ECON 771 Module 3 Empirical Exercise

Due: November 4, 2022

Noah MacDonald

Ericson's replication package was 9.5/10, I am a fan! I just wish his tables were automated.

Question 1.

Table 1: Descriptive Statistics of Medicare Part D Plans

	Cohort (Year of plan introduction)				
	2006	2007	2008	2009	2010
Mean monthly premium	\$37.43	\$40.31	\$35.96	\$30.27	\$32.71
	(12.86)	(17.15)	(19.57)	(5.34)	(9.22)
Mean deductible	\$92.25	\$114.10	\$146.29	\$253.43	\$118.04
	(115.79)	(127.74)	(124.91)	(101.87)	(138.74)
Fraction enhanced benefit	0.43	0.43	0.58	0.03	0.69
Fraction of plans offered by firms already offering a plan...					
...in the United States	0.00	0.76	0.98	1.00	0.97
...in the same state	0.00	0.53	0.91	0.67	0.86
Number of unique firms	51	38	16	5	6
Number of plans	1429	658	202	68	107

Notes: Plan characteristics are taken from the year the plan was introduced (e.g., premium in plan's first year). Standard deviations in parentheses.

Source: Ericson's calculations from CMS Landscape Source Files.

Question 2.

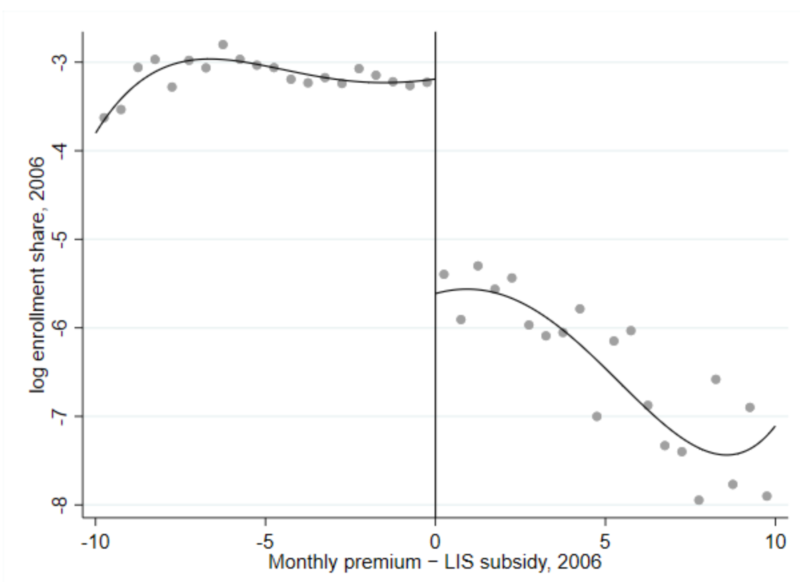

Figure 1: The Effect of 2006 Benchmark Status on 2006 Enrollment

Question 3.

Figures 2 and 3 show Ericson's Table 3 with 20 and 80 total bins, respectively. Figure 2 is almost identical to my figure 1, but figure 3 has a wider range on the y-axis and contains points that are quite far from our estimated quartic polynomial. It seems that 40 bins on either side of the cutoff is too many to accomplish our goal of creating a plot with less noise that highlights the discontinuity.

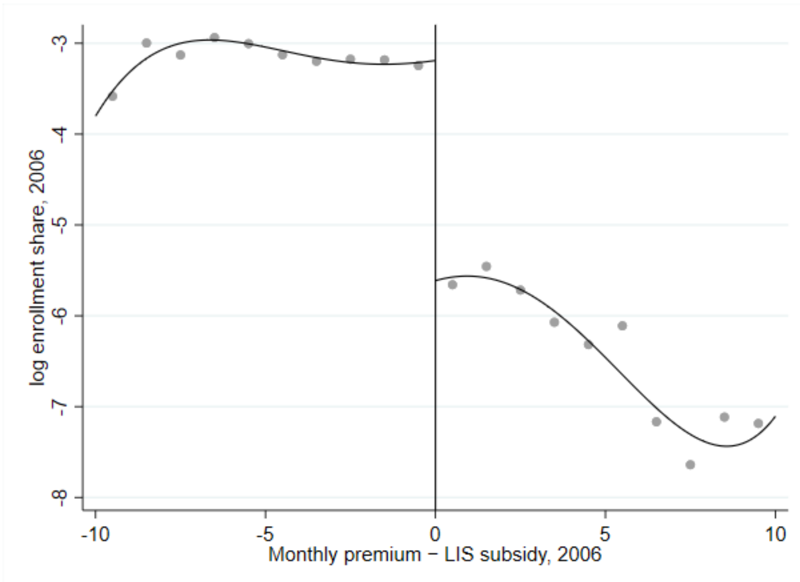

Figure 2: The Effect of 2006 Benchmark Status on 2006 Enrollment (20 bins)

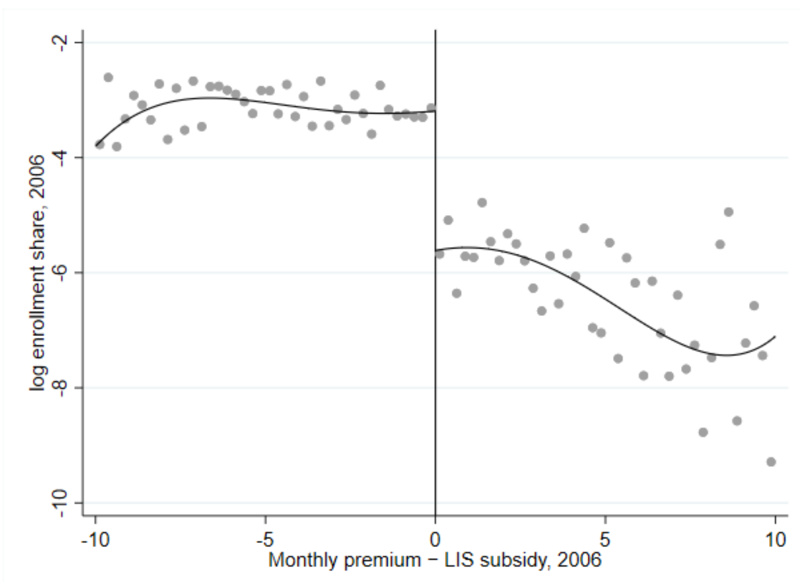

Figure 3: The Effect of 2006 Benchmark Status on 2006 Enrollment (80 bins)

Question 4.

The optimal number of bins with an evenly-spaced binning strategy is six bins below the cutoff and five bins above the cutoff, as shown in figure 4 below.

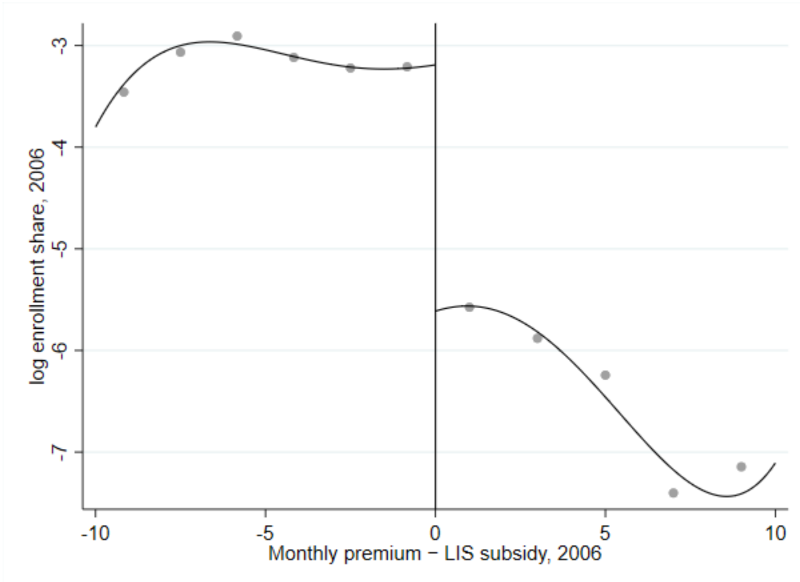

Figure 4: The Effect of 2006 Benchmark Status on 2006 Enrollment (ES bins)

Question 5.

Our RD manipulation test yields a p-value of 0.9955. Therefore, there is no statistical evidence of systemic manipulation of our running variable, Monthly Premium - LIS Subsidy. We can also see evidence of this from the lack of a jump in density on either side of the cutoff in figure 5.

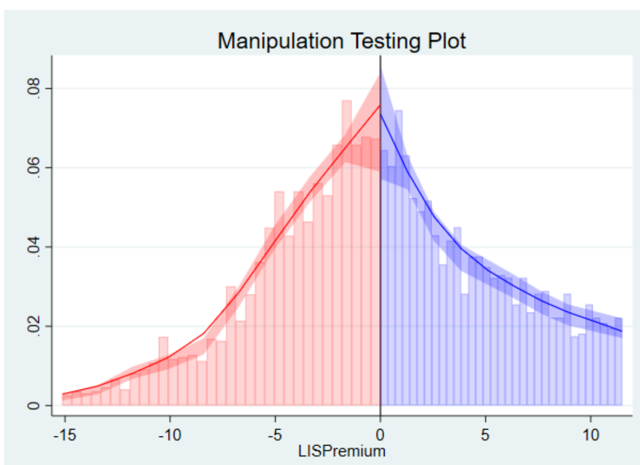

Figure 5: Density of Monthly Premium - LIS Subsidy

Note: Sorry figure 5 is so ugly. For some reason I couldn't get the standard graph options to work with this plot.

Question 6.

Table 2: Effect of LIS Benchmark Status in 2006 on Plan Enrollment

$\ln s_t$	2006	2007	2008	2009	2010
Panel A. Local linear, bandwidth $4					
Below benchmark, 2006	2.224***	1.332***	0.902***	0.803**	0.677
	(0.283)	(0.267)	(0.248)	(0.362)	(0.481)
Premium-subsidy, 2006					
Below benchmark	-0.014	-0.077	-0.073	-0.170	−0.215**
	(0.032)	(0.088)	(0.116)	(0.105)	(0.088)
Above benchmark	−0.142*	-0.033	0.049	0.074	0.049
	(0.078)	(0.110)	(0.163)	(0.170)	(0.202)
Observations	306	299	298	246	212
R^2	0.576	0.325	0.131	0.141	0.124
Panel B. Polynomial without controls, bandwidth $4					
Below benchmark, 2006	2.349***	1.206***	0.697*	0.238	0.152
	(0.279)	(0.387)	(0.394)	(0.516)	(0.633)
Premium-subsidy, 2006	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic
Observations	306	299	298	246	212
R^2	0.577	0.327	0.137	0.163	0.140

Notes: See Table 3 of Ericson (2014) for details.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Question 7.

Using rdrobust's rdbwselect command, I find that the optimal bandwidth for a linear fit with standard errors clustered at the firm level is 3.685, while the optimal bandwidth for a quadratic fit with clustered standard errors is 5.393. Results based on these new bandwidths are presented in table 3. The results in panel A of tables 2 and 3 largely tell the same story, although the sample sizes are smaller in table 3, as expected with the smaller bandwidth. The two panels show significant effects in all the same years, with less than 0.1 percentage point differences in any of the point estimates. Surprisingly, the results in panel B of tables 2 and 3 are completely identical. I at least expected the sample sizes in table 3 to be larger since we're using a larger bandwidth, but for some reason that is not the case.

Question 8.

To answer this question, I believe we'd need to adapt lines 308-339 of Ericson's replication package to include the variable LIS as an instrument in the regressions for his Table 4.

Table 3: Effect of LIS Benchmark Status in 2006 on Plan Enrollment

$\ln s_t$	2006	2007	2008	2009	2010
Panel A. Local linear, bandwidth \$3.685					
Below benchmark, 2006	2.184***	1.295***	0.940***	0.794**	0.619
	(0.294)	(0.281)	(0.275)	(0.364)	(0.472)
Premium-subsidy, 2006					
Below benchmark	0.007	-0.031	-0.017	-0.115	−0.217**
	(0.020)	(0.098)	(0.141)	(0.117)	(0.100)
Above benchmark	−0.194***	-0.109	0.027	0.016	0.007
	(0.020)	(0.078)	(0.157)	(0.162)	(0.194)
Observations	286	279	278	226	194
R^2	0.597	0.334	0.128	0.133	0.121
Panel B. Polynomial without controls, bandwidth \$5.393					
Below benchmark, 2006	2.349***	1.206***	0.697*	0.238	0.152
	(0.279)	(0.387)	(0.394)	(0.516)	(0.633)
Premium-subsidy, 2006	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic
Observations	306	299	298	246	212
R^2	0.577	0.327	0.137	0.163	0.140

Notes: See Table 3 of Ericson (2014) for details.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Question 9.

Looking back at our various binwidth selections, it seems that if our goal is to get a clear visual of the discontinuity at the cutoff, we should err on the side of too few bins as opposed to too many bins. Compared to Ericson's original selection of 20 bins on either side of the cutoff (or the alternative selection of 40 bins on either side), having 10 bins on either produces a cleaner plot with less noise. This is again true when we reduce the number of bins to the optimal number of evenly-spaced bins in Question 4.

Changing our bandwidth selection didn't alter the results for our linear model very much, and didn't alter the results for the quadratic model at all. That being said, we had Ericson's original bandwidth selection to fall back on in this homework assignment, which we won't have when conducting our own research. That's where Cattaneo and coauthor's contributions on optimal bandwidth selection could really come in handy for us.

Question 10.

I think this exercise is great for showing the pros and cons of packages like rdrobust. They make certain tasks like bandwidth selection and plotting so much easier, but you can't always get all of your desired output (i.e., the "Below benchmark" and "Above benchmark" rows in tables 2 and 3) by using only the built-in functionalities. As a native Stata user, it was also fun to see how Ericson organized and carried out his analysis in Stata before Cattaneo and coauthors automated much of the process.

I'd say the most challenging part of the assignment was going back and forth between the 2014 syntax Ericson used and the new suite of commands in rdrobust. The most surprising part was the consistency of the results in Panel B of tables 2 and 3 when we used different bandwidths. I still don't understand how this could be the case, but hopefully the solutions will shine light this point (or on my error).