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# Applied Statistical Analysis II

## POP77003

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REPLICATION STUDY

**Presenter's Name**

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# How Partisanship in Cities Influences Housing Policy

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## How Partisanship in Cities Influences Housing Policy

Faculty Research Working Paper Series

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# Papaer Overview

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## Research Question

In this paper, authors leverage a bevy of data sources to test these competing ideas and holistically assess the degree to which the election of city leaders from different parties delivers different housing policy to constituents.

Are partisan battles between city councilors and mayors having an impact on housing policy?

## Fill Blanks

Previous work has indicated the fiscal policy consequences of local officials' partisanship (de Benedictis-Kessner and Warshaw, 2016, 2020). But it has been unclear whether partisanship in local governments extends to other areas of policy. Here, we show that mayoral partisanship affects contentious multifamily housing production. Together, our results examining both city councilors and mayors help to provide an updated and holistic assessment of the consequences of partisanship in cities for a policy area of contentious contemporary debate – and contribute to a larger literature on democratic representation in local governments (Trounstone, 2010; Warshaw, 2019).

## Model

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### McCrary Tests

It is a statistical testing method, usually used to test whether a variable has a breakpoint or jump point at a specific value. To determine whether a variable has structurally changed at a specific numerical point. The authors present the results of the MacRae test observing density continuity at the 50% voting threshold. These tests replicate the RDD framework but use the observed density as the result. If the density of observations "jumps" in quantity across a threshold, this indicates that the assumption that the underlying results.

### Regression Discontinuity Design

This is a commonly used method of causal inference to assess the impact of a treatment on an outcome. RDDs are suitable for sudden changes due to a continuous feature (often called a "breakpoint"). They employed a Regression Discontinuity Design (RDD) to examine the causal impact of the partisanship of city councilors and mayors on housing policies, particularly focusing on the construction of multifamily housing units.



# Data Collection

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To assess the effects of partisanship on local housing policy, we leverage a variety of sources of original data. We collect data on city mayoral and legislative elections and housing policy based on permits for private housing development.

## **City Election Data**

- The authors utilized a new dataset comprising 15,520 city council elections and 3,238 mayoral elections across large cities.

## **City Housing Permits Data**

-To study the impact of the partisanship of city leaders on housing policy, we use data on the housing development permits issued by each city in each year from the Census Bureau's Building Permits Survey.

# McCrary Tests on the Density of Observations

```
# formal McCrary test:
```

```
width <- .005
data.graph <- data_2p %>%
  mutate(bin=cut(demshare, breaks=seq(0,1, width))
  )
```

```
bins <- data.frame(bin = levels(data.graph$bin),
  mid = seq(0 + width/2, 1 - width/2, width)
)
```

```
data.graph <- left_join(data.graph,bins,by="bin")
```

```
data.graph.all <- data.graph %>%
  select(bin, mid.y, ratio_units_multisingle_delta23avg) %>%
  group_by(bin, mid.y) %>%
  summarise(bin.mean = mean(ratio_units_multisingle_delta23avg, na.rm=T),
            n = sum(!is.na(ratio_units_multisingle_delta23avg))) %>%
  mutate(mid_adj = mid.y - 0.5)
```

```
mc.rd.councils <- lm(n ~ mid_adj * (mid_adj>=0), data=data.graph.all[whic
(data.graph.all$mid.y>=(0.5-fit_ratio_units_multisingle_delta23avg$bws["h", "left"]) &
data.graph.all$mid.y<=(0.5+fit_ratio_units_multisingle_delta23avg$bws["h", "right"])),)
summary(mc.rd.councils)
```

# McCrary Tests on the Density of Observations

Table A3: McCrary Tests

| (a) City Council Elections                      |                               | (b) Mayoral Elections                           |                               |
|---|-------------------------------|---|-------------------------------|
|   | <i>Dependent variable:</i>    |   | <i>Dependent variable:</i>    |
|   | Number of observations in bin |   | Number of observations in bin |
| Votes share bin                                 | 277.922***<br>(50.605)        | Votes share bin                                 | 79.739***<br>(17.272)         |
| Votes share $\geq 0.5$                          | 6.042<br>(4.337)              | Votes share $\geq 0.5$                          | 0.514<br>(1.692)              |
| Votes share bin $\times$ Votes share $\geq 0.5$ | -510.390***<br>(71.567)       | Votes share bin $\times$ Votes share $\geq 0.5$ | -143.739***<br>(24.427)       |
| Constant  | 42.829***<br>(3.067)          | Constant  | 14.659***<br>(1.196)          |
| Observations                                    | 42                            | Observations                                    | 48                            |
| R <sup>2</sup>                                  | 0.636                         | R <sup>2</sup>                                  | 0.464                         |
| <i>Note:</i>                                    | *p<0.1; **p<0.05; ***p<0.01   | <i>Note:</i>                                    | *p<0.1; **p<0.05; ***p<0.01   |

# McCrary Tests on the Density of Observations

In panel (a), “Voteshare bin” and “Voteshare bin  $\times$  Voteshare  $\geq 0.5$ ” are statistically significant, indicating strong evidence of discontinuity in city council elections at the 50% threshold.

In panel (b), the results for the mayoral election are similar, but with a smaller number of observations and a slightly lower  $R^2$ .

The  $R^2$  values in both panels indicate that the independent variables explain moderate variation in the number of observations in the bins for both types of elections, more so for city council elections ( $R^2 = 0.636$ ) than for mayoral elections ( $R^2 = 0.464$ ).

These data may indicate potential manipulation near the cutoff points for city council and mayoral elections, as the interaction terms in both panels are significantly negative. This may indicate that fewer candidates just pass the threshold than expected under a smooth distribution, which is exactly the evidence of manipulation that the McCrary test looks for.



# RDD Rrgression

```
fit_RI_total_units_multi_ln_delta234avg <- with(data_2p,  
  rdrandinf(Y = total_units_multi_ln_delta234avg,  
    R = demshare,  
    wl=0.48,wr=0.52,  
    rep=10000,  
    cutoff = 0.5,  
    ci=0.05,  
    seed=02139  
    # cluster = cluster,weight=weight  
  ))
```

This code shows how to use stochastic inference methods to estimate the causal impact on the increase in housing units for a Democratic mayor who narrowly won the election.

```
fit_RI_total_units_multi_ln_deltaterm234avg <- with(data_2p,  
  rdrandinf(Y = total_units_multi_ln_deltaterm234avg,  
    R = demshare,  
    wl=0.48,wr=0.52,  
    rep=10000,  
    cutoff = 0.5,  
    ci=0.05,  
    seed=02139  
  ))
```

# RDD Rrgression

```
fit_RI_total_units_multi_ln_delta23avg <- with(data_2p,  
  rdrandinf(Y = total_units_multi_ln_delta23avg,  
    R = demshare,  
    wl=0.48,wr=0.52,  
    rep=10000,  
    cutoff = 0.5,  
    ci=0.05,  
    seed=02139  
    # cluster = cluster,weight=weight  
  ))
```

```
fit_RI_total_units_multi_ln_delta23avg <- with(data_2p,  
  rdrandinf(Y = total_units_multi_ln_delta23avg,  
    R = demshare,  
    wl=0.48,wr=0.52,  
    rep=10000,  
    cutoff = 0.5,  
    ci=0.05,  
    seed=02139  
    # cluster = cluster,weight=weight  
  ))
```

# RDD Rrgression

```
fit_RI_total_units_multi_ln_deltaterm4avg <- with(data_2p,  
  rdrandinf(Y = total_units_multi_ln_deltaterm4avg,  
    R = demshare,  
    wl=0.48,wr=0.52,  
    rep=10000,  
    cutoff = 0.5,  
    ci=0.05,  
    seed=02139  
  ))
```



# RDD Rrgression

Table A6 and A7 are examining the effects of councilor partisanship, while Table A8 and A9 are examining the effects of mayoral partisanship. For Table A6, the p-values are all above 0.05, suggesting that the effects of councilor partisanship on the outcomes related to total buildings, single-family buildings, multi-family buildings, and total units are not statistically significant.

Table A7 also shows no statistically significant effect of councilor partisanship on the proportion of multi-family buildings or units.

Table A6: Effect of Councilor Partisanship on  $\Delta \log(\text{Outcome} + 1)$

| DV                                 | Coef                  | p-value | BW    | Obs  |
|------------------------------------|-----------------------|---------|-------|------|
| Total buildings, T+2/3 Avg         | 0.04<br>(-0.18, 0.27) | 0.7     | 11.97 | 1496 |
| Single-family buildings, T+2/3 Avg | 0.05<br>(-0.18, 0.28) | 0.66    | 12.63 | 1554 |
| Multi-family buildings, T+2/3 Avg  | 0.03<br>(-0.25, 0.38) | 0.67    | 12.64 | 1556 |
| Total units, T+2/3 Avg             | 0.03<br>(-0.26, 0.31) | 0.85    | 10.26 | 1345 |
| Single-family units, T+2/3 Avg     | 0.05<br>(-0.18, 0.28) | 0.66    | 12.63 | 1554 |
| Multi-family units, T+2/3 Avg      | 0.05<br>(-0.48, 0.65) | 0.76    | 9.8   | 1311 |

Table A7: Effect of Councilor Partisanship on  $\Delta$  Housing Composition

| DV  | Coef                   | p-value | BW    | Obs  |
|---|------------------------|---------|-------|------|
| Multi-family proportion of buildings, T+2/3 Avg | -0.01<br>(-0.04, 0.02) | 0.54    | 14.18 | 1668 |
| Multi-family proportion of units, T+2/3 Avg     | -0.03<br>(-0.11, 0.05) | 0.51    | 10.54 | 1364 |

# RDD Rrgression

In Table A8, there is a significant result: the effect of mayoral partisanship on the coefficient of multifamily construction (Coef = 0.37, p-value = 0.04).

Table A9 shows a significant effect of mayoral partisanship on the share of multifamily housing (Coef = 0.08, p value = 0.05), which is right at the common threshold of statistical significance.

Table A8: Effect of Mayoral Partisanship on  $\Delta \log(\text{Outcome} + 1)$

| DV                                 | Coef                   | p-value | BW    | Obs |
|------------------------------------|------------------------|---------|-------|-----|
| Total buildings, T+2/3 Avg         | -0.03<br>(-0.31, 0.19) | 0.62    | 9.65  | 451 |
| Single-family buildings, T+2/3 Avg | -0.06<br>(-0.38, 0.19) | 0.5     | 10.45 | 480 |
| Multi-family buildings, T+2/3 Avg  | 0.37<br>(0.02, 0.77)   | 0.04    | 12.72 | 531 |
| Total units, T+2/3 Avg             | 0.11<br>(-0.19, 0.35)  | 0.55    | 8.82  | 417 |
| Single-family units, T+2/3 Avg     | -0.06<br>(-0.38, 0.19) | 0.5     | 10.45 | 480 |
| Multi-family units, T+2/3 Avg      | 0.75<br>(0.14, 1.5)    | 0.02    | 10.18 | 467 |

Table A9: Effect of Mayoral Partisanship on  $\Delta$  Housing Composition

| DV   | Coef                  | p-value | BW    | Obs |
|--|-----------------------|---------|-------|-----|
| Multifamily proportion of buildings, T+2/3 Avg | 0.03<br>(-0.01, 0.08) | 0.19    | 12.08 | 510 |
| Multifamily proportion of units, T+2/3 Avg     | 0.08<br>(0, 0.18)     | 0.05    | 12.47 | 516 |

# RDD Regression

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Overall, these tables suggest that councilor partisanship has few significant effects on housing outcomes, whereas mayoral partisanship may have some significant effects, at least for multifamily buildings.

- The RDD was central to isolating the causal effects of electing Democrats vs. Republicans.
- Local linear regression was used within the RDD framework, with optimal bandwidth selection to minimize mean-square-error.
- Treatment effects were estimated based on the "jump" in housing outcomes at the threshold of election results.
- Analyses were weighted, and standard errors were clustered by city-year or by city to account for the structure of the data.



# Extended reflection

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**Is it reasonable for the authors to use a regression discontinuity design (RDD) to assess the impact of mayoral partisanship on housing policy?**

-Explicit Intervention Thresholds

(In this scenario, the election outcome (the processing condition) is determined through a predefined, clear threshold (i.e., 50% vote share) that meets the basic conditions for RDD application.)

-Providing estimates of local causal effects

(The ability of RDDs to provide estimates of local causal effects around intervention thresholds is particularly important for understanding the nuances of the impact of mayoral party changes on housing policy.)

-Robustness can be tested in multiple ways

# Extended reflection

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## Limitations!

- Localised causal effects

- Heterogeneity of treatment effects

(For example, cities with different economic conditions, demographics, or city sizes may respond differently to a change in mayor's party affiliation. it is difficult for RDD itself to directly capture and estimate this heterogeneity of effects.)

- Alternative Strategies and External Effects

(For example, a change in mayor's party affiliation may affect other policy decisions related to housing policy (e.g., tax policy, infrastructure development, etc.))



## Findings

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### Contribution

The authors provided evidence that electing mayors from different political parties, particularly Democrats, leads to an increase in multifamily housing production. They suggested that these effects are concentrated in cities where city councils have less power over land use changes.

### Notable findings

While city councilors' partisanship did not show a detectable effect on housing policy outcomes, mayoral partisanship had significant effects on housing outcomes.

The election of a Democratic mayor led to a substantial increase in the supply of multifamily housing units.

The increase in multifamily housing production led to a decrease in housing prices in some instances. Regulatory environments were found to play a role in moderating the influence of mayoral partisanship on housing policy.