

Effect of a Garbage Incinerator's Location on Housing Prices

Kiel and McClain (1995) studied the effect that a new garbage incinerator had on housing values in North Andover, Massachusetts. They used many years of data and a fairly complicated econometric analysis. We will use two years of data and some simplified models, but our analysis is similar.

The rumor that a new incinerator would be built in North Andover began after 1978, and construction began in 1981. The incinerator was expected to be in operation soon after the start of construction; the incinerator actually began operating in 1985. We will use data on prices of houses that sold in 1978 and another sample on those that sold in 1981. The hypothesis is that the price of houses located near the incinerator would fall relative to the price of more distant houses.

For illustration, we define a house to be near the incinerator if it is within three miles (variable `nearinc=1`).

a) What is the treatment to be evaluated?

Efecto de la construcción de un incinerador de basura sobre los precios de tratamiento

b) Which group could represent the “treatment group” and which the “control group”?

Tratamiento: Casas ubicadas cerca del incinerador

Control: Casas ubicadas lejos del incinerador

c) Open the data set KIELMC.DTA, what represents each observation? (For example in the injury data each observation represents an individual)

La unidad de observación es cada casa

d) Compare the average price of houses near the incinerator in 1978 and 1981 (use the variable `rprice`, the price of houses in 1978 dollars)

| 1978 or 1981 | Summary of price, 1978 dollars | | |
|-----------------|--------------------------------|------------------|-----------|
| | Mean | Std. dev. | Freq. |
| 1978 | 63692.857 | 42722.027 | 56 |
| 1981 | 70619.24 | 34816.795 | 40 |

e) Compare the average price of houses distant from the incinerator in 1978 and 1981. (use the variable `rprice`, the price of houses in 1978 dollars)

| 1978 or 1981 | Summary of price, 1978 dollars | | |
|-----------------|--------------------------------|------------------|------------|
| | Mean | Std. dev. | Freq. |
| 1978 | 82517.228 | 20831.1 | 123 |
| 1981 | 101307.51 | 29741.118 | 102 |

f) What is the difference-in-differences estimator?

| | Before change | After Change | Difference |
|--|---------------|--------------|----------------|
| Treatment Group = Near incinerator | 63 692 | 70 619 | 6 927 |
| Control Group = Distant incinerator | 82 517 | 101 307 | 18 790 |
| Difference in differences = | | | -11 863 |

g) Demonstrate that the DID estimator in part f) can be also be estimated by running the following regression

$$rprice = \beta_0 + \beta_1 nearinc + \beta_2 y81 + \delta nearinc * y81 + e_{it}$$

```
gen post_treatment=y81*nearinc
reg rprice y81 nearinc post_treatment
```

| Source | SS | df | MS | Number of obs | = | 321 |
|----------|-------------------|------------|-------------------|---------------|---|---------------|
| Model | 6.1055e+10 | 3 | 2.0352e+10 | F(3, 317) | = | 22.25 |
| Residual | 2.8994e+11 | 317 | 914632739 | Prob > F | = | 0.0000 |
| Total | 3.5099e+11 | 320 | 1.0969e+09 | R-squared | = | 0.1739 |
| | | | | Adj R-squared | = | 0.1661 |
| | | | | Root MSE | = | 30243 |

| rprice | Coefficient | Std. err. | t | P> t | [95% conf. interval] | |
|-----------------------|------------------|-----------------|--------------|--------------|----------------------|------------------|
| y81 | 18790.29 | 4050.065 | 4.64 | 0.000 | 10821.88 | 26758.69 |
| nearinc | -18824.37 | 4875.322 | -3.86 | 0.000 | -28416.45 | -9232.293 |
| post_treatment | -11863.9 | 7456.646 | -1.59 | 0.113 | -26534.67 | 2806.867 |
| _cons | 82517.23 | 2726.91 | 30.26 | 0.000 | 77152.1 | 87882.36 |

h) Kiel and McClain (1995) included various housing characteristics in their analysis of the incinerator siting. There are two good reasons for doing this. First, the kinds of houses selling in 1981 might have been systematically different than those selling in 1978; if so, it is important to control for characteristics that might have been different. But just as important, even if the average housing characteristics are the same for both years, including them can greatly reduce the error variance, which can then shrink the standard error of δ .

- Control for distance to the interstate in feet (intst), land area in feet (land), house area in feet (area), number of rooms (rooms), and number of baths (baths), age of the house (age). What is the coefficient for δ ? Is it statistically different from zero?

```
// g
reg rprice y81 nearinc post_treatment
est store reg1

// h
reg rprice y81 nearinc post_treatment intst land area rooms baths age
est store reg2

esttab reg1 reg2, star(* 0.1 ** 0.05 *** 0.01) r2 ar2
```

| | (1) rprice | (2) rprice |
|--------------|------------------------|------------------------|
| y81 | 18790.3*** (4.64) | 12713.6*** (4.45) |
| nearinc | -18824.4*** (-3.86) | -173.1 (-0.04) |
| post_treat~t | -11863.9 (-1.59) | -10769.4*** (-2.13) |
| intst | | -0.400** (-2.01) |
| land | | 0.137*** (4.31) |
| area | | 18.14*** (7.66) |
| rooms | | 4312.5** (2.55) |
| baths | | 11044.8*** (4.49) |
| age | | -210.1*** (-5.01) |

i) Now we want to approximate the percentage reduction in housing value due to the incinerator. Use $\log(\text{rprice})$ to estimate the equations above (estimate three equations, one without controls, one with controls as in (h), and one with controls but with log of land (lland), log of area (larea) and log of intst (lintst)).

- Complete: because of a new incinerator, houses near the incinerator lost about _____% in value.

```
reg lprice y81 nearinc post_treatment
est store reg4

reg lprice y81 nearinc post_treatment intst land area rooms baths age
est store reg5

reg lprice y81 nearinc post_treatment lintst lland larea rooms baths age
est store reg6

esttab reg4 reg5 reg6, star(* 0.1 ** 0.05 *** 0.01)
```

| | (1) lprice | (2) lprice | (3) lprice |
|--------------|----------------------|--------------------|---------------------|
| y81 | 0.193*** (4.26) | 0.126*** (4.21) | 0.152*** (5.20) |
| nearinc | -0.340*** (-6.23) | -0.0765 (-1.64) | 0.00679 (0.14) |
| post_treat~t | -0.0626 (-0.75) | -0.0565 (-1.07) | -0.0973* (-1.84) |