# Cap-and-Apply: Unintended Consequences of College Application Policy in South Korea

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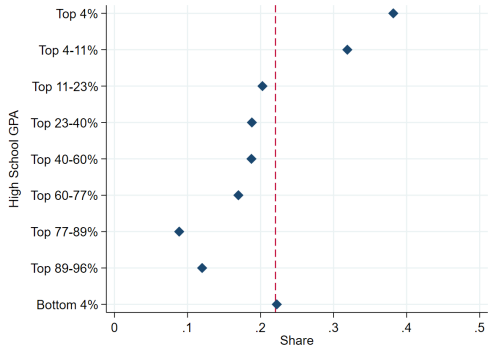
# Policy Overview: The Cap

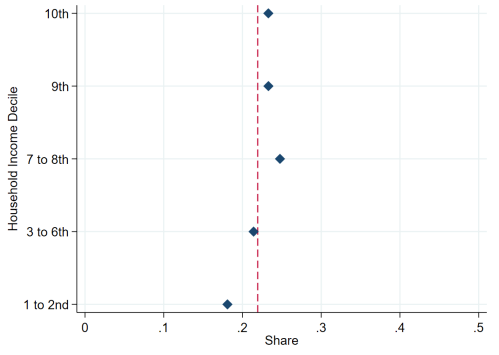
Since 2013, South Korea has limited students to six applications in early decision.

- To reduce costs from excessive applications and this was achieved.
  - Students, household, high school teachers, and college committees
  - consulting,$138/session; prep for college-specific exams,$259/month; fees,$60/app

# Motivation




(a) Share of 6+ apps by High School GPA




(b) Share of 6+ apps by Income Decile

*Source*: The Korean Educational Longitudinal Survey (KELS) 2005.

# This Paper

Research Question

- Does the application cap affect student-college allocation?
  - Match quality: alignment between high performing stu. and college prestige
  - Socioeconomic equity: access to prestigious colleges across different SES

Findings: matching model + empirical analysis

- $\searrow$ high-performing and $\nearrow$ low SES students in top-tier colleges
  - Failure risks from ability noise increase preference for safety colleges.
  - Limiting opportunities narrows socioeconomic disparities in college access.

Contributions

- I extend an existing matching model to incorporate application constraints that vary by SES. *(Chen and Kao, 2023)*
- I construct a new college-year panel data and test the predictions.

# Match Quality

Zero application costs, and outcome is the number of Good students enrolled.

**Before**, $G$ → A

$N$ → B

**After**, $G$ ⇢ A

$N$ ⇢ B

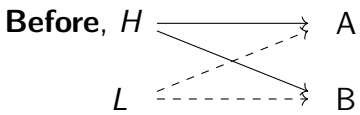
- Before the Cap: outcome depends on the prestige difference.
- After the Cap: Risk makes G adjust $e_g$ s.t.

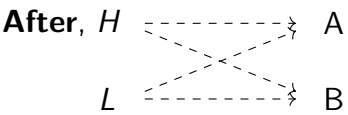
$$\underline{p_A^g(e_g, e_n)}(a - e_g) = \underline{p_B^g(e_g, e_n)}(b + e_g).$$

- **Match quality decreases.**

# Socioeconomic Equity

Now, students are 4 types: $(G, N) \times (H, L)$ by application constraints.
The outcome of interest is the number of low-SES students enrolled.




- Before the Cap: Only the L is constrained.
- After the Cap: Gap in application opportunities reduces.
- **Socioeconomic equity improves.**

# Event Study

$$Y_{it} = \alpha + \sum_{\tau=2010,\, \tau \neq 2012}^{2022} \beta_\tau \left( TopTier_i \times D_\tau \right) + X_{it}'\gamma + \theta_i + \delta_t + \varepsilon_{it},$$

- College-year panel data from the Korean Council for University Education (KCUE)
  - 2010 to 2022, Top 45 colleges, excluding the very top
  - Ranking data from JoongAng (2010), which is correlated with CSAT cut-off score from Daesung (2012).
- Sample selection
  - Available ranking and cut-off data
  - Competitive institutions where the cap is binding

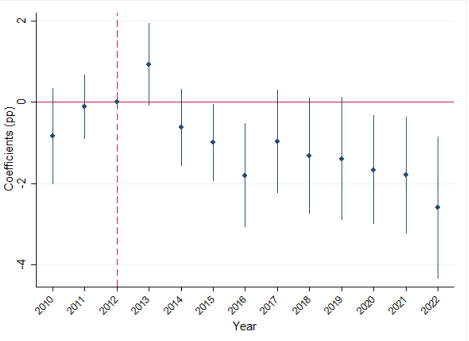
# Event Study

$$Y_{it} = \alpha + \sum_{\tau=2010,\, \tau \neq 2012}^{2022} \beta_\tau \left( TopTier_i \times D_\tau \right) + X_{it}'\gamma + \theta_i + \delta_t + \varepsilon_{it},$$

- $Y_{it}$
  - Share of freshmen from special-purpose high schools
    - High performing in terms of CSAT score and enrollment in very top college.
  - Share of government student loan borrowers
    - High-SES students typically receive financial support from their parents.
- $TopTier_i = 1$ for top 22 colleges, 0 for the remaining in the top 45.
- Controls: faculty size, the number of departments, admission quota, tuition, public, and Seoul metropolitan area.

# Match Quality: % Freshmen from Special-Purpose HS

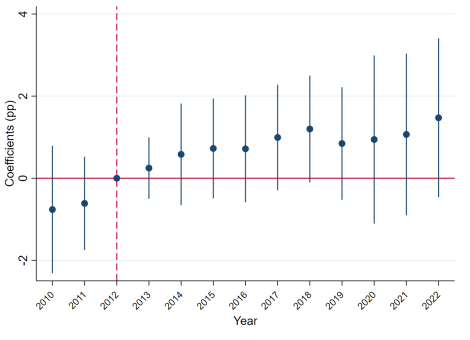
↘ 9.56% of Good students in the top-tier colleges




In 2013, special-purpose HS have advantages in information and network *(Cattan et al., 2025)*. Then, information diffuses to general HS, and outcome converges to equilibrium.

# Socioeconomic Equity: % Student Loan Borrowers

↗ 12.04% of Low-SES students in the top-tier colleges



# Summary

The cap policy creates a tradeoff between efficiency and equity.

- *9.6% decrease in match quality, 12% increase in socioeconomic equity*
- Model predictions support the empirical findings.
  - Uncertainty of true type leads Good students to choose safety options.
  - The cap narrows opportunity gap across SES.

Policymakers should weigh costs and benefits when restricting competition in matching markets.

# Robustness and Heterogeneity

Robustness Check

- Including the top college Top
- Spillover effects of Science and Technology focused colleges Spillover
- Weighting by Student Size Weight
- Adjusting Tier cutoff Tier

Heterogeneous Effects

- Ownership Public
- College Location SMA

Thank You!

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# Potential Alternative Explanations

- Interaction with regular decision
- Introduction of wait list in early decision
- Change in admission policy for special-purpose high school graduates
- Anticipatory effects

# The Application Cap was Effective.

Return

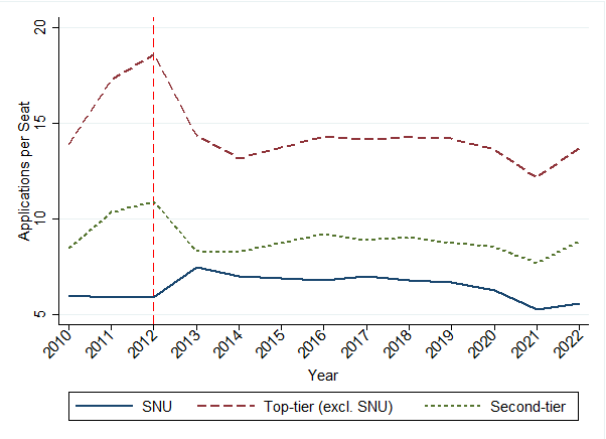
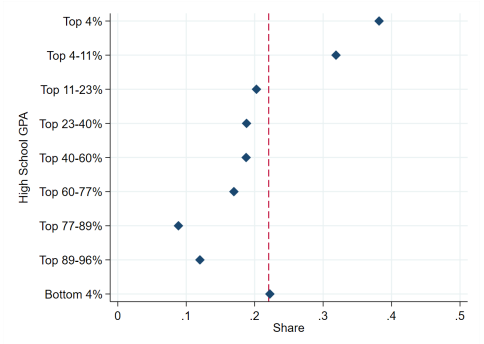


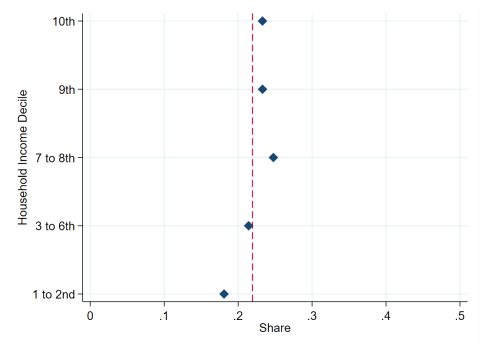

Figure: Time trend of applications per seat

# The Better or Wealthier, the Tougher the Competition.

Return




(a) Share of 6+ apps by HS GPA

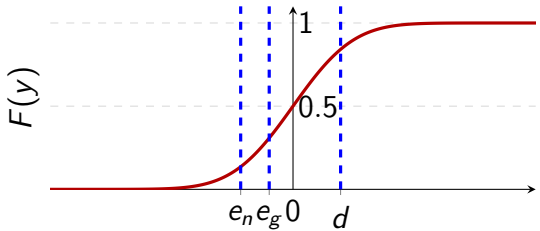



(b) Share of 6+ apps by HH Income

# Explicit Formulas for the Acceptance Rates

The equilibrium strategy profile, $(e_g, e_n)$, implies a pair of cutoff values.

- $d$ changes into the cutoff value $e_g$ or $e_n$ depending on the signal.




- $e_g$ where applicants with $s_i = g$ are indifferent between A and B.
- If $e_i > e_g$, then $i$ prefer to B.
- Given $e_g$, there exists an interior solution for $e_n$ such that $p_A^n(e_g, e_n)(a - e_n) = p_B^n(e_g, e_n)(b + e_n)$ with ... (cont.)

# Explicit Formulas for the Acceptance Rates, cont'd

Return

- $p_A^n(e_g, e_n) = \min\left[\max\left[0, \frac{k_A - \mu F(e_g)}{(1-\mu)(pF(e_g)+(1-p)F(e_n))}\right], 1\right]$

  $p_B^n(e_g, e_n) = \min\left[\max\left[0, \frac{k_B - \mu(1-F(e_g))}{(1-\mu)(p(1-F(e_g))+(1-p)(1-F(e_n)))}\right], 1\right]$
- $p_A^h(e_g, e_n) = \pi \min\left[\frac{k_A}{\mu F(e_g)}, 1\right] + (1-\pi)p_A^n(e_g, e_n)$

  $p_B^h(e_g, e_n) = \pi \min\left[\frac{k_B}{\mu(1-F(e_g))}, 1\right] + (1-\pi)p_B^n(e_g, e_n)$

# Details for Socioeconomic Equity

Return

$$w_A = \frac{w_A^L}{w_A^L + w_A^H} = \frac{(1-\eta)\mu F(e_g) p_A^g(e_g, e_n)}{(1-\eta)\mu F(e_g) p_A^g(e_g, e_n) + \eta\mu (F(e_g) p_A^g(e_g, e_n) p_B^g(e_g, e_n) + (1 - p_B^g(e_g, e_n)))} < 1 - \eta.$$

$$v_A = \frac{v_A^L}{v_A^L + v_A^H} = \frac{(1-\eta)\mu F(e_g) p_A^g(e_g, e_n)}{(1-\eta)\mu F(e_g) p_A^g(e_g, e_n) + \eta\mu F(e_g) p_A^g(e_g, e_n)} = 1 - \eta.$$

$$\Rightarrow v_A > w_A$$

# Explicit Formulas for the Acceptance Rates-Equity

Return

Before the Cap

- $p_A^g(e_g, e_n) = \pi min\left[\frac{k_A}{\eta\mu+(1-\eta)\mu F(e_g)}, 1\right] + (1-\pi)p_A^n(e_g, e_n),$

  $p_A^n(e_g, e_n) = min\left[max\left[0, \frac{k_A-(\eta\mu+(1-\eta)\mu F(e_g))}{(1-\mu)(\eta+(1-\eta)(pF(e_g)+(1-p)F(e_n)))}\right], 1\right]$

After the Cap

- $p_A^g(e_g, e_n) = \pi min\left[\frac{k_A}{\mu F(e_g)}, 1\right] + (1-\pi)p_A^n(e_g, e_n),$

  $p_A^n(e_g, e_n) = min\left[max\left[0, \frac{k_A-\mu F(e_g)}{(1-\mu)(pF(e_g)+(1-p)F(e_n))}\right], 1\right]$

# Descriptive Statistics

Return

| | Pre | | | Post | | |
|---|---|---|---|---|---|---|
| | Mean | SD | N | Mean | SD | N |
| Freshmen from Selective HS | 5.48 | 6.99 | 135 | 4.89 | 5.98 | 450 |
| Student Loan Debtor | 12.46 | 3.90 | 135 | 7.62 | 4.36 | 450 |
| Pr(Grad. in 6 yrs) | 52.83 | 8.68 | 220 | 55.99 | 7.28 | 132 |
| Pr(Grad. in 6 yrs), male | 35.96 | 8.46 | 210 | 35.41 | 7.21 | 126 |
| Pr(Grad. in 4 yrs), female | 24.26 | 9.54 | 220 | 25.01 | 9.27 | 132 |
| Average Duration | 5.69 | 0.26 | 220 | 5.61 | 0.24 | 132 |
| Average Duration, male | 6.30 | 0.23 | 210 | 6.23 | 0.21 | 126 |
| Average Duration, female | 5.05 | 0.27 | 220 | 5.00 | 0.25 | 132 |
| Seoul Capital Area | 0.58 | 0.50 | 135 | 0.58 | 0.49 | 450 |
| Public | 0.31 | 0.46 | 135 | 0.31 | 0.46 | 450 |
| Faculties | 700 | 407 | 135 | 784 | 435 | 450 |
| Departments | 113 | 62 | 135 | 69 | 34 | 450 |
| Number of Slots (Early) | 1,756 | 726 | 135 | 2,131 | 866 | 449 |
| Number of Slots (Regular) | 1,706 | 648 | 135 | 1,191 | 536 | 449 |
| Applications per Slot | 13.09 | 7.30 | 135 | 11.09 | 5.38 | 449 |
| Enrollment Rate (Early) | 75.34 | 13.29 | 135 | 89.96 | 7.85 | 449 |
| Enrollment Rate (Regular) | 99.94 | 6.75 | 135 | 97.03 | 5.60 | 449 |
| Attendance | 13,387 | 5,063 | 135 | 13,713 | 5,240 | 450 |

# Rankings: Daesung (2012) and JoongAng (2010)

Return

Table: Daesung (2012), and JoongAng (2010)

| Daesung (2012) | | JoongAng (2010) | | |
|---|---|---|---|---|
| CSAT Score | Rank | Rank | Tier | College |
| 384.21 | 1 | 1 | (1) | Seoul National University |
| 380.96 | 2 | 4 | 1 | Yonsei University |
| 377.03 | 4 | 5 | 1 | Korea University |
| 373.04 | 6 | 6 | 1 | Sungkyunkwan University |
| 364.76 | 12 | 7 | 1 | Kyung Hee University |
| 376.00 | 5 | 8 | 1 | Sogang University |
| 369.42 | 7 | 9 | 1 | Hanyang University |
| 367.30 | 9 | 13 | 1 | Ewha Women's University |
| 351.80 | 26 | 14 | 1 | Inha University |
| 363.20 | 14 | 15 | 1 | Chung-Ang University |
| ... | ... | ... | ... | ... |

All the educational and science and technology-focused colleges are excluded.

- $\rho$=.77, Wilcoxon test reveals no significant difference (Z = -.83, p = .41)

# DD results: Dropout rates

| | (1) | (2) |
|---|---|---|
| | %From Special Purpose High School | |
| TopTier × Post | -1.059** | -0.878* |
| | (0.508) | (0.506) |
| Controls | | X |
| College FE | X | X |
| Year FE | X | X |
| R sq. | 0.135 | 0.145 |
| Obs. | 572 | 572 |

Standard errors in parentheses are clustered at the college level.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

# Why There Exists a Decreasing Trend? Return

## Government Scholarship for Low-SES Students expand.

- Still, there is a need for loans among the income decile 4th and above.
- Lower household income correlates with higher student loan usage rates. (KRIVET, 2011)

| Income Decile | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |
|---|---|---|---|---|---|---|---|---|---|---|
| % Median Income | 30 | 70 | 90 | 110 | 130 | 155 | 180 | 220 | 290 | - |
| % Supporting Tuition | 100 | 100 | 75 | 55 | 32 | 23 | 13 | 13 | 0 | 0 |

Source: Ahn and Kim (2017)

# Government Student Loan

Return

1. General Student Loan for Tuition
2. General Student Loan for Tuition and Living Costs

   1&2: repay right after graduation. for everyone.
3. After Employment Student Loan for Tuition
4. After Employment Student Loan for Tuition and Living Costs

   3&4: repay after being employed. bottom 90% available for tuition loan, bottom 80% available for living cost loan

- Type I: 1&3
- Type II: 2&4

# Information Structure

Return

- Compared to perfectly screening colleges, students with ability noise incompletely know their type before taking the CSAT.
- Students get signal $s_i \in \{g, n\}$ for their ability type.
  - Good type, $s_i = g$ always

$$\text{Normal type} \begin{cases} s_i = g, & \text{with } p \\ s_i = n, & \text{with } (1-p) \end{cases}$$

- Posterior probability
  - $s_i = g$ $\begin{cases} \text{Good type}, & \text{with } \pi = \frac{\mu}{\mu + (1-\mu)p} \\ \text{Normal type}, & \text{with } (1-\pi) \end{cases}$

  $s_i = n$, Normal type, always

# Before the Cap

- Noise makes some L with $s_i = h$ but normal type and $s_i = l$ have risk to fail.
- Then some L apply B even if they slightly prefer A
  - This is because $p_B^g(e_g, e_n) > p_A^g(e_g, e_n)$ from $k_B > k_A$. explicit
  - $V_h(A) \geq V_h(B) \Leftrightarrow d > e_g$.

- For A, outcome is $\frac{L}{H+L} = \frac{F(e_g)}{F(d)+F(e_g)} < \frac{1}{2}$ for signal $h$ and $\frac{F(e_n)}{F(d)+F(e_n)} < \frac{1}{2}$ for signal $l$. Then $v_A < w_A = \frac{1}{2}k_A$. ■
- For B, outcome is $\frac{L}{H+L} = \frac{1-F(e_g)}{(1-F(d))+(1-F(e_g))} > \frac{1}{2}$ for signal $h$ and $\frac{1-F(e_n)}{(1-F(d))+(1-F(e_n))} > 1/2$ for signal $l$. Then $v_B > w_B = \frac{1}{2}k_B$

After the cap, L-SES students increase in more prestigious college (A) because of ability noise.

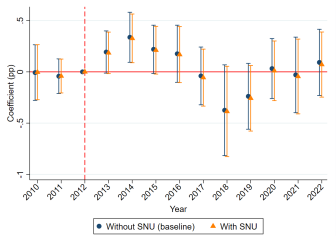
# Heterogeneous effect across Region and Public

- Impact size increases among colleges out of SCA because of pref. to SCA.
- Impact size decreases among private colleges because of pref. to public.

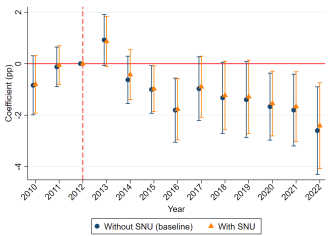
| | (1) | (1) | (2) |
|---|---|---|---|
| | %From Selective High School | | |
| Rank× Post | -0.061*** | -0.063*** | -0.056** |
| | (0.021) | (0.022) | (0.021) |
| × Seoul Capital Area (SCA) | | -0.006 | |
| | | (0.009) | |
| × Public | | | 0.015* |
| | | | (0.008) |
| Obs. | 584 | 584 | 584 |

# Including Top College (Seoul National University)

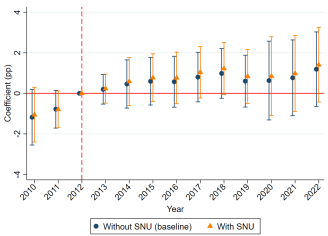
Return




(a) Dropout Rate




(b) % Special-Purpose HS




(c) Loan Borrower Rate

# Spillover Effects of Sci-Tech. Focused Colleges

Return

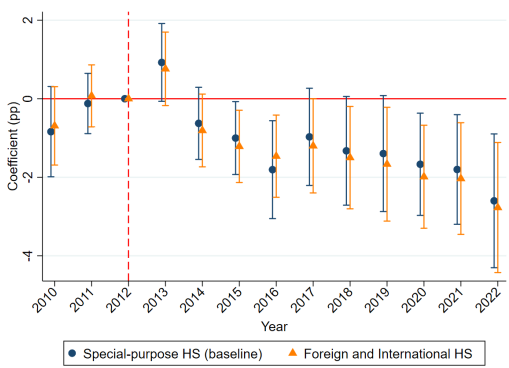
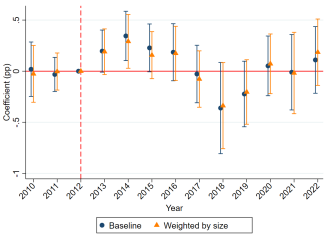



Figure: % Freshmen from Foreign Language and International HS

# Weighting by Student Size

Return

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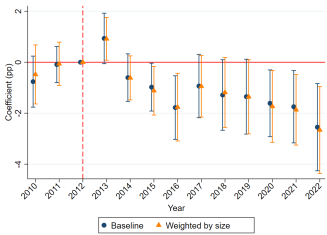


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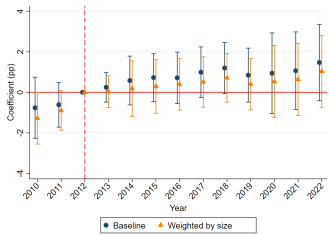
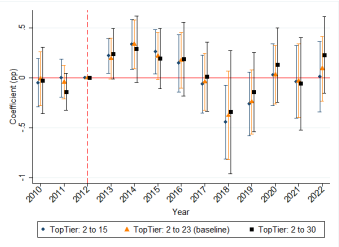



(c) Loan Borrower Rate

# Adjusting Tier Cutoff

Return

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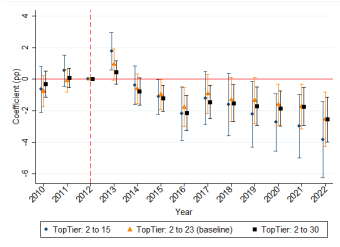


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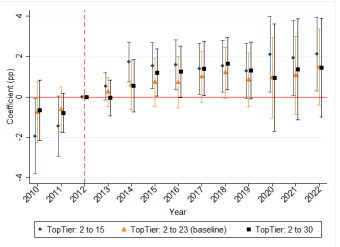
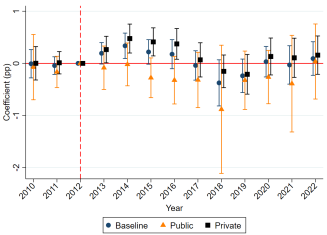



(c) Loan Borrower Rate

# Heterogeneous Effects by Ownership

Return

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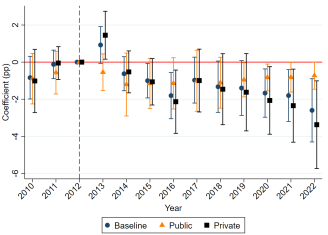


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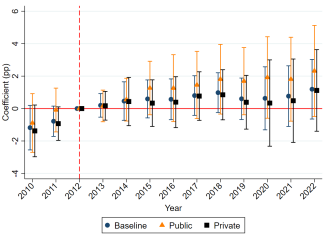
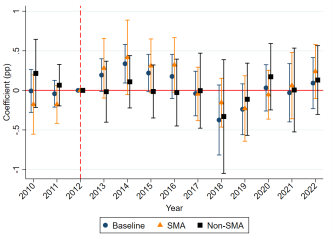



(c) Loan Borrower Rate

# Heterogeneous Effects by College Location

Return

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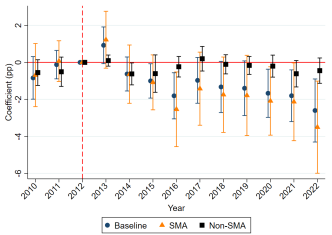


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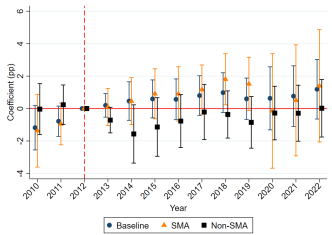


(c) Loan Borrower Rate

# Alternative Explanations

- Interaction between the ED and RD? Requirements are quite different.
  - Two-thirds of seats are for the Early Decision, decreasing RD.
- Balloon effect from Science-focused colleges?
  - Findings little change with Foreign Language and International HS students, who rarely go to the science colleges.
- Other admission policies changes discriminating students from selective HS.
  - No incentive to do that. Can't find any evidence.