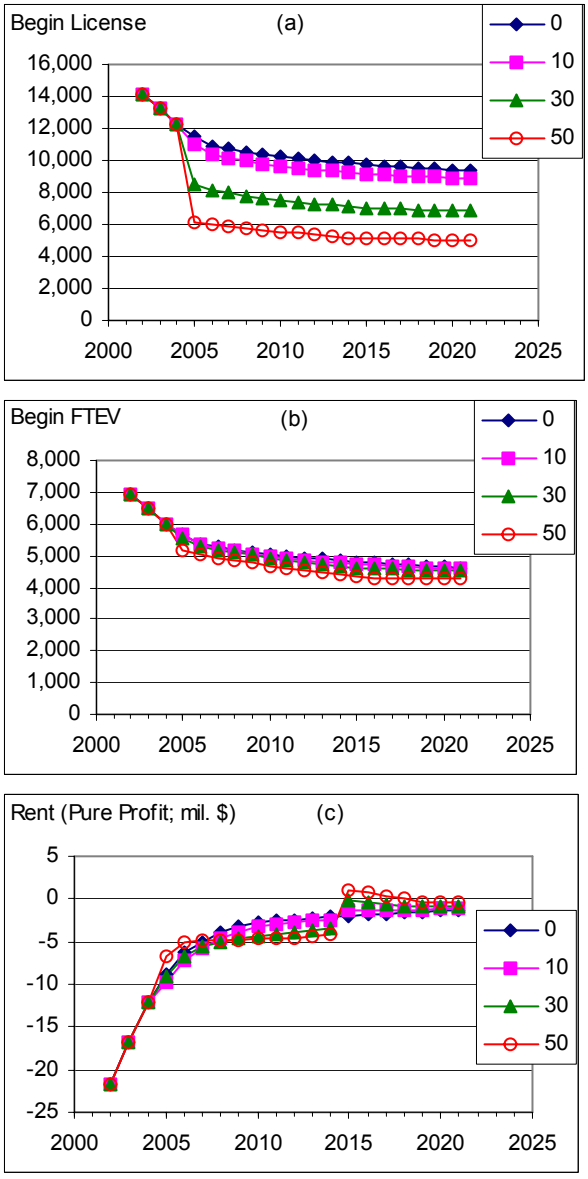


Figure A.25. Government Buyback w/Loan for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **no permit/license moratorium on small or large vessels**.

Bottom line: The excessive number of licenses relative to the number of FTEV needed to harvest the shrimp crop reduces the effect of this policy and, given there is no license moratorium, by the end of the simulation the same number of small vessels will be in the fishery with or without a buyback program.

Small Vessels

The annual loan repayment per permit/license holder is $91, $351 and $819 for a 10%, 30%, and 50% buyback (Table A.9). Comparing Figure A.25 with A.10, we see that the loan repayment reduces rent during the 10-year loan repayment period. At the end of the 20-year simulation, there is very little difference between the policies in terms of the number of vessels in the fishery and the near zero rents.

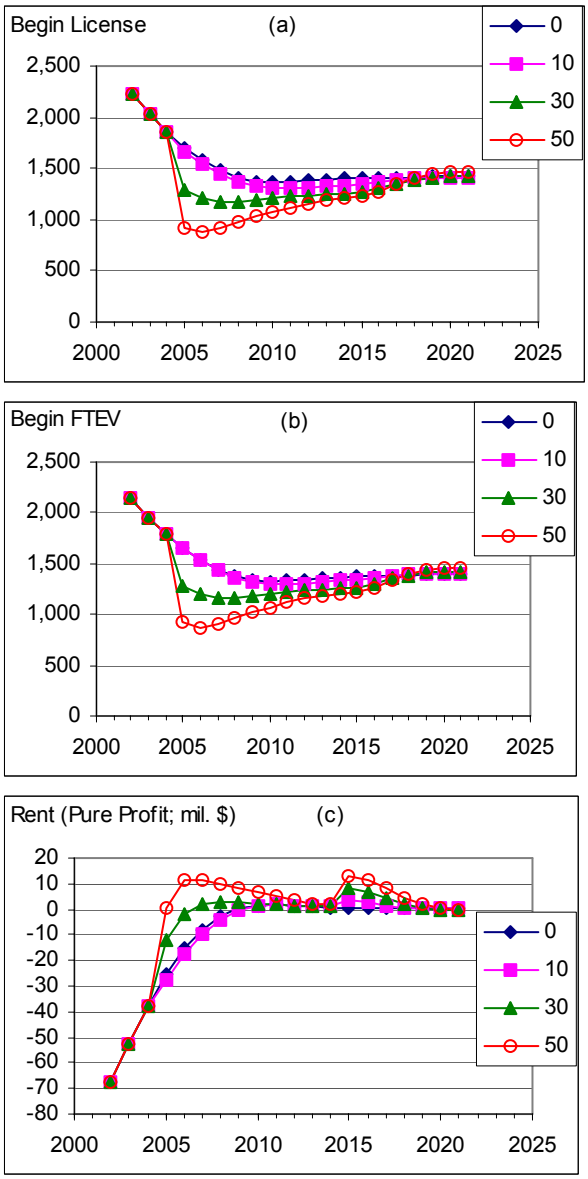


Figure A.26. Government Buyback w/Loan for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **no permit/license moratorium on small or large vessels**.

Bottom line: Buyback loans decrease rents during the repayment period; however, the long-run equilibrium is the same as open access because there is no permit/license moratorium.

Large Vessels

Comparing Figures A.26 and A.10, we see that the rents are lower during the loan repayment period. Rents increase after the loan is paid off but the final results are the same because there is not permit/license moratorium.

A.1.3.10 Government Buyback w/Loan for Large Vessels Only, Year-2000 Shrimp Prices, and No Permit/License Moratorium (Figures A.27 and A.28)

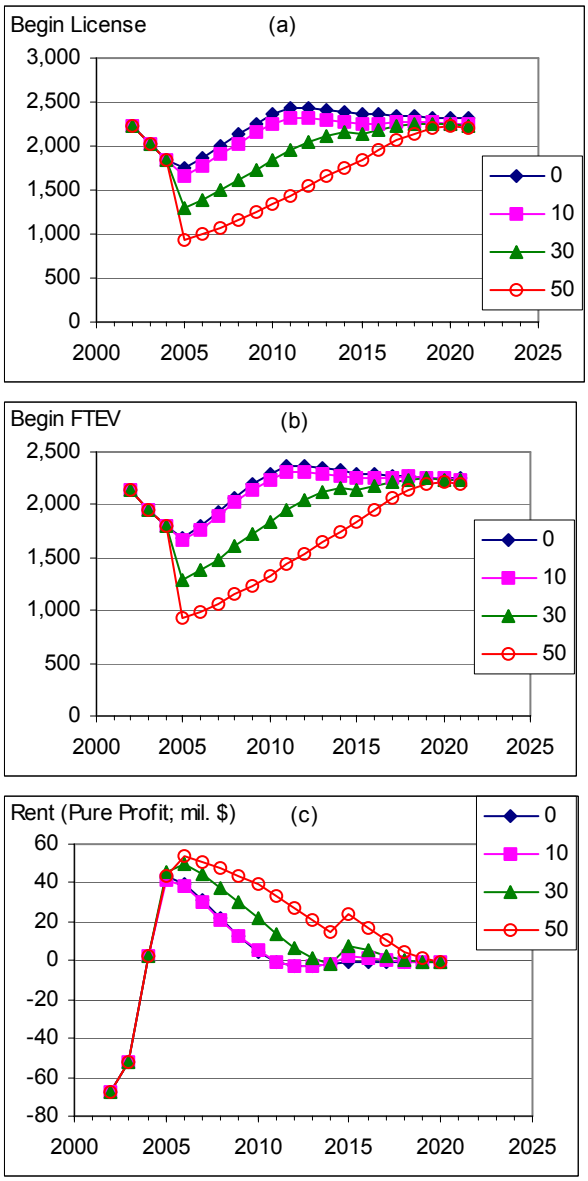


Figure A.27. Government Buyback w/Loan for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **no permit/license moratorium**.

Bottom line: With higher shrimp prices, rents are positive but reduced by the loan payment. However, in the long run results are no different from the open access equilibrium; rents go to zero and the same number of vessels will be in the fishery.

Large Vessels

Compare Figures A.27 and A.11.

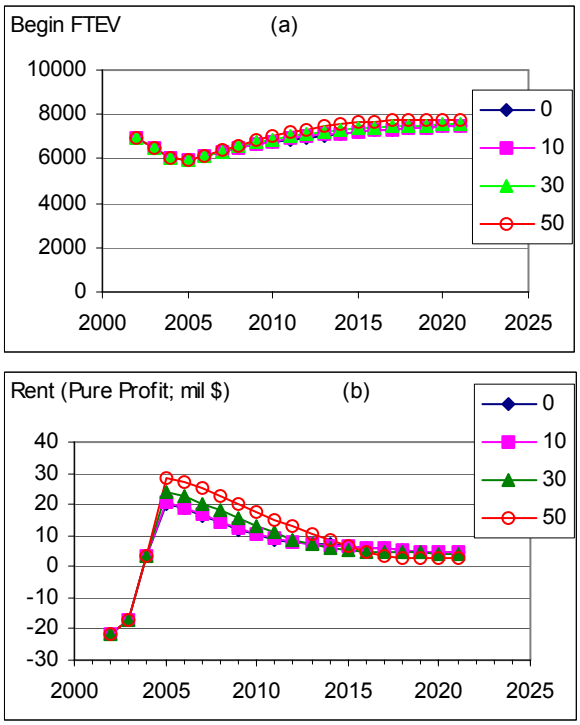


Figure A.28. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government loan at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **no permit/license moratorium**.

Bottom line: An increase in price to the 2000-year level will produce positive rents; however, these positive rents are dissipated because both small and large vessels are entering the fishery since there is no permit/license moratorium.

Small Vessels

Compare Figures A.28 and A.12.

A.1.3.11 Government Buyback w/Loan for Small & Large Vessels, Year-2000 Shrimp Prices, and No Permit/License Moratorium (Figures A.29 and A.30)

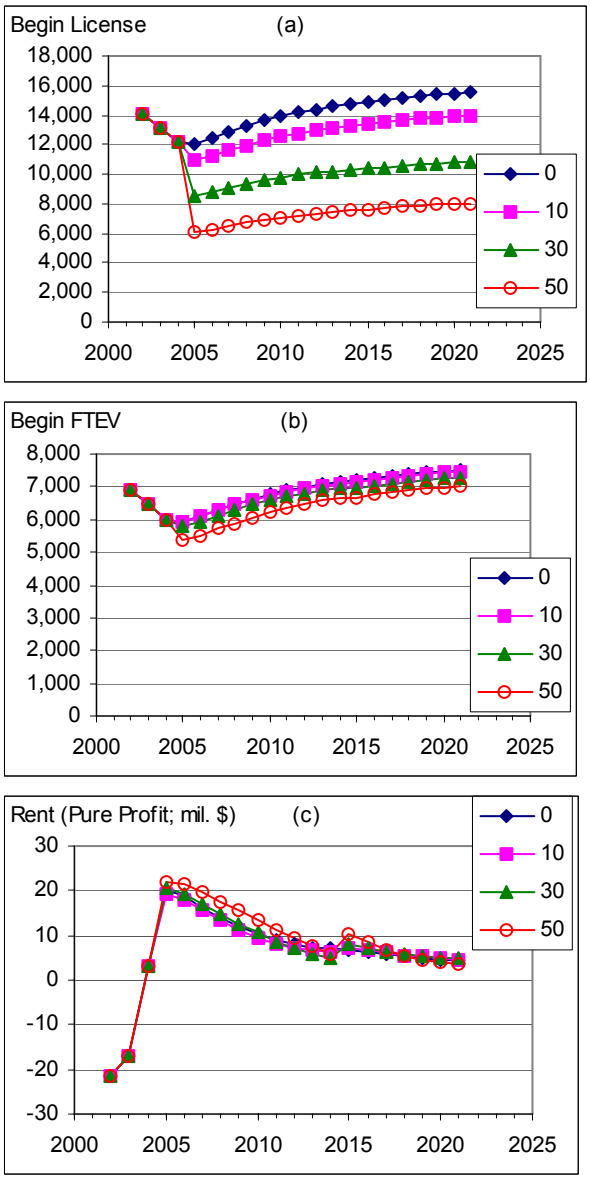


Figure A.29. Government Buyback w/Loan for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **no permit/license moratorium**.

Bottom line: Buyback loans decrease rents during the repayment period, however, the long run equilibrium is basically the same as open access because there is no permit/license moratorium. Excess licenses are reduced.

Small Vessels

Compare Figures B.29 and B.13.

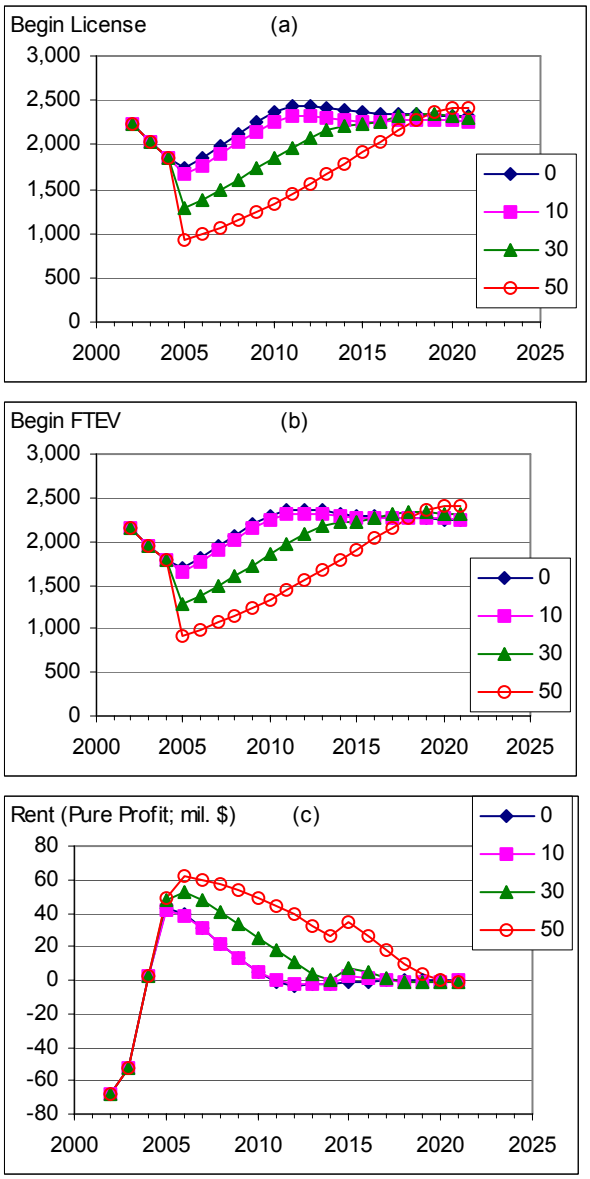


Figure A.30. Government Buyback w/Loan for Large Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico **with year-2000 shrimp prices,** and **no permit/license moratorium**.

Bottom line: Buyback loans decrease rents during the repayment period; however, the long-run equilibrium is basically the same as open access because there is no permit/license moratorium. However, excess licenses are reduced.

Large Vessels

Compare Figures A.30 and A.14.

A.1.3.12 Government Buyback w/Loan for Large Vessels Only, Year-2002 Shrimp Prices, and With a Permit/License Moratorium (Figures A.31 and A.32)

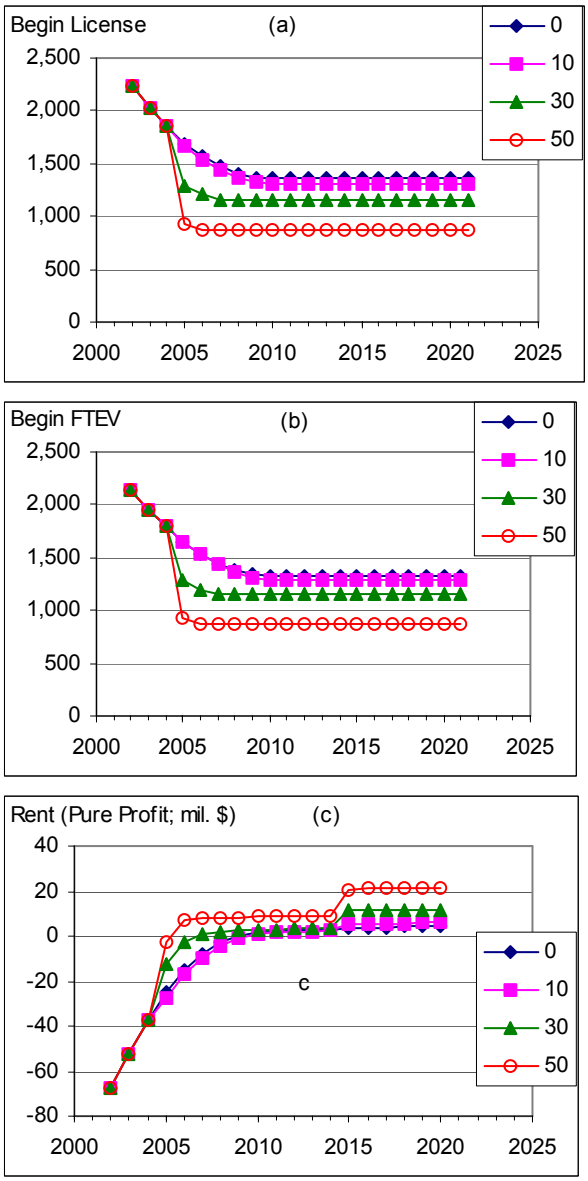
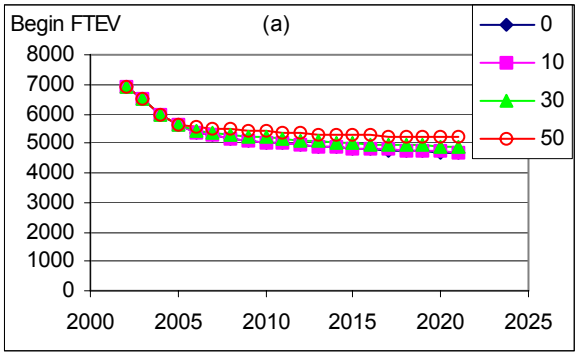


Figure A.31. Government Buyback w/Loan for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **with a permit/license moratorium on large vessels**.

Bottom line: A permit/license buyback program is effective in producing positive rents in the long run provided there is a moratorium on permits/licenses and there is no capital stuffing or effort creep. The rent is reduced by the loan payment for 10 years.

Large Vessels

Compare Figures A.31 and A.14.



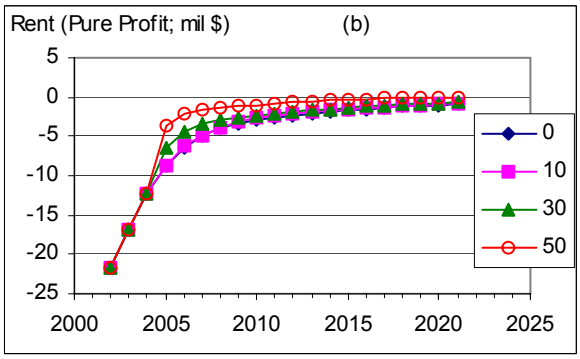


Figure A.32. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government loan at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **with a permit/license moratorium on large vessels**.

Bottom line: There are only minor temporary benefits for the small vessels, which remain under open-access, from the buyback program of the large vessels license.

Small Vessels

Comparing Figures A.32 and A.16 we see that they are basically the same.

A.1.3.13 Government Buyback w/Loan for Small & Large Vessels, Year-2002 Shrimp Prices, and With a Permit/License Moratorium (Figures A.33 and A.34)

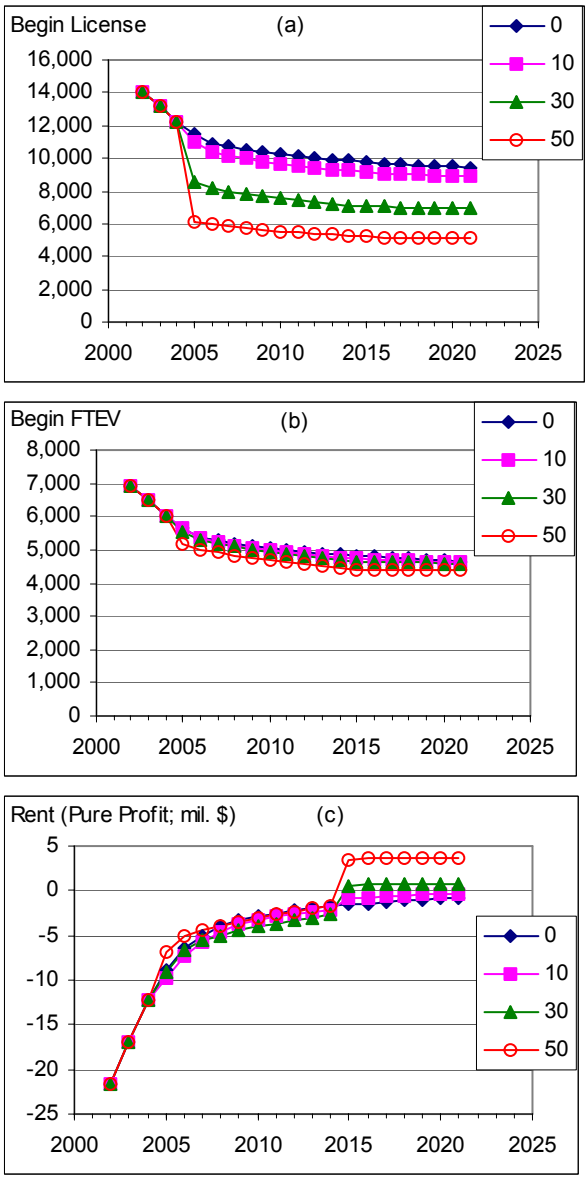


Figure A.33. Government Buyback w/Loan for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **with a permit/license moratorium on large and small vessels**.

Bottom line: The large excess number of small vessel licenses with respect to FTEV reduces the effectiveness of the buyback with a loan, however, the loan payments slightly increase the exiting of small vessels from the fishery so that after the loan is paid off there are some positive rents at the 50% buyback.

Small Vessels

Comparing Figure A.33 to Figure A.17 we see that payment of the loan causes slightly more small vessels to leave the fishery during the 10-year loan payment period (the FTEV curves are slightly steeper). As a result, when the loans are paid off there is a positive rent for the 50% buyback program.

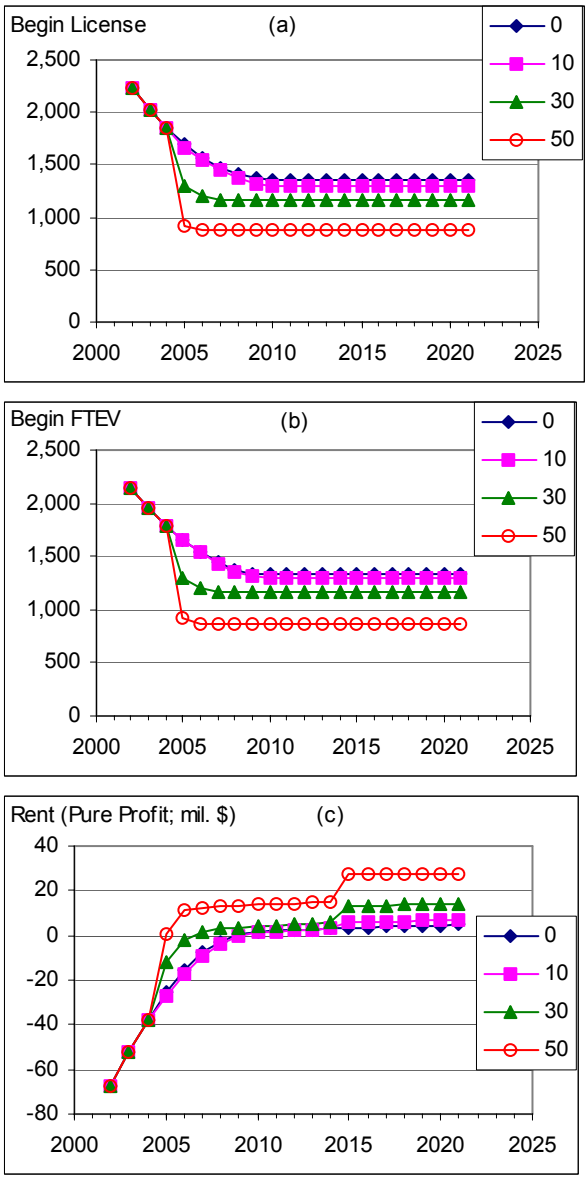


Figure A.34. Government Buyback w/Loan for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **no permit/license moratorium on small and large vessels**.

Bottom line: The loan payment causes slightly more vessels to leave the fishery so that when the loan is paid off rents are higher than when vessels are bought back with a government grant.

Large Vessels
Compare Figures A.34 and A.19.

AB.1.3.14 Government Buyback w/Loan for Large Vessels Only, Year-2000 Shrimp Prices, and With a Permit/License Moratorium (Figures A.35 and A.36)

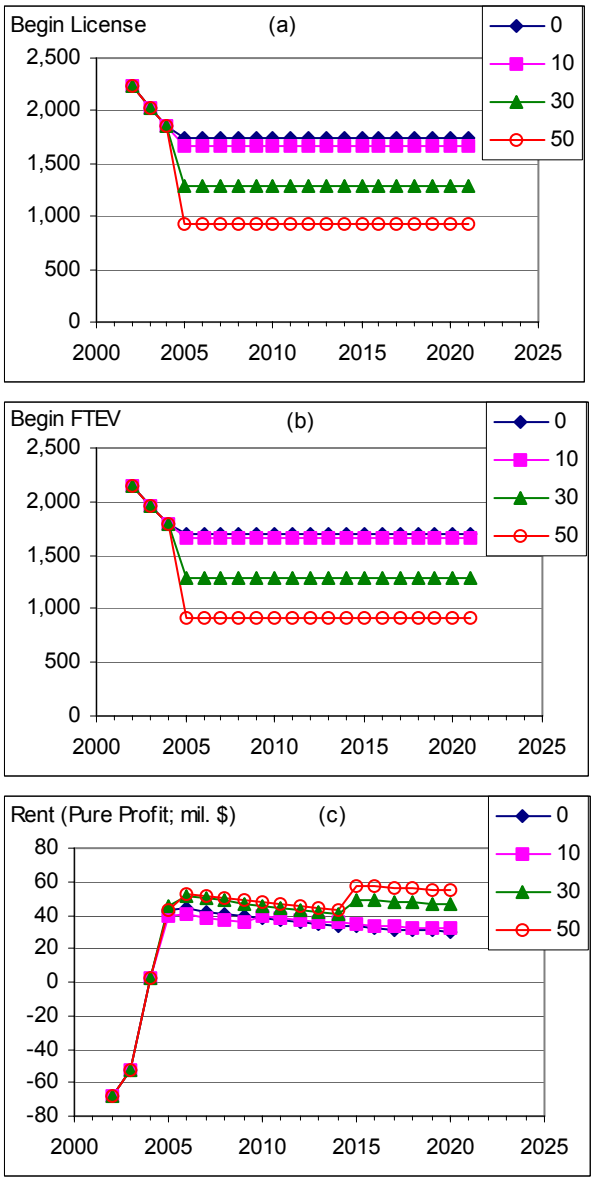


Figure A.35. Government Buyback w/Loan for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **with a permit/license moratorium**.

Bottom line: When shrimp prices are high and positive rents are being incurred, as they are under 2000-year prices, a buyback program with a permit/license moratorium for only large vessels is effective, although rents will decline slightly because small vessels are entering the fishery.

Large Vessels

Compare Figures A.35 and A.19. Basically the only difference between these figures is the rent is reduced by the amount of the loan payment.

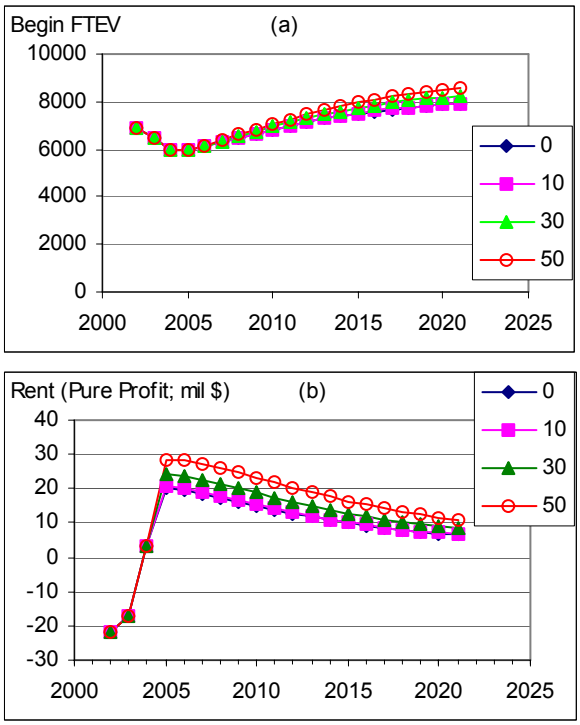


Figure A.35. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government loan at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **with a permit/license moratorium only on large vessels**.

Bottom line: When rent is positive under open access small vessels will enter the fishery until their rent is dissipated.

Small Vessels

Comparing Figures A.35 and A.20 for small vessels we see that the end result is the same. By the end of the simulation there are more small boats in the fishery than at the beginning because there is less fishing pressure from fewer large vessels in the near-shore area.

A.1.3.15 Government Buyback w/Loan for Small & Large Vessels, Year-2000 Shrimp Prices, and With a Permit/License Moratorium (Figures A.37 and A.38)

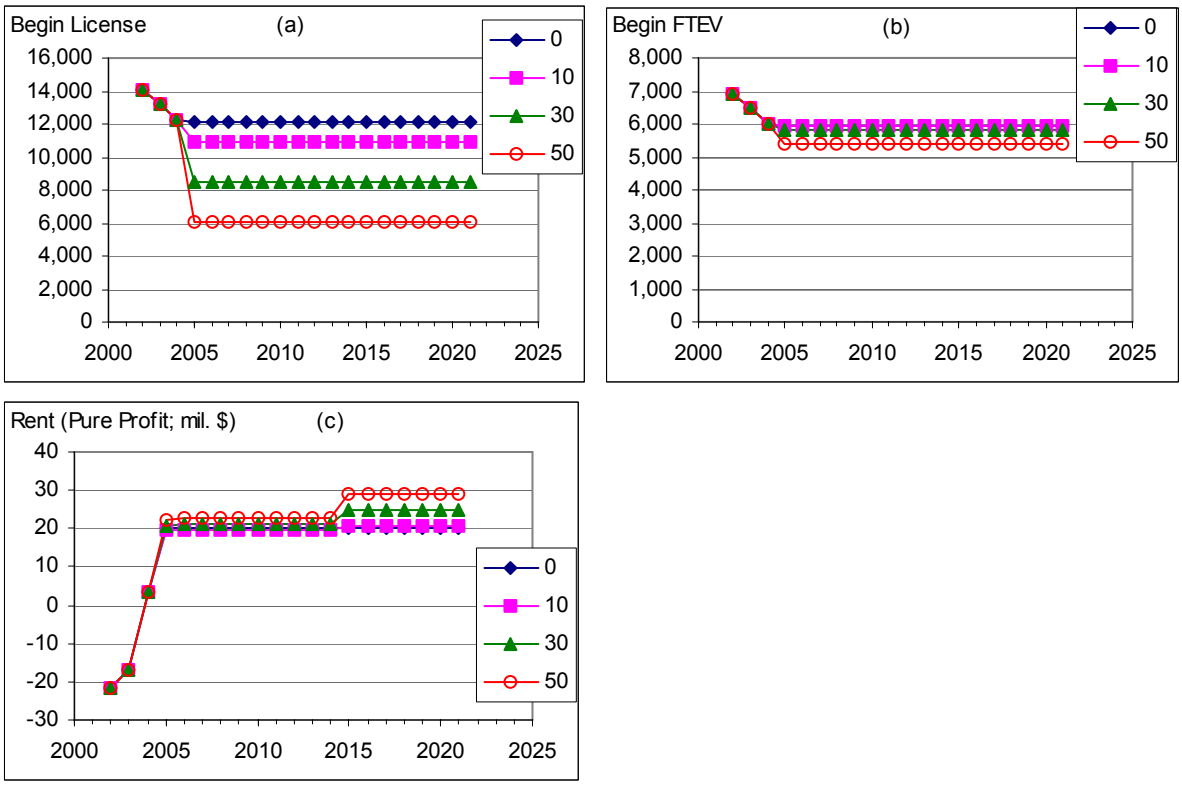
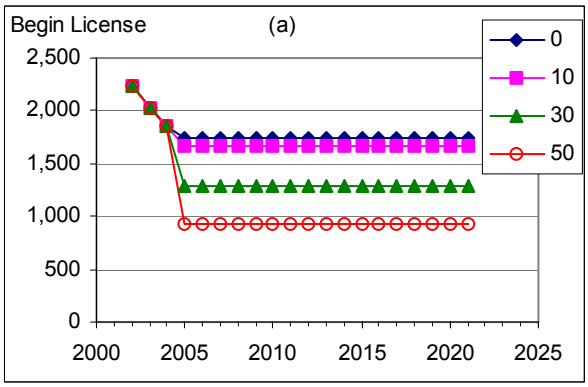


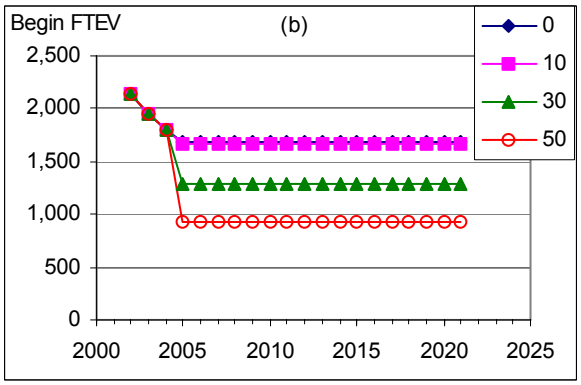
Figure A.37. **Government Buyback w/Loan for Small Vessel**: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices, and with a permit/license moratorium on small and large vessels.**

Bottom line: When shrimp prices are high and positive rents are being incurred, as they are under 2000-year prices, a buyback program with a permit/license moratorium for small vessels is effective provided there is no capital stuffing or effort creep.

Small Vessels

Compare Figures A.37 and A.21. Rent is reduced during the period the loan is being paid.





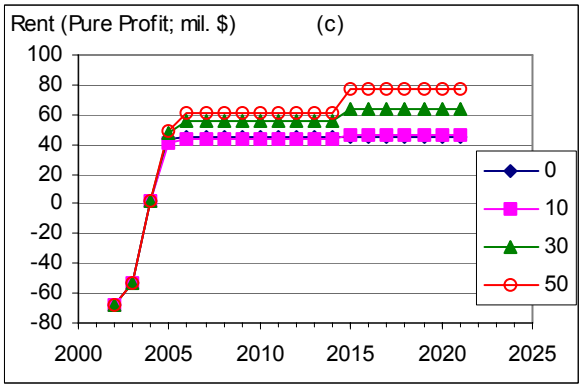


Figure A.38. Government Buyback w/Loan for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the Gulf of Mexico with **year-2000 shrimp prices,** and **with a permit/license moratorium on small and large vessels**.

Bottom line: When shrimp prices are high and large positive rents are being incurred as they are under 2000-year prices, a buyback program with a permit/license moratorium for large vessels is most effective when there is also a buyback program with a permit/license moratorium for small vessels.

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Large Vessels

Compare Figures A.38 and A.22. Rent is reduced during the period the loan is being paid

A.1.4 Government Price Supports

A.1.4.1 Target price above average price for Year-2002 Shrimp Prices and No Permit/License Moratorium (Figures A.39 and A.40)

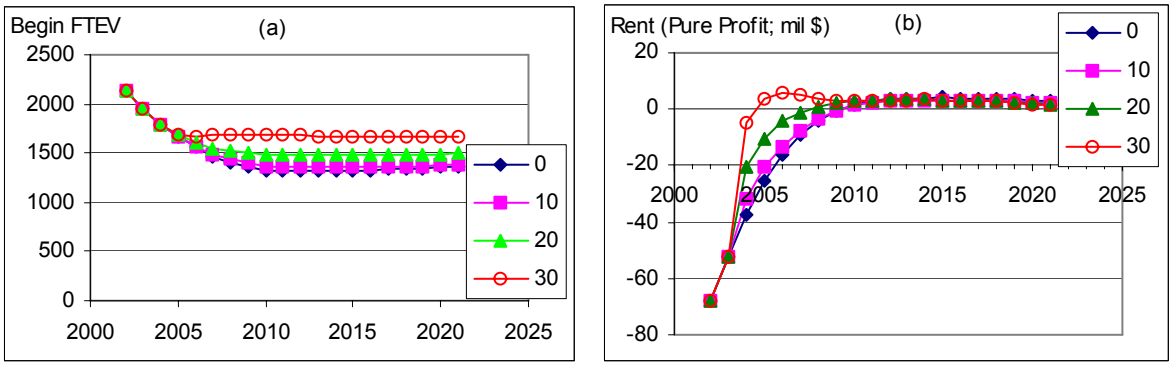


Figure A.39. Government Price Support for Large Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices, and no permit/license moratorium**.

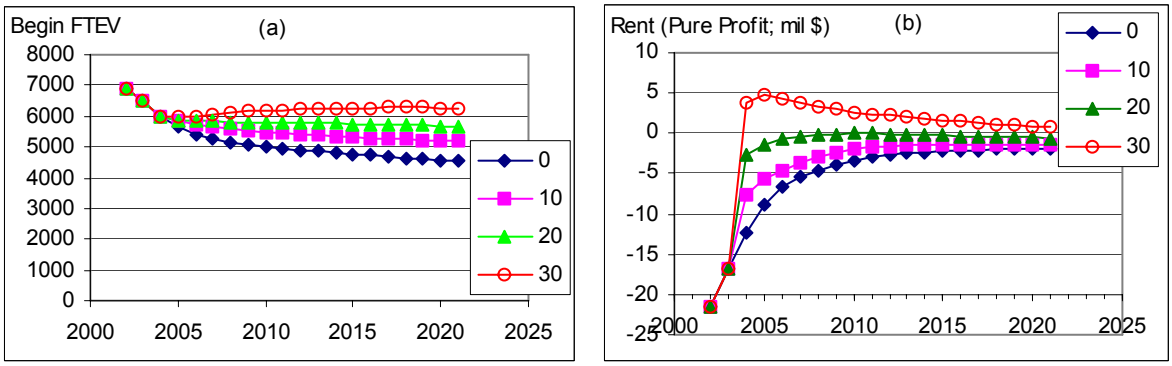


Figure A.40. Government Price Support for Small Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices, and no permit/license moratorium.**

Bottom line: When price are low and rents are negative a target price program will reduce the number of vessels leaving the fishery at a substantial cost to the taxpayer. Since there is no permit/license moratorium, vessels enter the fishery (if rents are positive) or exit the fishery (if rents are negative) until rents are dissipated.

Table A.14 shows the average price increase received by the shrimpers, the annual cost to the government and the discounted cost to the government over the 20-year simulation. For every one cent increase in the price it costs the government $1.16M.

A.1.4.2 Target price above average price for Year-2000 Shrimp Prices and No Permit/License Moratorium (Figures A.41 and A.42)

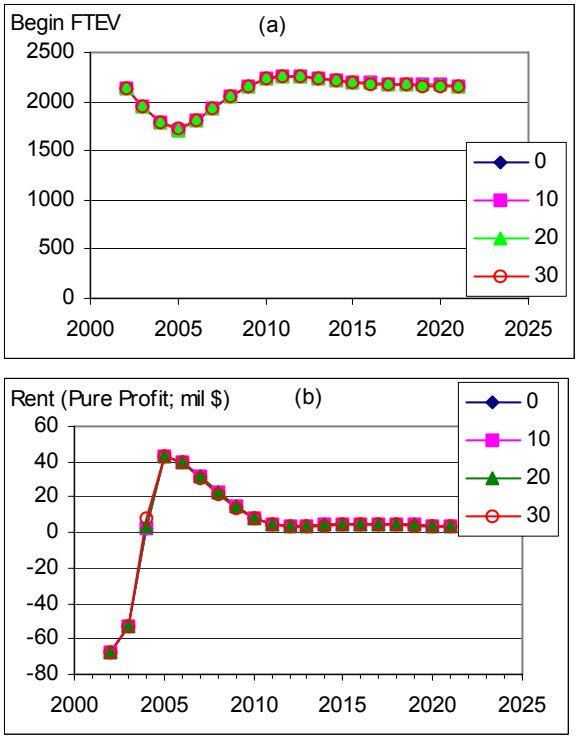


Figure A.41. Government Price Support for Large Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices, and no permit/license moratorium.**

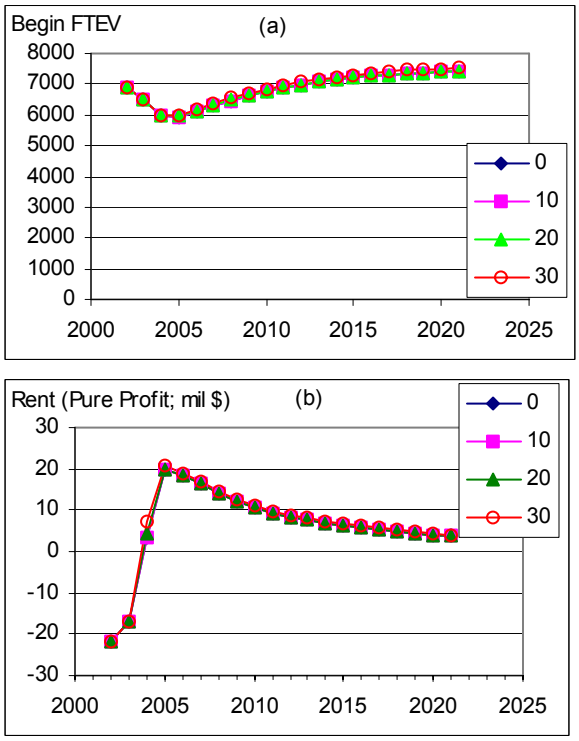


Figure A.41. Government Price Support for Small Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices, and no permit/license moratorium.**

Bottom line: When price are high and rents are positive a target price program has little effect on the shrimp fishery. Since there is no permit/license moratorium, vessels enter the fishery (if rents are positive) or exit the fishery (if rents are negative) until rents are dissipated. Target prices are not needed when the price of shrimp is at the 2000-year price level.

Table A.14 shows the average price increase received by the shrimpers was small.

A.1.4.3 Target price above average price for Year-2002 Shrimp Prices and With a Permit/License Moratorium (Figures A.43 and A.44)

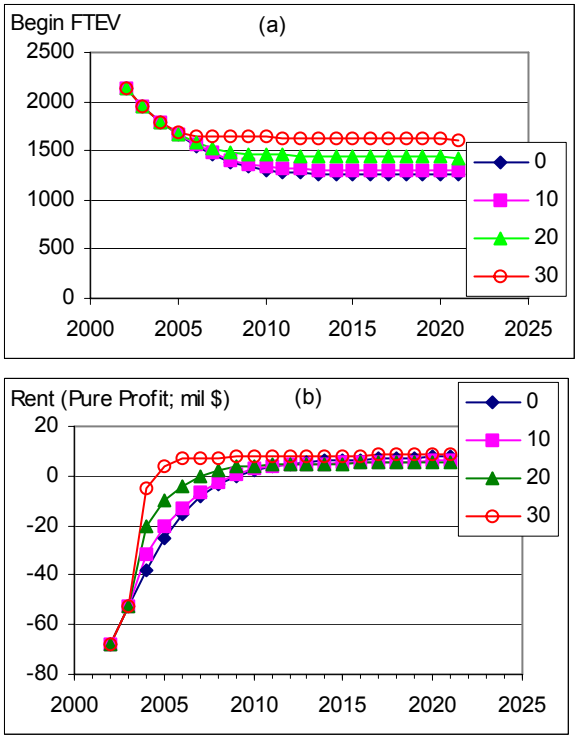


Figure A.43. Government Price Support for Large Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices, and with a permit/ license moratorium.**

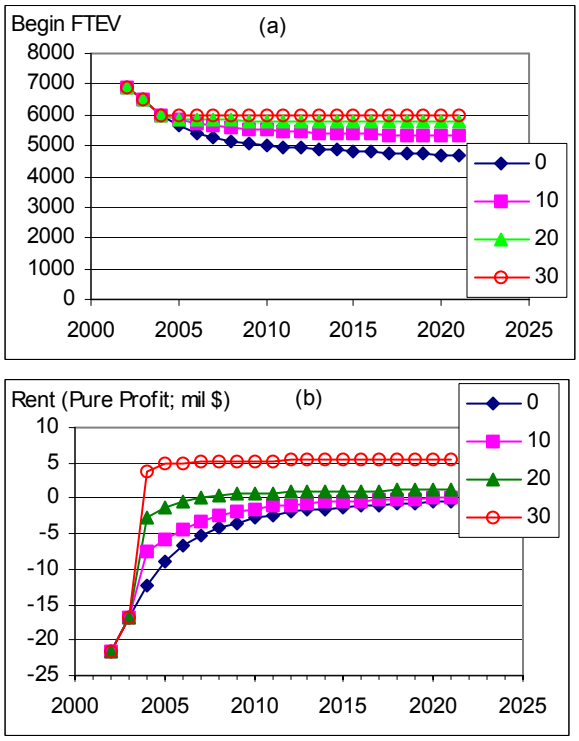


Figure A.44. Government Price Support for Small Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices, and with a permit/license moratorium.**

Bottom line: When price are as low as the 2002-year shrimp prices, it takes a target price slightly greater than 20% above average price for shrimpers to have zero rents (normal profits). It would cost the government over $34M to increase average price by 20%. These rents could be maintained if there is no capital stuffing and no effort creep.

A.1.4.4 Target price above average price for Year-2002 Shrimp Prices and With a Permit/License Moratorium (Figures A.45 and 46)

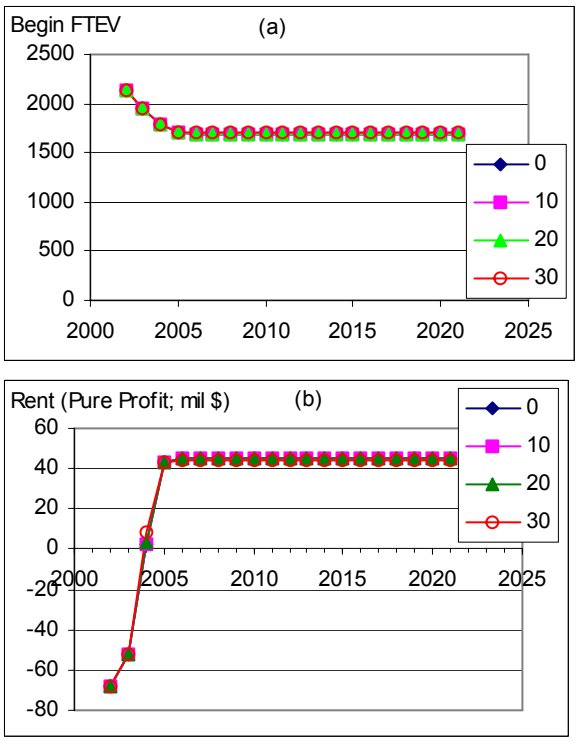


Figure A.45. Government Price Support for Large Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices, and with a permit/license moratorium.**

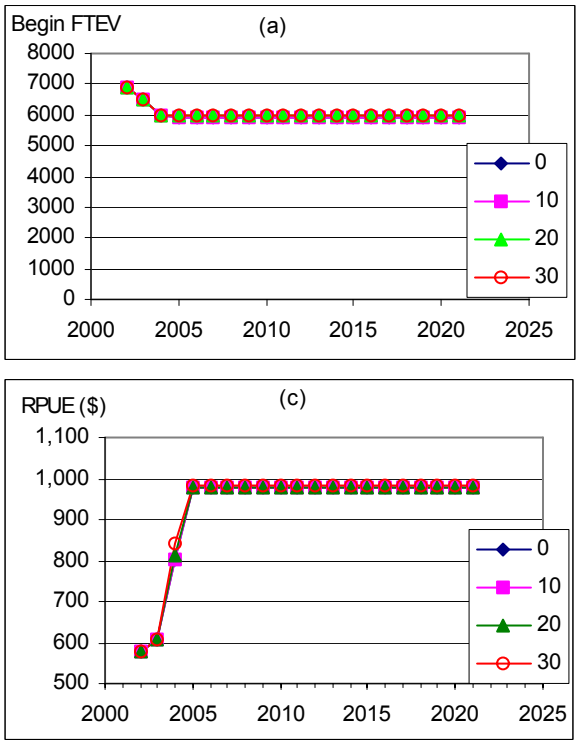


Figure A.46. Government Price Support for Small Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with year-2002 shrimp prices, and with a permit/license moratorium.

Bottom line: Target prices are not needed when the price of shrimp is at the 2000-year price level.

A 1.5 Increase Price Through Marketing Paid for by Tax on Per Pound of Shrimp Landed

A 1.5.1 Marketing increase based on Year-2002 Shrimp Prices and No Permit/License Moratorium (Figures A.47 and A.48)

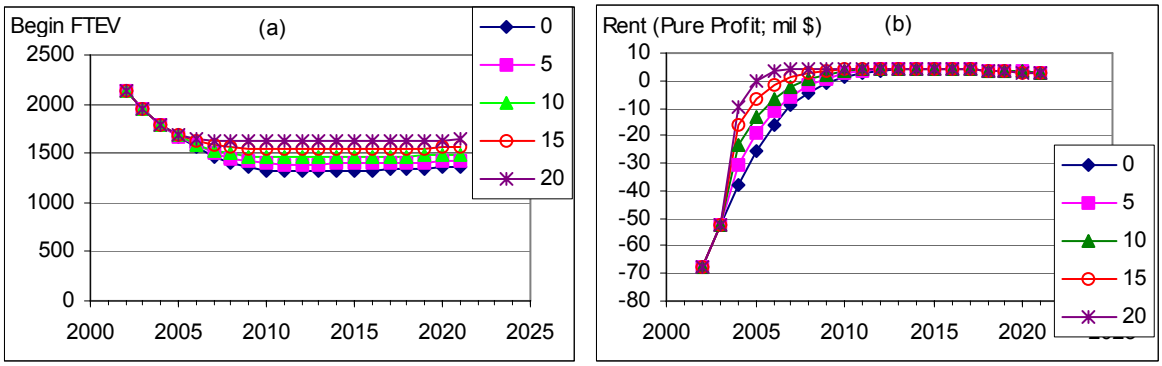


Figure A.47. Marketing Shrimp for Large Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **no permit/license moratorium**.

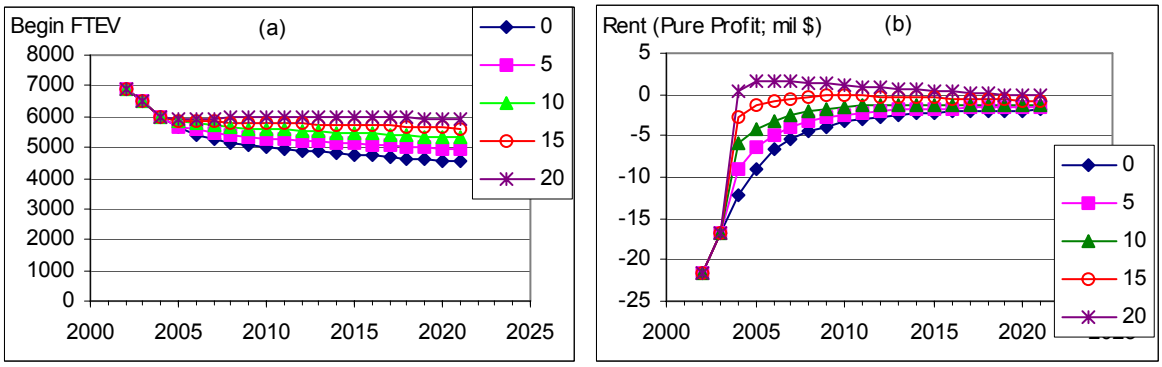


Figure A.48. Marketing Shrimp Support for Small Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **no permit/license moratorium**.

Bottom line: A 20% price increase through marketing efforts is needed to achieve zero rents in 2004. The higher the price that can be achieved through marketing, the fewer shrimp vessels that leave the shrimp fishery. Marketing expenses are approximately $11.6M.

A 1.5.2 Marketing increase based on Year-2000 Shrimp Prices and No Permit/License Moratorium (Figures A.49 and A.50)

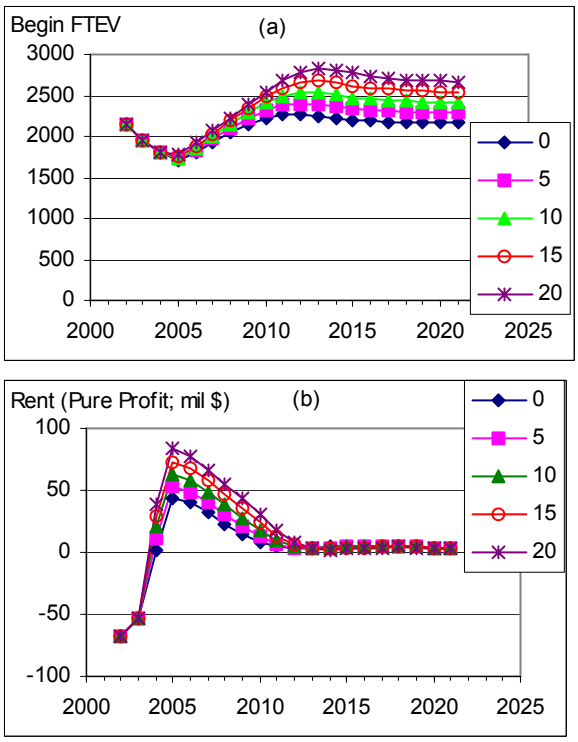


Figure A.49. Marketing Shrimp for Large Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices, and no permit/license moratorium**.

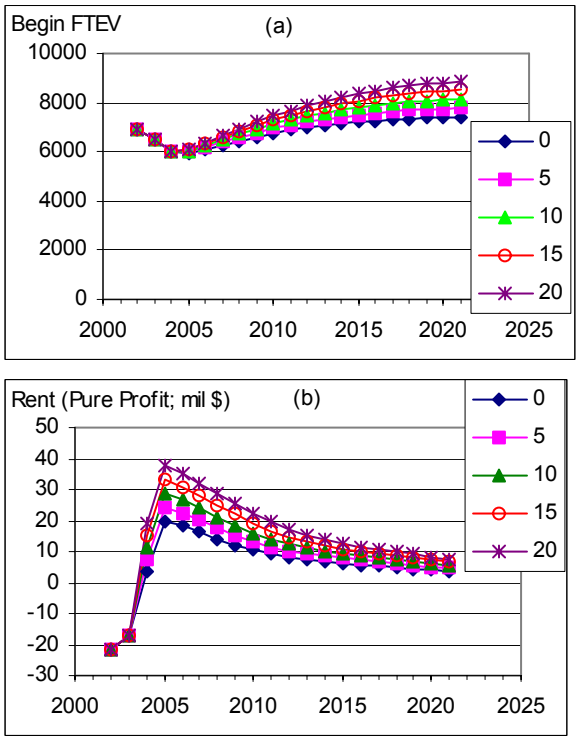


Figure A.50. Marketing Shrimp for Small Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **no permit/license moratorium**.

Bottom line: When prices are high and rents are positive, a marketing program that increases the price of shrimp will result in more vessels entering the shrimp fishery than was originally in the fishery in 2002. This happens because there is no permit/license moratorium to keep vessels from entering the fishery for either small or large vessels.

A 1.5.3 Marketing increase based on price for Year-2002 Shrimp Prices and With a Permit/License Moratorium (Figures A.51 and A.52)

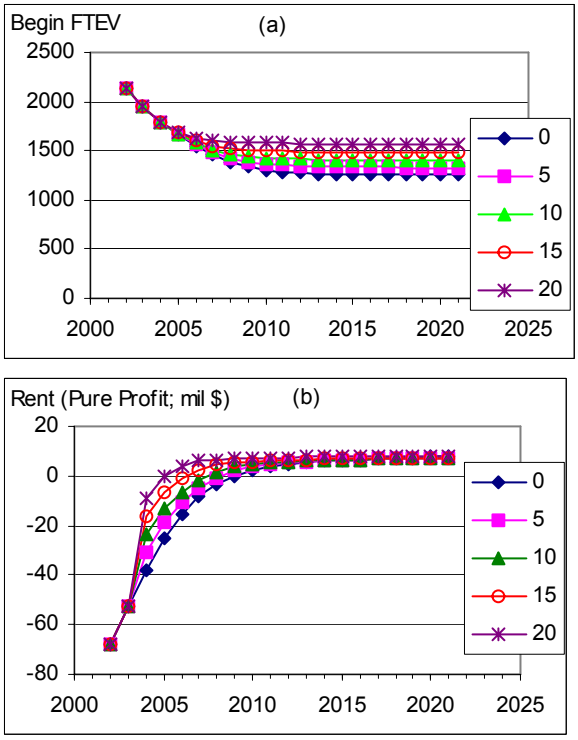


Figure A.51. Marketing Shrimp for Large Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **with a permit/license moratorium**.

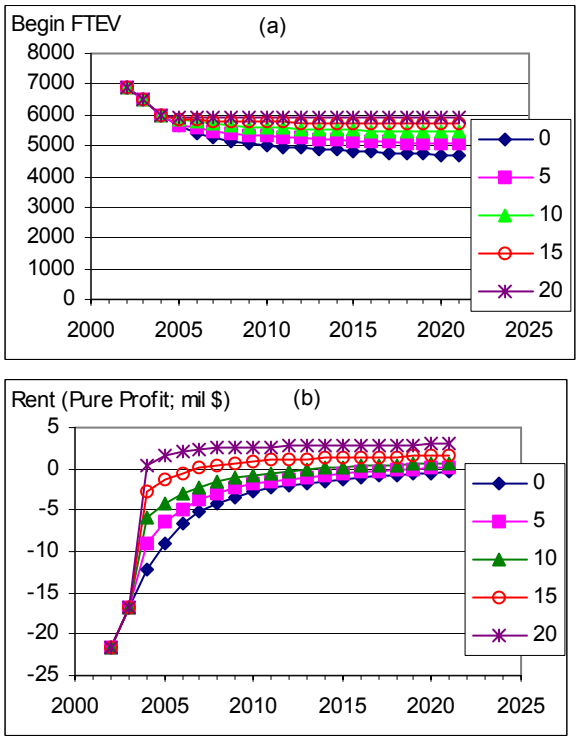


Figure A.52. Marketing Shrimp for Small Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **with a permit/license moratorium**.

Bottom line: The marketing activities keep some vessels from leaving the shrimp fishery that would otherwise leave. When positive rents are achieved with the assumed 15% and 20% price increases through marketing, the permit/license moratorium keeps additional vessels from entering the fishery to dissipate the rents. This also assumes that there will be no capital stuffing or effort creep.

Compare these results to Figures A.47 and A.48.

A 1.5.4 Marketing increase based on Year-2000 Shrimp Prices and With a Permit/License Moratorium (Figures A.53 and A.54)

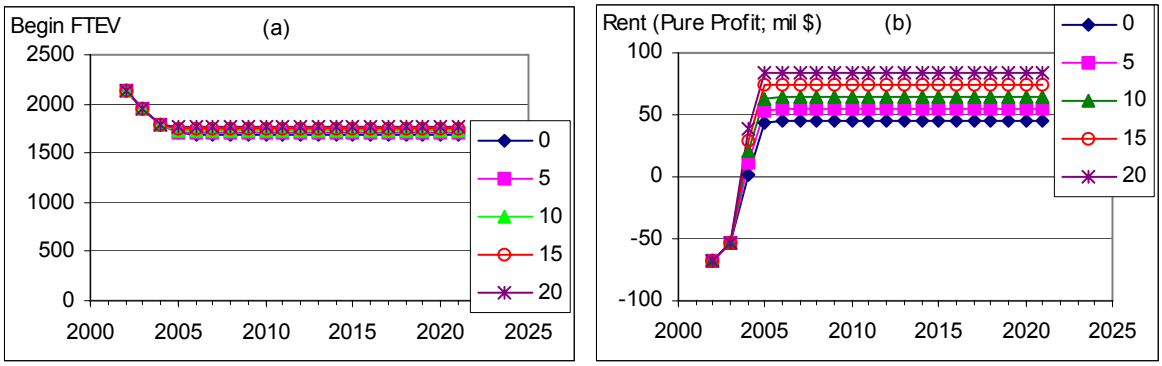


Figure A.53. Marketing Shrimp for Large Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **with a permit/license moratorium**.

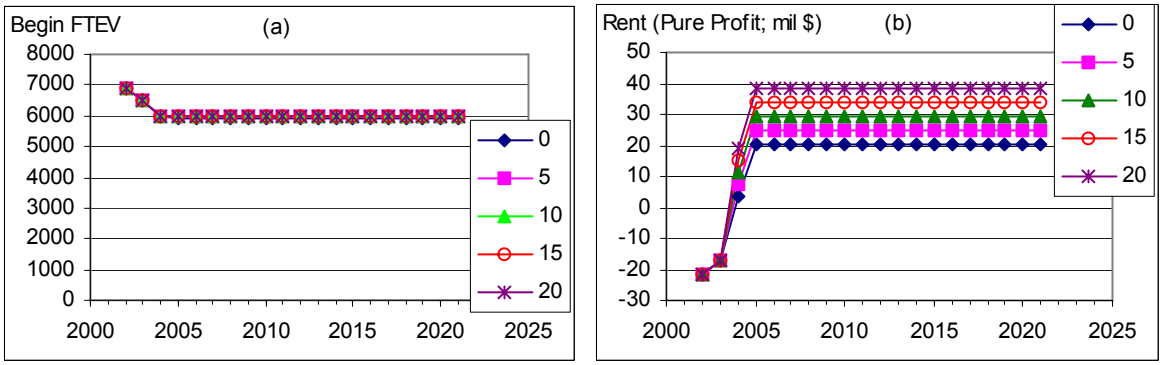


Figure A.54. Marketing Shrimp for Small Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the Gulf of Mexico with **year-2002 shrimp prices,** and **with a permit/license moratorium**.

Bottom line: When prices are high and rents are positive, a marketing program that increases the price of shrimp will result in increased rents. The permit/license moratorium keeps additional vessels from entering the fishery to dissipate the rents. This also assumes that there will be no capital stuffing or effort creep.

A.1.6 Cooperatives for Maximum Profit (Collective Group Action)

A.1.6.1 Cooperatives for Maximum Profit Based on Year-2002 Shrimp Prices (Figures A.55 and A.56)

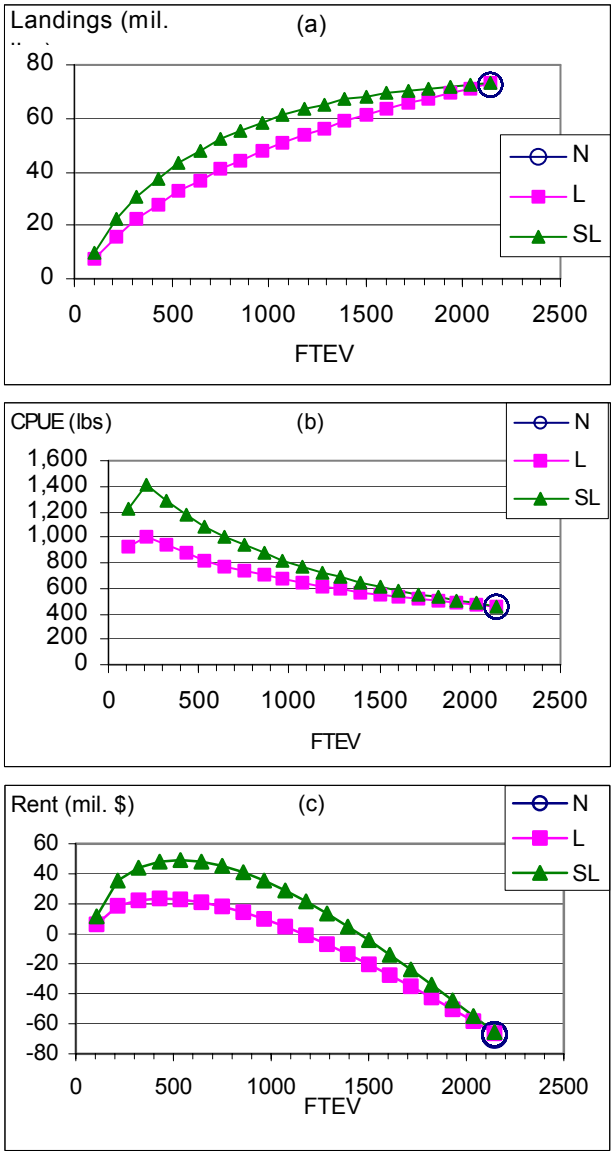


Figure A.55. Cooperatives for Maximum Profit for Large Vessels: Simulation by varying the number of FTEV from 5% to 100% in 5% increments based on FTEV in 2002 for the Gulf of Mexico **with year-2002 shrimp prices.**

Bottom line: If all large vessels owners were to form a cooperative and manage the large vessel fleet to maximize profit, then at the 2002-year price level for shrimp, the number of vessels should be reduced to approximately 500 FTEV. This would be less than 25% of the large FTEV that are operating in the Gulf of Mexico today. This would be true whether small vessels formed a cooperative or continued under open access.

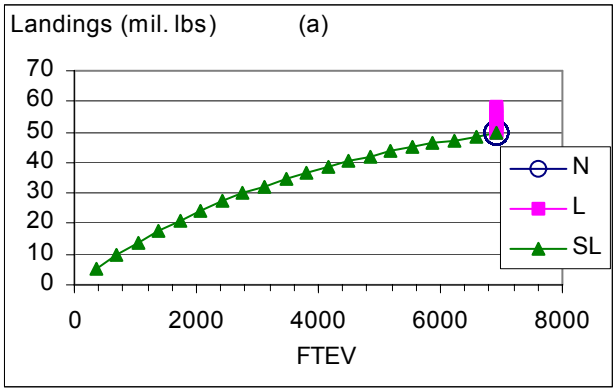
Large Vessels

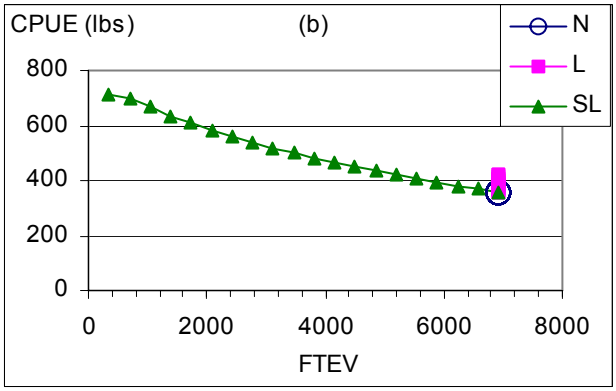
If small vessels continued to operate under open access then for large vessels:

Maximum rent would occur at approximately 500 FTEV. At maximum rent the CPUE would be over 800 pounds instead of the current level of less than 450 pounds. Rent would be approximately $20M.

If small vessels formed a cooperative and operated to maximize profit, then for large vessels:

Maximum rent would occur at approximately 500 FTEV. At maximum rent the CPUE would be over 1000 pounds. Rent would be over $40M.





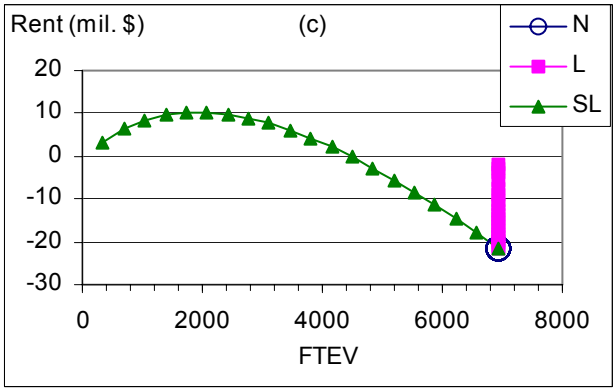


Figure A.56. Cooperatives for Maximum Profit for Small Vessels: Simulation by varying the number of FTEV from 5% to 100% in 5% increments based on FTEV in 2002 for the Gulf of Mexico with **year-2002 shrimp prices.**

Bottom line: If all small vessel owners were to form a cooperative and manage the small vessel fleet to maximize profit, then at the 2002-year price level for shrimp, the number of vessels should be reduced to just under 2,000 FTEV. This would be just over 25% of the small FTEV that are currently operating in the Gulf of Mexico today.

Small vessels

If large vessels formed a cooperative and operated to maximize profit, then for small vessels to operate as a cooperative to maximize profits:

Maximum rent would occur just under 2,000 FTEV. Rent would be over $10M. At maximum rent the CPUE would be just less than 600 pounds instead of less than 400 pounds as they are currently doing. Total landings would be just over 20M pounds.

A.1.6.2 Cooperatives for Maximum Profit Based on Year-2000 Shrimp Prices (Figures A.57 and A.58)

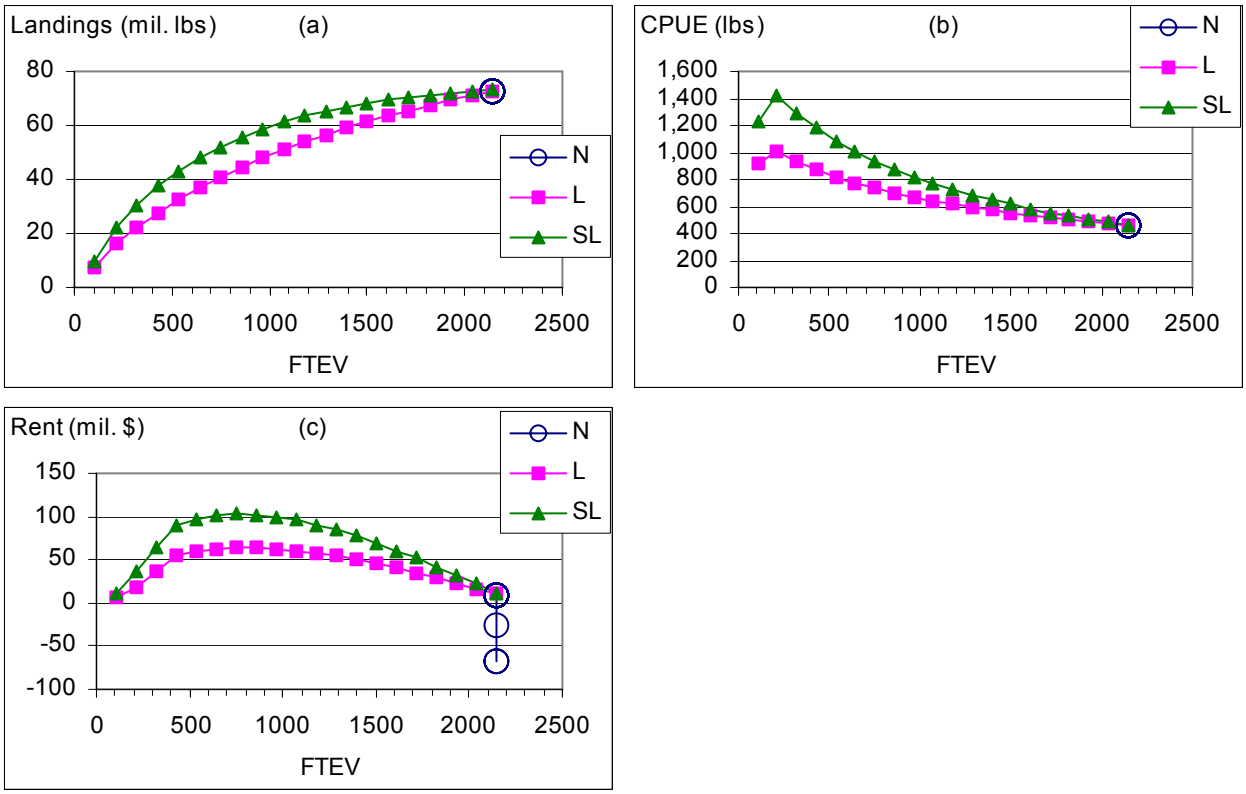


Figure A.57. Cooperatives for Maximum Profit for Large Vessels: Simulation by varying the number of FTEV from 5% to 100% in 5% increments based on FTEV in 2002 for the Gulf of Mexico with **year-2002 shrimp prices.**

Bottom line: If all large vessels owners were to form a cooperative and manage the large vessel fleet to maximize profit then, at the 2000-year price level for shrimp, the number of vessels should be reduced to approximately 750 FTEV. This would be less then 35% of the large FTEV that are currently operating in the Gulf of Mexico today. This would be the case whether small vessels continue to operate as open access or if small vessels formed cooperatives and operated to maximize profit.

Large vessels

If small vessels continued to operated under open access then for large vessels:

Maximum rent would occur at approximately 750 FTEV. At maximum rent the CPUE would be over 700 pounds instead of the current level of less then 450 lbs. Rent would be approximately $60M.

If small vessels formed a cooperative and operated to maximize profit then for large vessels:

Maximum rent would occur at approximately 750 FTEV. At maximum rent the CPUE would be over 900 pounds. Rent would be over $100M.

Comparing Figures A.57 and A.58 or A.56 and A.58, it is obvious that the higher the price the more vessels that can be supported by the shrimp fishery. The real price of shrimp has been declining since 1980 and therefore the number of vessels that can be supported by the shrimp fishery, where the vessels are financial stable, is declining.

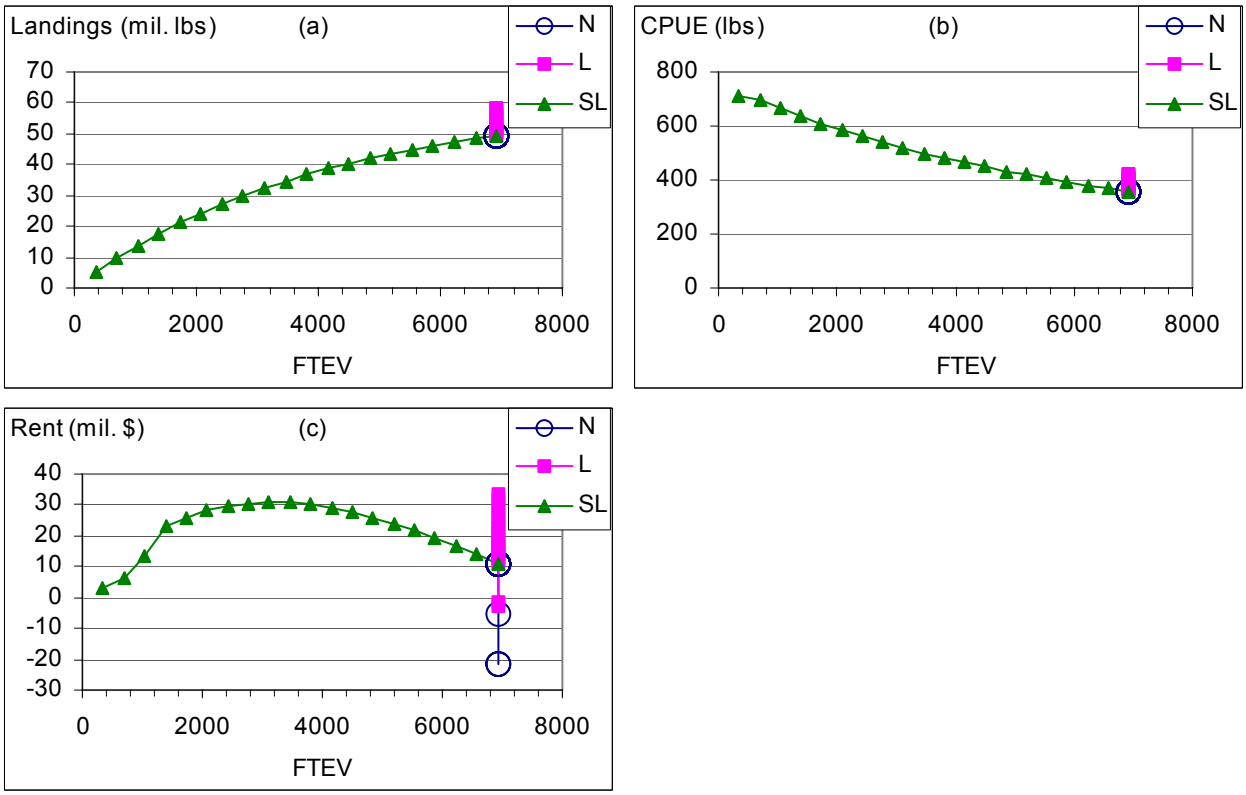


Figure A.58. Cooperatives for Maximum Profit for Small Vessels: Simulation by varying the number of FTEV from 5% to 100% in 5% increments based on FTEV in 2002 for the Gulf of Mexico with **year-2002 shrimp prices.**

Bottom line: If all small vessels owners were to form a cooperative and manage the small vessel fleet to maximize profit, then at the 2000-year price level for shrimp, the number of vessels should be reduced to just under 3,200 FTEV. This would be approximately 45% of the small FTEV that are currently operating in the Gulf of Mexico today.

Small vessels

If large vessels formed a cooperative and operated to maximize profit, then for small vessels to operate as a cooperative and maximize profits:

Maximum rent would occur just under 3,200 FTEV. Rent would be about $30M. At maximum rent the CPUE would be about 500 pounds instead of less than 400 pounds as they are currently doing. Total landings would be just over 35M pounds.

A.1.7 Fractional License Program

Program Summary: A fractional license (FL) program reduces the number of licenses held in the fleet by requiring a fixed percentage of the vessels to sell their right to a license to other vessels in the fleet.

A.1.7.1 Fractional license Program for Small & Large Vessels, Year-2002 Shrimp Prices (Figures A.59 and A.60)

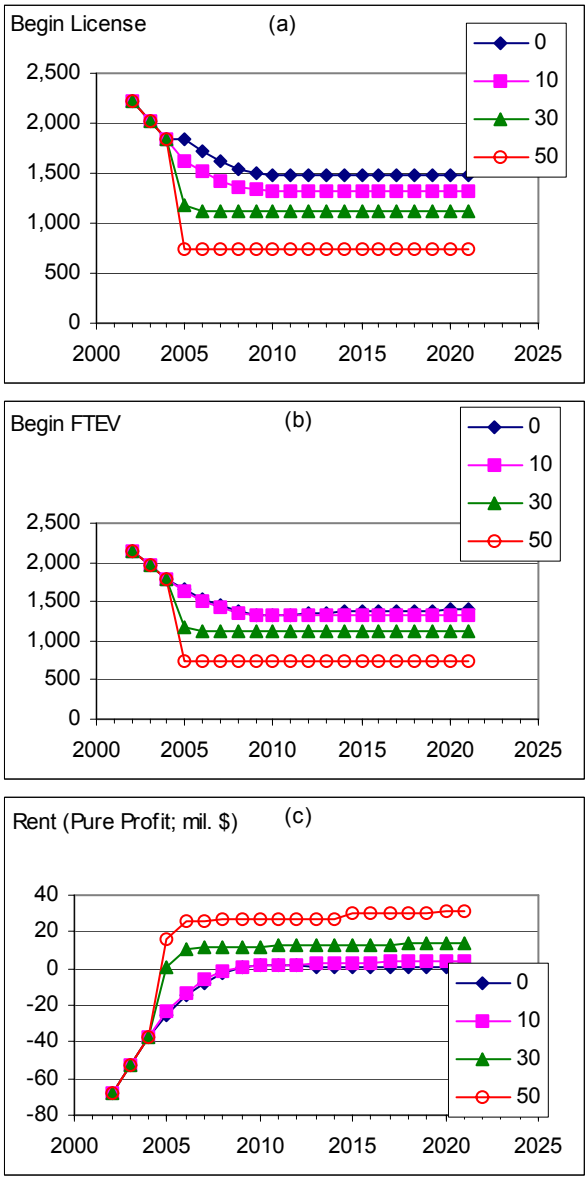


Figure A.59. Fractional License program for Small and Large Vessels, Large Vessel results: Simulation over the period 2002-2021 with 0%, 10%, 30%, and 50% reductions in the number of licenses in 2004 in the Gulf of Mexico. **Year 2002 prices assumed**.

Bottom line: Under low 2002 prices, the large vessel fleet can sustain positive profits in the long term if at least 10% of the licenses are retired. For small boats, however, only a 50% reduction in the licenses is sufficient to offset the surplus licenses currently in existence.

Large Vessels

Under 2002 prices, large vessel rents become positive as long as 30% or more of the licenses are retired. Because of the low prices, loans per boat are much lower than in the case when year 2000 prices are assumed. The loans per remaining large vessels are predicted to be negligible for a 10% program, about $200 for a 30% program, to $31,000 for a 50% program.

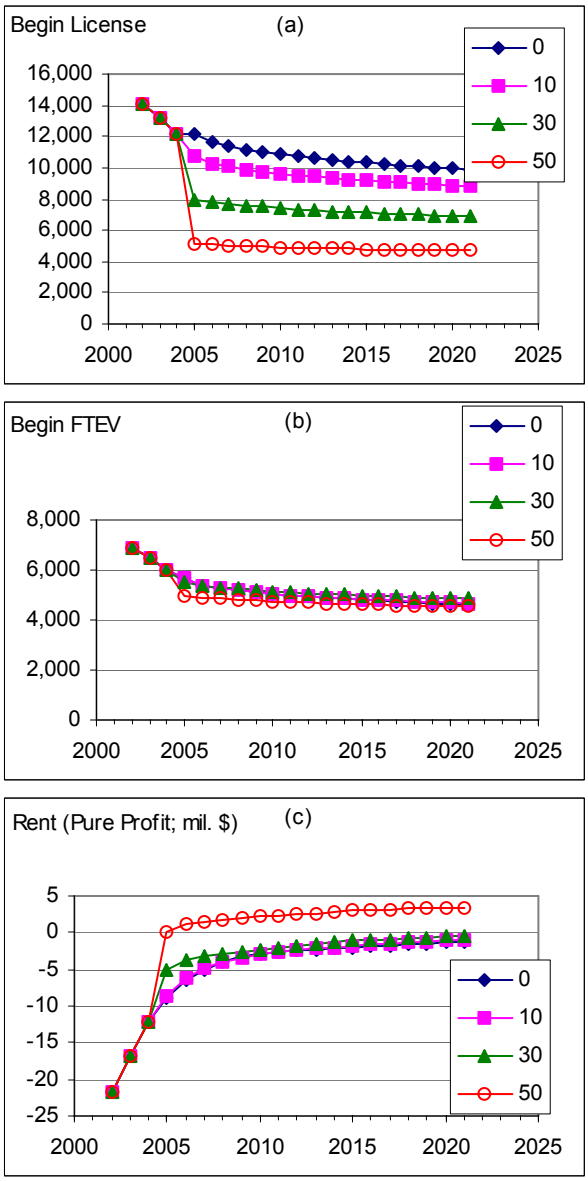


Figure A.60. Fractional License program for Small and Large Vessels, Small Vessel results: Simulation over the period 2002-2021 with 0%, 10%, 30%, and 50% reductions in the number of licenses in 2004 in the Gulf of Mexico. **Year 2002 prices assumed**.

Small Vessels

For small vessels, positive rents can be achieved only for the 50% FL scenario. For lower reductions, the vessels continue to lose money and exit the fishery voluntarily. The loans required for the reduction are predicted to be less than $200 per remaining vessel, even when as much as 50% of the licenses are retired.

A.1.7.2 Fractional license Program for Small & Large Vessels, Year-2000 Shrimp Prices (Figures A.61 and A.62)

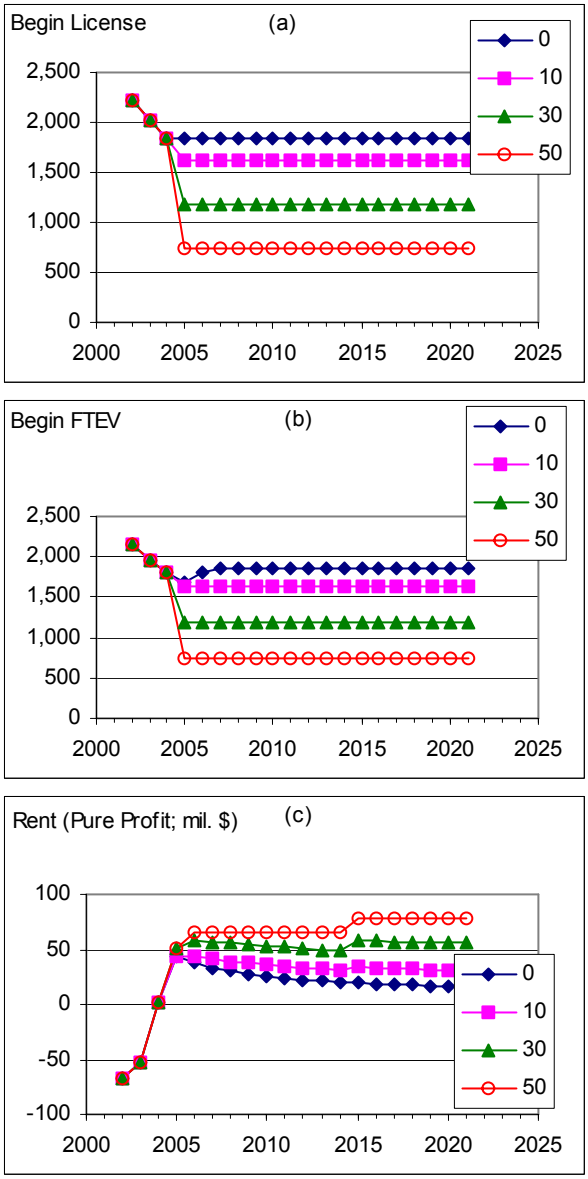


Figure A.61. Fractional License program for Small and Large Vessels, Large Vessel results: Simulation over the period 2002-2021 with 0%, 10%, 30%, and 50% reductions in the number of licenses in 2004 in the Gulf of Mexico. **Year 2000 prices assumed from 2005-2021.**

Bottom line: Under 2000 prices the large vessel fleet can sustain positive profits in the long term if at least 10% of the licenses are retired. For small vessels, however, only a 50% reduction in the licenses is sufficient to offset the surplus licenses currently in existence and restore the fleet's profitability.

Large Vessels

Under 2000 prices the fishery is expected to be profitable and the selling price of licenses is relatively high. As evidence of the excess effort in the fishery, however, rents increase as effort is reduced, even when up to 50% of the licenses are retired. Financing the FL program through loans is predicted to require loans per vessel of $14,000 for a 10% reduction, $61,000 for a 30% reduction, and $133,000 for a 50% reduction.

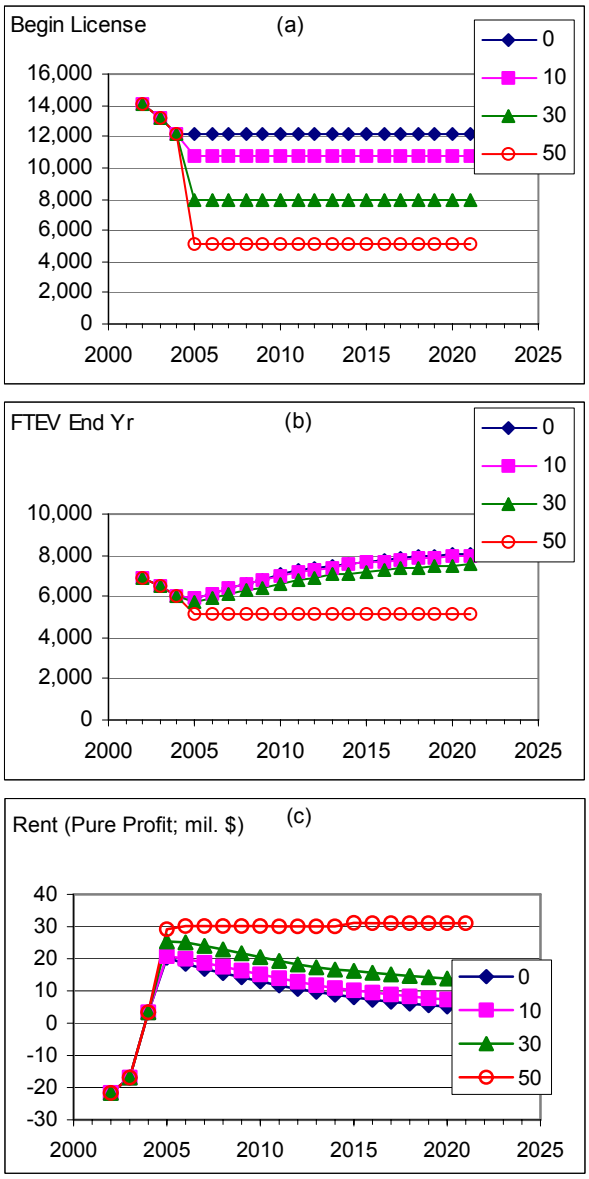


Figure A.62. Fractional License program for Small and Large Vessels, Small Vessel results: Simulation over the period 2002-2021 with 0%, 10%, 30%, and 50% reductions in the number of licenses in 2004 in the Gulf of Mexico. **Year 2000 prices assumed from 2005-2021.**

Small Vessels

For small vessels, the FL programs under 2000 prices offer sustainable economic benefit only at the 50% level. Because the number of licenses greatly exceeds the FTEV currently in the fishery, small percentage license reductions do not constrain effort expansion and lead to the dissipation of rents. The loans per remaining vessel required are about $140 for a 10% reduction, $330 for a 30% reduction, and $3,600 for a 50% reduction.

A.1.7.3 Fractional license Program for Large Vessels, Year-2002 Shrimp Prices (Figures A.63 and A.64)

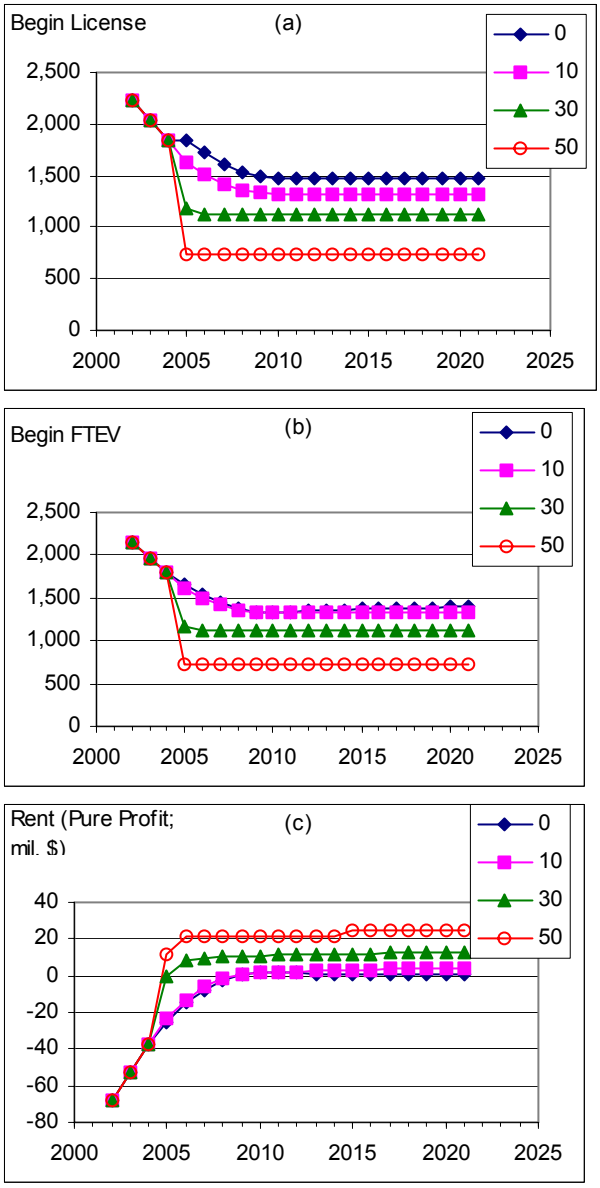


Figure A.63. Fractional License program for Large Vessels, Large Vessel results: Simulation over the period 2002-2021 with 0%, 10%, 30%, and 50% reductions in the number of licenses in 2004 in the Gulf of Mexico**. Year 2002 prices assumed.**

Bottom line: Under 2002 prices, we find that a FL program on only large vessels can restore the large vessel fleet to profitability, but only helps reduce losses among small vessels. Only a 50% FL program is found to have a noticeable effect on the fishery's overall economic situation.

Large Vessels

Under 2000 prices, large vessel rents become positive as long as 10% or more of the large vessel licenses are retired. The loans per boat are predicted to be negligible for 10% or 30% programs, and only $28,000 for a 50% program.

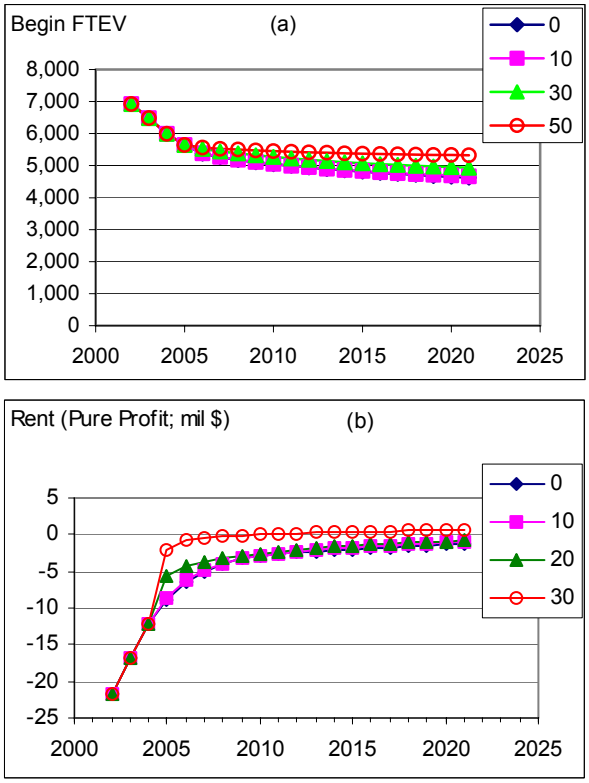


Figure A.64. Fractional License program for Large Vessels, Small Vessel results: Simulation over the period 2002-2021 with 0%, 10%, 30%, and 50% reductions in the number of licenses in 2004 in the Gulf of Mexico**. Year 2002 prices assumed.**

Small Vessels

Under 2002 prices, small vessels are predicted to make negative rents even when 50% of the large vessel licenses are retired from the fishery. The situation of this fleet will improve only as vessels voluntarily exit the fishery.

A.1.7.4 Fractional license Program for Large Vessels, Year-2000 Shrimp Prices (Figures A.65 and A.66)

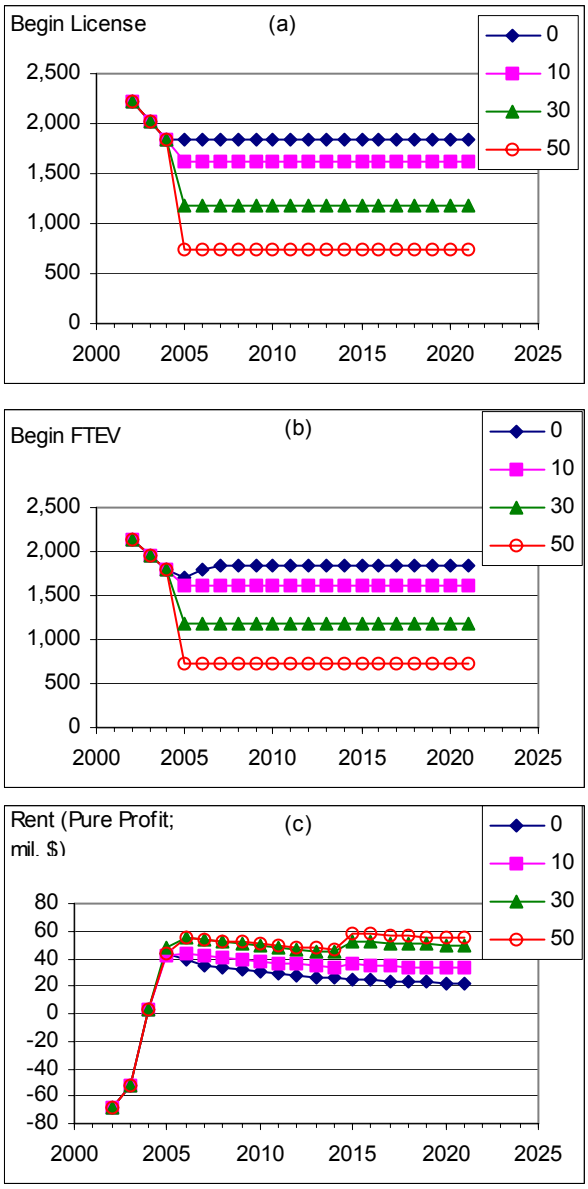


Figure A.65. Fractional License program for Large Vessels, Large Vessel results: Simulation over the period 2002-2021 with 0%, 10%, 30%, and 50% reductions in the number of licenses in 2004 in the Gulf of Mexico. **Year 2000 prices assumed from 2005-2021.**

Bottom line: If prices revert to their 2000 level, both large and small vessel fleets would become profitable. A FL program that only retires the licenses of large vessels is helpful in restoring profitability to the large fleet, and slows a gradual decline in the rents of small vessels.

Large Vessels

Under 2000 prices, large vessel rents become positive as long as 10% or more of the large vessel licenses are retired. The loans per boat are predicted to be about $13,000 for a 10% program, about $60,000 for a 30% program, and $130,000 for a 50% program.

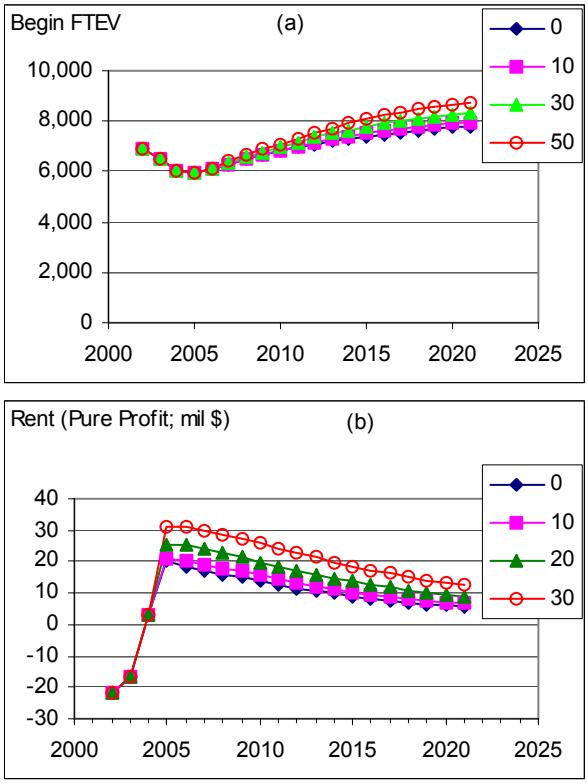


Figure A.66. Fractional License program for Large Vessels, Small Vessel results: Simulation over the period 2002-2021 with 0%, 10%, 30%, and 50% reductions in the number of licenses in 2004 in the Gulf of Mexico. Year 2000 prices assumed from 2005-2021.

Small Vessels

Small vessels benefit from the reduction in large vessel licenses, but as positive rents are enjoyed over the simulated period, vessels continue to enter the fleet, dissipating rents.

A.2 Results: South Atlantic Shrimp Fishery

A.2.1 Open Access

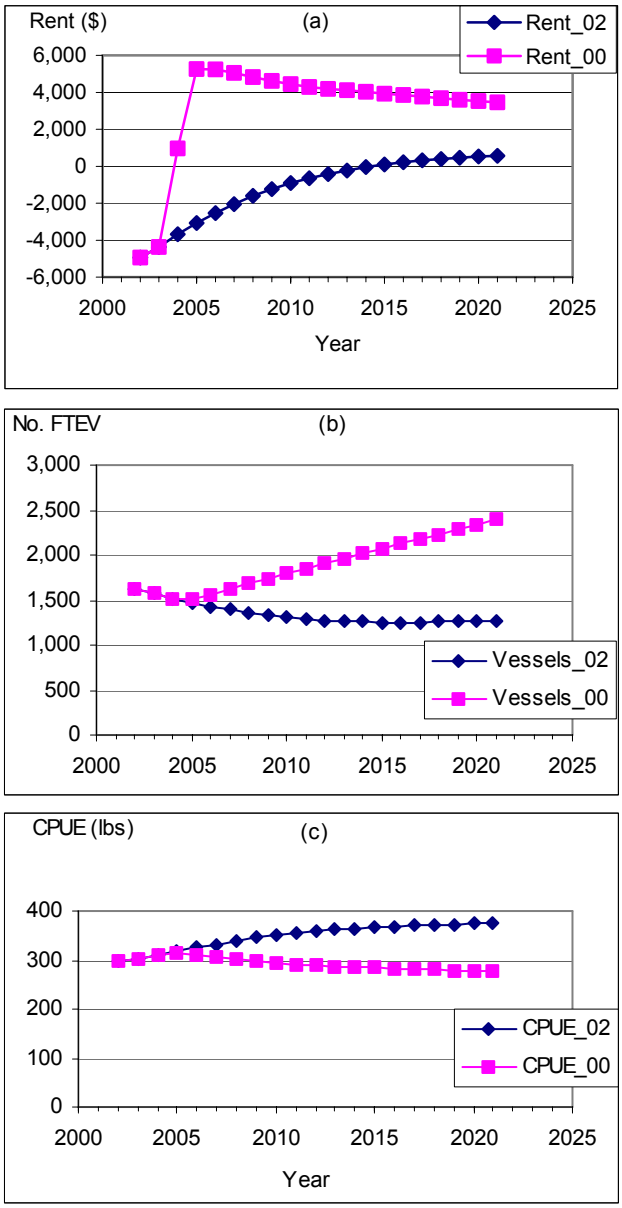


Figure A.67. Open Access Small Vessels: Simulated rent, number of FTEV, and CPUE for small vessels in the South Atlantic, 2002-2021.

Summary: Before discussing the various policies we will briefly examine the South Atlantic shrimp fishery under open access for the 20-year simulation at the two price levels. Figures A.68a and A.68b show rent and number of FTEV, respectively, for the simulated period 2002 through 2021. Rent is defined as zero when the average vessel is making normal profit. If rent is greater than zero, then the average vessel is making above normal profits and, given the open access nature of the fishery, additional vessels will enter the shrimp fishery. If rent is less than zero then the average vessel is making below normal profit and vessels will leave the shrimp fishery.

Bottom line: In the short term, higher prices benefit the fishery; however, in the long run under open access, rents in the fishery tend toward zero regardless of the price level.

Small Vessels

In Figure B.1a, when prices remain at the 2002 level the small vessels are making negative rents; therefore, small vessels will leave the industry (Figure A.67b). As small vessels leave the fishery, rent approaches zero. When prices increase to the year-2000 price level by 2005, small vessels make positive rents and small vessels begin to enter the fishery. As small vessels enter the fishery, rent declines and approaches zero. Thus, under 2002-year price level, the simulation period ends with about 1,400 small FTEV in the fleet, whereas with year-2000 price level the simulation period ends with about 2,500 small FTEV in the fleet. When vessels enter the fishery, CPUE declines. Figure A.2c shows that catch per unit effort (CPUE) increases when vessels leave the fishery.

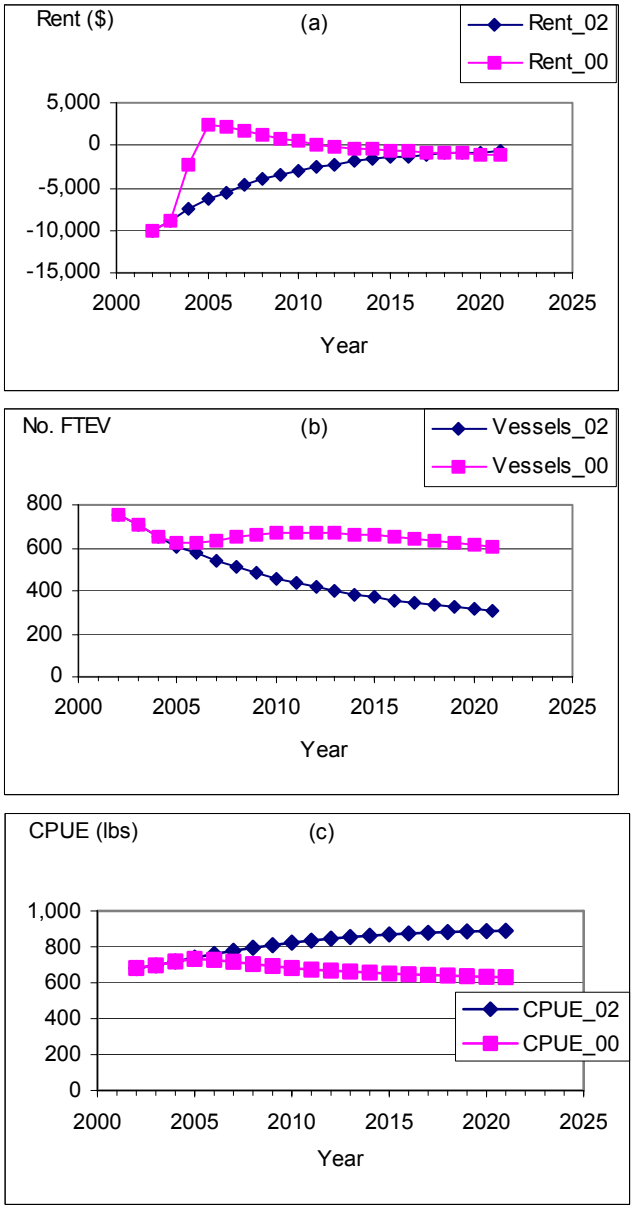


Figure A.68. Open Access Large Vessels: Simulated rent, number of FTEV, CPUE and RPUE in the South Atlantic, 2002-2021.

Large Vessels

Figure A.68 shows the same information as Figure A.67 except for large vessels. Like small vessels, large vessels exit the fishery when the average vessel incurs negative rents and enter the fishery when rents are positive.

We can see that under open access, vessels will leave the fishery when negative rents are incurred and enter the fishery when positive rents are incurred. Open access causes rents to be dissipated.

A.2.2 Permit/License Moratorium

A.2.2.1 Low Prices (2002 Shrimp Prices)

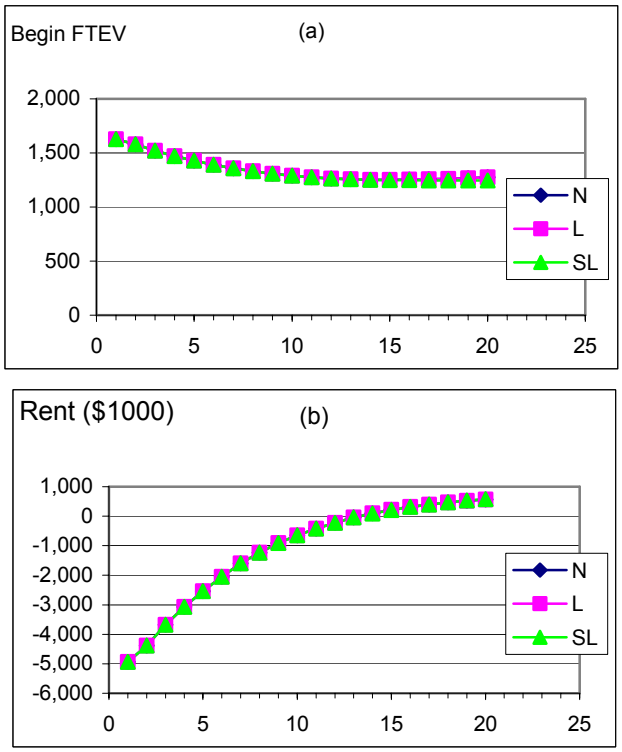


Figure A.69. Permit/License Moratorium Small Vessels: Simulation over the period 2002-2021 with year-**2002 shrimp prices** where N is no permit/license moratorium (except Texas small vessels), L is a permit/license moratorium on large vessels (>60ft) beginning in 2004, and SL is a permit/license moratorium on small (<60ft) and large vessels (>60ft) beginning in 2004 in the South Atlantic.

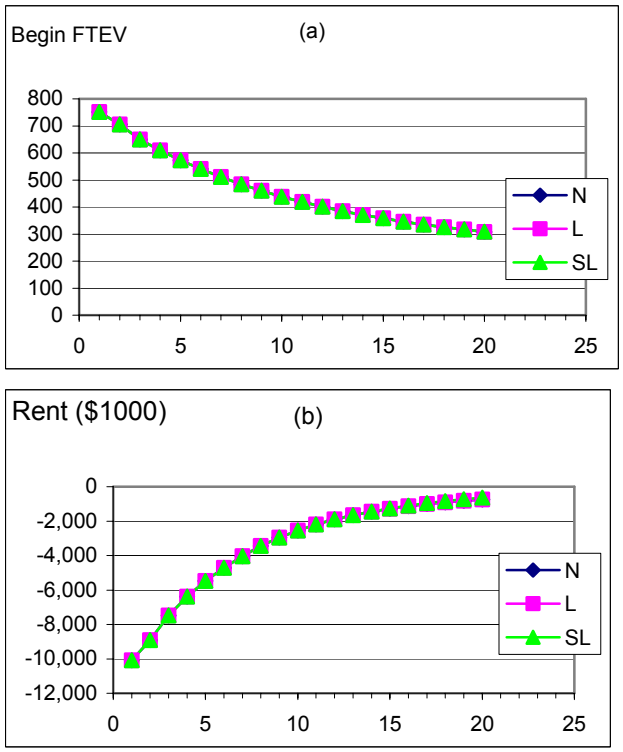


Figure A.70. Permit/License Moratorium Large Vessels: Simulation over the period 2002-2021 with year-**2002 shrimp prices** where N is no permit/license moratorium (except Texas small vessels), L is a permit/license moratorium on large vessels (>60ft) beginning in 2004, and SL is a permit/license moratorium on small (<60ft) and large vessels (>60ft) beginning in 2004 in the South Atlantic.

Bottom line: When prices remain at their current low levels, a license removal program has no significant impact on the economic state of the shrimp fishery.

Figures A.69 and A.70 show the results for the simulation of various types of permit/license moratoria with prices set at the 2002-year level. When vessels are incurring negative rents (Figures A.69b and A.70b) there is very little difference between no permit/license moratorium (N), a permit/license moratorium on large vessel only (L) and a permit/license moratorium on both small and large vessels (SL). This result is due to the large negative rents incurred such that many vessels will leave the fishery even without a moratorium (Figures A.69a and A.70a). Moratoriums are to keep vessels from entering the fleet when rent is positive rather than keeping vessels from leaving the fishery when rent is negative.

A.2.2.2 High Prices (2000 Shrimp Prices)

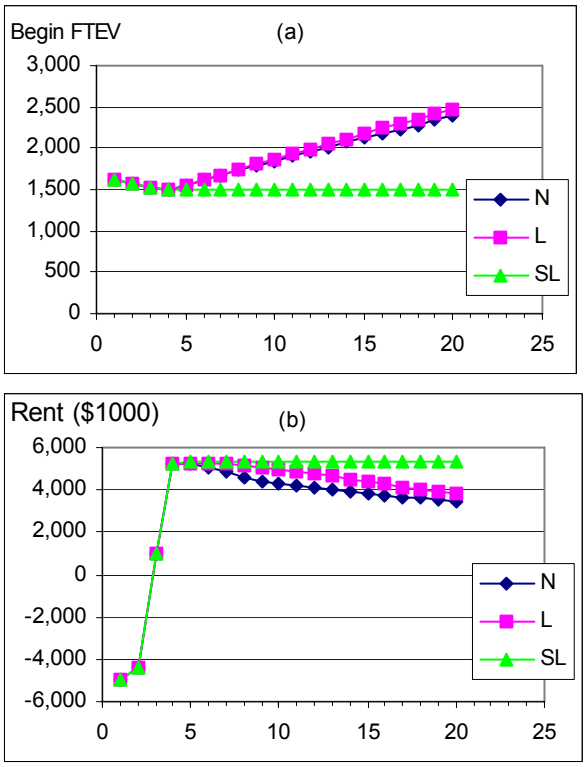


Figure A.71. Permit/License Moratorium Small Vessels: Simulation over the period 2002-2021 with year-**2000 shrimp prices** where N is no permit/license moratorium (except Texas small vessels), L is a permit/license moratorium on large vessels (>60ft) beginning in 2004, and SL is a permit/license moratorium on small and large vessels (>60ft) beginning in 2004 in the South Atlantic.

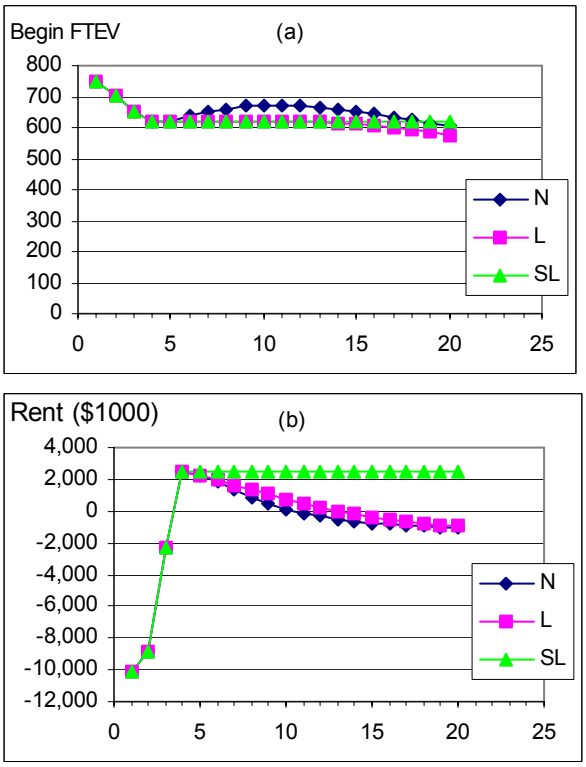


Figure A.72. Permit/License Moratorium Large Vessels: Simulation over the period 2002-2021 with year-**2000 shrimp prices** where N is no permit/license moratorium (except Texas small vessels), L is a permit/license moratorium on large vessels (>60ft) beginning in 2004, and SL is a permit/license moratorium on small and large vessels (>60ft) beginning in 2004 in the South Atlantic.

Bottom line: With higher prices as in the year-2000 price level, if a permit/license moratorium is imposed in 2004 on both small and large vessels positive rents can be maintained by small and large vessels provided capital stuffing and effort creep is prevented. If only large vessels have a permit/license moratorium then it will not be much different than if there was no permit/license moratorium.

Figures A.71 and A.72 show the results for the simulation at the year-2000 price level. Notice that rents are negative in 2002 and 2003 given they are at the 2002-year price level. In this simulation we assume that the price goes up to the 2001 price level in 2004 and the year-2000 price level in 2005, leading to positive rents. As we saw under open access (i.e., no permit/license moratorium), vessels will be added to the fleet and rents will approach zero over time for both the large and small vessels.

A.2.3 Government Buyback Program

A.2.3.1 Government Buyback w/ Grant for Large Vessels Only, Year-2002 Shrimp Prices, and No Permit/License Moratorium (Figures A.73 and A.74)

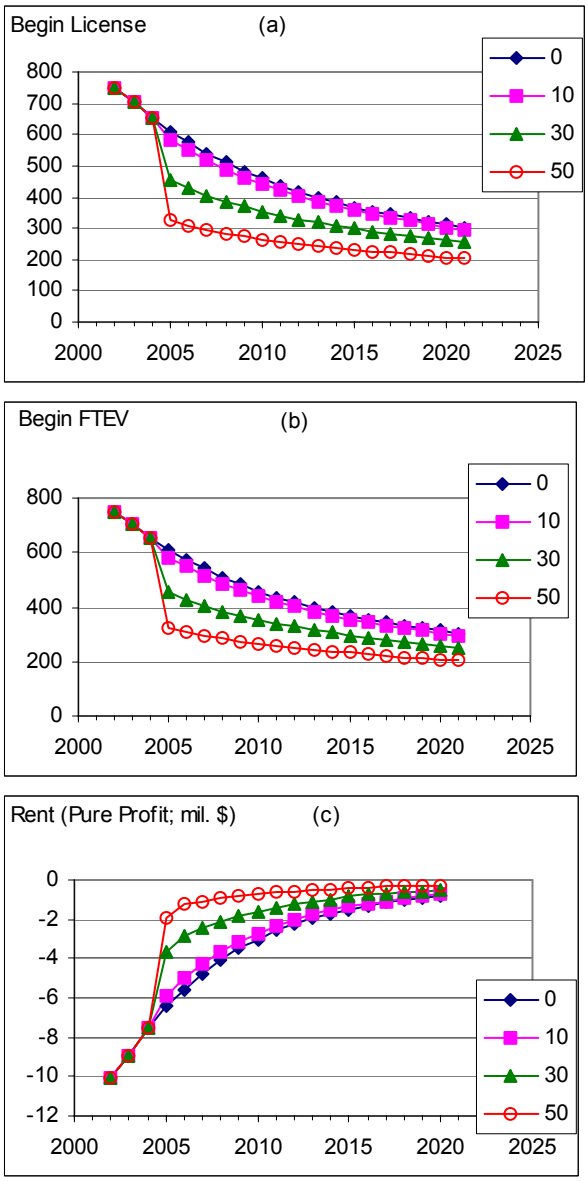


Figure A.73.Government Buyback w/Grant for Only Large Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic for the following conditions:, **year-2002 shrimp prices, and no permit/license moratorium**.

Bottom line: A permit/license buyback program reduces the large FTEV and permit/license significantly, but not sufficiently to allow positive rents. Large vessels will continue to leave the fishery until rents are zero. The long run equilibrium will be the same as open access because there is no permit/license moratorium.

In Figure A.73, buying back 10% of the permits/licenses of large vessels is basically no different from the open access fishery. Table A.7 shows that, at a 10% buyback removed 65 licenses, purchased at a price of $41,461 per permit/license, at a total government cost of $2.7M. A purchase of 50% of the permits/licenses will remove 195 FTEV at a cost to the government of $13.5M and rent is still negative in 2005 (Figure A.73c). The government purchasing the vessels just gets the large vessels to leave the fishery quicker.

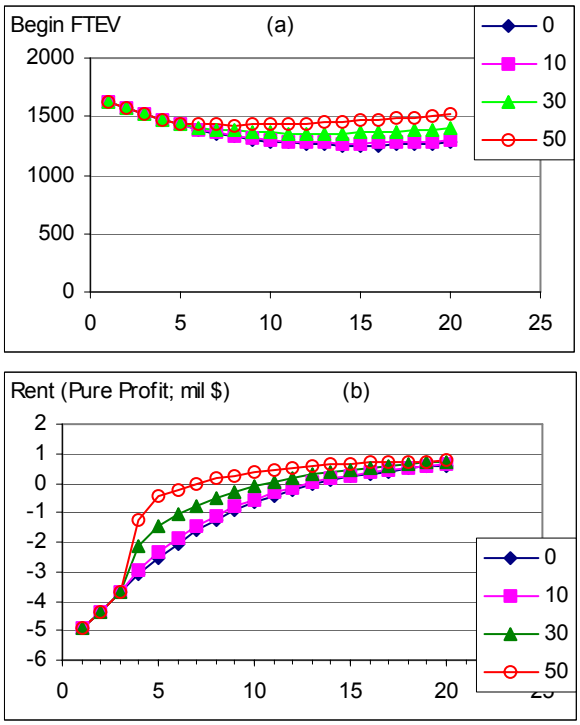


Figure A.74. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government grant at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices, and no permit/license moratorium**.

Bottom line: Removal of the large vessels makes the small vessels better off, such that they begin to make positive rents. Since small vessels are under open access, when they begin to make positive rents they begin to enter the fishery (Figure A.74). The long-run equilibrium will be the same as open access because there is no permit/license moratorium.

A.2.3.2 Government Buyback w/ Grant for Small & Large Vessels, Year-2002 Shrimp Prices, and No Permit/License Moratorium (Figures A.75 and A.76)

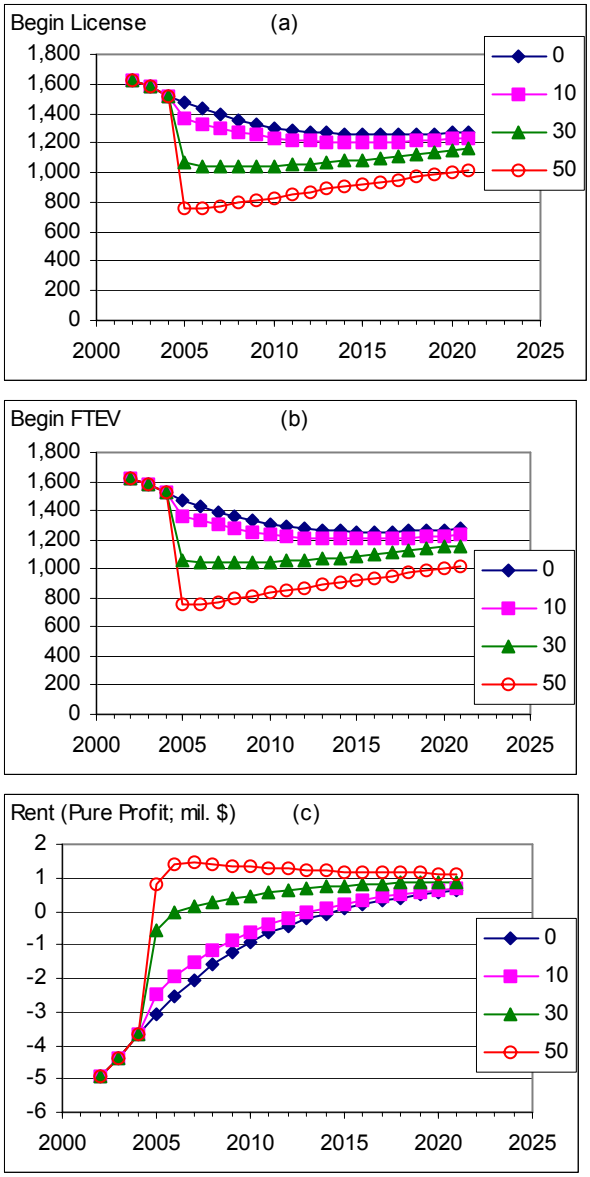


Figure A.75. Government Buyback w/Grant for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices, and no permit/license moratorium on small or large vessels**.

Bottom line: A buyback of 50% of the license will produce positive rents; however, with no permit/license moratorium, vessels will enter the fishery when rents are positive and therefore dissipate rents. The long-run equilibrium will be the same as open access because there is no permit/license moratorium.

Small Vessels

Figure B.75 shows the simulation results for the small vessel for a government buyback with a grant. The licenses are predicted to cost approximately $14,146, and the cost to the government ranged from $2.2M when purchasing 10% of the licenses, to $10.8M when purchasing 50% of the licenses.

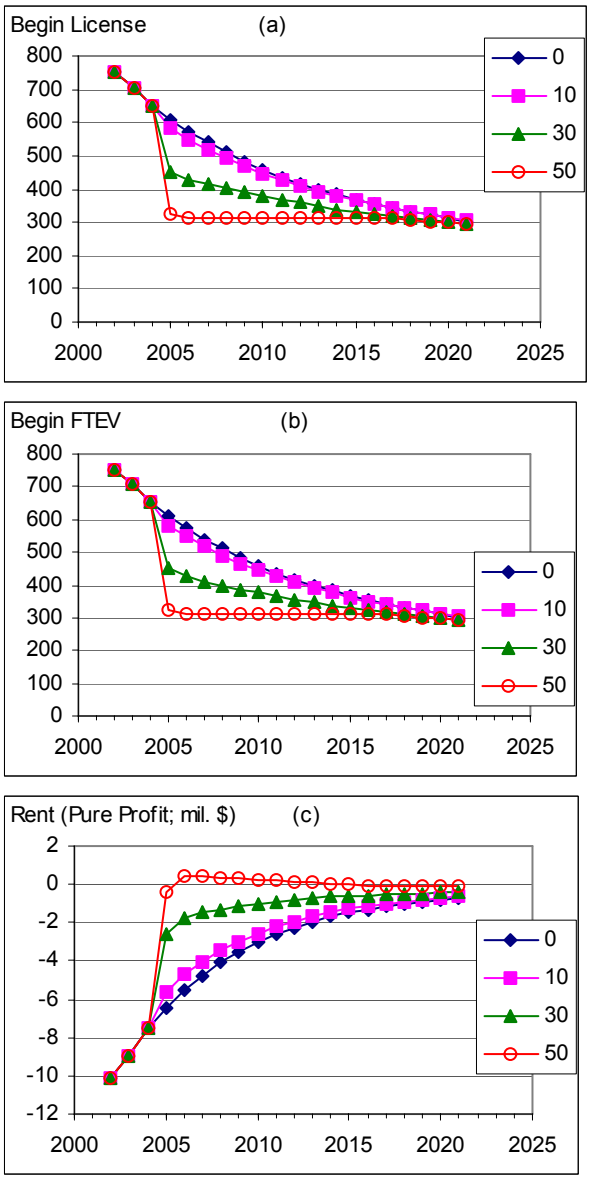


Figure A.76. Government Buyback w/Grant for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices, and no permit/license moratorium on small or large vessels**.

Bottom line: Zero rents are generated in the short run to the large vessels when there is at least a 50% permit/license buyback. The long-run equilibrium will be the same as open access because there is no permit/ license moratorium.

Large Vessels

The results in Figure A.76 resemble the results in Figure A.73.

A.2.3.3 Government Buyback w/ Grant for Large Vessels Only, Year-2000 Shrimp Prices, and No Permit/License Moratorium (Figures A.77 and A.78)

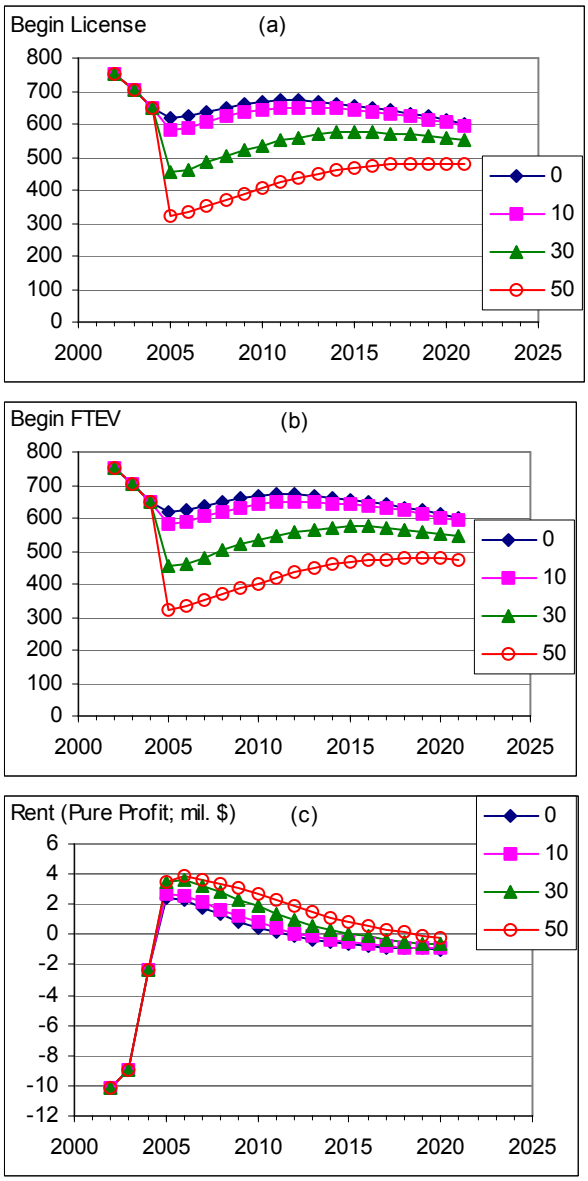


Figure A.77. Government Buyback w/Grant for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices, and no permit/license moratorium**.

Bottom line: As a result of the higher shrimp prices there is a longer period of time where rents are positive than under the lower year 2002 prices. However, in the long run results are no different from the open access equilibrium; rents go to zero and approximately the same number of vessels will be in the fishery.

Large Vessels

Figure A.77 shows that rent rises slightly above $2M when 10% of the permits/licenses are bought and shrimp prices increase to the year-2000 price level by 2005. When comparing these results to Figure B.73 with year-2002 shrimp prices we see that profits are considerably higher. This higher shrimp price causes the price to buy back a large vessel permit/license to increase by almost $10,400, thereby increasing the total cost to the government.

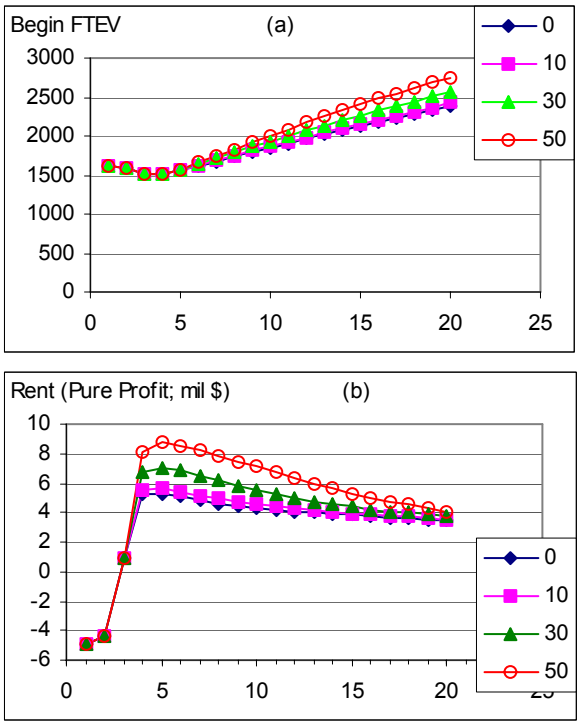


Figure A.78. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government grant at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices, and no permit/license moratorium**.

Bottom line: An increase in price to the 2000-year level will produce positive rents; however, these positive rents will dissipated because both small and large vessels are entering the fishery since there is no permit/license moratorium.

Small Vessels

Figure A.78 shows that small vessels move from negative to positive rents due to the increase in the price of shrimp to the 2000-year level by 2005. Also, their rent increased due to large vessels being removed from the fishery at the end of 2004. The greater the number of large vessels removed from the fishery the greater their rent. This occurs because there is less competition in the near-shore fishery for the small vessels due to the removal of the large vessels.

A.2.3.4 Government Buyback w/Grant for Small & Large Vessels, Year-2000 Shrimp Prices, and No Permit/License Moratorium (Figures A.79 and A. 80)

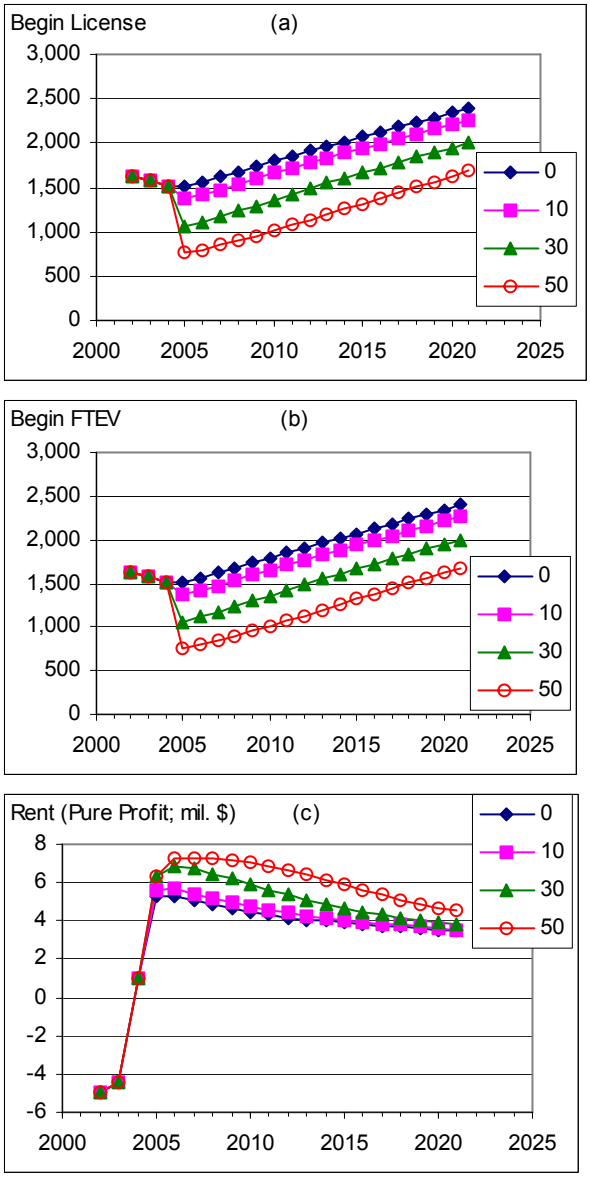


Figure A.79. Government Buyback w/Grant for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices, and no permit/license moratorium**.

Bottom line: The positive rents induced by the increase in prices to the year-2000 level and the buyback cause small vessels to enter the fishery. Without a license moratorium, positive rents will cause the purchase of additional licenses and more small vessels will enter the fleet, which will cause rents to dissipate.

Small Vessels

Figure A.79a shows the reduction in small vessel license in 2004 with the government buyback program. With the shrimp price increasing to the 2000-year level, rent exceeds $5M and since there is no license moratorium, vessels will begin to enter the fishery until rents are being dissipated. It does little good to reduce FTEV, and therefore fishing effort, with a buyback because with the positive rents small vessels begin to enter the fishery and by the end of the simulation there are more small vessels in the fishery than there was at the beginning of the simulation.

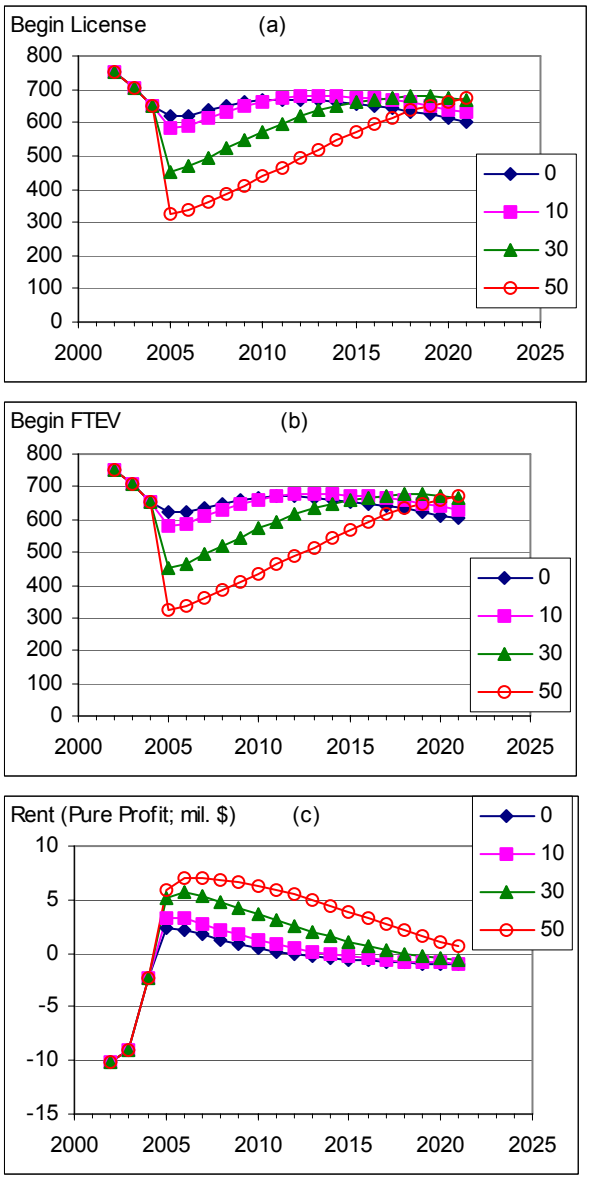


Figure A.80. Government Buyback w/Grant for Large Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices, and no permit/license moratorium**.

Bottom line: A permit/license reduction program is ineffective in the long run when rents are positive and there is no permit/license moratorium program to keep vessels from entering the fishery.

Large Vessels

In Figure A.80 we see that rents are negative in 2002 and large vessels will leave the fishery. In this simulation shrimp prices increase to the 2000-year level by 2004, and the government buyback occurs at the end of 2004 causing large rents to occur in 2005. With the 50% buyback program, large FTEV are reduced to about 320. However, since there is no permit/license moratorium, vessels are free to enter the open access fishery and there are almost as many FTEV in the fishery by the end of the simulation period as there were before the buyback occurred. Rents are dissipated by the entry of vessels into the fishery.

A.2.3.5 Government Buyback w/Grant for Large Vessels Only, Year-2002 Shrimp Prices, and With a Permit/License Moratorium (Figures A.81 and A.82)

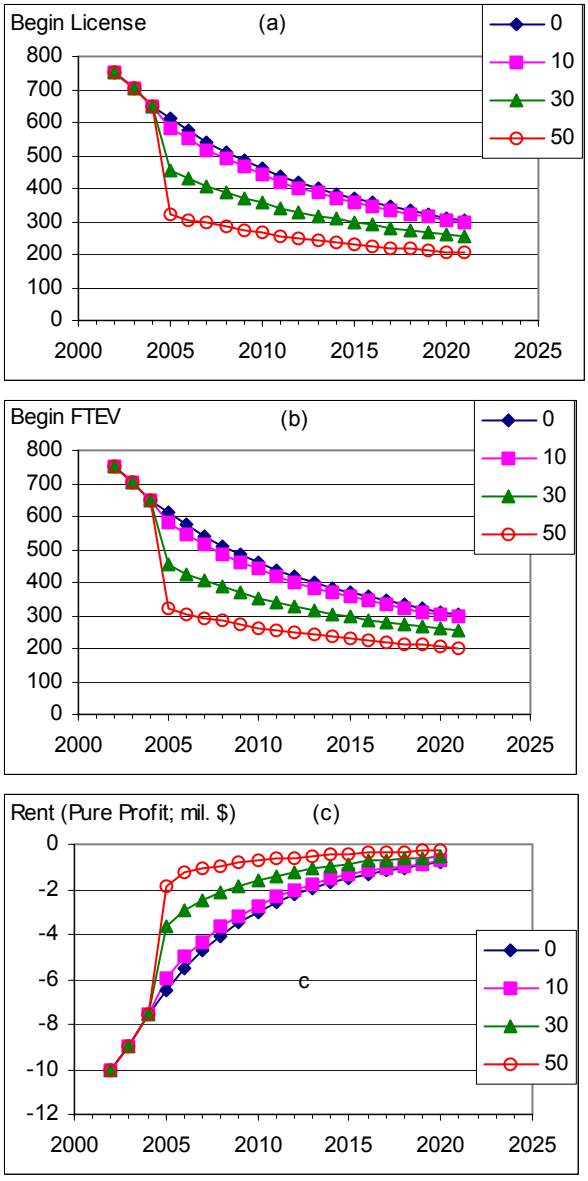


Figure A.81. Government Buyback w/Grant for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices, and with a permit/license moratorium on large vessels**.

Bottom line: A permit/license buyback program of 50% or less is not effective in producing positive rents in the short run or long run.

Large Vessels

Notice that buying only 10% of the licenses does not make the vessels remaining in the fishery better off than with the natural departure of vessels due to negative rents. A 50% buyback is insufficient to produce rents.

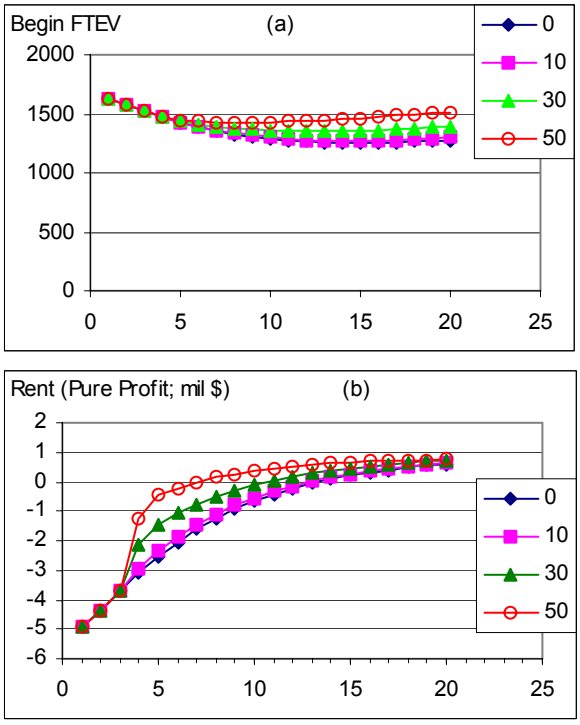


Figure A.82. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government grant at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices**, **and with a permit/license moratorium on large vessels**.

Bottom line: There are only minor temporary benefits for the small vessels, which remain under open-access, from the government purchase of large vessels' licenses. When positive rents are achieved, small vessels begin to enter the fishery which will dissipate rents in the long run.

Small Vessels

Figure A.82 should be compared with Figure A.74. Basically, since large vessels cannot re-enter the fishery, the competition for shrimp in the near-shore area is lessened for the small vessels.

A.2.3.6 Government Buyback w/Grant for Small & Large Vessels, Year-2002 Shrimp Prices, and With a Permit/License Moratorium (Figures A.83 and A.84)

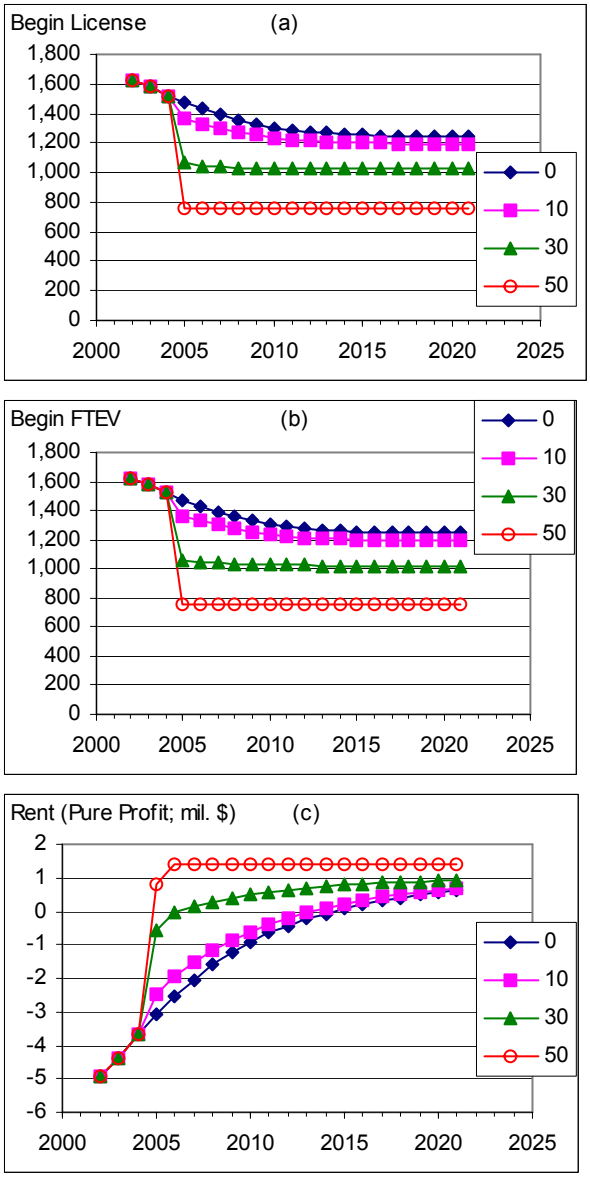


Figure A.83. Government Buyback w/Grant for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices,** and **with a permit/license moratorium on large and small vessels**.

Bottom line: When shrimp prices are low and large negative rents are being incurred as they are in 2002, a buyback program with a permit/license moratorium for small vessels is effective with or without a buyback program for small vessels.

Small Vessels

The buyback is more effective when both large and small vessels are in the buyback program and there is a permit/license moratorium.

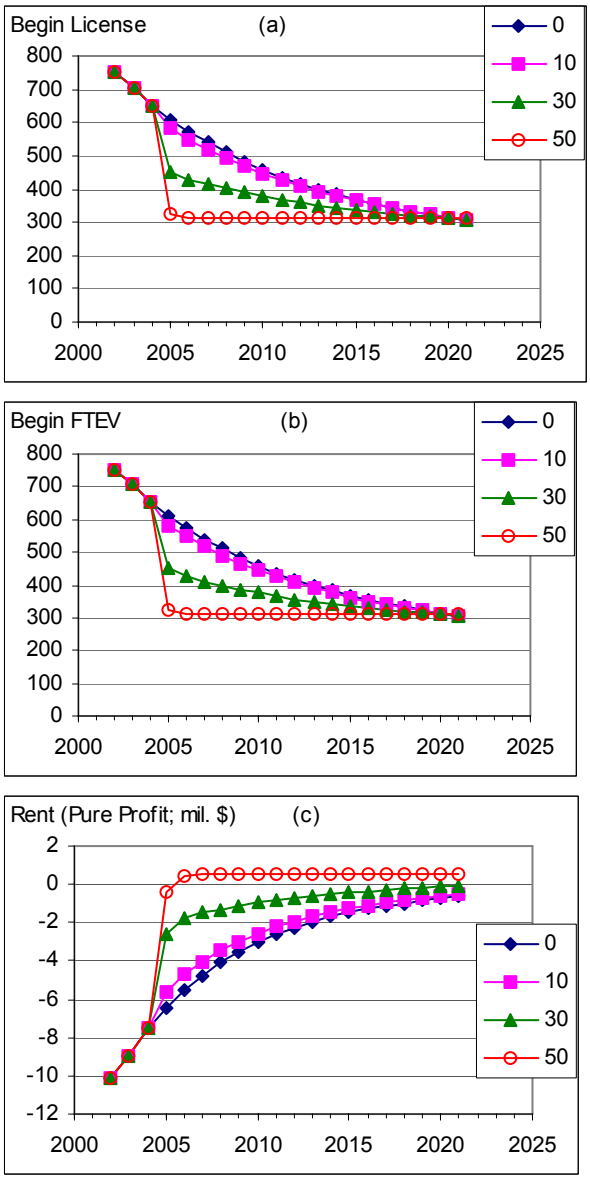


Figure A.84. Government Buyback w/Grant for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices, and no permit/license moratorium on small and large vessels**.

Bottom line: Large vessels will achieve a positive rent with at least a 50% buyback. This can only be maintained if there is no capital stuffing or effort creep.

Large Vessels

The buyback is more effective when both large and small vessels are in the buyback program and there is a permit/license moratorium.

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A.2.3.7 Government Buyback w/Grant for Large Vessels Only, Year-2000 Shrimp Prices, and With a Permit/License Moratorium (Figures A.85 and A.86)

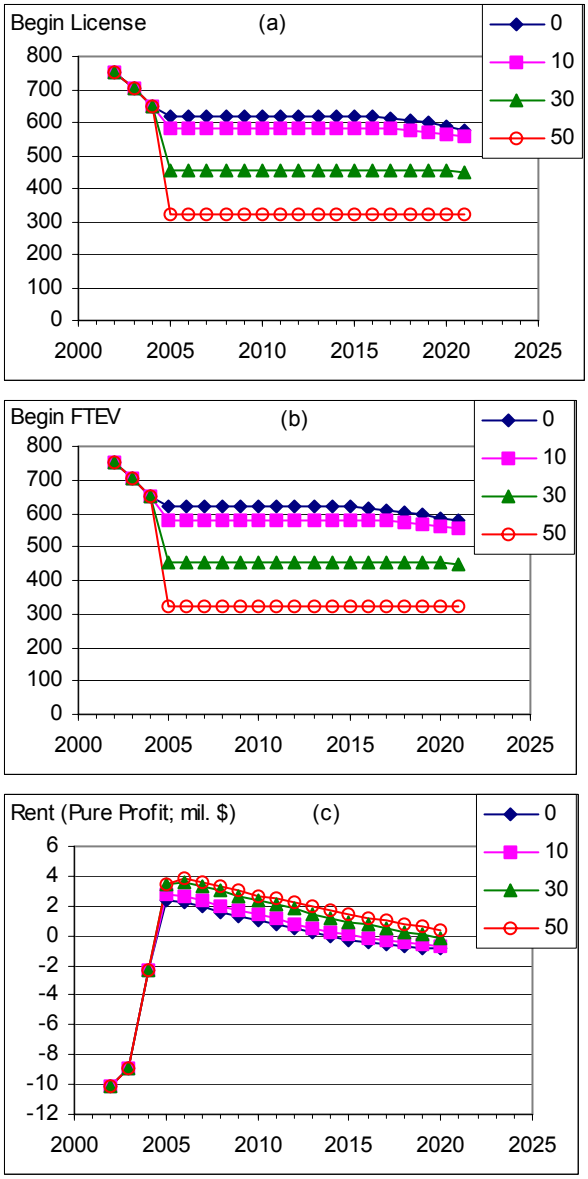


Figure A.85. Government Buyback w/Grant for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices, and with a permit/license moratorium.**

Bottom line: When shrimp prices are high and positive rents are being incurred as they are in 2000, a buyback program with a permit/license moratorium for large vessels is somewhat effective without a buyback program for small vessels although rents are declining because small vessels are entering the fishery at the maximum rate the simulation will allow.

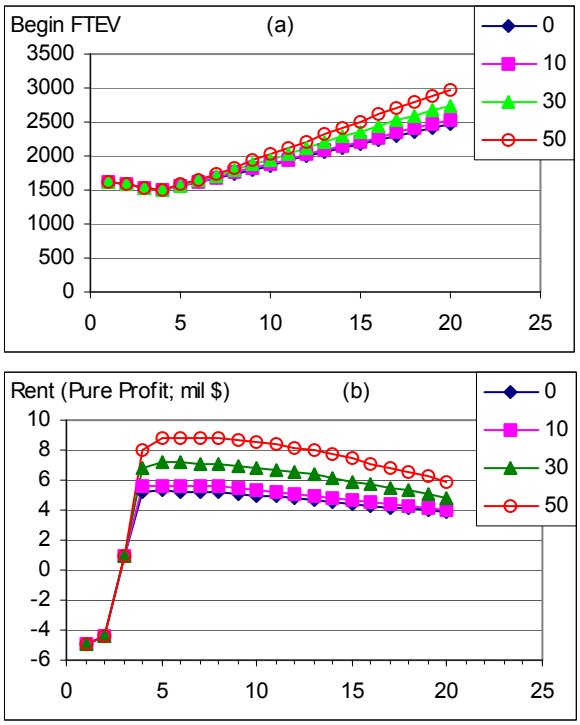


Figure A.86. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government grant at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices, and with a permit/license moratorium only on large vessels**.

Bottom line: When rents are positive, small vessels will enter the fishery until their rent is dissipated.

Small Vessels

Comparing Figures A.78 and A.86 for small vessels, we see that the end result is the same. The main difference is that since large vessels cannot enter the fishery it takes the small vessel longer to dissipate their rents. But the net results are the same; small vessels will enter the fishery until their rents are zero.

A.2.3.8 Government Buyback w/Grant for Small & Large Vessels, Year-2000 Shrimp Prices, and With a Permit/License Moratorium (Figures A.87 and A.88)

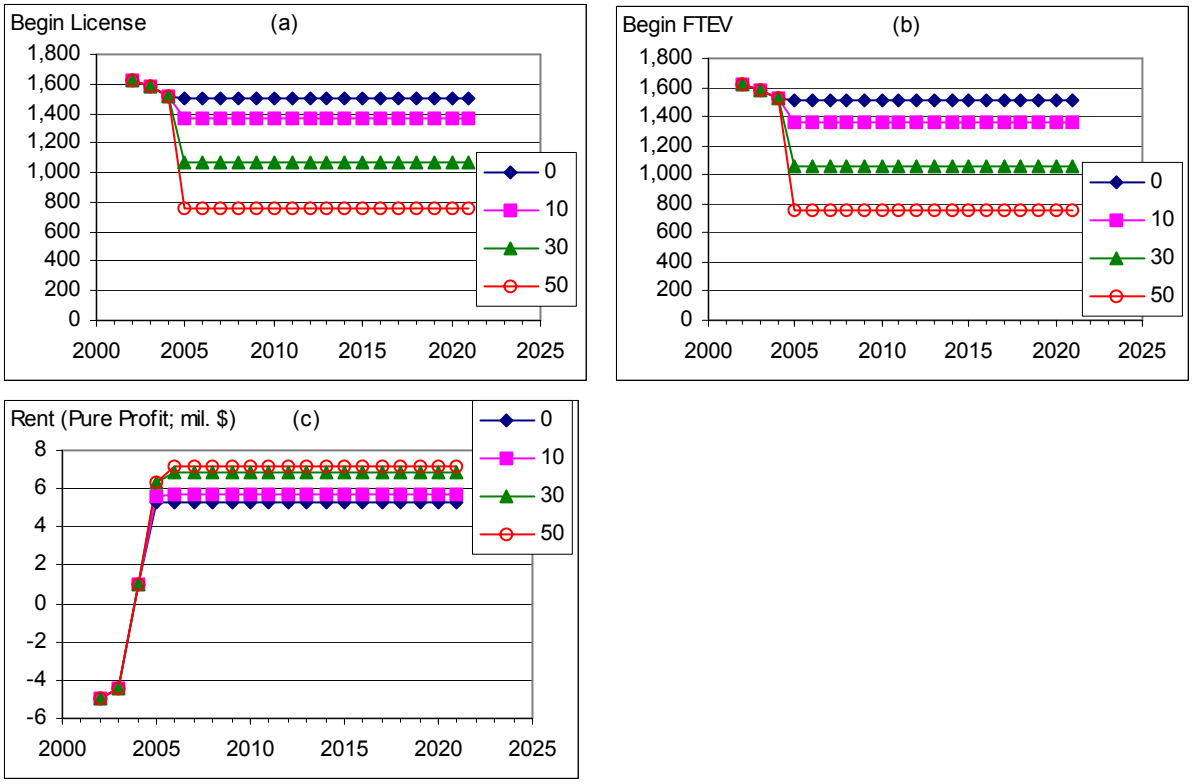


Figure A.87. Government Buyback w/Grant for Small Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with year-2000 shrimp prices, and with a permit/license moratorium on small and large vessels.

Bottom line: When shrimp prices are high and positive rents are being incurred as they are at year-2000 prices, a buyback program with a permit/license moratorium for small vessels is effective provided there is no capital stuffing or effort creep.

Small Vessels

Compare Figures A.86 and A.87 for the small vessels. Both simulations are the same through 2004 when the license buyback occurs. In Figure A.87, there was no license moratorium and small vessels were free to enter the fishery and their rents are dissipated. In Figure A.87, there is a license moratorium on small vessels and they cannot enter the shrimp fishery even though large rents are being earned. Provided there is no capital stuffing or effort creep, the rents will be maintained given the year-2000 shrimp price level.

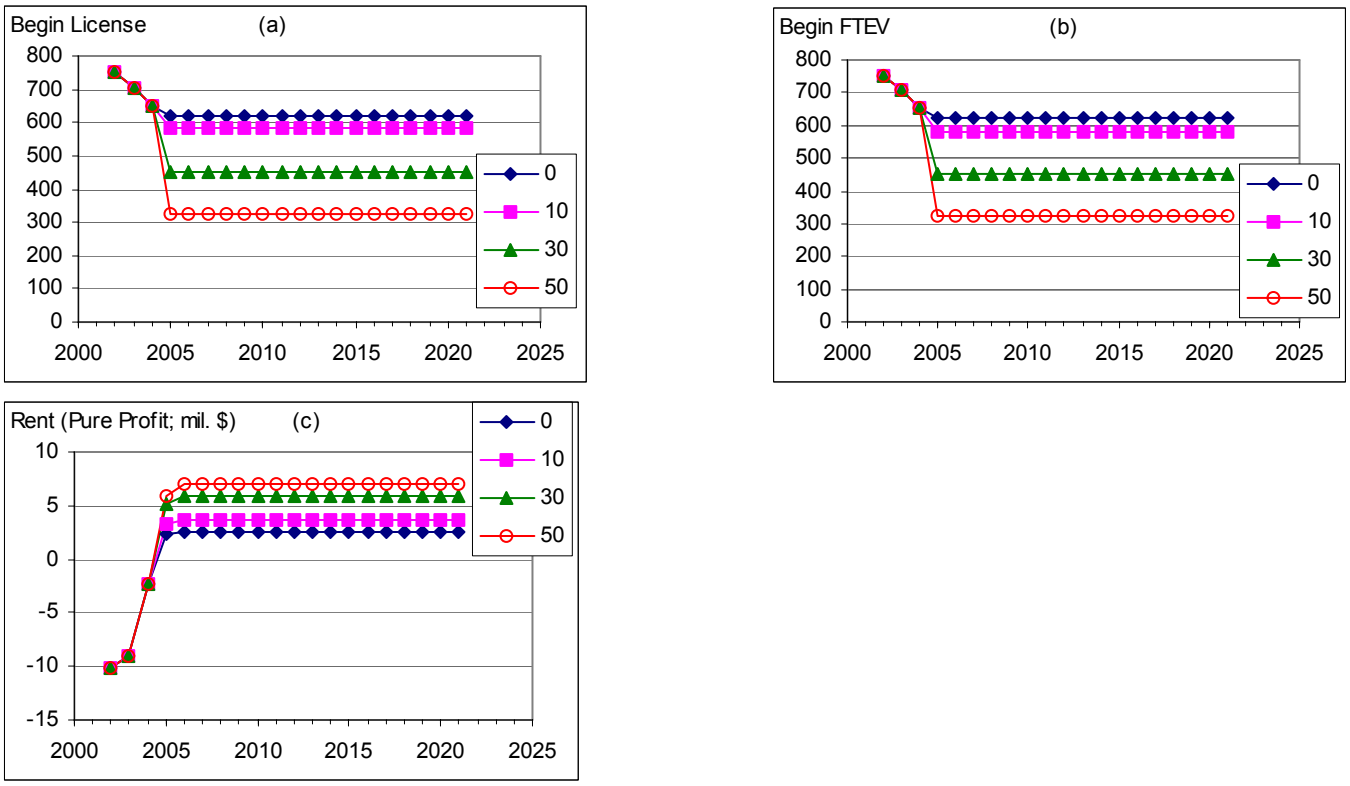


Figure A.88. Government Buyback w/Grant for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with year-2000 shrimp prices, and with a permit/license moratorium on small and large vessels.

Bottom line: When shrimp prices are high and large positive rents are being incurred as they are at year-2000 prices, a buyback program with a permit/license moratorium for large vessels is most effective when there is also a buyback program with a permit/license moratorium for small vessels.

Large Vessels

Compare Figures A.85 and A.88 where the difference is that, in the latter simulation, small vessels are under a license moratorium and cannot enter the fishery as they did in the Figure A.86 simulation. As a result, rents to the large vessels do not decline gradually because small vessels cannot enter the fishery. Both small and large vessels are under a permit/license moratorium, which keeps rents from being dissipated. Provided there are effective measures to prevent capital stuffing or effort creep, these rents can be maintained given the year-2000 price level.

Figures A.89 through A.104 are government buyback with a loan that must be paid back by the South Atlantic fishermen remaining in the fishery. Figures A.89 through A.104 will be compared with Figures A.75 through A.88 above, which are for government buyback with a grant of South Atlantic fishermen's permits/licenses. The difference between the two sets of figures will be the 10-year loan repayment beginning in 2005. If only large vessels are in the buyback program, then only large vessels owners with a permit/license will pay back the loan. If both small and large vessels are in the buyback program, then both small and large vessels owners with a permit/license will pay back the loan for their respective vessel classes. The total payment per vessel is assumed to be equal across all participants within a given market; i.e., five state markets for small vessels and one market for large vessels. The payment is assumed to occur at the end of the year as a lump sum payment.

A.2.3.9 Government Buyback w/Loan for Large Vessels Only, Year-2002 Shrimp Prices, and No Permit/License Moratorium (Figures A.89 and A.90)

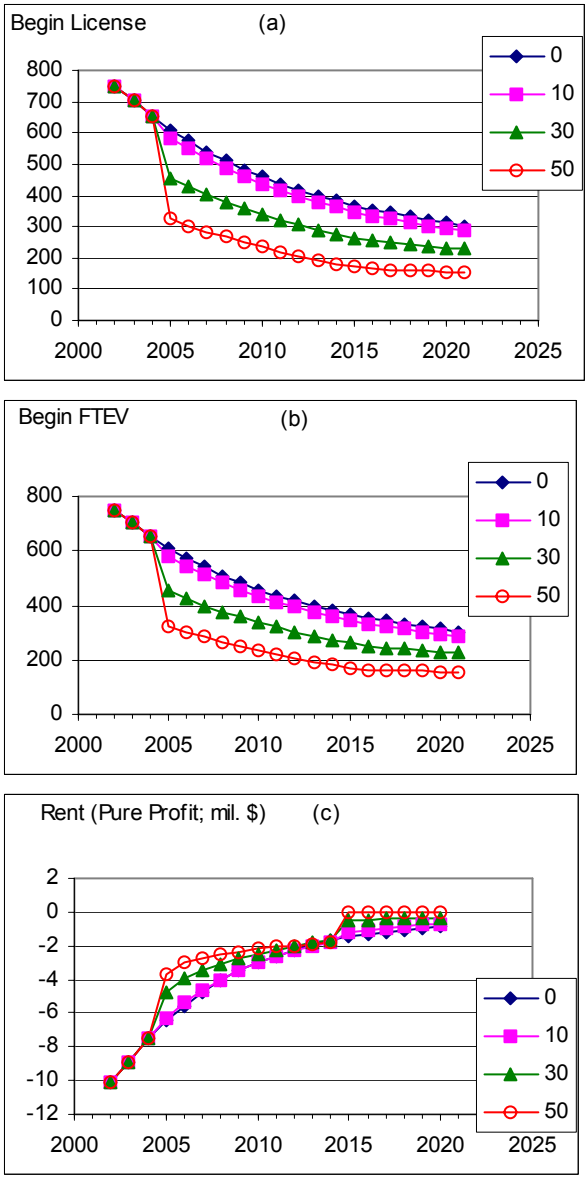


Figure A.89. Government Buyback w/Loan for Only Large Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp price,** and **no permit/license moratorium**.

Bottom line: The loan payment reduces the rent during the amount of the loan repayment period. Vessels continue to leave the fishery because of negative rents, which are aggravated by the loan payment.

Large Vessels

The annual loan repayment per permit/license holder is $598, $2,306, and $5,386 for a 10%, 30% and 50% buyback (Table A.11). Comparing Figure A.89 with Figure A.74, we see that the loan repayment reduces rent during the 10-year loan repayment period. Notice that rent is equal to zero for 50% buyback after the loan is paid off. Less than 50% buyback yields negative rents.

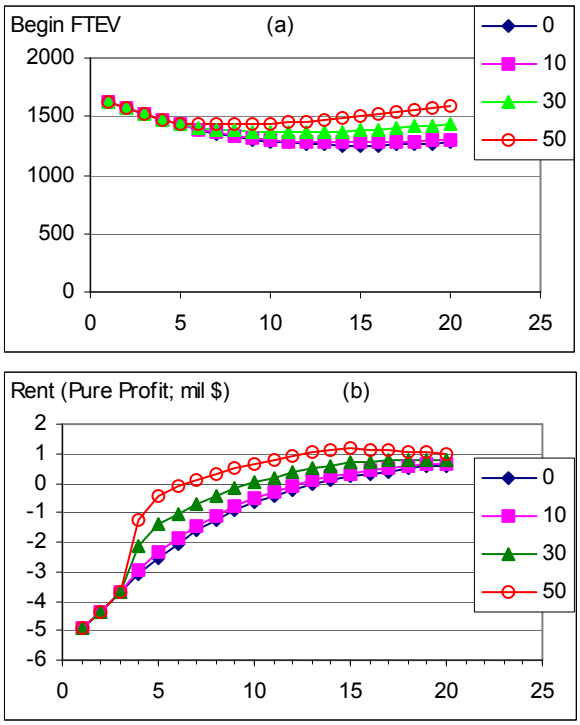


Figure A.90. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government loan at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices,** and **no permit/license moratorium**.

Bottom line: The buyback of large vessels is quite helpful to the small vessels. This is due to there being only one depth offshore where both large and small vessels fish.

Small vessels

There is basically no difference between Figure A.90 and Figure A.74.

A.2.3.10 Government Buyback w/Loan for Small & Large Vessels, Year-2002 Shrimp Prices, and No Permit/License Moratorium (Figures A.91 and A.92)

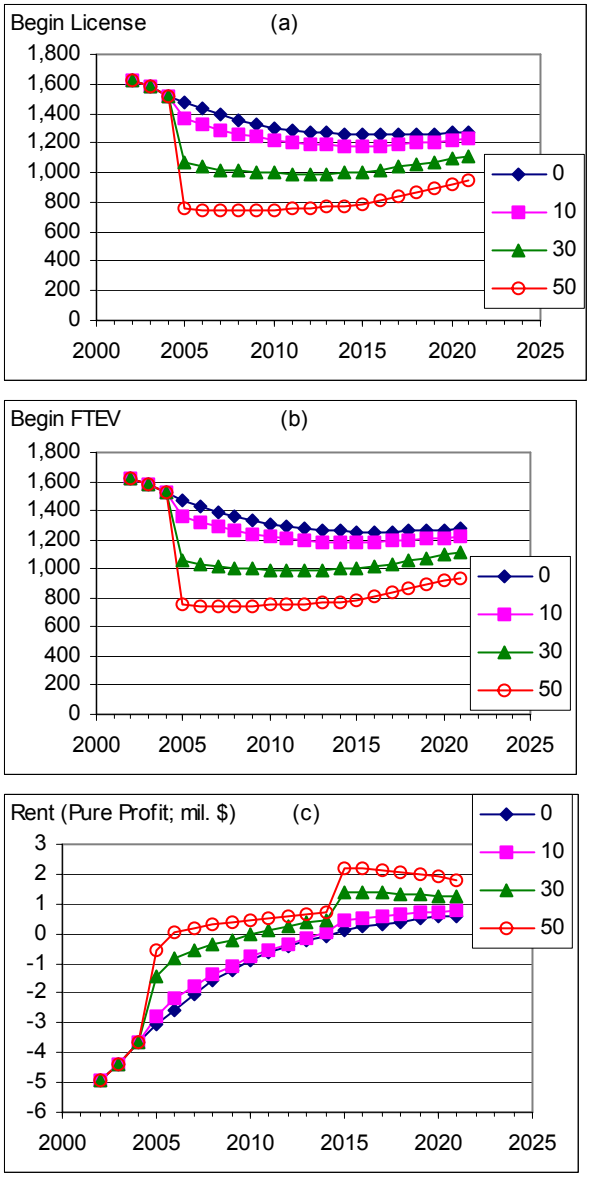


Figure A.91. Government Buyback w/Loan for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices,** and **no permit/license moratorium on small or large vessels**.

Bottom line: The loan repayment keeps small vessels from having positive rents until the loan is paid off. In 2015 when rents are positive, small vessels will enter the fishery since there is no license moratorium.

Small Vessels

The annual loan repayment per permit/license holder is $204, $788, and $1,839 for a 10%, 30%, and 50% buyback (Table A.11). Comparing Figure A.91 with Figure A.75, we see that the loan repayment reduces rent during the 10-year loan repayment period. At the end of the 20-year simulation there is very little difference between the policies in terms of the number of vessels in the fishery and the near zero rents. Lack of a permit/license moratorium causes the policies to be the same in the long run.

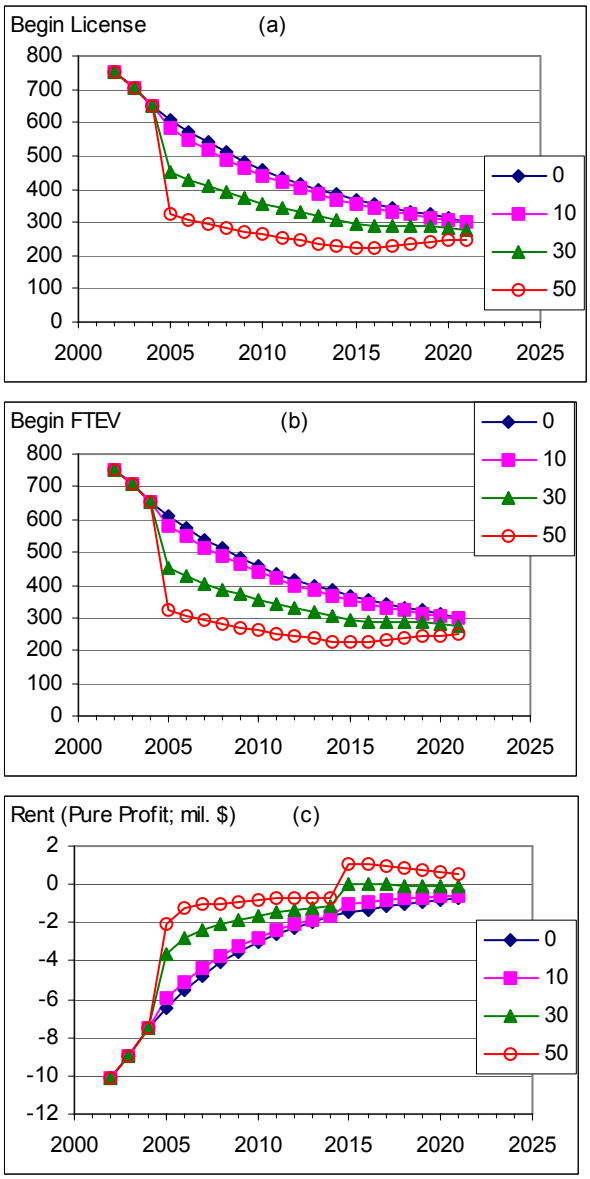


Figure A.92. Government Buyback w/Loan for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices,** and **no permit/license moratorium on small or large vessels**.

Bottom line: The loan repayment keeps large vessels from having positive rents with the 50% buyback program until the loan is paid off. In 2015 when rents are positive and vessels will enter the fishery since there is no permit/license moratorium.

Large Vessels

Comparing Figures A.92 and A.76 we see that the rents are lower during the loan repayment period. Rents increase after the loan is paid off but the final results are the same in the long run because there is no permit/license moratorium.

A.2.3.11 Government Buyback w/Loan for Large Vessels Only, Year-2000 Shrimp Prices, and No Permit/License Moratorium (Figures A.93 and A.94)

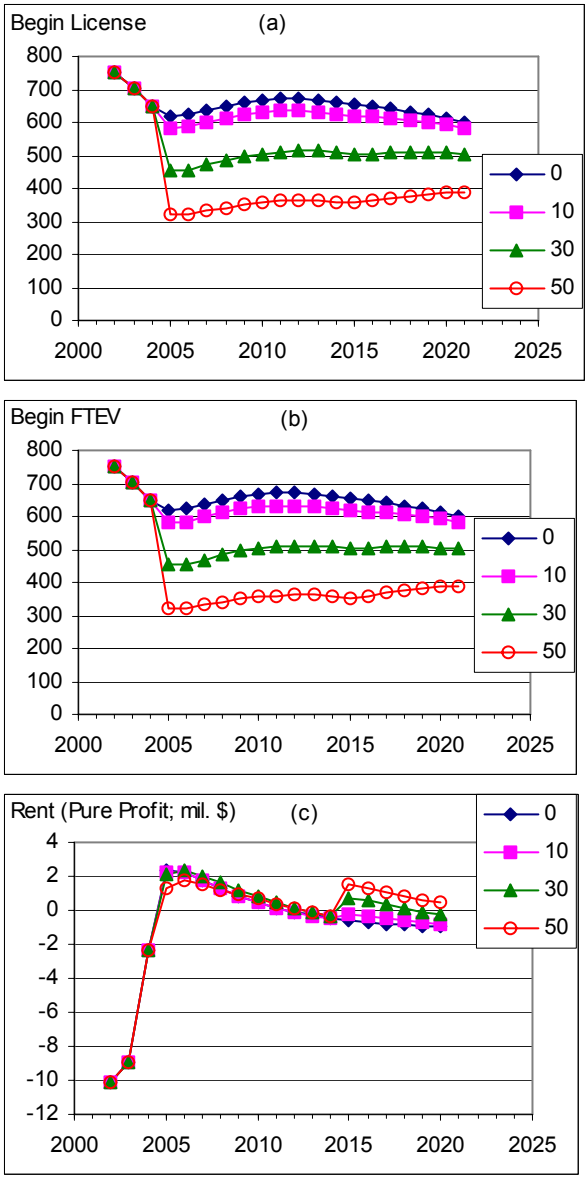


Figure A.93. Government Buyback w/Loan for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices,** and **no permit/license moratorium**.

Bottom line: With higher shrimp prices, rents are positive but reduced by the loan payment. However, in the long run the results will be no different from the open access equilibrium; rents will go to zero and the same number of vessels will be in the fishery.

Large Vessels

Compare Figures A.93 and A.77.

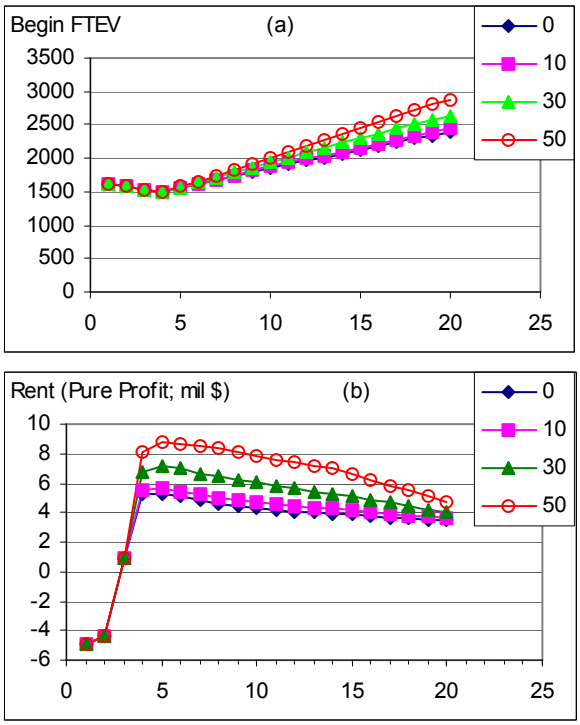


Figure A.94. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government loan at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices,** and **no permit/license moratorium**.

Bottom line: An increase in price to the 2000-year level will produce positive rents; however, these positive rents are dissipated because both small and large vessels are entering the fishery since there is no permit/license moratorium. In the long run the buyback policies will be no different in terms of rent and FTEV than if no vessels are bought back.

Small Vessels

Compare Figures A.94 and A.78.

A.2.3.12 Government Buyback w/Loan for Small & Large Vessels, Year-2000 Shrimp Prices, and No Permit/License Moratorium (Figures A.95 and A.96)

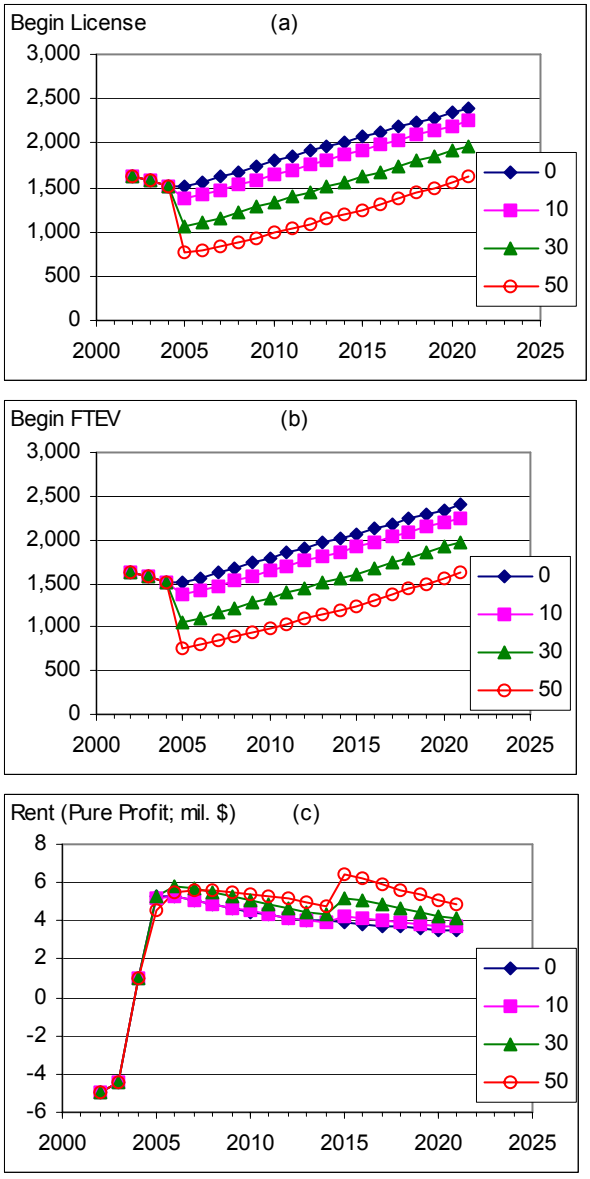


Figure A.95. Government Buyback w/Loan for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices,** and **no permit/license moratorium**.

Bottom line: Buyback loans decrease rents during the repayment period; however, the long-run equilibrium is basically the same as open access because there is no permit/license moratorium. Rent will return to zero.

Small Vessels

Compare Figures A.95 and A.79.

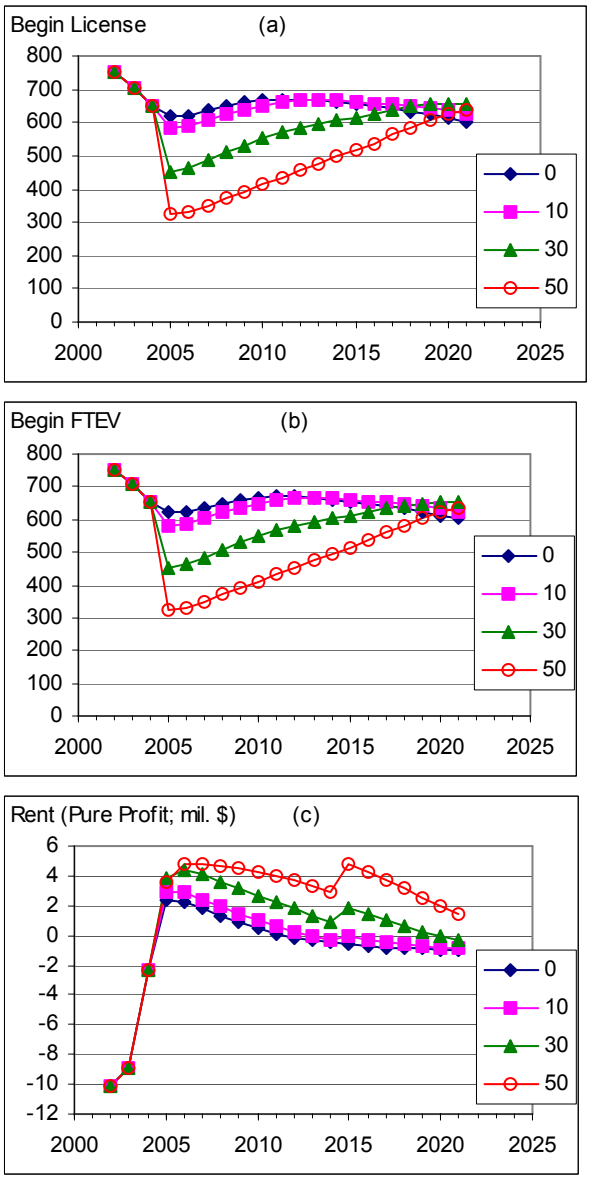


Figure A.96. Government Buyback w/Loan for Large Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic **with year-2000 shrimp prices,** and **no permit/license moratorium**.

Bottom line: Buyback loans decrease rents during the repayment period; however, the long-run equilibrium is basically the same as open access because there is no permit/license moratorium.

Large Vessels

Compare Figures A.96 and A.80.

A.2.3.13 Government Buyback w/Loan for Large Vessels Only, Year-2002 Shrimp Prices, and With a Permit/License Moratorium (Figures A.97 and A.98)

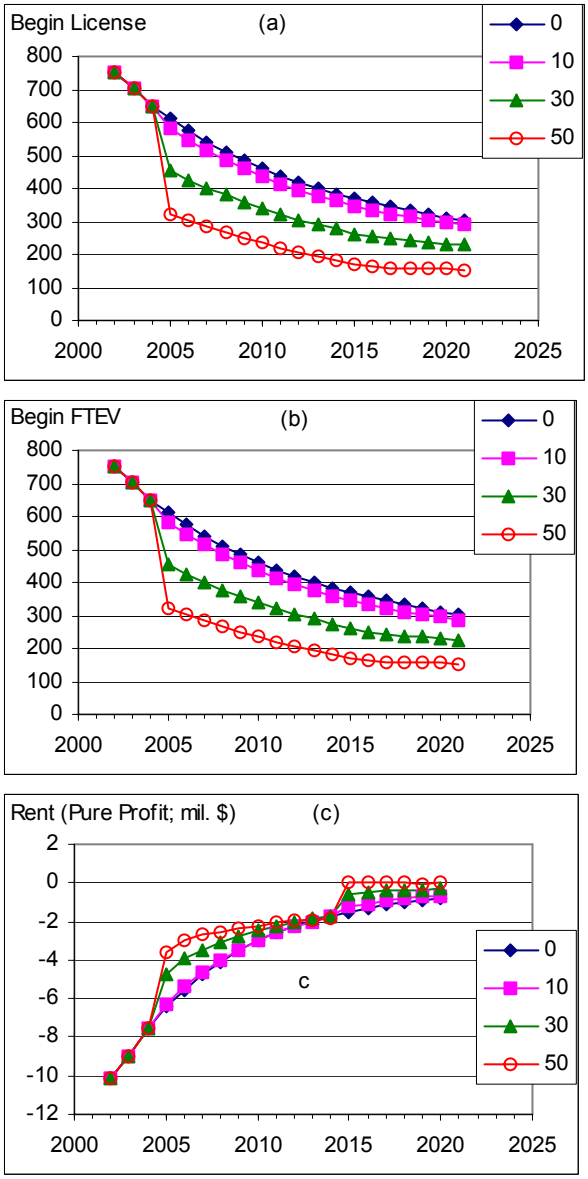


Figure A.97. Government Buyback w/Loan for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices,** and **with a permit/license moratorium on large vessels**.

Bottom line: A permit/license buyback program for large vessels is not effective in producing positive rents during the loan repayment period. Large vessels continue to exit the fishery during the loan repayment period due to negative rents. After the loan is paid off, only the 50% have at least zero or better rents.

Large Vessels

Compare Figures A.97 and A.81.

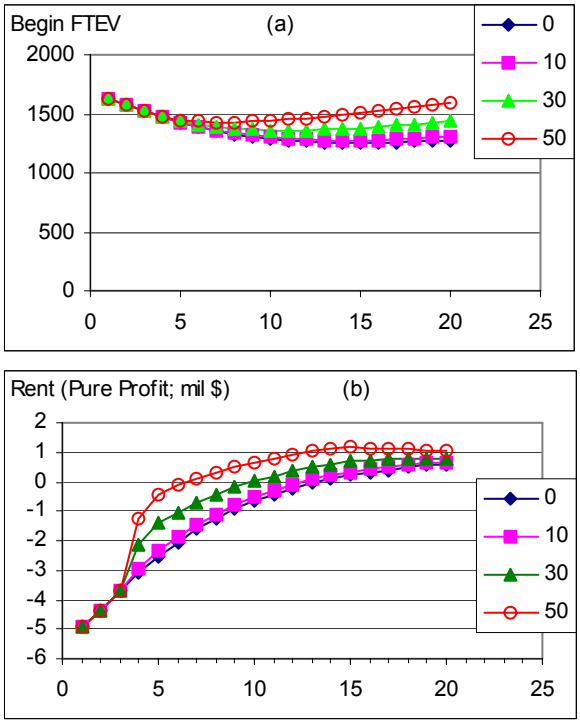


Figure A.98. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government loan at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices,** and **with a permit/license moratorium on large vessels**.

Bottom line: Small vessels are made better off (less negative rents) because the large vessels are in a buyback program. When rent becomes positive, small vessels will enter the fishery because of open access and therefore dissipate rents.

Small Vessels

Comparing Figures A.98 and A.82 we see that they are basically the same.

A.2.3.14 Government Buyback w/Loan for Small & Large Vessels, Year-2002 Shrimp Prices, and With a Permit/License Moratorium (Figures A.99 and A.100)

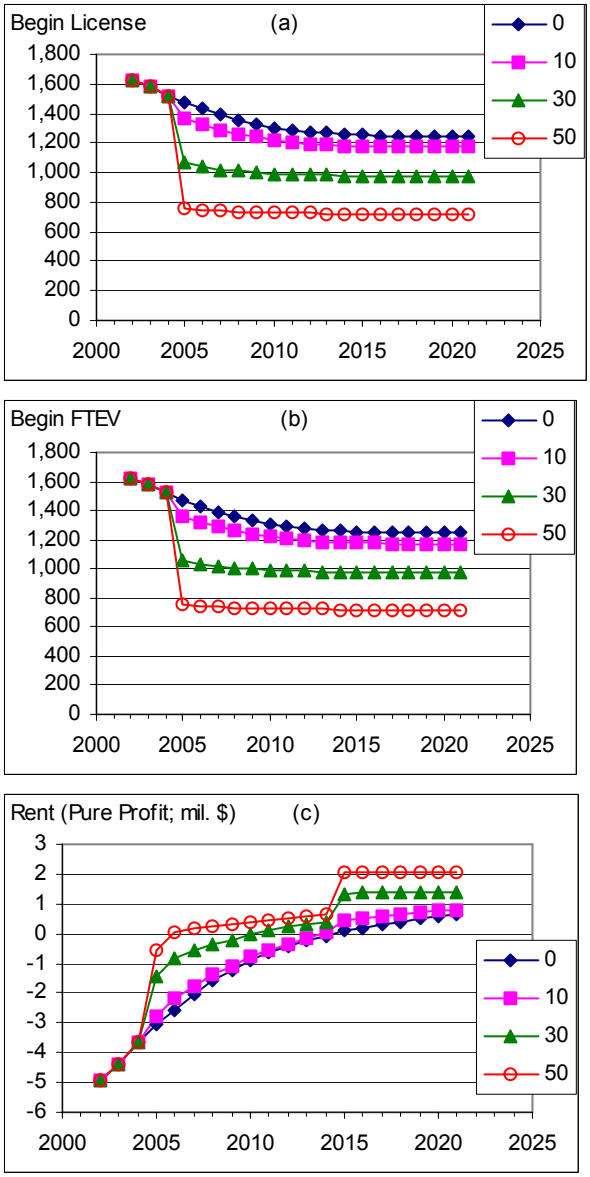


Figure A.99. Government Buyback w/Loan for Small Vessel: Simulation over the period 2002-2021 with a buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices,** and **with a permit/license moratorium on large and small vessels**.

Bottom line: The large excess number of small vessel licenses with respect to FTEV reduces the effectiveness of the buyback with a loan; however, the loan payments slightly increase the exiting of small vessels from the fishery, so that after the loan is paid off there are some positive rents at the 50% buyback.

Small Vessels

Comparing Figures A.33 to Figure A.17 we see that payment of the loan causes slightly more small vessels to leave the fishery during the 10-year loan payment period (the FTEV curves are slightly steeper). As a result, when the loans are paid off there is a positive rent for the 50% buyback program.

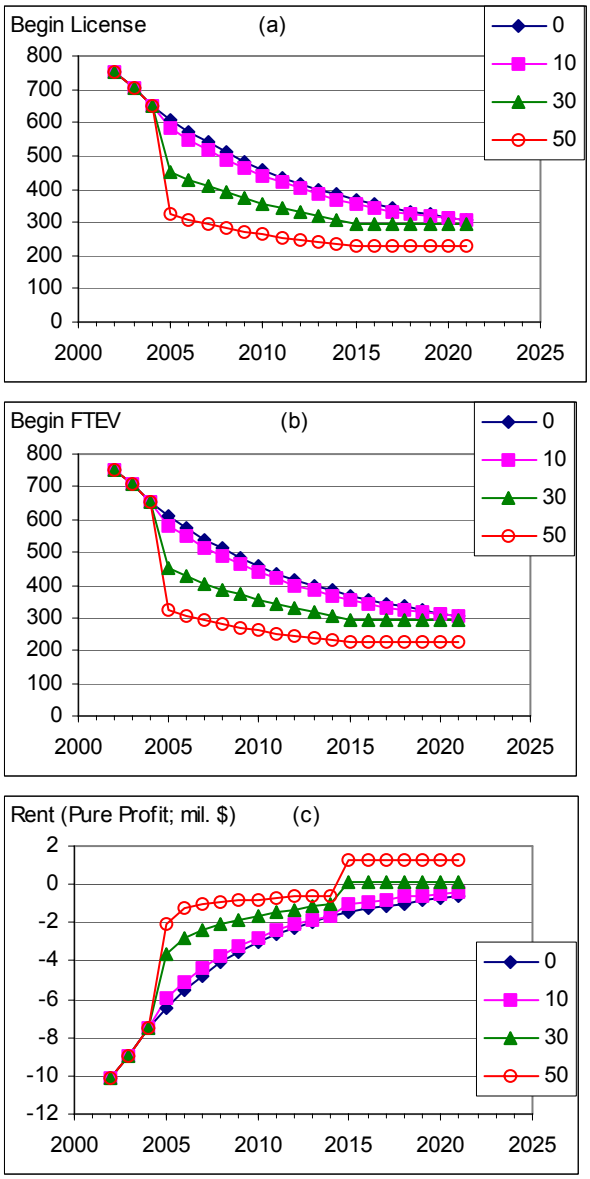


Figure A.100. Government Buyback w/Loan for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2002 shrimp prices,** and **no permit/license moratorium on small and large vessels**.

Bottom line: The loan payment causes slightly more vessels to leave the fishery, so that when the loan is paid off rents are higher than when vessels are bought back with a government grant.

Large Vessels

Compare Figures A.100 and A.84.

A.2.3.15 Government Buyback w/Loan for Large Vessels Only, Year-2000 Shrimp Prices, and With a Permit/License Moratorium (Figures A.101 and A.102)

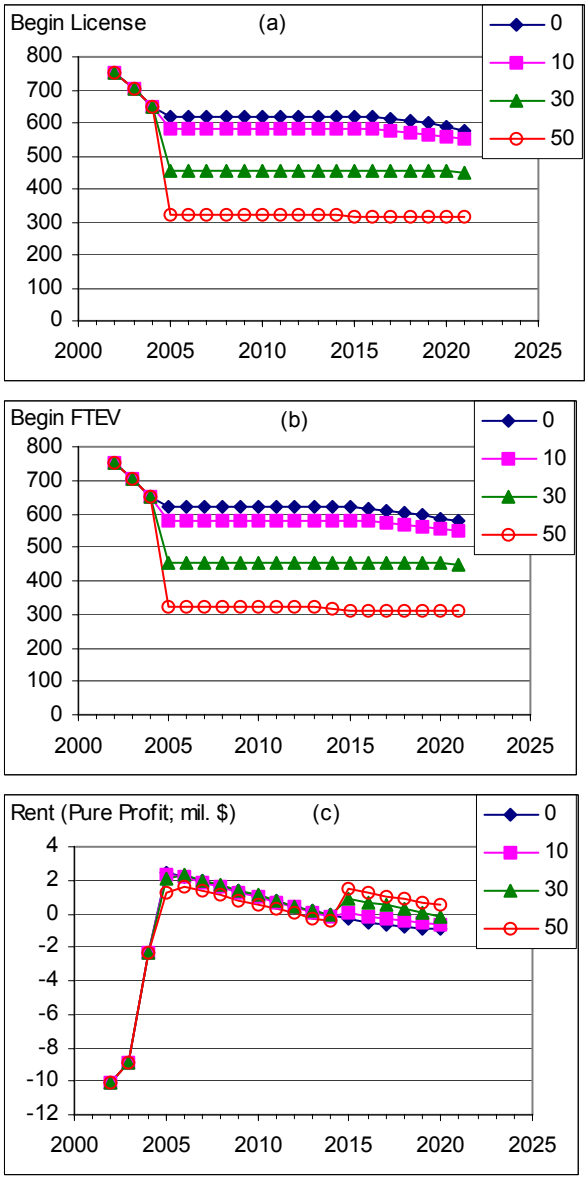


Figure A.101. Government Buyback w/Loan for Only Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices,** and **with a permit/license moratorium**.

Bottom line: When shrimp prices are high and positive rents are being incurred, as they are under 2000-year prices, a buyback program with a permit/license moratorium for only large vessels is not as effective in the South Atlantic, because 1) small and large vessels fish in the same areas, and 2) small vessels are entering the fishery at a rapid rate (Figure A.101) because of high positive rents caused by large vessels being bought back and the year-2000 shrimp prices.

Large Vessels

Compare Figures A.101 and A.85. Basically the only difference between these figures is the rent is reduced by the amount of the loan payment.

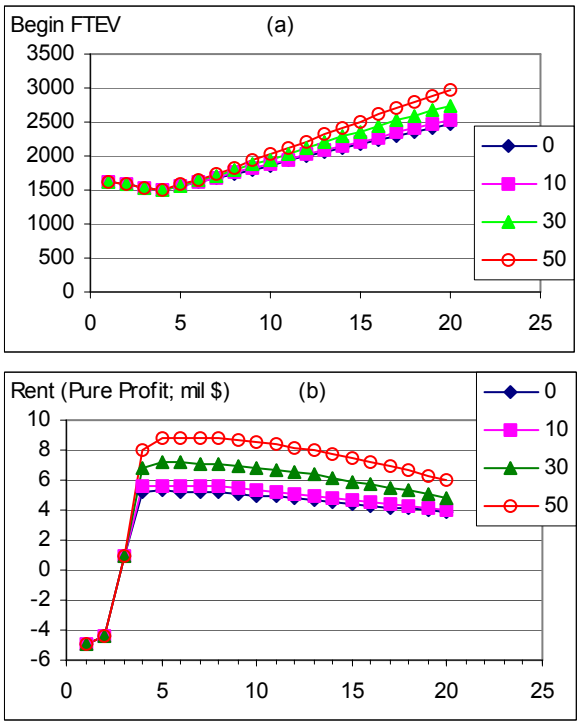


Figure A.102. Open Access Small Vessels: Simulation over the period 2002-2021 with a only a large vessel buyback with a government loan at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices,** and **with a permit/license moratorium only on large vessels**.

Bottom line: When rent is positive under open access small vessels will enter the fishery until their rent is dissipated.

Small Vessels

Comparing Figures A.102 and A.87 for small vessels we see that the end result is the same. By the end of the simulation there are more small boats in the fishery than at the beginning because there is less fishing pressure from fewer large boats.

A.2.3.16 Government Buyback w/Loan for Small & Large Vessels, Year-2000 Shrimp Prices, and With a Permit/License Moratorium (Figures A.103 and A.104)

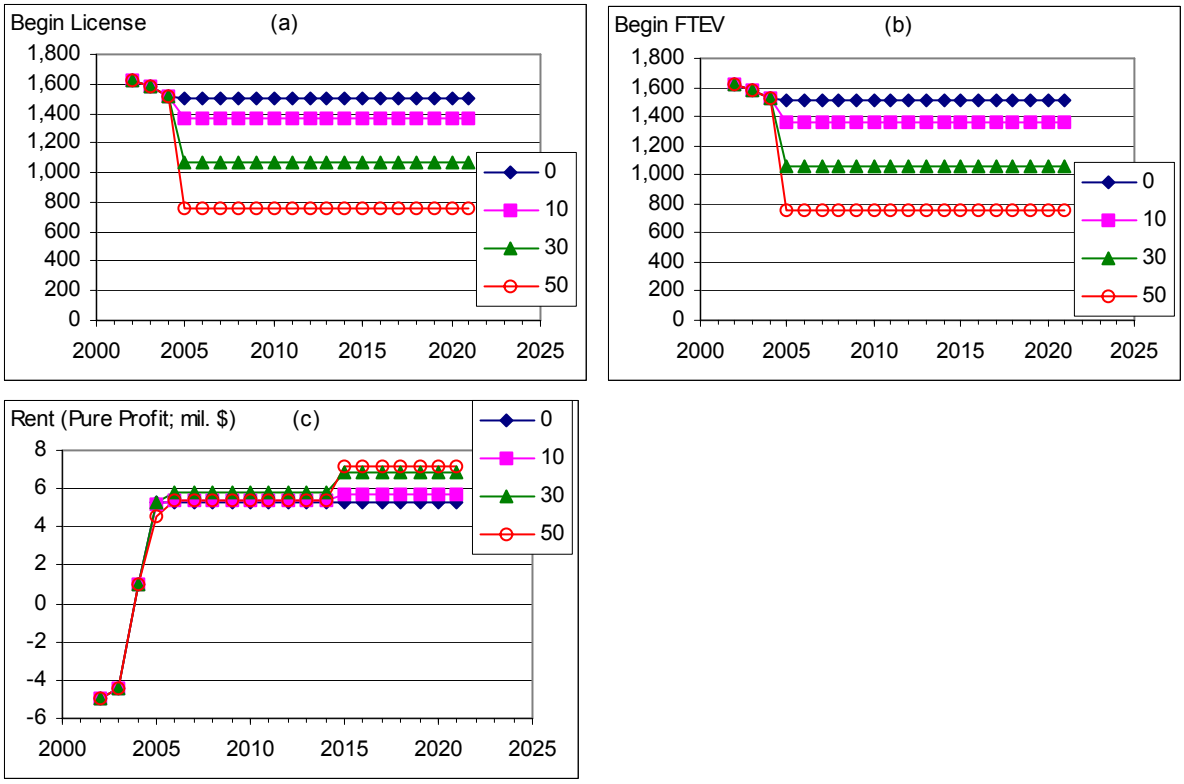


Figure A.103. Government Buyback w/Loan for Small Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices,** and **with a permit/license moratorium on small and large vessels**.

Bottom line: When shrimp prices are high and positive rents are being incurred, as they are under 2000-year prices, a buyback program with a permit/license moratorium for small and large vessels is effective provided there is no capital stuffing or effort creep.

Small Vessels

Compare Figures A.103 and A.87. Rent is reduced during the period the loan is being paid.

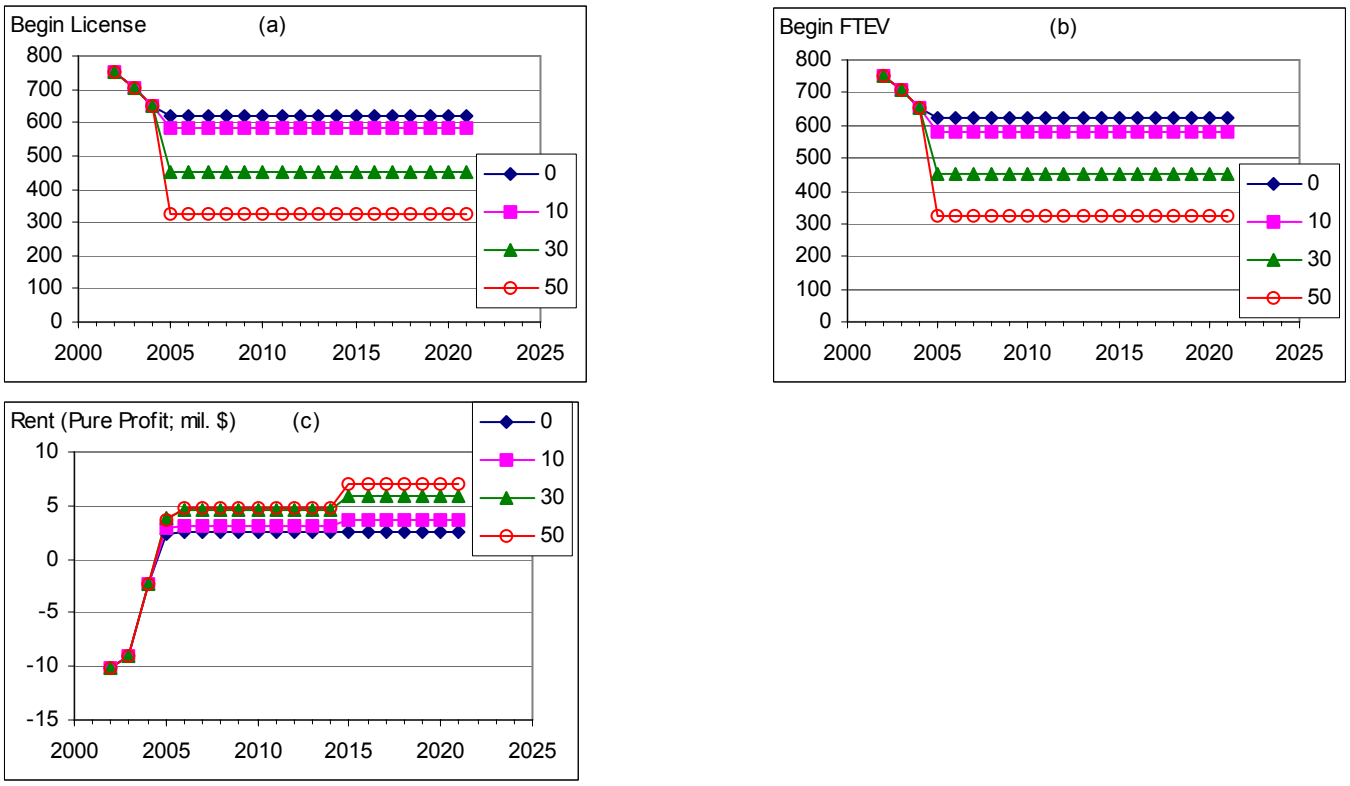


Figure A.104. Government Buyback w/Loan for Large Vessel: Simulation over the period 2002-2021 with a large vessel buyback at 0%, 10%, 30%, and 50% of the fleet in year 2004 in the South Atlantic with **year-2000 shrimp prices,** and **with a permit/license moratorium on small and large vessels**.

Bottom line: When shrimp prices are high and large positive rents are being incurred, as they are under 2000-year prices, a buyback program with a permit/license moratorium for large vessels is most effective when there is also a buyback program with a permit/license moratorium for small vessels.

Large Vessels

Compare Figures A.104 and A.88. Rent is reduced during the period the loan is being paid.

A.2.4 Government Price Supports

A.2.4.1 Target Price Above Average Price for Year-2002 Shrimp Prices and No Permit/License Moratorium (Figures A.105 and A.106)

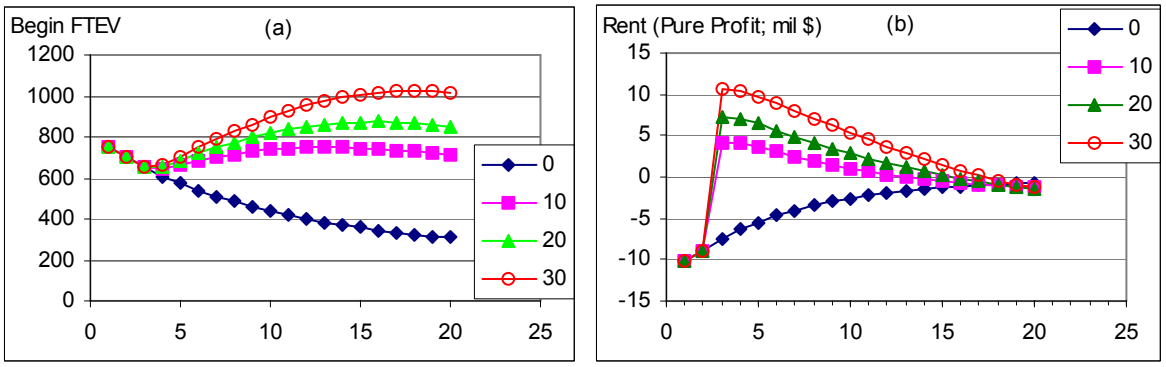


Figure A.105. Government Price Support for Large Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with year-2002 shrimp prices and no permit/license moratorium.

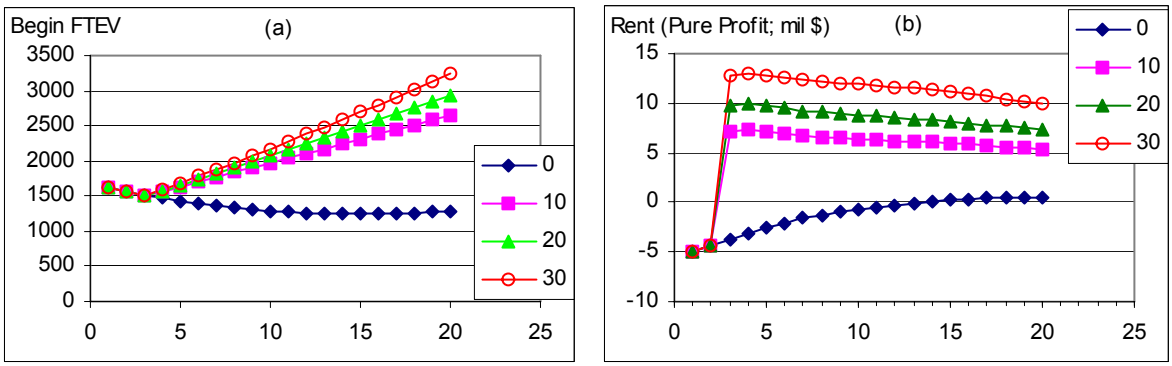


Figure A.106. Government Price Support for Small Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with **year-2002 shrimp prices** and **no permit/license moratorium**.

Bottom line: When price are low and rents are negative, a target price program will reduce the number of vessels leaving the fishery at a substantial cost to the taxpayer. Since there is no permit/license moratorium, vessels will enter the fishery (if rents are positive) or exit the fishery (if rents are negative) until rents are dissipated.

Table A.15 shows the average price increase received by the shrimpers, the annual cost to the government and the discounted cost to the government over the 20-year simulation. For every one cent increase in the price it costs the government $1.16M.

A.2.4.2 Target Price Above Average Price for Year-2000 Shrimp Prices and No Permit/License Moratorium (Figures A.107 and A.108)

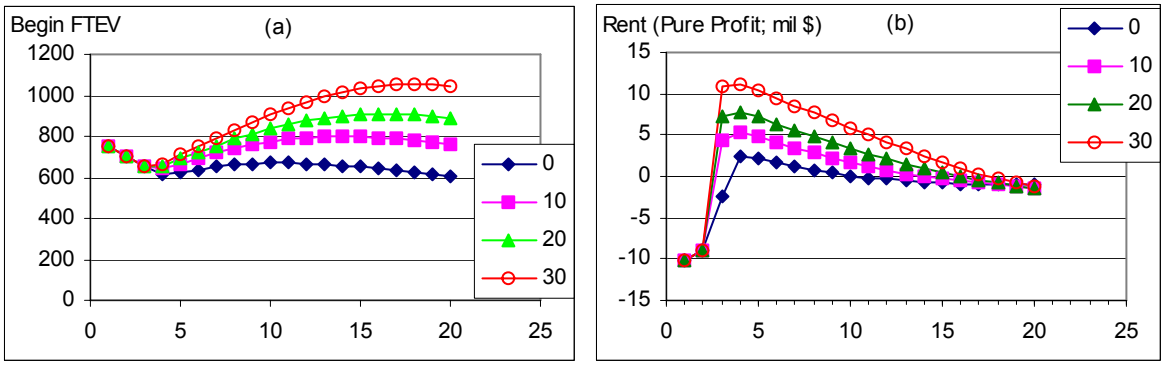


Figure A.107. Government Price Support for Large Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the South Atlantic with year-2002 shrimp prices, and no permit/license moratorium.

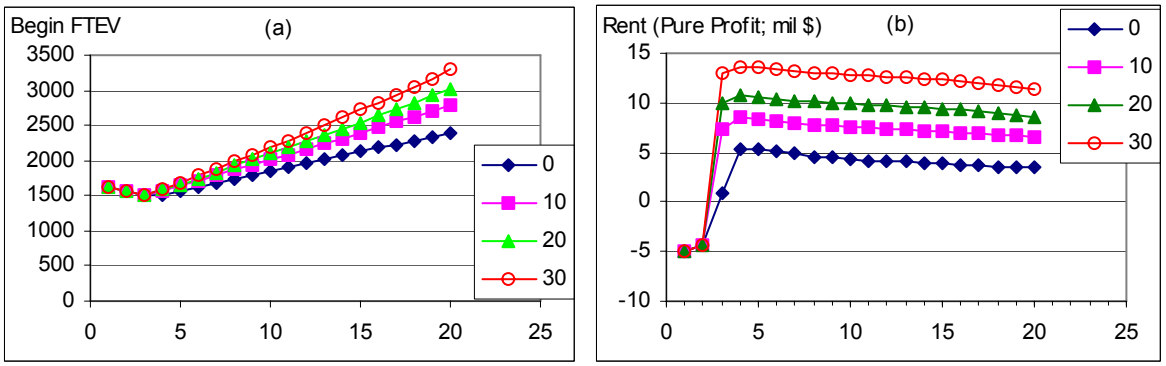


Figure A.108. Government Price Support for Small Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with **year-2002 shrimp prices** and **no permit/license moratorium**.

Bottom line: When price are high and rents are positive, a target price program has little effect on the shrimp fishery. Since there is no permit/license moratorium, vessels will enter the fishery (if rents are positive) or exit the fishery (if rents are negative) until rents are dissipated. Target prices are not needed when the price of shrimp is at the 2000-year price level.

Table A.15 shows that the average price increase received by the shrimpers was small.

A.2.4.3 Target Price Above Average Price for Year-2002 Shrimp Prices and With a Permit/License Moratorium (Figures A.109 and A.110)

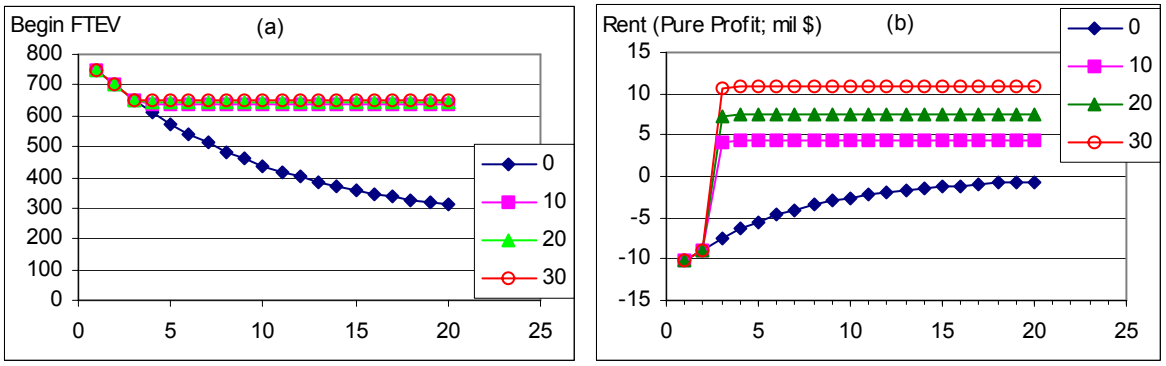


Figure A.109. Government Price Support for Large Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with **year-2002 shrimp prices** and **with a permit/license moratorium**.

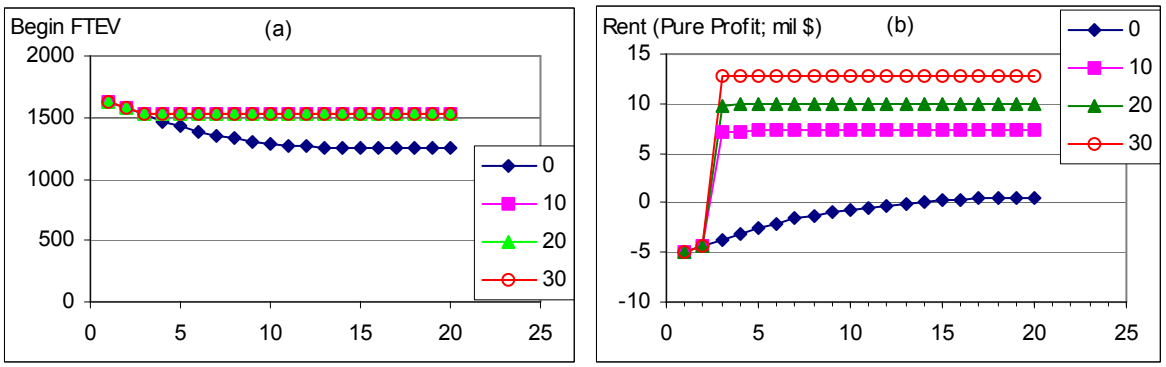


Figure A.110. Government Price Support for Small Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with **year-2002 shrimp prices** and **with a permit/license moratorium**.

Bottom line: When price are as low as the 2002-year, it only takes a target price of less than 10% above average price for shrimpers to have positive rents (normal profits). It would cost the government over $117.2M to increase average price by 10%. These rents could be maintained if there is no capital stuffing and no effort creep.

A.2.4.4 Target Price Above Average Price for Year-2002 Shrimp Prices and With a Permit/License Moratorium (Figures A.111 and A.112)

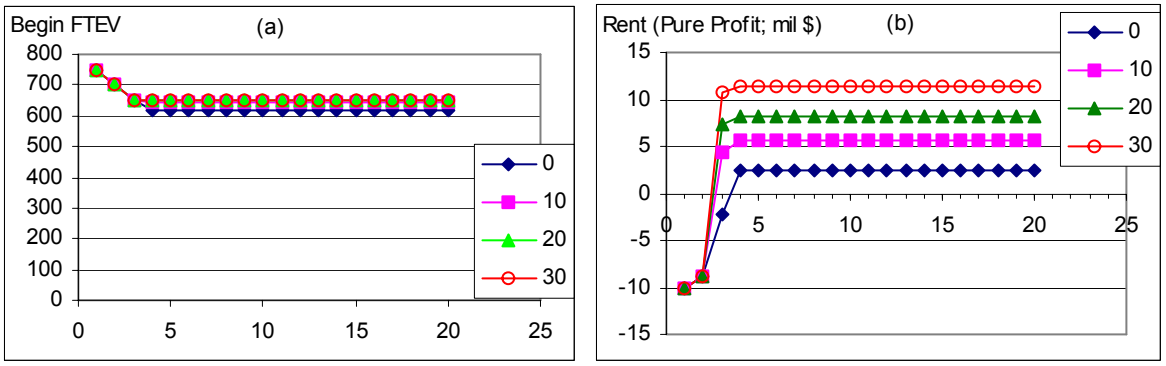


Figure A.111. Government Price Support for Large Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with **year-2002 shrimp prices** and **with a permit/license moratorium**.

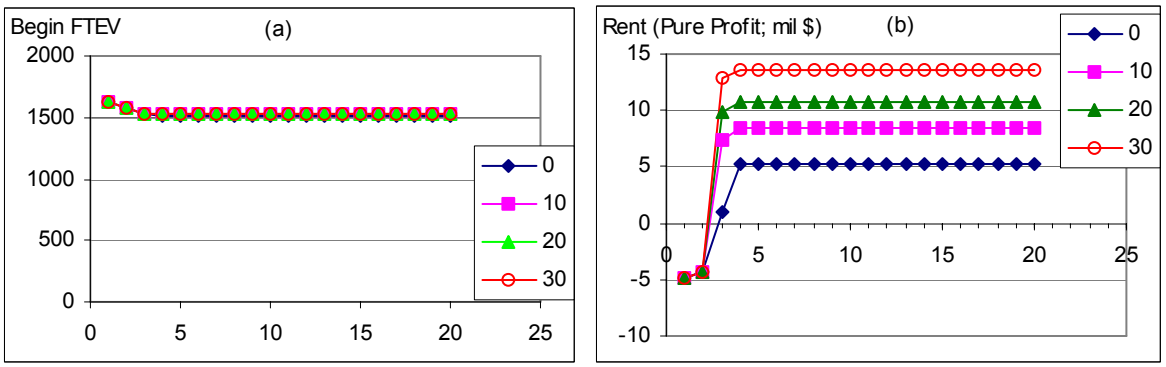


Figure A.112. Government Price Support for Small Vessels: Simulation over the period 2002-2021 with a target price at 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with **year-2002 shrimp prices** and **with a permit/license moratorium**.

Bottom line: Target prices are not needed when the price of shrimp is at the 2000-year price level.

A.2.5 Increase Price Through Marketing Paid for by Tax on Per Pound of Shrimp Landed

A.2.5 .1 Marketing Increase Based on Year-2002 Shrimp Prices and No Permit/License Moratorium (Figures A.113 and A.114)

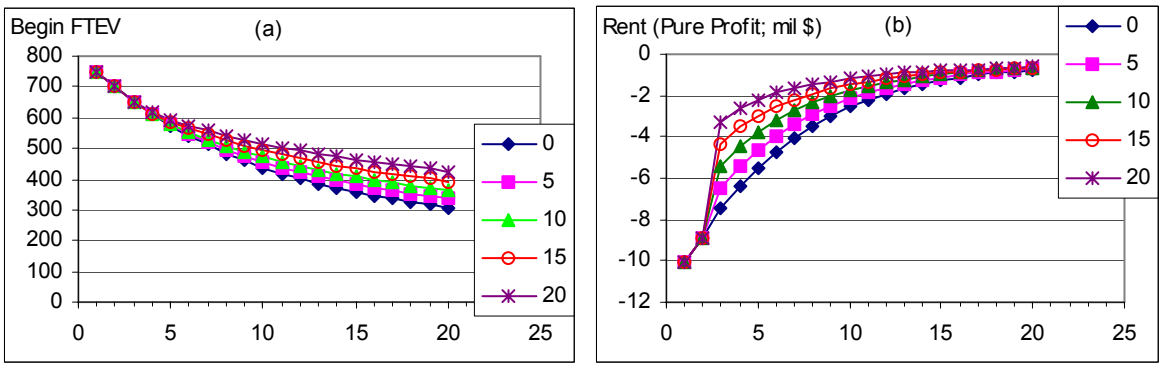


Figure A.113. Marketing Shrimp for Large Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with year-2002 shrimp prices and no permit/license moratorium.

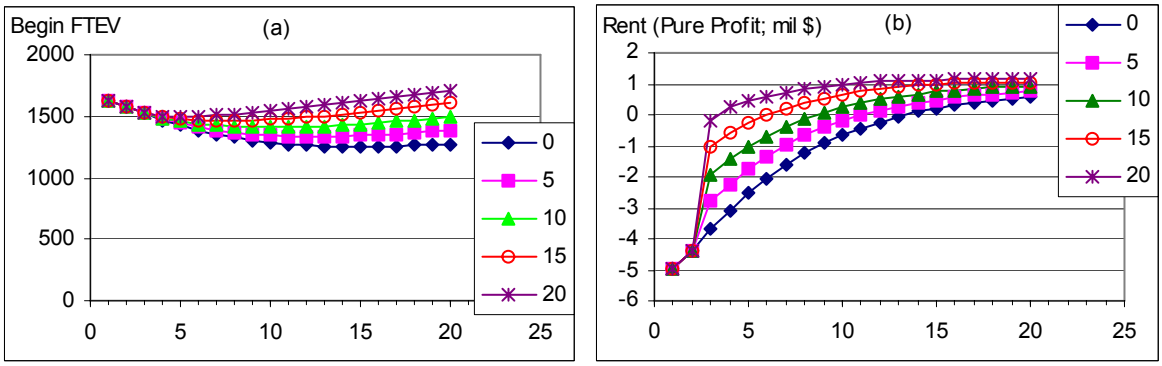


Figure A.114. Marketing Shrimp Support for Small Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with year-2002 shrimp prices and no permit/license moratorium.

Bottom line: A 20% price increase through marketing efforts is needed to achieve zero rents in 2004 for the small vessels. Large would require a higher increase in the price of shrimp through marketing activities to achieve a zero rent. The higher the price that can be achieved through marketing, the fewer the shrimp vessels that leave the shrimp fishery. Marketing expenses are approximately $75,000 when the marketing tax is one cent per pound.

A.2.5.2 Marketing Increase Based on Year-2000 Shrimp Prices and No Permit/License Moratorium (Figures A.115 and A.116)

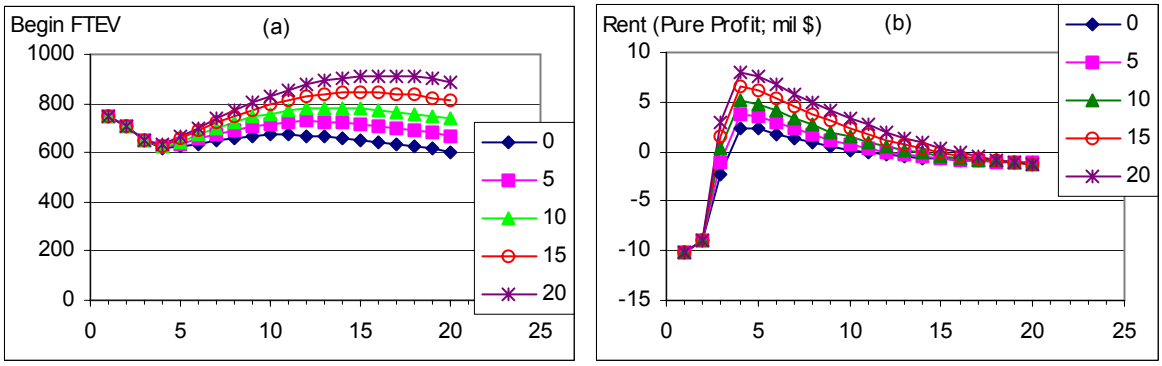


Figure A.115. Marketing Shrimp for Large Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with **year-2002 shrimp prices**, and **no permit/license moratorium**.

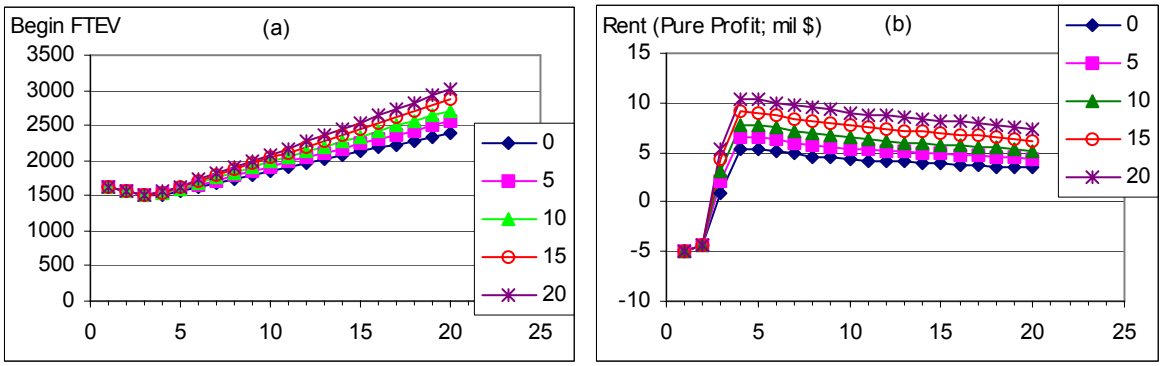


Figure A.116. Marketing Shrimp for Small Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with **year-2002 shrimp prices** and **no permit/license moratorium**.

Bottom line: When price are high and rents are positive a marketing program that increases the price of shrimp will result in more vessels entering the shrimp fishery than were originally in the fishery in 2002. This happens because there is no permit/license moratorium to keep vessels from entering the fishery for either small or large vessels.

A.2.5.3 Marketing Increase Based on Price for Year-2002 Shrimp Prices and With a Permit/License Moratorium (Figures A.117 and A.118)

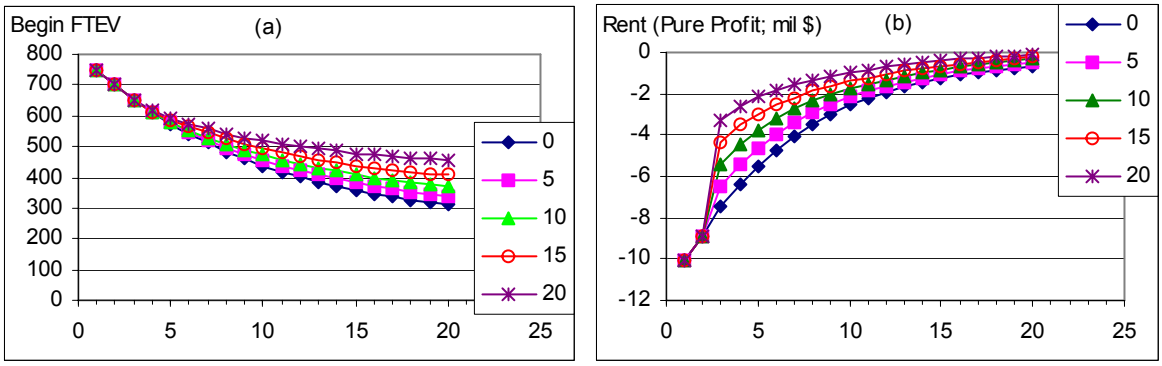


Figure A.117. Marketing Shrimp for Large Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average beginning year 2004 in the South Atlantic with **year-2002 shrimp prices** and **with a permit/license moratorium**.

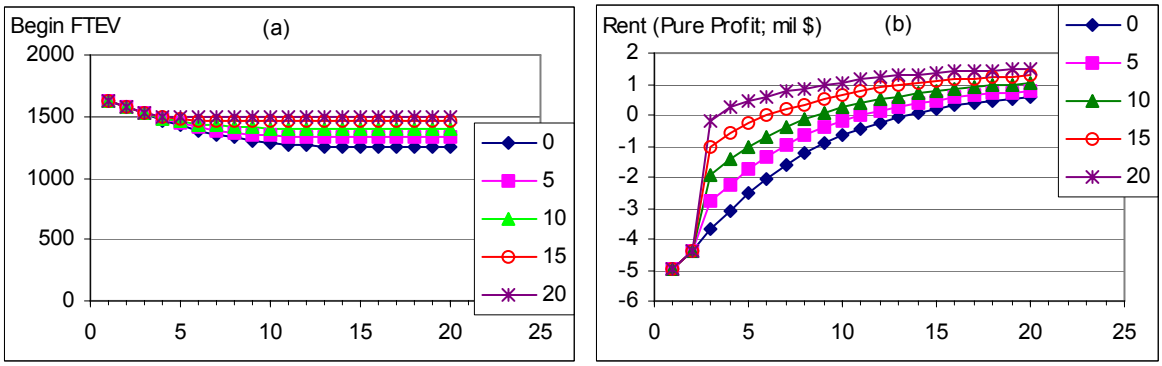


Figure A.118. Marketing Shrimp for Small Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with **year-2002 shrimp prices** and **with a permit/license moratorium**.

Bottom line: When shrimp prices are low, the marketing activities keep some vessels from leaving the shrimp fishery that would otherwise leave. When positive rents are achieved by the small vessels, the permit/license moratorium keeps additional vessels from entering the fishery to dissipate the rents. This also assumes that there will be no capital stuffing or effort creep.

Compare these results to Figures A.114 and A.115.

A.2.5.4 Marketing Increase Based on Year-2000 Shrimp Prices and With a Permit/License Moratorium (Figures A.119 and A.120)

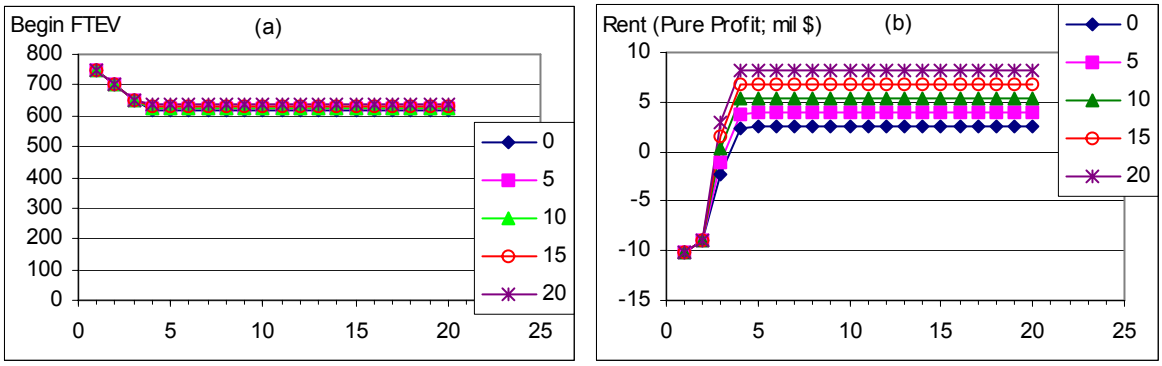


Figure A.119. Marketing Shrimp for Large Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with **year-2002 shrimp prices** and **with a permit/license moratorium**.

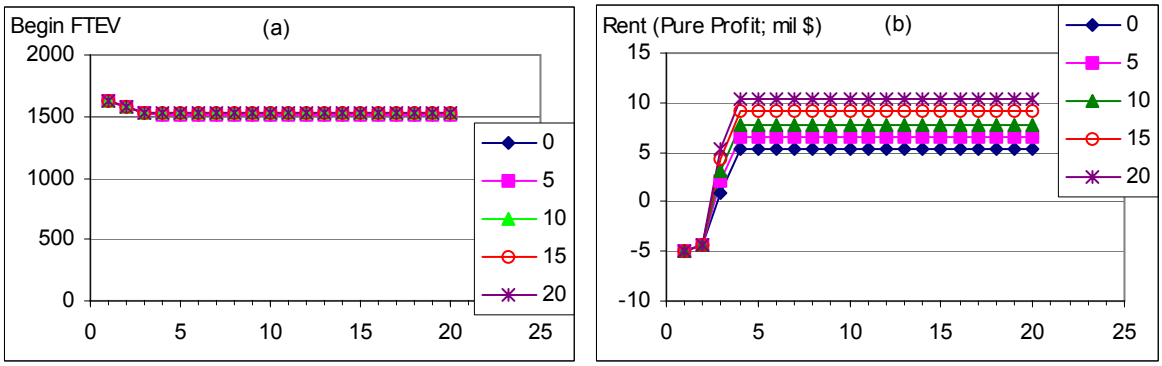
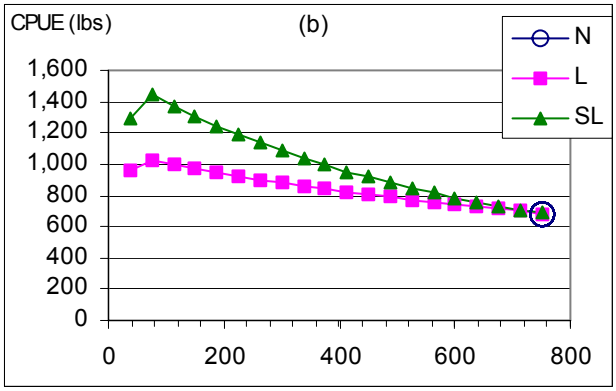


Figure A.120. Marketing Shrimp for Small Vessels: Simulation over the period 2002-2021 with marketing increasing prices 0%, 5%, 10%, 15%, and 20% above the average, beginning year 2004 in the South Atlantic with **year-2002 shrimp prices** and **with a permit/license moratorium**.

Bottom line: When prices are high and rents are positive, a marketing program that increases the price of shrimp will result in increased rents. The permit/license moratorium keeps additional vessels from entering the fishery to dissipate the rents. This also assumes that there will be no capital stuffing or effort creep.

A.2.5 Cooperatives for Maximum Profit (Collective Group Action)

A.2.5.1 Cooperatives for Maximum Profit Based on Year-2002 Shrimp Prices (Figures A.121 and A.122)



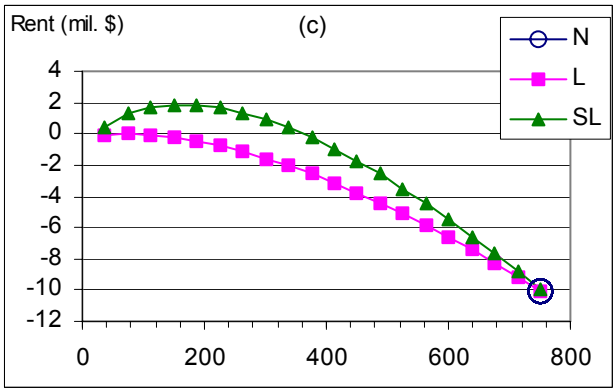


Figure A.121. Cooperatives for Maximum Profit for Large Vessels: Simulation by varying the number of FTEV from 5% to 100% in 5% increments based on FTEV in 2002 for the South Atlantic with **year-2002 shrimp prices**.

Bottom line: If all large vessel owners were to form a cooperative and manage the large vessel fleet to maximize profit, then at the 2002-year price level for shrimp, the number of vessels should be reduced to approximately 200 FTEV. This would be less than 25% of the large FTEV that are operating in the South Atlantic today. If small vessels were to remain as open access, then large vessels would need to reduce to about 100 to maximize profits and even at that, rent would be zero.

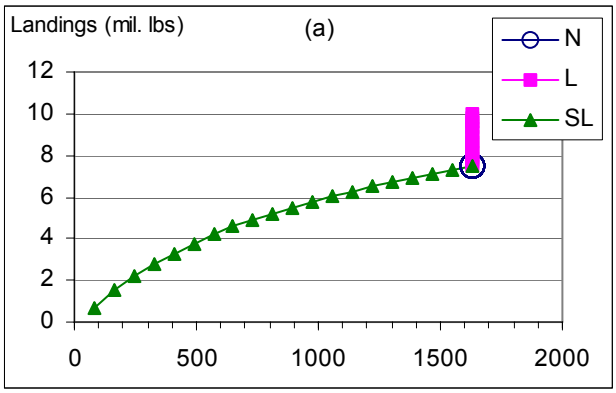
Large Vessels

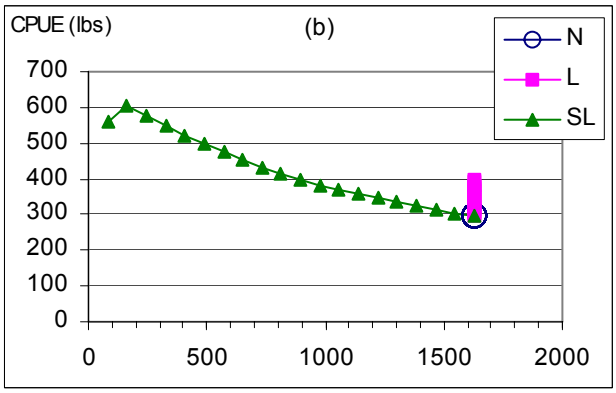
If small vessels continued to operate under open-access, then for large vessels:

> Maximum rent would occur at less than 100 FTEV. At maximum rent the CPUE would be over 1,000 pounds instead of the current level of less then 700 pounds. Rent would be approximately $0M.

If small vessels formed a cooperative and operated to maximize profit, then for large vessels:

> Maximum rent would occur at approximately 200 FTEV. At maximum rent the CPUE would be over 1,200 pounds. Rent would be about $2M.





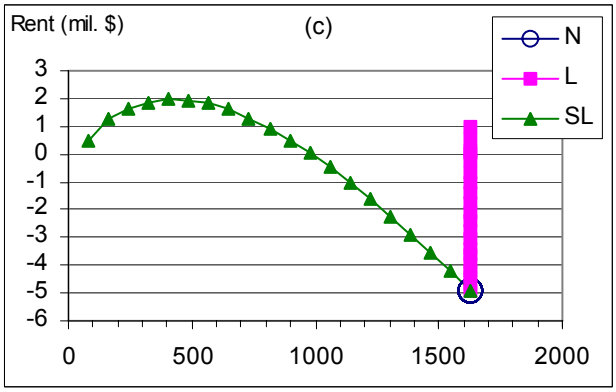


Figure A.122. Cooperatives for Maximum Profit for Small Vessels: Simulation by varying the number of FTEV from 5% to 100% in 5% increments based on FTEV in 2002 for the South Atlantic with **year-2002 shrimp prices**.

Bottom line: If all small vessel owners were to form a cooperative and manage the small vessel fleet to maximize profit, then at the 2002-year price level for shrimp, the number of vessels should be reduced to about 400 FTEV. This would be just over 25% of the small FTEV that are currently operating in the South Atlantic today.

Small vessels

If large vessels formed a cooperative and operated to maximize profit, then for small vessels to operate as a cooperative to maximize profits:

Maximum rent would occur just about 400 FTEV. Rent would be over $2M. At maximum rent, the CPUE would be just less than 500 pounds instead of less than 300 pounds as they are currently doing. Total landings would be over 3M pounds.

A.2.5.2 Cooperatives for Maximum Profit Based on Year-2000 Shrimp Prices (Figures A.123 and A.124)

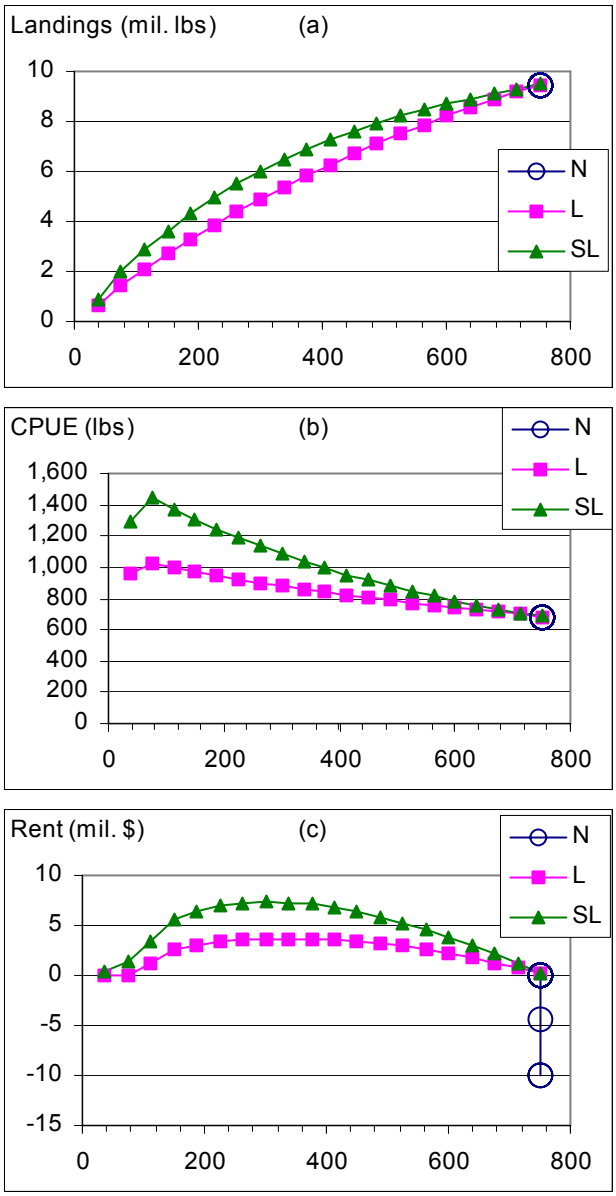


Figure A.123. Cooperatives for Maximum Profit for Large Vessels: Simulation by varying the number of FTEV from 5% to 100% in 5% increments based on FTEV in 2002 for the South Atlantic with **year-2000 shrimp prices**.

Bottom line: If all large vessels owners were to form a cooperative and manage the large vessel fleet to maximize profit, then at the 2000-year price level for shrimp, the number of vessels should be reduced to approximately 300 FTEV. This would be less than 35% of the large FTEV that are currently operating in the South Atlantic today. This would be the case whether small vessels continue to operate as open access or if small vessels formed cooperatives and operated to maximize profit.

Large vessels

If small vessels continued to operate under open access, then for large vessels:

> Maximum rent would occur at approximately 300 FTEV. At maximum rent the CPUE would be over 900 pounds instead of the current level of less then 700 pounds. Rent would be approximately $4M.

If small vessels formed a cooperative and operated to maximize profit, then for large vessels:

> Maximum rent would occur at approximately 300 FTEV. At maximum rent the CPUE would be about 1,100 pounds. Rent would be over $7M.

Comparing Figures A.122 and A.124 or A.123 and A.125, it is obvious that the higher the price, the more vessels that can be supported by the shrimp fishery. The real price of shrimp has been declining since 1980 and therefore the number of vessels that can be supported by the shrimp fishery, where the vessels are financially stable, is declining.

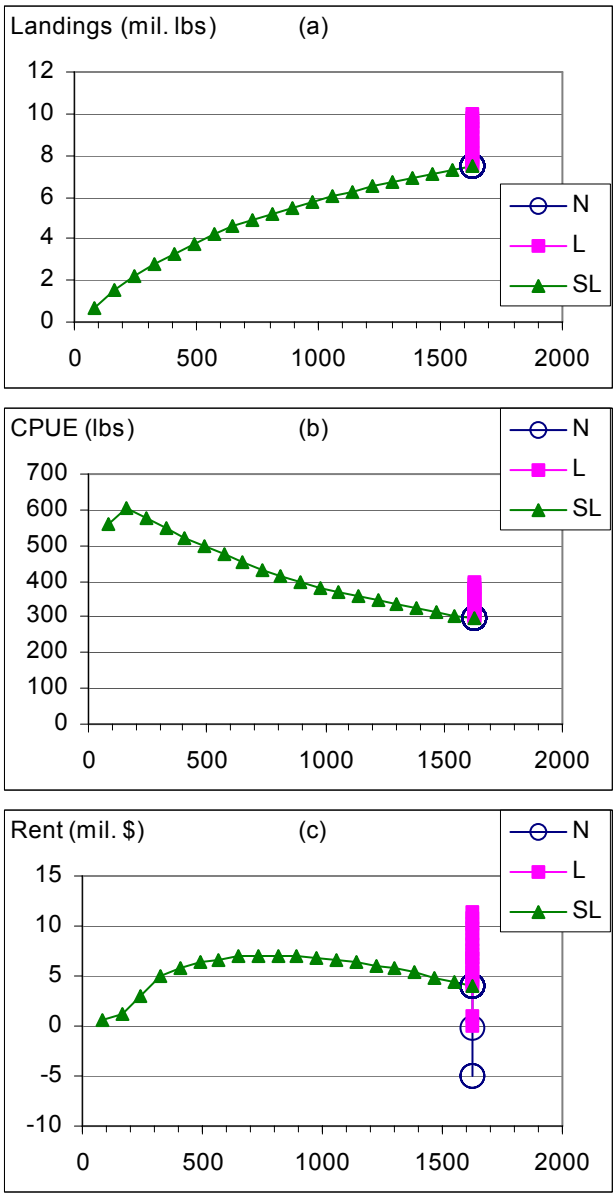


Figure A.124. Cooperatives for Maximum Profit for Small Vessels: Simulation by varying the number of FTEV from 5% to 100% in 5% increments based on FTEV in 2002 for the South Atlantic with **year-2000 shrimp prices**.

Bottom line: If all small vessel owners were to form a cooperative and manage the small vessel fleet to maximize profit, then at the 2000-year price level for shrimp, the number of vessels should be reduced to about 800 FTEV. This would be less than 50% of the small FTEV that are currently operating in the South Atlantic today.

Small vessels

If large vessels formed a cooperative and operated to maximize profit then for small vessels to operate as a cooperative and maximize profits:

Maximum rent would occur at about 800 FTEV. Rent would be about $6M. At maximum rent the CPUE would be about 400 pounds instead of less than 300 pounds as they are currently doing. Total landings would be over 5M pounds.