The net value of open space preservation: Regression discontinuity evidence from ballot initiatives

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August 11, 2014

Motivation

- Urban sprawl is a major problem
  - Rapid loss of undeveloped farm, forest and open space lands
  - Loss of amenities, ecosystem services and rural character

Research question

- Urban-rural fringe communities face choices: allow development vs. actively conserve

	Benefits	**Costs**
Conservation	• Amenities, ecosystem services • No service expansion	• Increased taxes

➢ What is the net value of open space preservation?

Research question

- What is the net value of open space preservation?
- Evaluate using hedonic framework – house prices capitalize open space amenities and tax changes.
- If housing prices increase with new preservation, then sum effect of taxes and preserved open space is positive for community
  - Indication of under-provision

Prior literature

- Extensive literature on hedonic valuation of open space, typically focused on proximity (e.g., Irwin 2002, Anderson and West 2006)
- Two problems:
  1. Limited policy relevance
  2. Endogeneity

Research design

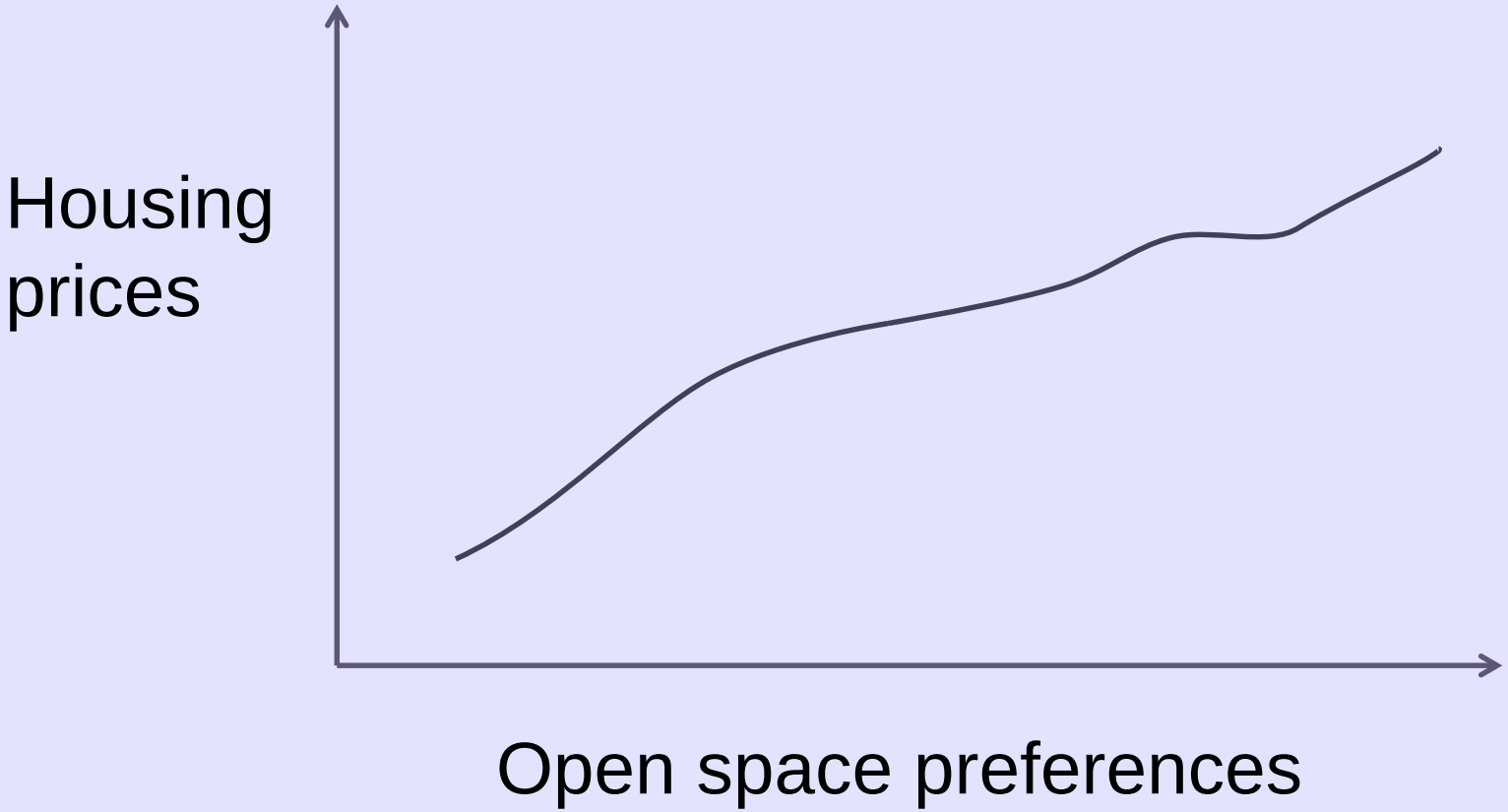
1. Limited policy relevance

- Compare communities that preserve to those that do not preserve.
  - Heintzelman (2010a, 2010b) finds zero to negative capitalization

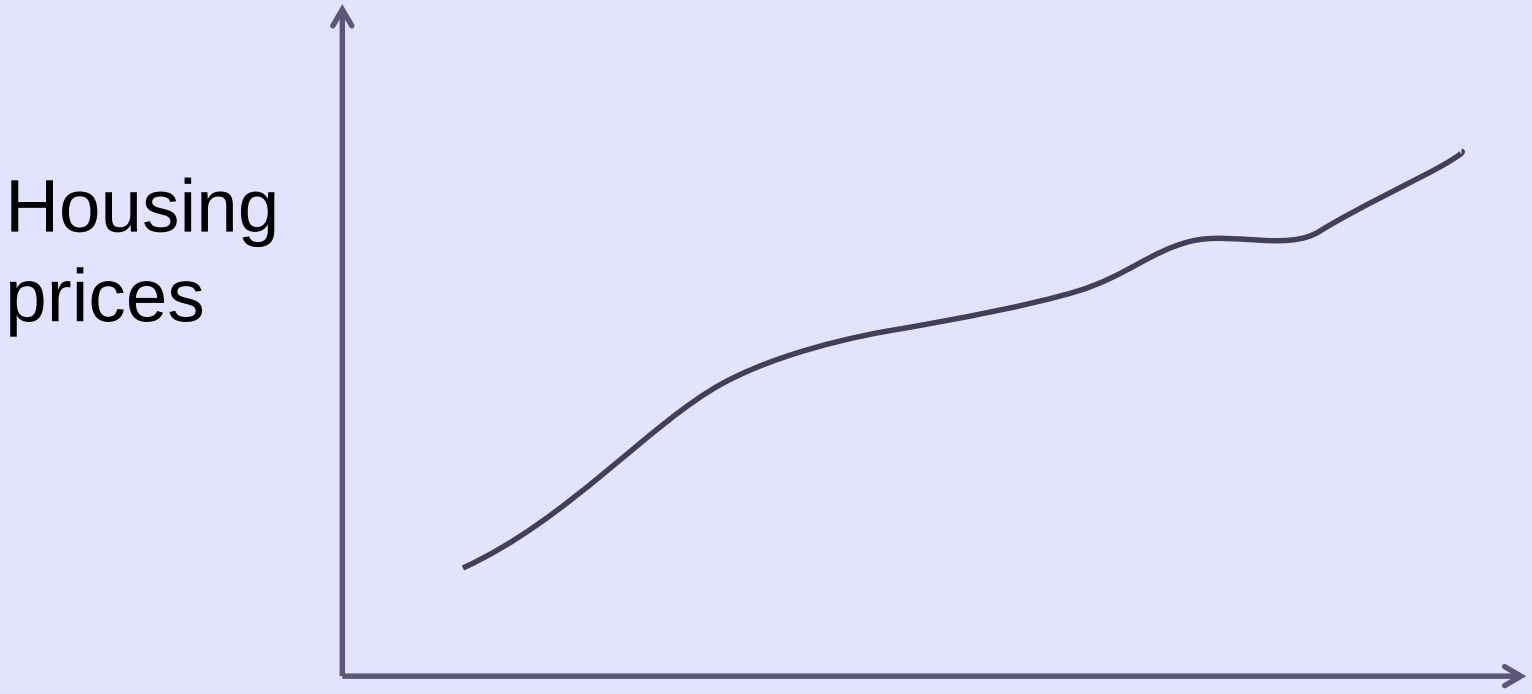
2. Endogeneity

- Use regression discontinuity based on voting outcomes on open space referenda
  - Cellini, Ferreira and Rothstein (2010, *QJE*) examine school bonds

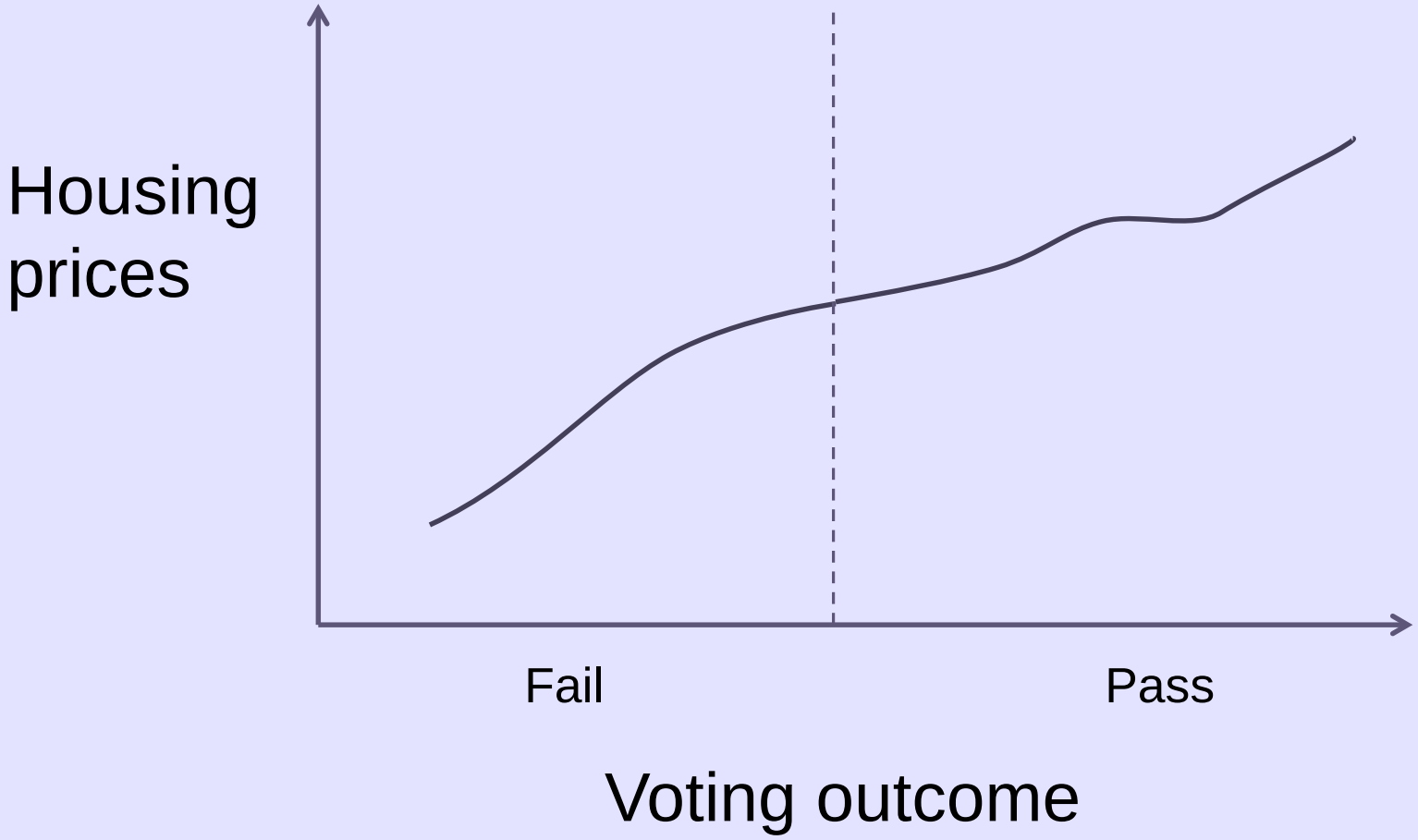
Endogeneity



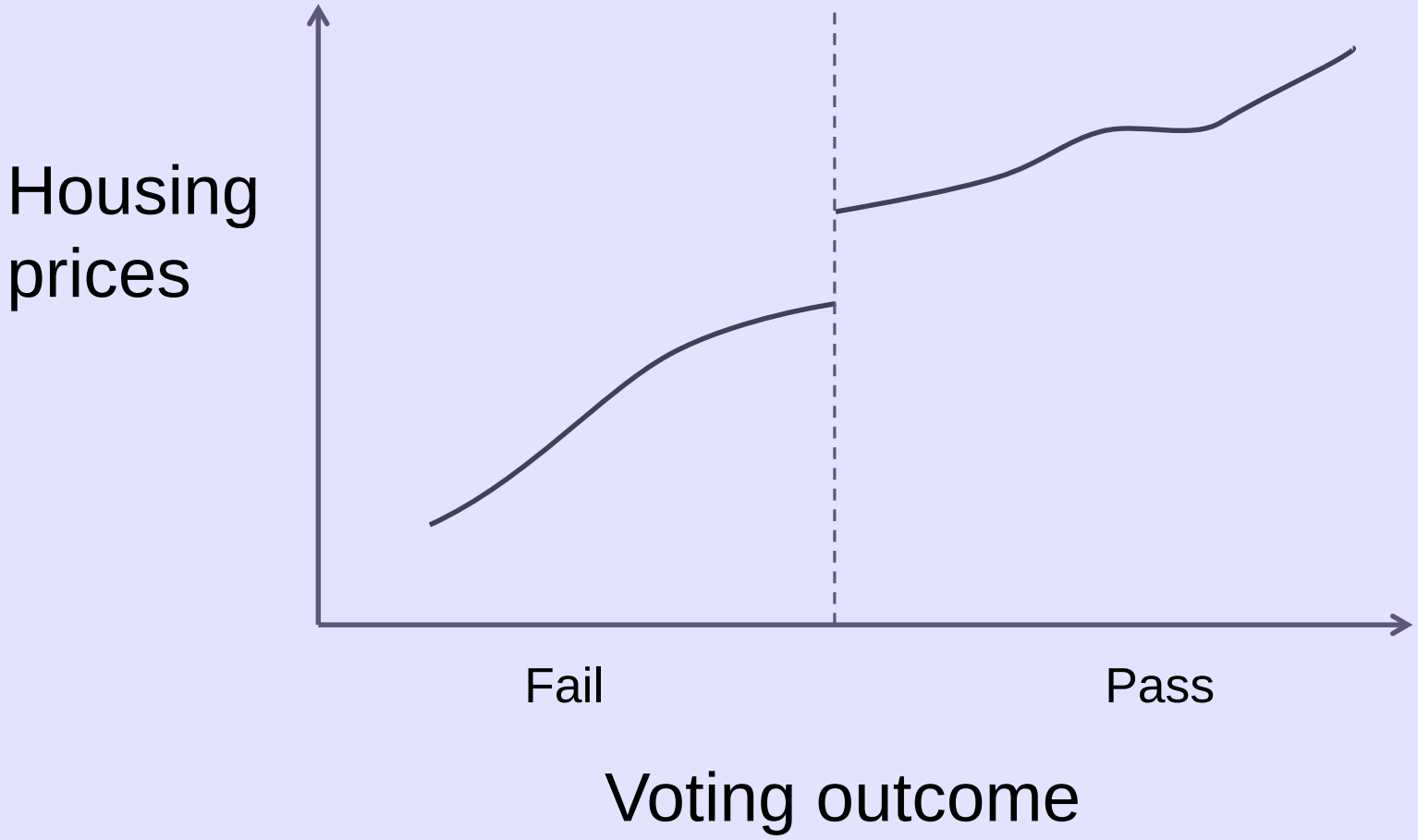
Endogeneity



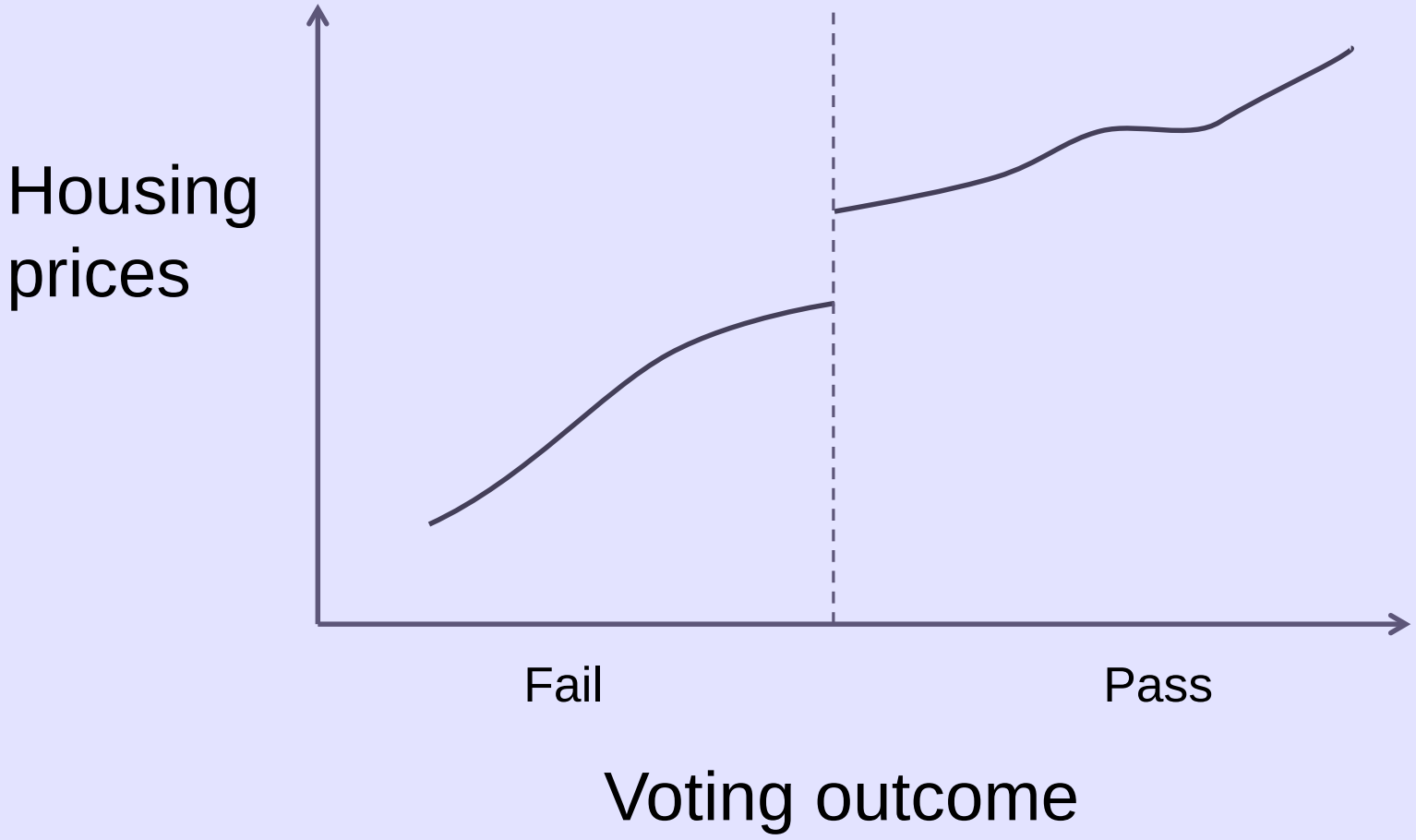
Endogeneity



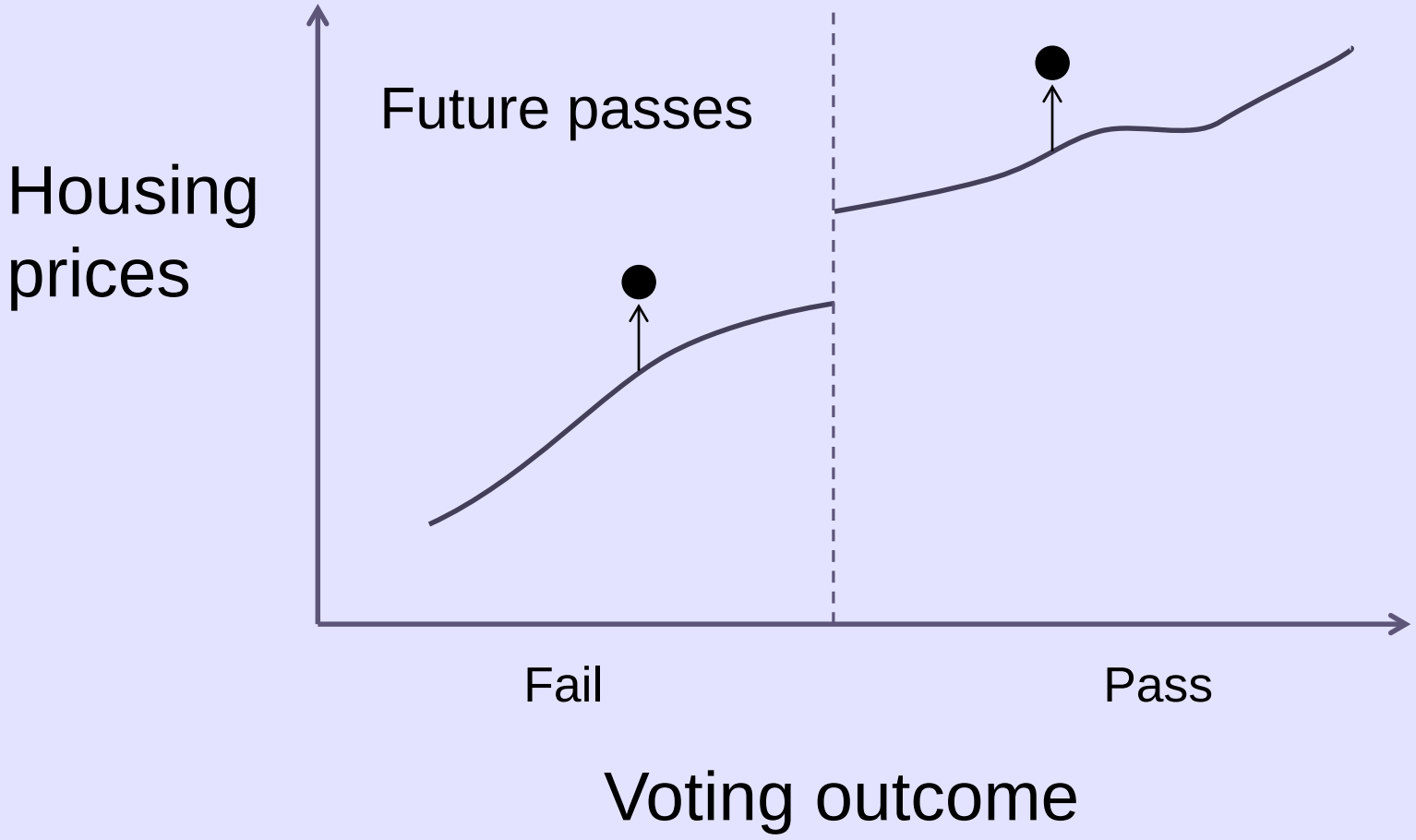
Endogeneity



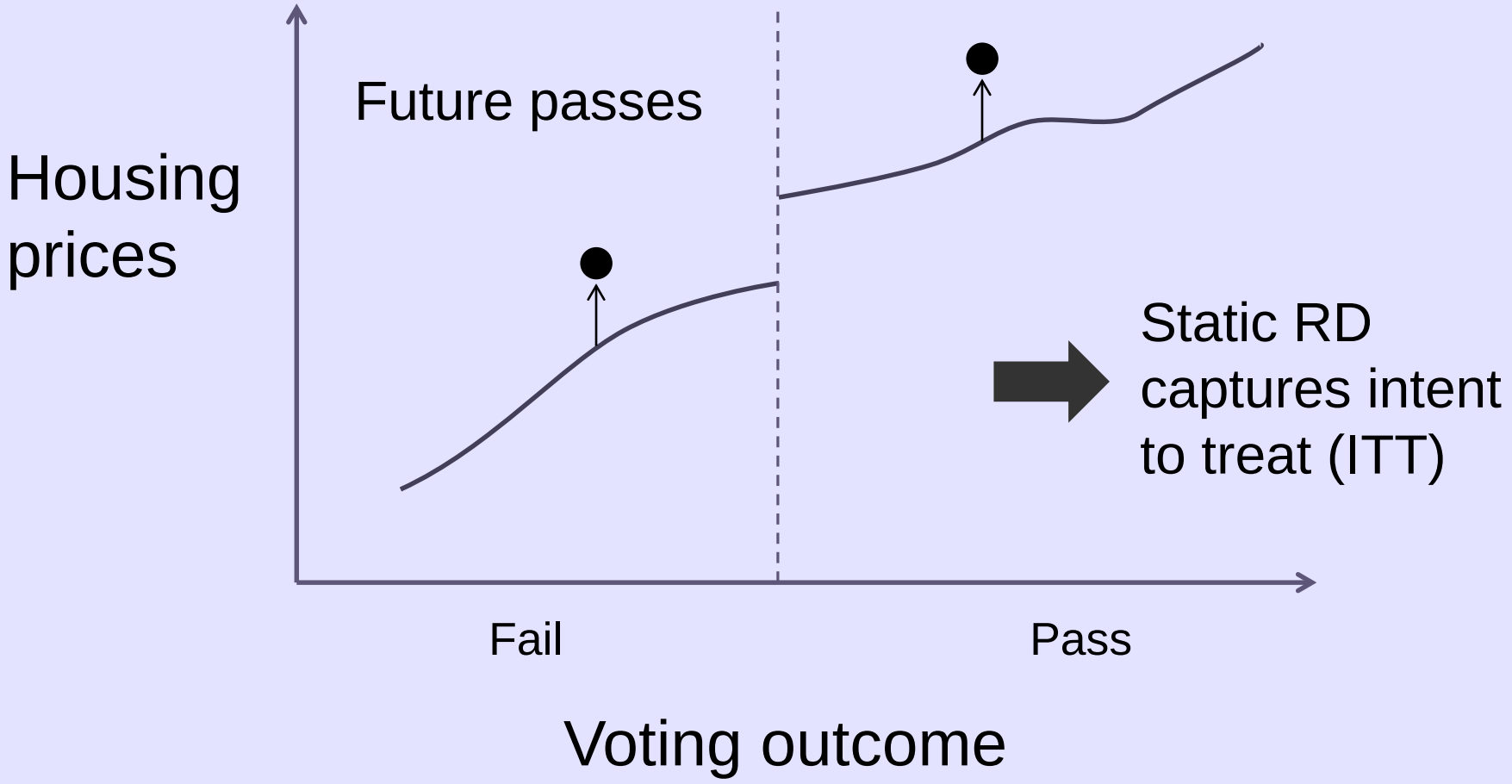
Multiple referenda



Multiple referenda



Multiple referenda



Methods

Basic difference-in-differences:

$$\ln(p_{it}) = \beta pass_{it} + \vartheta_i + \pi_t + \varepsilon_{it}$$

$$\ln(p_{it}) = \beta dollars_{it} + \vartheta_i + \pi_t + \varepsilon_{it}$$

Methods

RD Intent to treat:

$$\ln(p_{it}) = \beta dollars_{it} + f(vm_i, \gamma) + \vartheta_i + \pi_t + \varepsilon_{it}$$

Methods

Dynamic regression discontinuity:

$$\ln(p_{it}) = \sum_{\tau=0}^{\infty}(\beta_\tau\, dollars_{i,t-\tau} + \alpha_\tau b_{i,t-\tau} + f(vm_{i,t-\tau}, \gamma_\tau)) + \vartheta_i + \pi_t + \varepsilon_{it}$$

Data

Land Vote database

- Municipal referenda nationwide, 1988-2013
- Drop if incomplete data or municipality is “large”
- Includes %yes votes, %yes required to pass, amount of funding proposed, amount of funding designated for open space
- Final sample is 1,243 referenda

Data

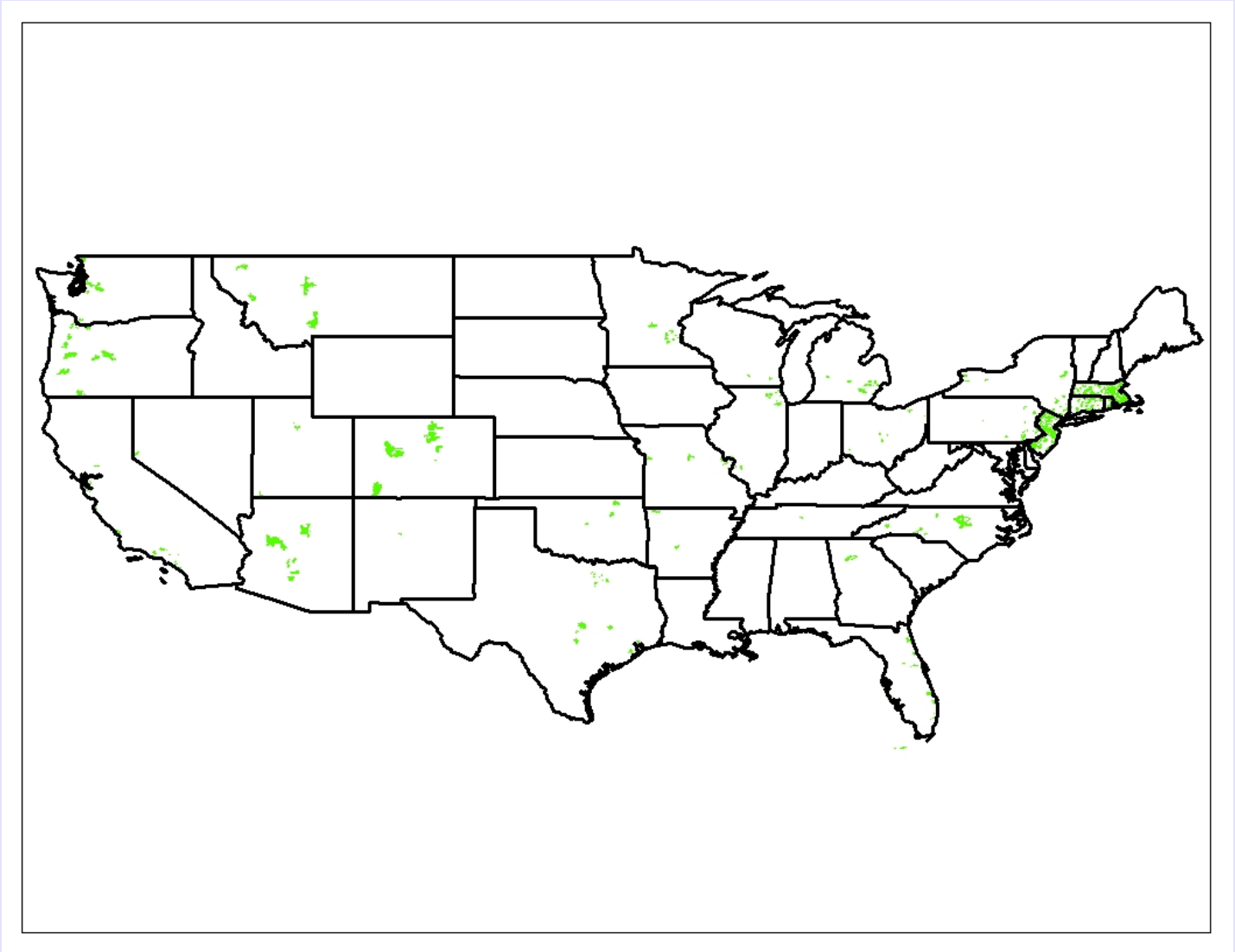
Zillow zip code price estimates

- Annual average, 1997-2013
- Estimates are for a consistent housing stock

Match municipalities to zips

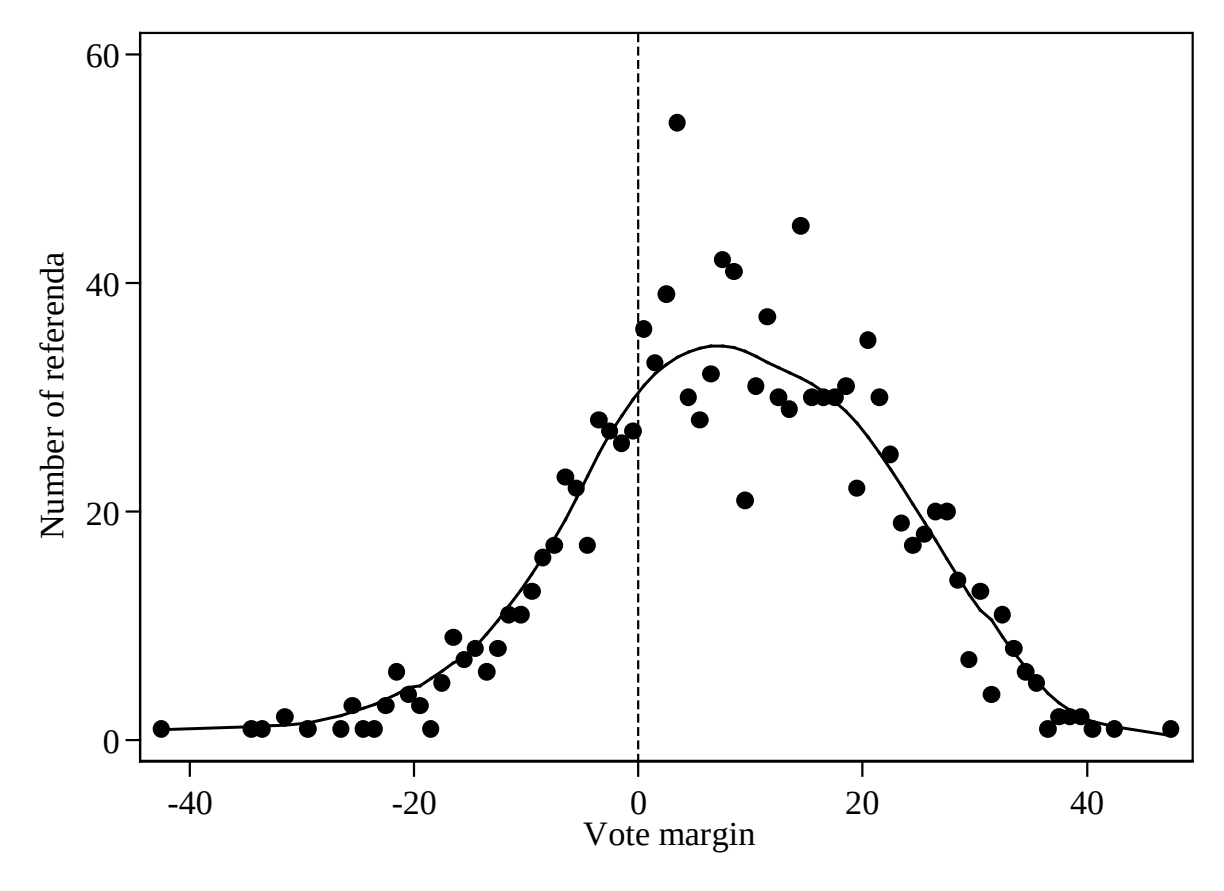
- Final sample is 1,123 zips and 18,536 zip-year observations

Data

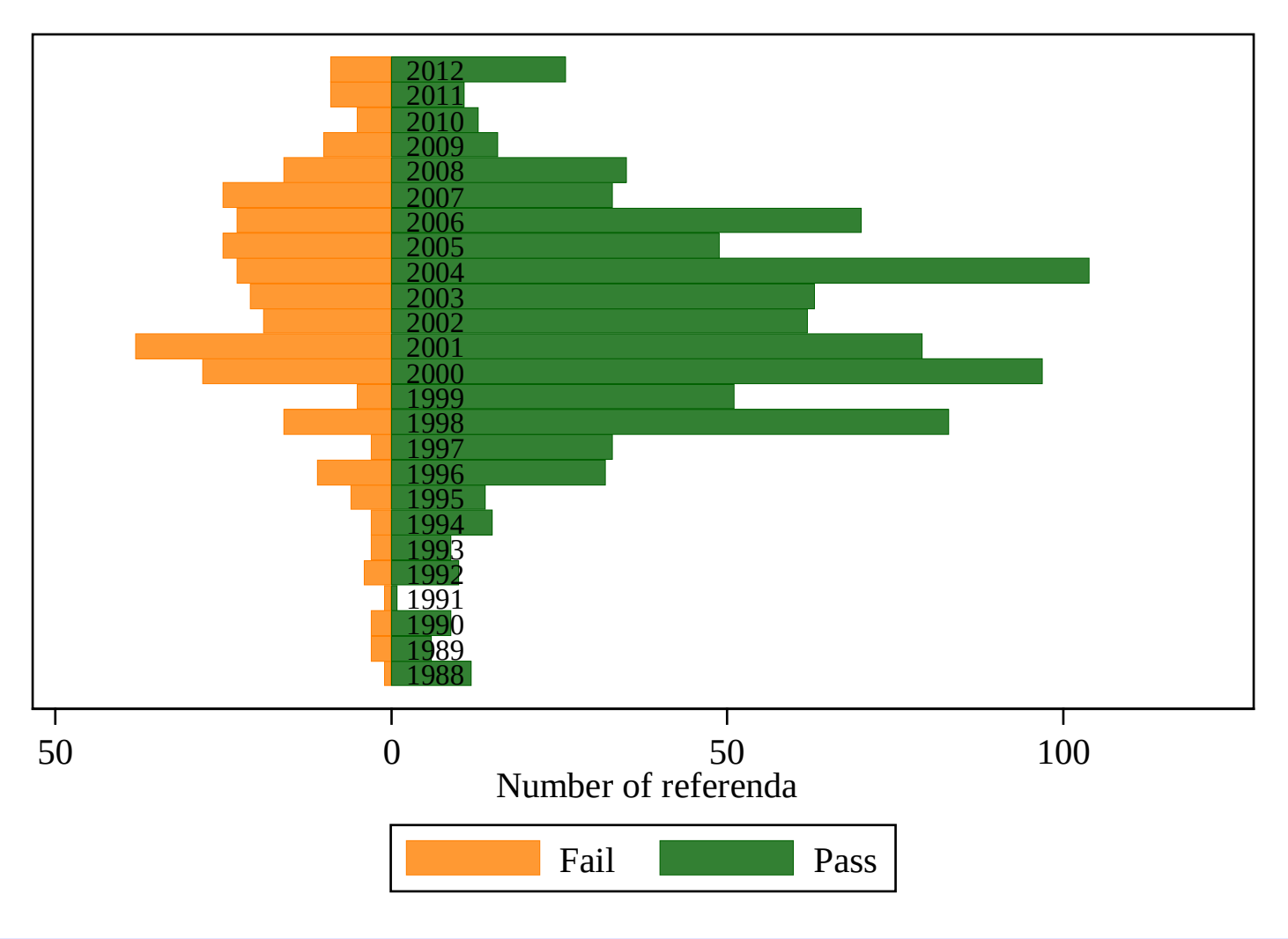


Data

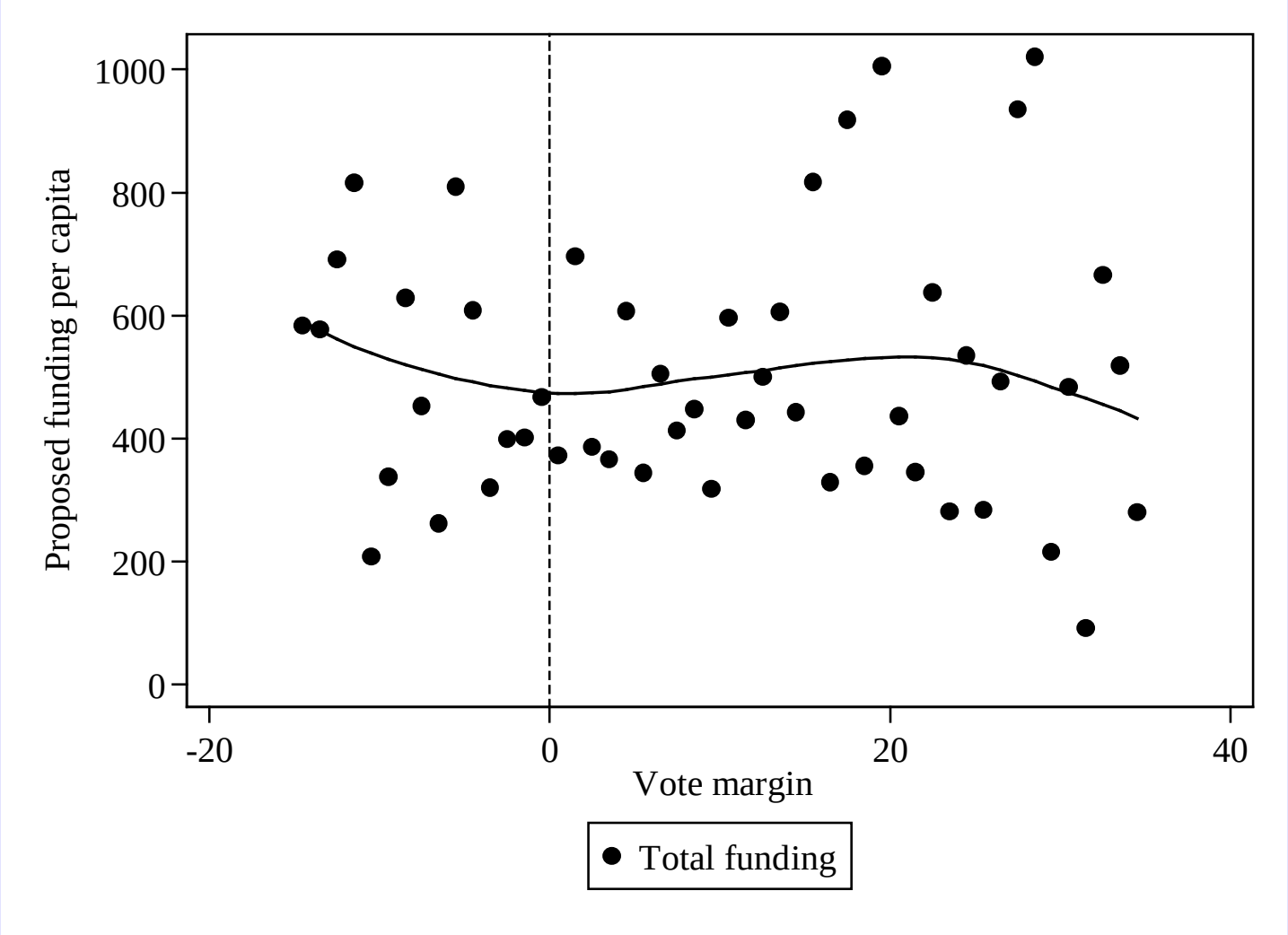
Density of the running variable



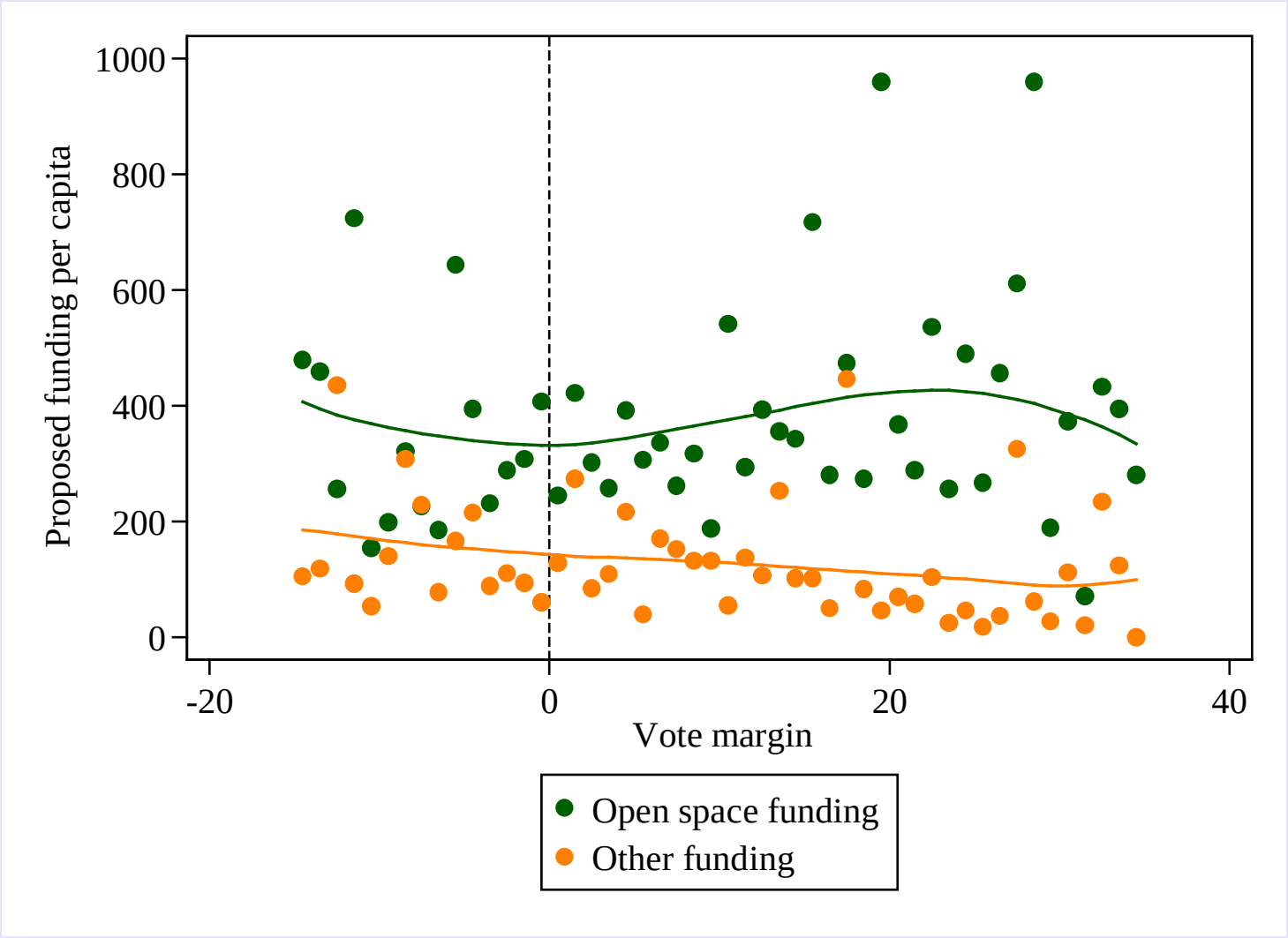
Data


2012
2011
2010
2009
2008
2007
2006
2005
2004
2003
2002
2001
2000
1999
1998
1997
1996
1995
1994
1993
1992
1991
1990
1989
1988
50
0
50
100
Number of referenda
Fail
Pass

Data


Proposed funding per capita
1000
800
600
400
200
0
-20
0
20
40
Vote margin
Total funding

Data


Proposed funding per capita
1000
800
600
400
200
0
-20
0
20
40
Vote margin
Open space funding
Other funding

Results

Dynamic regression discontinuity:

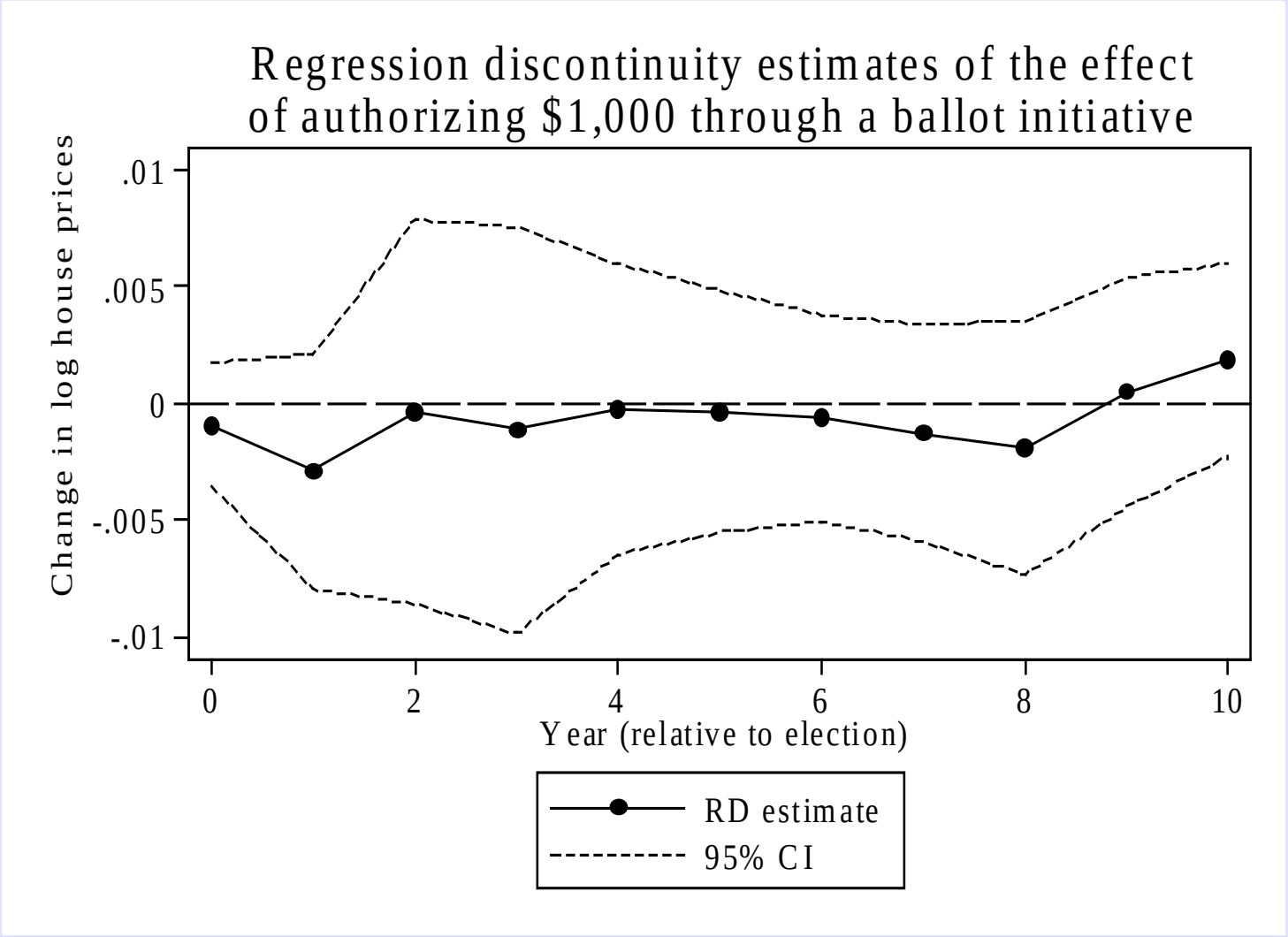
$$\ln(p_{it}) = \sum_{\tau=0}^{\infty}(\beta_\tau \, dollars_{i,t-\tau} + \alpha_\tau b_{i,t-\tau} + f(vm_{i,t-\tau}, \gamma_\tau)) + \vartheta_i + \pi_t + \varepsilon_{it}$$

Split by funding type

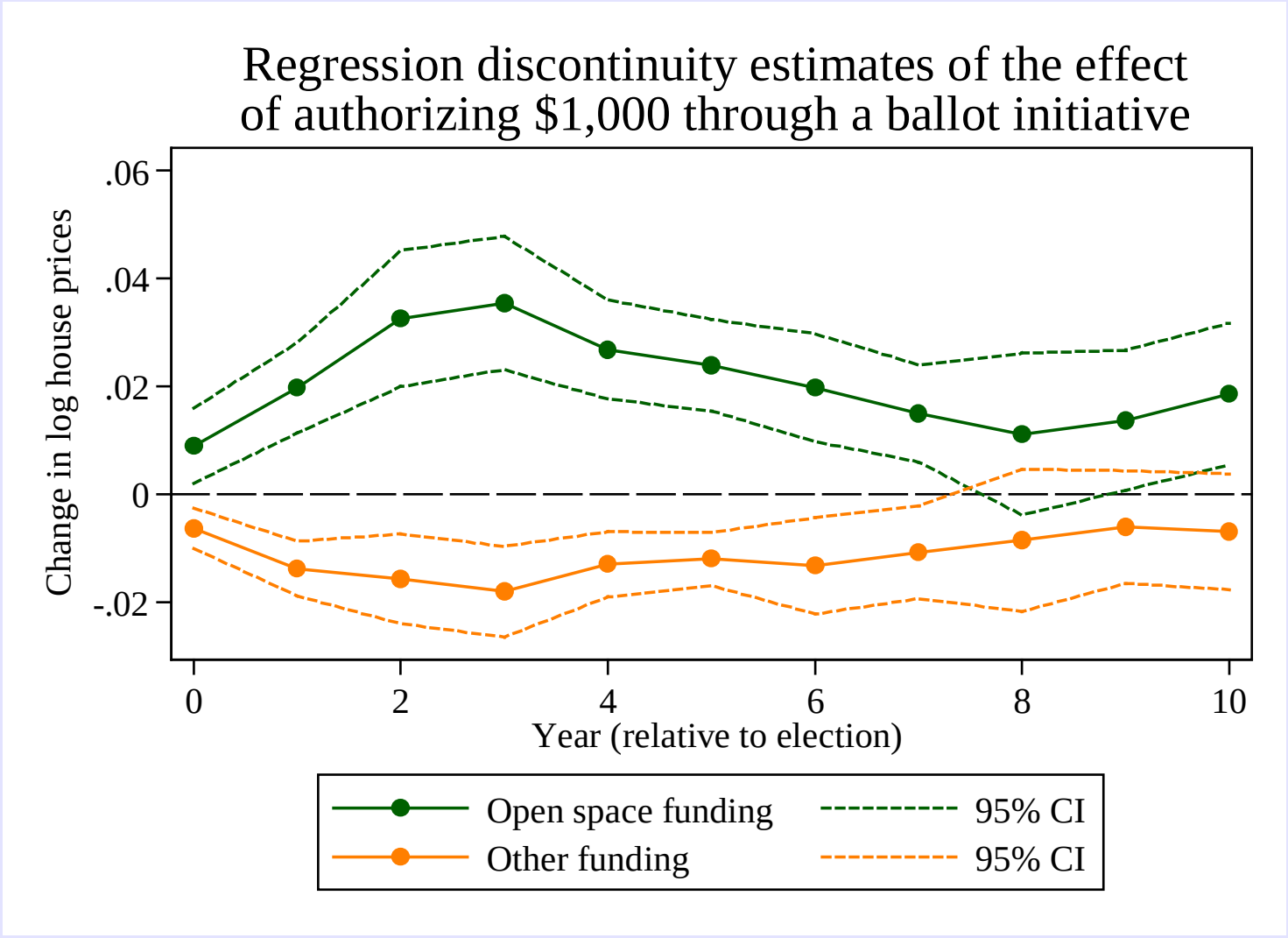
3rd order polynomial

Division-year FE

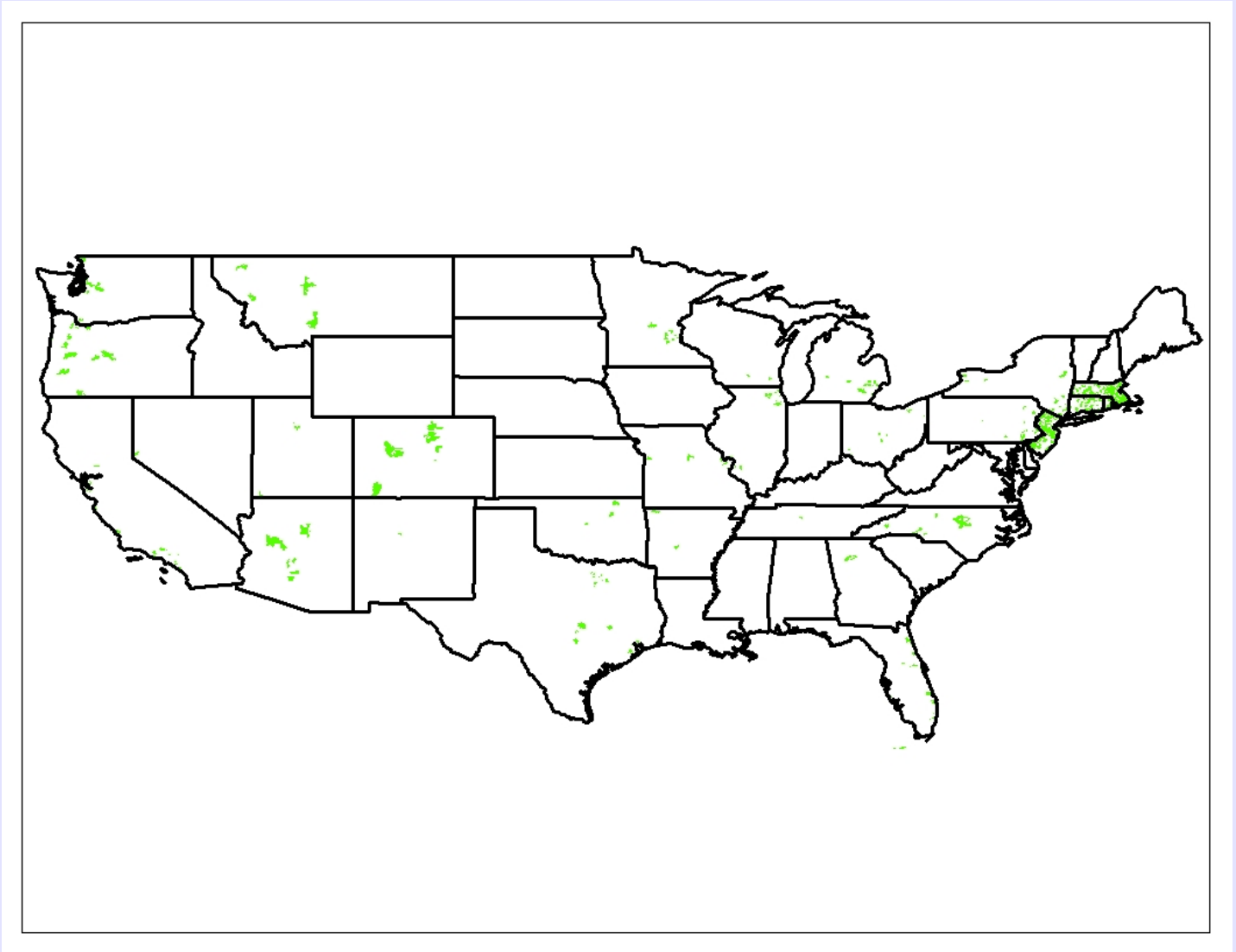
Results


Regression discontinuity estimates of the effect of authorizing $1,000 through a ballot initiative
Change in log house prices
.01
.005
0
-.005
-.01
0
2
4
6
8
10
Year (relative to election)
RD estimate
95% CI

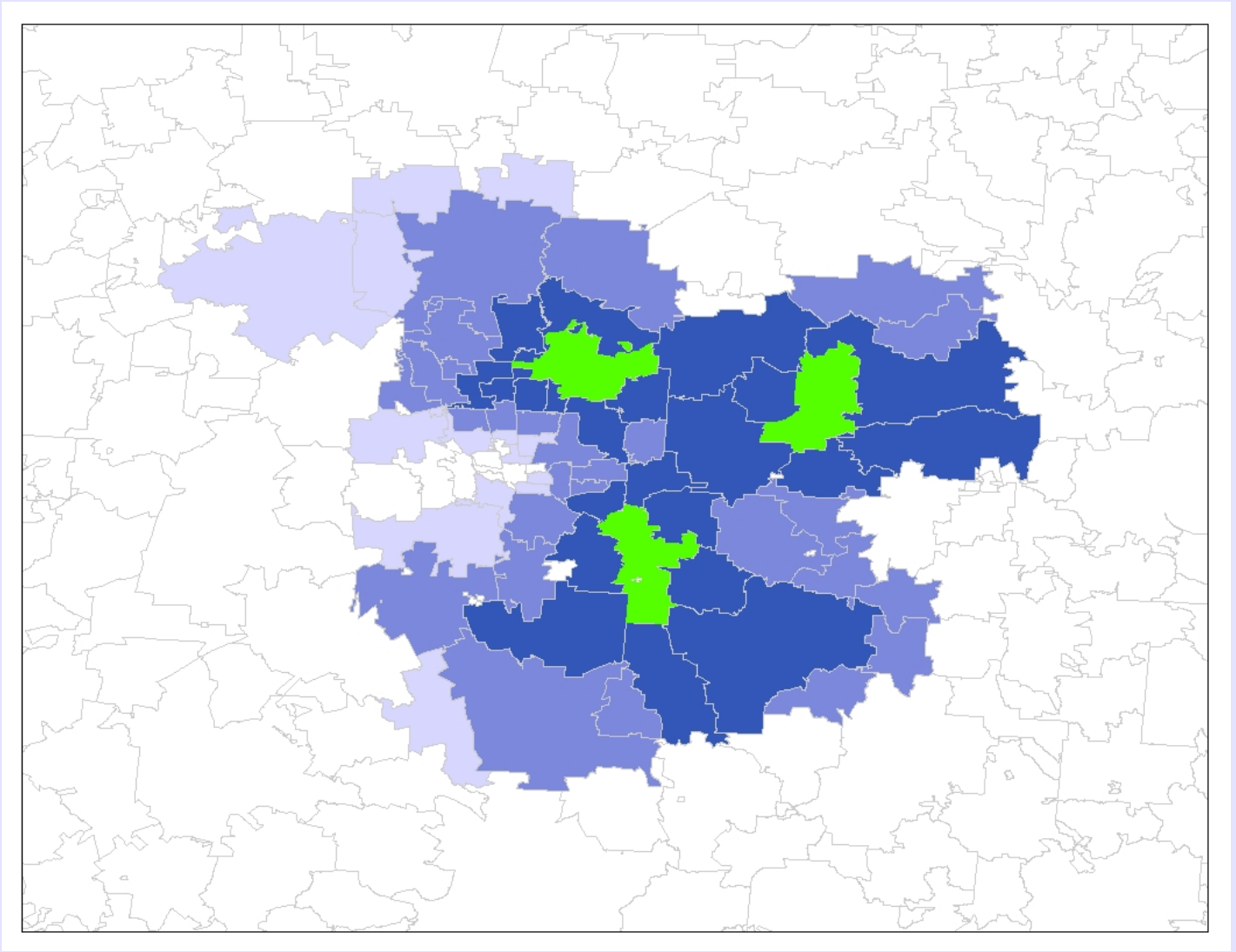
Results


Regression discontinuity estimates of the effect of authorizing $1,000 through a ballot initiative
Change in log house prices
.06
.04
.02
0
-.02
0
2
4
6
8
10
Year (relative to election)
Open space funding
95% CI
Other funding
95% CI

Spatial spillovers



Spatial spillovers



Methods

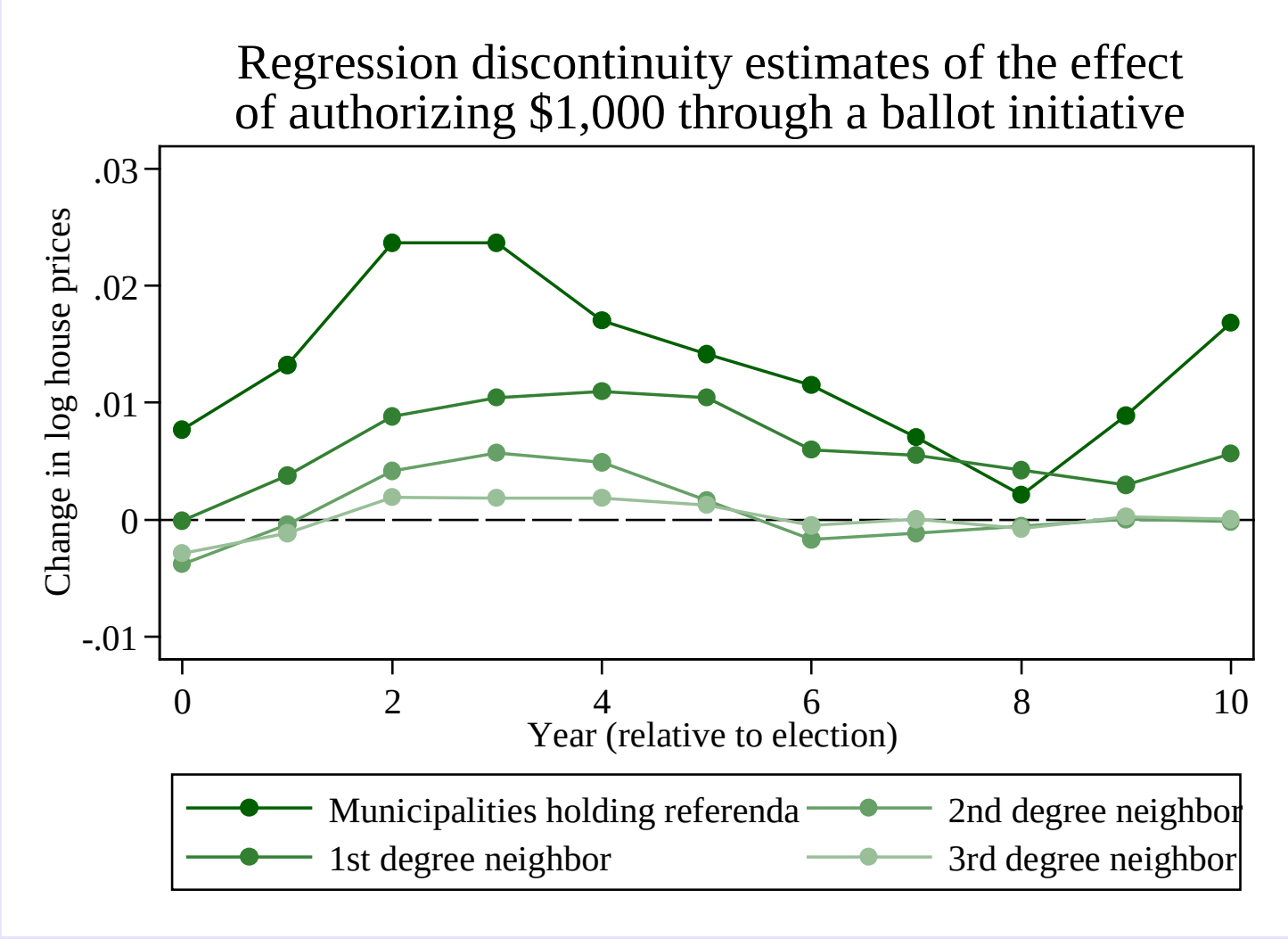
Dynamic regression discontinuity conditional on neighbor behavior:

$$\ln(p_{it}) = \sum_{\tau=0}^{\infty}(\beta_\tau\, dollars_{i,t-\tau} + \alpha_\tau b_{i,t-\tau} + f(vm_{i,t-\tau}, \gamma_\tau))$$

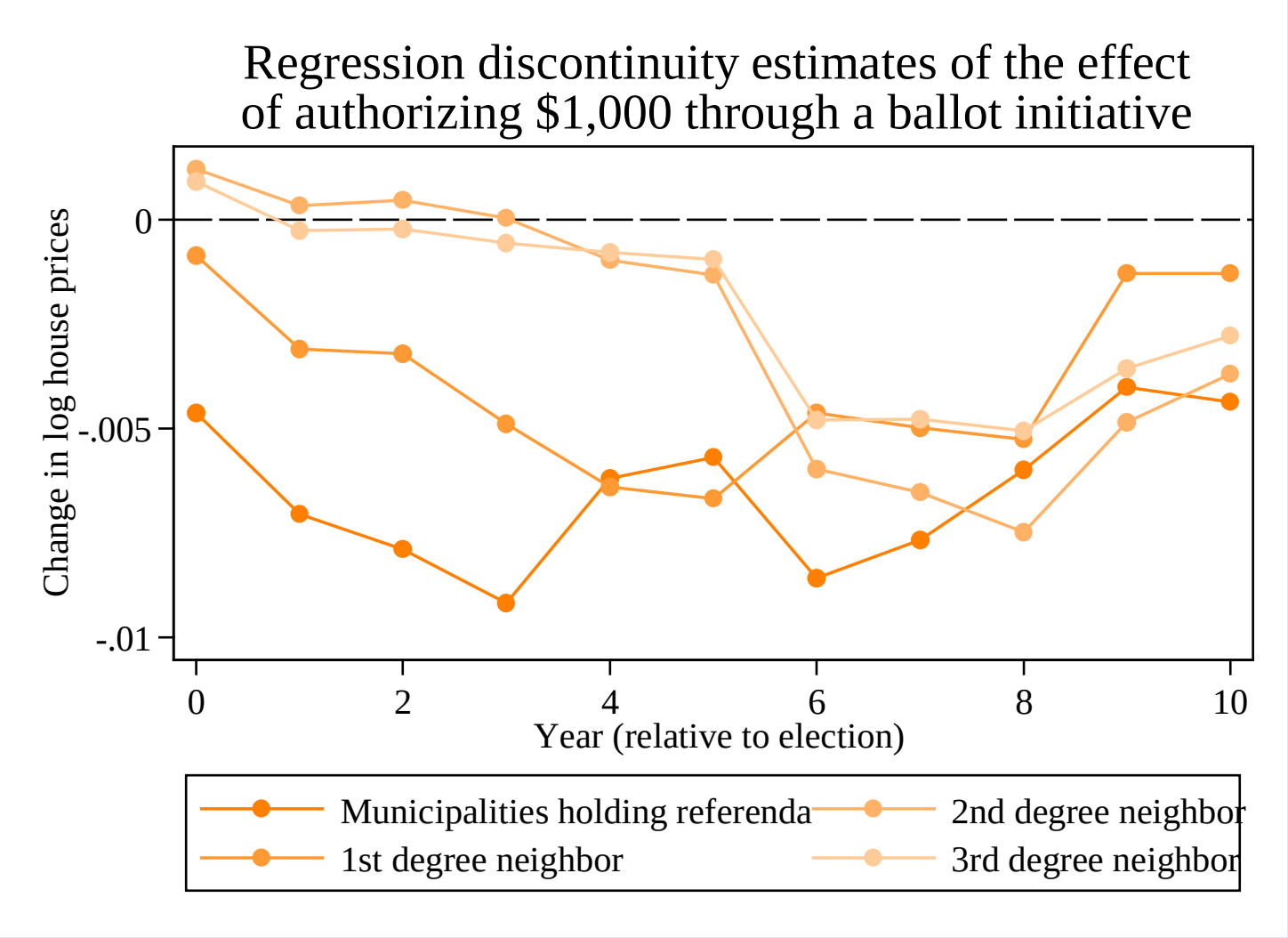
$$+ \sum_{\tau=0}^{\infty}(\bar{\beta}_\tau\, pass_{j,t-\tau} + \bar{\alpha}_\tau b_{j,t-\tau} + f(vm_{j,t-\tau}, \bar{\gamma}_\tau))$$

$$+ \vartheta_i + \pi_t + \varepsilon_{it}$$

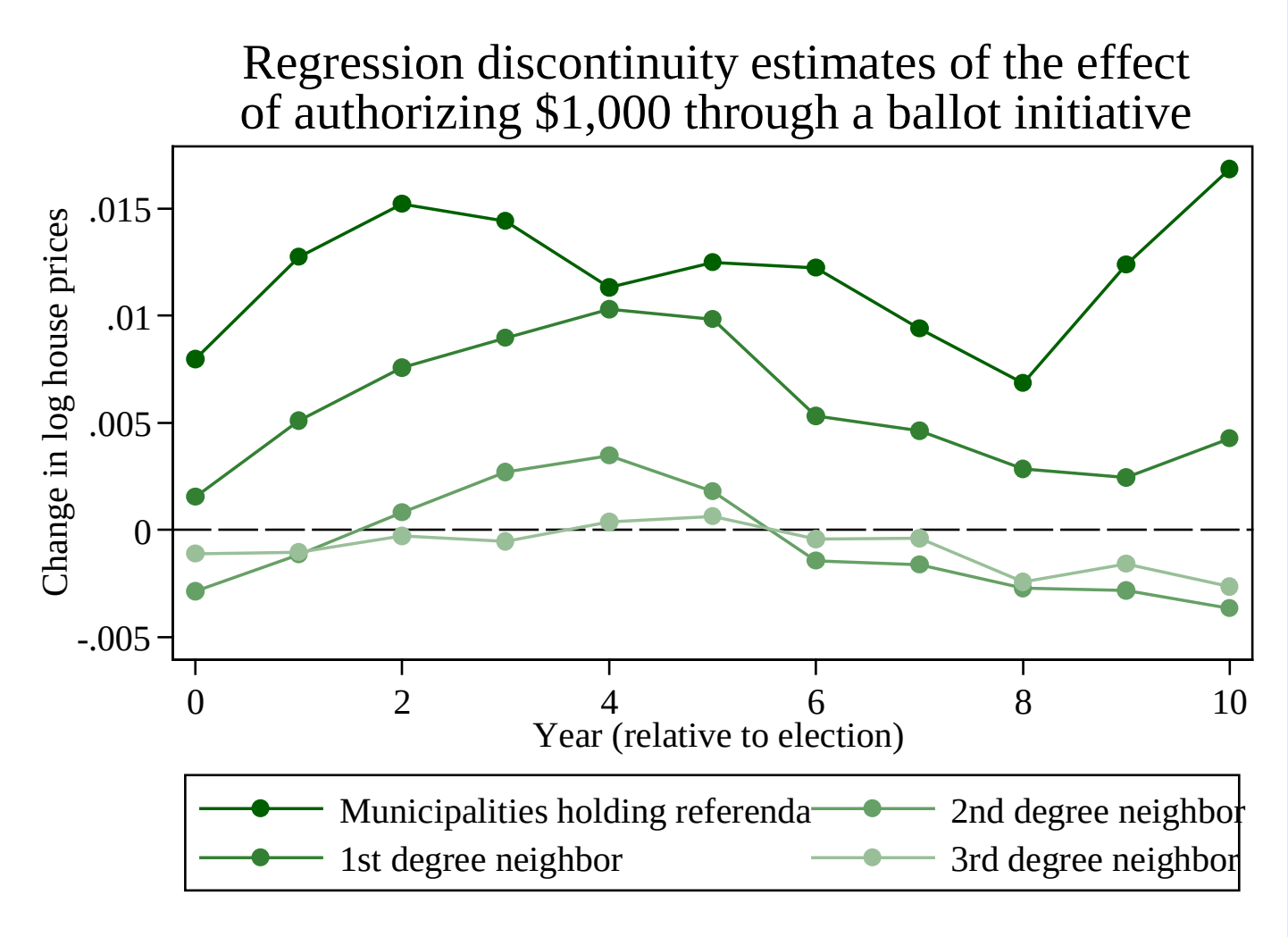
Results


Regression discontinuity estimates of the effect
of authorizing $1,000 through a ballot initiative
Change in log house prices
.03
.02
.01
0
-.01
0
2
4
6
8
10
Year (relative to election)
Municipalities holding referenda
1st degree neighbor
2nd degree neighbor
3rd degree neighbor

Results


Regression discontinuity estimates of the effect
of authorizing $1,000 through a ballot initiative
Change in log house prices
0
-.005
-.01
0
2
4
6
8
10
Year (relative to election)
Municipalities holding referenda
1st degree neighbor
2nd degree neighbor
3rd degree neighbor

Results


Regression discontinuity estimates of the effect
of authorizing $1,000 through a ballot initiative
Change in log house prices
.015
.01
.005
0
-.005
0
2
4
6
8
10
Year (relative to election)
Municipalities holding referenda
1st degree neighbor
2nd degree neighbor
3rd degree neighbor

Conclusions

- Results suggest that funding open space preservation causes increases in property values
  - As much as 3% per $1000 per capita
  - Indicates inefficiently low preservation
- Results hinge on separating open space funds from other uses
  - Interesting policy question is appropriateness of coupling multiple types of funding