

## Misspecified Matching Markets

School choice markets often seek to create a stable matching, but none (to our knowledge) ask about students' peer preferences.

What if students have peer preferences but we use a matching mechanism that creates a stable matching only under the assumption that students don't have peer preferences?

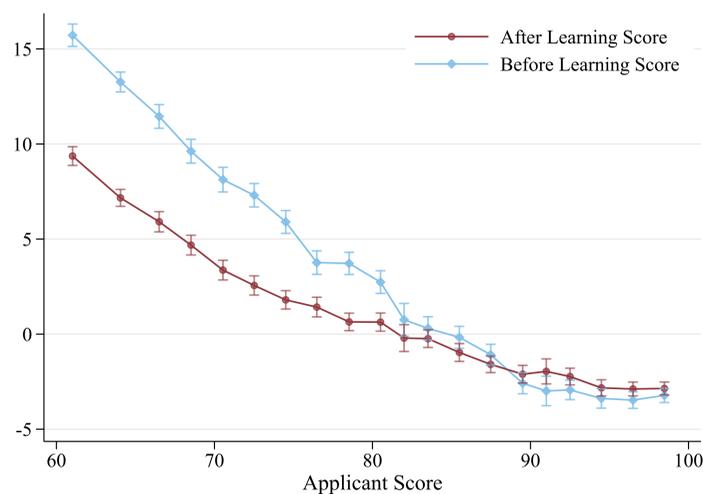
## Empirical Evidence of Peer Preferences: Centralized College Admissions in NSW, Australia

Students know **PYS**, a summary statistic of previous year's entering cohort at each program:

Course code	1st round clearly in ATAR	1st round % below the clearly in ATAR
3200332501	70.00	40.0%

One identification strategy: how do students change preferences upon learning how their "ability" matches up with PYS at different programs? Students submit Rank-Order List (ROL) **before** and **after** learning own "ability." We can compare only **inversions** in preferences, which can't be explained by students maximizing admissions probability.

Gap between PYS and student's ability



Identify **big-fish** preferences: student's prefer not to have ability below PYS:

1. Larger inversions in preferences for students with large gap
2. Students invert opposite way when initial gap  $\geq 0$

Peer preferences are important: conservatively estimate that **25%** of

## Model

Continuum of workers with types  $\theta \in \Theta$  and finite set of programs  $C = \{c_1, \dots, c_N\} \cup \{c_0\}$ ,  $c_0$  outside option, each with capacity  $q^c > 0$ .

A matching  $\mu$  assigns each student a program respecting capacity constraints.

Each student-type  $\theta$  has preferences over programs **and matchings**  $\succeq^{\theta|\mu}$  and program-specific scores  $r^{\theta,c}$ .

A stable matching  $\mu^*$  is one without a blocking pair  $(\theta, c)$  such that  $c \succ^{\theta|\mu^*} \mu^*(\theta)$  and either  $\mu(c) < q^c$  (unused capacity) or there is no  $\theta'$  with  $r^{\theta',c} < r^{\theta,c}$  and  $\mu(\theta') = c$ .

Assume that peer preferences depend only on distribution of scores of other students at each program, denoted:  $\lambda^{c,x}(\mu)$ .

**Theorem:** If peer preferences are "aggregate unresponsive" there exists a stable matching

## Tâtonnement with Intermediate Matching (TIM)

Even though there is a stable matching in our setting with peer preferences, canonical "misspecified" mechanisms will not generate a stable matching under most beliefs of students. But what if students update their beliefs using data **from the past**?

- Discrete time  $t = 0, 1, 2, \dots$ , replica economy in each period
- At every period  $t \geq 1$  students observe  $\lambda_{t-1}$
- Students (truthfully) submit ROL  $\succeq^{\theta|\lambda_{t-1}}$ , matching in each period constructed using deferred acceptance
- We call the process *Tâtonnement with Intermediate Matching* (TIM)

**Theorem:** Let  $t \geq 1$ .  $\lambda(\mu_t)$  is (approximately) in steady-state if and only if the matching  $\mu_{t+1}$  is (approximately) stable.

We can therefore know that we are close to a stable matching by checking if score distribution  $\lambda_t$  converges.

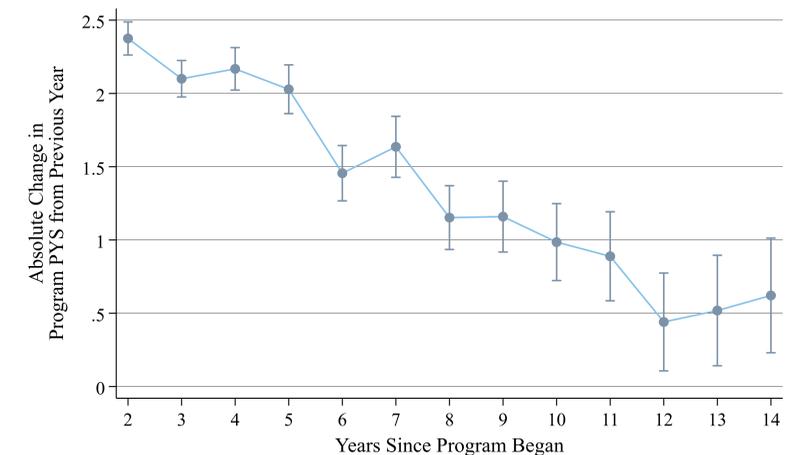
## Does TIM Necessarily Converge?

No! Convergence depends on:

1. Functional form of peer preferences
2. Capacity of programs
3. Alignment of program scores
4. Alignment of student preferences over programs (in absence of peer preferences)

## Convergence of TIM in NSW, Australia

Do we observe convergence in NSW?



... But is this a fluke? Some features of Australian market:

1. Scores are **common** across programs
2. Students have **big-fish** preferences, facing utility cost only if own ability is lower than PYS
3. PYS is the  $k^{th}$ -**highest score** at each program

**Theorem:** Under the above conditions, TIM generically converges in finite time.

## Remaining Instability in the Market

Entry and exit of programs leads to non-convergence of PYS of short-lived programs. This leads to **long-run instability** in many programs. Instability disproportionately affects lower-score, lower-SES students.

We propose new matching mechanism. Does not rely on past data, so is not affected entry and exit of programs across years. Also has better convergence properties than TIM.

**Please email Bobby at [bph@brown.edu](mailto:bph@brown.edu) for more details and with any questions!**