Homework 7

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Problem 1 Python

- 1. It might not be a sharp RD as vehicle sold in 2017 might be from previous inventory that is produced when the policy is not in place.
- 2. Scatter plot of the data is shown in Figure 1. The plot shows that there is a discontinuity at the cutoff point.

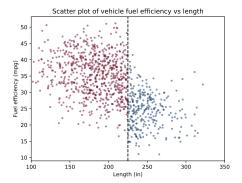


Figure 1: Scatter plot of fuel efficiency vs length of vehicle

3. Table 1 shows the RD estimates for using different polynomial.

Table 1: RD estimates

	Dependent variable: Fuel efficiency (mpg)		
	(1)	(2)	(3)
LATE	-10.920** (4.495)	-8.255 (46.302)	0.376 (0.342)
Polynomial specification	1^{st} order	2^{nd} order	5^{th} order
Observations	1000	1000	1000
R^2	0.399	0.399	0.401
Adjusted R^2	0.397	0.396	0.395
Residual Std. Error	6.158	6.160	6.165
F Statistic	259.649***	162.427***	248.217***

Note:

*p<0.1; **p<0.05; ***p<0.01

The following figure show the resulting first order polynomial.

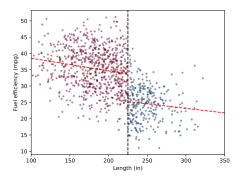


Figure 2: RD using first order polynomial

4. The following figure show the resulting second order polynomial.

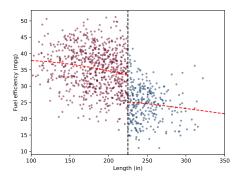


Figure 3: RD using second order polynomial

5. The following figure show the resulting fifth order polynomial.

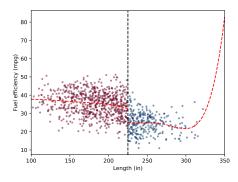


Figure 4: RD using fifth order polynomial

6. Using the discontinuity as instrument for fuel efficiency, average treatment effect estimate is 158.77 \$/mpg.

Problem 2 - Stata

- 1. The LATE from the RD design is -7.9915 with a standard error of 1.2434.
 - (a) The following table shows the second-stage estimates. Note that I did not correct the standard error and directly use the second stage result from Stata. The ATE is $157.43 \$ /mpg.

Table 2: ATE estimates			
	Second-stage estimates		
Miles per gallon	157.43***		
	(26.68)		
=1 if the vehicle is sedan	-3674.49***		
	(224.25)		
Adjusted R^2	0.219		
Observations	1000		

Standard errors in parentheses

(b) The plot of the RD is shown in Figure 5.

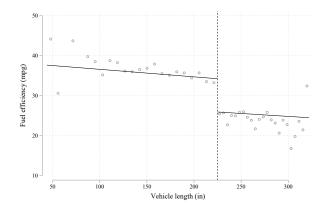


Figure 5: RD using first order polynomial in Stata

2. abc

^{*} p < .1, ** p < .05, *** p < .01