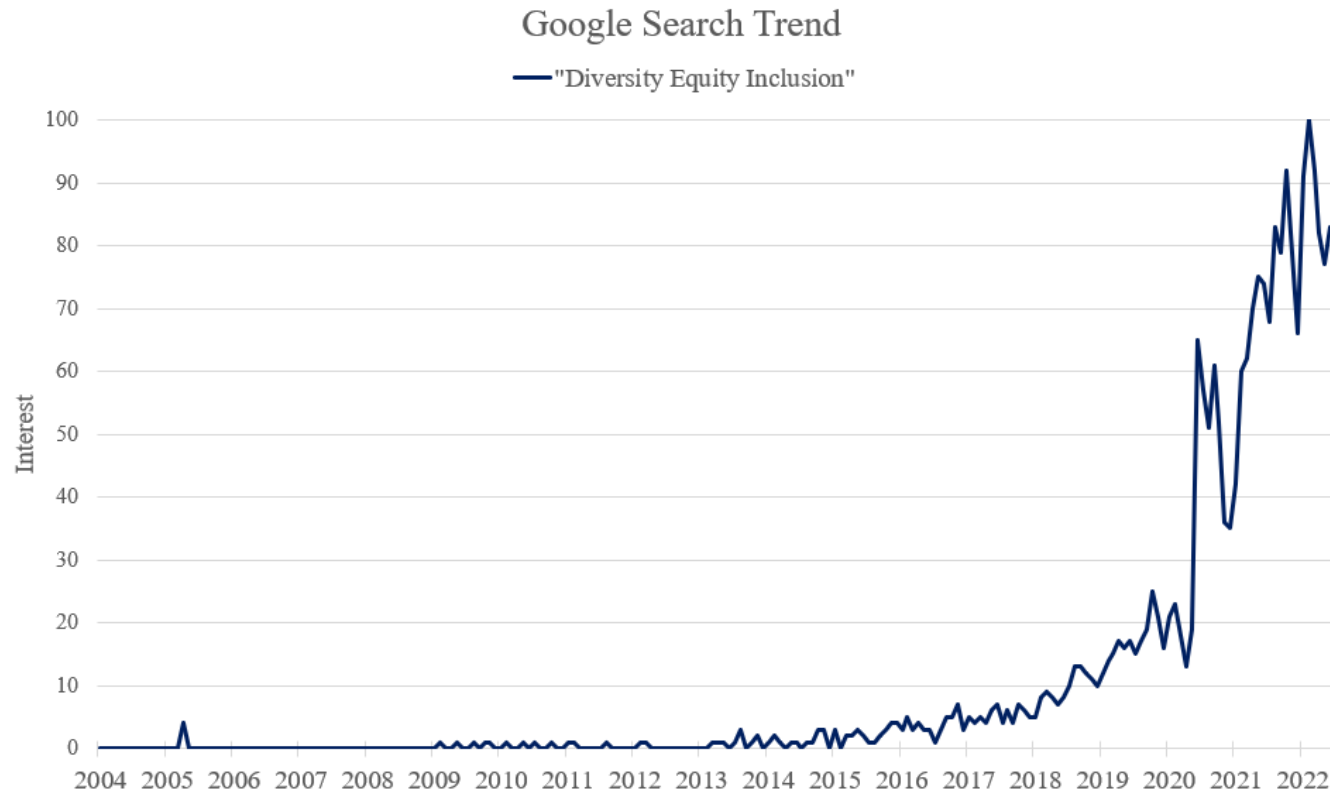# Market-Based Policy Promoting Diversity and Equity: Evidence from the Housing Market

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(Georgia State University)

Motivation:
The rise of diversity and equity movement

Google Search Trend
"Diversity Equity Inclusion"

- Similar trend for searched terms:
  - "Critical race theory"
  - "Black Lives Matter"
  - "equity inclusion"
  - "racial justice"

- Diversity, Equity, and Inclusion (DEI) has emerged as one of the most pressing issues in the US today.

"In the Fourth Industrial Revolution – accelerated by the COVID-19 crisis –leading institutions are increasingly recognizing diversity, equity and inclusion and proactively leveraging technology for "Diversity, Equity and Inclusion 4.0"."

- World Economic Forum

Motivation:
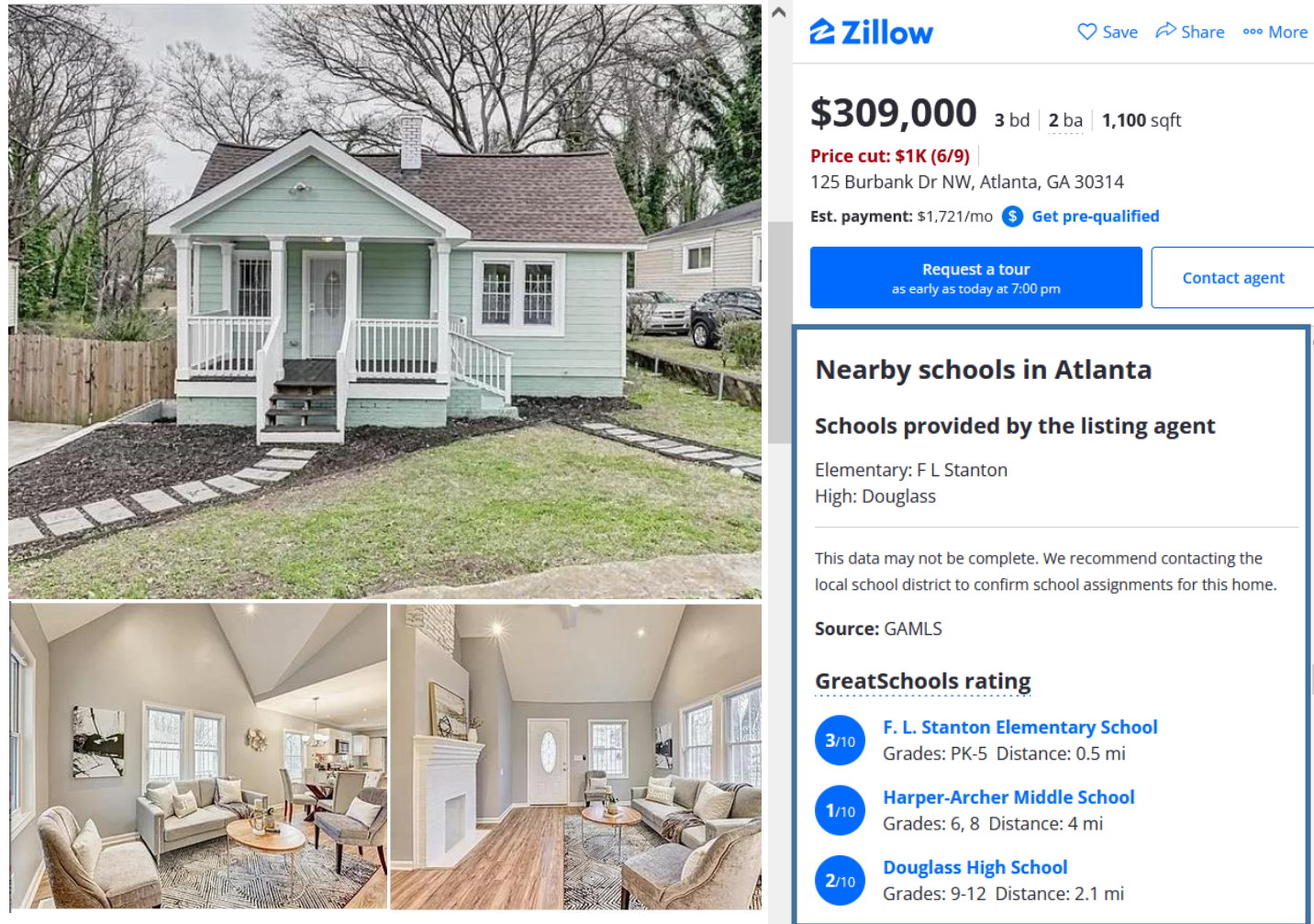# Policy alternatives in addressing diversity and equity issues

➢ Literature on DEI:
- study importance, benefits, and drawbacks of DEI   *(e.g., Aggarwal et al., 2019; Gomez and Bernet, 2020)*

- evaluate <u>government policies</u> to address DEI issues
  1) Tax credit policies
           e.g., 'LIHTC', 'OZ', 'EZ', 'NMTC'   *(e.g., Freedman et al., 2021; Neumark and Simpson, 2014)*
  2) The Civil Rights Act of 1964   *(e.g., Baum-Snow and Lutz, 2011; Boustan, 2012)*

➢ This study:
- investigates a <u>market-based</u>, non-governmental policy setting

- exploits a <u>change in school rating</u> provided by a 3rd-party non-profit organization (GreatSchools, or GS)
  - independent entity, exogenous change
  - the 1st school rating designed to promote DEI
  - GS social mission: "*creating a more equitable future for all children*"

- leverages the <u>nationwide influence</u> of GS rating
  - most visible: made available on major real estate listing platforms (Zillow, Trulia, Realtor, Redfin)
  - most commonly used: >49 mil users/year

Example of GS rating

- GS rating for K-12 public schools
  - 1-4: below average
  - 5-6: average
  - 7-10: above average
- YE 2017: changed GS rating system

GS rating change policy

Nov 2017 (YE2017), GS announced its score component changes

Before Nov 2017: GS Summary Rating	
Rating components	Weight
Test scores	100%

After Nov 2017: GS Summary Rating	
Rating components	Weight
Test scores	19%
Equity	26%
Student progress	36%
College readiness	20%

GS = 100% TS

GS = 19% TS + others

Jan-16 Feb-16 Mar-16 Apr-16 May-16 Jun-16 Jul-16 Aug-16 Sep-16 Oct-16 Nov-16 Dec-16 Jan-17 Feb-17 Mar-17 Apr-17 May-17 Jun-17 Jul-17 Aug-17 Sep-17 Oct-17 Nov-17 Dec-17 Jan-18 Feb-18 Mar-18 Apr-18 May-18 Jun-18 Jul-18 Aug-18 Sep-18 Oct-18 Nov-18 Dec-18 Jan-19 Feb-19 Mar-19 Apr-19 May-19 Jun-19 Jul-19 Aug-19 Sep-19 Oct-19 Nov-19 Dec-19

- Purpose of GS rating change: [updated November, 2017]

   "These changes will help uncover the strengths of schools *successfully serving Black, Latinx, Native American and low-income students*.

   [This] multifaceted information is not only based on research, but also *reflective of what parents find meaningful*."

Contribution

- Household preferences in location choice:
    - school:
        - ↑ school quality → ↑ home price ; measure=test score → criticized   *(e.g., Black, 1999; Bayer et al., 2007; Kane et al., 2006; Barrow, 2002)*
    - ➢ This study provides new evidence of these preferences when school quality rating promotes diversity and incorporates components beyond academic performance.

    - racial composition:
        - households sort by race: ↑ % Black students → ↓ % White enrollment *(e.g., Boustan, 2012; Baum-Snow and Lutz, 2011)*
    - ➢ This study contributes to a better understanding of the tradeoffs between the preference of school quality and that of racial composition.

- Policy impacts in promoting equity:
    - *The Civil Rights Act of 1964*: narrow racial inequality, not equity   *(e.g., Billings et al., 2014)*
    - *Location-based policies*: mostly benefit businesses   *(e.g., Freedman et al., 2021; Neumark and Simpson, 2014)*
    - *Controlled experiments*: support the disadvantaged, but costly   *(e.g., Bergman et al., 2019; Chetty et al., 2016)*
        (e.g. 'CMTO', 'Moving to Opportunity', 'Housing Opportunity Program')

    - ➢ This study explores whether a market-based, low-cost policy that promotes diversity and equity via school rating can be the driver for upward equitable growth.

Data coverage

- GS rating

  - 100% nationwide coverage

  - covers all schools in a district

- School-level test score (TS)

  - 100% statewide coverage

- ZTRAX transactions

  - 100% nationwide coverage

Sample

- Proprietary GS data
  - 2015 to 2018
  - primarily Atlanta-CBSA
  (100% of elementary schools - each property
  is fixed to only 1 elementary school)
  - *Source*: national homebuilder

- TS data
  - 2015 to 2018
  - Atlanta-MSA
  (100% of elementary schools)
  - *Source*: GA Governor's office of student achievement (the <u>only</u> source for GA test score)

- ZTRAX residential real estate data
  - 2017 to 2019
  - 103,207 transactions (in GS available districts)
  - *Source*: Zillow's assessor and real estate database

GreatSchools data coverage in metro Atlanta, GA

- ◆ school location
- ▭ GA county boundary
- ▨ GA elementary attendance zone
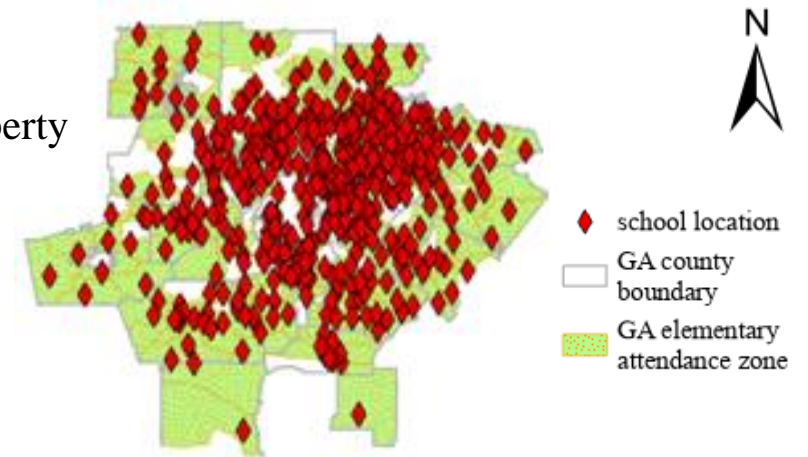
Empirical analysis

1) ***Validation***: show evidence that the nature of GS rating change is about promoting DEI

2) ***Market responses***: Whether people respond to the new school rating in their housing choice?

- main specification: difference-in-differences
  - compares houses in schools with change vs. schools without change before vs. after YE2017
- main dependent variable: *home price*
  - captures outcomes of the locational decisions by households
- main independent variable: *GS rating change* x *post*
  - GS rating change is a deviation between non-TS change and TS change
  - this deviation represents equitable growth/decline
- controls: hedonics factors, school FE, month FE, block group FE, housing supply, zip x quarter FE, test score (academic performance)

3) ***Mechanism***: How do people respond to the new school rating?

Social phenomena

Locations of the 4 social phenomena

Social
progress

GS↑ and TS↑

Social
regress

GS↓ and TS↓

Academic
growth

GS↓ and TS↑

Non-academic
growth

GS↑ and TS↓

Contradictory GS & TS capture the DEI
component of the new GS rating

Legend

- Social progress
- Social regress
- Academic growth
- Non-academic growth
- No GS or TS change
- Interstate Highway
- Downtown Atlanta
- Hartsfield-Jackson International Airport
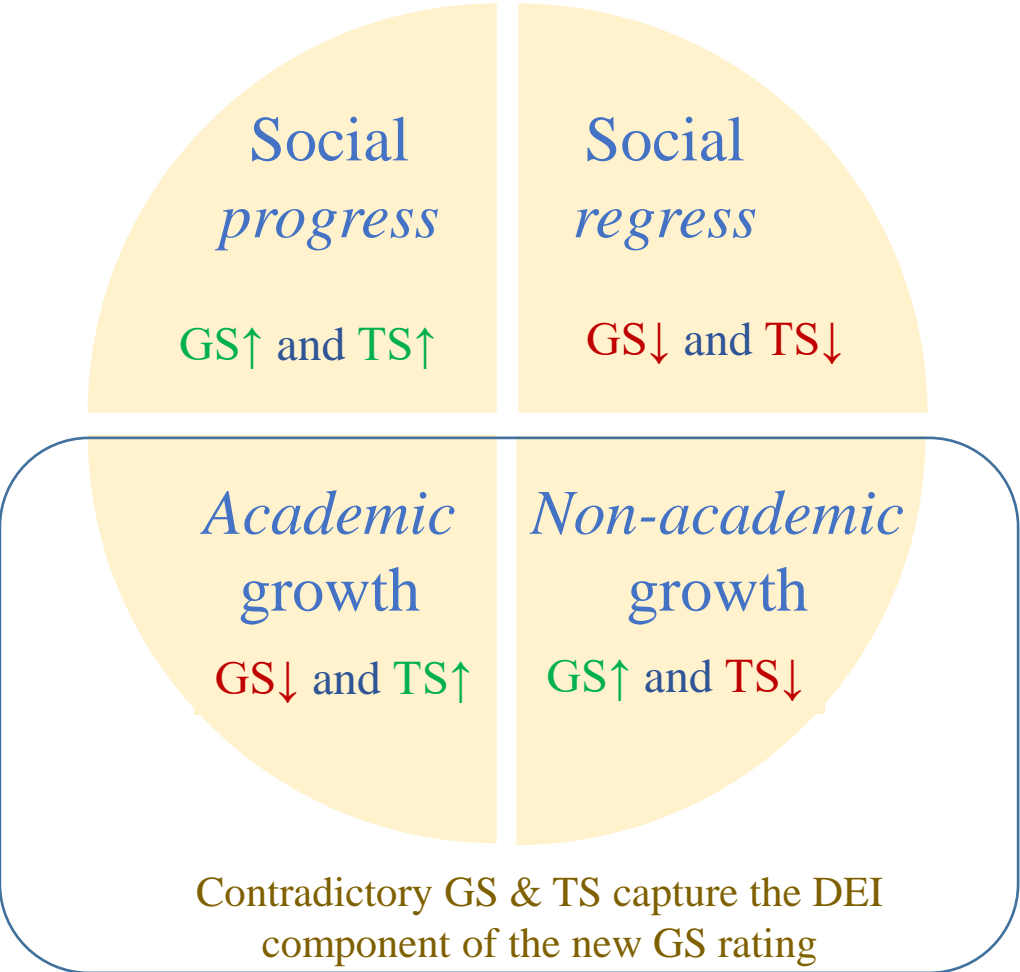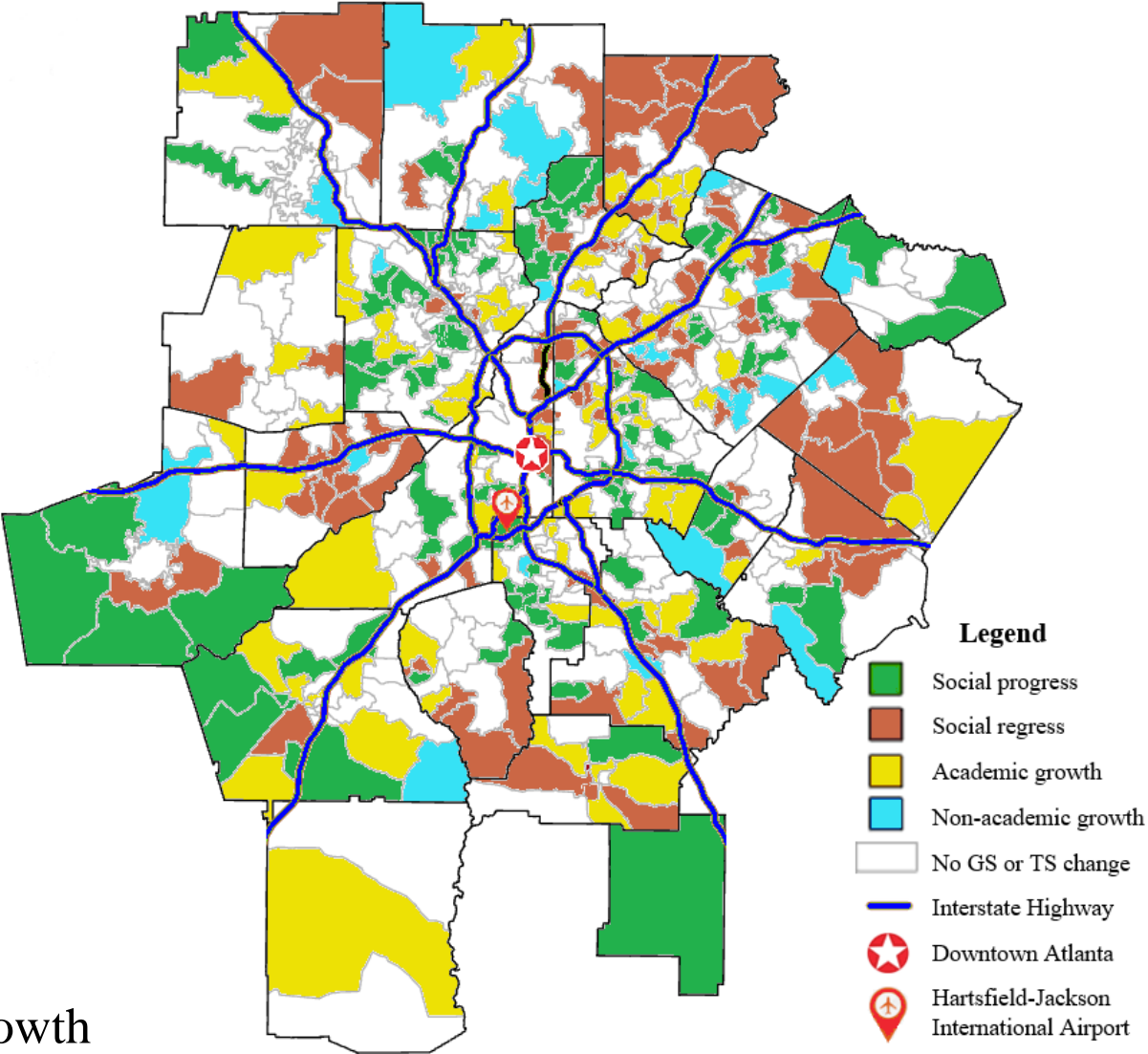
ΔGS rating = Δnon-academic - Δacademic = equitable growth

Hypotheses and empirical setting

Scenario:	*Academic* growth (GS↓, TS↑)	
Price response:	P ↑	P ↓
H_0:	TS dominant	GS dominant
Implication:	people follow TS	people follow GS rating
Scenario:	*Non-academic* growth (GS↑, TS↓)	
Price response:	P ↓	P ↑

- Control group: $\Delta GS_{t-1} = 0$
- Treated group: $\Delta GS_{t-1} > 0 \; and \; \Delta GS_{t-1} < 0$

$$\ln(price_{i,s,b,t}) = \beta \times treated_{i,s,b} \times post_t + X'_{i,t}\gamma + Z'_{b,t}\delta + \alpha_s + \lambda_t + \sigma_b + \epsilon_{i,s,b,t}$$

- i: individual home
- s: specific elementary school associated with the home
- b: Census block group
- t: month

Summary statistics (full sample)

variable unit	period: 2017, 2018, 2019 mean
$\triangle$GS 0,1	0.44
post-YE 2017 0,1	0.66
GS score	6
TS score	78.2
price per SF	$127
house size SF	2,511
lot size SF	22,111
bedrooms count	4
bathrooms count	3
prop age yrs	28
median income $	86,463
white %	0.50
college degrees %	0.44
employment %	0.69
population growth %	0.02
obs	103,207

- Considerable heterogeneity in schools
- Considerable heterogeneity in properties

1) Manual characteristic match:
   - starting baseline (GS, TS)
   - market condition (sale date)
   - prop char (# bed, SF, age, use)
   - location (zip)

2) Others: PSM (nearest neighbor 1:1), spatial RDD

Main matching procedure

Manual characteristics match sampling methodology: Match criteria according to USPAP

- Starting baseline
  - ±2 of starting GS score in 2016
  - ±15% of TS in 2016
- Market conditions: ±4 quarters of sale
- Location: same zip code
- Physical characteristics:
  - same # bedrooms
  - ±50% house square footage
- Economic characteristics:
  - ±20 years of age
  - arm's length transaction
- Property use:
  - single family only

- Criteria to narrow down to 1 control in each category:
  - **PSM**: nearest-neighbor selection using block group median income
  - **Geodistance**: select a property closest in distance to the subject using geodesic method in Karney (2013)

Per matched group	$\mathbb{1}_{\Delta GS}$	$\mathbb{1}_{after}$
1 obs	1	0
1 obs	1	1
1 obs	0	0
1 obs	0	1

Summary statistics (matched samples)

match process:	△GS (+)						△GS (-)					
period:	before			after			before			after		
variable △GS	0	1	difference	0	1	difference	0	1	difference	0	1	difference
PROPERTY												
price per SF	$110	$115	5	$114	$116	2	$105	$103	(2)	$111	$109	(2)
test score	74.6	76.1	2 ***	77.9	80.1	2 ***	84.2	82.8	(1) ***	82.8	83.4	1 ***
house size	2,525	2,542	17	2,436	2,466	30	2,497	2,598	102 ***	2,525	2,472	(53) ***
bedrooms	4	4	0	4	4	0	4	4	0	4	4	0
bathrooms	3	3	(0)	3	3	(0) ***	4	3	(0)	3	3	(0) ***
prop age	27	26	(1) **	27	27	(1)	20	19	(1) ***	20	20	1 **
DEMOGRAPHIC												
median income	89,610	88,688	(922)	88,271	90,602	2,331 *	82,388	82,468	80	85,566	80,733	(4,834) ***
white	0.45	0.43	(0) *	0.42	0.41	(0)	0.58	0.54	(0) ***	0.53	0.52	(0)
college degrees	0.46	0.48	0 **	0.49	0.47	(0) ***	0.40	0.40	(0) ***	0.41	0.39	(0) ***
employment	0.67	0.68	0 ***	0.68	0.68	(0)	0.69	0.70	0	0.70	0.68	(0) ***
population growth	0.02	0.02	(0)	0.02	0.01	(0) ***	0.04	0.03	(0) ***	0.05	0.06	0 **
obs	2,115	2,115		2,115	2,115		5,509	5,509		5,509	5,509	

- Heterogeneity ↓ significantly
- the treated GS↓ experience avg. TS↑, while control GS↓ experience avg. TS↓
- PPSF for the treated:
  - Pre-YE 2017: stable
  - Post-YE 2017: increase

I. Validation

Evidence of major GS rating change in 2017

Dependent variable **GS rating**	Comparing to Year 2016
Year= 2015	0.065
	(0.35)
Year= 2017	-0.264***
	(0.00)
Year= 2018	-0.238***
	(0.00)
School-level controls	X
School FE	X
Observations	1,676
Adj R-squared	82%

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Coefficient Plot of GS Rating by Year
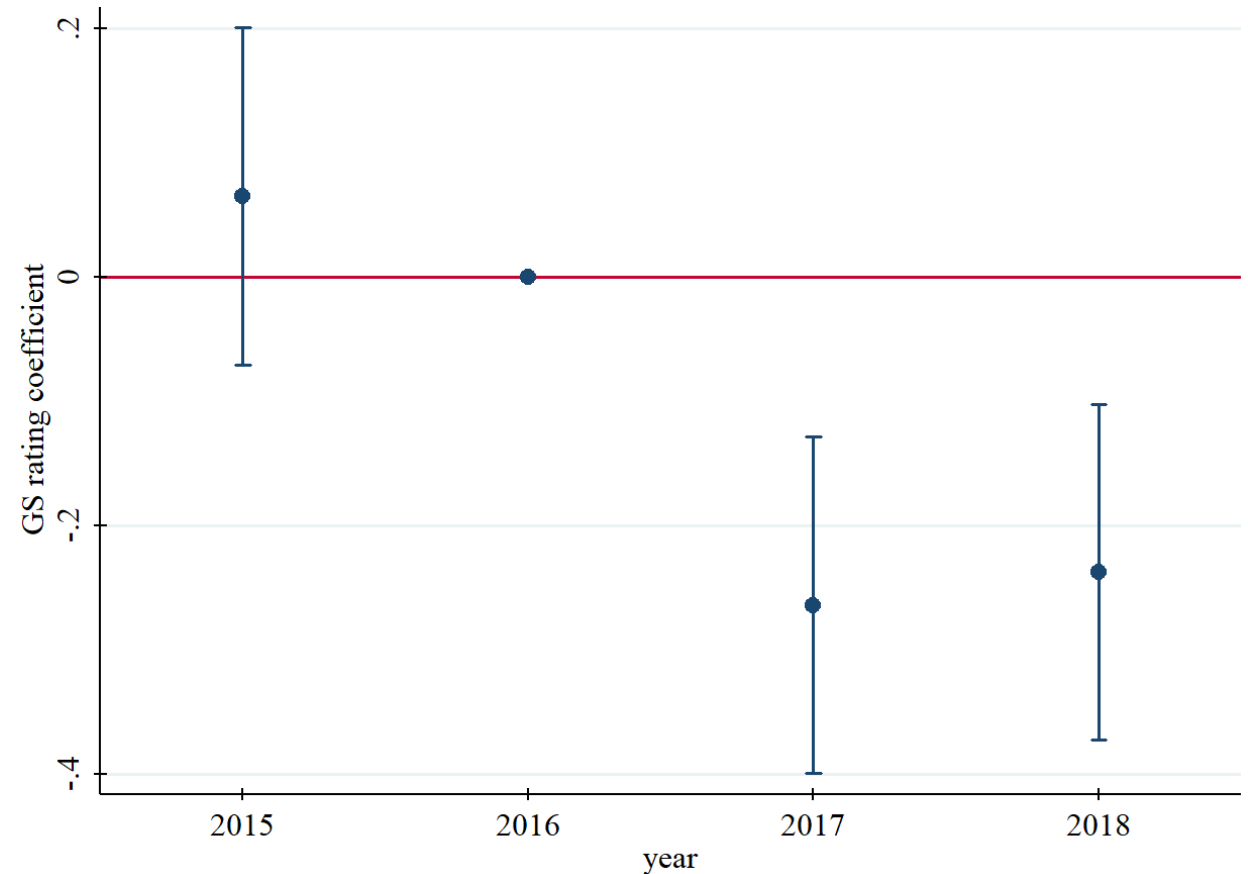
Where does the upgraded GS change take place?

$$\mathbb{I}_{\Delta GS>0} = \frac{1}{1 + e^{-(X'_{i,b,t}\gamma + \gamma_0)}} + \epsilon_{i,b,t}$$

Dependent variable					$\mathbf{1}_{\triangle GS>0}$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
△% test score	-1.978*** (0.08)								-2.247*** (0.08)
% Black		0.736*** (0.03)							0.798 *** (0.03)
% White			-0.557*** (0.03)						
% SNAP families				1.199*** (0.04)					
% disability					-0.261 (0.30)				-0.015 (0.31)
log(median income)						-0.169*** (0.02)			
% employment							-1.565*** (0.11)		-1.393*** (0.11)
population growth								-0.064 (0.08)	-0.071 (0.08)
Observations	17,493	17,493	17,493	17,493	17,493	17,493	17,493	17,493	17,493
Pseudo R-squared	1%	1%	1%	0%	0%	0%	0%	0%	2%
AIC	73,725	73,683	73,291	73,458	74,342	74,276	74,139	74,342	72,752

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

- Areas more likely to get GS boost:
  - more Black:
    - more SNAP students
    - lower income
  - lower employment
  - △TS-

Where does the downgraded GS change take place?

$$\mathbb{I}_{\Delta GS<0} = \frac{1}{1 + e^{-(X'_{i,b,t}\gamma + \gamma_0)}} + \epsilon_{i,b,t}$$

Dependent variable					$\mathbb{1}_{\Delta GS<0}$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
△% test score	1.468*** (0.07)								1.913*** (0.07)
% Black		-0.928*** (0.03)							-1.042 *** (0.03)
% White			0.701*** (0.03)						
% SNAP families				-0.547*** (0.04)					
% disability					0.775*** (0.28)				0.404 (0.28)
log(median income)						0.049** (0.02)			
% employment							0.296*** (0.10)		0.005 (0.10)
population growth								0.223 (0.07)	0.239*** (0.07)
Observations	23,385	23,385	23,385	23,385	23,385	23,385	23,385	23,385	23,385
Pseudo R-squared	1%	1%	1%	0%	0%	0%	0%	0%	2%
AIC	82,547	81,859	82,421	82,775	82,970	82,972	82,970	82,969	81,185

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

- The opposite characteristics are reflected in the case of GS downgrade

GS rating change & test score

GS rating distribution — Number of schools vs GS rating (1–10); Before YE2017 (green), After YE2017 (orange)

TS distribution — Number of schools vs Test score (F [40, 59.9], D [60, 69.9], C [70, 79..9], B [80, 89.9], A [90, 103]); Before YE2017 (green), After YE2017 (red)
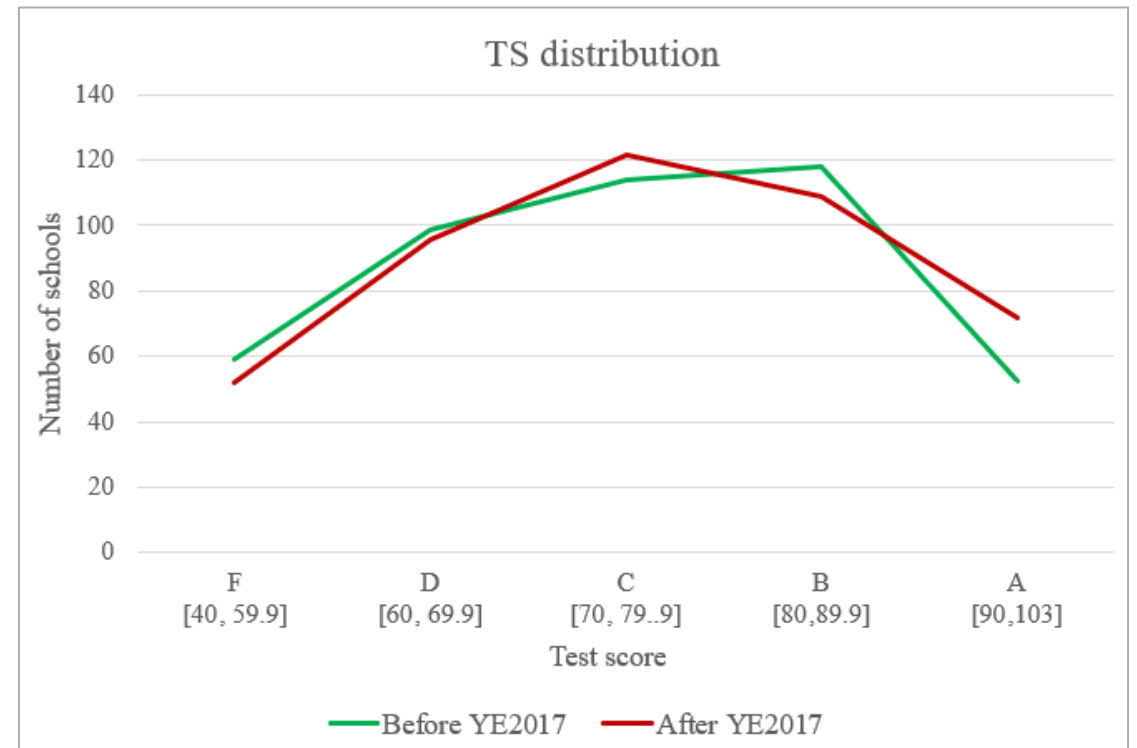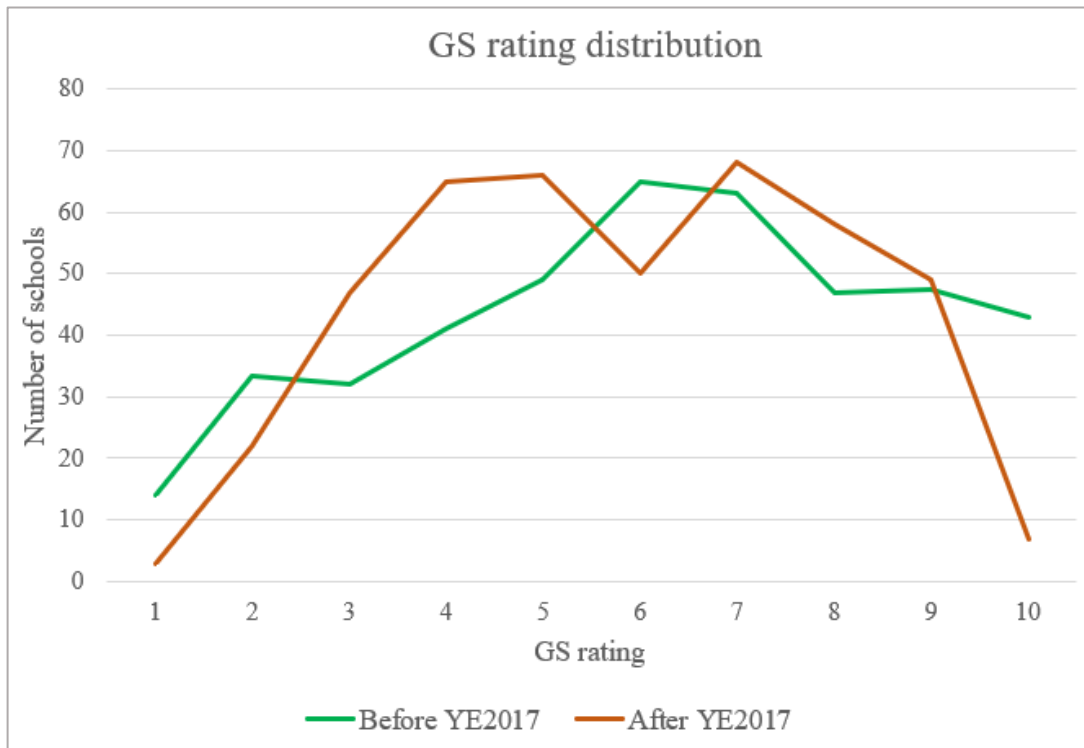
- post-YE 2017: ↓ {1,2,6,10}   (took from the tails)
  ↑ {3,4,5,8}   (gave to the middle)

- post-YE 2017: test scores didn't change much

GS rating categories

GS	# schools	median income	median %white	median college education	% GS ↑	% GS ↓
10						
9	202	$93,384	65%	49%	11%	65%
8						
7						
6	104	$71,528	45%	35%	34%	42%
5						
4						
3	129	$56,907	11%	29%	64%	15%
2						
1						

- {7-10} :
  - in higher income, more white, more educated areas
  - likely to get downgraded
- {1-4} : the opposite

Historic GS rating change vs. *YE2017* GS rating change

Which schools historically got ΔGS (+)?
- Before vs. after YE2017
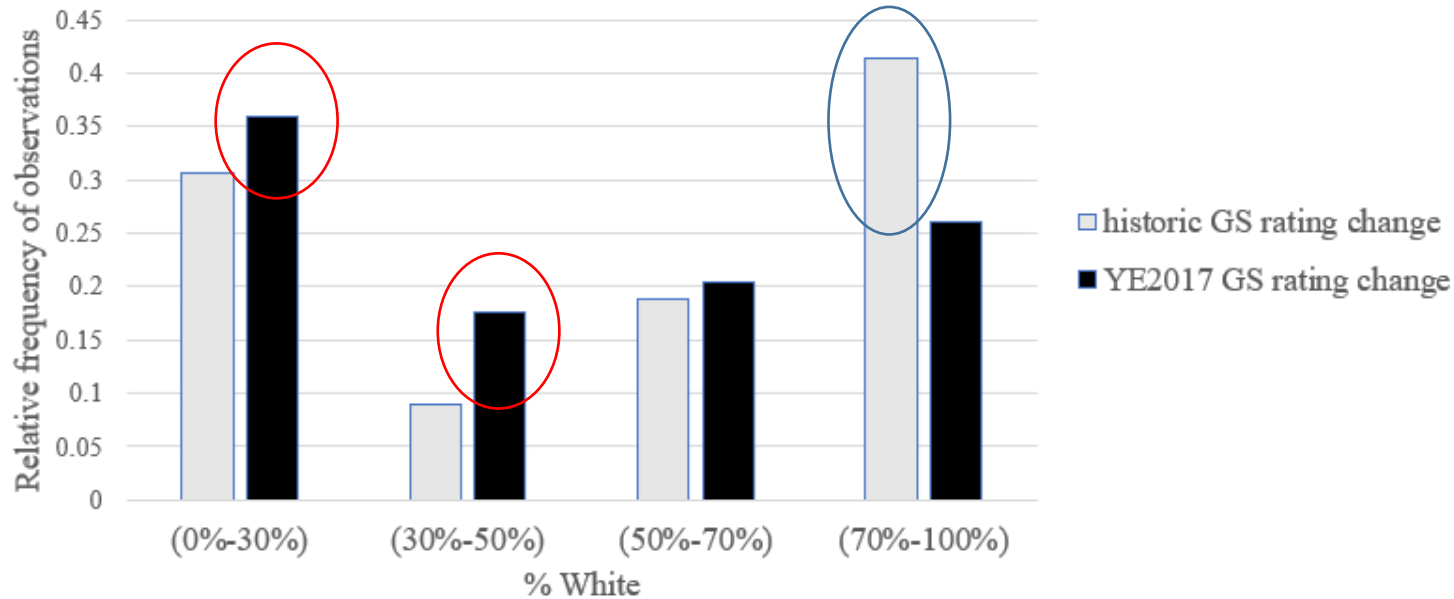
Which schools historically got ΔGS (-)?
- Before vs. after YE2017
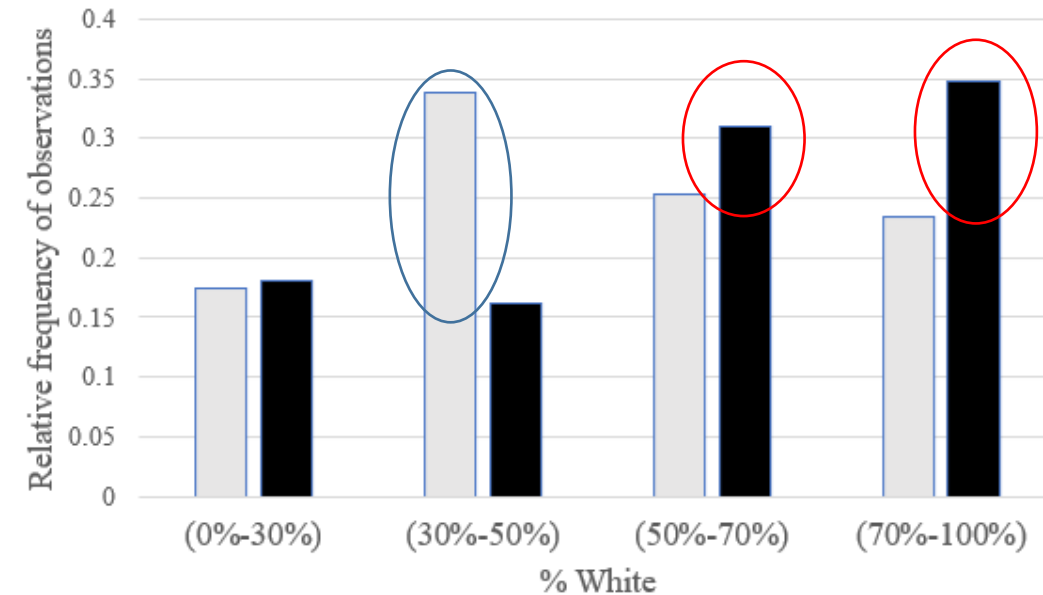
- **Historically**: △GS+ → mainly white areas

  △GS- → mainly non-white areas
- **YE2017**:   opposite

II. Household Responses

Home price & rating coefficients

Panel A. Home price against GS rating categories
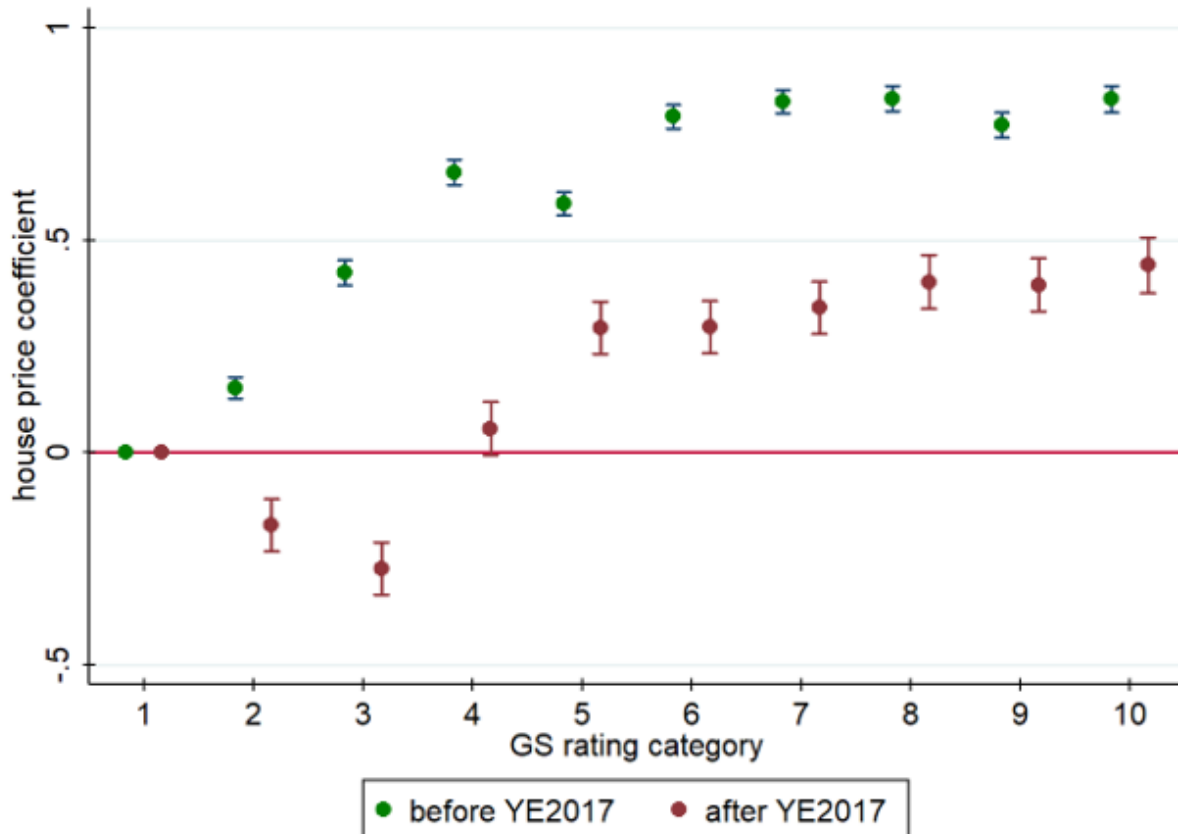
Panel B. Home price against TS categories
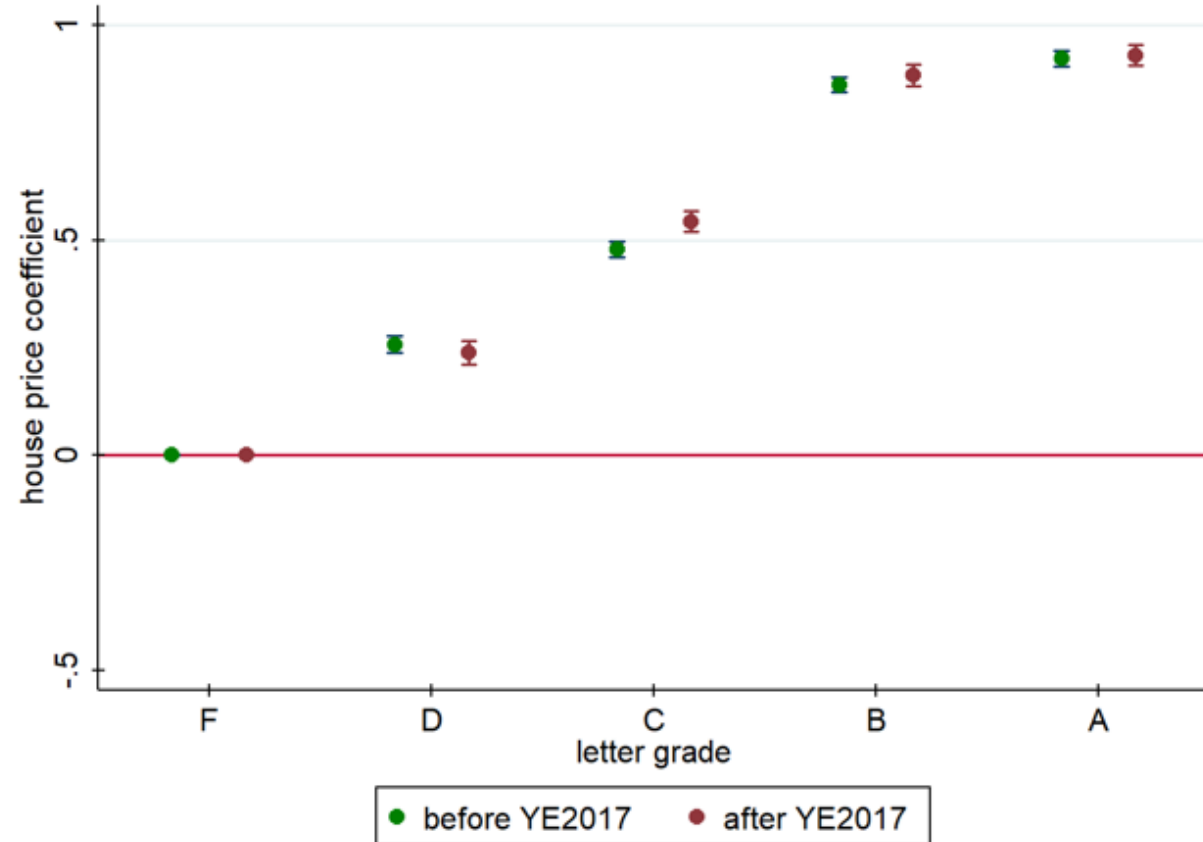
- People react to GS rating via their willingness to pay for homes in different GS rating categories
- People still respond to *new* GS rating, but not as much

Impact of GS rating change *(split treatment groups)*

	ΔGS+							ΔGS-						
Dependent variable: **log(price)**	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
post	0.077***	0.103***						0.036***	0.032***					
	(0.023)	(0.018)						(0.009)	(0.008)					
treated	0.026	0.022						0.003	-0.023***					
	(0.023)	(0.018)						(0.009)	(0.008)					
treated*post	-0.056*	-0.045*	-0.024	-0.032	-0.031	0.008	0.023	0.000	0.041***	0.026***	0.031***	0.031***	0.022*	0.022**
	(0.033)	(0.025)	(0.023)	(0.024)	(0.024)	(0.028)	(0.029)	(0.013)	(0.011)	(0.010)	(0.010)	(0.010)	(0.011)	(0.011)
Hedonic controls		X	X	X	X	X	X		X	X	X	X	X	X
Month FE			X	X	X	X	X			X	X	X	X	X
School FE			X	X	X	X	X			X	X	X	X	X
Block group FE				X	X	X	X				X	X	X	X
Building permits					X	X	X					X	X	X
Zip x quarter FE						X	X						X	X
Test score control							X							X
Observations	8,460	8,460	8,460	8,460	8,460	8,460	8,460	22,036	22,036	22,036	22,036	22,036	22,036	22,036
Match samples	2,115	2,115	2,115	2,115	2,115	2,115	2,115	5,509	5,509	5,509	5,509	5,509	5,509	5,509
Adj R-squared	0%	43%	67%	70%	70%	73%	73%	0%	36%	55%	59%	59%	62%	62%

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

- △GS+ school zones see home price unchanged.
- △GS- school zones see home price ↑.

Impact of GS rating change *(overall)*

Dependent variable: log(price)	ΔGS+ and ΔGS-						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
post	0.047***	0.045***					
	(0.009)	(0.007)					
treated	0.010	-0.019**					
	(0.009)	(0.007)					
treated*post	-0.015	0.027**	0.020**	0.015	0.015	0.019*	0.019*
	(0.013)	(0.011)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
Hedonic controls		X	X	X	X	X	X
Month FE			X	X	X	X	X
School FE			X	X	X	X	X
Block group FE				X	X	X	X
Building permits					X	X	X
Zip x quarter FE						X	X
Test score control							X
Observations	30,496	30,496	30,496	30,496	30,496	30,496	30,496
Match samples	7,624	7,624	7,624	7,624	7,624	7,624	7,624
Adj R-squared	0%	37%	60%	64%	64%	66%	66%

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Placebo design

- Create counterfactual groups: 2017 & 2018 GS scores **based on the older rating system**

- Older rating system: **based on 100% test score**
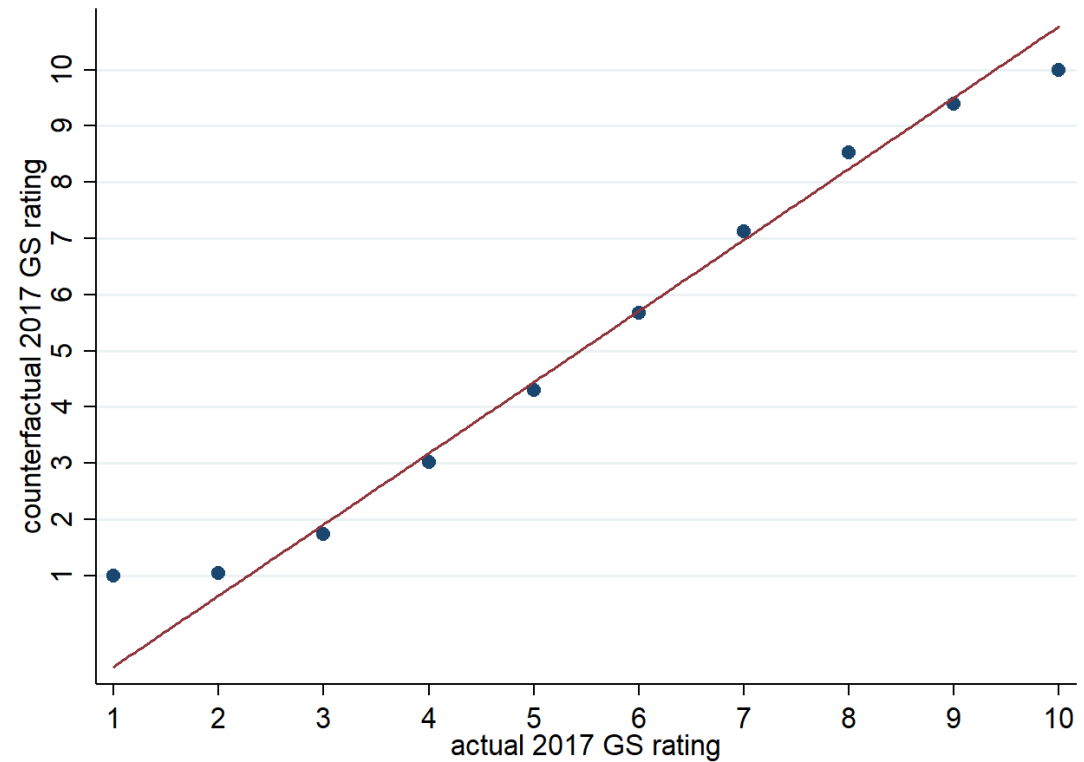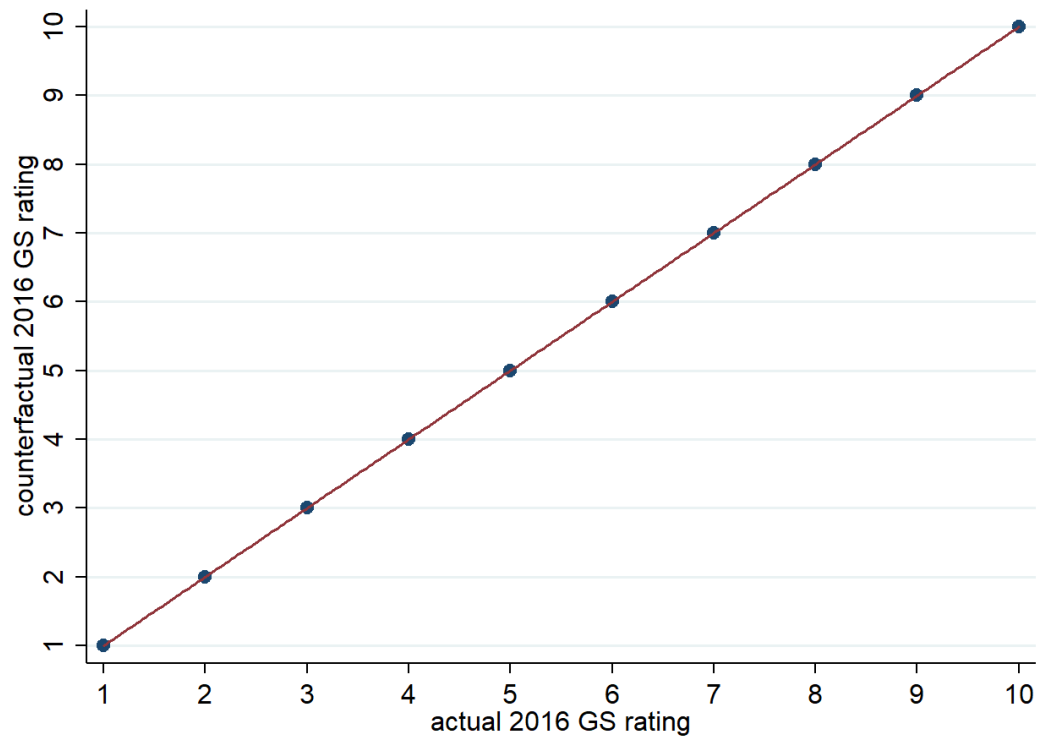
- 2017 is the first year of new GS rating
- Actual 2017 GS rating over-rated lower-bound GS categories, and under-rated upper-bound GS categories

Results of placebo test

Dependent variable: log(price)	ΔGS+ (or TS↑)						ΔGS- (or TS↓)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
post	0.001	0.016					0.238***	0.230***				
	(0.013)	(0.011)					(0.031)	(0.028)				
treated	-0.051***	-0.103***					0.264***	0.171***				
	(0.013)	(0.011)					(0.031)	(0.029)				
treated*post	0.057***	0.051***	0.060***	0.096***	0.097***	0.091***	-0.167***	-0.115***	-0.100**	-0.121***	-0.121***	-0.084*
	(0.018)	(0.016)	(0.014)	(0.015)	(0.015)	(0.015)	(0.044)	(0.040)	(0.042)	(0.044)	(0.044)	(0.048)
Hedonic controls		X	X	X	X	X		X	X	X	X	X
Month FE			X	X	X	X			X	X	X	X
School FE			X	X	X	X			X	X	X	X
Block group FE				X	X	X				X	X	X
Building permits					X	X					X	X
Zip x quarter FE						X						X
Observations	19,956	19,956	19,956	19,956	19,956	19,956	2,244	2,244	2,244	2,244	2,244	2,244
Match samples	4,989	4,989	4,989	4,989	4,989	4,989	561	561	561	561	561	561
Adj R-squared	0%	26%	54%	56%	56%	61%	5%	23%	52%	59%	59%	64%

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

- ΔGS+ school zones (or TS↑) see positive change in home price.

- ΔGS- school zones (or TS↓) see negative change in home price.

  ➢ Households follow TS performance.

Confirmation: heterogeneity test by TS

ΔGS+

Dependent variable: **log(price)**	ΔTS+						ΔTS-					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
post	0.041	0.101***					0.174***	0.125***				
	(0.027)	(0.021)					(0.039)	(0.027)				
treated	-0.027	0.002					0.167***	0.090***				
	(0.027)	(0.021)					(0.039)	(0.027)				
treated*post	-0.001	-0.023	0.011	-0.001	0.005	0.040	-0.201***	-0.120***	-0.112**	-0.087*	-0.103**	-0.093
	(0.039)	(0.030)	(0.026)	(0.039)	(0.028)	(0.032)	(0.056)	(0.038)	(0.053)	(0.052)	(0.052)	(0.082)
Hedonic controls		X	X	X	X	X		X	X	X	X	X
Month FE			X	X	X	X			X	X	X	X
School FE			X	X	X	X			X	X	X	X
Block group FE				X	X	X				X	X	X
Building permits					X	X					X	X
Zip x quarter FE						X						X
Observations	6,136	6,136	6,136	6,136	6,136	6,136	2,324	2,324	2,324	2,324	2,324	2,324
Match samples	1,534	1,534	1,534	1,534	1,534	1,534	581	581	581	581	581	581
Adj R-squared	0%	40%	64%	66%	66%	69%	1%	54%	72%	77%	77%	80%

ΔGS-

Dependent variable: **log(price)**	ΔTS+						ΔTS-					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
post	0.027*	0.047***					0.043***	0.009				
	(0.014)	(0.012)					(0.012)	(0.010)				
treated	0.012	0.003					-0.005	-0.061***				
	(0.014)	(0.012)					(0.012)	(0.010)				
treated*post	0.030	0.053***	0.105***	0.128***	0.132***	0.118***	-0.025	0.046***	-0.061***	-0.078***	-0.079***	-0.090***
	(0.020)	(0.016)	(0.015)	(0.015)	(0.015)	(0.017)	(0.017)	(0.014)	(0.014)	(0.016)	(0.016)	(0.017)
Hedonic controls		X	X	X	X	X		X	X	X	X	X
Month FE			X	X	X	X			X	X	X	X
School FE			X	X	X	X			X	X	X	X
Block group FE				X	X	X				X	X	X
Building permits					X	X					X	X
Zip x quarter FE						X						X
Observations	10,348	10,348	10,348	10,348	10,348	10,348	11,688	11,688	11,688	11,688	11,688	11,688
Match samples	2,587	2,587	2,587	2,587	2,587	2,587	2,922	2,922	2,922	2,922	2,922	2,922
Adj R-squared	0%	34%	61%	65%	65%	69%	0%	37%	52%	55%	55%	58%

➤ Households follow TS performance, rather than GS rating.

III. Mechanisms

The following empirical tests focus on the cases of contradictory GS & TS ([△GS+ and ΔTS-] vs. [△GS- and ΔTS+]) to capture households' responses to the DEI component of the new GS rating.

Heterogeneity test by migration type

△GS- and △TS+

Dependent variable: log(price)	Local (1)	Local (2)	Local (3)	Local (4)	Local (5)	Local (6)	Non-local (7)	Non-local (8)	Non-local (9)	Non-local (10)	Non-local (11)	Non-local (12)
post	-0.040***	-0.015					0.137***	0.147***				
	(0.014)	(0.012)					(0.030)	(0.020)				
treated	-0.037***	-0.039***					0.092**	0.080***				
	(0.014)	(0.012)					(0.030)	(0.020)				
treated*post	0.112***	0.125***	0.176***	0.204***	0.207***	0.187***	-0.104**	-0.083***	-0.034	-0.049*	-0.046*	-0.219***
	(0.019)	(0.017)	(0.018)	(0.019)	(0.019)	(0.019)	(0.043)	(0.029)	(0.025)	(0.026)	(0.026)	(0.036)
Hedonic controls		X	X	X	X	X		X	X	X	X	X
Month FE			X	X	X	X			X	X	X	X
School FE			X	X	X	X			X	X	X	X
Block group FE				X	X	X				X	X	X
Building permits					X	X					X	X
Zip x quarter FE						X						X
Observations	6,408	6,408	6,408	6,408	6,408	6,408	3,940	3,940	3,940	3,940	3,940	3,940
Match samples	1,602	1,602	1,602	1,602	1,602	1,602	985	985	985	985	985	985
Adj R-squared	1%	19%	35%	41%	41%	47%	1%	54%	77%	80%	80%	84%

△GS+ and △TS-

Dependent variable: log(price)	Local (1)	Local (2)	Local (3)	Local (4)	Local (5)	Local (6)	Non-local (7)	Non-local (8)	Non-local (9)	Non-local (10)	Non-local (11)	Non-local (12)
post	0.274***	0.234***					0.118**	0.109***				
	(0.043)	(0.034)					(0.052)	(0.033)				
treated	0.064	0.027					0.224***	0.132***				
	(0.043)	(0.034)					(0.052)	(0.033)				
treated*post	-0.246***	-0.157***	-0.052	-0.068	-0.108	-0.179*	0.176**	0.143***	0.026	0.035	0.044	0.001
	(0.060)	(0.048)	(0.055)	(0.055)	(0.075)	(0.099)	(0.074)	(0.047)	(0.116)	(0.119)	(0.119)	(0.124)
Hedonic controls		X	X	X	X	X		X	X	X	X	X
Month FE			X	X	X	X			X	X	X	X
School FE			X	X	X	X			X	X	X	X
Block group FE				X	X	X				X	X	X
Building permits					X	X					X	X
Zip x quarter FE						X						X
Observations	832	832	832	832	832	832	1,492	1,492	1,492	1,492	1,492	1,492
Match samples	208	208	208	208	208	208	373	373	373	373	373	373
Adj R-squared	5%	41%	60%	67%	67%	71%	1%	60%	74%	78%	78%	82%

➢ Market dominated by non-local buyers are more responsive to rating related to non-academic performance.

△GS+ and △TS-

	Majority majority						Majority minority					
Dependent variable: **log(price)**	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
post	0.078*	0.050*					0.260***	0.194***				
	(0.045)	(0.026)					(0.062)	(0.042)				
treated	-0.013	-0.072***					0.328***	0.208***				
	(0.045)	(0.026)					(0.062)	(0.042)				
treated*post	-0.042	-0.017	-0.040	-0.040	-0.072	-0.079	-0.344***	-0.210***	-0.305***	-0.235**	-0.226**	-0.101
	(0.064)	(0.037)	(0.053)	(0.058)	(0.064)	(0.096)	(0.088)	(0.060)	(0.114)	(0.103)	(0.103)	(0.170)
Hedonic controls		X	X	X	X	X		X	X	X	X	X
Month FE			X	X	X	X			X	X	X	X
School FE			X	X	X	X			X	X	X	X
Block group FE				X	X	X				X	X	X
Building permits					X	X					X	X
Zip x quarter FE						X						X
Observations	1,100	1,100	1,100	1,100	1,100	1,100	1,224	1,224	1,224	1,224	1,224	1,224
Match samples	275	275	275	275	275	275	306	306	306	306	306	306
Adj R-squared	0%	67%	72%	74%	74%	78%	2%	55%	75%	80%	80%	84%

△GS- and △TS+

	Majority majority						Majority minority					
Dependent variable: **log(price)**	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
post	0.015	0.039***					0.040*	0.060***				
	(0.017)	(0.013)					(0.023)	(0.018)				
treated	0.038**	0.016					-0.013	-0.008				
	(0.017)	(0.013)					(0.023)	(0.018)				
treated*post	-0.025	0.010	0.063***	0.080***	0.088***	0.061***	0.083***	0.087***	0.122***	0.142***	0.146***	0.188***
	(0.024)	(0.019)	(0.016)	(0.017)	(0.017)	(0.018)	(0.032)	(0.026)	(0.025)	(0.026)	(0.026)	(0.034)
Hedonic controls		X	X	X	X	X		X	X	X	X	X
Month FE			X	X	X	X			X	X	X	X
School FE			X	X	X	X			X	X	X	X
Block group FE				X	X	X				X	X	X
Building permits					X	X					X	X
Zip x quarter FE						X						X
Observations	5,136	5,136	5,136	5,136	5,136	5,136	5,212	5,212	5,212	5,212	5,212	5,212
Match samples	1,284	1,284	1,284	1,284	1,284	1,284	1,303	1,303	1,303	1,303	1,303	1,303
Adj R-squared	0%	37%	64%	69%	69%	73%	1%	36%	61%	63%	63%	69%

- Preferences for academic quality is not different across race.
- Similar pattern for median income, education level, median age

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Heterogeneity test by homeownership rate

ΔGS+ and ΔTS-

Dependent variable: **log(price)**	High homeownership rate						Low homeownership rate					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
post	0.258***	0.254***					0.101*	0.006				
	(0.045)	(0.037)					(0.061)	(0.038)				
treated	0.298***	0.242***					0.052	-0.042				
	(0.045)	(0.037)					(0.061)	(0.038)				
treated*post	-0.272***	-0.276***	-0.154**	-0.141**	-0.139**	-0.035	-0.140	0.029	-0.117	-0.077	-0.064	0.064
	(0.064)	(0.052)	(0.071)	(0.068)	(0.068)	(0.128)	(0.086)	(0.053)	(0.080)	(0.075)	(0.075)	(0.122)
Hedonic controls		X	X	X	X	X		X	X	X	X	X
Month FE			X	X	X	X			X	X	X	X
School FE			X	X	X	X			X	X	X	X
Block group FE				X	X	X				X	X	X
Building permits					X	X					X	X
Zip x quarter FE						X						X
Observations	1,080	1,080	1,080	1,080	1,080	1,080	1,244	1,244	1,244	1,244	1,244	1,244
Match samples	270	270	270	270	270	270	311	311	311	311	311	311
Adj R-squared	5%	38%	55%	65%	65%	71%	0%	62%	85%	87%	87%	90%

ΔGS- and ΔTS+

Dependent variable: **log(price)**	High homeownership rate						Low homeownership rate					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
post	0.000	0.020					0.055**	0.080***				
	(0.019)	(0.017)					(0.022)	(0.016)				
treated	-0.019	-0.023					0.044**	0.033**				
	(0.019)	(0.017)					(0.022)	(0.016)				
treated*post	0.042	0.076***	0.170***	0.217***	0.209***	0.162***	0.017	0.006	0.022	0.034	0.035	-0.016
	(0.027)	(0.024)	(0.022)	(0.023)	(0.023)	(0.026)	(0.031)	(0.022)	(0.020)	(0.022)	(0.022)	(0.027)
Hedonic controls		X	X	X	X	X		X	X	X	X	X
Month FE			X	X	X	X			X	X	X	X
School FE			X	X	X	X			X	X	X	X
Block group FE				X	X	X				X	X	X
Building permits					X	X					X	X
Zip x quarter FE						X						X
Observations	5,208	5,208	5,208	5,208	5,208	5,208	5,140	5,140	5,140	5,140	5,140	5,140
Match samples	1,302	1,302	1,302	1,302	1,302	1,302	1,285	1,285	1,285	1,285	1,285	1,285
Adj R-squared	0%	21%	51%	54%	54%	60%	1%	47%	72%	76%	76%	80%

➢ Owner-occupants are more responsive to academic quality than renters.

Conclusion

1) a. Post major GS change in YE2017, schools that receive positive GS rating change are likely to: comprise of more Blacks, more SNAP students, and more children from lower income families; perform worse academically, as justified by TS; be located in neighborhoods with lower employment.

c. However, historically, when GS rating is perfectly corresponded with TS, the largest category of positive GS rating change took place in predominantly White areas.

2) The YE2017 GS rating change made GS rating less relevant, since home prices are less responsive to changes in the rating index.

3) Prices of homes assigned to schools with negative GS rating changes are positively and significantly impacted by increases in the rating portion that is attributable to the TS-based component, when compared to matched samples of home prices in nearby areas that did not experience a change in TS.

The average homebuyer follows TS as a signal of school quality, instead of GS rating.

1) A more detailed heterogeneity analysis shows that:

a. home premiums move in the same direction as GS rating changes in markets that are heavily comprised of nonlocal homebuyers.

b. markets with high proportions of local homebuyers see home premiums move in the same direction as TS, irrespective of the third-party school rating changes.

c. this finding is consistent with the notion that heuristics are likely most valuable to informationally disadvantaged homebuyers.