

# Data and Code for “Information and Spillovers from Targeting Policy in Peru’s Anchoveta Fishery”

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## Data and Code Availability Statement

The paper uses public, non-confidential data from Peru’s Ministerio de la Producción (PRODUCE). The archive contains the data in the folder “Data/”. The files from PRODUCE are BE\_2017to2019\_allvessels.xlsx, landings\_2017to2019.xlsx, closures\_2014to2019.xlsx, and owndf.csv. BE\_2017to2019\_allvessels.xlsx are the Bitácora Electrónica data for all vessels, landings\_2017to2019.xlsx are the landings data for all vessels, closures\_2014to2019.xlsx are the temporary spatial closures that PRODUCE declared between 2014 and 2019 (I only use those between 2017 and 2019 in the analysis), and owndf.csv are ownership information and vessel characteristics for all vessels.

The paper uses public, non-confidential data from Sociedad Nacional de Pesquería (SNP). The archive contains the data in the folder “Data/”. The file from SNP is bedat\_snp.csv. This file contains Bitácora Electrónica data for SNP vessels.

The paper uses public, non-confidential boundary data of Peru’s Exclusive Economic Zone from the Flanders Marine Institute (Flanders Marine Institute, 2012). The archive contains the data in the folder “Data/Intersect\_IHO\_EEZ\_v2\_2012”.

The paper uses public, non-confidential population-level length distribution data from Peru’s scientific agency (IMARPE, 2017). The archive contains the data in the folder “Data/”. The file from IMARPE is EvaluacionHidroacusticaRecPelagicosCrucero170304\_march2017.jpg. This file is page 23 from their public report (IMARPE, 2017).

## Statement about Rights

I certify that the author of the manuscript has legitimate access to and permission to use the data used in this manuscript.

## Dataset list

Data file	Source	Notes	Provided
Data/BE_2017to2019_allvessels.xlsx	PRODUCE		Yes
Data/landings_2017to2019.xlsx	PRODUCE		Yes
Data/closures_2014to2019.xlsx	PRODUCE		Yes
Data/owndf.csv	PRODUCE		Yes
Data/bedat_snp.csv	SNP		Yes
Data/Intersect_IHO_EEZ_v2_2012	Flanders Marine Institute (2012)		Yes
Data/EvaluacionHidroacusticaRecPelagicosCrucero170304_march2017.jpg	IMARPE (2017)		Yes
Output/Data/closed.Rdata	Created by Scripts/make_data/0. make_closures_df.R		Yes
Output/Data/matched_be_landings_level.Rdata	Created by Scripts/make_data/1. match_be_landings.R		Yes

Data file	Source	Notes	Provided
Output/Data/grid2p.Rdata	Created by Scripts/make_data/1. match_be_landings.R		Yes
Output/Data/pbe_imp_uncorrected.Rdata	Created by Scripts/make_data/2. impute_size_be.R		Yes
Output/Data/pbe_imp.Rdata	Created by Scripts/make_data/3. correct_be.R		Yes
Output/Data/rddf_10km_lead_holag_13dayrect.Rdata	Created by Scripts/make_data/4. make_rddf.R		Yes
Output/Data/fleetthere_selfthere.Rdata	Created by Scripts/make_data/5. make_fleetthere_selfthere.R		Yes
Output/TempData/prelim_data_figA13.Rdata	Created by Scripts/make_data/7. make_data_figA13.R		Yes
Output/Data/data_figA13.Rdata	Created by Scripts/make_data/7. make_data_figA13.R		Yes

## Computational Requirements

### Software Requirements

-Software: R. I used Version 4.1.2, but other versions should work too, especially those  $\geq 4.1.0$ .

You may also need to install Rtools 4.0: <https://cran.r-project.org/bin/windows/Rtools/rtools40.html>

-Packages: There are many of them. They are all recorded in renv.lock file. When you run Scripts/RUN THIS FIRST.R, the renv package will automatically install all of them.

-OS: I used Windows 10. Other versions of Windows, as well as Mac and Linux, should work too.

-CPU: I have Intel(R) Xeon(R) Gold 6132 CPU @ 2.60GHz 2.60 GHz (2 processors). This is the equivalent of 16 cores. Some scripts hard-code parallel processing by specifying the number of cores to use. If you have fewer than 16 cores, calls like this will use all of your cores, and your runtime will be longer than the estimates provided here.

### Controlled Randomness

-Random seed is set at line 71 of program Scripts/make\_figures/make\_figure6.R -Random seed is set at line 111 of program Scripts/make\_figures/make\_figureB1\_figureB2.R

### Memory and Runtime Requirements

-Memory: 128 GB. You can run most scripts with as little as 4 GB of memory though. A few scripts will require 128 GB of memory though, such as Scripts/make\_figures/make\_figureA11.R.

-Necessary disk space: 3 GB

-Wall clock-time: 86 hours. 64 hours for Scripts/make\_data/7. make\_data\_figA13.R and 22 hours for all other scripts. If you don't want to run Scripts/make\_data/7. make\_data\_figA13.R, you may skip to make\_figureA13.R since I provide the data necessary for creating Figure A13 in Output/Data/data\_figA13.Rdata.

## Description of programs/code

- Scripts/make\_data/0. make\_closures\_df.R cleans closures data and creates Output/Data/closed.Rdata.
- Scripts/make\_data/1. match\_be\_landings.R matches Bitácora Electrónica data and landings data, creating matched\_be\_landings\_belevel.Rdata.
- Scripts/make\_data/2. impute\_size\_be.R constructs an uncorrected length distribution for all sets in the Bitácora Electrónica data, creating pbe\_imp\_uncorrected.Rdata.
- Scripts/make\_data/3. correct\_be.R corrects the Bitácora Electrónica data with the landings data, creating pbe\_imp.Rdata.
- Scripts/make\_data/4. make\_rddf.R creates the potential closures data, which serves as input for many of the analysis scripts. The potential closures data file it creates is rddf\_10km\_lead1tolag4\_3dayrect.Rdata.
- Scripts/make\_data/5. make\_fleetthere\_selfthere.R creates the data necessary for creating Figures 8 and 9. The data file it creates is fleetthere\_selfthere.Rdata.
- Scripts/make\_data/6. make\_actualclosure\_regressioncontrol.R creates the data necessary for creating Figure A12. The data file it creates is actualclosure\_regressioncontrol.Rdata.
- Scripts/make\_data/7. make\_data\_figA13.R creates the data necessary for creating Figure A13. The data file it creates is data\_figA13.Rdata.
- Scripts/make\_figures/... create the figure(s) referenced in the script file name. For example, Scripts/make\_figures/make\_figure1\_figure4.R creates Figures 1 and 4.
- Scripts/make\_tables/... create the table(s) referenced in the script file name. For example, Scripts/make\_tables/make\_table1.R creates Table 1.
- Scripts/other\_empirics/appendix\_C\_robustness\_length\_distribution\_imputation.R conducts a robustness check described in Appendix C. Instead of imputing length distribution of non-SNP sets at the two-week-of-sample by two-degree grid cell (as in the main specification of the paper), this script does so at the level of one-week-of-sample by one-degree-grid-cell. Then the script re-estimates the effect of the policy on juvenile catch.
- Scripts/other\_empirics/appendix\_D1.R estimates heterogeneous treatment effects by size of closure and length of closure period.
- Scripts/other\_empirics/appendix\_D2\_firmsize.R estimates heterogeneous treatment effects by size of firm.
- Scripts/other\_empirics/appendix\_D2\_vesselsize.R estimates heterogeneous treatment effects by vessel size.
- Scripts/other\_empirics/appendix\_D2\_mediumvesselonly.R estimates heterogeneous treatment effects by vessel size, among vessels owned by medium-sized firms.
- Scripts/other\_empirics/discussion\_alternative\_policy.R simulates the effect on juvenile catch of replacing the closures policy with an alternative policy.
- Scripts/other\_empirics/discussion\_exports.R calculates the short-run effect of the policy on exports.

## Instructions to Replicators

Some scripts hard-code parallel processing by specifying the number of cores to use. If you have fewer than 16 cores, calls like this will use all of your cores, and your runtime will be longer than the estimates provided here.

## Downloading and opening the replication files

If you are cloning the repository from Github ([https://github.com/englander/replication\\_closures](https://github.com/englander/replication_closures)), open RStudio, click File -> New Project -> Version Control -> Git, paste “[https://github.com/englander/replication\\_closures.git](https://github.com/englander/replication_closures.git)”, and click Create Project. If you downloaded the replication files as a zip file, extract

them, open RStudio, click File -> Open Project, find replication\_closures.Rproj among the files on your computer, and click Open.

### Installing specific package versions

First, run Scripts/RUN THIS FIRST.R. That script will install all R packages you need. It installs the same package versions I used to facilitate reproducibility.

### Data preparation

Run the scripts in Scripts/make\_data folder in numeric order, starting with 0. make\_closures\_df.R. Scripts 0 to 6 take 5 hours to run in total. Script 7 takes 64 hours.

After running 4. make\_rddf.R, you will have created the data necessary to create all tables, Figures 1-7, Figures A1-A11, Figures B1-B2, Figures C1-C2, and Figure E1. After running 5. make\_fleetthere\_selfthere.R, you will have created the data necessary to create Figures 8 and 9. Figure A12 requires running 6. make\_actualclosure\_regressioncontrol.R, and Figure A13 requires running 6. make\_actualclosure\_regressioncontrol.R and 7. make\_data\_figA13.R.

Note that 7. make\_data\_figA13.R requires 64 hours with 14 cores. The combined runtime of all other make\_data scripts is five hours. I provide output from all make\_data scripts in Output/Data folder. So if you want to skip the data preparation stage, and go right to reproducing tables and figures, you may do so. The only exception is Figure A12. Due to the size of the data used to create Figure A12, you must run 6. make\_actualclosure\_regressioncontrol.R on your computer to create Output/TempData/actualclosure\_regressioncontrol.Rdata. Because of data provided in Output/Data folder, you could run 6. make\_actualclosure\_regressioncontrol.R without running the preceding make\_data scripts.

### Analysis

Scripts/make\_figures folder contains the scripts that make all figures in the paper. Scripts are named by the figure(s) they create. The combined runtime for all make\_figures scripts, excluding make\_figureA11.R, is 5 hours. The runtime for make\_figureA11.R is 2.5 hours.

Scripts/make\_tables folder contains the scripts that make all tables in the paper. Scripts are named by the table(s) they create. The combined runtime for all make\_tables scripts is 4 hours.

Files in Scripts/other\_empirics folder contain calculations that are described in the paper but which do not produce a table or figure. The combined runtime for all other\_empirics scripts is 5.5 hours.

### List of tables and programs

Figure/Table #	Program	Line Number	Output file	Note
Figure 1	make_figures/make_figure1.R	2271	figure1.pdf	
Figure 2	make_figures/make_figure2.R	1532	figure2.pdf	
Figure 3	make_figures/make_figure3.R	2083	figure3.pdf	
Figure 4	make_figures/make_figure4.R	2841	figure4.pdf	
Figure 5	make_figures/make_figure5.R	4085	figure5.pdf	
Figure 6	make_figures/make_figure6.R	2326	figure6.pdf	
Table 1	make_tables/make_table1.R	482	table1.tex	
Table 2	make_tables/make_table2.R	309	table2.tex	
Figure 7	make_figures/make_figure7.R	5137	figure7.pdf	
Table 3	make_tables/make_table3.R	1283	table3.tex	
Table 4	make_tables/make_table4.R	304	table4.tex	
Figure 8	make_figures/make_figure8.R	7538	figure8.pdf	
Figure 9	make_figures/make_figure9.R	2938	figure9.pdf	

Figure/Table #	Program	Line Number	Output file	Note
Figure A1	make_figures/make_fig	504	A1.R	figureA1.pdf
Table A1	make_tables/make_ta	259	A1_table2.R	tableA1.tex
Figure A2	make_figures/make_fig	232	A2	figureA2.pdf figureA5.R
Figure A3	make_figures/make_fig	270	A2	figureA3.pdf figureA5.R
Figure A4	make_figures/make_fig	306	A2	figureA4.pdf figureA5.R
Figure A5	make_figures/make_fig	346	A2	figureA5.pdf figureA5.R
Figure A6	make_figures/make_fig	232	A6.R	figureA6.pdf
Figure A7	make_figures/make_fig	166	A7.R	figureA7.pdf
Figure A8	make_figures/make_fig	166	A8.R	figureA8.pdf
Figure A9	make_figures/make_fig	178	A9.R	figureA9.pdf
Figure A10	make_figures/make_fig	473	A10.R	figureA10.pdf
Figure A11	make_figures/make_fig	109	A11.R	figureA11.pdf
Figure A12	make_figures/make_fig	238	A12.R	figureA12.pdf
Figure A13	make_figures/make_fig	125	A13.R	figureA13.pdf
Figure B1	make_figures/make_fig	179	B1_B2.R	figureB1.pdf
Figure B2	make_figures/make_fig	84	B1_B2.R	figureB2.pdf
Figure C1	make_figures/make_fig	225	C1.R	figureC1.pdf
Figure C2	make_figures/make_fig	226	C2.R	figureC2.pdf
Table D1	make_tables/make_ta	115	D1.R	tableD1.tex
Table D2	make_tables/make_ta	110	D2.R	tableD2.tex
Figure E1	make_figures/make_fig	767	ee1.R	figuree1.pdf

In-text numbers #	Program	Line Number	Output file	Note
49%	other_empirics/append	322	C_robustness.Dat	TempData/appendix_C_robustness.Dat
5.7%	other_empirics/append	324	C_robustness.Dat	TempData/appendix_C_robustness.Dat
0.18	other_empirics/append	520	D1.R	TempData/appendix_D1_het
0.55	other_empirics/append	779	D1.R	TempData/appendix_D1_het
78%	other_empirics/append	493	D2_firms	TempData/appendix_D2_large-firm effect
70%	other_empirics/append	414	D2_firms	TempData/appendix_D2_large-firm vessels, as well as fraction caught by medium-firm and singleton vessels

In-text numbers #	Program	Line Number	Output file	Note
0.0005	other_empirics/appendix_D2	407	TempData/appendix_D2	medium-firm vessels only, grand total treatment effect by vessel length, among medium-firm vessels only
91%	other_empirics/appendix_D2	391	TempData/appendix_D2	above median of length, vessel_frac_effect.Rdata effect that above-median length vessels account for
83%	other_empirics/appendix_D2	395	TempData/appendix_D2	above median of length, vessel_frac_effect.Rdata from above-median length vessels
96%	other_empirics/appendix_D2	403	TempData/appendix_D2	96% of vessels owned by top 7 firms are above median length
-52%	other_empirics/discussion	139	TempData/change_juv_catch	alternative juvenile catch from replacing closures policy with an alternative
\$75 million	other_empirics/discussion	162	TempData/change_tons_exports	change in exports due to policy

## References

- Flanders Marine Institute. 2012. “Intersect of IHO Sea Areas and Exclusive Economic Zones (version 2).” <http://www.marineregions.org>.
- IMARPE. 2017. “Informe ‘Evaluación Hidroacústica de Recursos Pelágicos’ Crucero 1703-04.” Instituto del Mar del Perú (IMARPE).