Endogenous information acquisition in matching markets: China's college admission mechanisms

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Motivation

Theoretical results tell us:

- Full information? Costly information acquisition to discover preferences.(Corcoran et al. 2018)
- Market designers should pay attention to the acquisition and flow of information.
- Finding regret-free stable matching $\Leftrightarrow$ finding market-clearing cutoffs.(Azevedo and Loshno. 2016, Immorlica et al. 2020)
- Information deadlocks. Market-clearing cutoffs $\rightarrow$ budget set $\rightarrow$ preference formation $\rightarrow$ determine cutoffs

Motivation

Real mechanism implementations:

- Achieve approximately regret-free stable outcomes by providing external historical data + perturbed capacities: Australia.
- 2023 Australia: 62,846, China: 12,910,000.
- Parallel admission (PA) - Direct serial dictatorship (DirSD)+ length restriction of the rank-ordered list (ROL)
- Inner Mongolia dynamic admission (IM) - Sequential serial dictatorship (SeqSD) + sequential moves by groups + time constraints
- In 2025 Inner Mongolia will give up IM and use PA. IM began in 2007.

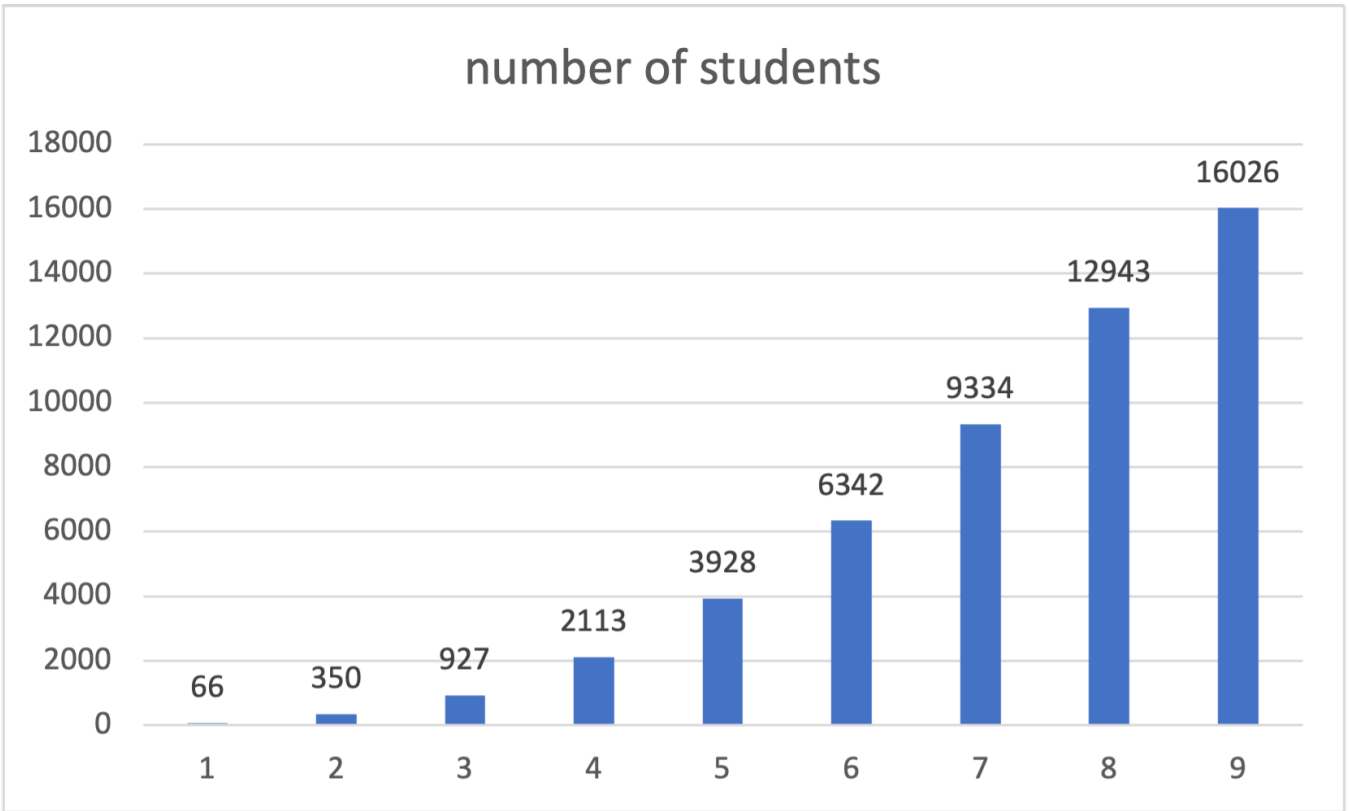
Motivation

Why switch from IM to PA?

- Both PA and IM provides historical cutoff scores, but IM offers additional information regarding matching outcomes. Counterintuitive.
- Theoretically and experimentally, SeqSD leads to higher student welfare than DirSD. (Hakimov et all. 2023)

Motivation

Real life implementation of SeqSD: groups + time constraints



Research question

Does PA result in higher student welfare than IM? If so why?

- The time constraints in IM make the price discovery process too costly?
- Information communication in IM is not effective?
- The additional information is too noisy?
- Maybe IM is actually better than PA and the policy change is purely of political intention.
- Are there better ways to communicate information to students in IM? Change group size?

Contribution

- Provide empirical and experimental comparisions of real-life implementation of DirSD (PA) and SeqSD (IM) mechanisms.
- Shed light on the importance of information flows in market design and validate costly endogenous information acquisition.
- Gong and Liang (2023) shows experimentally IM mechanism achieves similar stability as DA mechanism and similar efficiency as Bostom mechanism. Incomplete information. Low correlation of preferences.
- Chen and Kesten (2019) shows experimentally DA mechanism is better than PA in terms of stability, but the setup assumes complete information.

Empirical strategy

- $$y_i = \alpha_0 + \alpha_1 X_i + \beta Y_{2025} + \varepsilon_i$$
- y_i: college prestige index (determined by cutoff scores of year 2022 and 2023).
  X_i: students' gender, ethnicity, rank by exam scores being normalized to be within (0,1).
- Implicitly assumes higher-ranked students prefer more prestigious colleges. Only care about big names without considering majors.

Empirical strategy

- Data: students' gender, ethnicity, exam score, rank and admission result.
- Spearman's rank correlation coefficient.

$$\rho = 1 - \frac{6\Sigma_i^N d_i^2}{n(n^2-1)}$$

Experiment design

General setup:

- Exam scores are randomly and independently drawn from the IM empirical distribution between 0 and 100.
- 30 students competing for 15 seats in 10 colleges. Admission rate is 50%.
- Students are told that any ranking of the university is equally possible. Preferences are randomly drawn from the space of rankings.
- Students only know their own exam scores and ranks.

Experiment design

General setup:

- University's quotas and historical cutoffs are common knowledge.
- Historical cutoffs are gotten by running DirSD.
- Students need to pay search costs to know their own preferences.
- Preferences are private knowledge.
- Students receive more rewards for being assigned to more preferred university.

Experiment design

Environments:

- Dimension 1: The degree of correlation of preferences among students.
  One tier, two tiers and three tiers.
- Dimension 2: The cost of information acquisiton.
  Low and high costs.

Experiment design

Predictions:

- Hypothesis 1: Lower-ranked students gain more from IM compared to PA.
- Hypothesis 2: IM has a higher probability of being unmatched.
- Hypothesis 3: Students are more likely to oversearch in IM.

Experiment design

Predictions:

- Hypothesis 4: Welfare: on average IM $<$ PA, but not hold for all students.
- Hypothesis 5: Smaller group size produces better matching outcomes.
- Hypothesis 6: Increasing the ROL in PA improves the matching outcomes.

Empirical distribution