

# Homework 4

Environmental Economics II  
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## Problem 1 Python

### 1. Line Plot

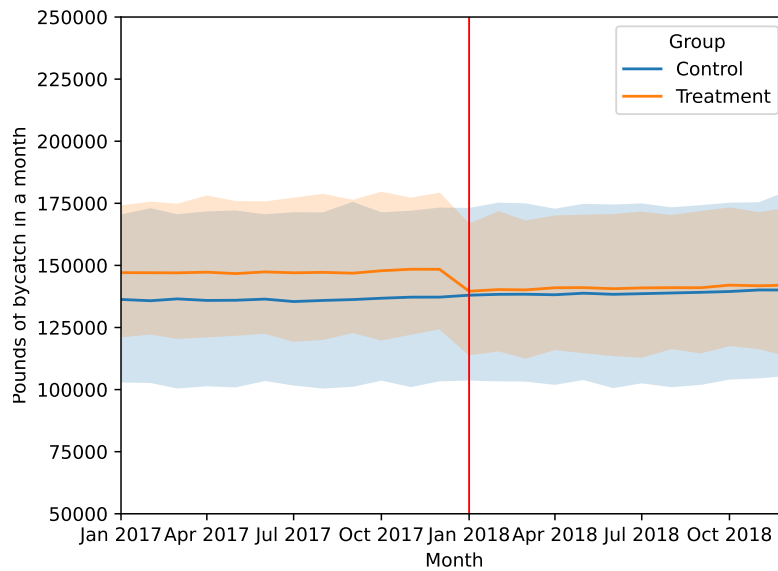


Figure 1: Bycatch by month plot

### 2. DID estimates

Table 1: Parameter and average marginal effect estimates from Stata

	Sample analog value
$E[Y_{igt} g(i) = treatment, t = Pre] =$	148430.64
$E[Y_{igt} g(i) = treatment, t = Post] =$	139612.51
$E[Y_{igt} g(i) = control, t = Pre] =$	137228.60
$E[Y_{igt} g(i) = control, t = Post] =$	139612.51
DID=	-9591.35

### 3. Estimating DID using different specification in Python

Table 2: DID estimates from different specification

	(a)	(b)	(c)
DID estimates	-9591.35 (3198.64)	-8956.78 (3135.04)	-8436.28 (2795.47)
Group FE	✓	✓	✓
Month Indicator	✓	✓	✓
Controls	×	×	✓
Sample	Dec 2017 - Jan 2018	Jan 2017 - Dec 2018	Jan 2017 - Dec 2018

Standard errors are clustered at firm.

- (a) The following specification is used.

$$bycatch_{it} = \alpha + \lambda_{t=2017} + \gamma g(i) + \delta treat_{i,t} + \epsilon_{i,t} \quad (1)$$

By using sample from December 2017 and January 2018, the DID estimates is -9591.35 with a standard error of 3198.64. This means after the treatment started, the treated firms' bycatch yield is on average 9591.35 lbs less compared to the control group.

- (b) The following specification is used.

$$bycatch_{it} = \alpha + \lambda_t + \gamma g(i) + \delta treat_{i,t} + \epsilon_{i,t} \quad (2)$$

By using sample from January 2017 and December 2018, the DID estimates is -8956.78 with a standard error of 3135.04. This means after the treatment started, the treated firms' bycatch yield is on average 8956.78 lbs less compared to the control group. Using this specification we are now comparing the average of the entire after treatment period with the average of the entire before treatment period average, instead of only using 1 month of observations. This specification is more robust in capturing common time trends or seasonality of bycatch yields between both treated and untreated firms.

- (c) The following specification is used.

$$bycatch_{it} = \alpha + \lambda_t + \gamma g(i) + \delta treat_{i,t} + \beta X_{i,t} + \epsilon_{i,t} \quad (3)$$

By using sample from January 2017 and December 2018, the DID estimates is -8436.28 with a standard error of 2795.47. In this specification, we include firm size, salmon yields, and shrimp yields as control variables. This specification is more robust in capturing common time trends or seasonality of bycatch yields between both treated and untreated firms, and also controlling for other factors that might affect bycatch yields.

- (d) Table 2 show the DID estimates from the different specification shown in part (a), (b), and (c).

## Problem 2 Stata

1. Estimating DID using different specification in Stata

Table 3: DID estimates from different methods in Stata

	(a)	(b)
DID estimates	-8085.14 (2619.21)	-8149.06 (478.05)
Method	Firm indicators	Within-transformation
Observations	1200	1200

Standard errors in parentheses

Standard errors are clustered at firm.

- (a) The following specification is used.