

# Selecting\_beaches

May 6, 2022

## 1 Description of analysis

I use the beach pollution data (1994-2021) to find the UK beaches with sufficient number of pre and post observations, considering 2015 as the year of policy change - the year when England began charging 5p for single use plastic bags. Here are some important dates to remember: \* A five pence charge came into effect on single use carrier bags in England on 5 October 2015.

- Wales, Northern Ireland, and Scotland introduced a 5p levy on single use carrier bags in 2011, 2013, and 2014 respectively. The purpose of each single use carrier bag charge is to reduce the number of bags given out, increase their re-use and reduce litter.

Source: <https://commonslibrary.parliament.uk/research-briefings/cbp-7241/>

```
[1]: # Loading packages and data
import pandas as pd
import numpy as np

df = pd.read_excel("Beachwatch_AllData_1994-23.01.21inc Public Source Litter_
↪YChen.xlsx")
```

To include sufficient pre and post periods, I am only include beach pollution data between January 01, 2010 and December 31, 2018. We chose to exclude 2019 to avoid the pandemic years.

```
[2]: start_date = pd.to_datetime('2010-01-01')
end_date = pd.to_datetime('2018-12-31')

df['Date of Survey'] = pd.to_datetime(df['Date of Survey'])

df = df[(df["Date of Survey"]>=start_date) & (df["Date of Survey"]<=end_date)]

df = df.reset_index(drop = True)
```

After filtering the dataset for the 2010 - 2018 period, the resulting data set has 7,250 observations for a total of 1,628 beaches.

```
[3]: # number of beaches
len(np.unique(df.BeachID))
```

```
[3]: 1628
```

```
[4]: # number of observations
len(df)
```

[4]: 7250

If we used monthly data for the above 1,628 beaches, we should have 175,824 observations  $[(9 \times 12) \times 1628]$ . But the current data appears to have only 7,250 observations. Perhaps, we should use yearly data instead of monthly.

### 1.0.1 Converting to yearly data

The new dataset below, `ndf`, now contains beach pollution in yearly frequency.

```
[5]: ndf = df.sort_values(by = ['BeachID', 'Date of Survey'], ascending=[True,
    ↪ True]) #sorting
ndf = ndf.set_index('Date of Survey')
ndf = ndf.groupby('BeachID').resample('Y').sum() # converting to yearly average
    ↪ data
del ndf["BeachID"]
ndf = ndf.reset_index(level=1).reset_index() # resetting index
```

Now, considering October 2015 as the month of policy change, each beach should have maximum 5 years of pre-2015 observations and maximum 4 years of post-2015 (including 2015) observations. Below I subset the dataset, including only the beaches that have at least 3 years' observations (total 6 years) from each of pre and post periods.

```
[6]: # Separating the dataset for pre and post period

intervention = pd.to_datetime('2015-10-05') # the date when UK began the 5p
    ↪ charge
post_period = ndf[ndf['Date of Survey'] >= intervention]
pre_period = ndf[ndf['Date of Survey'] < intervention]

pre_observations_per_beach = pre_period.groupby('BeachID').size()
pre_observations_per_beach = pre_observations_per_beach.reset_index()
pre_observations_per_beach.columns = ['BeachID', '#of_Pre_observations']

post_observations_per_beach = post_period.groupby('BeachID').size()
post_observations_per_beach = post_observations_per_beach.reset_index()
post_observations_per_beach.columns = ['BeachID', '#of_Post_observations']

## Keeping only the beaches that have at least 3 years of pre data out of 5
    ↪ years
pre_observations_per_beach =
    ↪ pre_observations_per_beach[pre_observations_per_beach['#of_Pre_observations'] >= 3]

## Keeping only the beaches that have at least 3 years of post data out of 4
    ↪ years
```

```
post_observations_per_beach =
↳ post_observations_per_beach[post_observations_per_beach['#of_Post_observations']>=3]
```

The merged data set below shows the BeachID's with at least 3 years of pre and 3 years of post periods

```
[7]: ## Merging the two subsets above
merged = pd.merge(pre_observations_per_beach, post_observations_per_beach, on =
↳ 'BeachID')
```

```
[8]: print(merged.to_string())
```

	BeachID	#of_Pre_observations	#of_Post_observations
0	2063	4	4
1	2065	5	4
2	2070	5	4
3	2084	5	4
4	2089	5	4
5	2095	5	3
6	2097	4	4
7	2101	5	4
8	2104	5	4
9	2107	4	4
10	2109	5	4
11	2115	5	4
12	2118	4	4
13	2119	5	4
14	2122	5	4
15	2123	3	4
16	2128	3	4
17	2129	4	4
18	2130	5	4
19	2141	5	4
20	2142	3	4
21	2151	5	3
22	2153	5	3
23	2165	5	3
24	2173	5	4
25	2180	5	4
26	2182	5	3
27	2186	5	4
28	2195	5	4
29	2198	5	4
30	2199	5	4
31	2204	5	4
32	2218	5	4
33	2225	3	3
34	2229	5	4

35	2234	5	4
36	2235	5	3
37	2236	4	4
38	2239	3	4
39	2243	5	4
40	2245	5	4
41	2249	5	3
42	2251	3	4
43	2254	5	4
44	2261	5	4
45	2263	5	4
46	2264	5	4
47	2269	5	4
48	2271	5	3
49	2274	5	4
50	2279	5	4
51	2283	5	4
52	2284	5	4
53	2296	3	3
54	2305	4	4
55	2307	5	4
56	2310	5	4
57	2315	5	4
58	2333	5	3
59	2336	5	4
60	2343	5	4
61	2346	3	4
62	2356	5	4
63	2367	3	4
64	2372	5	3
65	2376	5	4
66	2381	5	3
67	2384	5	4
68	2387	5	3
69	2388	5	4
70	2396	5	4
71	2397	5	4
72	2399	5	4
73	2403	5	4
74	2412	5	4
75	2413	5	4
76	2422	4	4
77	2427	5	4
78	2429	5	4
79	2431	4	4
80	2451	5	4
81	2458	5	4
82	2459	5	4

83	2460	5	4
84	2461	5	4
85	2462	5	4
86	2470	5	4
87	2471	5	4
88	2489	5	3
89	2490	5	4
90	2496	5	3
91	2498	3	4
92	2505	5	3
93	2509	5	4
94	2510	3	3
95	2514	3	4
96	2520	4	4
97	2525	5	4
98	2530	5	4
99	2533	5	4
100	2545	3	4
101	2550	3	3
102	2551	5	4
103	2552	5	4
104	2554	5	4
105	2561	5	4
106	2564	5	4
107	2570	5	3
108	2579	4	4
109	2582	5	4
110	2585	5	4
111	2587	5	3
112	2600	5	4
113	2602	5	4
114	2611	5	4
115	2612	5	4
116	2613	5	4
117	2626	5	4
118	2627	4	4
119	2629	4	3
120	2632	5	4
121	2637	4	3
122	2647	5	3
123	2650	5	4
124	2660	5	4
125	2685	5	4
126	2692	5	4
127	2699	5	4
128	2700	5	4
129	2709	5	4
130	2710	5	4

131	2727	5	4
132	2733	5	4
133	2737	4	4
134	2740	5	4
135	2769	5	4
136	2792	3	4
137	2796	5	4
138	2801	5	4
139	2808	5	4
140	2812	5	3
141	2813	5	4
142	2819	5	4
143	2836	4	3
144	2839	5	4
145	2846	4	4
146	2848	5	4
147	2852	5	4
148	2858	5	4
149	2871	5	4
150	2873	3	4
151	2877	5	4
152	2882	5	4
153	2888	5	4
154	2889	3	4
155	2892	5	4
156	2903	5	4
157	2920	5	4
158	2927	4	4
159	2929	4	4
160	2931	5	4
161	2938	5	4
162	2946	4	3
163	2957	5	4
164	2971	5	4
165	2981	5	4
166	2992	5	3
167	2995	3	4
168	2997	5	4
169	3009	5	4
170	3022	4	3
171	3029	5	4
172	3037	5	4
173	3040	3	3
174	3054	5	4
175	3086	3	4
176	3090	5	4
177	3091	5	4
178	3092	5	4

179	3094	5	4
180	3095	5	4
181	3099	5	3
182	3102	4	4
183	3108	5	4
184	3116	5	4
185	3126	3	4
186	3138	5	3
187	3144	3	4
188	3165	3	4
189	3173	5	4
190	3174	5	4
191	3177	5	4
192	3180	4	3
193	3184	5	4
194	3190	3	4
195	3196	5	3
196	3204	5	4
197	3222	5	4
198	3225	5	4
199	3229	5	4
200	3243	5	4
201	3244	5	3
202	3251	5	4
203	3258	4	4
204	3259	5	4
205	3270	3	4
206	3277	5	4
207	3278	5	3
208	3280	5	3
209	3301	5	3
210	3302	5	4
211	3310	5	4
212	3318	5	3
213	3339	5	4
214	3345	5	4
215	3348	5	4
216	3352	5	4
217	3355	3	4
218	3361	5	3
219	3371	5	4
220	3382	5	4
221	3389	5	4
222	3392	4	4
223	3393	5	4
224	3401	5	3
225	3431	5	4
226	3442	5	4

227	3444	3	4
228	3446	5	4
229	3454	5	4
230	3455	5	3
231	3459	5	4
232	3466	5	4
233	3485	5	4
234	3490	3	3
235	3493	5	4
236	3501	5	4
237	3506	4	3
238	3509	5	4
239	3512	5	4
240	3514	5	4
241	3515	5	4
242	3516	4	3
243	3530	5	3
244	3532	5	3
245	3536	5	3
246	3537	3	4
247	3540	5	4
248	3544	5	4
249	3554	5	4
250	3564	5	3
251	3565	4	4
252	3588	5	4
253	3591	5	4
254	3592	5	4
255	3602	5	4
256	3610	5	4
257	3618	4	4
258	3619	5	4
259	3620	5	4
260	3622	4	4
261	3624	3	3
262	3627	5	4
263	3633	5	4
264	3638	3	3
265	3643	4	3
266	3645	5	4
267	3649	5	4
268	3651	5	3
269	3652	5	4
270	3653	5	4
271	3662	4	4
272	3663	3	3
273	3665	5	4
274	3668	4	3



275	3678	5	4
276	3679	5	4
277	3694	5	4
278	3695	5	4
279	3713	5	4
280	3735	5	4
281	3739	5	4
282	3754	5	4
283	3756	5	4
284	3760	5	4
285	3761	5	4
286	3764	5	4
287	3770	5	3
288	3772	5	4
289	3774	5	4
290	3776	4	3
291	3780	5	4
292	3798	5	4
293	3807	5	4
294	3808	5	4
295	3820	5	4
296	3823	5	4
297	3830	5	4
298	3836	5	4
299	3845	4	3
300	3849	4	4
301	3855	4	3
302	3866	4	4
303	3869	4	4
304	3872	4	4
305	3873	4	4
306	3875	4	4
307	3894	3	4
308	3897	3	4
309	3901	3	4
310	3909	3	4
311	3917	3	4
312	3921	3	4
313	3923	3	4
314	3924	3	3
315	3926	3	4
316	4196	3	4
317	4202	3	4
318	4272	3	3
319	4273	3	4
320	4274	3	4
321	4275	3	4
322	4391	3	4

323	4941	3	4
324	4991	3	4
325	5019	3	4