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Supplementary Information for

Supporting Information for "The Blue Paradox: Preemptive Overfishing in Marine Reserves"

McDermott, Meng, McDonald, and Costello

Grant R. McDermott, Kyle C. Meng.
E-mail: grantmcd@uoregon.edu, kmeng@bren.ucsb.edu

This PDF file includes:

Supporting Information Text

This SI documentation depicts various robustness checks, which are based upon the primary regression specification described in the main paper. We briefly capitulate this regression equation below in eq. [1] before presenting the associated figures.

Methods. We model total daily fishing hours per 1000 squared kilometers, y_{it}, for region i during date t as

$$y_{it} = f(t)P_i + g(t) + \gamma P_i + \Pi' \mathbb{Z}_{it} + \epsilon_{it} \quad [1]$$

where $f(t)$ and $g(t)$ are restricted cubic splines with knots that are evenly-spaced in time and P_i is an indicator variable equal to one if i is PIPA and zero if i is the Kiribati control region.

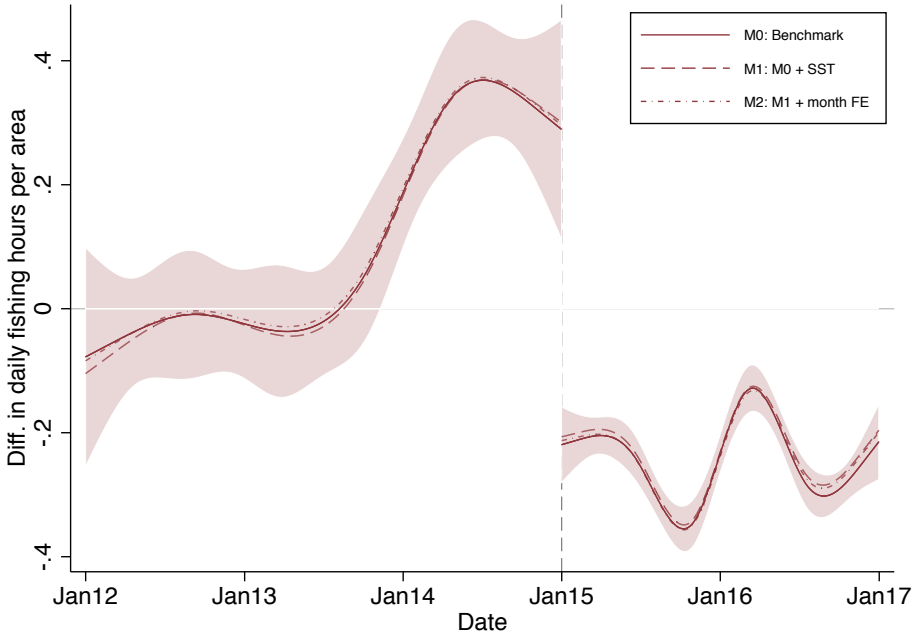

Fig. S1. Estimated restricted cubic spline functions for the difference in daily fishing hours per 1000 km^2 between PIPA and Kiribati control regions, before and after PIPA implementation (see eq. 1 in Methods and Materials). Line shows point estimates, shaded area shows 90% confidence intervals that are robust to serial correlation and heteroscedasticity of arbitrary form within a 60-day time window (1). M0 is benchmark model with only a constant term. M1 adds a quadratic in region-specific sea-surface temperatures to M0. M2 adds month fixed effects to M1.

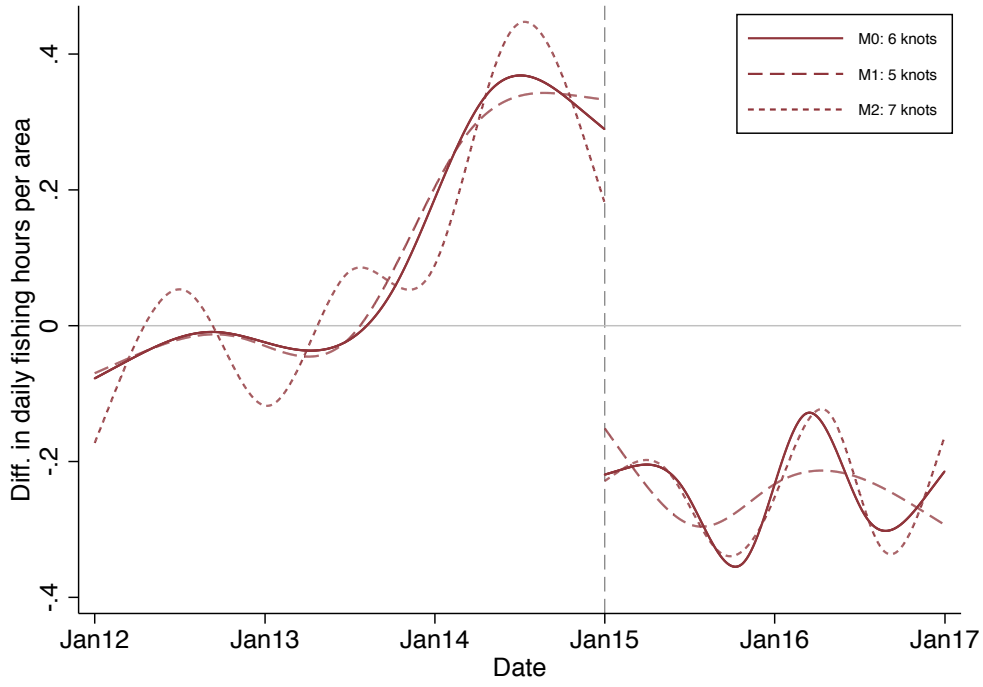

Fig. S2. Estimated restricted cubic spline functions for the difference in daily fishing hours per 1000 km^2 between PIPA and Kiribati control regions, before and after PIPA implementation (see eq. 1 in Methods and Materials). M0 shows point estimates from benchmark model with 6 evenly-spaced knots. M1 (M2) uses 5 (7) evenly-spaced knots.

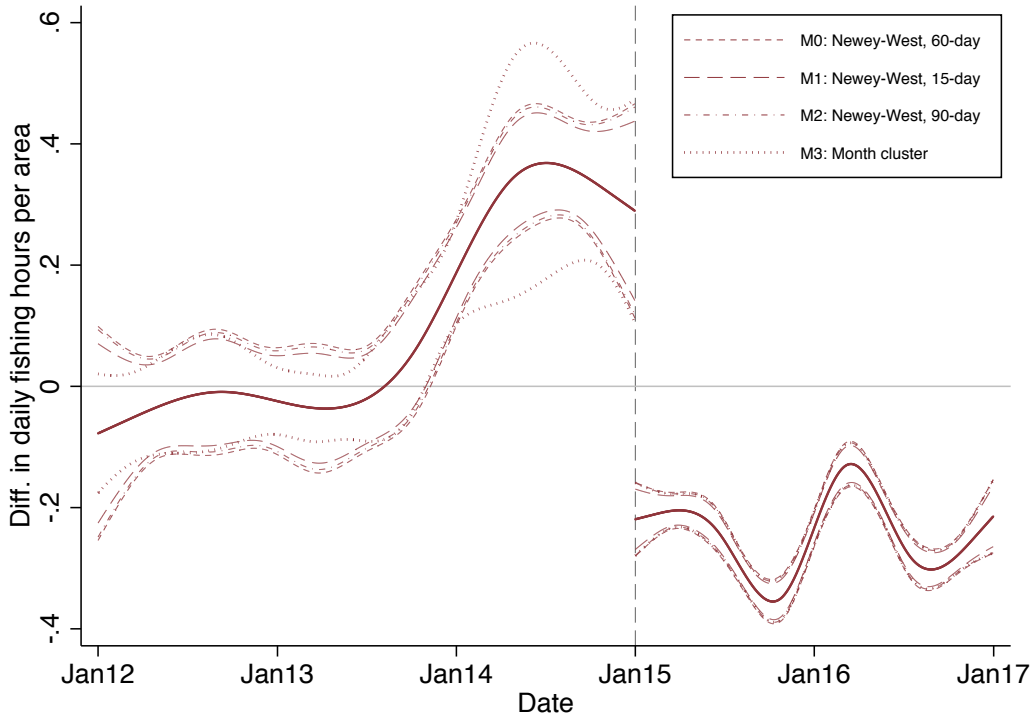

Fig. S3. Estimated restricted cubic spline functions for the difference in daily fishing hours per 1000 km^2 between PIPA and Kiribati control regions, before and after PIPA implementation (see eq. 1 in Methods and Materials). Solid line shows point estimates for benchmark model. M0 shows 90% confidence intervals for benchmark errors that are robust to serial correlation and heteroscedasticity of arbitrary form within a 60-day time window. M1 uses a 15-day time window. M2 uses a 90-day time window. M3 has errors that are clustered at the month-level.

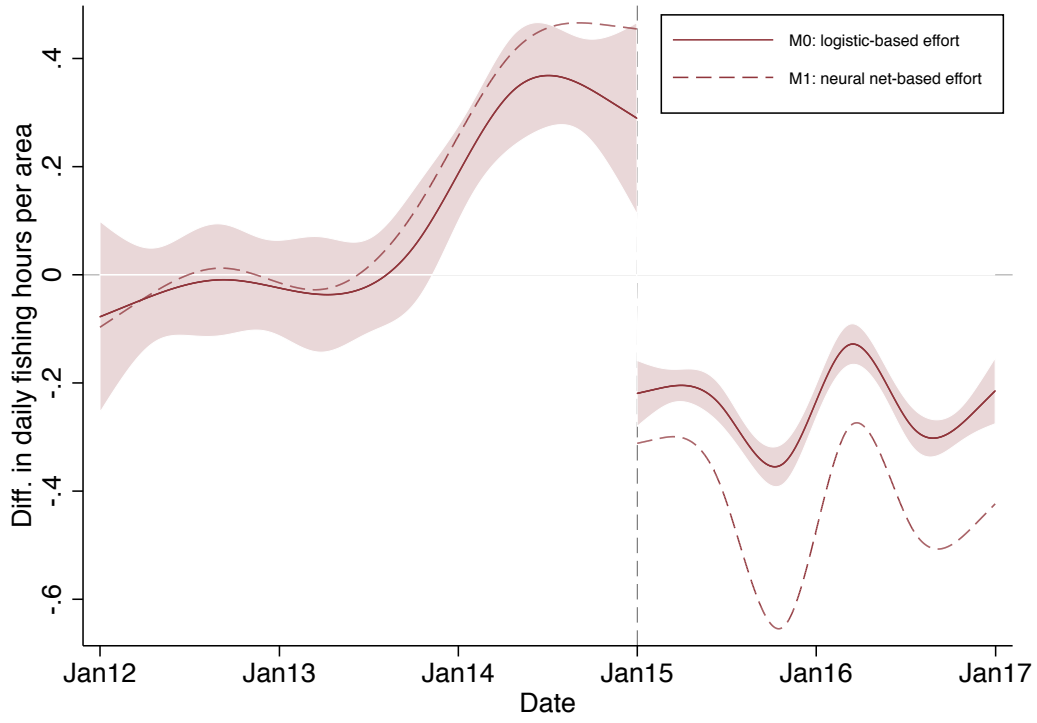

Fig. S4. Estimated restricted cubic spline functions for the difference in daily fishing hours per 1000 km^2 between PIPA and Kiribati control regions, before and after PIPA implementation (see eq. 1 in Methods and Materials). M0 shows point estimates from benchmark model with fishing effort based on a logistic regression model classification procedure. M1 uses a neural net machine learning algorithm to classify fishing effort.

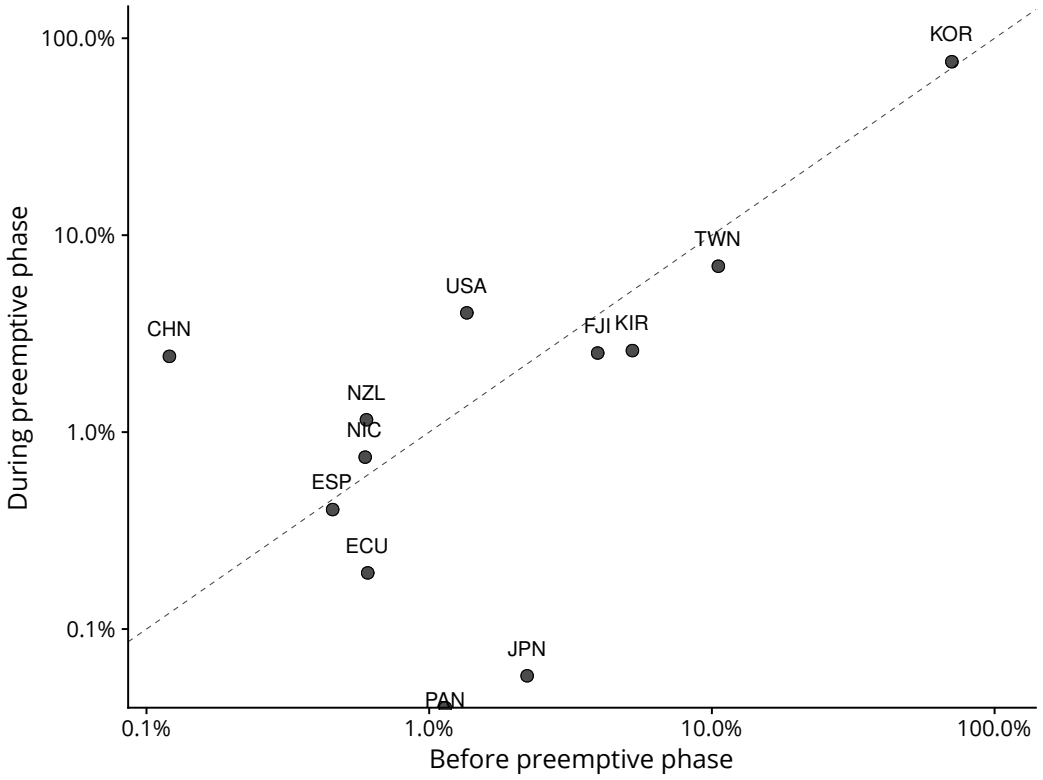

Fig. S5. Relative contribution to total fishing effort within PIPA by country, before and during the preemptive harvesting phase (beginning September 1, 2013). The dashed 45 degree line represents equal relative contributions in the "before" and "during" periods. The full time window under consideration is 2012–2015, so that each period is approximately 18 months long. Vessels without a known country (flag) ID have been excluded from the analysis. Note the logarithmic scale.

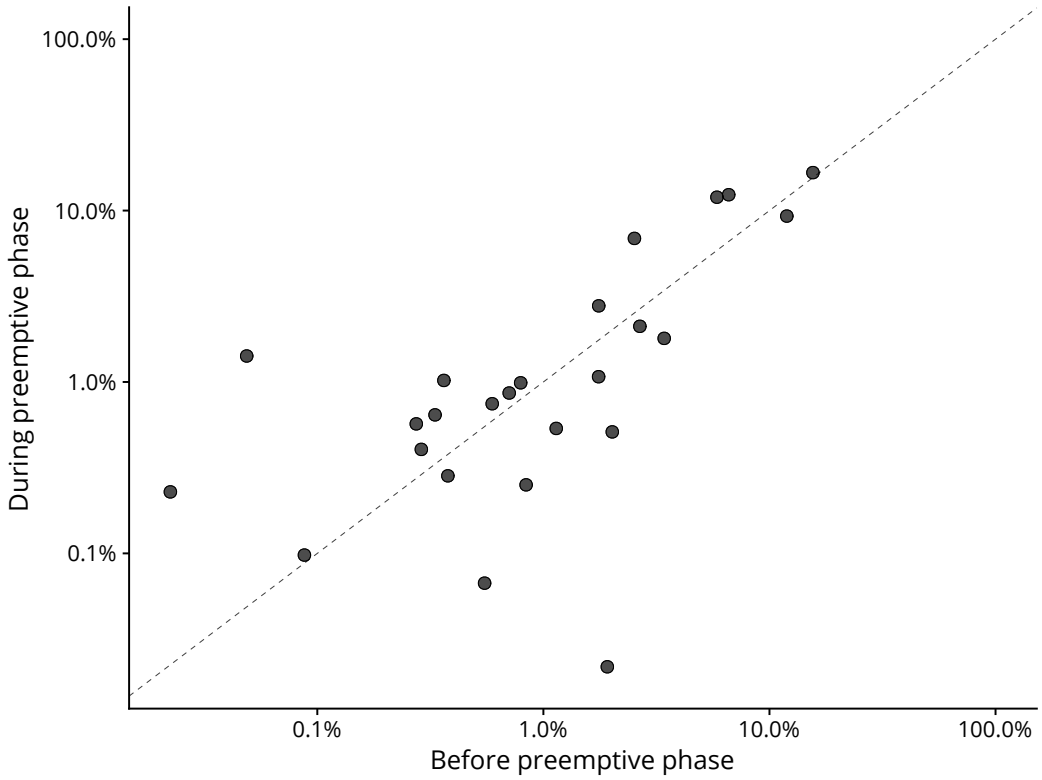

Fig. S6. As per Fig. S5, but aggregated at the level of owner (i.e. company) rather than country.

References

1. Newey WK, West KD (1987) A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica* 55(3):703–708.