Competitive Behaviour in Economics: How Different are Men and Women?

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Gender Diffs in Competitiveness

- Regardless of stage of development, most economies exhibit significant gender gaps in wages & other labour mkt outcomes.
- Recent research in experimental & behavioural economics has focused on the role that preferences - such as attitudes to risk & willingness to complete - might play in explaining economic outcomes.
- Some experimental studies find that choosing whether or not to compete varies with gender (e.g. Gneezy, Niederle, & Rustichini (2003), Gneezy & Rustichini (2004), Niederle & Vesterlund (2011).
- Moreover, actual performance once individuals have chosen to compete can vary depending on the gender of competitors (Gneezy et al, 2003.)

This talk outlines my research with co-authors that explores gender differences in willingness to compete, using data from laboratory & field.

These examples show how environment/culture affect economically important preferences & behaviour.

A. **Choosing to Compete** (whether to be paid via tournament or piece rate). Here we use secondary school students.
B. **Choosing to Compete:** Here we use different birth cohorts in China & Taiwan.
C. **How Performance Varies across different environments.** Here we use data from a competitive sport in Japan that randomly assigns participants into mixed-sex & single-sex races.

A. Choosing to Compete: Secondary School Students in UK

- Booth & Nolen (*JEBO*, 2012)) adolescent subjects (yrs 10 & 11).
- We examined effect on competitive choices of 2 environments (i) schooling (single-sex or coed); (ii) randomly-assigned experimental groups (single-sex or coed).
- Subjects were 260 girls & boys from 4 publicly-funded single-sex & 4 coed schools in Essex & Suffolk counties.
- Essex is one of the few counties that retains publicly-funded single-sex schools. Suffolk has only coeducational schools.
- School mix: 2 coed schools in Suffolk (103 students), 2 coed schools in Essex (45 students), 2 all-girls schools in Essex (66 students) & 2 all-boy schools in Essex (46 students).

Subjects and educational environment

Subjects from 8 publicly funded schools in Essex & Suffolk in the UK were bussed to the University of Essex.

The students were from years 10 or 11, with average age just under 15 years.

On arrival, students from each school were randomly assigned into 65 groups of four.

- Groups were of three types: all-girls; all-boys; or mixed. Mixed groups had at least one student of each gender & the modal group comprised two boys & two girls.
- The composition of each group – the appropriate mix of single-sex schools, coeducational schools & gender – was determined beforehand.
- Only the assignment of the 260 girls & boys from a particular school to a group was random.

Why might single-sex peer groups nurture girls to be more competitive?

- Sometimes argued that girls benefit academically from single-sex education, in part by achieving higher scores on standardized exams.
- Educational studies show that there may be more pressure for girls to maintain their gender identity in schools or groups where boys are present than for boys when girls are present (Maccoby, 1990, 1998; Brutsaert, 1999).
- In a coeducational environment, adolescent girls are more explicitly confronted with adolescent subculture (e.g. personal attractiveness to members of the opposite sex) than they are in a single-sex environment (Coleman, 1961).
- This may lead them to conform to male expectations of how girls should behave to avoid social rejection (American Association of University Women, 1992).
- If behaving competitively is viewed as being a part of male gender identity but not of female, then being in a coeducational school environment (school or group) might lead girls to make less competitive choices than boys.

How we measured competition

- We used a well-tested experimental strategy. At start of experiment, students told that they would be performing a number of tasks, one of which would be randomly chosen for payment at the end.
- In each round students had 5 min to solve as many of 15 mazes as possible.
- Before the first task was explained, students were shown a practice maze, given instructions on how to solve it, & allowed to ask any questions.
- Immediately before each round, students were told the nature of the task to be carried out and the payment for that round. At this stage, students were permitted to ask questions of clarification about that round.
- At no stage were students told how they performed relative to others in their group.
- No student was able to solve all 15 mazes in the time allotted. All mazes were double-blind marked as is standard in UK universities.

- **Round 1:** Piece rate. Students were asked to solve as many mazes as possible in 5 min. They would receive £0.50 for each maze solved correctly if this round was randomly selected for payment.
- **Round 2:** Tournament. Students were asked to solve as many mazes as possible in 5 min. If this round was randomly selected for payment, the group-winner would receive £2 for each maze solved correctly and the other members zero.
- **Round 3:** Choice of tournament or piece rate. Students were asked to choose either Option One or Option Two and then solve as many mazes as possible in 5 min.

- **Exit questionnaire at end**. After completing this, each student given a bag containing a soft drink, packet of crisps & bar of chocolate.
- **The cash payments** (show-up fee of £5 plus any payment from performance in the randomly selected round) hand-delivered in clearly-labeled sealed envelopes to the schools a few days after the experiment. Average was £7.

Results

- The gender composition of the experimental group, as well as the gender mix of the school the student attended, significantly affected female decisions on whether or not to enter the competition.
- Girls from single-sex schools more likely to enter; so too were girls randomly assigned to single-sex groups for experiment.
- Boys from single-sex and coed schools are statistically just as likely to enter competition.
- The effect was larger and more precisely determined for school-type than experimental group-type.
- Assignment to experimental group-type was random so we know selection isn't an issue here.
- Estimates were robust to a number of sensitivity checks.

B. Experiment in Beijing & Taipei

'Gender Differences in Willingness to Compete: The Role of Institutions and Culture' (Booth, Fan, Meng and Zhang, (Forthcoming, *Economic Journal*)

China: Gender equality under Mao

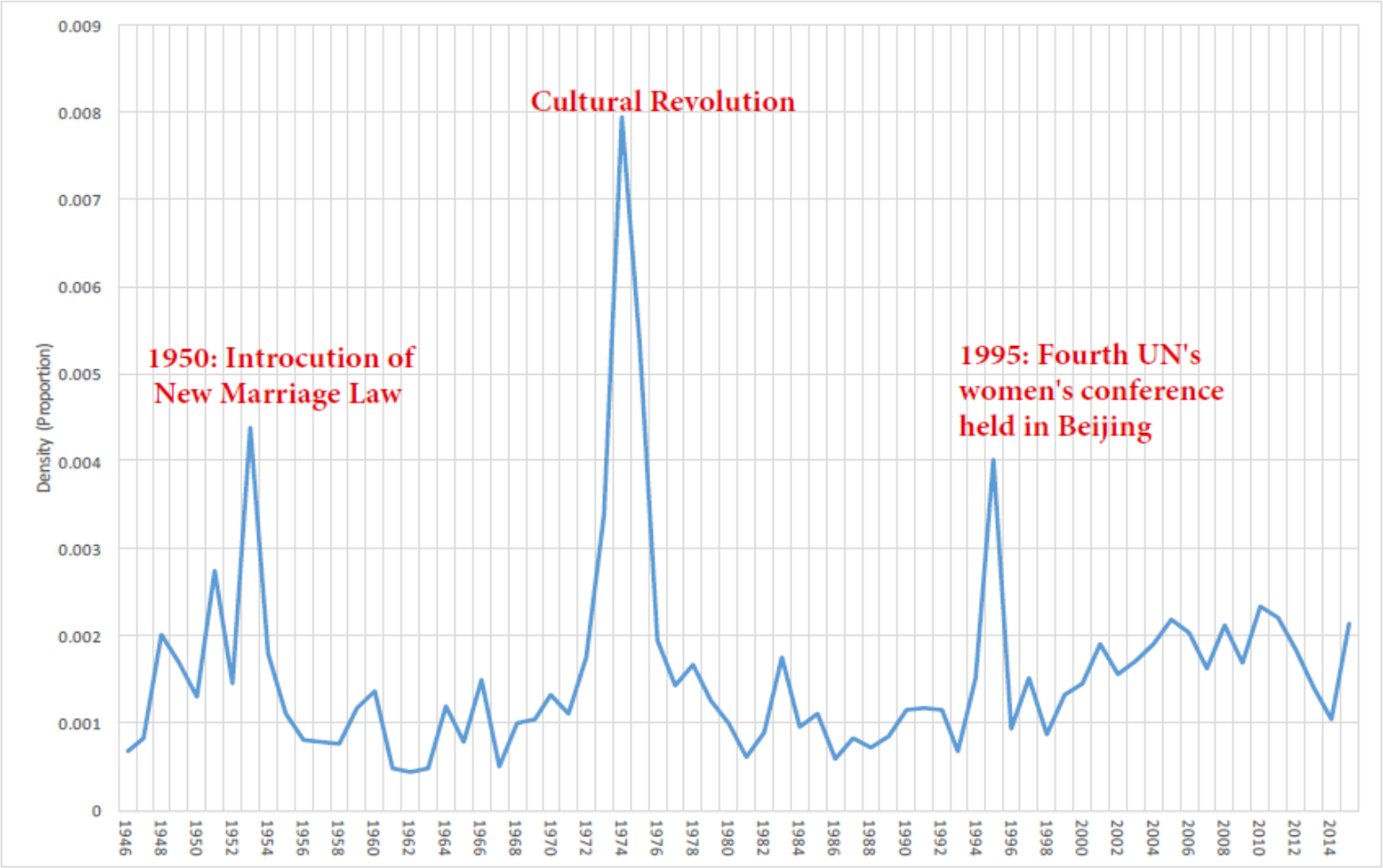
- In 1950, China introduced the New Marriage Law to establish equality for men & women in marriage & family, education, land rights, workforce participation.
- Confucian values (subordination of women) denounced.
- Mass media propaganda promoting gender equality: 'women hold up half the sky' and 'person capable of working but who doesn't is "social parasite".'

Working is glorious, men and women are equal

Women can hold up half of the sky

Gender Equality

Density of articles with the phrases 'women can hold up half of the sky' and/o 'gender equality' appeared on China's official newspapaper *"People's Daily"*



Do change in social norms alter gender gaps in willingness to compete?

We use 2 major changes in gender-relevant social norms in mainland China as natural experiments:

- 1949-1977 switch from Confucian to communist culture;
- 1978- switch from communist to market-dominated individualistic culture

Examine gender gaps in choice to compete across cohorts growing up under different regimes.

Use Taiwan to gauge potential counterforce.

Taiwan

- Like mainland China, Taiwan mostly Han Chinese (95%).
- Early migration from mainland 13th to 16th centuries; 1948-9 KMT lost power to CPC & retreated to Taiwan.
- Taiwan shares same language & Confucian culture as mainland did.
- No revolutionary ideological change, traditional values remain dominant.
- Economic growth and rising average education increased social awareness of gender equality.

Experimental Design

Beijing

- 1958 birth cohort spent all school years in Cultural Revolution (CR) period
- 1966 birth cohort: 3 primary school years in CR & rest in reform era
- 1977 birth cohort entirely in reform era

Taipei

- Same 3 birth cohorts

Representativeness: used household survey data to get cohort-specific gender-education-employment distribution. Recruited subjects based on quota for each cell.

Goal was 60 subjects for each cohort in each city.

Payments analogous to those for B-N (2012)

Experiment for competition

Task: addition of 5 sets of 2-digit numbers in 5 minutes

Payment methods:

- Round 1: piece-rate
- Round 2: tournament
- Round 3: choice btw piece-rate & tournament

Other controls: ability, risk-taking, over-confidence, gender-mix, session size.

Experiments conducted at Peking University & National University of Taiwan.

Main Results

- Women who grew up in Mao regime more competitive than male counterparts
- Weak evidence they are more competitive than younger female counterparts
- They are more competitive than Taipei female counterparts
- We also have robustness checks and explore mechanisms

- Findings confirm that exposure to different institutions & social norms during the crucial developmental age changes individuals' behaviour.
- Exposure to strong gender equality message for a relatively short period can change women's willingness to compete.
- To the extent that today's world has embarked on a journey to defy the old gender order, this finding has policy implications.

C. ‘Performance in Mixed-sex & Single-sex Competitions: What We Can Learn from Speedboat Races in Japan

(Booth and Yamamura, *Review of Economics and Statistics*, 2018)

- Gneezy et al. (2003) showed in an experiment that women’s performance in competitions varies with competitors’ gender.
- We adopt a different but complementary approach by using data from the field.
- In speedboat racing in Japan, women racers compete under same conditions as men, & all individuals are randomly assigned to mixed-sex or single-sex groups for each race.
- We use a sample of over 140,000 observations of individual-level racing records provided by the Japanese Speedboat Racing Association.
- We examine how male-dominated circumstances affect women’s racing performance.
- We control for individual fixed-effects plus a host of other factors affecting performance including ability-proxies.

Speedboat Racing in Japan: Overview

- Tournaments controlled by Japanese Motorboat Race Association .
- Male & female racers receive same intensive training (one-year long, tough exam at end).
- Students master various skills, including driving techniques, & inspection & maintenance of engine & boat.
- Women & men participate & compete under same conditions. Only difference: men have to weigh over 50 kg & women over 47.5 kg.
- Participants randomly allocated by lottery to either single-sex or mixed-sex races. Boats & engines randomly allocated on race day.
- 6 competitors in each race. Prizes considerable.
- Women represent approximately 13% of all racers.
- Rules of race strictly monitored. Breaches result in disqualification & severe sanctions (no participation & fall in annual revenue).
- Thus racers have strong incentive to follow the rules. But also tradeoffs: to win, they may have to engage in risky lane-changing.

Speedboat racing financed by betting

More Background

- In speedboat racing in Japan there about 1600 racers, of whom around 1400 are men and 200 women.
- Their ages range between 18 and 70 years old.
- The Japanese Speedboat Racing Association was established in 1952.
- The youngest age of a racer is 16 years (only those aged 15 - 29 years can enter the Yamato Kyotei Gakko).
- No compulsory retirement age.

The Stadium

- 24 speedboat racing stadiums throughout Japan & boat races are randomly held about 4 days per week in each stadium.
- Racers go to many different stadiums to compete. In each racing fixture, there are 12 races, & 6 racers compete in any given race.
- The circuit is a large artificial pond or sectioned-off body of water 600 metres in length.
- Competitors race around it three times, leading to a total race-distance of 1800 metres.

Boat race course at Suminoe in Osaka

Procedure on Race Day

- Boats and engines are randomly allocated to racers.
- Before every race, each racer's name is announced. S/he then drives 150 metres along a straight section of circuit.
- His or her performance time is immediately reported, providing a public measure of the racer's condition.
- Exhibition time depends on physical & mental factors (that may or may not vary across days) & also on the boat & engine.
- Racers inspect and maintain mechanically the boat & engine allocated to them, & have no assistance.
- Racers motivated to aim for a good exhibition time to learn the boat's condition & its match to their talents.
- Performance-time information also used by betting fraternity.

Coming out of the Pit for Race Start

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ja.m.wikipedia.org

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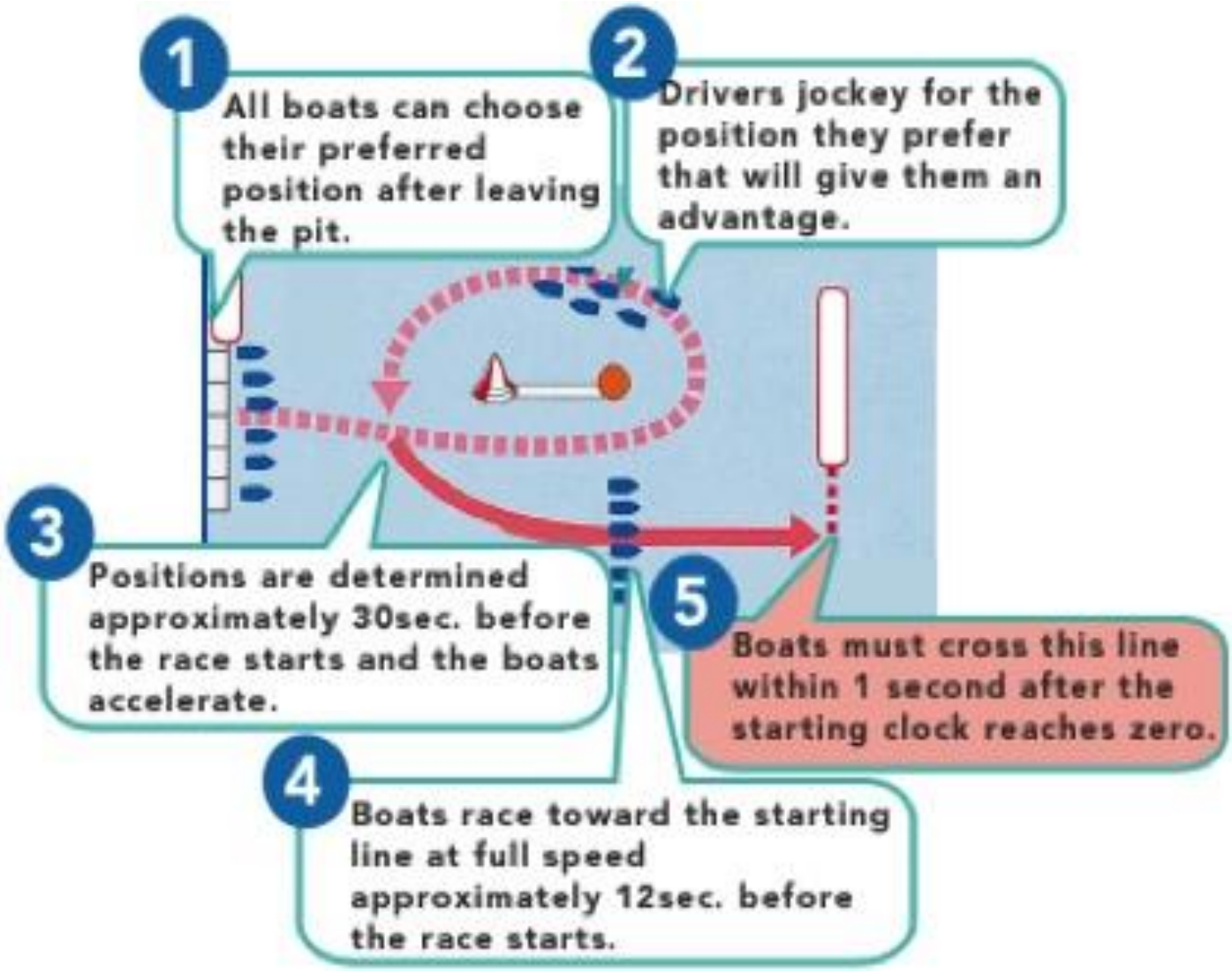
The ‘premature start system’

- Boat races use premature start system. Boats must pass the starting line within a second after starting clock reaches zero.
- Standby warm-up refers to the period from the time the boats receive the signal to leave the docks (pit) to the moment they cross the starting line.
- Racers’ initial pits & lanes determined prior to race by committee of the association. But racers can strategically change their lane at the pit during the initial period of turn-round & thereby end up in a different position for the start of the measured race.
- “Boats must round the 2nd turn marker, an orange buoy, racing in a counterclockwise direction. At this point, all boats must find a position. Following in a position behind another boat is not allowed, and is judged as a violation”.
- Thus a racer’s lane for the actual race is possibly different from the initial allocated lane.

Figure 1: Premature Start System



Gender composition of races

- Three categories of races depending on gender-composition: all-male race where all six racers are men; the women-only race where only women participate: and the mixed-gender race in which both men and women racers participate.
- There are only one or two women racers among six racers in most cases of mixed-sex races.
- For a woman, a mixed-gender race involves her racing against a majority-male set of competitors.
- For a man, a mixed-gender race also involves him racing against a majority-male set of competitors with only one or two female competitors.

Prizes & Race Grades

- Participants win prize money according to whether they come first, second, etc in each race.
- Five race grades: Super Grade (SG), Grade I (GI), Grade II (GII), Grade III (GIII), & the 'Usual' races. In higher grade races, the number of points that winners earn is greater.
- Any racers can participate in the Usual race which is the bottom rank.
- In GIII races, racers under 30 years old with high winning rates are selected to participate.
- The criteria for participation in GII and GI races are stricter.
- In SG, racers are selected from the top-ranked racers by considering prior performance. Within a year, the number of races is 8 in the SG; around 40 in the GI; 8 in the GII; around 50 in the GIII; and almost every day for the Usual races.
- Selection is done by Japanese Motorboat Association.
- Various status racers from top to bottom levels are evenly & randomly assigned to Usual races. Thus the top-class racers participate not only in the high-grade races like SG & GI but also in Usual races.

Participants' points & grades

- Racers are awarded points according to place in race (1st, 2nd, $3^{rd\ etc}$) & race grade (Usual, GIII, GII etc).
- They lose points for poor navigation or rule-breaking.
- They can also be disqualified, losing further points & opportunity to participate.
- An individuals' aggregated points in a season used for selection into the top grade (SG) race.
- There is also an extra element to points-accumulation: each individual's points are aggregated for three years and the total then determine racers' own grade: A1, A2, B1, & B2.
- We use this to control for ability.

Winnings

- **Prize money for race-winners** around US $300k (SG), US $100k (GI), US $40k (GII), US $10k (GIII) & under US $10k (Usual).
- **Also prizes for non-winners.** Take example of SG: prize winnings are around $150k (2nd place), $50k (3rd place), $20k (4th place), $10k (5th), under $10k (6th).
- **For the 4 grades of racer**, average annual earnings are: A1 grade (top grade): US$330k; A2 grade $190k; B1 grade: $80k; B2 grade: $50k.
- Higher-grade racers participate in more races. Even at meeting with no high-grade races, A1 racers can take part in the Usual race. They are also more able to participate in higher-grade races with greater rewards.
- Percentages of women racers for A1, A2, B1, & B2 are about 11%, 19%, 46%, and 23 %, respectively. For men racers, are roughly 21 %, 20%, 43%, & 14%, respectively.

Data

- individual records for period April 2014-October 2015 from "Boat Advisor" (http://boat-advisor.com database of Japanese Speedboat Racing Association).
- Of 24 boat-race stadiums in Japan, 7 provide **all racers'** records. From these we construct a panel dataset for each racer & race.
- In a racing fixture, racers participate in two or three races.
- We have 202 females (ave age 34.0) & 1,430 males (ave age 37.3). Each participated in 250 races, yielding over 400,000 person-race observations.
- Our estimating subsample comprises all races with **complete information about racers' records**, yielding approximately 140,000 person-race observations.
- Far larger sample than other datasets used to consider gender differences in competitive behavior obtained from experiments & from survey data.

Results from our FE Estimates

- Women's race-time is slower in mixed-sex races than all-women races, whereas male racer's time faster in mixed-gender races than men-only races.
- Same results when dependent variable 'place-in-the-race'.
- In mixed-sex races, males tend to be more aggressive – as proxied by lane-changing – in spite of the risk of penalty if they contravene the rules. Women follow less aggressive strategies.
- No gender differences in disqualification rates.
- Gender-differences in risk-attitudes & confidence may result in different responses to competitive environment.
- Gender-identity also likely to play a role.

Conclusions (speed boat paper)

- Female competitive performance - even for women who've chosen a competitive career & are very good at it –is enhanced by being in a single-sex environment rather than in a mixed-sex environment in which they are a minority.
- Gender-proportion in mixed-sex boat races skewed towards men. This gender-imbalance is likely to trigger awareness of gender-identity for both men & women.
- Gender-identity might go some way to explain our observed differences in behavior across the mixed-sex & single-sex groups.
- Our findings may have implications for other activities in which men & women compete, & where gender-balance is skewed.
- E.g. STEM disciplines. Being in a minority may well affect the performance of women in that situation.
- Sportspeople selected on willingness to compete. Thus our effects of mixed-sex treatments may be muted compared to other settings where selection is not as competitive.

Overall conclusions from 3 studies

- Choosing to compete, or willingness to compete, is malleable.
- Women tend to avoid competing against men but this tendency is less pronounced for those who have been educated in an environment in which women's value is upheld.
- Many economic outcomes – education, innovation, promotion – are dependent on willingness to compete. Our results show that the environment can affect this.
- Implications for countries or situations where women are not encouraged.
- Once women have chosen to be in a competitive environment, how well they perform is also influenced by who they're competing with.

The End

Table 2 (Baseline)

FE Estimates of Place in Race, Baseline Specification			
	(1) All	(2) Women	(3) Men
Mixed-sex dummy* Women racer dummy	0.93*** (0.04)		
Mixed-sex dummy	−0.28*** (−0.01)		
No. of opposite-sex racers		0.19*** (0.01)	−0.23*** (0.01)

(i) Baseline specification also includes controls for starting lane, race grade (SG, GI etc), stadium location, interactions btw location and day.
(ii) Robust standard errors clustered on race shown in parentheses.

Comment

- Our randomisation allows us to document our basic stylised fact: that the same woman performs relatively worse in mixed-sex races as compared with single-sex races, while for the average male the opposite is true.

- But does the direct effect of mixed-sex variables alter when we control for ability, experience and weight of competitors in each race?

Table 2 (Expanded Specification)

FE Estimates of Place in Race, Expanded Specification			
	(1) All	(2) Women	(3) Men
Mixed-sex dummy* Women racer dummy	0.74*** (0.04)		
Mixed-sex dummy	−0.19*** (−0.01)		
No. of opposite-sex racers		0.19*** (0.01)	−0.17*** (0.01)

Expanded specification includes all controls of baseline specification plus the numbers of higher ability racers, of lower ability racers, of more experienced racers, of less experienced racers, of heavier weight racers, of lighter weight racers.

Results from our FE Estimates

- Women perform relatively worse in mixed-sex races than all-women races, whereas for the average male the opposite is true. This is the case in both the baseline and expanded specifications.
- Same result when the dependent variable is ‘place-in-the-race’ or race-time.
- In mixed-sex races, male racers tend to be more aggressive – as proxied by lane-changing – in spite of the risk of penalty if they contravene the rules. Women follow less aggressive strategies.
- No gender differences in disqualification rates.

Table 1. Means and definition of selected variables

	Women [1]	Men [2]	Difference [1] – [2]
Race time (seconds)	113.2	112.7	0.05***
Place in the race	3.68	3.43	0.25***
Exhibition time (seconds)	6.72	6.73	−0.01***
Weight (kgs)	47.5	52.0	−4.5***
Number of lanes changed down towards the first lane	0.07	0.12	−0.05***
Number of lanes changed up towards the sixth lane	0.09	0.09	−0.005**
Poor navigation	0.0003	0.0004	−0.0001
Disqualification	0.0010	0.0012	−0.0002
Mixed-sex race	0.31	0.12	0.19***
Number of opposite-sex racers	1.25	0.15	1.10***
Number of higher class racers	1.77	1.53	0.24***
Number of lower class racers	1.36	1.47	−0.10***

Table 2. Mean Differences in single-sex and mixed-sex races

	Single-sex [1]	Mixed-sex [2]	Difference [1]-[2]
(a) Place in race			
Women (1)	3.46	4.19	−0.72***
Men (2)	3.46	3.22	0.23***
(1) – (2)	0.00003	0.96***	
(b) Racers' time (seconds)			
Women (1)	112.8	114.2	−1.4***
Men (2)	112.7	112.6	0.01
(1) – (2)	0.01**	1.6***	
(c) Exhibition time (seconds)			
Women (1)	6.71	6.74	−0.03***
Men (2)	6.73	6.73	0.001
(1) – (2)	−0.02***	0.01***	
(d) weight (Kgs)			
Women (1)	47.4	47.5	−0.01***
Men (2)	51.9	51.9	−0.002
(1) – (2)	−4.5***	−4.4***	