Homework 4: Submission 2

Research Methods, Spring 2024

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Homework 4: Repository

Summarize The Data

1. Remove all SNPs, 800-series plans, and prescription drug only plans (i.e., plans that do not offer Part C benefits). Provide a box and whisker plot showing the distribution of plan counts by county over time. Do you think that the number of plans is sufficient, too few, or too many?

See Figure 1:

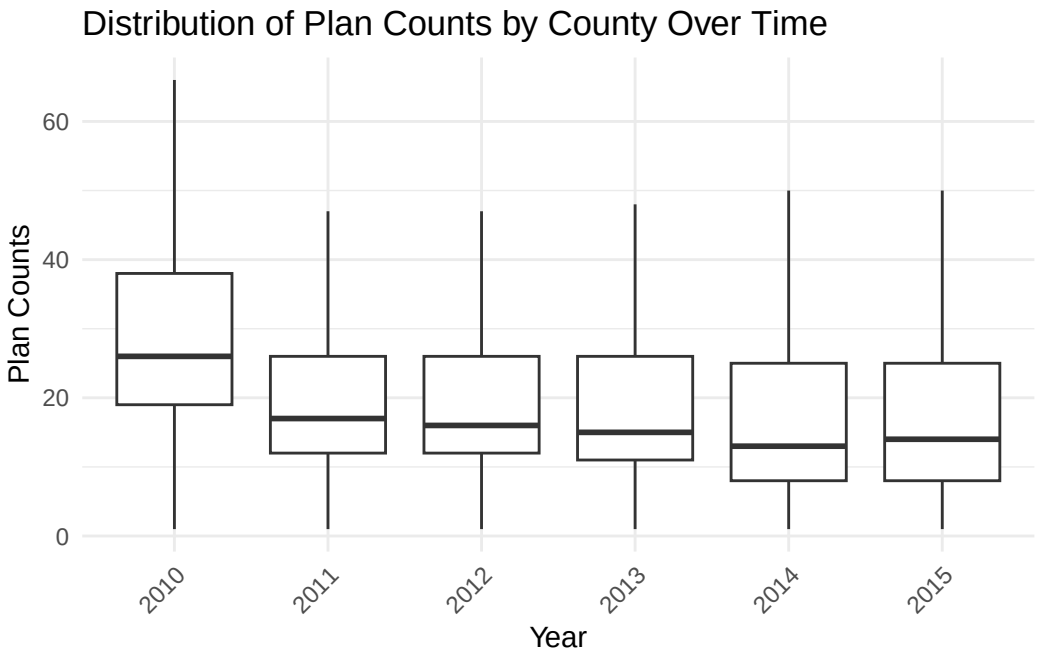


Figure 1: Distribution of Plan Counts by County Over Time

Figure 1 shows that the distribution of plan counts by country varies overtime. The median plan count is pretty close to 20 plans across the years (2010 is slightly higher). Looking at the interquartile ranges, we can see that they are relatively wide which indicates that there is a significant variation in plan counts across counties. The year 2010 stands out in that there appears to be more counties with more plans than the median—more outliers. Becuase the distribution of plan counts by county is generally consistent over time, I would say that the number of plans is sufficient.

2. Provide bar graphs showing the distribution of star ratings in 2010, 2012, and 2015. How has this distribution changed over time?

See Figure 2:

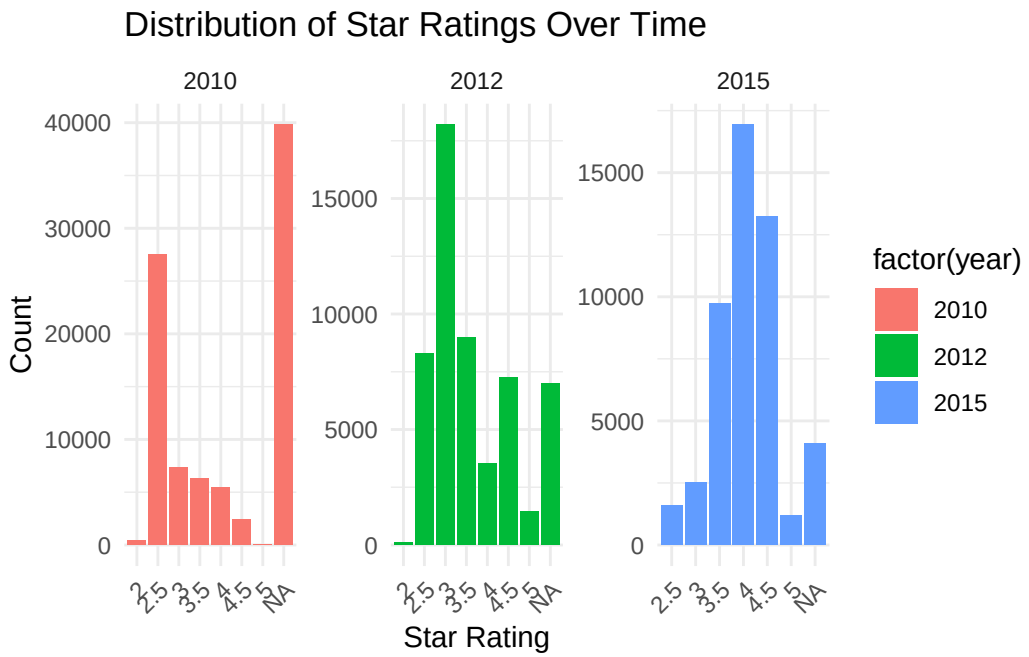


Figure 2: The Distribution of Star Ratings in 2010, 2012, and 2015

Figure 2 displays a slight shift towards higher star ratings over time. In 2010, the distribution appears more even across star ratings (2 to 4), with a clear mode around 2.5 stars. In 2015, there are more ratings of 4 and 5 stars than ever before, with the mode being around 4 stars.

3. Plot the average benchmark payment over time from 2010 through 2015. How much has the average benchmark payment risen over the years?

See Figure 3:

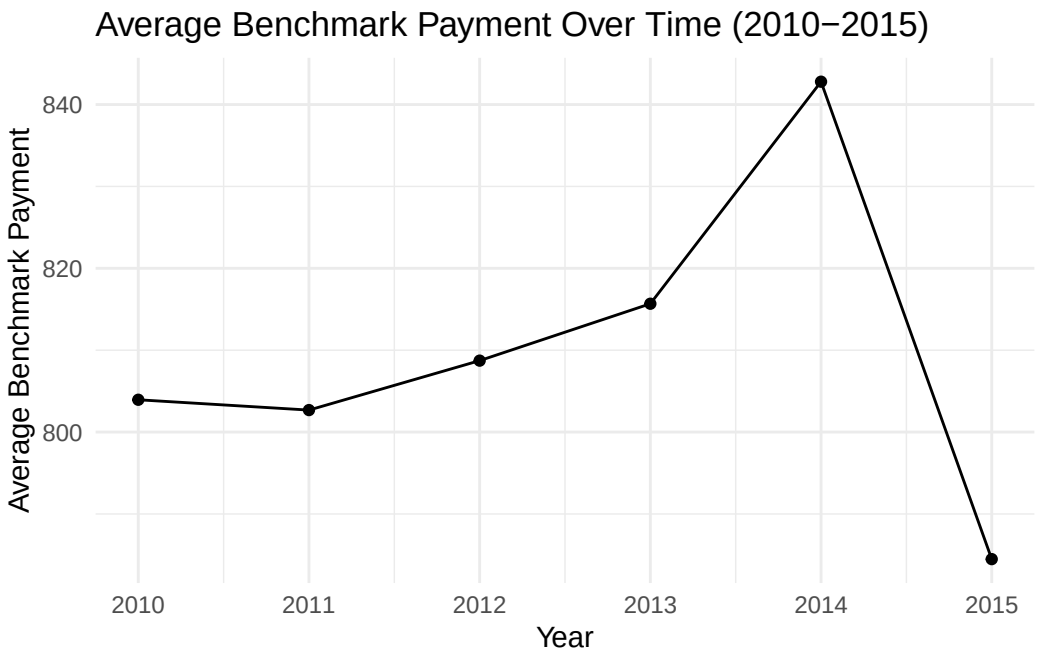


Figure 3: The Average Benchmark Payment Over Time From 2010 Through 2015

Figure 3 shows that the average benchmark payment has risen by approximately 20% between 2010 and 2015. Interestly, however, we can see a massive drop off in benchmark payments in 2015 compared to 2014.

4. Plot the average share of Medicare Advantage (relative to all Medicare eligibles) over time from 2010 through 2015. Has Medicare Advantage increased or decreased in popularity? How does this share correlate with benchmark payments?

See Figure 4:

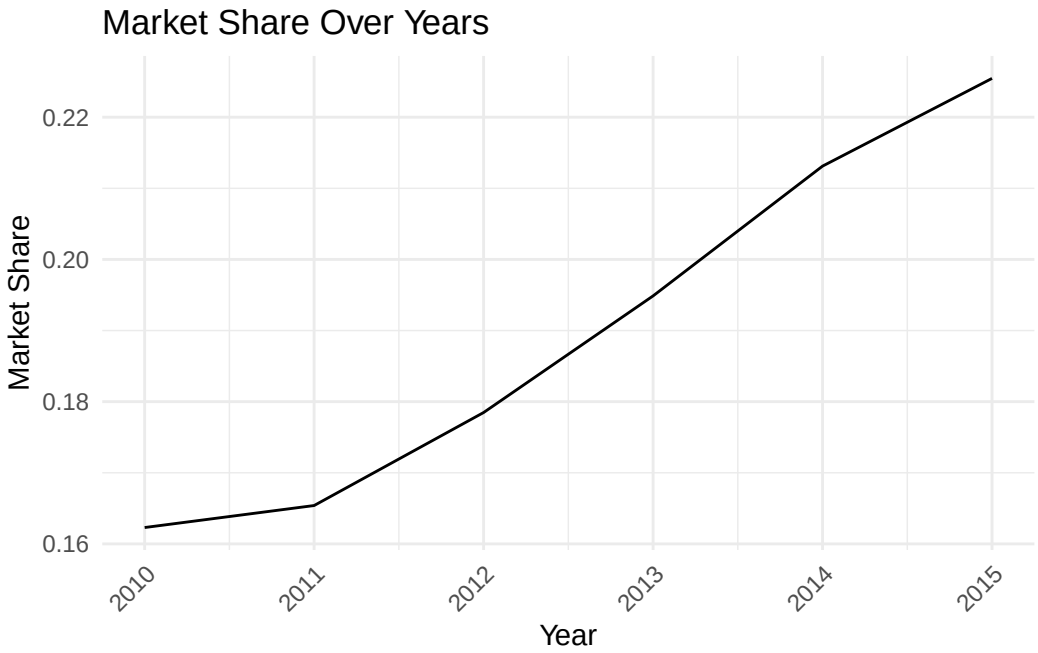


Figure 4: The Average Share of Medicare Advantage (relative to all Medicare eligibles) Over Time From 2010 Through 2015

Figure 4 shows that the average share of Medicare Advantage enrollees (relative to all Medicare eligibles) has increased in popularity over time from 2010 to 2015. This coincides with the increase in average benchmark payments over the same period (excluding 2015 for now). Figure 4 suggests a possible correlation between the rise in benchmark payments and the growing popularity of Medicare Advantage plans. Higher benchmark payments could incentivize insurers to offer more attractive Medicare Advantage plans (benefits, coverage options, etc.), potentially leading to increased enrollment.

Estimate ATEs

For the rest of the assignment, we'll use a regression discontinuity design to estimate the average treatment effect from receiving a marginally higher rating. We'll focus only on 2010.

5.Calculate the running variable underlying the star rating. Provide a table showing the number of plans that are rounded up into a 3-star, 3.5-star, 4-star, 4.5-star, and 5-star rating.

Table 1: Number of Plans Rounded Up Into a 3-star, 3.5-star, 4-star, 4.5-star, and 5-star Rating

3-star	3.5-star	4-star	4.5-star	5-star
1734	1815	606	0	26

6. Using the RD estimator with a bandwidth of 0.125, provide an estimate of the effect of receiving a 3-star versus a 2.5 star rating on enrollments. Repeat the exercise to estimate the effects at 3.5 stars, and summarize your results in a table.

Table 2: RD Estimator With a Bandwidth of 0.125, Estimate of the Effect of Receiving a 3-star Versus a 2.5 Star Rating on Enrollments

	Rating	Coeff	Std..Err.	z	P.Value
Conventional	3 vs 2.5	-0.0075367	0.0047387	-1.5904336	1
Bias-Corrected	3 vs 2.5	0.0070187	0.0047387	1.4811294	1
Robust	3 vs 2.5	0.0070187	0.0117124	0.5992535	1

The coefficient value is about 0.007, which represents the estimated difference in enrollment probability between the 3-star and 2.5-star rating groups. A positive coefficient indicates that a 3-star rating is associated with a higher enrollment probability. The positive, but very small (around 0.7%) coefficient indicates that a 3-star rating is associated with a higher enrollment probability. However, the p-value is 1 which is greater than 0.05, indicating that the observed effect is unlikely to be due to random chance—that the small positive coefficient might not be statistically significant.

Table 3: RD Estimator With a Bandwidth of 0.125, Estimate of the Effect of Receiving a 3.5-star Versus a 3 Star Rating on Enrollments

	Rating	Coeff	Std..Err.	z	P.Value
Conventional	3 vs 3.5	-0.0050337	0.0025888	-1.944436	1
Bias-Corrected	3 vs 3.5	-0.0621078	0.0025888	-23.991186	1
Robust	3 vs 3.5	-0.0621078	0.0083430	-7.444267	1

Looking at the coefficient value for the Bias-Corrected estimate, -0.0621, we can infer that a 3.5-star rating is associated with a lower enrollment probability compared to a 3-star rating. The coefficient here is negative and much larger in magnitude than the coefficient for the 3-star vs 2.5-star comparison. However, the p-value is 1 which again suggests that the observed effect might not be statistically significant.

7. Repeat your results for bandwidhts of 0.1, 0.12, 0.13, 0.14, and 0.15 (again for 3 and 3.5 stars). Show all of the results in a graph. How sensitive are your findings to the choice of bandwidth?

Figure 5

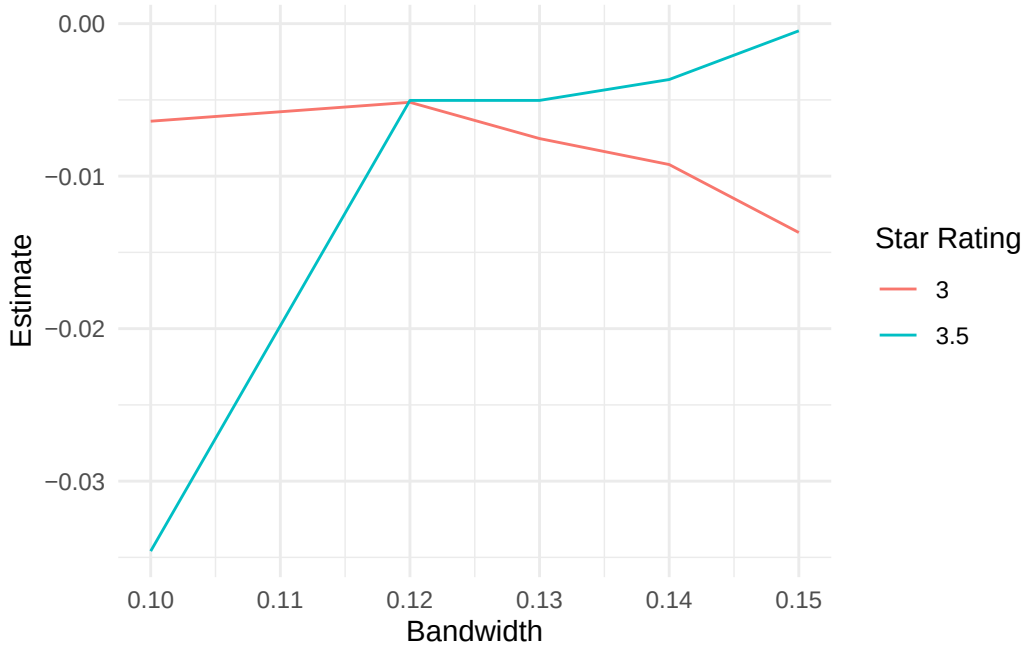
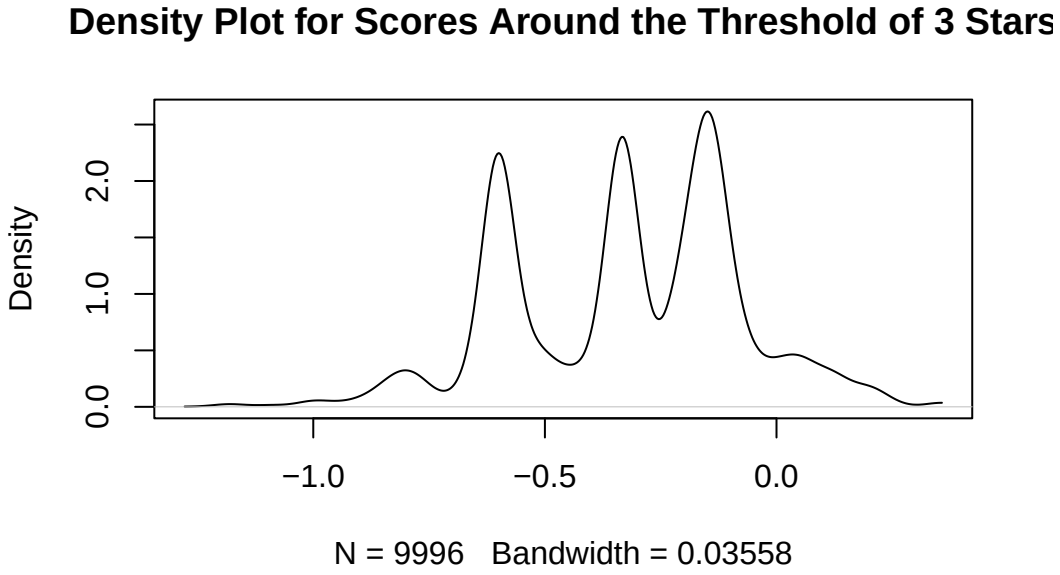
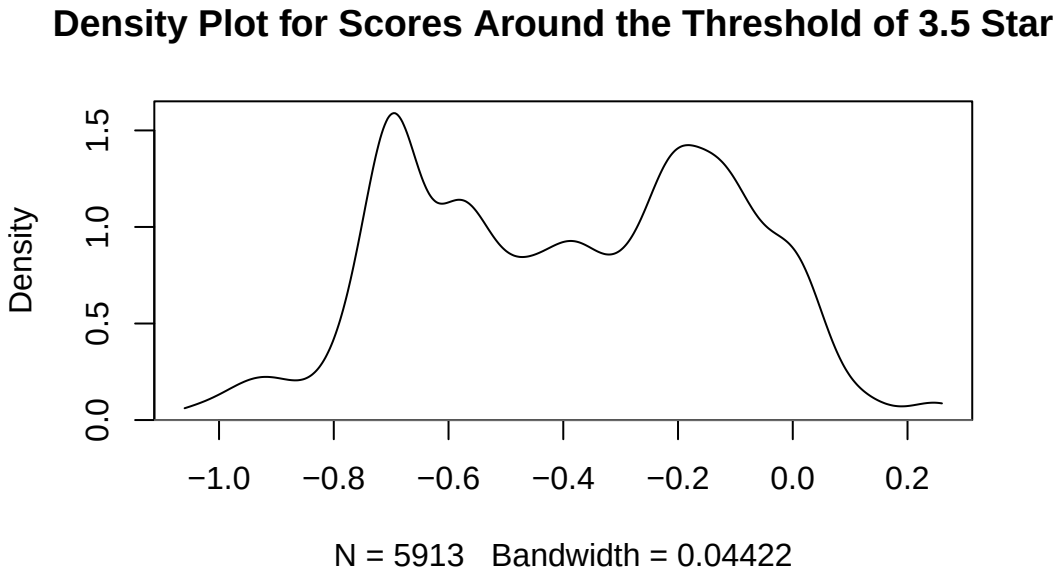


Figure 5: Regression Output of Log(Sales) on Log(Prices) with Cigarette Tax as an Instrumental Variable

Figure 5 shows that the RD estimate for the effect of a 3-star rating compared to a 2.5-star rating is positive, indicating a higher enrollment for plans with a 3-star rating. Similarly, the effect for a 3.5-star rating is also positive and likely higher than the effect for a 3-star rating. This suggests that a higher star rating is associated with an increase in enrollment. The lines for both the 3-star and 3.5-star effects appear relatively flat across the different bandwidth values (0.1 to 0.15), with a change at 0.12. This suggests that the findings are not highly sensitive to the specific choice of bandwidth within this range.

8. Examine (graphically) whether contracts appear to manipulate the running variable. In other words, look at the distribution of the running variable before and after the relevent threshold values. What do you find?





There seems to be a concentration of data points at higher values of the running variable after the thresholds. This means that contracts with scores that just meet or exceed the thresholds (3 stars and 3.5 stars) are more common than contracts with scores slightly below the thresholds. However this doesn't necessarily show that there was data manipulation. I think the concern about manipulation would be if there were a sharp increase in scores right at the thresholds, with very few scores just below the threshold. The plots do show a higher density of scores near the thresholds, but the increase is gradual rather than a sharp spike.

9. Similar to question 4, examine whether plans just above the threshold values have different characteristics than contracts just below the threshold values. Use HMO and Part D status as your plan characteristics.

See Figure 6:

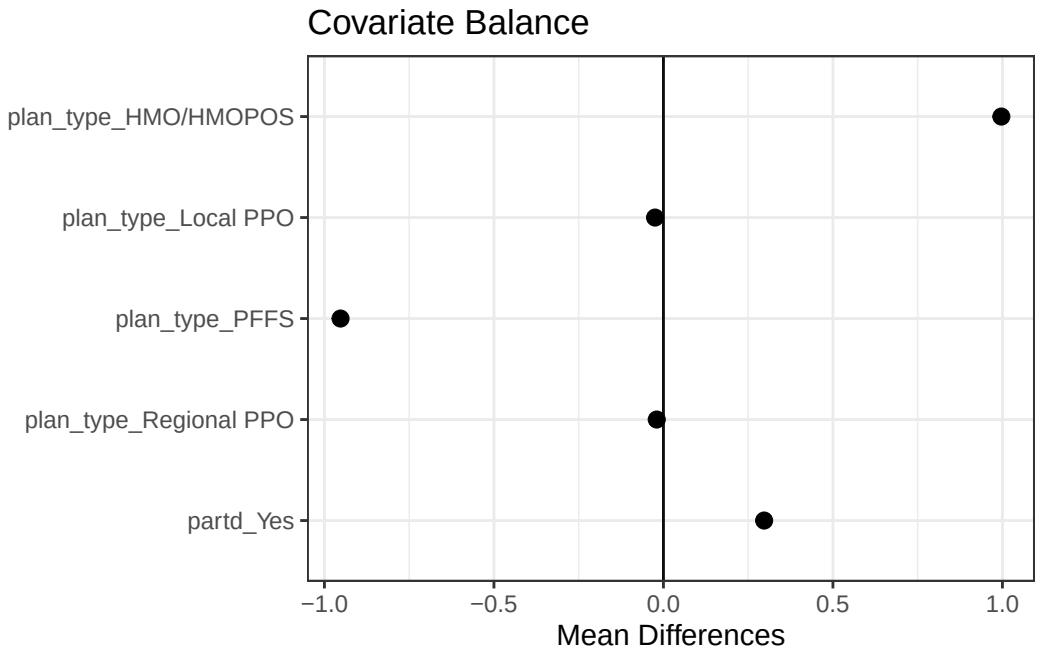


Figure 6: Comparison Below and Above 3-Star Threshold with HMO and Part D Status as Plan Characteristics

See Figure 7:

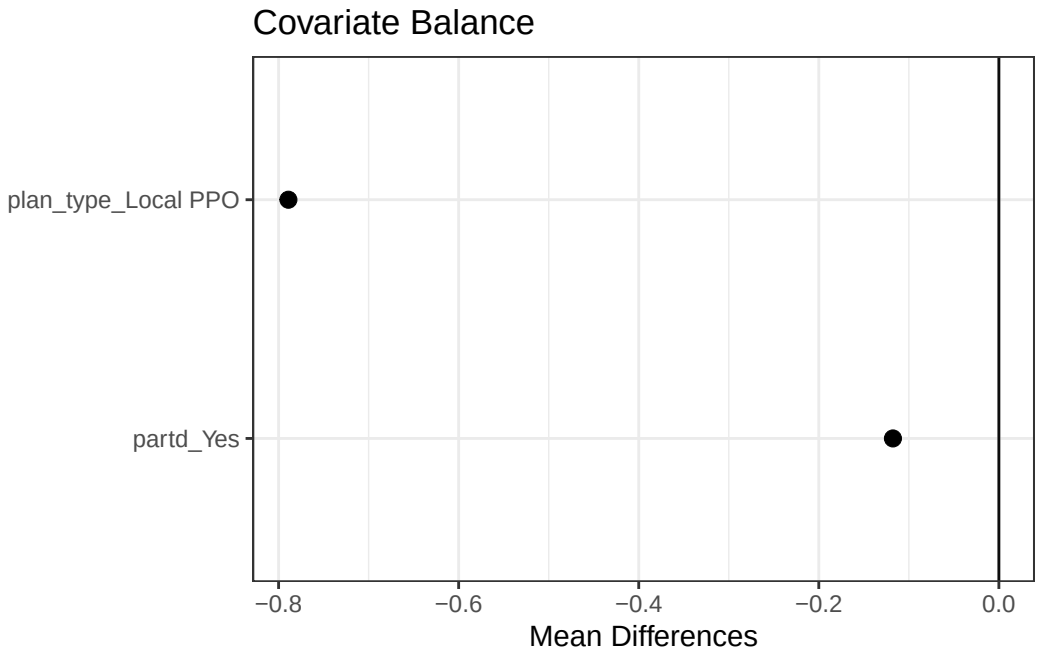


Figure 7: Comparison Below and Above 3.5-Star Threshold with HMO and Part D Status as Plan Characteristics

10. Summarize your findings from 5-9. What is the effect of increasing a star rating on enrollments? Briefly explain your results.

The analysis suggests a positive correlation between higher star ratings and increased enrollment in Medicare Advantage plans. This means that plans with higher star ratings tend to have more enrollees compared to plans with lower star ratings. The bar graphs for star rating distribution over time (2010, 2012, 2015) show a shift towards higher ratings, potentially indicating a connection to increased popularity. The line graph for the average share of Medicare Advantage enrollees shows an upward trend from 2010 to 2015, coinciding with the potential increase in enrollment for higher-rated plans. The findings suggest a potential link between higher star ratings and increased enrollment in Medicare Advantage plans. Additionally, questions and 8 and 9 show little evidence of manipulation of star ratings, making our results more robust.