

Supplemental Appendix

Deterring Industrial Vessels from African Coastal Fisheries

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Appendix A explains how we construct our IEZ boundaries. Appendix B presents results and robustness checks for our regression discontinuity, bunching, and discrete choice analyses. Appendix C details our back-of-the-envelope calculations of how a country’s IEZ affects fish stocks and catches.

A IEZ Boundaries

Our IEZ boundaries data begin from Table 1 of Belhabib et al. (2020). We retain boundaries corresponding to complete prohibitions on all industrial fishing, dropping partial prohibitions on certain kinds of industrial fishing because our radar data do not distinguish among vessels’ fishing methods. We validated each country’s IEZ boundary against official government documents, other academic articles, and international or non-governmental organization reports, resulting in the following differences in our data compared to Belhabib et al. (2020):

- Equatorial Guinea expanded its IEZ from 4 to 12 nautical miles in November 2017 (República de Guinea Ecuatorial, 2017). We treat Equatorial Guinea as two distinct units in our analysis: one for before November 2017 with an IEZ boundary of 4 nautical miles, and another for after November 2017 with an IEZ boundary of 12 nautical miles.
- Ghana’s IEZ boundary is the maximum of: (1) the 30 meter isobath (the line connecting points where the ocean depth is 30 meters) and (2) 6 nautical miles from shore

(Republic of Ghana, 2002). In Figure 1(b) we display the boundary’s average distance to shore. We calculate this average distance as 12.2 nautical miles, compared to the 12 nautical miles reported in Belhabib et al. (2020).

- Guinea’s Inshore Exclusion Zone is 6 nautical miles (Beye Traore, 2021).
- We exclude from our analysis Mauritius, a small island far east of mainland Africa, and Mayotte, a non-sovereign French overseas department.
- Madagascar’s 2 nautical mile IEZ began in July 2021 (Carver, 2021). Though the legislation only specifically prohibits industrial shrimp trawling, “due to the characteristics of traditional fishing and the geography of the country, the 2 nm-trawling ban serves de facto as a small-scale fishing zone” (Philippe, 2023).
- We exclude Senegal from our analysis because its IEZ depends on vessels’ fishing methods and other characteristics (République du Sénégal, 2015).
- Sierra Leone’s IEZ boundary is defined by 7 pairs of longitude-latitude coordinates (Baio, Sei, & Brookfields, 2017). In Figure 1(b) we display the boundary’s average distance to shore. We calculate this average distance as 15.2 nautical miles, compared to the 6 nautical miles reported in Belhabib et al. (2020).

In the course of processing data and conducting analyses, we also use Exclusive Economic Zone boundaries data from Flanders Marine Institute (2023) and national land boundary data from World Bank (2024) and Ruth (2014).

B Empirical Appendix Figures and Tables

Table B1: Composition of AIS Apparent Fishing Hours by Vessel Origin

Country (1)	Domestic (2)	Neighbors (3)	Africa (4)	Europe (5)	Asia (6)	Other (7)
Angola	34.9%	8.5%	1.4%	37.2%	8.3%	9.7%
Benin	0.0%	3.2%	86.2%	0.3%	0.2%	10.1%
Cameroon	46.2%	2.4%	0.0%	0.5%	17.3%	33.5%
Cape Verde	0.4%	2.9%	0.3%	34.1%	61.2%	1.1%
Equatorial Guinea	0.0%	21.7%	2.3%	2.9%	24.1%	49.0%
Gabon	0.0%	0.1%	2.4%	24.6%	55.1%	17.8%
Gambia	7.2%	29.8%	5.6%	4.9%	49.2%	3.3%
Ghana	85.6%	0.0%	0.3%	3.9%	4.3%	5.9%
Guinea	8.9%	5.9%	10.9%	41.1%	31.4%	1.8%
Guinea-Bissau	7.3%	16.7%	3.7%	32.3%	39.7%	0.3%
Ivory Coast	0.4%	42.7%	0.7%	17.7%	29.4%	9.0%
Liberia	1.0%	0.3%	18.8%	12.9%	62.0%	5.0%
Madagascar	22.1%	3.2%	0.4%	10.3%	63.8%	0.3%
Mauritania	6.5%	0.8%	5.0%	38.3%	42.1%	7.3%
Mozambique	36.7%	2.6%	15.2%	5.3%	39.5%	0.7%
Nigeria	30.4%	0.0%	0.1%	0.0%	0.1%	69.3%
Republic of Congo	0.0%	4.2%	2.6%	56.6%	15.2%	21.5%
Sierra Leone	0.0%	1.9%	17.4%	61.9%	14.9%	3.8%
Somalia	0.0%	1.0%	15.1%	1.3%	82.6%	0.0%
Togo	0.0%	48.8%	1.3%	1.1%	0.1%	48.7%
Total	18.7%	6.4%	5.2%	22.8%	34.1%	12.9%

Notes: This table displays the percentage of AIS apparent fishing hours in the Exclusive Economic Zone (EEZ) of the country given in Column 1 allocated between the categories in Columns 2 to 7: (2) domestic vessels, those registered in (“flagged to”) the same country as the EEZ; (3) vessels registered in neighboring countries, defined as countries whose EEZ boundary lies within 10 km of the focal country’s EEZ; (4) vessels registered in non-neighboring African countries; (5) vessels registered in European countries; (6) vessels registered in Asian countries; and (7) all other vessels, including those registered in countries in the Americas and Oceania as well as vessels with unknown or missing registration information. Percentages are calculated for each country (rows) and sum to 100% across columns. The final row displays the distribution of total fishing hours pooled across all 20 EEZs. AIS apparent fishing hours are based on Global Fishing Watch data for the years 2017 to 2021.

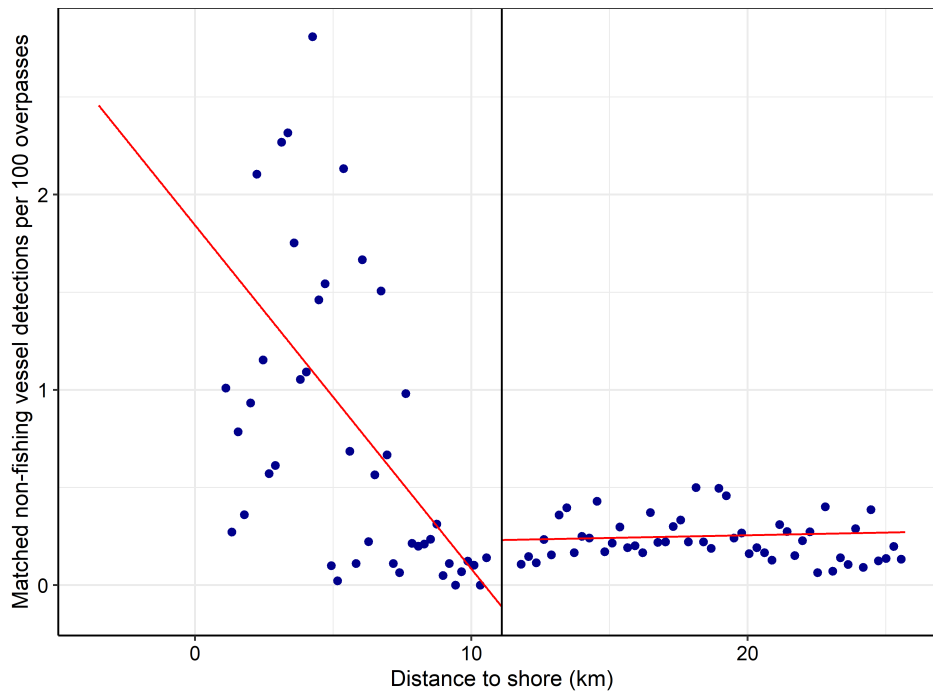
Table B2: Placebo Test Results for Discontinuities at IEZ Boundaries

Country-Boundary (1)	Outcome (2)	Coefficient (3)	SE (4)	q-value (5)	Bandwidth (6)	N (7)
Republic of Congo	Nonfishing	0.342	0.105	0.0444	14.59	3,018
Madagascar	Chlorophyll	0.146	0.051	0.0946	5.25	43,283
Angola	SST	-0.226	0.091	0.1801	4.73	10,992
Madagascar	Nonfishing	0.005	0.002	0.2079	5.07	29,820
Benin	Chlorophyll	0.194	0.088	0.2079	7.28	1,332
Eq. Guinea - 4 nm	Depth	-77.105	36.276	0.2079	6.40	5,299
Eq. Guinea - 4 nm	Nonfishing	0.011	0.005	0.2079	9.13	6,685
Gambia	Depth	-1.369	0.665	0.2079	6.80	817
Liberia	Chlorophyll	0.148	0.077	0.2548	5.91	4,845
Guinea-Bissau	Nonfishing	0.003	0.002	0.2877	14.96	9,438
Sierra Leone	Nonfishing	0.040	0.026	0.4692	11.21	6,107
Cape Verde	Depth	-58.928	39.330	0.4692	4.42	7,887
Mauritania	Depth	-1.286	1.022	0.6524	5.71	6,028
Cameroon	Depth	-9.237	7.710	0.6524	1.17	384
Gambia	Nonfishing	0.035	0.029	0.6524	12.33	1,552
Togo	Chlorophyll	0.046	0.040	0.6767	9.79	761
Eq. Guinea - 12 nm	Chlorophyll	0.097	0.088	0.6767	4.67	4,453
Gambia	SST	-0.065	0.068	0.7930	7.29	885
Guinea	Chlorophyll	0.058	0.064	0.8010	8.55	4,920
Angola	Depth	-9.631	11.164	0.8155	5.18	12,185
Mauritania	Nonfishing	0.021	0.027	0.8166	9.99	11,209
Guinea-Bissau	Chlorophyll	0.072	0.098	0.8166	7.25	3,948
Sierra Leone	Depth	-1.529	2.096	0.8166	5.11	2,650
Mozambique	Depth	-4.560	6.430	0.8166	3.63	16,732
Eq. Guinea - 12 nm	Nonfishing	0.006	0.009	0.8166	6.32	6,275
Mauritania	SST	-0.035	0.058	0.8739	5.95	6,312
Cameroon	SST	-0.093	0.221	0.9112	0.95	249
Nigeria	Chlorophyll	0.069	0.163	0.9112	5.00	5,687
Mozambique	SST	-0.022	0.054	0.9112	3.38	15,327
Republic of Congo	Chlorophyll	0.047	0.134	0.9112	9.74	2,388
Guinea	SST	-0.012	0.035	0.9112	5.76	3,167
Liberia	Nonfishing	0.002	0.007	0.9112	10.76	8,975
Guinea	Depth	-0.222	0.721	0.9112	5.93	3,263
Mozambique	Nonfishing	0.006	0.019	0.9112	4.50	20,400
Republic of Congo	Depth	-0.328	1.158	0.9112	7.15	1,715
Ghana	Chlorophyll	0.013	0.048	0.9112	7.33	6,152
Guinea-Bissau	SST	-0.007	0.047	0.9806	6.46	3,477
Eq. Guinea - 12 nm	SST	-0.008	0.053	0.9806	7.66	7,713
Somalia	Chlorophyll	0.000	0.007	1.0000	5.90	26,224
Somalia	Depth	-0.524	14.743	1.0000	8.84	40,666

Eq. Guinea - 4 nm	Chlorophyll	-0.007	0.126	1.0000	9.67	7,608
Mauritania	Chlorophyll	-0.009	0.159	1.0000	6.71	7,208
Sierra Leone	Chlorophyll	-0.012	0.086	1.0000	7.78	4,212
Liberia	Depth	0.246	1.139	1.0000	8.09	6,836
Eq. Guinea - 12 nm	Depth	24.178	94.967	1.0000	5.09	4,912
Cape Verde	Chlorophyll	-0.003	0.008	1.0000	7.71	13,258
Somalia	SST	0.005	0.014	1.0000	9.99	46,320
Nigeria	SST	0.005	0.016	1.0000	3.80	4,143
Eq. Guinea - 4 nm	SST	0.018	0.051	1.0000	9.17	7,545
Benin	SST	0.012	0.029	1.0000	6.62	1,200
Madagascar	SST	0.026	0.052	1.0000	2.96	24,009
Sierra Leone	SST	0.007	0.014	1.0000	8.87	4,853
Liberia	SST	0.005	0.009	1.0000	5.44	4,419
Cameroon	Chlorophyll	-1.225	2.113	1.0000	1.43	555
Guinea	Nonfishing	-0.145	0.248	1.0000	9.90	5,856
Guinea-Bissau	Depth	0.251	0.429	1.0000	7.94	4,363
Nigeria	Nonfishing	-0.140	0.179	1.0000	9.77	10,973
Ghana	Nonfishing	-0.089	0.109	1.0000	9.77	8,337
Angola	Chlorophyll	-0.123	0.139	1.0000	7.17	19,312
Ghana	Depth	2.416	2.485	1.0000	6.81	5,682
Madagascar	Depth	3.746	3.669	1.0000	2.57	20,019
Republic of Congo	SST	0.021	0.020	1.0000	11.12	2,916
Cameroon	Nonfishing	-1.225	1.112	1.0000	2.37	1,154
Somalia	Nonfishing	-0.001	0.001	1.0000	6.18	27,649
Cape Verde	Nonfishing	-0.015	0.013	1.0000	8.80	7,564
Mozambique	Chlorophyll	-0.072	0.063	1.0000	3.74	17,434
Gabon	Nonfishing	-0.087	0.069	1.0000	10.79	9,355
Ghana	SST	0.022	0.016	1.0000	7.23	6,066
Ivory Coast	Chlorophyll	-0.193	0.135	1.0000	4.55	3,351
Togo	SST	0.009	0.007	1.0000	10.50	822
Gabon	SST	0.090	0.061	1.0000	5.15	9,150
Nigeria	Depth	0.915	0.577	1.0000	5.31	6,089
Gambia	Chlorophyll	-0.156	0.083	1.0000	6.08	723
Ivory Coast	Nonfishing	-0.474	0.227	1.0000	9.77	5,495
Gabon	Depth	4.665	2.220	1.0000	5.17	10,582
Angola	Nonfishing	-0.108	0.051	1.0000	10.61	20,726
Cape Verde	SST	0.042	0.019	1.0000	6.34	11,664
Gabon	Chlorophyll	-0.370	0.148	1.0000	7.04	8,920
Togo	Depth	7.453	2.876	1.0000	5.13	377
Togo	Nonfishing	-3.350	1.232	1.0000	13.56	1,077
Benin	Nonfishing	-0.637	0.211	1.0000	15.04	2,179
Benin	Depth	5.663	1.777	1.0000	7.51	1,374
Ivory Coast	SST	0.112	0.023	1.0000	5.37	4,943
Ivory Coast	Depth	12.771	1.435	1.0000	6.74	6,510

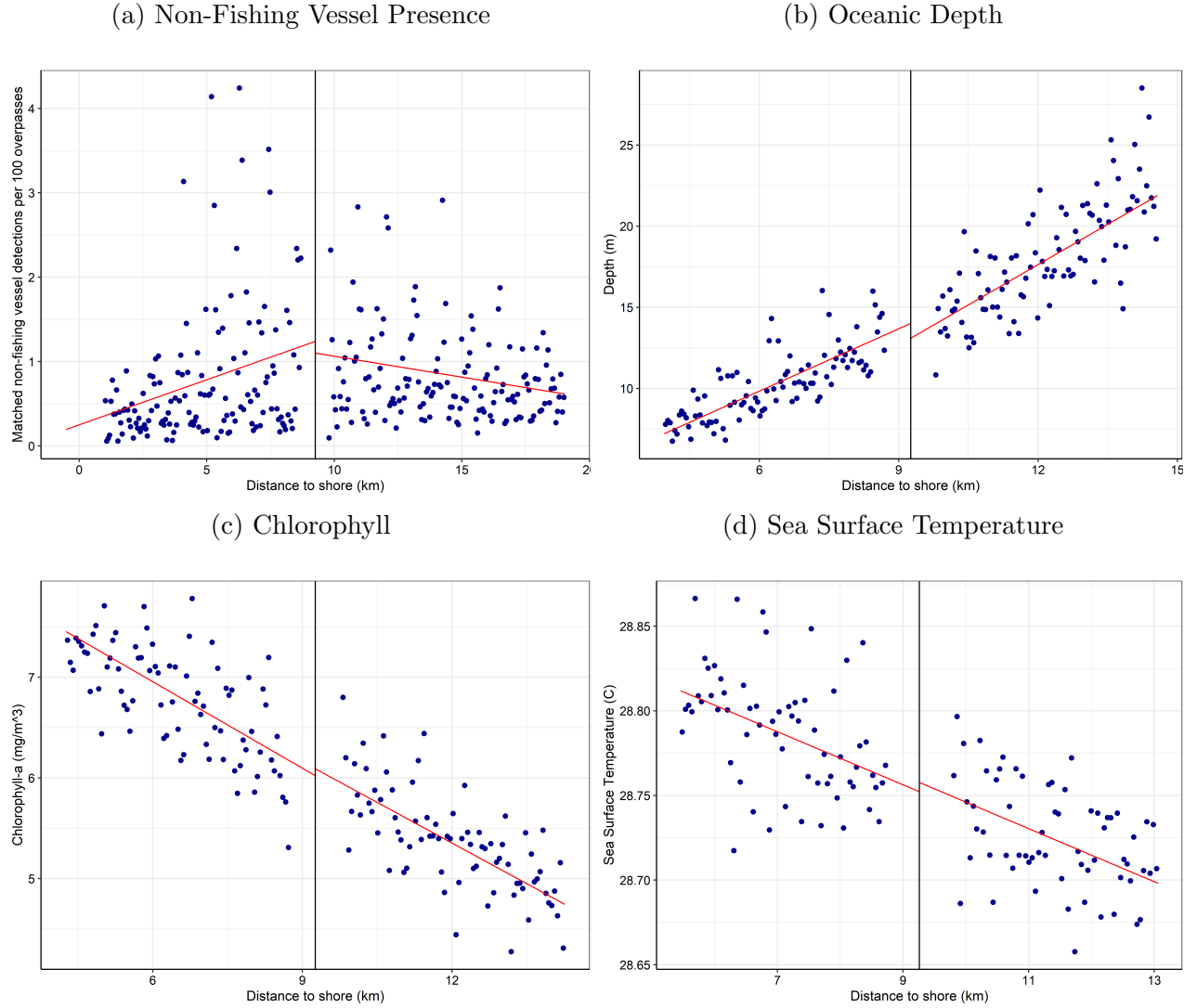
Notes: This table presents the results of testing for discontinuities in placebo outcomes. Each row presents a separate regression result. Column 1 indicates the data used and Column 2 specifies the placebo outcome variable. SST is Sea Surface Temperature and Nonfishing is non-fishing vessel presence. Columns 3 to 5 report the point estimate, standard error (SE), and q-value for the IEZ boundary discontinuity indicator. Some q-values are identical across different regressions due to the Benjamini-Hochberg procedure's monotonicity constraint. Column 6 is the optimal bandwidth in km and Column 7 is the number of observations that fall within that bandwidth.

Figure B1: Non-Fishing Vessel Presence Near the Republic of the Congo's IEZ Boundary



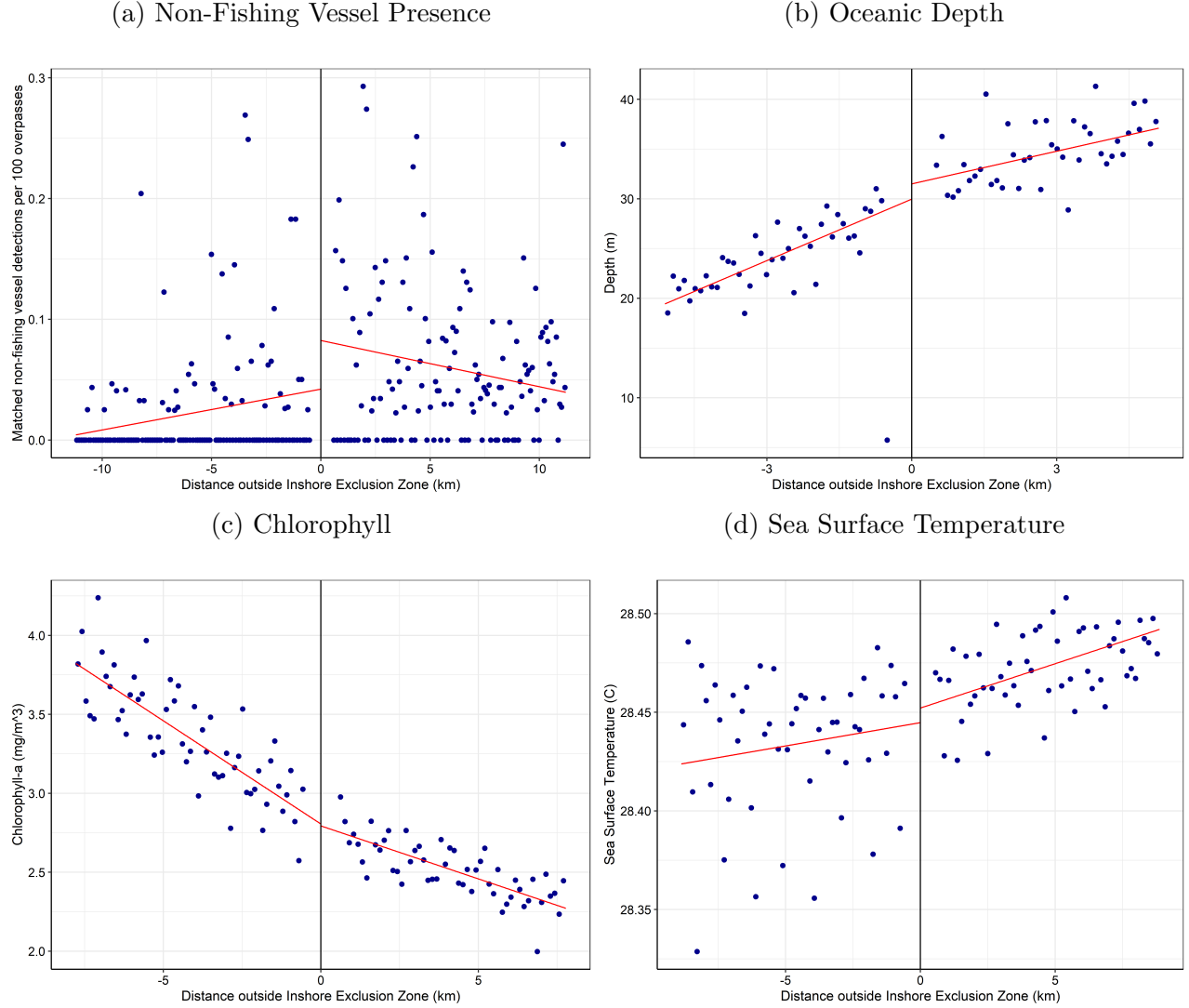
Notes: This figure displays the only placebo outcome with a statistically significant discontinuity at an IEZ boundary. The dependent variable is non-fishing vessel presence: the number of matched non-fishing vessels detected per 100 Sentinel-1 overpasses. The q-value is 0.044.

Figure B2: Nigeria Placebo Tests



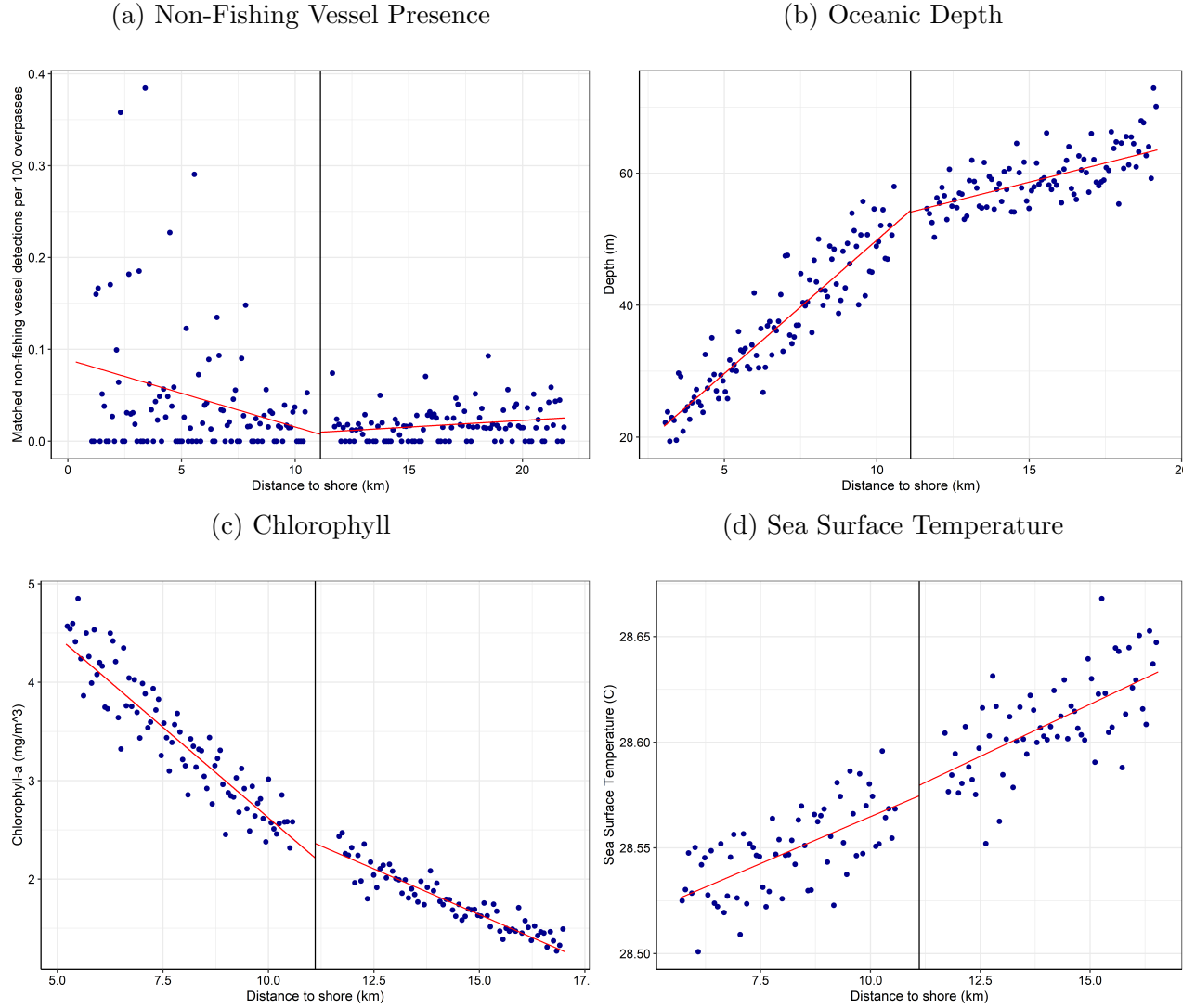
Notes: Each subfigure illustrates the estimated discontinuity at Nigeria's IEZ boundary using a different placebo outcome. Table B2 reports the corresponding coefficients, standard errors, q-values, optimal bandwidths, and number of observations within those optimal bandwidths.

Figure B3: Sierra Leone Placebo Tests



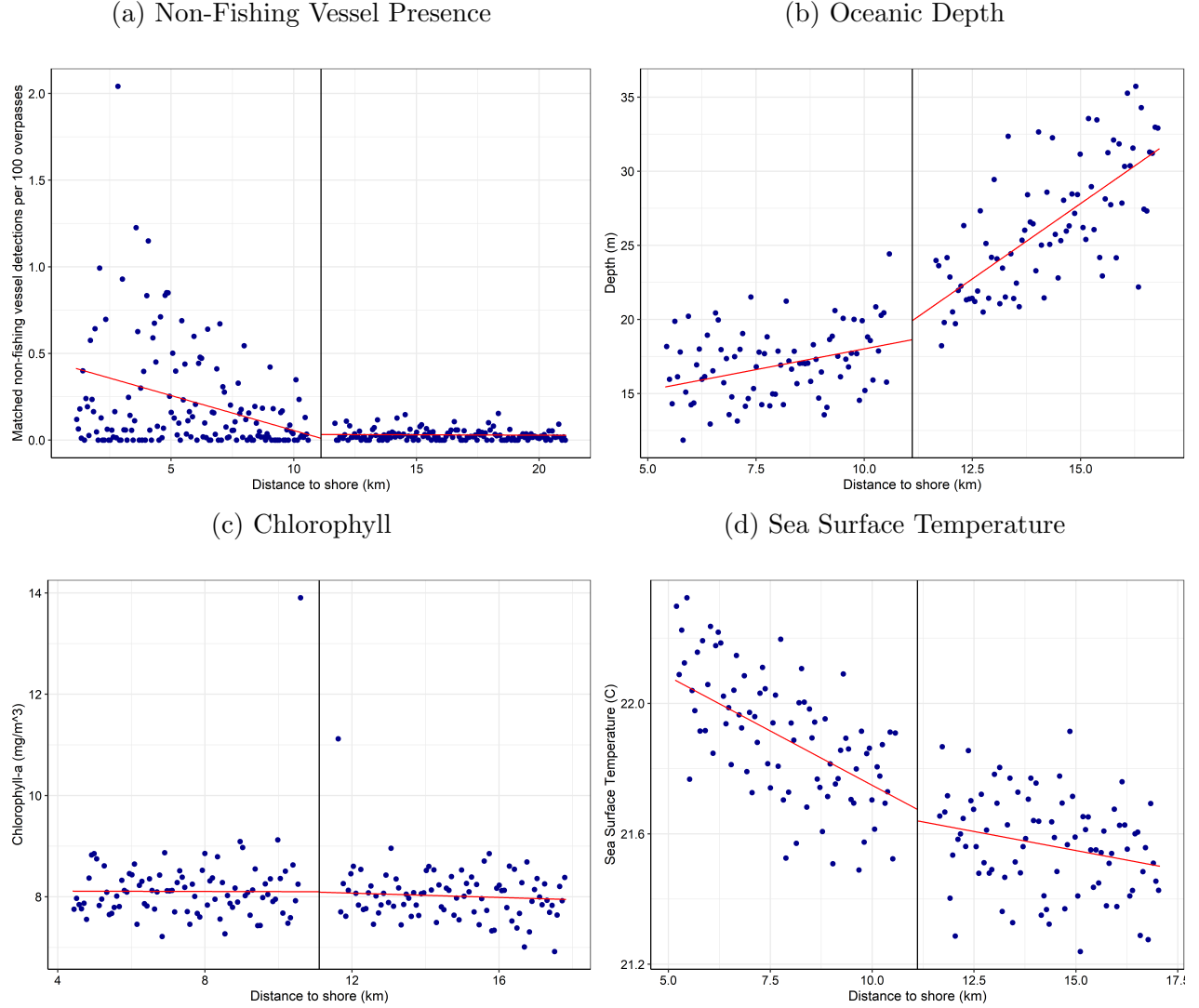
Notes: Each subfigure illustrates the estimated discontinuity at Sierra Leone's IEZ boundary using a different placebo outcome. Table B2 reports the corresponding coefficients, standard errors, q-values, optimal bandwidths, and number of observations within those optimal bandwidths.

Figure B4: Liberia Placebo Tests



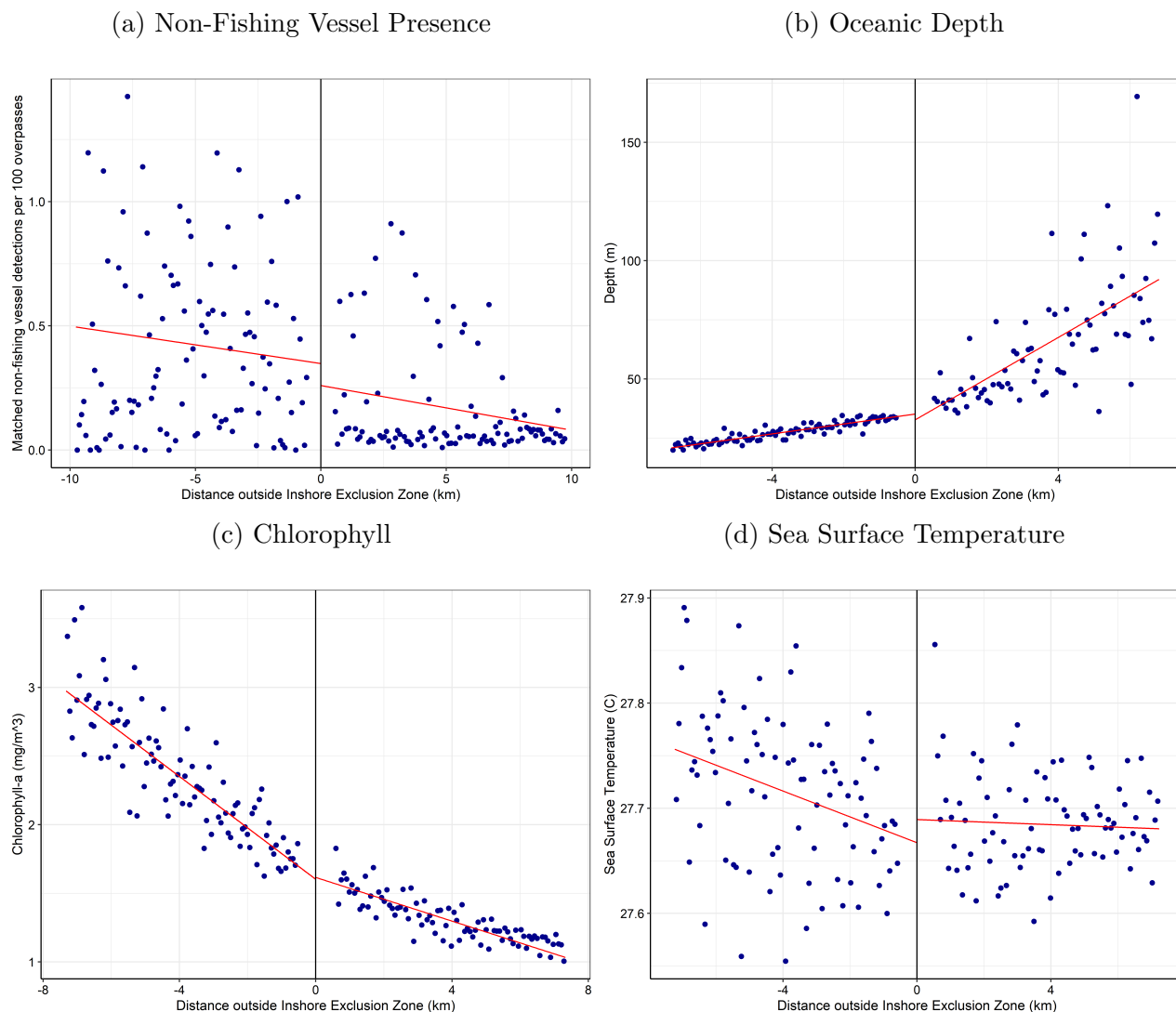
Notes: Each subfigure illustrates the estimated discontinuity at Liberia's IEZ boundary using a different placebo outcome. Table B2 reports the corresponding coefficients, standard errors, q-values, optimal bandwidths, and number of observations within those optimal bandwidths.

Figure B5: Mauritania Placebo Tests



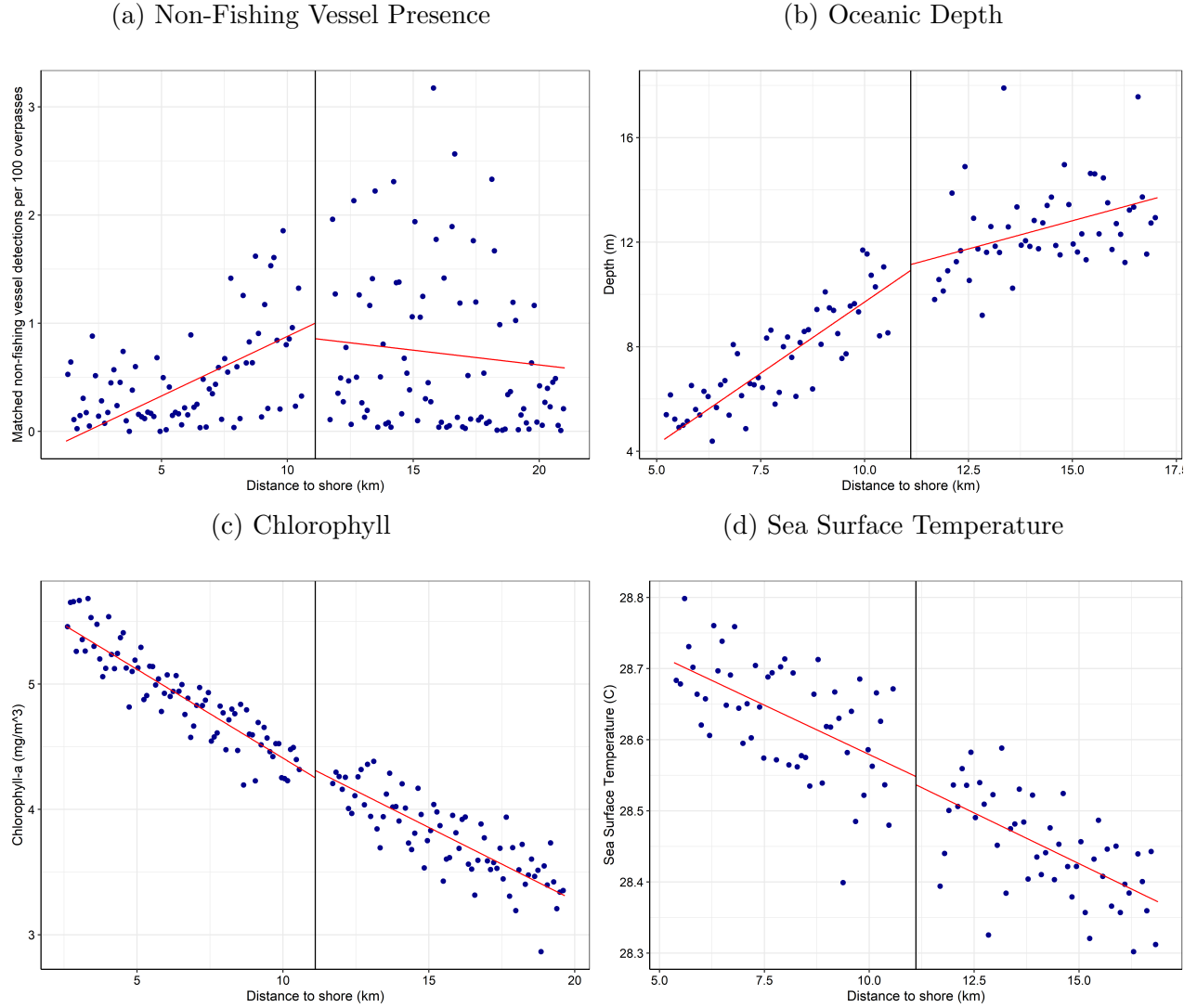
Notes: Each subfigure illustrates the estimated discontinuity at Mauritania's IEZ boundary using a different placebo outcome. Table B2 reports the corresponding coefficients, standard errors, q-values, optimal bandwidths, and number of observations within those optimal bandwidths.

Figure B6: Ghana Placebo Tests



Notes: Each subfigure illustrates the estimated discontinuity at Ghana's IEZ boundary using a different placebo outcome. Table B2 reports the corresponding coefficients, standard errors, q-values, optimal bandwidths, and number of observations within those optimal bandwidths.

Figure B7: Guinea Placebo Tests



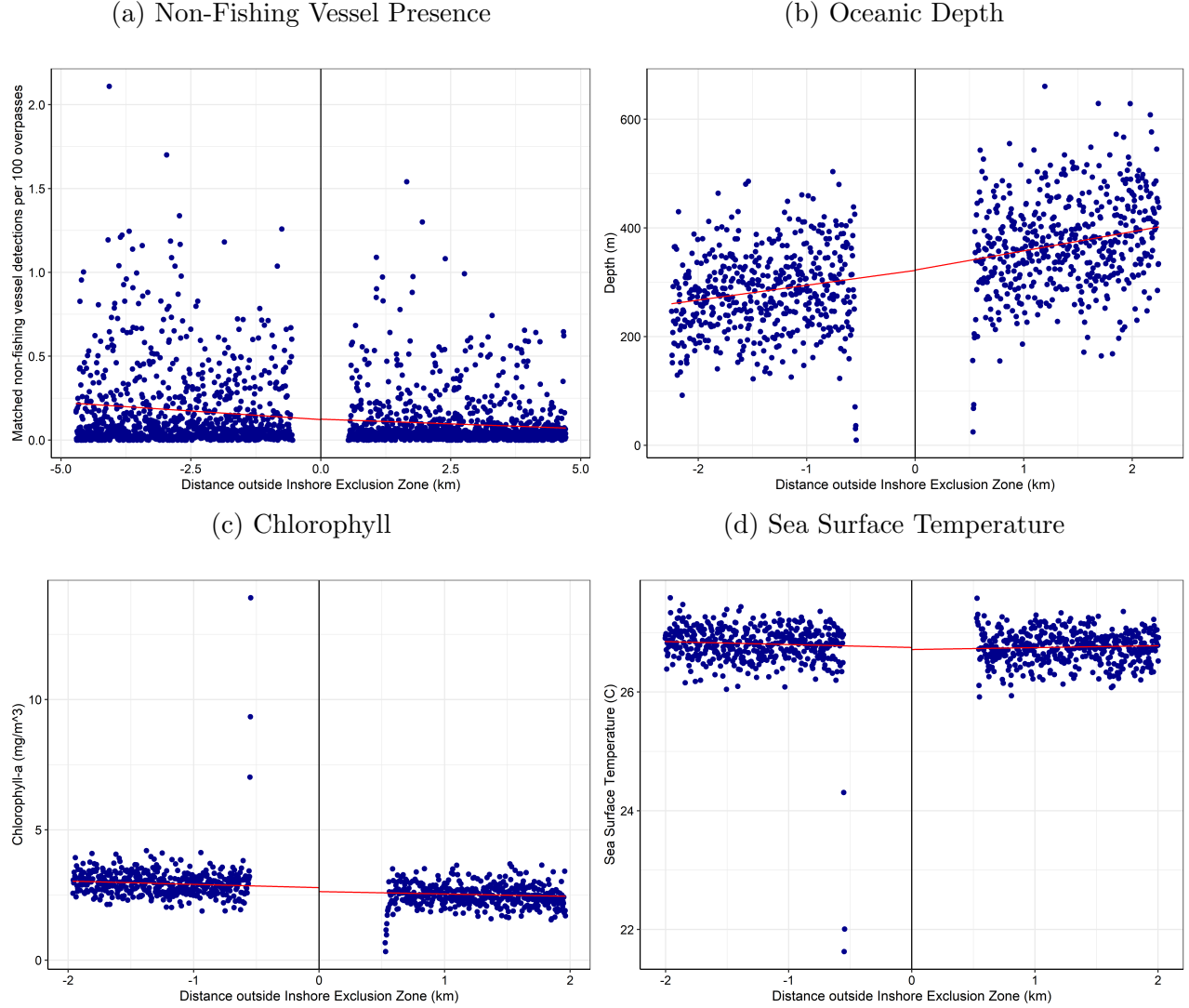
Notes: Each subfigure illustrates the estimated discontinuity at Guinea's IEZ boundary using a different placebo outcome. Table B2 reports the corresponding coefficients, standard errors, q-values, optimal bandwidths, and number of observations within those optimal bandwidths.

Table B3: RD Estimates Pooled Across All Country–IEZ Boundaries

Outcome Variable (1)	Coefficient (2)	Std. Error (3)	p-value (4)	Bandwidth (5)	N (6)
A. Placebo Outcomes					
Nonfishing	0.0023	(0.0225)	0.4595	4.7133	133,494
Depth	0.7446	(17.5041)	0.5170	2.2466	61,671
Chlorophyll	-0.1514	(0.0961)	0.9424	1.9639	51,311
Sea Surface Temperature	-0.0350	(0.0606)	0.2822	2.0053	52,824
B. Fishing Outcomes					
Normalized SAR	0.0323	(0.0065)	0.0000	4.2234	119,804
AIS Fishing Hours	3.4513	(0.2622)	0.0000	9.5510	255,939

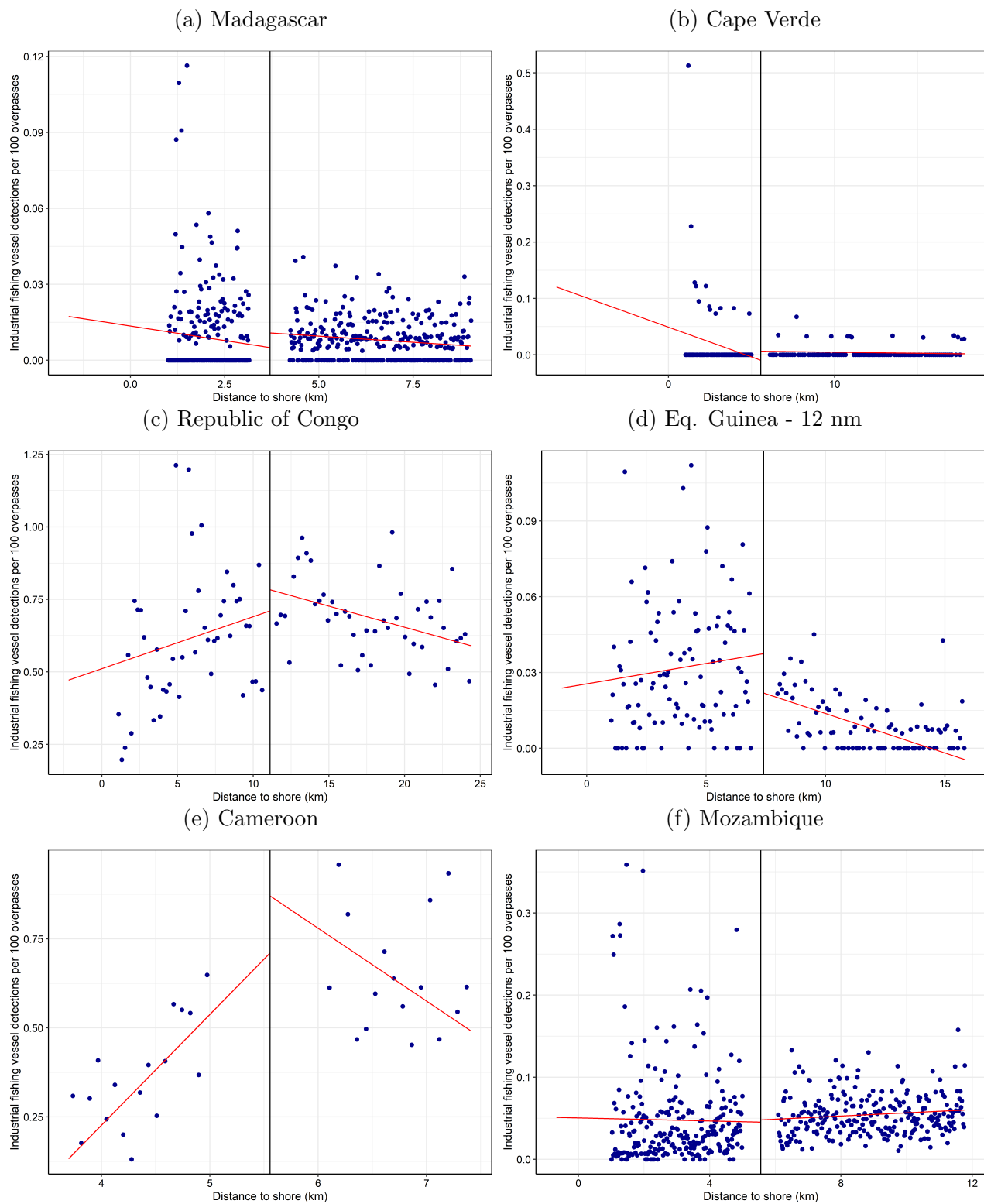
Notes: This table presents pooled regression discontinuity results. Each row reports a separate RD estimate obtained by pooling every 0.01° grid cell from the 21 country–boundary cross-sections and estimating Equation 1 with the outcome shown in Column 1. The running variable is the distance in km from the cell centroid to the IEZ boundary. “Nonfishing”, “Normalized SAR”, and “AIS Fishing Hours” indicate non-fishing vessel presence, industrial fishing vessel presence, and AIS apparent fishing hours, respectively. Columns 2 and 3 report the point estimate and standard error. Figure B8 visualizes the Panel A regressions and Figure B11 visualizes the Panel B regressions. Because this pooled exercise is illustrative rather than a formal hypothesis test, we report unadjusted p-values in Column 4. These one-sided p-values use the same directional hypotheses as the non-pooled regressions. Columns 5 and 6 display the optimal bandwidth in km and the number of observations within that bandwidth.

Figure B8: Pooled Placebo Tests

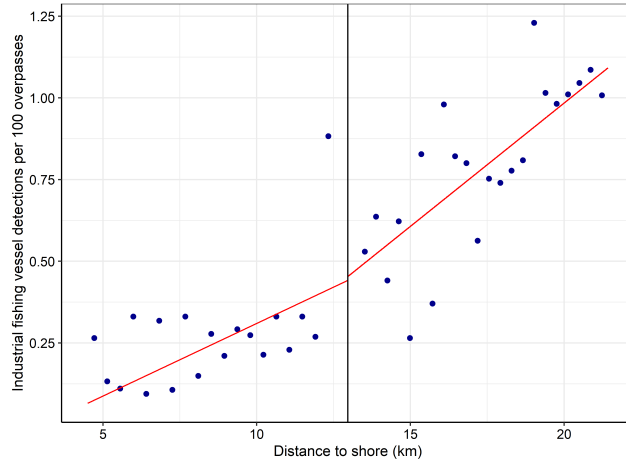


Notes: Each subfigure illustrates the estimated discontinuity in a placebo outcome variable at IEZ boundaries, pooling every 0.01° grid cell across the 21 country–boundary cross-sections. The corresponding coefficients, standard errors, p-values, and number of observations are reported in Panel A of Table B3.

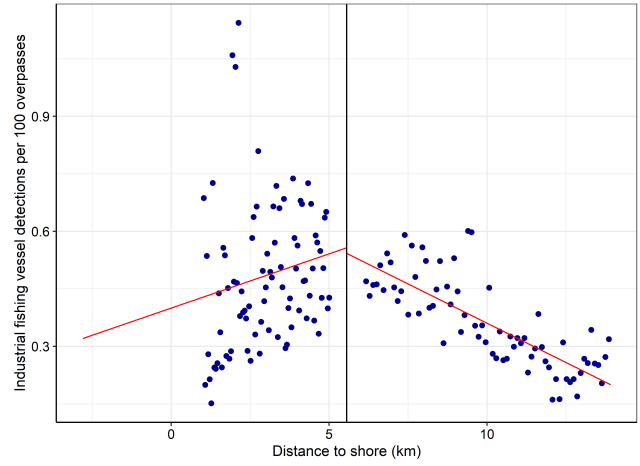
Figure B9: Industrial Fishing Vessel Presence Near Country-Boundaries Without Deterrence Effects



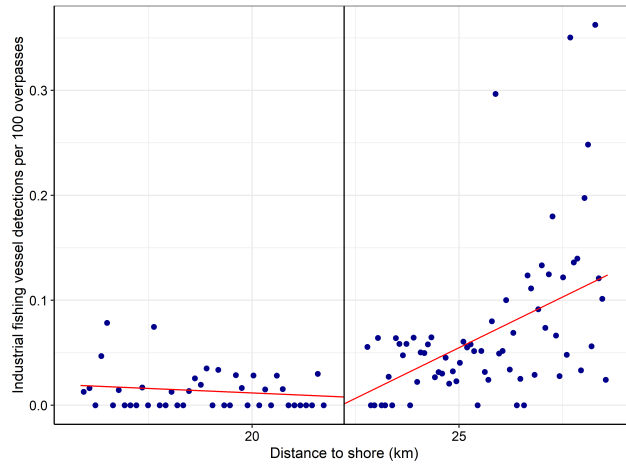
(g) Gambia



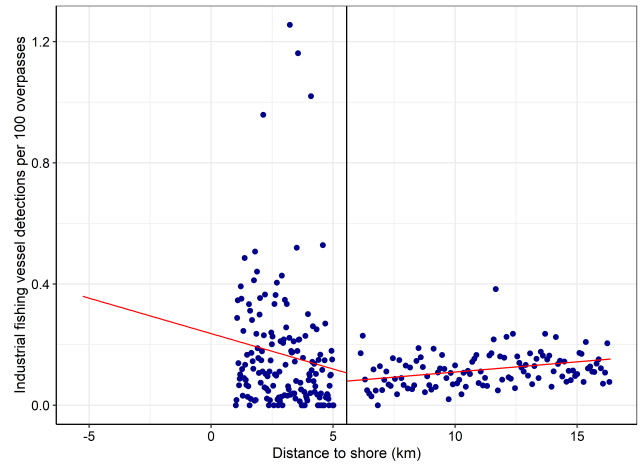
(h) Ivory Coast



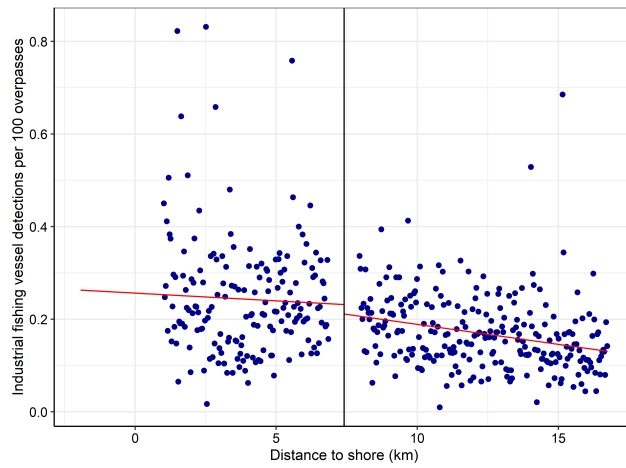
(i) Guinea-Bissau



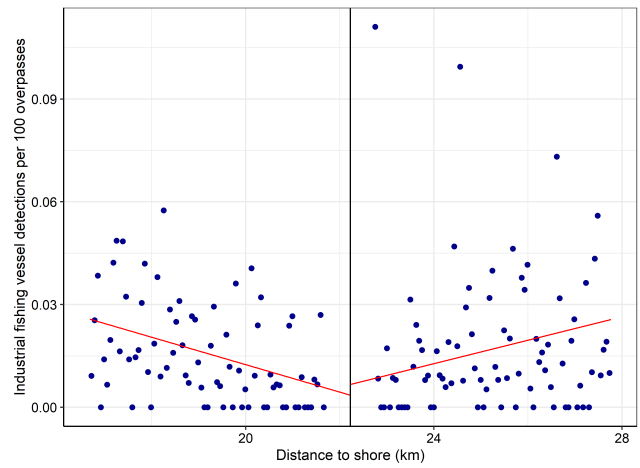
(j) Gabon

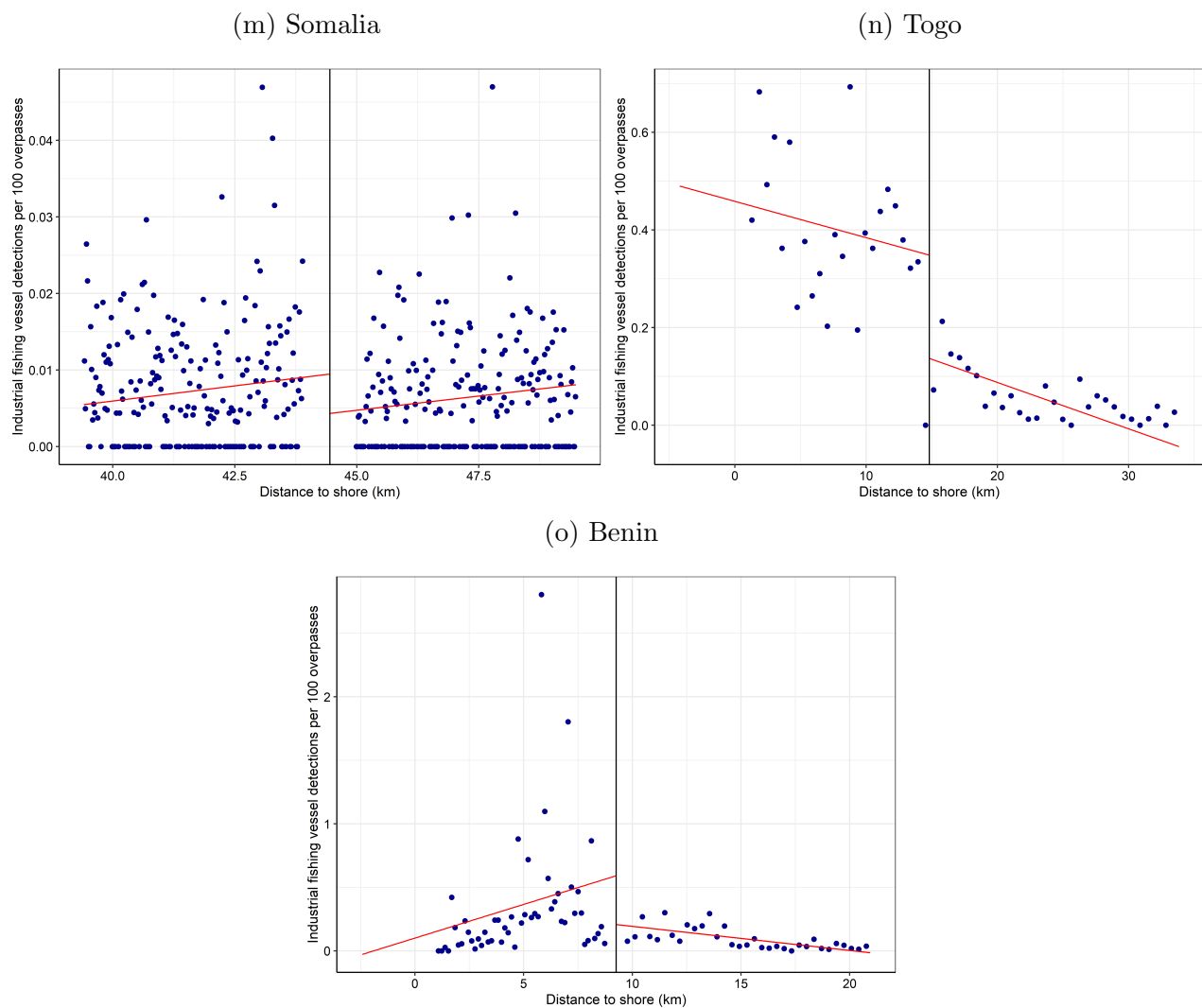


(k) Angola



(l) Eq. Guinea - 4 nm





Note: This figure presents regression discontinuity results for country-boundaries that do not have higher industrial fishing vessel presence just outside their IEZ boundary, which indicates an absence of deterrence. Subfigures reproduce the regressions corresponding to the last 15 rows of Table 2.

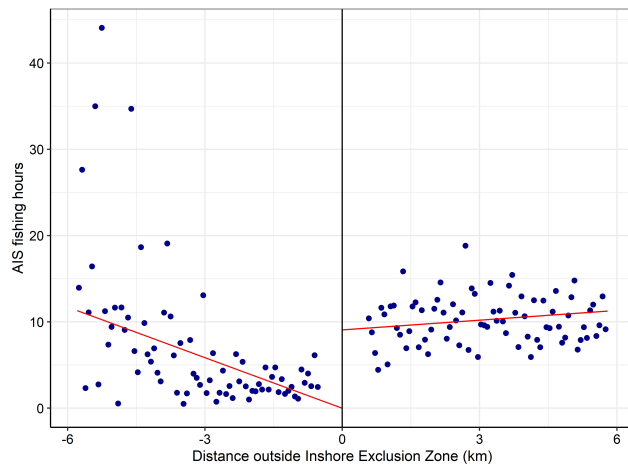
Table B4: Estimated Discontinuities in AIS Apparent Fishing Hours at IEZ Boundaries

Country-Boundary (1)	Coefficient (2)	Std. Error (3)	q-value (4)	Bandwidth (5)	N (6)
Ghana	9.079	(0.881)	0.0000	5.795	4,765
Liberia	6.428	(0.630)	0.0000	5.378	4,365
Nigeria	31.425	(3.362)	0.0000	7.458	8,913
Republic of Congo	1.761	(0.345)	0.0000	6.751	1,604
Sierra Leone	1.184	(0.264)	0.0000	6.901	3,701
Eq. Guinea - 12 nm	0.189	(0.073)	0.0170	5.112	4,939
Mauritania	4.476	(1.859)	0.0241	8.838	9,754
Gabon	1.992	(0.931)	0.0378	6.613	6,831
Madagascar	0.210	(0.098)	0.0378	4.487	29,374
Cameroon	291.809	(146.746)	0.0491	1.196	408
Guinea	2.465	(1.434)	0.0817	12.643	6,688
Ivory Coast	0.738	(0.541)	0.1512	9.505	5,403
Cape Verde	0.015	(0.018)	0.3296	6.705	10,547
Benin	0.021	(0.036)	0.4155	15.266	2,208
Angola	-0.580	(0.497)	1.0000	5.130	12,044
Somalia	-0.014	(0.010)	1.0000	9.116	41,988
Mozambique	-0.623	(0.369)	1.0000	5.548	24,339
Togo	-11.722	(6.394)	1.0000	10.389	813
Gambia	-4.928	(1.625)	1.0000	8.360	1,031
Eq. Guinea - 4 nm	-0.807	(0.220)	1.0000	8.961	6,595
Guinea-Bissau	-2.468	(0.393)	1.0000	7.106	3,872

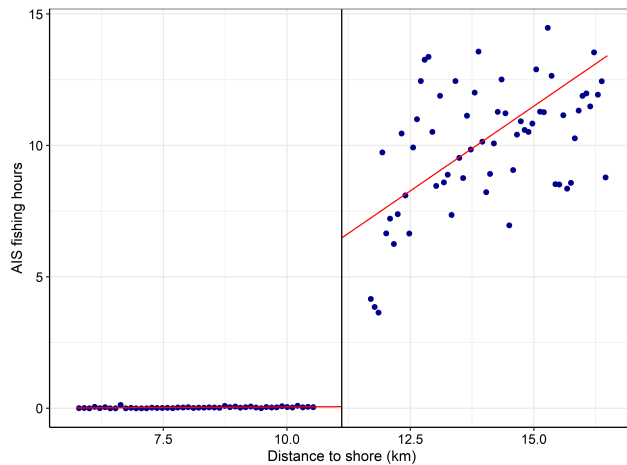
Notes: This table presents the results from testing which country-boundaries have higher AIS fishing hours just outside their IEZ boundary. Each row presents a separate regression result, with Column 1 indicating the data used. Columns 2 to 6 report the point estimate, standard error, q-value, optimal bandwidth in km, and number of observations within that bandwidth.

Figure B10: Discontinuities in AIS Apparent Fishing Hours

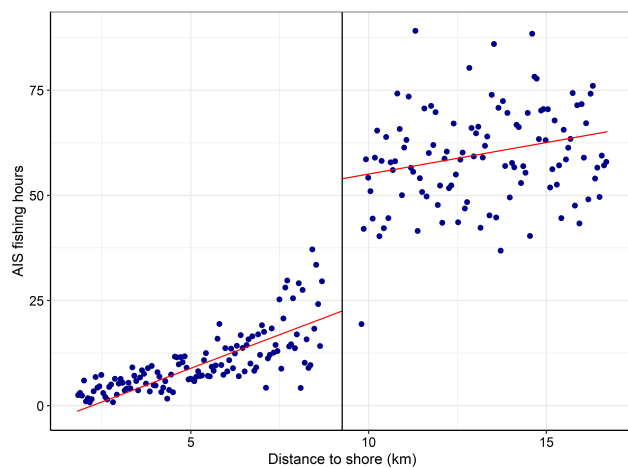
(a) Ghana



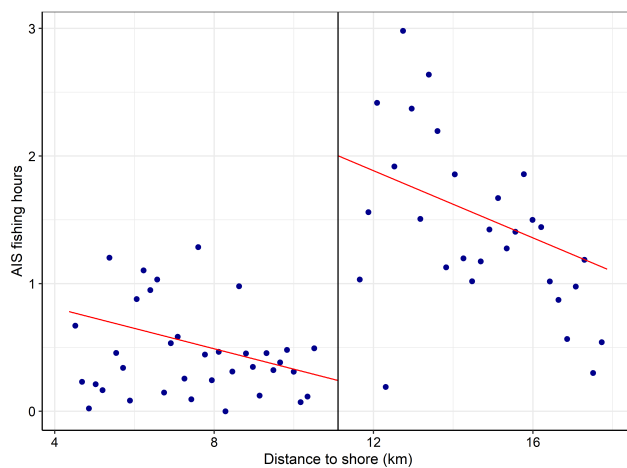
(b) Liberia



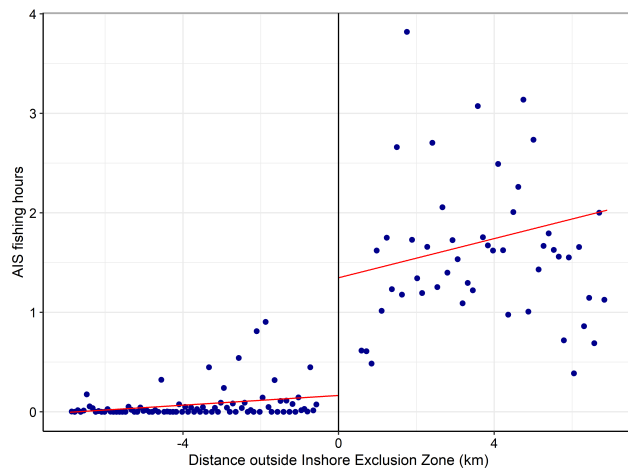
(c) Nigeria



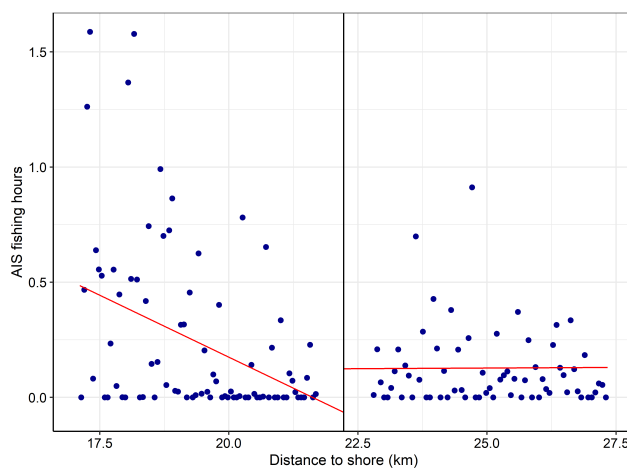
(d) Republic of Congo



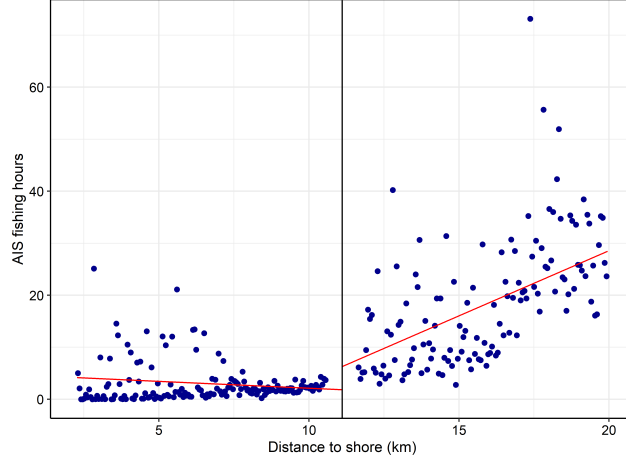
(e) Sierra Leone



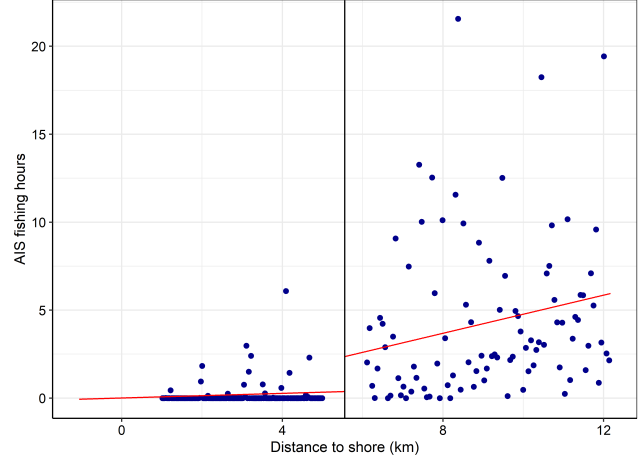
(f) Equatorial Guinea - 12 nm



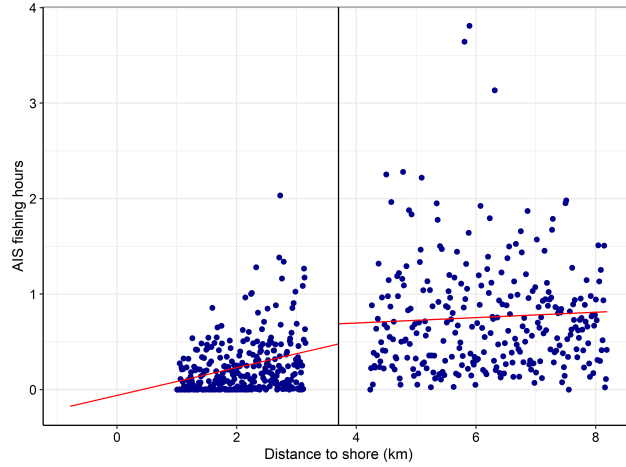
(g) Mauritania



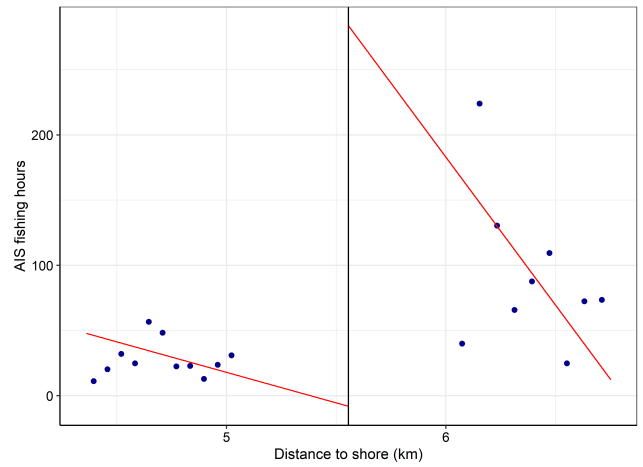
(h) Gabon



(i) Madagascar

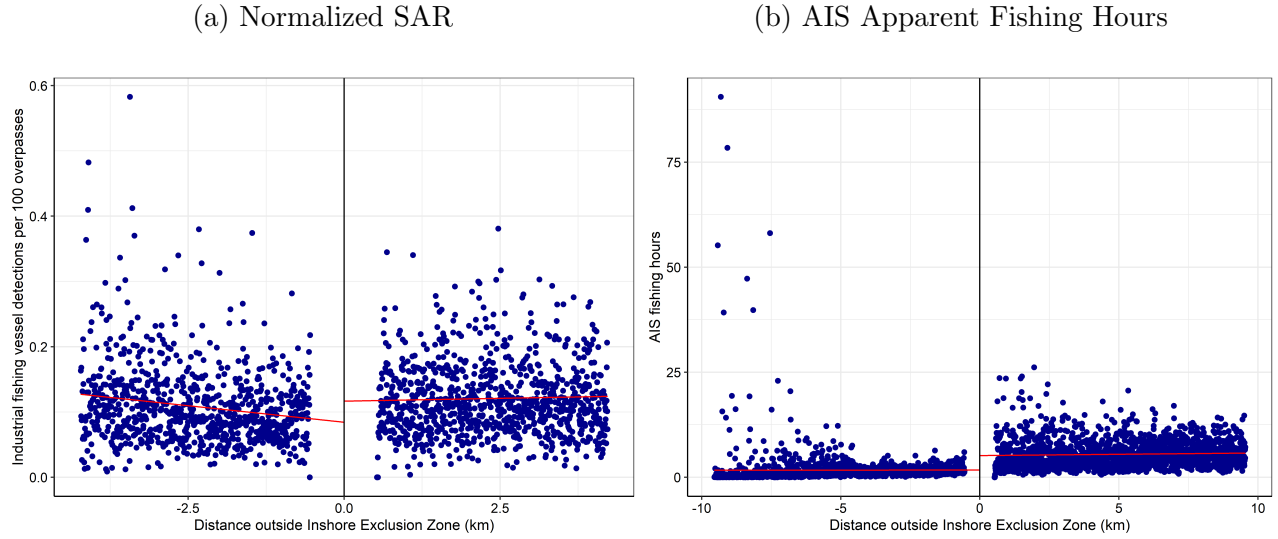


(j) Cameroon



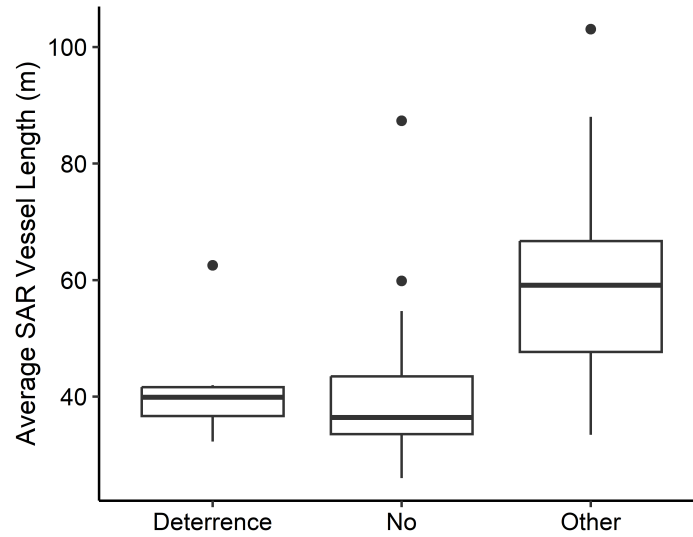
Note: This figure presents regression discontinuity results for country-boundaries with higher AIS fishing hours just outside their IEZ boundary. Subfigures reproduce the regressions corresponding to the first 10 rows of Table B4.

Figure B11: Pooled Fishing RD Estimates



Notes: This figure presents pooled regression discontinuity results for the two fishing outcome variables. Each subfigure illustrates the estimated discontinuity at IEZ boundaries, pooling every 0.01° grid cell across the 21 country–boundary cross-sections. The corresponding coefficients, standard errors, p-values, and number of observations are reported in Panel B of Table B3.

Figure B12: Average Length of Industrial Fishing Vessels by Country Group



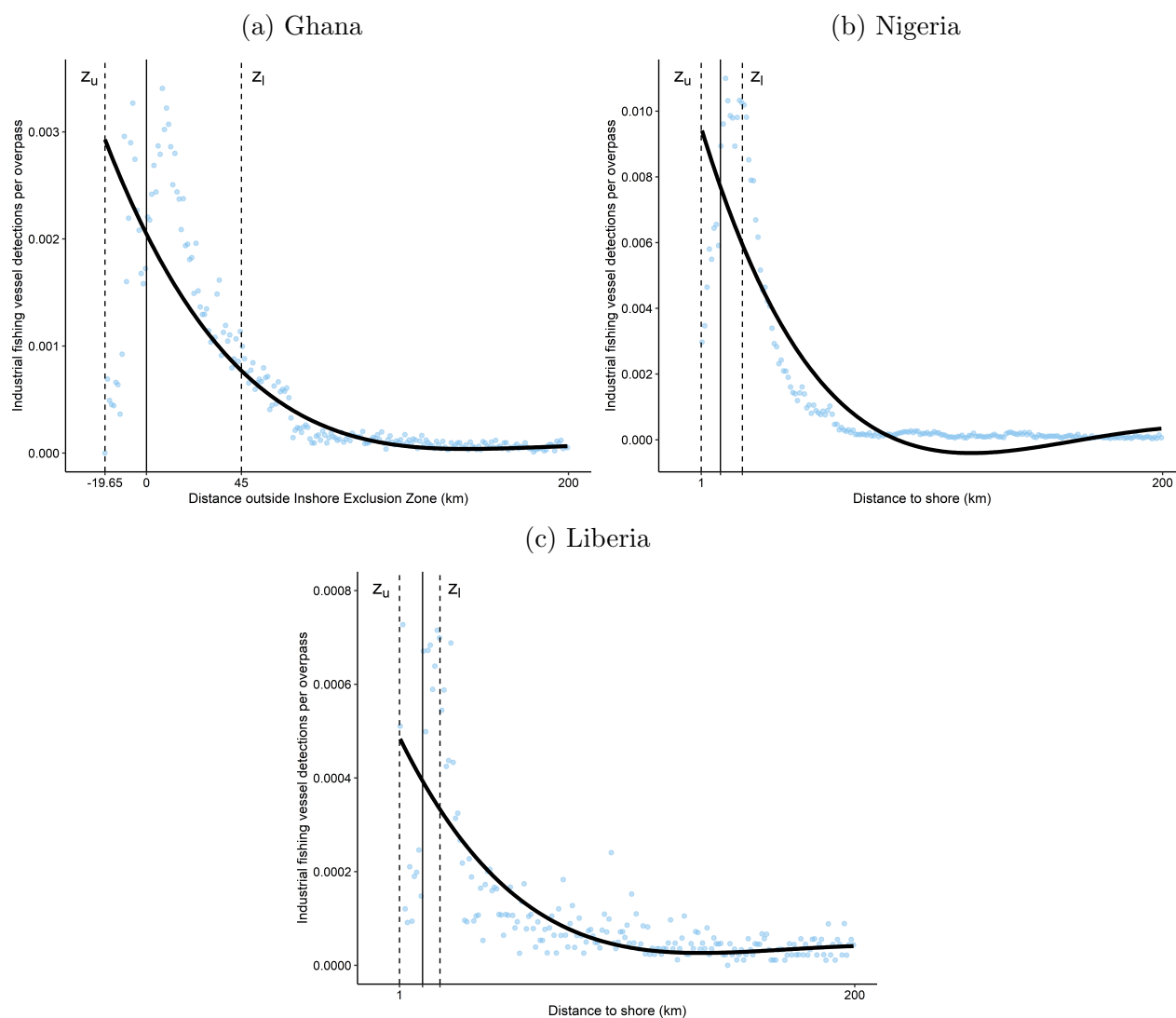
Notes: This figure provides evidence against the hypothesis that deterring industrial fishing vessels from IEZs shifts the fleet composition toward larger vessels. Boxplots display the average length of SAR-detected industrial fishing vessels within each country’s EEZ. “Deterrence” countries are Nigeria, Sierra Leone, Liberia, Mauritania, Ghana, and Guinea. The 14 other countries in our estimation sample comprise the “No” category. “Other” contains the remaining Sub-Saharan African coastal countries: Comoros, Democratic Republic of the Congo, Djibouti, Eritrea, Kenya, Namibia, São Tomé and Príncipe, Senegal, Seychelles, South Africa, and Tanzania.

Table B5: Estimated Discontinuity in Industrial Fishing Vessel Presence at Ghana’s IEZ Boundary, Different Bandwidth Selectors

Bandwidth Selector (1)	Coefficient (2)	Std. Error (3)	Bandwidth (4)	N (5)
mserd	0.085	(0.029)	[5.984, 5.984]	4,936
msetwo	0.187	(0.020)	[6.667, 35.831]	18,823
msesum	0.080	(0.030)	[5.680, 5.680]	4,668
msecomb1	0.080	(0.030)	[5.680, 5.680]	4,668
msecomb2	0.085	(0.029)	[5.984, 5.984]	4,936
cerrd	0.030	(0.046)	[3.263, 3.263]	2,484
certwo	0.108	(0.030)	[3.636, 19.542]	10,016
cersum	0.027	(0.049)	[3.098, 3.098]	2,315
cercomb1	0.027	(0.049)	[3.098, 3.098]	2,315
cercomb2	0.030	(0.046)	[3.263, 3.263]	2,484

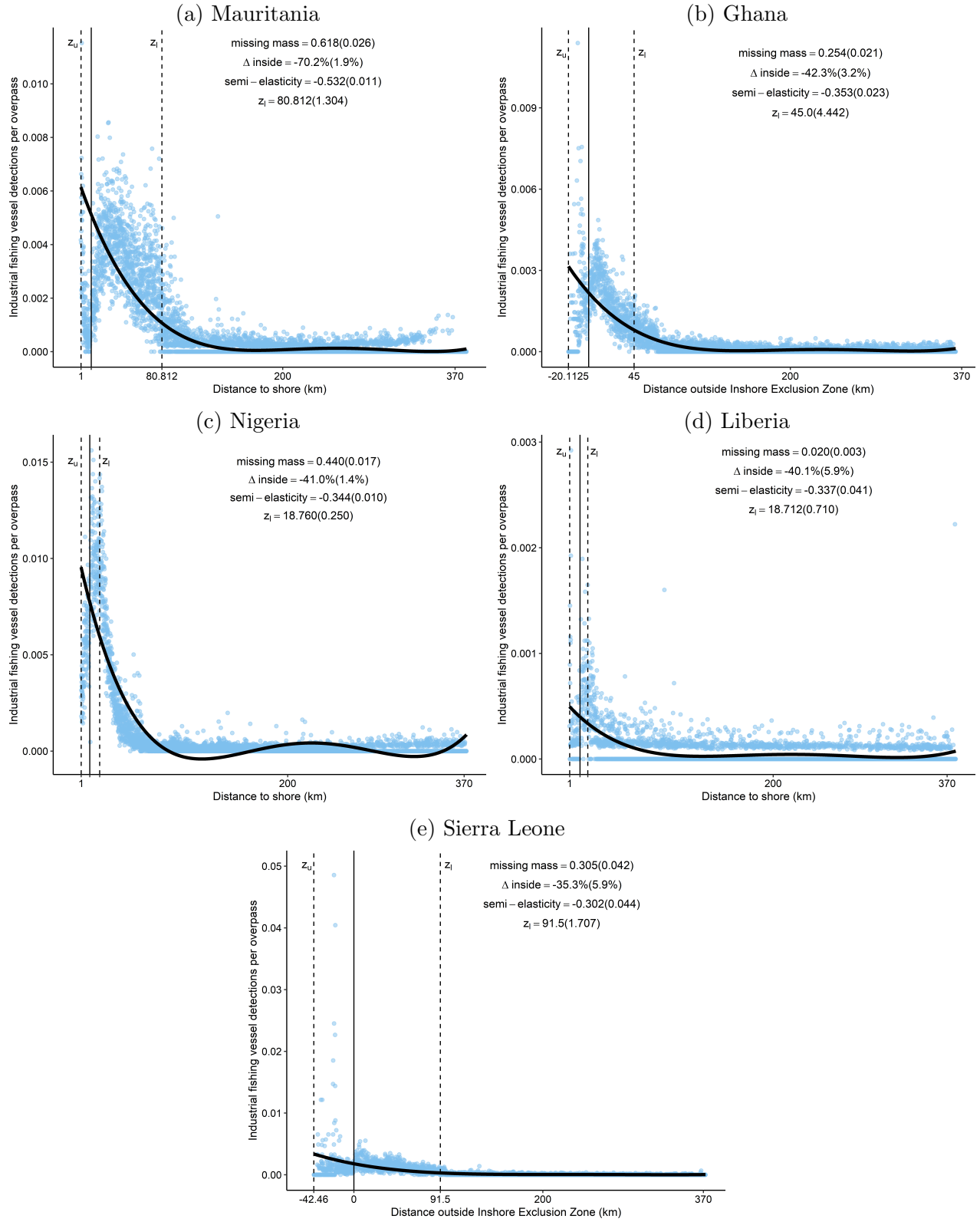
Notes: This table presents regression discontinuity results of re-estimating Equation 1 for Ghana using each of the ten possible bandwidth selectors in the rdrobust package. Each row presents a separate regression result, with Column 1 indicating the bandwidth selector used. Columns 2 to 5 report the point estimate, standard error, the bandwidth in km on each side of the IEZ boundary, and the number of observations within that bandwidth. The first row reproduces our primary specification (Section 4.1) The other bandwidth selectors are: msetwo uses two different MSE-optimal bandwidth selectors (below and above the boundary), msesum uses a mean-squared error (MSE) optimal bandwidth selector for the sum of regression estimates, msecomb1 selects the minimum value between mserd (the default option) and msesum, msecomb2 selects the median value between msetwo, mserd, and msesum for each side of the boundary separately, cerrd uses a coverage-error-rate (CER)-optimal bandwidth selector, certwo uses two different CER-optimal bandwidth selectors (below and above the boundary), cersum uses a CER-optimal bandwidth selector for the sum of regression estimates, cercomb1 selects the minimum value between cerrd and cersum, and cercomb2 selects the median value between certwo, cerrd, and cersum for each side of the boundary separately.

Figure B13: Bunching Countries with Intermediate Percent Reductions Inside IEZs



Notes: This figure presents the bunching results for the countries with intermediate effects. 1 km wide binned data (blue dots) and 200 km x-axis range displayed for easier visualization of fourth-order polynomial fit (black curve) outside the manipulation zone. The two dashed vertical lines mark the manipulation zone boundaries and the solid vertical line indicates the IEZ boundary.

Figure B14: Bunching Results with RD-Optimal Bin Widths



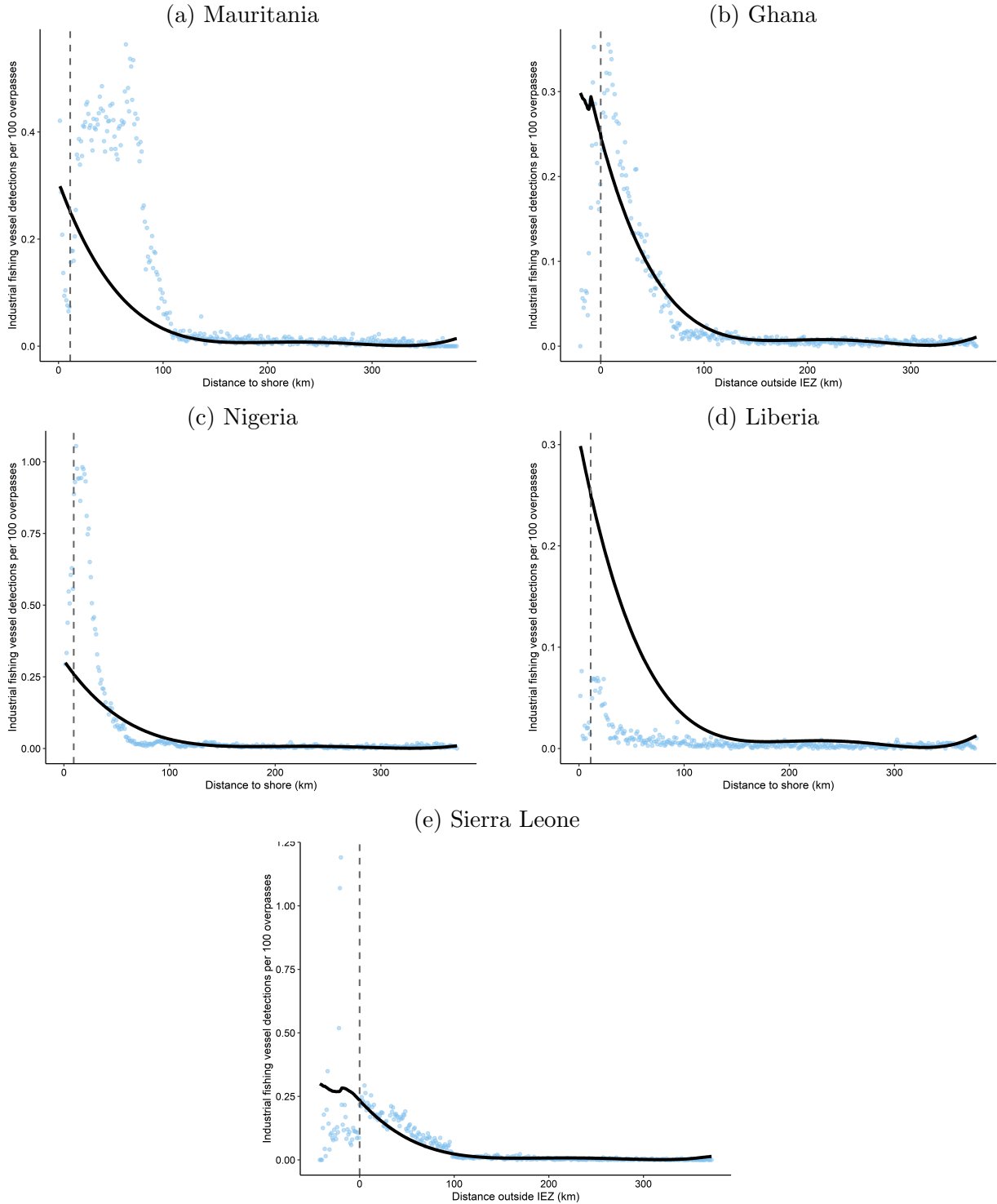
Notes: These figures correspond to the numeric estimates displayed in Table 3. They use a fourth-order global polynomial and RD-optimal bin widths.

Table B6: Bunching Results with Third-Order Polynomial

Country (1)	Missing Mass (2)	Percent Change (3)	Semi-Elasticity (4)	Outer Width (km) (5)
Mauritania	0.489 (0.022)	-65.1% (2.2%)	-0.501 (0.014)	59.3 (0.88)
Ghana	0.190 (0.018)	-35.4% (3.4%)	-0.303 (0.026)	17.4 (1.12)
Liberia	0.013 (0.003)	-30.1% (7.0%)	-0.263 (0.053)	4.5 (0.82)
Sierra Leone	0.211 (0.036)	-27.4% (6.0%)	-0.242 (0.047)	74.1 (5.23)
Nigeria	0.231 (0.015)	-26.8% (1.8%)	-0.237 (0.014)	4.4 (0.29)

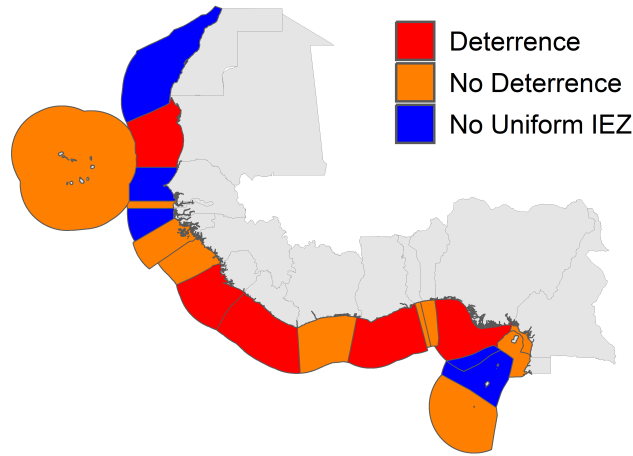
Notes: This table presents the results of a robustness check using a third-order global polynomial. These estimates use the same RD-optimal bin widths as in our primary specification. Semi-elasticities in Column 4 equal $-\log(1 - \text{Percent Change})$. Column 5 is the estimated width of the zone of manipulation outside the IEZ ($z_l - z^*$). Standard errors (bootstrapped for Columns 2, 3, and 5; delta method for Column 4) appear in parentheses.

Figure B15: Counterfactual Estimated from Bordering Countries



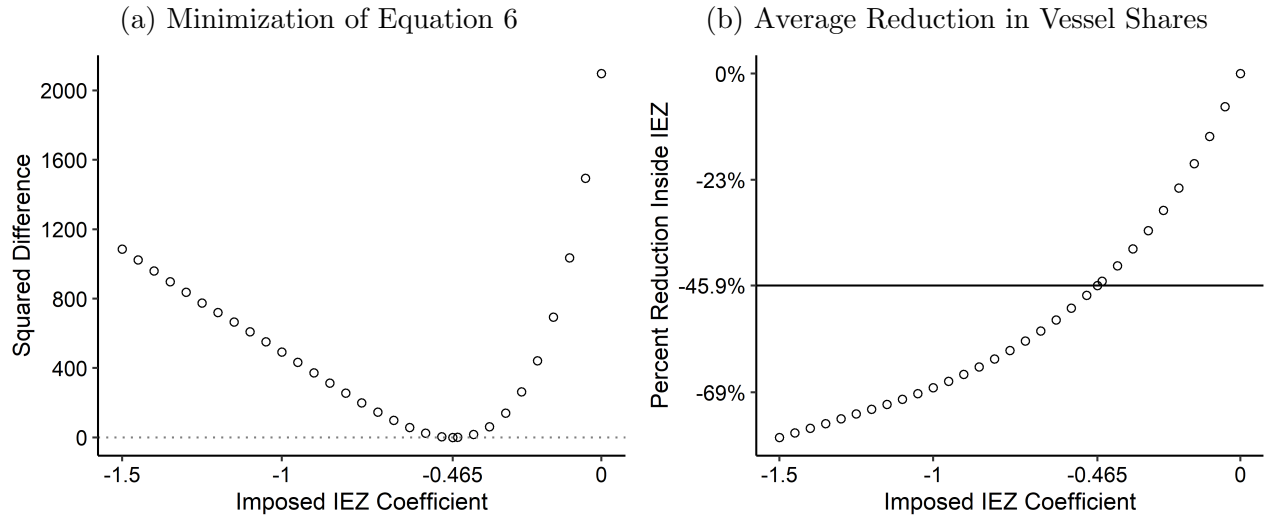
Notes: This figure presents the results of predicting counterfactual industrial fishing vessel presence from a fourth-order polynomial in distance to shore estimated on all 0.01° grid cells within the EEZs of the bordering countries. Blue dots and black lines show observed and counterfactual vessel presence, respectively, aggregated into 1 km wide bins. The dashed vertical lines mark the IEZ boundaries. The counterfactual does not appear as a fourth-order polynomial for Ghana and Sierra Leone because their IEZ boundaries do not correspond to a fixed distance from the coast.

Figure B16: Upper Nest EEZs in the Choice Model



Notes: This figure depicts the EEZs available in the choice set, defined as a one country buffer around the countries with deterrence and bunching effects (red). Orange EEZs belong to countries in our estimation sample that lack deterrence or bunching effects (Cape Verde, Guinea, Gambia, Guinea-Bissau, Ivory Coast, Togo, Benin, Equatorial Guinea, and Cameroon). The southernmost polygon is part of the EEZ of Equatorial Guinea. Blue EEZs belong to Western Sahara, Senegal, and São Tomé and Príncipe, who do not have uniform IEZs (those that prohibit all industrial fishing).

Figure B17: Calibration of the IEZ Disutility Parameter β_1



Notes: This figure presents the results of our calibration of the IEZ disutility parameter. The (a) squared difference minimized in Equation 6 and (b) model-predicted average reduction in vessel shares inside IEZs. The solid horizontal line in (b) indicates the model-predicted average reduction (45.9%) at the minimizing value of β_1 (-0.465).

Table B7: Observed and Model-Predicted Vessel Location Shares

	Observed (1)	Status Quo (2)
Inside IEZ	0.2676	0.2548 (0.00166)
Zone of Manipulation	0.4846	0.4835 (0.00167)
Rest of EEZ	0.0284	0.0337 (0.00024)
Total EEZ	0.7806	0.7720 (0.00119)
Rest of Market	0.2194	0.2280 (0.00119)
N	249,244	249,244
Pseudo R ²	0.2215	

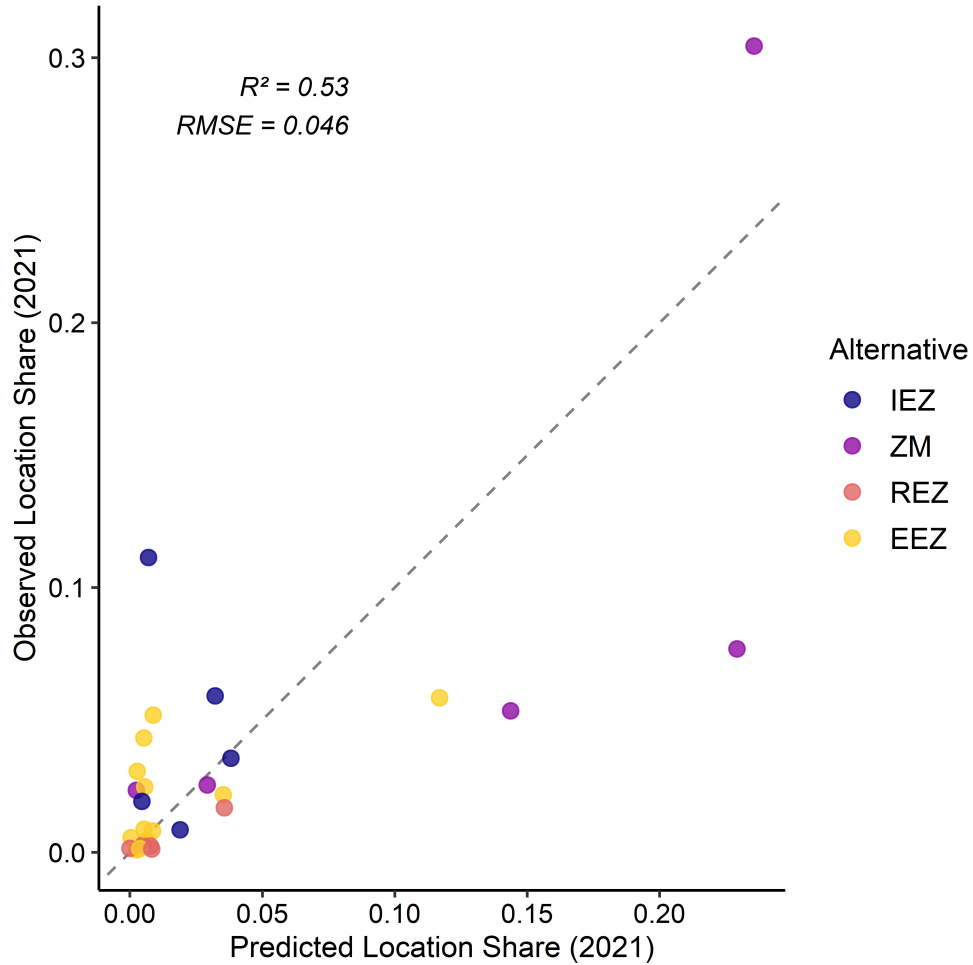
Notes: This table demonstrates the fit between observed data and the discrete choice model when vessel location shares are aggregated at the alternative level. Row values represent the sum of shares across alternatives as follows: Inside IEZ (five IEZ alternatives), Zone of Manipulation (five outside IEZ manipulation zone alternatives), Rest of EEZ (five remainder of EEZ alternatives), Total EEZ (all alternatives within the five countries' EEZs), and Rest of Market (all other countries' EEZs in the choice set). Standard errors (in parentheses) are heteroskedasticity-robust and calculated using a parametric bootstrap, where we draw 1,000 times from the estimated distribution of model parameters and recalculate predicted shares.

Table B8: Nested Logit Coefficients

	(1)	(2)
1{IEZ}	-0.43536 (0.01092)	-0.465
log(biomass)	0.46677 (0.00697)	0.45929 (0.00547)
log(price)	0.57493 (0.03847)	0.51120 (0.02817)
log(area)	-0.17660 (0.00668)	-0.17826 (0.00661)
Fraction pelagic	-0.99696 (0.05552)	-1.02298 (0.05561)
log(km to port)	0.78103 (0.02183)	0.77475 (0.02199)
Vessel length $\times$ log(km to port)	-0.00003 (0.00021)	-0.00005 (0.00021)
Sea surface temperature, average	-0.23989 (0.00304)	-0.23754 (0.00301)
Sea surface temperature, sd	-1.05688 (0.03097)	-1.06958 (0.03016)
Chlorophyll, average	-0.17106 (0.00853)	-0.16579 (0.00851)
Chlorophyll, sd	0.39569 (0.01268)	0.39839 (0.01256)
Depth, average	0.00060 (0.00001)	0.00059 (0.00001)
Depth, sd	0.00016 (0.00002)	0.00015 (0.00002)
Nest parameters		
Mauritania	0.35316 (0.07364)	0.35510 (0.07293)
Ghana	1	1
Nigeria	0.53826 (0.08932)	0.55302 (0.07614)
Liberia	0.52868 (0.10124)	0.52639 (0.10024)
Sierra Leone	0.74316 (0.11389)	0.74550 (0.11450)
N	249,244	249,244
Pseudo R ²	0.22153	0.22151

Notes: This table shows freely estimated nested logit parameters in Column 1 and parameters with β_1 calibrated to match our bunching moment in Column 2. Ghana's nest parameter is fixed to 1 to avoid a singular covariance matrix, while all other nest parameters are freely estimated. Standard errors (in parentheses) are heteroskedasticity-robust.

Figure B18: Out-of-Sample Fit: Predicted vs. Observed Location Shares



Notes: This figure assesses the out-of-sample fit of our discrete choice model by temporally splitting the data. Each dot represents one of the 27 alternatives in the choice set. The y -axis plots the observed share of vessel detections in each alternative in 2021; the x -axis plots the share predicted by the model estimated on 2017–2020 data. Colors indicate alternative type: IEZ denotes the five IEZ alternatives, ZM denotes the five manipulation zone alternatives outside the IEZ, REZ denotes the five remainder of EEZ alternatives, and EEZ denotes the undivided (entire) EEZs of bordering countries. The dashed line is the 45-degree line.

Table B9: EEZ-Level Industrial Fishing Vessel Location Shares: Effect of Each Country's IEZ When Including Congestion as an Additional Covariate

	Observed (1)	Status Quo (2)	Counterfactual (3)	Percent Difference (4)
Mauritania	0.1366	0.1432 (0.00123)	0.1676 (0.00162)	-14.5366% (0.17114%)
Ghana	0.1127	0.0901 (0.00080)	0.1119 (0.00105)	-19.5018% (0.09629%)
Nigeria	0.4347	0.4357 (0.00185)	0.4725 (0.00201)	-7.8068% (0.07526%)
Liberia	0.0263	0.0386 (0.00086)	0.0451 (0.00100)	-14.5203% (0.26752%)
Sierra Leone	0.0703	0.0649 (0.00083)	0.0813 (0.00102)	-20.1049% (0.14263%)

Notes: This table presents the results of a discrete choice robustness check. We add as a covariate the log number of other vessels choosing each alternative, while retaining all other aspects of our primary specification. Rows displays values at the EEZ-level for the five countries with bunching and deterrence effects. Column 1 values are the observed data and Column 2 are the model-predicted status quo values. Column 3 displays counterfactual vessel location shares from dissolving the IEZ of the country indicated in the row label, while holding the IEZs of the other four countries fixed; each row of Column 3 thus represents a different counterfactual simulation. Column 4 values are the percentage differences between Columns 2 and 3, indicating the effect of the country's IEZ on EEZ-level industrial fishing vessel presence.

C Biological Calculations Appendix

Let $E_{i,n}$ denote observed industrial fishing effort, which we measure as industrial fishing vessel presence inside the EEZ of country n . Let $E_{a,n}$ denote observed artisanal fishing effort, which we take from Rousseau et al. (2024) as kilowatts of engine power multiplied by days at sea, summed over artisanal vessels to the EEZ level. Fish biomass inside the EEZ is X_n (tons of fish summed over species). This approach treats each country's fish stocks as a single aggregated stock.

The change in biomass over time equals the Pella-Tomlinson growth function minus industrial catch minus artisanal catch:

$$\frac{dX_n}{dt} = \frac{\phi + 1}{\phi} g_n X_n \left[1 - \left(\frac{X_n}{\kappa_n} \right)^\phi \right] - \lambda_{i,n} E_{i,n} X_n - \lambda_{a,n} E_{a,n} X_n,$$

where g_n is the intrinsic growth rate, κ_n is the carrying capacity, $\phi = 0.188$ is the shape parameter (Thorson, Cope, Branch, & Jensen, 2012), and $\lambda_{i,n}, \lambda_{a,n}$ are sector-specific catchability coefficients. Setting $\frac{dX_n}{dt} = 0$ gives the status quo equilibrium:

$$(C1) \quad 0 = \frac{\phi + 1}{\phi} g_n X_n \left[1 - \left(\frac{X_n}{\kappa_n} \right)^\phi \right] - \lambda_{i,n} E_{i,n} X_n - \lambda_{a,n} E_{a,n} X_n.$$

Biomass estimates are not available for every fish stock. To scale up biomass estimates to include all of a country's fish stocks, we calculate a normalized ratio (X/X_{MSY}) that can be applied to unassessed species. We use stock assessments from our sample period of 2017 to 2021 to calculate status quo biomass levels. For Ghana and Mauritania, we compute averages over the 2017 and 2019 Nansen surveys (EAF-Nansen Programme, 2019; Ministry of Fisheries and Aquaculture Development, 2022). These research vessel surveys are conducted by Norway's Institute of Marine Research in collaboration with African scientists. Sierra Leone's data come from the 2019 Nansen survey (Ministry of Fisheries and Marine Resources,

2020), while Liberia’s data are from the 2017 survey (Jueseah, 2021). We could not obtain stock assessments for Nigeria, so we assign Nigeria the κ -weighted mean X/X_{MSY} ratio of the four assessed countries. This value is 0.313, indicating fish stocks that are depleted below the levels that would occur from fishing at maximum sustainable yield (X_{MSY}).

Under Pella-Tomlinson growth, $X_{\text{MSY}} = 0.4\kappa_n$, so we convert each survey biomass to $X/X_{\text{MSY}} = X_n/(0.4\kappa_n)$ using species- and country-level g and κ values from Costello et al. (2016). Country-level biomass-to-carrying-capacity ratios are calculated as κ -weighted averages across assessed species within each country. For countries with multiple species or multiple years of data, we weight by carrying capacity when aggregating to obtain a single X/X_{MSY} ratio per country.

Using the X/X_{MSY} ratios derived from stock assessments, we determine the total carrying capacity κ_n for each country by rearranging the equilibrium condition in Equation (C1). With this comprehensive carrying capacity estimate that accounts for all stocks, we then solve for the equilibrium biomass X_n numerically using the bisection method on the interval $0-0.4\kappa_n$. This interval assumes each country’s aggregated fish stock is at or below maximum sustainable yield levels (X_{MSY}), consistent with FAO data indicating that 85% of West African fish stocks are overfished or fully exploited (Box 28 of FAO (2024)). We use data on industrial and artisanal catch inside each country’s EEZ in 2017 from Sea Around Us (Belhabib, Baio, et al., 2020; Kane et al., 2020; Polido, Noël, & Amador, 2020). Sea Around Us catch data contain more stocks than Costello et al. (2016), so using it gives a more comprehensive estimate of each country’s total carrying capacity. For species present in Sea Around Us but absent from Costello et al. (2016), we assign the κ -weighted average intrinsic growth rate from the available species within each country.

We calculate sector-specific catchability coefficients:

$$\lambda_{a,n} = \frac{C_{a,n}}{E_{a,n}X_n} \quad \text{and} \quad \lambda_{i,n} = \frac{C_{i,n}}{E_{i,n}X_n},$$

where $C_{a,n}$ (artisanal) and $C_{i,n}$ (industrial) are total catches in tons. Allowing separate λ values for the two fleets accommodates differences in production technology and differences in the measurement scales of the fishing effort proxies. This functional form assumes that industrial catch is linear in industrial fishing vessel presence.

Tildes indicate the no-IEZ counterfactual values. Holding the parameters $(g_n, \kappa_n, \phi, \lambda_{a,n}, \lambda_{i,n})$ fixed leaves three unknowns in the counterfactual equilibrium: $\tilde{X}_n$, $\tilde{E}_{i,n}$, and $\tilde{E}_{a,n}$. Using Column 4 of Table 4, we calculate $\tilde{E}_{i,n} = E_{i,n}/(1 + \text{percent difference})$. This leaves two unknowns but only one equation. To solve for $\tilde{X}_n$, we assume artisanal effort is unchanged: $\tilde{E}_{a,n} = E_{a,n}$. This assumption is necessitated by the absence of comprehensive artisanal fishing data at sufficiently high spatial resolution for estimating effects of IEZs on artisanal vessels. We solve the equilibrium condition for $\tilde{X}_n$ algebraically:

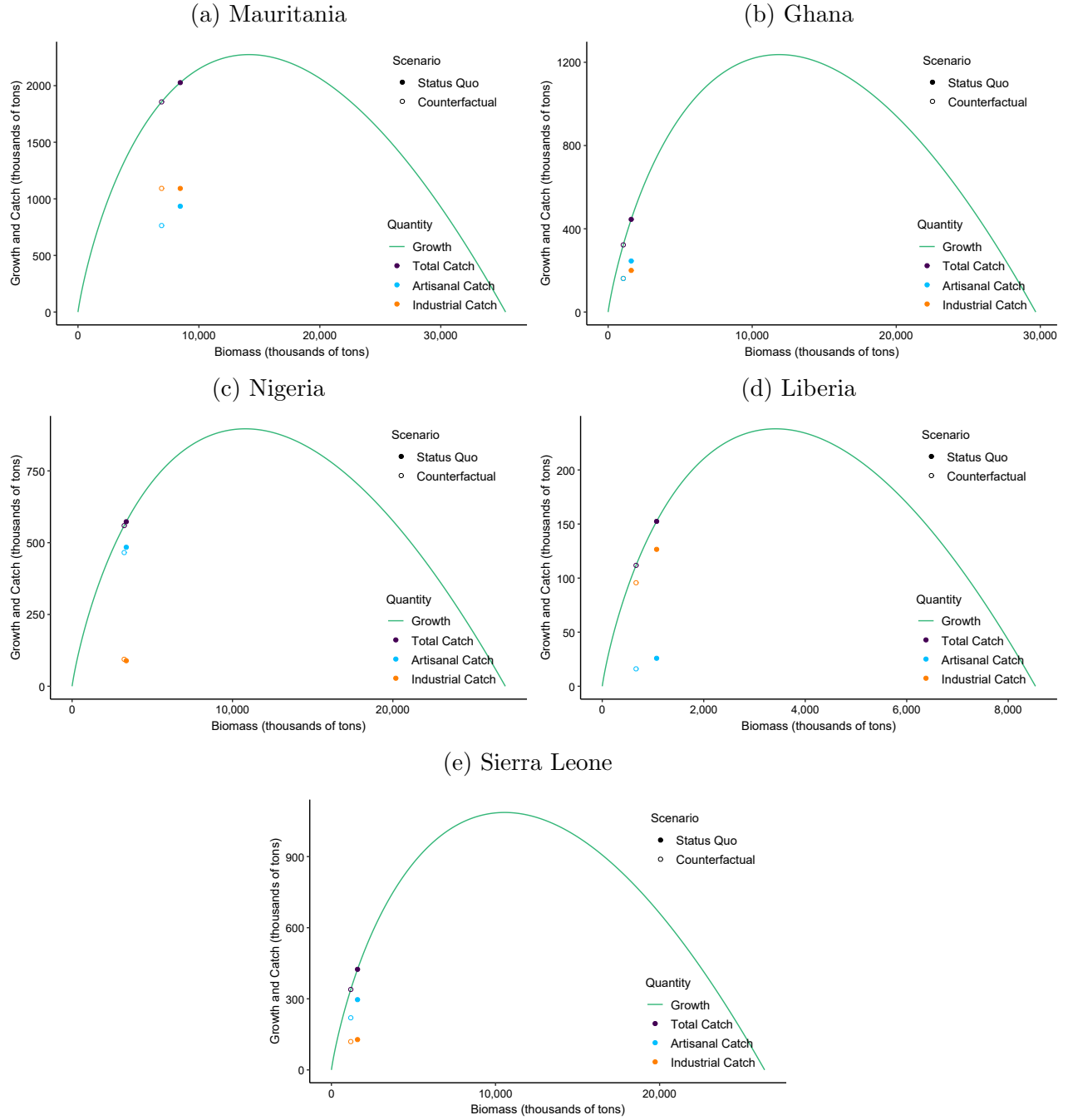
$$(C2) \quad 0 = \frac{\phi + 1}{\phi} g_n \tilde{X}_n \left[1 - \left(\frac{\tilde{X}_n}{\kappa_n} \right)^\phi \right] - \lambda_{i,n} \tilde{E}_{i,n} \tilde{X}_n - \lambda_{a,n} E_{a,n} \tilde{X}_n.$$

Counterfactual sectoral catches are then:

$$\tilde{C}_{i,n} = \lambda_{i,n} \tilde{E}_{i,n} \tilde{X}_n \quad \text{and} \quad \tilde{C}_{a,n} = \lambda_{a,n} E_{a,n} \tilde{X}_n.$$

To calculate nutritional benefits from IEZs, we use data from Basurto et al. (2025) on the percentage of six key micronutrients (calcium, iron, selenium, zinc, vitamin A, and omega-3) supplied by artisanal fisher catch from each country's EEZ. We determine what fraction of micronutrients is due to the existence of each country's IEZ by dividing the IEZ-induced gain in artisanal catch by the country's total micronutrient supply from all sources. Finally, we multiply this micronutrient fraction by each country's population to estimate the number of people whose micronutrient needs are fully met because of the existence of IEZs.

Figure C1: Status Quo and Counterfactual Biomasses and Fish Catches for the Five Countries with Deterrence and Bunching Effects



Notes: These figures illustrate the bioeconomic results displayed in Table 5. The x-axis is biomass and the y-axis is catch or growth of the stock at that level of biomass. Points indicate equilibria in the status quo (solid) and no-IEZ counterfactual (hollow) scenarios.

C.1 Biological Spillovers Robustness Check

To bring potential fish spillovers into the calculation we add one extra term to the steady-state condition for each country n :

$$(C3) \quad \frac{\phi + 1}{\phi} g_n X_n \cdot \left(1 - \left(\frac{X_n}{\kappa_n}\right)^\phi\right) + m_n \cdot (X_{SQ,n} - X_n) = \lambda_{i,n} E_{i,n} X_n + \lambda_{a,n} E_{a,n} X_n.$$

The new parameter m_n is the slope of net biological inflow when the domestic stock deviates from its status quo level $X_{SQ,n}$. When $X_n < X_{SQ,n}$ and $m_n > 0$, immigration raises the country's net biomass growth and the steady-state stock. Our baseline calculations implicitly set $m_n = 0$. We do not re-calculate the status quo values because those values are already calibrated from data that include whatever cross-boundary flows occur in practice.

Ramesh, Rising, and Oremus (2019) provides the only recent country-level estimates of biological spillover, but their analysis is restricted to larval exchange and therefore excludes the movement of juveniles and adults. We take their measure r_n —the share of each country's catch that began life in another EEZ—and convert it into a spillover slope by multiplying by the exploitation rate $u_n = \frac{C_n^{tot}}{X_{SQ,n}}$ (fraction of biomass caught each year). The product $m_n^R = r_n u_n$ tells us how many tons of extra inflow arrive for every ton by which the stock falls below its status quo level.

Because Ramesh, Rising, and Oremus (2019) focuses on larvae, we also consider a second, extreme value corresponding to highly mobile adults. Lynham and Villaseñor-Derbez (2024) find that tuna catch per unit effort is 12%-18% higher within 100 nautical miles outside nine large marine protected areas. Tuna are among the most migratory fished species, so the midpoint of their estimate, 15 percent, is a reasonable upper bound on adult spillover. Again scaling by the exploitation rate gives $m_n^L = 0.15 u_n$. Table C1 displays the spillover parameter values for each country. Table C2 displays the results from accounting for these biological spillovers alongside our baseline results.

Table C1: Parameters for Biological Spillovers Robustness Checks

	u_n	r_n	m_n^R	m_n^L
Mauritania	0.240	0.02356	0.006	0.036
Ghana	0.278	0.03155	0.009	0.042
Nigeria	0.170	0.00432	0.001	0.025
Liberia	0.142	0.01515	0.002	0.021
Sierra Leone	0.267	0.00743	0.002	0.040

Notes: This table displays the parameter values used in the biological spillover robustness checks. Appendix C.1 defines the variables indicated in the column header.

Table C2: Percent Changes in Biomass and Fish Catch from IEZs: Comparing Models With and Without Biological Spillovers

	Biomass (% Δ)			Artisanal Catch (% Δ)			Industrial Catch (% Δ)		
	None	Ramesh	Lynham	None	Ramesh	Lynham	None	Ramesh	Lynham
Mauritania	22.3	21.3	17.1	22.3	21.3	17.1	0.0	-0.9	-4.3
Ghana	52.4	43.8	28.0	52.4	43.8	28.0	23.7	16.7	3.9
Nigeria	4.0	3.9	2.8	4.0	3.9	2.8	-5.3	-5.4	-6.4
Liberia	60.8	57.0	37.7	60.8	57.0	37.7	32.3	29.1	13.3
Sierra Leone	34.8	33.5	20.0	34.8	33.5	20.0	7.0	5.9	-4.8
Total	23.3	21.9	16.1	22.1	20.7	15.1	4.6	3.1	-2.3

Notes: This table presents the results of the biological spillover robustness checks. “None” reports percent changes from the primary specification without cross-country biological spillovers. “Ramesh” incorporates spillovers calibrated from Ramesh, Rising, and Oremus (2019) and “Lynham” incorporates spillovers calibrated from Lynham and Villaseñor-Derbez (2024).

C.2 Artisanal Fisher Revenue and Ministerial Budgets

Using Sea Around Us catch data, which includes landed value (tons caught times price per ton) at the level of country-sector-taxon, we computed tons-weighted average prices for the artisanal sector in each country for 2019 (Belhabib, Baio, et al., 2020; Kane et al., 2020; Polido, Noël, & Amador, 2020). We then multiplied these prices by the additional artisanal catch that is due to each country’s IEZ. Across all five countries, this additional artisanal catch was worth \$253 million in 2019.

We were able to obtain 2019 budget data for fisheries ministries in four of the five coun-

tries. Mauritania’s Ministère des Pêches et de l’Économie Maritime had a total budget of 389,455,382 ouguiyas in 2019 (Chez Vlane, 2018). Ghana’s Ministry of Fisheries and Aquaculture Development received a total budget of 59,592,448 Ghanaian cedis in 2019 (Ministry of Fisheries and Aquaculture Development, 2020). Liberia’s National Fisheries and Aquaculture Authority budgets in Fiscal Years 2018/19 and 2019/20 were approximately 5.2 million Liberian dollars and 4.7 million Liberian dollars (Liberia National Fisheries and Aquaculture Authority, 2024). These fiscal years extended from July 1 to June 30, so we use the average of the two in order to estimate a budget of 4,950,000 Liberian dollars for calendar year 2019. Sierra Leone’s Ministry of Fisheries and Marine Resources received a total budget allocation of Le34.98 billion for the 2019 fiscal year (Keili, 2018). Converting these budgets to 2019 USD using historical exchange rates from July 2019, the combined ministerial budgets totaled \$25,486,590.

Supplemental appendix references

- Baio, A., Sei, S., & Brookfields, F. (2017). On the Development of Territorial Use Rights in the Marine Small-Scale Fisheries of Sierra Leone. <https://www.fao.org/fishery/static/tenure-user-rights/root/volume2/C23.pdf>
- Basurto, X., Gutierrez, N. L., Franz, N., Mancha-Cisneros, M. d. M., Gorelli, G., Aguión, A., Funge-Smith, S., Harper, S., Mills, D. J., Nico, G., et al. (2025). Illuminating the multidimensional contributions of small-scale fisheries. *Nature*, 637, 875–884.
- Belhabib, D., Baio, A., Camara, O., Copeland, D., Derrick, B., Doumbouya, A., Harper, S., Intchama, J., Mamie, J., Manel, J.-P., Ndiaye, D., Noël, S.-L., Pauly, D., Relano, V., Seilert, H., Seto, K., Anbar, Y., & Zeller, D. (2020). Updating to 2018 the catch reconstructions for 14 countries of the West African mainland [Data downloaded February 14, 2025]. In B. Derrick, M. Khalfallah, V. Relano, D. Zeller, & D. Pauly (Eds.), *Updating to 2018 the 1950-2010 Marine Catch Reconstructions of the Sea Around Us: Part I – Africa, Antarctica, Europe and the North Atlantic* (pp. 115–147, Vol. 28). Fisheries Centre, University of British Columbia.
- Belhabib, D., Cheung, W. W. L., Kroodsmas, D., Lam, V. W. Y., Underwood, P. J., & Virdin, J. (2020). Catching industrial fishing incursions into inshore waters of Africa from space [Data downloaded December 4, 2024]. *Fish and Fisheries*, 21(2), 379–392.
- Beye Traore, D. (2021). Les Enjeux des Zones de Pêche Artisanale en République de Guinée [Accessed April 10, 2025]. https://static1.squarespace.com/static/5d402069d36563000151fa5b/t/656ef0518f22c247cd821cb6/1701769304593/Guinee_FR_Sep_2022_Full_Report_web.pdf

- Carver, E. (2021). Madagascar’s small fishers cheer new trawl-free zone, but do trawlers obey it? [Accessed April 10, 2025]. *Mongabay*. <https://news.mongabay.com/2021/12/madagascars-small-fishers-cheer-new-trawl-free-zone-but-do-trawlers-obey-it/>
- Chez Vlane. (2018). Examen du budget du ministère des Pêches et de l’Economie Maritime [Accessed May 23, 2025]. https://www.chezvlane.com/Examen-du-budget-du-ministere-des-Peches-et-de-l-Economie-Maritime_a11519.html
- Costello, C., Ovando, D., Clavelle, T., Strauss, C. K., Hilborn, R., Melnychuk, M. C., Branch, T. A., Gaines, S. D., Szuwalski, C. S., Cabral, R. B., et al. (2016). Global fishery prospects under contrasting management regimes [Data downloaded February 6, 2025]. *Proceedings of the National Academy of Sciences*, 113(18), 5125–5129.
- EAF-Nansen Programme. (2019). Cruise Reports “Dr Fridtjof Nansen”: Survey of the Pelagic Fish Stocks and Ecosystem off Northwest Africa. Leg 4.2: Mauritania, 9–20 October 2019 [Accessed May 19, 2025]. https://fisheryprogress.org/sites/default/files/documents/actions/Evidence%20-%20-%20Summary%20of%20results%20Acoustic%20Survey%20August%20C%202019%20DR%20FRIDTJOF%20NANSEN_3.pdf
- FAO. (2024). The State of World Fisheries and Aquaculture 2024: Blue Transformation in Action [Rome. <https://doi.org/10.4060/cd0683en>].
- Flanders Marine Institute. (2023). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), Version 12 [Downloaded August 20, 2024]. <https://doi.org/10.14284/632>
- Jueseah, A. S. (2021). A critical review of the Liberian fisheries sector: A technical report [Department of Economics, School of Social Sciences, University of Iceland. Accessed May 19, 2025].
- Kane, E., Beibou, E., Dia, M., Belhabib, D., & Page, E. (2020). Mauritania: Updated catch reconstruction for 2011–2018 [Data downloaded February 14, 2025]. In B. Derrick, M. Khalfallah, V. Relano, D. Zeller, & D. Pauly (Eds.), *Updating to 2018 the 1950–2010 Marine Catch Reconstructions of the Sea Around Us: Part I – Africa, Antarctica, Europe and the North Atlantic* (pp. 60–64, Vol. 28). Fisheries Centre, University of British Columbia.
- Keili, A. (2018). Sierra Leone’s finance minister’s balancing act on a trapeze – the 2019 budget [Accessed May 23, 2025]. <https://www.thesierraleonetelegraph.com/sierra-leones-finance-ministers-balancing-act-on-a-trapeze-the-2019-budget/>
- Liberia National Fisheries and Aquaculture Authority. (2024). National Fisheries and Aquaculture Authority (NaFAA) Revenue Analysis and Trend from 2018/2019 to 2024 Fiscal Year [Received by email from NaFAA on May 28, 2025].
- Lynham, J., & Villaseñor-Derbez, J. C. (2024). Evidence of spillover benefits from large-scale marine protected areas to purse seine fisheries. *Science*, 386(6727), 1276–1281.
- Ministry of Fisheries and Aquaculture Development. (2020). Medium Term Expenditure Framework (MTEF) for 2020-2023: Programme Based Budget Estimates for 2020 [Accessed May 23, 2025]. <https://www.mofep.gov.gh/sites/default/files/pbb-estimates/2020/2020-PBB-MOFAD.pdf>
- Ministry of Fisheries and Aquaculture Development. (2022). Fisheries Management Plan of Ghana (2022–2026) [Accessed May 19, 2025]. <https://chinaglobalsouth.com/wp-content/uploads/2015/05/FINAL-DRAFT-2022-2026-MFMP-MFMD-28-APR.pdf>

- Ministry of Fisheries and Marine Resources. (2020). Fisheries Management Plan of Sierra Leone (2020-2025) [Accessed May 19, 2025]. <https://faolex.fao.org/docs/pdf/sie214135.pdf>
- Philippe, J. (2023). The role of artisanal fishing “exclusive” zones in preferential access to resources [Accessed April 8, 2025]. *Coalition for Fair Fisheries Arrangements*. <https://www.cffacape.org/publications-blog/preferential-access-ssf-artisanal-fishing-zone>
- Polido, R., Noël, S.-L., & Amador, K. (2020). Ghana: Updated catch reconstruction for 2011–2018 [Data downloaded February 14, 2025]. In B. Derrick, M. Khalfallah, V. Relano, D. Zeller, & D. Pauly (Eds.), *Updating to 2018 the 1950–2010 Marine Catch Reconstructions of the Sea Around Us: Part I – Africa, Antarctica, Europe and the North Atlantic* (pp. 40–45, Vol. 28). Fisheries Centre, University of British Columbia.
- Ramesh, N., Rising, J. A., & Oremus, K. L. (2019). The small world of global marine fisheries: The cross-boundary consequences of larval dispersal. *Science*, *364*(6446), 1192–1196.
- Republic of Ghana. (2002). Fisheries Act, 2002 (Act 625) [Accessed April 9, 2025]. <https://faolex.fao.org/docs/pdf/gha34737.pdf>
- República de Guinea Ecuatorial. (2017). Ley Núm. 11/2017, de fecha 20 de noviembre, Reguladora de la Actividad Pesquera y Acuícola en la República de Guinea Ecuatorial [Accessed April 9, 2025]. <https://www.fao.org/faolex/results/details/en/c/LEX-FAOC199295/>
- République du Sénégal. (2015). Décret portant application de la loi n° 2015-18 du 13 juillet 2015 portant Code de la Pêche maritime [Ministère de la Pêche et de l’Economie maritime. Accessed 2025-04-09]. <https://www.aprapam.org/images/migrate/2016/12/decret-application-loi-2015-18-du-13-juillet-2015-portant-code-peche-maritime.pdf>
- Rousseau, Y., Blanchard, J. L., Novaglio, C., Pinnell, K. A., Tittensor, D. P., Watson, R. A., & Ye, Y. (2024). A database of mapped global fishing activity 1950–2017 [Data downloaded February 14, 2025]. *Scientific Data*, *11*(1), 48.
- Ruth, M. (2014). Africa Boundaries Compiled from GADM (Database of Global Administrative Areas) [Downloaded August 20, 2024.]. <https://hub.arcgis.com/datasets/07610d73964e4d39ab62c4245d548625>
- Thorson, J. T., Cope, J. M., Branch, T. A., & Jensen, O. P. (2012). Spawning biomass reference points for exploited marine fishes, incorporating taxonomic and body size information. *Canadian Journal of Fisheries and Aquatic Sciences*, *69*(9), 1556–1568.
- World Bank. (2024). World Country Polygons — Very High Definition [Downloaded February 3, 2025]. <https://datacatalog.worldbank.org/int/search/dataset/0038272/world-bank-official-boundaries>