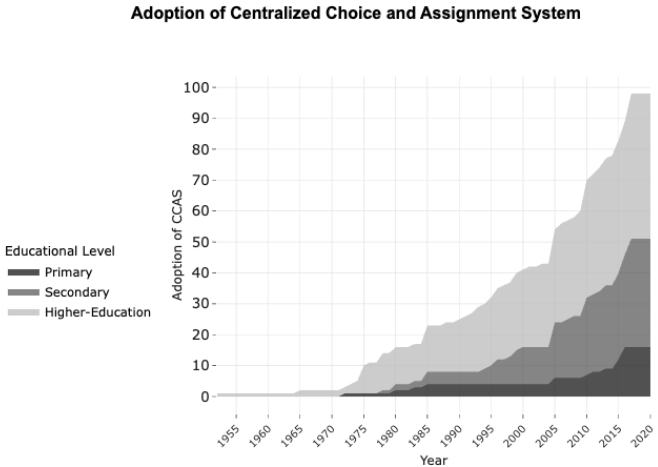
Social Interactions and Preferences for Schools: Experimental Evidence from Los Angeles

Christopher Campos

University of Chicago Booth School of Business

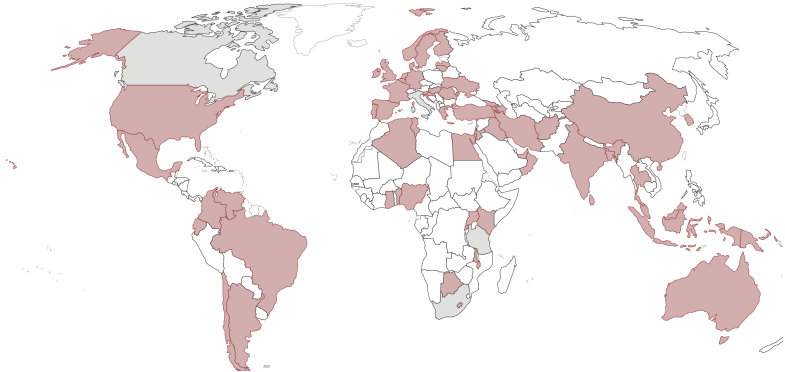
April 2023

Motivation: Rise of Centralized Choice in Public Education Systems



Source: Neilson 2021

Motivation: Rise of Centralized Choice in Public Education Systems



Source: Neilson 2021

Motivation

- Parents' choices govern the success of school choice initiatives

  → Evidence is mixed about parents' valuation of school effectiveness
  (Rothstein 2006, Abdulkadiroglu et al. 2020, Beurmann et al. 2021, Campos and Kearns 2022)

Motivation

- Parents' choices govern the success of school choice initiatives
- Imperfect information makes it challenging to infer preferences from observed choices
  - → A large body of evidence suggests information disparities loom large
    (Hastings and Weinstein 2008, Andrabi et al. 2017, Corcoran et al. 2018, Ainsworth et al. 2022)
  - → Heuristics may distort choices
    (Rothstein 2006, Abdulkadiroglu et al. 2020)
  - → **Open Question:** What do parents value?

Motivation

- Parents' choices govern the success of school choice initiatives
- Imperfect information makes it challenging to infer preferences from observed choices
- We know very little about what families actually know
  - → Are they aware of school and peer quality?
  - → Are their beliefs biased?
  - → **Open Question:** What do parents know?

Motivation

- Parents' choices govern the success of school choice initiatives
- Imperfect information makes it challenging to infer preferences from observed choices
- We know very little about what families actually know
- We know even less about factors mediating choices and their implications
  - → Social interactions and networks potentially mediate school quality gaps
  - → Social learning is important to consider in value-added-oriented campaigns
  - → **Open Question:** How important are social interactions in the school choice process?

Motivation

- Parents' choices govern the success of school choice initiatives
- Imperfect information makes it challenging to infer preferences from observed choices
- We know very little about what families actually know
- We know even less about factors mediating choices and their implications
- **This paper:** Jointly study the role of information, preferences, and social interactions in education markets and provide evidence on open questions

This paper

- Questions/objectives:
  1. **What parents know:** Are parents' beliefs about school and peer quality systematically biased?
  2. **What parents value:** What do parents value when informed about *both* peer and school quality?
  3. **Factors mediating choices:** Do social interactions matter in the school choice process?
  4. **Peaking into the black box:** What do information interventions really identify? Salience vs. information updating

This paper

- Questions/objectives:
  1. **What parents know:** Are parents' beliefs about school and peer quality systematically biased?
  2. **What parents value:** What do parents value when informed about *both* peer and school quality?
  3. **Factors mediating choices:** Do social interactions matter in the school choice process?
  4. **Peaking into the black box:** What do information interventions really identify? Salience vs. information updating
- Setting: Los Angeles Zones of Choice (ZOC) markets
  - → 53 middle schools feed into 16 separate high school markets
  - → ∼22,000 students part of the experimental sample
  - → Two experimental waves, 2019 and 2021
  - → Intervention occurs during the pre-established application cycle

This paper

- Questions/objectives:
  1. **What parents know:** Are parents' beliefs about school and peer quality systematically biased?
  2. **What parents value:** What do parents value when informed about *both* peer and school quality?
  3. **Factors mediating choices:** Do social interactions matter in the school choice process?
  4. **Peaking into the black box:** What do information interventions really identify? Salience vs. information updating
- Setting: Los Angeles Zones of Choice (ZOC) markets
- Design: Information provision experiment with a few additional features
  - → Elicit beliefs about peer and school quality at baseline
  - → Distribute information about peer quality and school quality
  - → Spillover design allows us to infer the empirical relevance of social interactions

Preview of Results

Evidence on Biases

1. Parents underestimate (pessimistic) school quality and overestimate (optimistic) peer quality
2. Substantial variation in school and peer quality bias

Changes in Demand

3. Families systematically shift their choices toward more effective (higher VA) schools
4. Decomposition: Salience impacts account for most of the changes in choices

Social Interactions and Implications

5. Indirectly treated families react in the same way as treated families (evidence of social interactions shaping demand)
6. Treatment effects (direct and spillover) depend on critical mass of parents receiving information

Related Literature

1. **Parents' Preferences**
   Rothstein 2006, Cullen et al. 2006, Harris 2015, Burgess et al. 2015, Abdulkadiroglu et al. 2020, Ainsworth et al. 2022, Beuermann et al. 2022
   Contribution: Use information provision to isolate *changes* in preferences

Related Literature

1. **Parents' Preferences**
   Rothstein 2006, Cullen et al. 2006, Harris 2015, Burgess et al. 2015, Abdulkadiroglu et al. 2020, Ainsworth et al. 2022, Beuermann et al. 2022
   Contribution: Use information provision to isolate *changes* in preferences

2. **Information (or lacktherof) in education markets**
   Hastings and Weinstein 2008, Andrabi et al. 2017, Allende et al. 2019, Corcoran et al. 2018, Haaland et al. 2021, Arteaga et al. 2022, Cohodes et al. 2022
   Contributions:
   - → Collect information about beliefs and randomize *two* measures of quality
   - → Decompose treatment effects into salience and information updating channels

Related Literature

1. **Parents' Preferences**
   Rothstein 2006, Cullen et al. 2006, Harris 2015, Burgess et al. 2015, Abdulkadiroglu et al. 2020, Ainsworth et al. 2022, Beuermann et al. 2022
   Contribution: Use information provision to isolate *changes* in preferences

2. **Information (or lacktherof) in education markets**
   Hastings and Weinstein 2008, Andrabi et al. 2017, Allende et al. 2019, Corcoran et al. 2018, Haaland et al. 2021, Arteaga et al. 2022, Cohodes et al. 2022
   Contributions:
   - → Collect information about beliefs and randomize *two* measures of quality
   - → Decompose treatment effects into salience and information updating channels

3. **Social interactions**
   Becker 1974, Banerjee 1992, Sasaki and Toda 1996, Bertrand et al. 2000, Manski 2000, Brock and Durlauf 2002, Durlauf 2004, Allende 2019, Billings et al. 2019, Breza and Chandrasekhar 2019, Golub et al. 2020, Banerjee et al. 2021 Cox et al. 2021, Leshno 2021
   Contribution: Empirical relevance of externality occurring at the preference formation stage

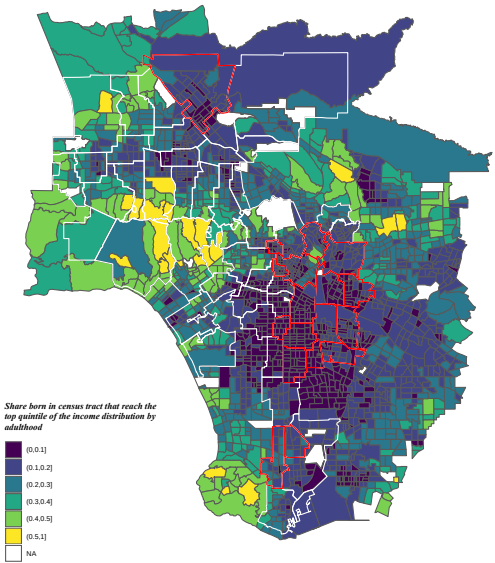
Roadmap

1. Setting and Experiment Design
2. Reduced Form Evidence
3. Survey Evidence: AG and IA Bias
4. Impacts on Utility Weights
   - → Simple school choice model with beliefs
   - → Decomposition of utility weight impacts
5. Implications

Setting: Zones of Choice

- ZOC is a neighborhood-based public school choice program
- Sixteen mutually exclusive high school markets within Los Angeles
  - → Catchment areas combined to create neighborhood-based markets
  - → Families' choice sets are fixed and specific to their neighborhood
  - → Segregated in terms of race/ethnicity and SES Map
- I intervene in middle schools that feed into different markets
  - → Students enrolled in a feeder middle school apply to a particular ZOC market
  - → Most families and students first learn about the program in eighth grade
  - → Useful stage to intervene with information before families submit applications
- Applications contain a rank-ordered list and assignments are centralized

ZOC neighborhoods are mostly classified as low mobility by Chetty et al. (2018)



Design: Timeline

1. Baseline Survey: Early September
   - → Distributed in the classroom and via text message
   - → Include a video that teaches families about the differences between school and peer quality
   - → Baseline beliefs and preferences

Design: Timeline

1. Baseline Survey: Early September
   - → Distributed in the classroom and via text message
   - → Include a video that teaches families about the differences between school and peer quality
   - → Baseline beliefs and preferences
2. Information provision: Late September
   - → Cross-randomize school *and* peer quality
     - School quality is estimated school value-added reported as a percentile rank
     - Peer quality is a measure of average test scores reported as a percentile rank
   - → Treatment-specific videos that help families understand the information

Design: Timeline

1. Baseline Survey: Early September
   - → Distributed in the classroom and via text message
   - → Include a video that teaches families about the differences between school and peer quality
   - → Baseline beliefs and preferences
2. Information provision: Late September
   - → Cross-randomize school *and* peer quality
     - School quality is estimated school value-added reported as a percentile rank
     - Peer quality is a measure of average test scores reported as a percentile rank
   - → Treatment-specific videos that help families understand the information
3. Applications cycle: October-November

School and Peer Quality Definition

$$Y_{ij} = \mu_j + a_i$$

- μ_j is school j mean potential outcome
- a_i is mean-zero student ability

Estimation and Validation:

$$Y_i = \mu_0 + \sum_j \beta_j D_{ij} + \gamma' X_i + u_i$$

- D_{ij} are school j enrollment indicators
- $a_i = \gamma' X_i + u_i$ with X_i containing baseline covariates and lagged test scores
- Model parameters estimated via OLS; use lotteries to validate OLS estimates Evidence

School and Peer Quality Definition

Peer and School Quality Definition:

$$\bar{Y}_j = \underbrace{\beta_j}_{School\ Quality\ Component} + \underbrace{\theta' \bar{X}_j}_{Peer\ Quality\ Component} \tag{1}$$

- School Quality is referred to as **Achievement Growth** and is defined as

$$Q_j^S = \text{int}\left(\frac{\text{rank}(\hat{\beta}_j)}{J} \times 100\right)$$

- Peer Quality is referred to as **Incoming Achievement** and is defined as

$$Q_j^P = \text{int}\left(\frac{\text{rank}(\hat{\theta}' \bar{X}_j)}{J} \times 100\right)$$

- Peer and school quality are positively correlated ▸ Evidence

Baseline Survey

Survey Goals:

- Collect information on families' Incoming Achievement (IA) and Achievement Growth (AG) beliefs
- Obtain a baseline rank-ordering of schools in their specific choice set
- Ask families' about their opinions on different school attributes

Challenges:

- How do you elicit beliefs?
  - → School quality referred to *achievement growth* and peer quality referred to as *incoming achievement*
  - → Ask families to assess where schools in their choice set rank across all other schools in the district
  - → Is School A in the Top 10%, 80-90%, ...?
- Explaining the difference between test score value-added and test score levels is challenging
  - → Survey and treatment includes a companion video to help explain

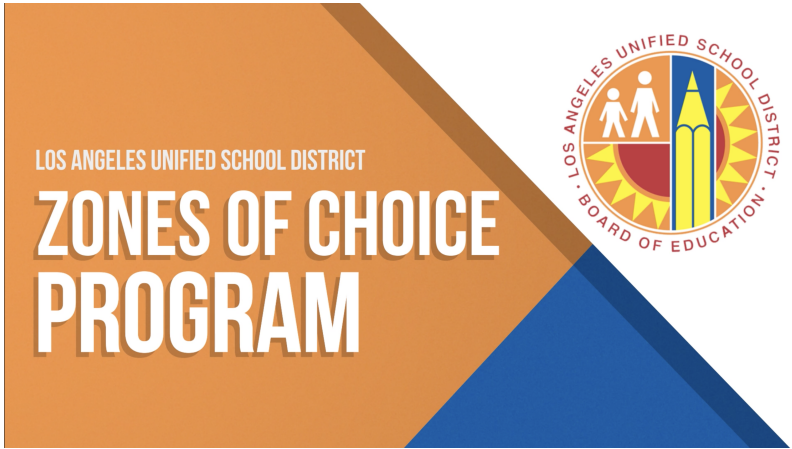
Companion Video

Watch Video

English

Spanish

Signal the information is on behalf of the school district



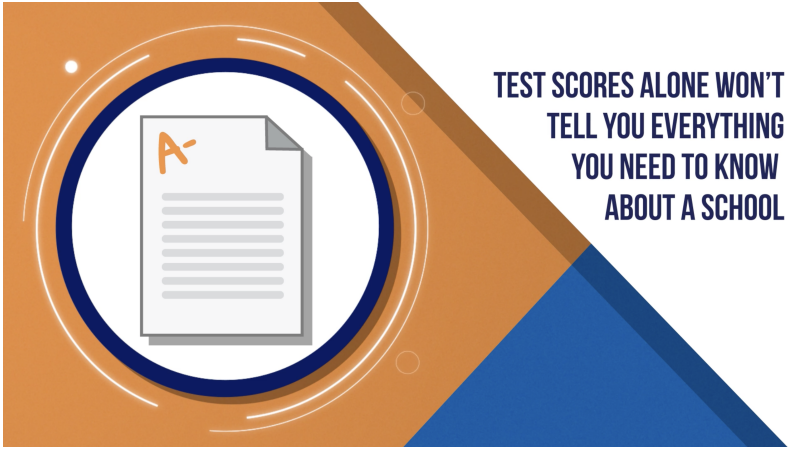
Introduce the two concepts

Use visual aid to describe IA

Use visual aid to describe AG

Describe some differences but remain agnostic about which is better

Remind parents that test scores are not all they should consider



Experiment Design

Goals:

1. Identify parents' relative valuation for peer and school quality

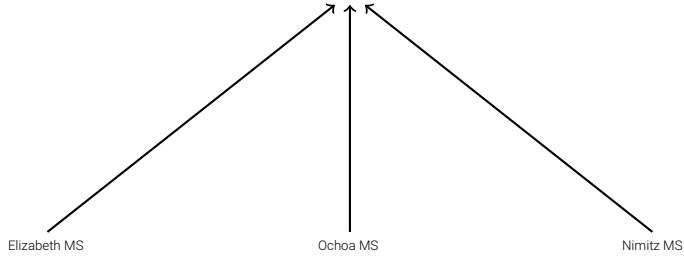
   → Cross-randomize peer and school quality

2. Identify social interactions

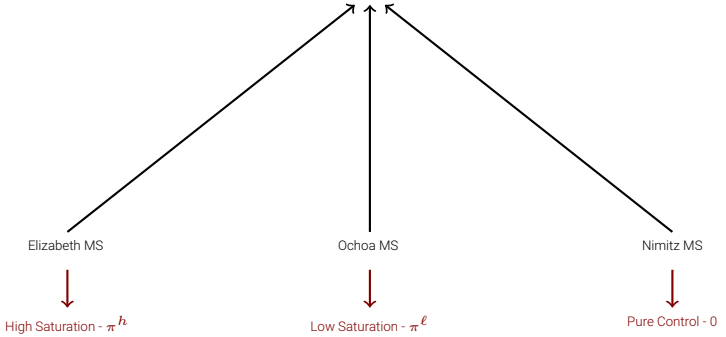
   → Two-stage randomization

   → Effects on untreated parents in treated schools identify social interactions

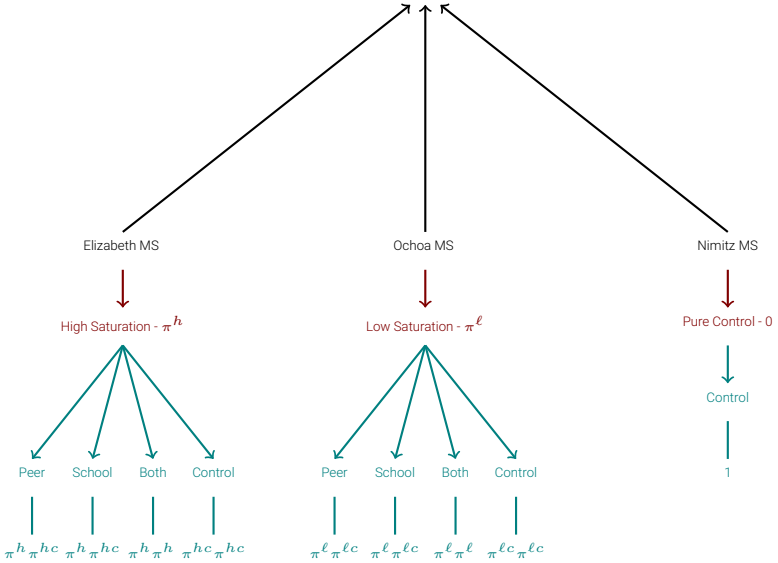
Bell Zone of Choice



Bell Zone of Choice



Bell Zone of Choice



Treatment Letters in English and Spanish

We are providing information about schools within your Zone of Choice to ensure you have the best information available prior to your upcoming decision.

Bell Zone of Choice

We determine the quality of a school based on students' average scores on state exams

This measure has two parts you should consider, one which measures the school's ability of attracting high scoring students, and the second is the school's impact on test score growth.

Therefore, a school's observed quality is a combination of both their students' **incoming achievement** and the **achievement growth** they obtain while at the school. Some parents may prefer schools with high incoming achievement, and others may prefer schools with high achievement growth. The table below provides each school's district-wide ranking.

Incoming Achievement

Incoming achievement is the average test scores of school's incoming students at the time they enter school.

Achievement Growth

We measure a school's ability improve test scores by measuring the growth of their students' test scores between entry into the school and eleventh grade.

We hope you use this information when choosing the right school for your student.

School	Incoming Achievement*	Achievement Growth*	Campus Location	Type of School
Science, Technology, Engineering, Arts & Math (STEAM) High School	76	94	Legacy HS	Small School
Visual & Performing Arts (VAPA) High School	74	67	Legacy HS	Small School
Health Academy	58	58	Elizabeth LC	Small Learning Community
Multilingual Teacher Academy	63	50	Bell HS	Linked Learning Academy
STEAM	47	82	Maywood Academy	Small Learning Community
Information Technology Academy	49	53	Elizabeth LC	Small Learning Community
Arts Language & Performance Humanities Academy	63	50	Bell HS	Linked Learning Academy
9thGrade Academy	47	82	Maywood Academy	Small Learning Community
Bell Global Studies	63	50	Bell HS	Small Learning Community

Estamos proporcionando información sobre las escuelas dentro de su Zona de Opción, para asegurarnos de que tenga la mejor información disponible antes de su próxima decisión.

Zona de Opción Bell

Determinamos la calidad de una escuela en función de los puntajes promedio de los estudiantes en los exámenes estatales

Esta medida tiene dos partes que debe considerar, una que mide la capacidad de la escuela para atraer a estudiantes con altas calificaciones, y la segunda es el impacto de la escuela en el crecimiento de las calificaciones de las pruebas.

Por lo tanto, la calidad observada de una escuela es una combinación tanto del **rendimiento entrante** de sus estudiantes como del **crecimiento de logros** o **crecimiento del rendimiento** que obtienen mientras están en la escuela. Algunos padres pueden preferir escuelas con alto rendimiento entrante, y otros pueden preferir escuelas con alto crecimiento de logros. A continuación, proporcionamos la clasificación de cada escuela comparado a todas escuelas en el distrito.

Rendimiento Entrante

El rendimiento entrante de una escuela es el puntaje promedio de sus estudiantes cuando ingresan a la escuela.

Crecimiento de logros

Medimos la capacidad de una escuela para mejorar los puntajes de los exámenes midiendo el crecimiento de los puntajes de los exámenes de sus estudiantes entre el ingreso a la escuela y el onceavo grado.

Esperamos que utilice esta información al elegir la escuela adecuada para su estudiante.

Escuela	Rendimiento Entrante*	Crecimiento de logros*	Ubicación del campus	Tipo de escuela
Preparatoria de Ciencia, Tecnología, Ingeniería, Artes y Matemáticas (STEAM)	76	94	Legacy HS	Escuela Pequeña
Preparatoria de Artes Visuales y Técnicas (VAPA)	74	67	Legacy HS	Escuela Pequeña
Academia de Salud	58	58	Elizabeth LC	Comunidad Educativa Pequeña (SLC)
Academia de Aprendizaje Enlazado/ Carrera de Profesores Multilingües	63	50	Bell HS	Academia de Aprendizaje Enlazado
Academia de Ciencia, Tecnología, Ingeniería, Artes y Matemáticas (STEAM)	47	82	Maywood Academy	Comunidad Educativa Pequeña (SLC)
Academia de Información Tecnológica	49	53	Elizabeth LC	Comunidad Educativa Pequeña (SLC)
Academia de Artes, Idiomas, Artes Escénicas y Humanidades	63	50	Bell HS	Academia de Aprendizaje Enlazado
Academia del 9° Grado	47	82	Maywood Academy	Comunidad Educativa Pequeña (SLC)
Estudios Globales	63	50	Bell HS	Comunidad Educativa Pequeña (SLC)

Data

- LAUSD administrative student data 2015-2021
  - → Demographics
  - → Test scores
  - → Addresses
- Zones of Choice data 2015-2021
  - → Applications containing rank-ordered lists
  - → Centralized assignments
- Survey data
  - → Baseline beliefs
  - → Baseline rank-ordered list

Descriptive Statistics: ZOC students are disadvantaged, mostly Hispanic, and mostly classified as poor

	Non-ZOC (1)	ZOC (2)	Difference (3)
Reading Scores	0.135	-0.117	-0.252
			(0.081)
Math Scores	0.099	-0.114	-0.213
			(0.081)
College	0.1	0.065	-0.036
			(0.017)
Migrant	0.036	0.054	0.018
			(0.007)
Female	0.513	0.481	-0.032
			(0.016)
Poverty	0.909	0.967	0.058
			(0.024)
Special Education	0.148	0.141	-0.007
			(0.022)
English Learners	0.076	0.134	0.058
			(0.017)
Black	0.107	0.03	-0.077
			(0.027)
Hispanic	0.683	0.862	0.179
			(0.075)
White	0.038	0.015	-0.024
			(0.009)
N	26,517	13,015	

▸ Balance Check

Descriptive Statistics: ZOC students are disadvantaged, mostly Hispanic, and mostly classified as poor

	Non-ZOC (1)	ZOC (2)	Difference (3)
Reading Scores	0.135	-0.117	-0.252
			(0.081)
Math Scores	0.099	-0.114	-0.213
			(0.081)
College	0.1	0.065	-0.036
			(0.017)
Migrant	0.036	0.054	0.018
			(0.007)
Female	0.513	0.481	-0.032
			(0.016)
Poverty	0.909	0.967	0.058
			(0.024)
Special Education	0.148	0.141	-0.007
			(0.022)
English Learners	0.076	0.134	0.058
			(0.017)
Black	0.107	0.03	-0.077
			(0.027)
Hispanic	0.683	0.862	0.179
			(0.075)
White	0.038	0.015	-0.024
			(0.009)
N	26,517	13,015	

▸ Balance Check

Descriptive Statistics: ZOC students are disadvantaged, mostly Hispanic, and mostly classified as poor

	Non-ZOC (1)	ZOC (2)	Difference (3)
Reading Scores	0.135	-0.117	-0.252
			(0.081)
Math Scores	0.099	-0.114	-0.213
			(0.081)
College	0.1	0.065	-0.036
			(0.017)
Migrant	0.036	0.054	0.018
			(0.007)
Female	0.513	0.481	-0.032
			(0.016)
Poverty	0.909	0.967	0.058
			(0.024)
Special Education	0.148	0.141	-0.007
			(0.022)
English Learners	0.076	0.134	0.058
			(0.017)
Black	0.107	0.03	-0.077
			(0.027)
Hispanic	0.683	0.862	0.179
			(0.075)
White	0.038	0.015	-0.024
			(0.009)
N	26,517	13,015	

▸ Balance Check

Descriptive Statistics: ZOC students are disadvantaged, mostly Hispanic, and mostly classified as poor

	Non-ZOC (1)	ZOC (2)	Difference (3)
Reading Scores	0.135	-0.117	-0.252
			(0.081)
Math Scores	0.099	-0.114	-0.213
			(0.081)
College	0.1	0.065	-0.036
			(0.017)
Migrant	0.036	0.054	0.018
			(0.007)
Female	0.513	0.481	-0.032
			(0.016)
Poverty	0.909	0.967	0.058
			(0.024)
Special Education	0.148	0.141	-0.007
			(0.022)
English Learners	0.076	0.134	0.058
			(0.017)
Black	0.107	0.03	-0.077
			(0.027)
Hispanic	0.683	0.862	0.179
			(0.075)
White	0.038	0.015	-0.024
			(0.009)
N	26,517	13,015	

▸ Balance Check

Reduced Form Approach

$$
\begin{aligned}
Y_i = \alpha_{zb} &+ \underbrace{\beta_{Ph} T_i^P \times D_{s(i)}^h + \beta_{Sh} T_i^S \times D_{s(i)}^h + \beta_{Bh} T_i^B \times D_{s(i)}^h}_{High\ Saturation\ Effects} \\
&+ \underbrace{\beta_{P\ell} T_i^P \times D_{s(i)}^\ell + \beta_{S\ell} T_i^S \times D_{s(i)}^\ell + \beta_{B\ell} T_i^B \times D_{s(i)}^\ell}_{Low\ Saturation\ Effects} \\
&+ \underbrace{\beta_h C_i \times D_{s(i)}^h + \beta_\ell C_i \times D_{s(i)}^\ell}_{Spillover\ Effects} + u_i
\end{aligned}
$$

- Y_i : student i's top-ranked school IA or AG
- T_i^x : Student-level treatment x indicator
- $D_{s(i)}^\ell$: Saturation ℓ specific school-level treatment indicator; C_i: Student-level untreated indicator
- α_{zb}: zone-block fixed effects

Reduced Form Approach

$$Y_i = \alpha_{zb} + \underbrace{\beta_{Ph} T_i^P \times D_{s(i)}^h + \beta_{Sh} T_i^S \times D_{s(i)}^h + \beta_{Bh} T_i^B \times D_{s(i)}^h}_{High\ Saturation\ Effects}$$
$$+ \underbrace{\beta_{P\ell} T_i^P \times D_{s(i)}^\ell + \beta_{S\ell} T_i^S \times D_{s(i)}^\ell + \beta_{B\ell} T_i^B \times D_{s(i)}^\ell}_{Low\ Saturation\ Effects}$$
$$+ \underbrace{\beta_h C_i \times D_{s(i)}^h + \beta_\ell C_i \times D_{s(i)}^\ell}_{Spillover\ Effects} + u_i$$

- Y_i : student i's top-ranked school IA or AG
- T_i^x : Student-level treatment x indicator
- $D_{s(i)}^\ell$: Saturation ℓ specific school-level treatment indicator; C_i: Student-level untreated indicator
- α_{zb}: zone-block fixed effects

Reduced Form Approach

$$Y_i = \alpha_{zb} + \underbrace{\beta_{Ph} T_i^P \times D_{s(i)}^h + \beta_{Sh} T_i^S \times D_{s(i)}^h + \beta_{Bh} T_i^B \times D_{s(i)}^h}_{High\ Saturation\ Effects}$$

$$+ \underbrace{\beta_{P\ell} T_i^P \times D_{s(i)}^\ell + \beta_{S\ell} T_i^S \times D_{s(i)}^\ell + \beta_{B\ell} T_i^B \times D_{s(i)}^\ell}_{Low\ Saturation\ Effects}$$

$$+ \underbrace{\beta_h C_i \times D_{s(i)}^h + \beta_\ell C_i \times D_{s(i)}^\ell}_{Spillover\ Effects} + u_i$$

- Y_i : student i's top-ranked school IA or AG
- T_i^x : Student-level treatment x indicator
- $D_{s(i)}^\ell$: Saturation ℓ specific school-level treatment indicator; C_i: Student-level untreated indicator
- α_{zb}: zone-block fixed effects

Reduced Form Approach

$$Y_i = \alpha_{zb} + \underbrace{\beta_{Ph} T_i^P \times D^h_{s(i)} + \beta_{Sh} T_i^S \times D^h_{s(i)} + \beta_{Bh} T_i^B \times D^h_{s(i)}}_{High\ Saturation\ Effects}$$

$$+ \underbrace{\beta_{P\ell} T_i^P \times D^\ell_{s(i)} + \beta_{S\ell} T_i^S \times D^\ell_{s(i)} + \beta_{B\ell} T_i^B \times D^\ell_{s(i)}}_{Low\ Saturation\ Effects}$$

$$+ \underbrace{\beta_h C_i \times D^h_{s(i)} + \beta_\ell C_i \times D^\ell_{s(i)}}_{Spillover\ Effects} + u_i$$

- Y_i : student i's top-ranked school IA or AG
- T_i^x : Student-level treatment x indicator
- $D^\ell_{s(i)}$: Saturation ℓ specific school-level treatment indicator; C_i: Student-level untreated indicator
- α_{zb}: zone-block fixed effects

Reduced Form Approach

$$
\begin{aligned}
Y_i = \alpha_{zb} &+ \underbrace{\beta_{Ph} T_i^P \times D_{s(i)}^h + \beta_{Sh} T_i^S \times D_{s(i)}^h + \beta_{Bh} T_i^B \times D_{s(i)}^h}_{High\ Saturation\ Effects} \\
&+ \underbrace{\beta_{P\ell} T_i^P \times D_{s(i)}^\ell + \beta_{S\ell} T_i^S \times D_{s(i)}^\ell + \beta_{B\ell} T_i^B \times D_{s(i)}^\ell}_{Low\ Saturation\ Effects} \\
&+ \underbrace{\beta_h C_i \times D_{s(i)}^h + \beta_\ell C_i \times D_{s(i)}^\ell}_{Spillover\ Effects} + u_i
\end{aligned}
$$

- Y_i : student i's top-ranked school IA or AG
- T_i^x : Student-level treatment x indicator
- $D_{s(i)}^\ell$: Saturation ℓ specific school-level treatment indicator; C_i: Student-level untreated indicator
- α_{zb}: zone-block fixed effects

Reduced Form Approach: Difference-in-differences

$$Y_i = \alpha_{z(i)t(i)} + \alpha_{g(i)} + \sum_{k \neq -1} \left(\beta_{Lk} D_{L(i)} \times Post_{k(i)} + \beta_{Hk} D_{H(i)} \times Post_{k(i)} \right) + u_i$$

School-level experiment:

- Aggregate across individual treatment statuses:
  - → $\beta_{xk} = \beta_{Pk} = \beta_{Sk} = \beta_{Bx}$ correspond to treatment $x \in \{H, L\}$ effects in period k
  - → Aggregates across directly and indirectly treated and different treatment statuses
- Difference-in-difference analog improves precision and provides placebo checks

Reduced Form Approach: Identifying Spillovers

$$Y_i = \alpha_{z(i)t(i)} + \alpha_{g(i)} + \sum_{k \neq -1} \Bigg(\underbrace{\beta_{Lk} D_{L(i)} \times Post_{k(i)} + \beta_{Hk} D_{H(i)} \times Post_{k(i)}}_{Treated} + \underbrace{\psi_{Lk} C_{L(i)} \times Post_{k(i)} + \psi_{Lk} C_{H(i)} \times Post_{k(i)}}_{Spillover} \Bigg) + u_i$$

School-level experiment:

- Aggregate across treatment types and separate by treatment and spillover within treated school:
  - → $\beta_{xk} = \beta_{Px} = \beta_{Sx} = \beta_{Bx}$ correspond to treatment $x \in \{H, L\}$ effects for period k
  - → ψ_{Hk} and ψ_{Lk} correspond to saturation-specific effects among the indirectly treated in treated schools
- Report saturation-specific effects; school-level experiment
- Difference-in-difference analog improves precision and provides placebo checks

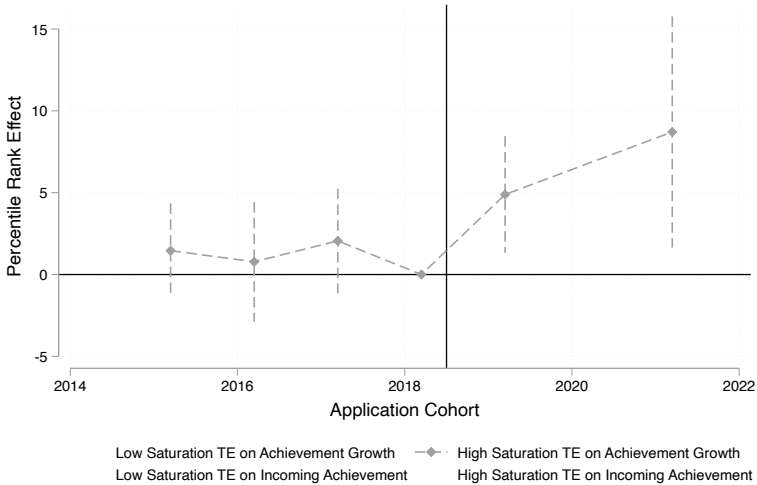
Reduced Form Approach: Distributional Estimates

$$1\{Y_i \leq a\} = \alpha_{zb} + \beta_P T_i^P + \beta_S T_i^S + \beta_B T_i^B + \beta_{Spill} C_i + u_i; \quad \text{for } a = 1, \cdots, 100$$

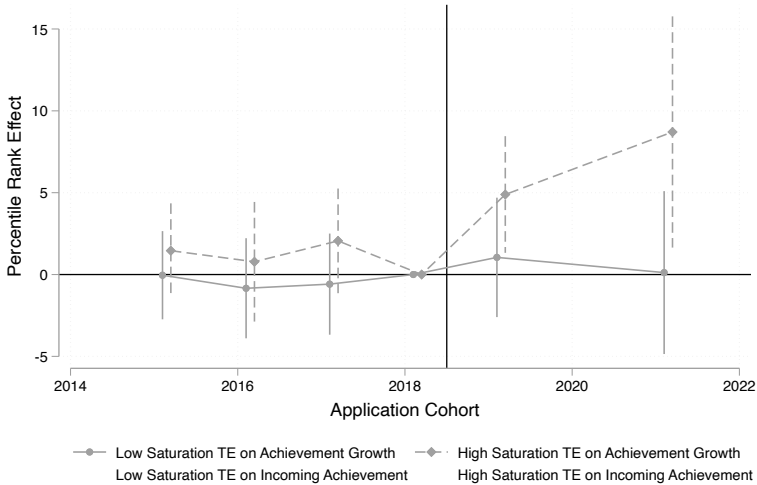
Distributional effects:

- Aggregate across saturation clusters:
  $\beta_{Ph} = \beta_{P\ell} = \beta_P, \quad \beta_{Sh} = \beta_{S\ell} = \beta_S, \quad \beta_{Bh} = \beta_{B\ell} = \beta_B, \quad \beta_h = \beta_\ell = \beta_{Spill}$
- $1\{Y_i \leq a\}$ as an outcome recovers effects on the CDF of Y at a point a
- Report estimates from 100 separate regressions at different points $a = 1, \cdots, 100$
- Report information-specific effects; individual-level treatments
- Distributional estimates demonstrate that demand moved uniformly across the distribution, regardless of individual treatment status

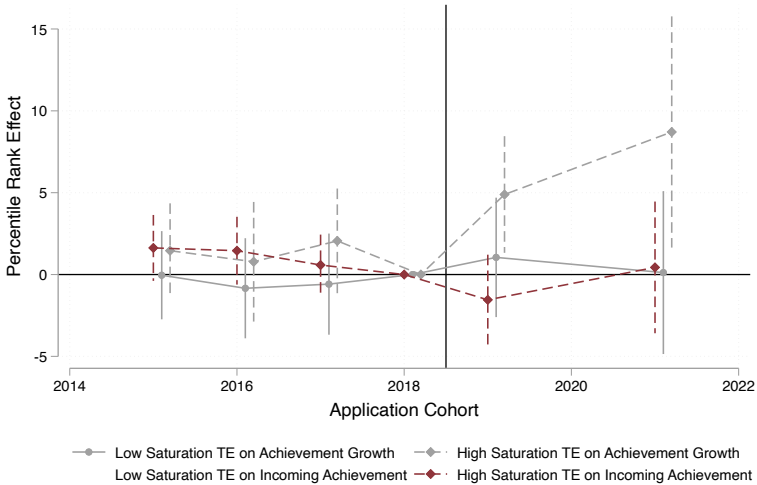
Increased demand for AG that depends on saturation status



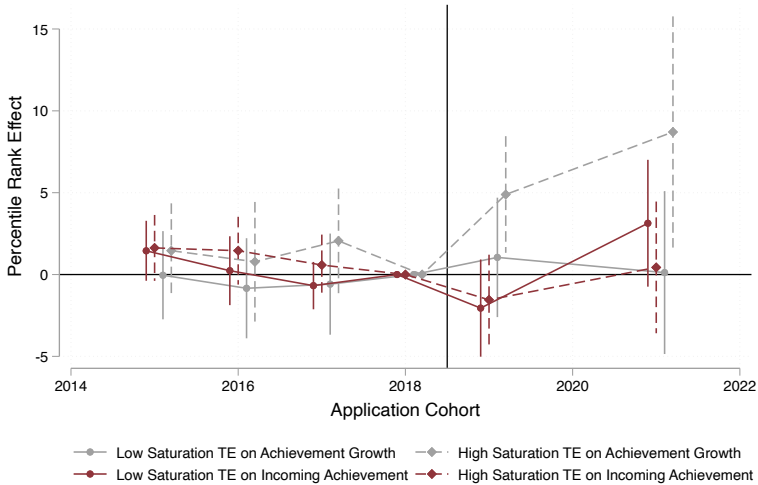
Increased demand for AG that depends on saturation status



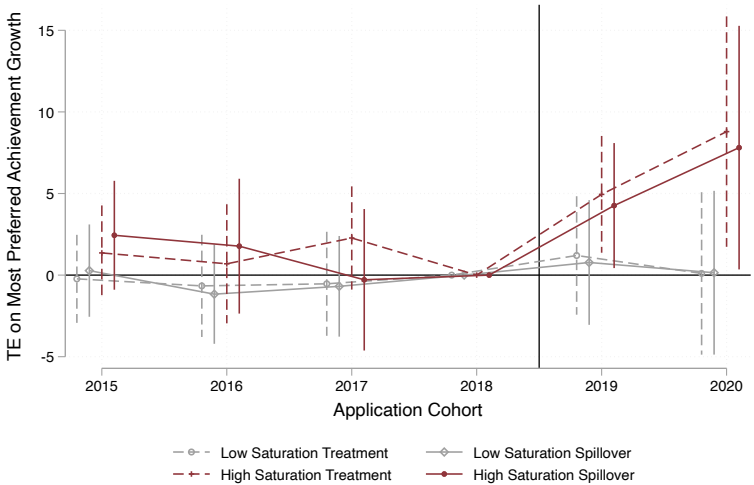
Increased demand for AG that depends on saturation status



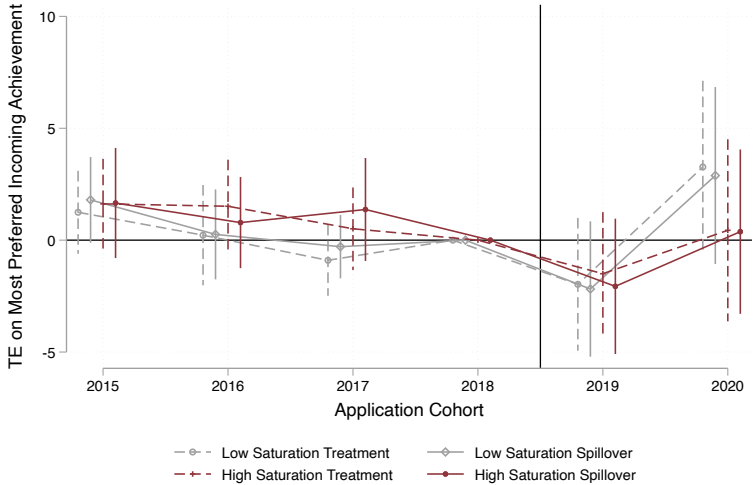
Increased demand for AG that depends on saturation status



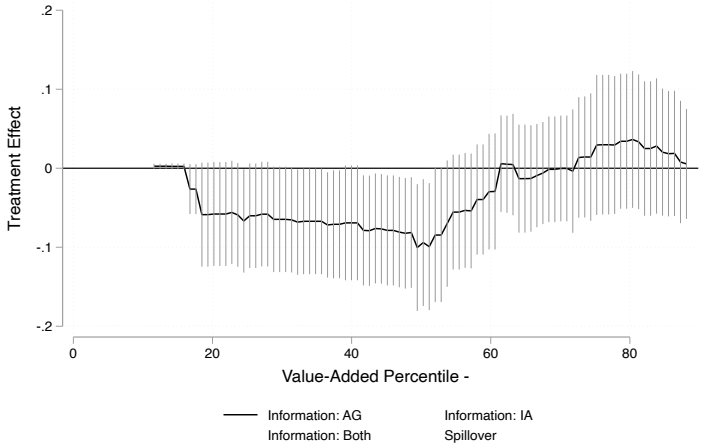
Increased demand for AG similar for spillover group



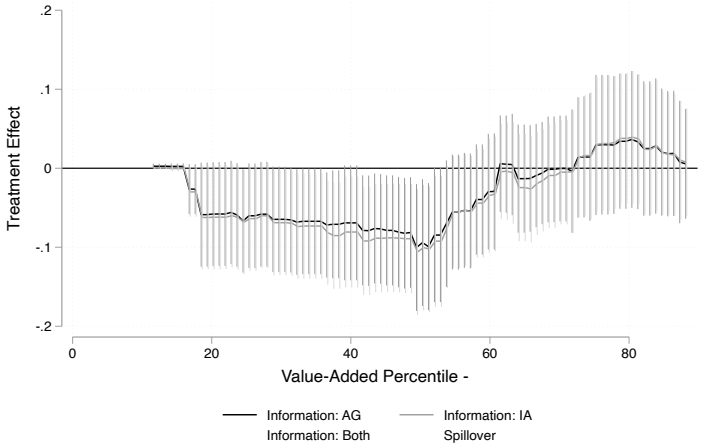
Null IA impact similar for spillover group



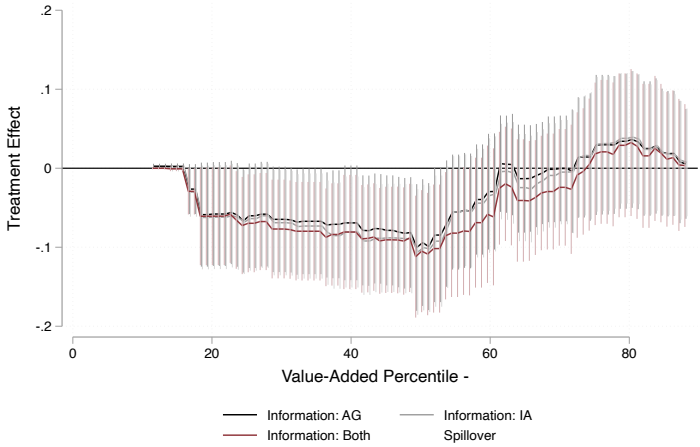
Distributional Effects: Increased demand for higher AG schools



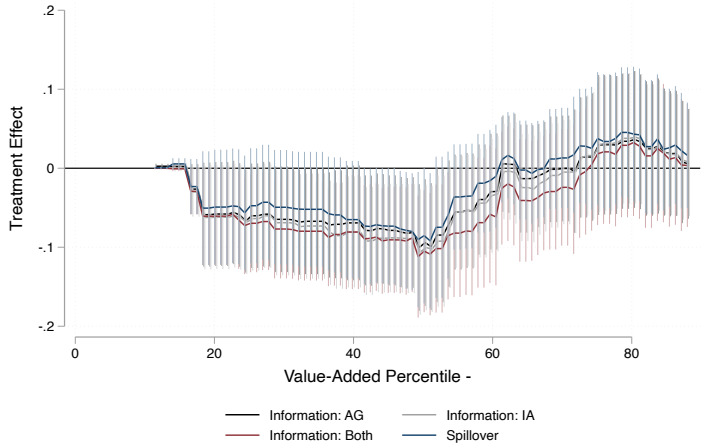
Distributional Effects: Increased demand for higher AG schools



Distributional Effects: Increased demand for higher AG schools



Distributional Effects: Spillover effects identical to treatment effects



IA and AG Support | Results at other ROL ranks | Impacts on Other Attributes | Other Specifications

Survey Evidence

- Survey evidence for the 2021 cohort
- Response rate is roughly 50 percent

Today:

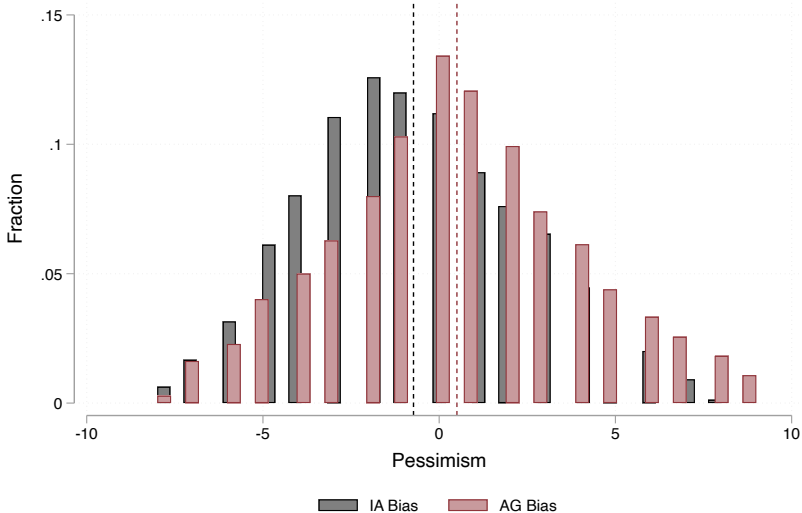
- First evidence on joint distribution of school and peer quality beliefs
- Predictors and correlates of biases
- Bias in terms of pessimism:

$$b_{ji}^{x} \equiv Q_{j}^{x} - \tilde{Q}_{ji}^{x} \quad x \in \{IA, AG\}$$

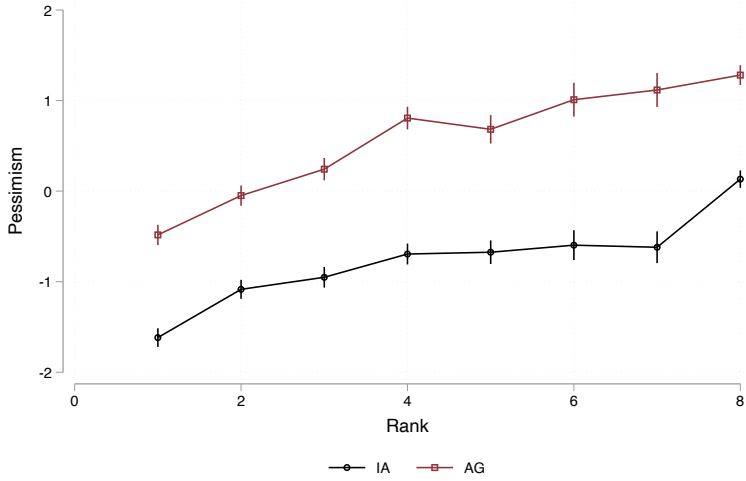
with Q_j^x referring to researcher-generated quality and $\tilde{Q}_{ji}^x$ referring to beliefs

IA and AG Pessimism Distribution

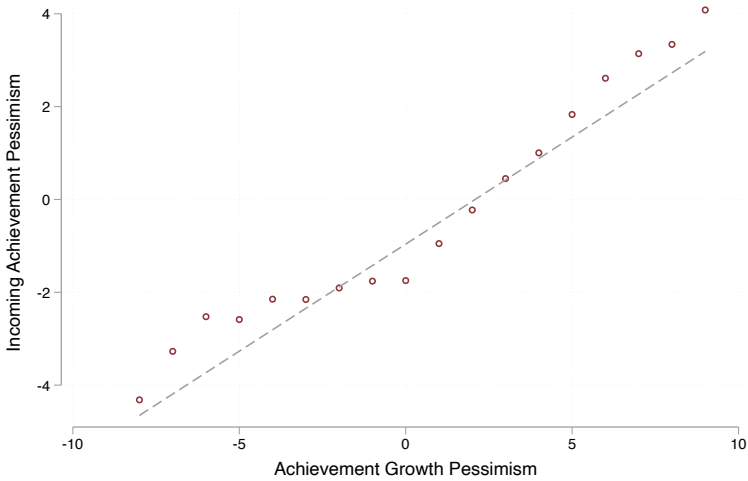
Families overestimate IA and underestimate AG



Bias by Position of the Rank-Ordered List



Bias is positively correlated ($\rho \approx 0.45$)



Taking Stock of Results

Survey Evidence Reveals:

- Families are pessimistic about achievement growth and optimistic about incoming achievement
- Few observables predict AG bias, more so for IA bias Evidence

Reduced Form Evidence:

- School-level experiment: families systematically choose higher VA schools but TEs depend on saturation
- Social Interactions: untreated families in treated schools respond similarly to treated families; type of information does not matter as all prefer higher VA schools
- Reduced-form evidence does not leverage all information on ROL and reports TEs on correlated attributes

Next steps:

- Modest structure allows us to leverage all information and decompose TEs

School Choice Model

Family i's perceived indirect utility of enrolling in school j is

$$U_{ij} = \delta_{ji} - \lambda d_{ij} + \varepsilon_{ij}$$
$$\delta_{ji} = \gamma_P \tilde{Q}^P_{ji} + \gamma_S \tilde{Q}^S_{ji}$$

- δ_{ji} : mean utility at school j for individual i
- $\tilde{Q}^P_{ji}$, $\tilde{Q}^S_{ji}$: peer and school quality *beliefs*, respectively
- d_{ij}: distant to school j for family i
- ε_{ij} : unobserved preference heterogeneity

Quality and beliefs

Families have beliefs about *true* Q_j^P and Q_j^S

$$\tilde{Q}_{ji}^P = (1 + b_{Pji})Q_j^p \qquad \tilde{Q}_{ji}^S = (1 + b_{Sji})Q_j^S$$

Quality and biases are jointly normal

$$\begin{pmatrix} Q_j^P \\ Q_j^S \end{pmatrix} \sim \mathcal{N}\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_P^2 & \rho_Q \sigma_P \sigma_S \\ \rho_Q \sigma_P \sigma_S & \sigma_S^2 \end{pmatrix} \right)$$

$$\begin{pmatrix} b_{Pji} \\ b_{Sji} \end{pmatrix} \sim \mathcal{N}\left(\begin{pmatrix} \mu_P \\ \mu_S \end{pmatrix}, \begin{pmatrix} \sigma_{Pb}^2 & \rho_b \sigma_{Pb} \sigma_{Sb} \\ \rho_b \sigma_{Pb} \sigma_{Sb} & \sigma_{Sb}^2 \end{pmatrix} \right)$$

Modeling treatment

Information treatments potentially cause families to change the weights they assign to school and peer quality:

$$\tilde{U}_{ij} = \lambda d_{ij} + \underbrace{\gamma_P \tilde{Q}^P_{ji} + \gamma_S \tilde{Q}^S_{ji}}_{Pure\ Control} + \underbrace{\beta_P Q^P_j \times 1\{i \in \mathcal{I}_P\}}_{Peer\ Treatment} + \underbrace{\beta_S Q^S_j \times 1\{i \in \mathcal{I}_S\}}_{School\ Treatment} + \underbrace{\psi_P Q^P_j \times 1\{i \in \mathcal{I}_C\} + \psi_S Q^S_j \times 1\{i \in \mathcal{I}_C\}}_{Spillover\ Treatment} + \tilde{\varepsilon}_{ij}$$

- $1\{i \in \mathcal{I}_P\}$, $1\{i \in \mathcal{I}_S\}$, $1\{i \in \mathcal{I}_C\}$: indicators for receiving peer, school, and spillover treatment
- β_P, β_S, ψ_P, and ψ_S are changes in utility weights identified by comparisons with pure control group
- $\frac{\beta_P}{\lambda}$, $\frac{\beta_S}{\lambda}$, $\frac{\psi_S}{\lambda}$, and $\frac{\psi_S}{\lambda}$ are changes in WTT

Survey moments allow for decomposition of utility weight impacts

Single-information treatment effects identified by comparisons with the pure-control group. The treatment P utility weight impact is

$$\hat{\beta}_P = (\underbrace{\beta_P}_{Salience} - \underbrace{\mu_P \gamma_P}_{Information\ \ Updating} - \underbrace{\rho_B \frac{\sigma_{Sb}}{\sigma_{Pb}} \mu_S \rho_Q \frac{\sigma_S}{\sigma_P} \gamma_S}_{Correlated\ \ Beliefs}) \tag{2}$$

and among those that get both treatments, the treatment P utility weight impact is:

$$\hat{\beta}_P = (\underbrace{\beta_P}_{Salience} - \underbrace{\mu_P \gamma_P}_{Information\ \ Updating})$$

Survey moments allow for decomposition of utility weight impacts

Single-information treatment effects identified by comparisons with the pure-control group. The treatment P utility weight impact is

$$\hat{\beta}_P = (\underbrace{\beta_P}_{Salience} - \underbrace{\mu_P \gamma_P}_{Information\ \ Updating} - \underbrace{\rho_B \frac{\sigma_{Sb}}{\sigma_{Pb}} \mu_S \rho_Q \frac{\sigma_S}{\sigma_P} \gamma_S}_{Correlated\ \ Beliefs}) \tag{2}$$

and among those in the spillover group, the treatment P utility weight impact is :

$$\hat{\psi}_P = \underbrace{\pi^C}_{Saturation\ status} (\underbrace{\psi_P}_{Salience} - \underbrace{\mu_P \gamma_P}_{Information\ \ Updating})$$

where π^C is the saturation level

Survey moments allow for decomposition of utility weight impacts

Single-information treatment effects identified by comparisons with the pure-control group. The treatment P utility weight impact is

$$\hat{\beta}_P = (\underbrace{\beta_P}_{Salience} - \underbrace{\mu_P \gamma_P}_{Information\ \ Updating} - \underbrace{\rho_B \frac{\sigma_{Sb}}{\sigma_{Pb}} \mu_S \rho_Q \frac{\sigma_S}{\sigma_P} \gamma_S}_{Correlated\ \ Beliefs}) \tag{2}$$

- μ_P, μ_S : mean bias identified in the survey
- ρ_B, ρ_Q: beliefs and quality correlations identified in the survey
- $\sigma_{Sb}, \sigma_{Pb}, \sigma_S, \sigma_P$: belief and quality standard deviations identified in the survey
- γ_P, γ_S : utility weights for the control group
- $\beta_P, \beta_S, \psi_S, \psi_P$: identified as a residual
- π^C : saturation level chosen by the researcher

Assumptions and Estimation

Assumptions and Implications:

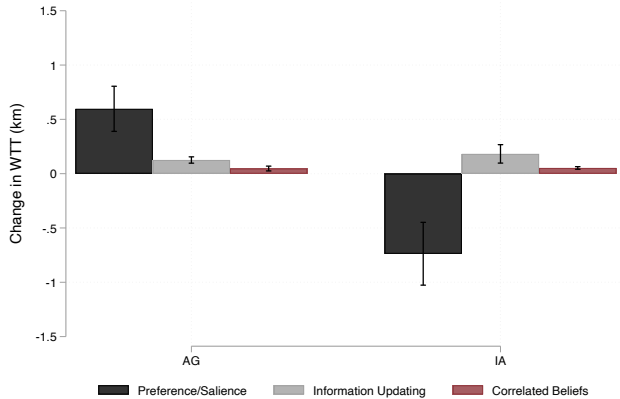
1. Perfect Compliance: families use the information and perfectly update if they receive information
2. Constant treatment effects: rules out variation in treatment effect with respect to initial biases
3. Omits uncertainty in beliefs
4. Any effects from the last two assumptions load into salience term

Estimation

- Rank-ordered logit model estimated via MLE
- Key assumption: truthful reports

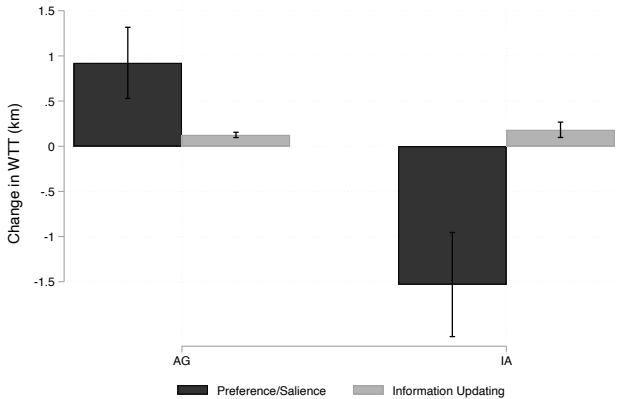
Utility Weight Impact Decomposition: Treatment Effects

Increased WTT for AG and decreased WTT for IA



Utility Weight Impact Decomposition: Spillover Effects

Increased WTT for AG and decreased WTT for IA



Discussion

What did we learn and not learn from the information campaign?

- Parents may systematically prefer school over peer quality in *some settings*
- Current results do not speak to whether parents “max” out on VA (Ainsworth et al. 2022)
- Results do not speak to long-run general equilibrium changes

Discussion

What did we learn and not learn from the information campaign?

- Parents may systematically prefer school over peer quality in *some settings*
- Current results do not speak to whether parents “max” out on VA (Ainsworth et al. 2022)
- Results do not speak to long-run general equilibrium changes

Social interactions and their implications

- Provide empirical evidence of an externality at the preference formation stage
- Information interventions that encourage social interactions can address network-based disparities in access to effective schools (Banerjee et al. 2022)

Discussion

What did we learn and not learn from the information campaign?

- Parents may systematically prefer school over peer quality in *some settings*
- Current results do not speak to whether parents "max" out on VA (Ainsworth et al. 2022)
- Results do not speak to long-run general equilibrium changes

Social interactions and their implications

- Provide empirical evidence of an externality at the preference formation stage
- Information interventions that encourage social interactions can address network-based disparities in access to effective schools (Banerjee et al. 2022)

The role of salience

- Information campaigns potentially operate by addressing information disparities but also by re-orienting demand
- Policymaker objectives potentially achieved through information campaigns, for better or worse

Concluding Thoughts

Parents' valuation and knowledge of effective schools:

1. There is substantial variation in beliefs about quality measures
2. In a setting where both measures of quality were widely available, families preferred school quality
3. Social interactions are key to generating any measurable changes in demand

Concluding Thoughts

Parents' valuation and knowledge of effective schools:

1. There is substantial variation in beliefs about quality measures
2. In a setting where both measures of quality were widely available, families preferred school quality
3. Social interactions are key to generating any measurable changes in demand

Information provision more generally:

3. Decomposition suggests impacts on choices mostly due to preference updating (salience) instead of information updating
4. Value-added oriented campaigns can lead to substantial reallocative changes in public education markets and influence competition

Concluding Thoughts

Parents' valuation and knowledge of effective schools:

1. There is substantial variation in beliefs about quality measures
2. In a setting where both measures of quality were widely available, families preferred school quality
3. Social interactions are key to generating any measurable changes in demand

Information provision more generally:

3. Decomposition suggests impacts on choices mostly due to preference updating (salience) instead of information updating
4. Value-added oriented campaigns can lead to substantial reallocative changes in public education markets and influence competition

Future Research:

Concluding Thoughts

Parents' valuation and knowledge of effective schools:

1. There is substantial variation in beliefs about quality measures
2. In a setting where both measures of quality were widely available, families preferred school quality
3. Social interactions are key to generating any measurable changes in demand

Information provision more generally:

3. Decomposition suggests impacts on choices mostly due to preference updating (salience) instead of information updating
4. Value-added oriented campaigns can lead to substantial reallocative changes in public education markets and influence competition

Future Research:

- Effects on school competition and outcomes
- Implications for segregation
- Equilibrium impacts of value-added campaigns

Thank you!

Christopher.Campos@chicagobooth.edu

VAM Validation

	(1) Uncontrolled	(2) Constant Effect
Forecast Coefficient	.63	1.111
	(.105)	(.134)
	[0]	[.41]
First-Stage F	277.507	37.016
Bias Tests:		
Forecast Bias (1 d.f.)	12.528	.683
	[0]	[.409]
Overidentification (180 d.f)	172.281	187.744
	[.647]	[.331]

▸ Go back ▸ Go back to main

School-level Balance

	Control (1)	Low - Control (2)	High - Control (3)
ELA	-.116	.021	.028
		(.102)	(.103)
Math	-.109	-.005	.029
		(.1)	(.116)
College	.081	.006	-.005
		(.022)	(.024)
Migrants	.063	-.009	-.005
		(.008)	(.008)
Female	.486	0	.015
		(.014)	(.01)
Poverty	.947	.011	.005
		(.026)	(.027)
Special Education	.126	.016	.008
		(.011)	(.009)
English Learner	.121	.005	.022
		(.015)	(.02)
Black	.04	-.009	-.011
		(.015)	(.014)
Hispanic	.846	.008	-.014
		(.037)	(.024)
White	.017	0	-.002
		(.007)	(.008)
Size of Cohort	239.639	16.212	18.399
		(44.856)	(42.92)
Number of Schools	20	16	16
Number Treated	0	2633	3780

Go Back

Student-level Balance (within treated schools)

	Control (1)	Peer - Control (2)	School - Control (3)	Both - Control (4)	P-value (5)
ELA Scores	-.101	.016	-.05	0	.144
		(.039)	(.021)	(.038)	
Math Scores	-.114	.027	-.004	-.025	.794
		(.031)	(.024)	(.037)	
Parents College	.065	.002	-.005	0	.856
		(.011)	(.008)	(.014)	
Migrant	.047	.01	0	.004	.156
		(.007)	(.008)	(.01)	
Female	.477	.001	.003	-.002	.998
		(.017)	(.018)	(.025)	
Poverty	.968	.006	.003	-.01	.263
		(.004)	(.006)	(.006)	
Special Education	.135	.007	.018	-.012	.35
		(.011)	(.01)	(.013)	
English Learners	.128	.007	.009	.001	.5
		(.01)	(.009)	(.013)	
Black	.024	.006	.002	-.007	.646
		(.005)	(.005)	(.007)	
Hispanic	.864	-.012	.007	.003	.121
		(.009)	(.011)	(.014)	
White	.014	.001	.001	-.002	.949
		(.004)	(.004)	(.005)	
Joint Test P-value		.757	.607	.905	
N	1836	1906	1906	2641	

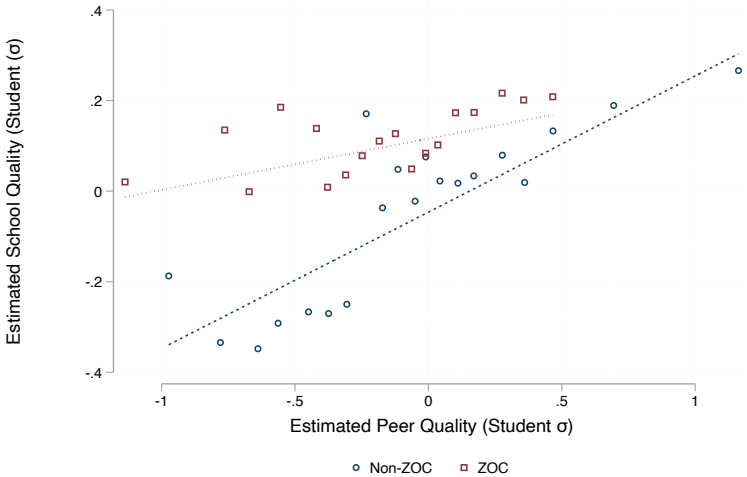
Go Back

Student-level Balance (within treated schools)

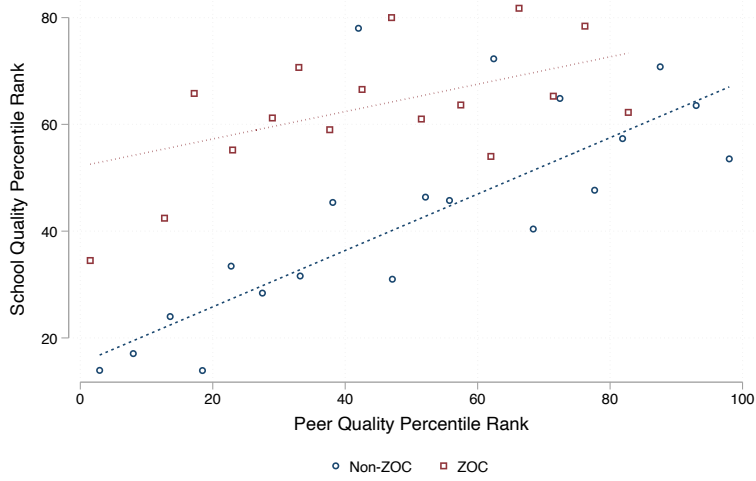
	Control (1)	Peer - Control (2)	School - Control (3)	Both - Control (4)	P-value (5)
ELA Scores	-.101	.016	-.05	0	.144
		(.039)	(.021)	(.038)	
Math Scores	-.114	.027	-.004	-.025	.794
		(.031)	(.024)	(.037)	
Parents College	.065	.002	-.005	0	.856
		(.011)	(.008)	(.014)	
Migrant	.047	.01	0	.004	.156
		(.007)	(.008)	(.01)	
Female	.477	.001	.003	-.002	.998
		(.017)	(.018)	(.025)	
Poverty	.968	.006	.003	-.01	.263
		(.004)	(.006)	(.006)	
Special Education	.135	.007	.018	-.012	.35
		(.011)	(.01)	(.013)	
English Learners	.128	.007	.009	.001	.5
		(.01)	(.009)	(.013)	
Black	.024	.006	.002	-.007	.646
		(.005)	(.005)	(.007)	
Hispanic	.864	-.012	.007	.003	.121
		(.009)	(.011)	(.014)	
White	.014	.001	.001	-.002	.949
		(.004)	(.004)	(.005)	
Joint Test P-value		.757	.607	.905	
N	1836	1906	1906	2641	

Go Back

IA-AG Correlation

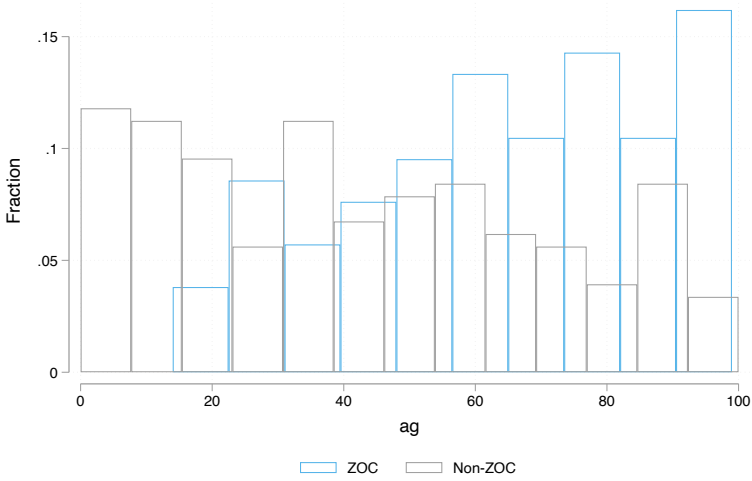


IA-AG Correlation

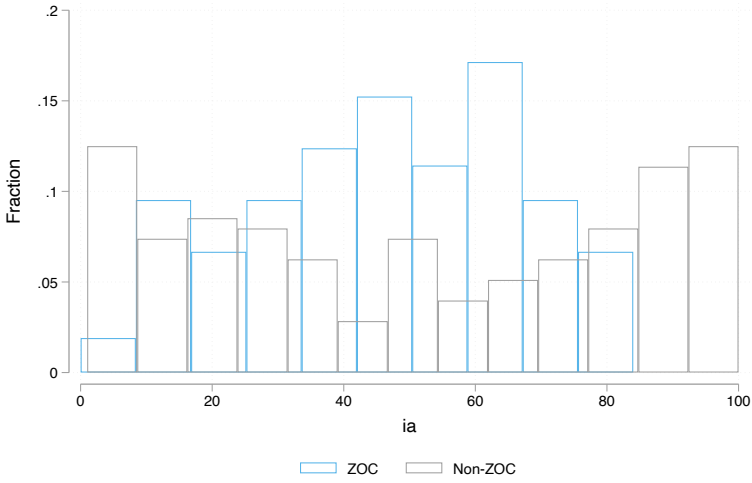


Go back

AG Support



IA Support



Go back

Treatment effects on other school attributes

	(1)	(2)	(3)	(4)	(5)
	Pure Control Mean	High Saturation 2019	Low Saturation 2019	High Saturation 2021	Low Saturation 2021
Achievement Growth	65.587	4.896**	1.033	8.775**	0.097
		(2.120)	(2.175)	(4.186)	(2.962)
Incoming Achievement	34.517	-1.540	-2.061	0.482	3.122
		(1.646)	(1.774)	(2.397)	(2.313)
Female	0.487	0.003	-0.001	0.006	-0.001
		(0.002)	(0.002)	(0.005)	(0.003)
Migrant	0.082	0.000	0.002*	-0.002	-0.001
		(0.001)	(0.001)	(0.003)	(0.002)
Poverty	0.979	0.000	0.003*	0.005	0.002
		(0.002)	(0.002)	(0.006)	(0.004)
Special Education	0.119	0.003**	0.001	0.004	0.000
		(0.001)	(0.001)	(0.004)	(0.002)
English Learner	0.146	0.002	0.004**	-0.010	0.000
		(0.003)	(0.002)	(0.009)	(0.005)
College	0.054	0.001	-0.002	0.002	0.000
		(0.002)	(0.002)	(0.006)	(0.003)
Black	0.044	0.000	0.000	-0.014	-0.003
		(0.002)	(0.001)	(0.013)	(0.004)
Hispanic	0.908	-0.002	0.002	0.008	0.002
		(0.003)	(0.003)	(0.014)	(0.007)
White	0.019	0.002*	-0.002	0.005	0.001
		(0.001)	(0.001)	(0.004)	(0.002)
Suspension Days	12.310	-0.572	0.162	-1.485	-0.582
		(0.605)	(0.545)	(3.517)	(2.832)
Suspension Incidents	0.007	0.000	0.000	-0.001	0.000
		(0.000)	(0.000)	(0.001)	(0.001)
N			69,054		

Go back

Treatment Effects across the Rank-Ordered List

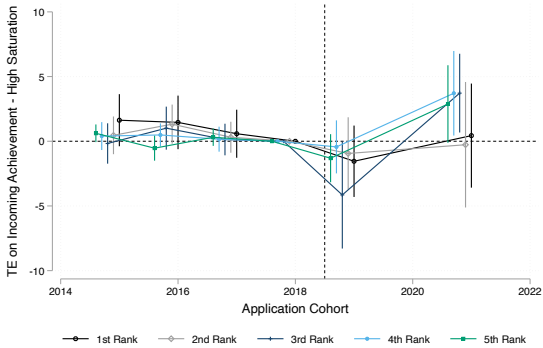


Figure: Effects on IA: High Saturation

Go back

Treatment Effects across the Rank-Ordered List

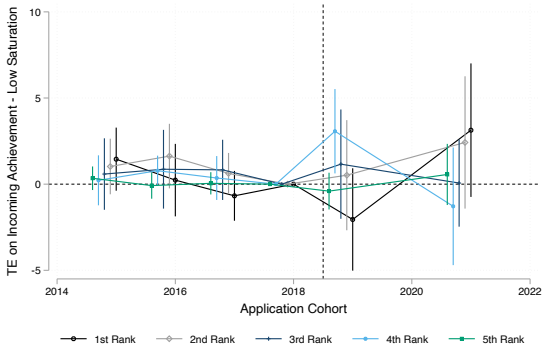


Figure: Effects on IA: Low Saturation

Go back

Treatment Effects across the Rank-Ordered List

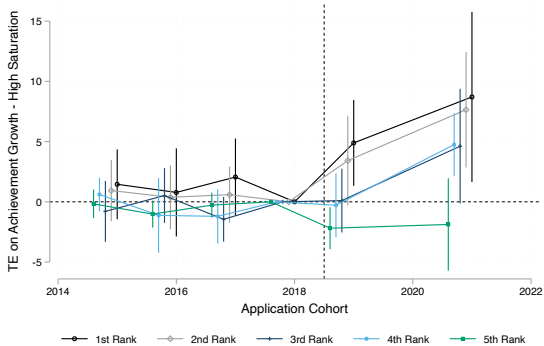


Figure: Effects on AG: High Saturation

Go back

Treatment Effects across the Rank-Ordered List

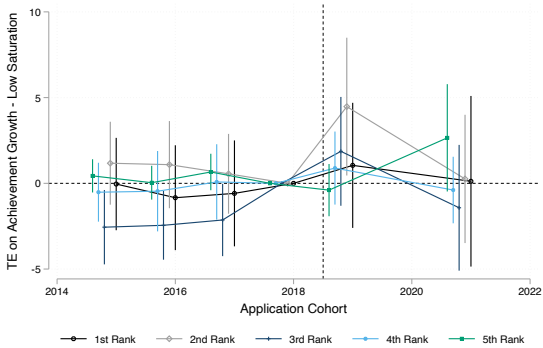


Figure: Effects on AG: Low Saturation

Go back

Other Spillover Specifications

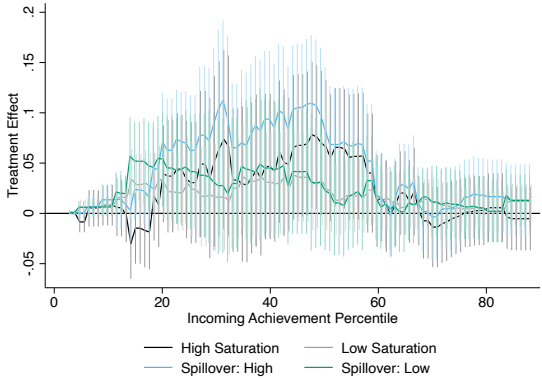


Figure: Impacts on IA Distribution

Other Spillover Specifications

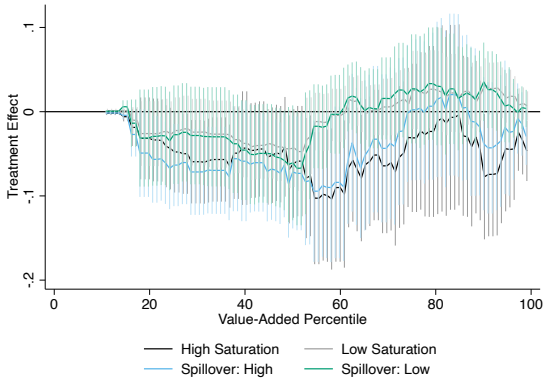
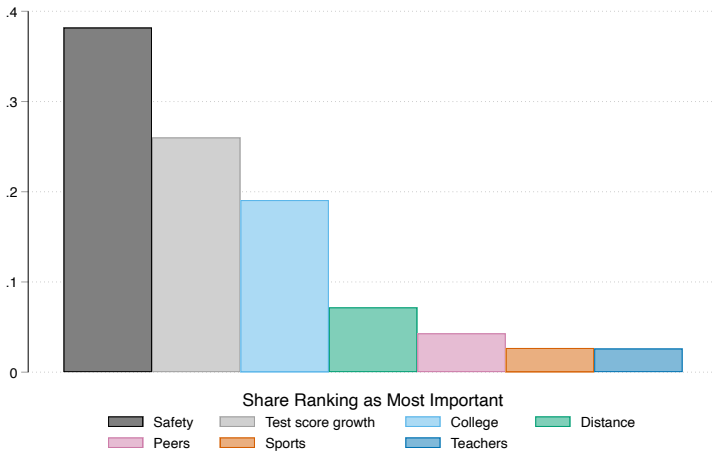


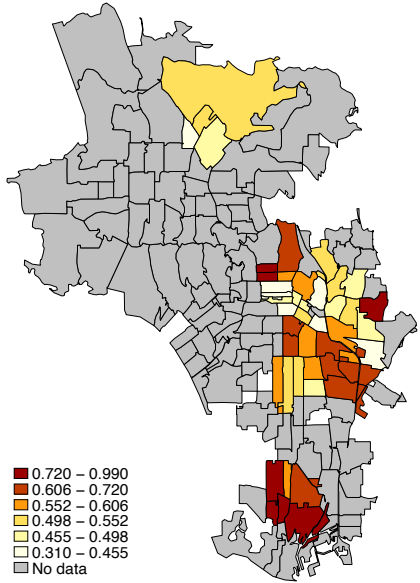
Figure: Impacts on AG Distribution

Go back

Survey Summary Statistics - Rankings of desired shcool characteristics



AG-IA Bias Correlation Across Space



Pessimism Correlates

	IA Pessimism		AG Pessimism	
	(1)	(2)	(3)	(4)
	Bivariate	Multivariate	Bivariate	Multivariate
Parents College +	1.085 ***	0.627 ***	-0.009	0.126
	(0.179)	(0.197)	(0.197)	(0.220)
Hispanic	-0.883 ***	-0.243	0.844 ***	1.045 ***
	(0.178)	(0.196)	(0.258)	(0.288)
English Learner	-0.365 **	-0.146	-0.064	-0.247
	(0.152)	(0.167)	(0.189)	(0.210)
Special Education	0.202	0.354 *	0.202	0.211
	(0.157)	(0.171)	(0.182)	(0.201)
Black	0.723 **	0.499	-0.882 **	0.288
	(0.323)	(0.359)	(0.437)	(0.490)
White	0.924 **	0.279	-0.024	0.781
	(0.410)	(0.449)	(0.525)	(0.584)
Female	-0.091	-0.141	-0.094	-0.091
	(0.107)	(0.118)	(0.114)	(0.127)
Poverty	-1.708 ***	-1.572 ***	0.086	-0.154
	(0.171)	(0.190)	(0.197)	(0.220)
Math Z-Score	0.161 ***	-0.043	-0.040	-0.043
	(0.060)	(0.066)	(0.098)	(0.110)
Reading Z-Score	0.194 ***	0.158	-0.026	0.010
	(0.061)	(0.067)	(0.102)	(0.114)
Migrant	-1.265	-1.019	-1.484	-1.533
	(1.026)	(1.123)	(1.006)	(1.118)
Mean	-1.63		-0.52	
SD	3.07		3.36	

Go Back

Pessimism Correlates

	(1) Bivariate	(2) Multivariate	(3) Bivariate	(4) Multivariate
Parents College +	1.085 ***	0.627 ***	-0.009	0.126
	(0.179)	(0.197)	(0.197)	(0.220)
Hispanic	-0.883 ***	-0.243	0.844 ***	1.045 ***
	(0.178)	(0.196)	(0.258)	(0.288)
English Learner	-0.365 **	-0.146	-0.064	-0.247
	(0.152)	(0.167)	(0.189)	(0.210)
Special Education	0.202	0.354 *	0.202	0.211
	(0.157)	(0.171)	(0.182)	(0.201)
Black	0.723 **	0.499	-0.882 **	0.288
	(0.323)	(0.359)	(0.437)	(0.490)
White	0.924 **	0.279	-0.024	0.781
	(0.410)	(0.449)	(0.525)	(0.584)
Female	-0.091	-0.141	-0.094	-0.091
	(0.107)	(0.118)	(0.114)	(0.127)
Poverty	-1.708 ***	-1.572 ***	0.086	-0.154
	(0.171)	(0.190)	(0.197)	(0.220)
Math Z-Score	0.161 ***	-0.043	-0.040	-0.043
	(0.060)	(0.066)	(0.098)	(0.110)
Reading Z-Score	0.194 ***	0.158	-0.026	0.010
	(0.061)	(0.067)	(0.102)	(0.114)
Migrant	-1.265	-1.019	-1.484	-1.533
	(1.026)	(1.123)	(1.006)	(1.118)
Mean	-1.63		-0.52	
SD	3.07		3.36	

▶ Go Back

Preference Impact Estimates

	Without School Effects		With School Effects	
	(1)	(2)	(3)	(4)
	IA	AG	IA	AG
Treatment				
Untreated	0.392***	0.658***		
	(0.093)	(0.078)		
Information: IA	-0.972***	0.474***	-0.812***	0.272**
	(0.174)	(0.104)	(0.209)	(0.131)
Information: AG	-0.865	0.424***	-0.594	0.181
	(0.171)	(0.101)	(0.199)	(0.127)
Information: Both	-0.815***	0.565***	-0.393**	0.455***
	(0.154)	(0.100)	(0.160)	(0.126)
Spillover	-0.947***	0.336***	-0.688***	0.097
	(0.172)	(0.100)	(0.204)	(0.129)
Distance	-0.068***		-0.051***	
	(0.006)		(0.007)	
Number of Choices	142,589			
Number of Students	21,774			

Preference Impact Estimates

	Without School Effects		With School Effects	
	(1)	(2)	(3)	(4)
	IA	AG	IA	AG
Treatment				
Untreated	0.392***	0.658***		
	(0.093)	(0.078)		
Information: IA	-0.972***	0.474***	-0.812***	0.272**
	(0.174)	(0.104)	(0.209)	(0.131)
Information: AG	-0.865	0.424***	-0.594	0.181
	(0.171)	(0.101)	(0.199)	(0.127)
Information: Both	-0.815***	0.565***	-0.393**	0.455***
	(0.154)	(0.100)	(0.160)	(0.126)
Spillover	-0.947***	0.336***	-0.688***	0.097
	(0.172)	(0.100)	(0.204)	(0.129)
Distance	-0.068***		-0.051***	
	(0.006)		(0.007)	
Number of Choices	142,589			
Number of Students	21,774			

Preference Impact Estimates

	Without School Effects		With School Effects	
	(1)	(2)	(3)	(4)
	IA	AG	IA	AG
Treatment				
Untreated	0.392***	0.658***		
	(0.093)	(0.078)		
Information: IA	-0.972***	0.474***	-0.812***	0.272**
	(0.174)	(0.104)	(0.209)	(0.131)
Information: AG	-0.865	0.424***	-0.594	0.181
	(0.171)	(0.101)	(0.199)	(0.127)
Information: Both	-0.815***	0.565***	-0.393**	0.455***
	(0.154)	(0.100)	(0.160)	(0.126)
Spillover	-0.947***	0.336***	-0.688***	0.097
	(0.172)	(0.100)	(0.204)	(0.129)
Distance	-0.068***		-0.051***	
	(0.006)		(0.007)	
Number of Choices	142,589			
Number of Students	21,774			

Preference Impact Estimates

	Without School Effects		With School Effects	
	(1)	(2)	(3)	(4)
	IA	AG	IA	AG
Treatment				
Untreated	0.392***	0.658***		
	(0.093)	(0.078)		
Information: IA	-0.972***	0.474***	-0.812***	0.272**
	(0.174)	(0.104)	(0.209)	(0.131)
Information: AG	-0.865	0.424***	-0.594	0.181
	(0.171)	(0.101)	(0.199)	(0.127)
Information: Both	-0.815***	0.565***	-0.393**	0.455***
	(0.154)	(0.100)	(0.160)	(0.126)
Spillover	-0.947***	0.336***	-0.688***	0.097
	(0.172)	(0.100)	(0.204)	(0.129)
Distance	-0.068***		-0.051***	
	(0.006)		(0.007)	
Number of Choices	142,589			
Number of Students	21,774			

Preference Impact Estimates

	Without School Effects		With School Effects	
	(1)	(2)	(3)	(4)
	IA	AG	IA	AG
Treatment				
Untreated	0.392***	0.658***		
	(0.093)	(0.078)		
Information: IA	-0.972***	0.474***	-0.812***	0.272**
	(0.174)	(0.104)	(0.209)	(0.131)
Information: AG	-0.865	0.424***	-0.594	0.181
	(0.171)	(0.101)	(0.199)	(0.127)
Information: Both	-0.815***	0.565***	-0.393**	0.455***
	(0.154)	(0.100)	(0.160)	(0.126)
Spillover	-0.947***	0.336***	-0.688***	0.097
	(0.172)	(0.100)	(0.204)	(0.129)
Distance	-0.068***		-0.051***	
	(0.006)		(0.007)	
Number of Choices	142,589			
Number of Students	21,774			