

Homework 4 - Submission 3

ECON 470

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Homework 4

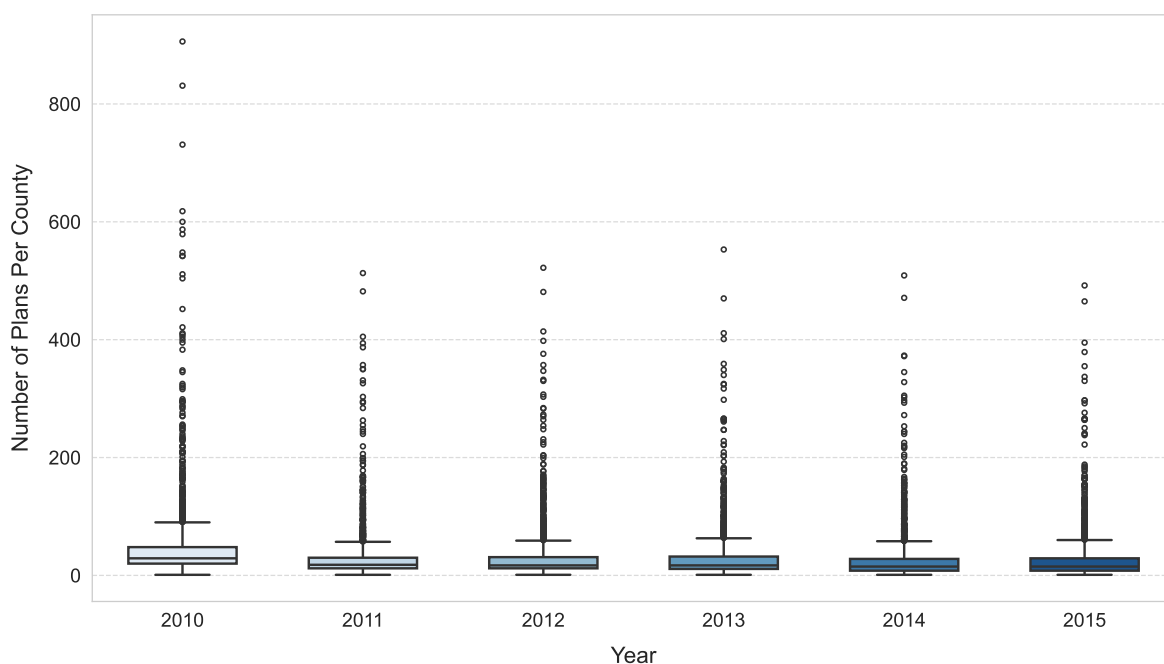
[Link to Github](#)

Summarizing the Data

1.

All SNPs, 800-series plans, and perscription drug only plans where removed from the dataset so that only plans that offer Part C benefits were included. Then, a box-and-whisper plot showing the distribution of plan counts by county over time was created. An accompanying table was also created to better digest the data.

Distribution of Medicare Advantage Plans by County (2010-2015)

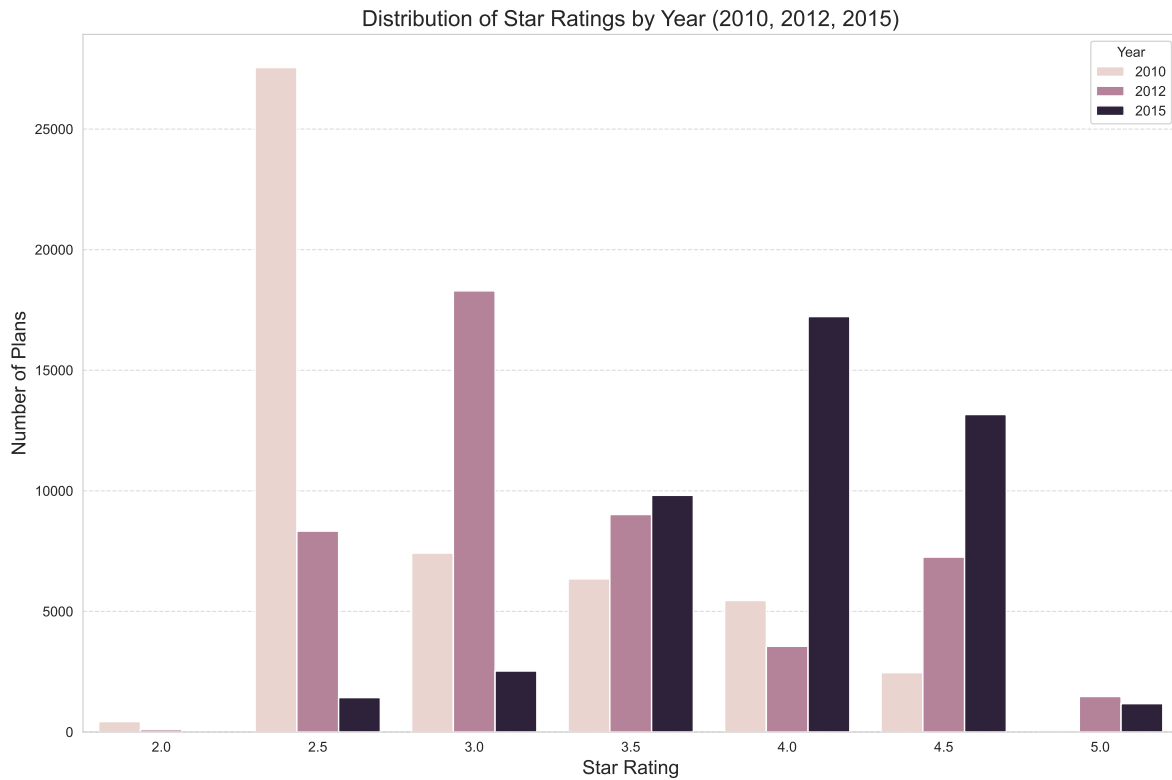


Year	Median	Mean	Min	Max
2010	29	48.7	1	906
2011	18	30.2	1	513
2012	17	30.0	1	522
2013	17	29.2	1	553
2014	15	26.5	1	509
2015	15	27.3	1	492

Looking at the table and graph table above, We can see that after 2010 the number of plans with Part C benefits offered in each country dropped significantly. The county with the highest number of Part C plans dropped from 906 in 2010 to 513 in 2011, and the median and mean dropped from 29 and 48.7 to 18 and 30.2 respectively. This trend continued after 2011, with the number of plans remaining significantly lower than in 2010.

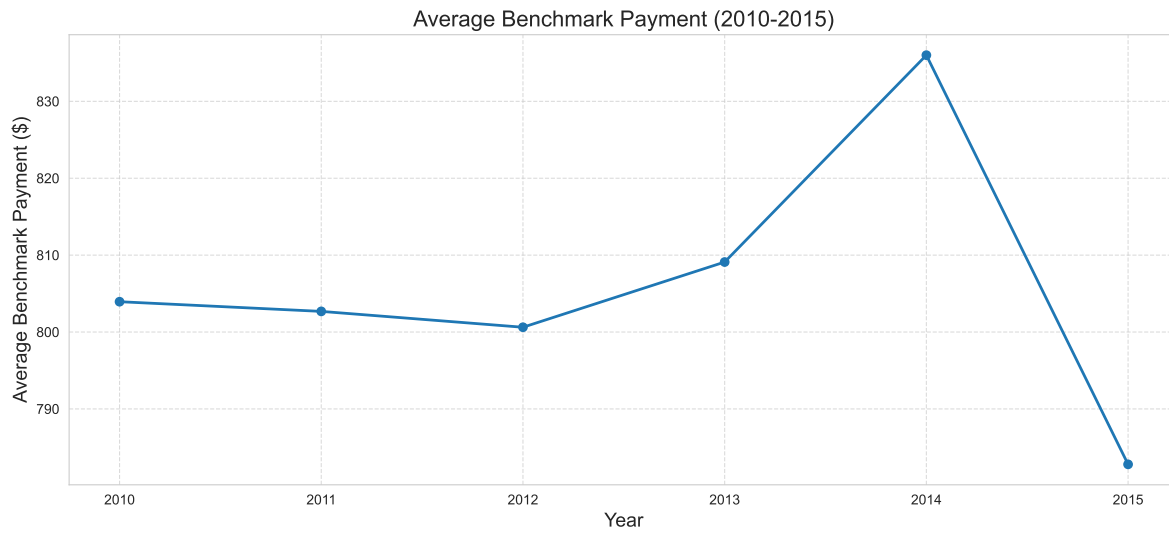
The number of Medicare Advantage plans per county appears generally sufficient. Median plan availability dropped from 29 to 15, while some counties still had hundreds of plans, suggesting a highly skewed distribution. While it seems sufficient, the wide variation points to potential inequality between rural and urban counties.

2.



Assessing the graph above, we can see a steady improvement in average star rating from 2010 to 2015. In 2010 the most common rating for a plan was 2.5. It then increased to 3.0 in 2012, and in 2015 the most popular star-rating was 4.0 by significant amount. 2015 also saw no plans being rated as low as 2.0, and some plans were rated as high as 5.0.

3.

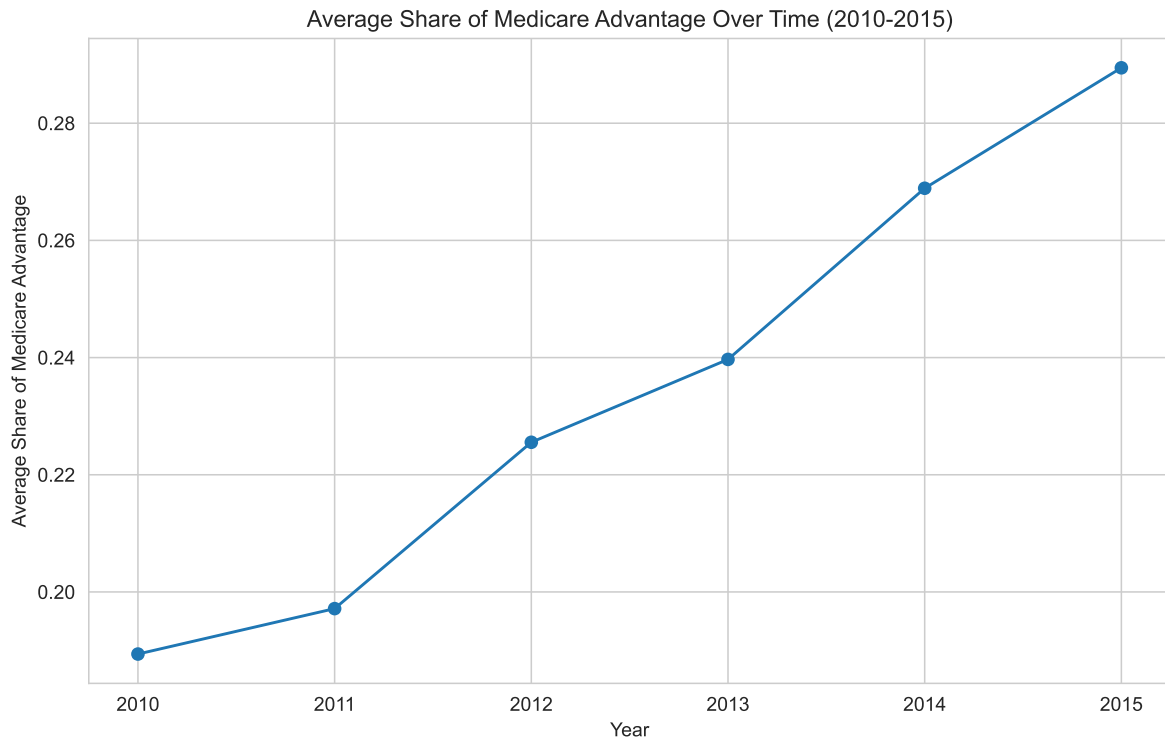


Increase from 2010 to 2015: \$-21.15 (-2.6%)

The graph slowly rised until 2014 where it drastically fell. However, due to the scale of the graph, the changes in average benchmark payment are not that significant when considering how large they are.

In order to assess the overall trend of average benchmark payments, broader years need to be analyzed. Further research should look to see if average benchmark payment continued to fall in 2016 and further into the present.

4.



The graph shows a steady increase in the average Medicare Advantage (MA) share from 2010 to 2015, rising from roughly 11% to over 30%.

This growth shows the increase of private insurance participation in Medicare which should also result in decreasing government expenditure. However, when we look at average benchmark payments, we see that there has not been any significant decrease in prices. Further research into the payment structure of Medicare Advantage, as well as the data being used, is necessary in order to draw any conclusions.

Estimating Average Treatment Effects (ATEs)

5.

	Star Rating	Number of Plans
0	3.0	4962
1	3.5	3611
2	4.0	1935
3	4.5	50
4	5.0	0

Even when rounding plans up the nearest half-star rating, we can see that a majority of plans are below 3.0. There are very few plans above 4.0, and none above 4.5. This falls in line with the graphs shown earlier in popints 1-4.

6.

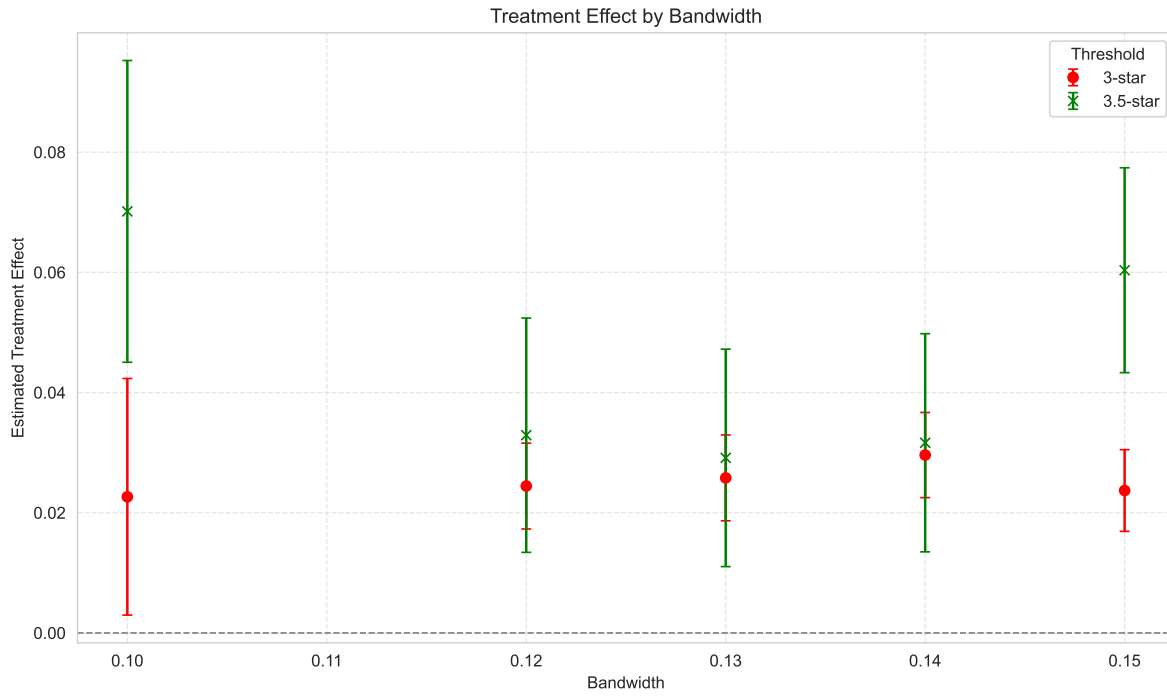
Table 2: RD Estimates at 3-Star and 3.5-Star Thresholds

	3-Star Threshold	3.5-Star Threshold
Intercept	0.189 (0.002)	0.224 (0.009)
Rounded	0.024 (0.004)	0.033 (0.010)
Running Score	0.093 (0.018)	0.316 (0.050)
N	5084	1733
R2	0.016000	0.046000

At the 3-star threshold, rounding increases market share by 2.4 percentage points, while at the 3.5-star threshold, the effect is slightly larger at 3.3 percentage points. The running score is also positively associated with market share at both thresholds, suggesting that even small differences in raw rating influence enrollment.

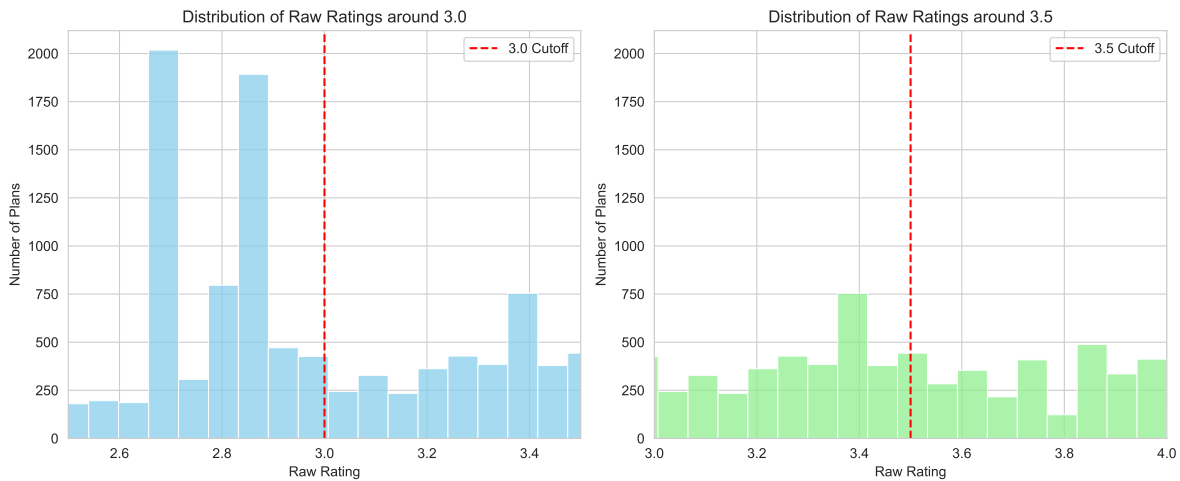
It is worth noting, however, that the R^2 for both thresholds is very small.

7.



- For the 3.0-star threshold, the treatment effect estimates remain stable and significant across all bandwidths, indicating low sensitivity to bandwidth choice. The narrow and overlapping confidence intervals reinforce the robustness of the estimated effect of rounding to 3 stars.
- For the 3.5-star threshold, the treatment effect estimates fluctuate more noticeably across bandwidths, suggesting greater sensitivity. The wider confidence intervals, especially at smaller bandwidths, highlight less precision and more uncertainty in the effect of rounding to 3.5 stars.

8.



These two histograms show the distribution of raw star ratings around the 3.0 and 3.5 cutoff points.

- At the 3.0 threshold, the distribution of the running variable shows potential signs of manipulation or rating bunching, which may challenge the validity of RD estimates there.
- In contrast, the 3.5 threshold appears more stable, suggesting it may be a more reliable setting for RD analysis.

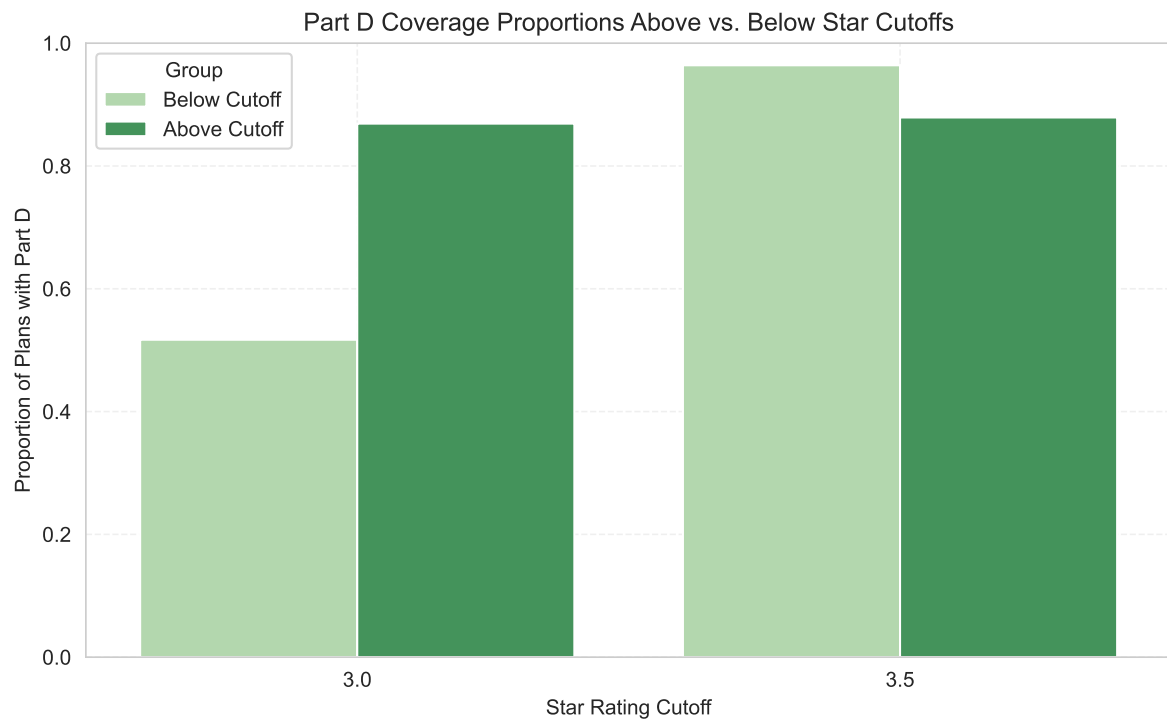
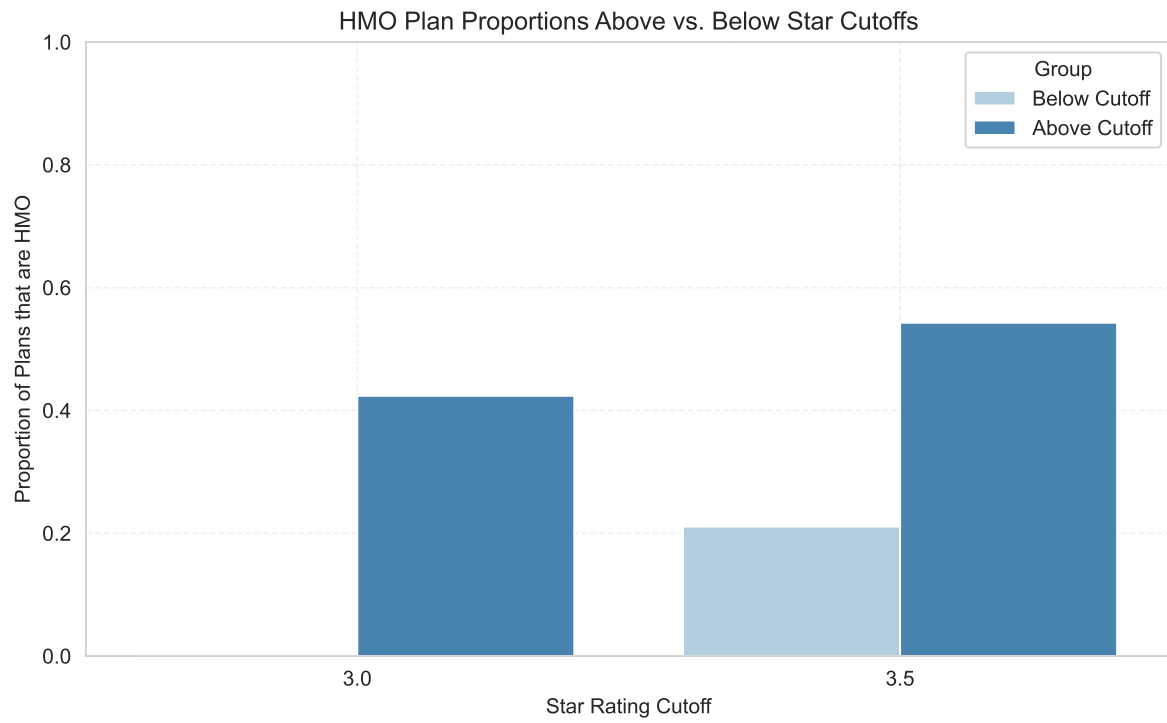
Left Plot: 3.0 Cutoff

- There is a clear jump in density just below 3.0, especially around 2.7–2.9, with much higher counts of plans compared to the bins just above 3.0.
- The drop in frequency immediately after the cutoff suggests that fewer plans narrowly achieved a rating just above 3.0.
- This could indicate manipulation or bunching below the cutoff, where plans either failed to make it past the threshold or were rated conservatively.

Right Plot: 3.5 Cutoff

- The distribution appears smoother and more balanced around the 3.5 threshold.
- There's no obvious discontinuity or bunching just above or below 3.5 —> the frequency of plans seems fairly even across the window.
- This supports the RD assumption of continuity at 3.5, making it a more credible cutoff for causal inference.

9.



For HMO status, there is a significant jump at the 3.5 threshold: the proportion of HMO plans rises from just over 20% below the cutoff to over 50% above it, indicating a shift in plan type composition. The same can also be said around the 3.0 rating. According to the data, there are no HMO plans below the 3.0 rating. This could be either due to errors in the dataset, or that all plans with an HMO are automatically rated 3.0 stars and above.

For Part D coverage, the difference is most significant at the 3.0 threshold. Plans just above the 3.0 cutoff are far more likely to offer drug coverage than those just below (around 87% vs. 52%). At the 3.5 threshold, Part D coverage remains high on both sides with minimal difference, suggesting little change in this characteristic across the higher threshold.

10. Analysis of Points 5 - 9

Increasing a star rating has a positive and significant effect on Medicare Advantage plan enrollments. At the 3.0-star threshold, rounding up increases market share by 2.4 percentage points, and at 3.5 stars, the effect rises slightly to 3.3 points. The estimated treatment effects at 3.0 are stable and statistically precise across bandwidths, while those at 3.5 are more variable and less precise, suggesting the 3.0 threshold offers more robust evidence. However, bunching in raw ratings just below the 3.0 threshold raises concerns about potential manipulation, whereas the 3.5 threshold shows a smoother, more credible distribution. Overall, higher ratings attract more enrollees, but the reliability of RD estimates depends on the threshold examined.