on one condition

the welfare effects of unraveling in the uk college admissions system

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Many differing opinions on UK college admissions in the late 2010s

*Geoff Barton, general secretary of the Association of School and College Leaders, said: "It is **infuriating** that universities have apparently responded to calls to end the use of certain types of unconditional offers by making more of them.*

*[...] "This practice has **more to do with the frenetic scramble to put 'bums on seats' than the best interests of students**."*

*[...] Following the lifting of the cap on student numbers, there has been **fierce competition between institutions** who are dependent for their survival on undergraduate tuition fees and are recruiting from a shrinking pool of 18-year-olds.*

–The Guardian, 2018

*"We don't use them to put bums on seats, in the minister's phrase, we use them to position ourselves at the top end of the attainment range and **attract a high calibre of students** ...I want them to come here and not to a university down the road"*

–Vice-Chancellor of Sheffield Hallam Univ., 2018

*A survey of 18-year-olds by Ucas found **70% of applicants supported the use of unconditional offers**, noting: "Many speak about a reduction in **stress**, and the mental health and wellbeing benefits this confers." Applicants themselves ...welcom[e] the **certainty** of knowing they have a place...*

–The Guardian, 2019

Unraveling leads to market failure, often in timing; requires coordination to fix

- Gastroenterology: inception–1986, 1996–2006 (Niederle and Roth, 2003)
  Offers made 1 year before start date, decreased mobility + scope of market
- College football bowl (post-season) games: inception–1992 (Fréchette et al., 2007)
  Bowls scheduled several weeks before end of regular season; coordination increased efficient matchings, viewership
- Law clerk hiring, inception–2017 (Avery et al., 2007)
  Hiring for clerkships began years in advance, with "exploding offers"; attempts at regulation had high non-adherence rates. New government-run online system (OSCAR) has improved coordination, match quality
- Pathology Fellowships, inception–2025(?) (Herrmann et al., 2022)
  Many offers made over 2 years in advance; joined NMRP this year in attempt to coordinate

We provide evidence of unraveling with modern empirical methods

Previous unraveling papers examine decentralized markets, and data is often incomplete + collected via surveys

In this paper, we examine unraveling in the higher education context, studying a centralized market where unraveling shifted risk from students to universities

Research questions

1. What determines a university's decision to adopt unconditional offers? How does this lead to unraveling over time?
2. What are the welfare impacts of this unraveling on student welfare, as measured by both their short-term utility and their long-term outcomes, such as college graduation and earnings?

Connections to other strands of literature

Theoretical modeling

- Unraveling: Roth and Xing (1994); Li and Rosen (1996); Suen (2000); Ostrovsky and Schwarz (2010); Saitto et al. (2024)
- College admissions: Avery and Levin (2010) (Early Decision), Lee and Suen (2022) (gaming + standardized tests)
- **This paper:** focus on behavior of universities, and dynamic response

Structural estimation

- Recent literature estimating preferences in admissions: Kapor (2024); Ajayi and Sidibe (2020); Bleemer (2024); Agarwal and Somaini (2020)
- **This paper:** incorporate risk preferences, dynamic evolution

Today: Descriptive evidence about incentives, models of students + uni behavior

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Agents in the UK college admissions system

Students $i \in I$

- Apply in year 13, usually 18 years old
- $\sim$750k applicants, $\sim$500k offers
- Restrict to first-time domestic applicants

Courses $s \in S$

- Students apply to *courses*, programs at a university in a specific major (Politics and History at Newcastle, Modern Languages at Oxford, etc.)
- $\sim$35k different courses at $\sim$400 universities
- Fees capped to £9,535 for domestic applicants, few price differences at uni level

Timeline of UK college admissions

Jan Apply for $\leq$5 courses through UCAS, centralized admissions system

Application includes personal statement, GCSEs (year 11 tests), AS-levels (year 12), A-levels (year 13 tests) **predicted** by teachers

Mar Offers made by universities **conditional** on unrealized A-level results

May Students take A-levels, usually $\geq$ 3 for college applicants

Jun Students rank $\leq$2 received offers, decline others; binding rank

Aug **achieved** A-level results released, students attend 1st choice if they meet conditions; else, 2nd if meet conditions

Students who miss conditions can still receive offers at course's discretion

10% miss conditions of 1st choice, go to 2nd choice

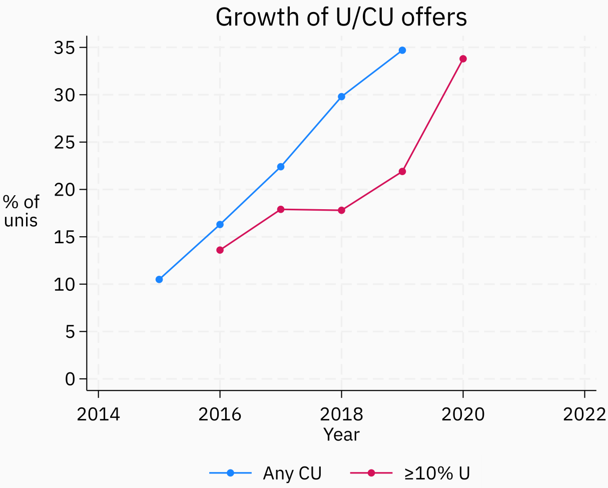
10% miss both conditions, unmatched

The rise of unconditional offers

Most offers **Conditional (C)**, as just described

2013: start + rapid growth of two other offer types:

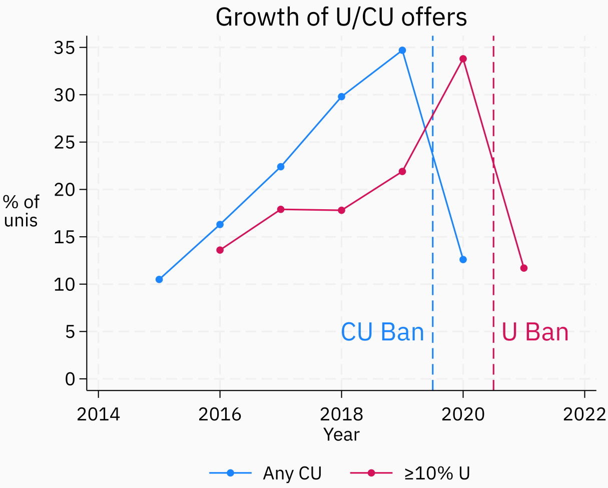
- **Unconditional (U)** offers: students were admitted with no conditions for their end-of-year exams
- **Conditional Unconditional (CU)** offers: admitted with no conditions *only if* that university was their first choice



The fall of unconditional offers

2020: UK government bans CU offers b/c COVID-19, concerns of pressure on students
2021: UK unis created "Fair admissions code of practice", limiting use of U offers

- EOY exams already completed (i.e., adult applicant)
- Course with interview/audition/portfolio
- Mitigating circumstances
- Courses designed to be nonselective



Use data from UCAS on universe of UK college applications

Analyze college applications from 2012–21, restricted to 18-year old first-time applicants, including:

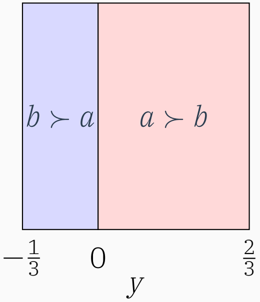
- Application portfolio
- Application results (including type of offer, ranking)
- College matriculation, graduation
- Demographic covariates
- Test scores (achieved and predicted)

Benefits of setting

- Data from UCAS, centralized application platform
- Unraveling on a single dimension which is observed

Quick model à la Avery and Levin 2010 describing incentives at play

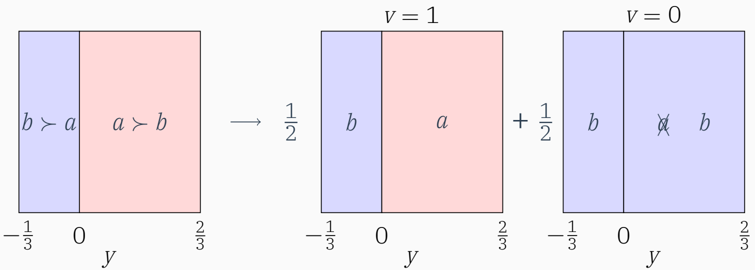
- Two schools, a and b, with capacity $\frac{1}{3}$ and $\frac{2}{3}$
- Unit mass of students with
  - Taste parameter $y \sim [-\frac{1}{3}, \frac{2}{3}]$ where $y > 0 \iff a \succ b$
    $u_i^a(y) = 1 + Ay$, where $A > 0$
    $u_i^b(y) = 1 - By$, where $B > 0$
  - Ability $v \sim$ Bernouilli(0.5) revealed by required test at $t = 1$ which costs effort c
- Schools make offers before v revealed; offers conditional on v
- Schools prefer higher-ability students w/ interest
  $u_a^i(y) = v + \alpha * y$
  $u_b^i(y) = v - \alpha * y$
- Students rank ≤ 2 schools, attend highest-ranked where conditions met



Quick model à la Avery and Levin 2010 describing incentives at play (2)

If a and b both use conditional offers, then

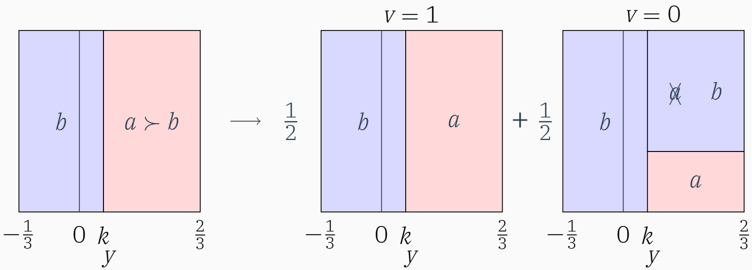
- Students rank $a \succ b$ iff $y > 0$
- a offers to all students, admits iff $v = 0$
- b offers to all students, always accepts



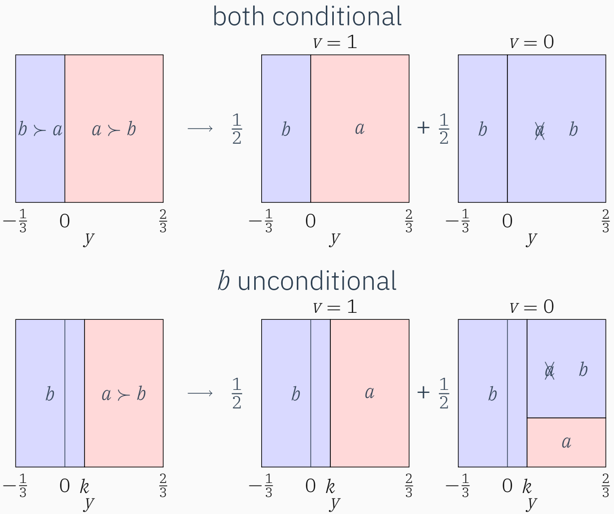
Quick model à la Avery and Levin 2010 describing incentives at play (3)

If b uses unconditional offers, then

- b makes an unconditional offer to all, allowing them to not take test
- Students rank $a \succ b$ iff $y > k > 0$; weak enough preference for a means students would rather take b than take test and incur c
- a offers to all students, admits all with $v = 1$ and some with $v = 0$



Quick model à la Avery and Levin 2010 describing incentives at play (4)



b's U offers draw high-ability students who would otherwise attend a

As a's value increases, fewer students diverted to b

Impacts on a are ambiguous — better match quality, lower academic quality

Incentives affecting agents make welfare ambiguous

	Courses	Students
Positive	Increased enrollment (particularly if spare capacity) Increased student quality, if offer sufficiently attractive	Certainty over decision-making Less stress in exam-taking Increased match rate
Negative	Admits have fewer signals of ability Admits may have learned less in HS Adverse selection of students	Potential employment effects (reduced learning, direct signal) Lower match quality

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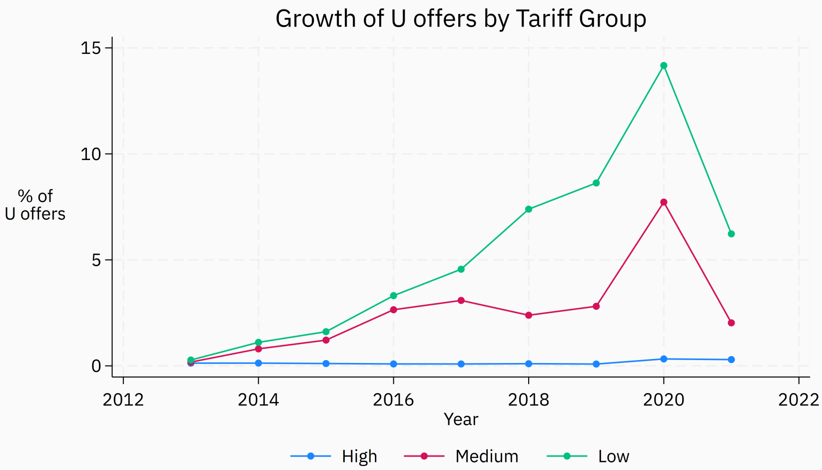
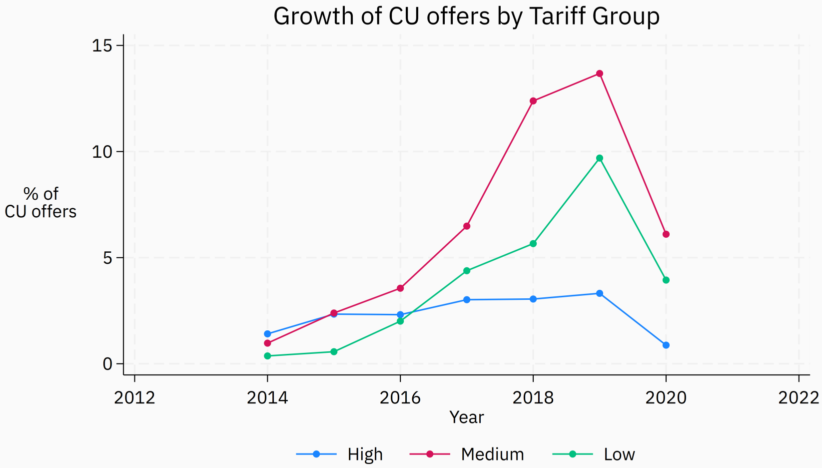
U offers driven by low, medium tariff universities



CU offers driven by medium tariff universities



U offers given by lower-achieving and less-popular courses

	(1) Frac. U offers	(2) Frac. U offers > 0
Avg. GCSE ptile, 2012 admit class	-0.0421**	-0.284***
	(0.0179)	(0.00821)
Avg. A-level ptile	-0.127***	0.0292
	(0.0173)	(0.00883)
Yield rate, 1st (lowest) quintile	0.0420***	0.0944***
	(0.00481)	(0.0148)
2nd quintile	0.0472***	0.132***
	(0.00539)	(0.00272)
3rd quintile	0.0369***	0.0901***
	(0.00371)	(0.0130)
4th quintile	0.0194***	0.0553***
	(0.00334)	(0.0124)
Observations	16115	16115

Regress fraction of U offers on course characteristics using 2012 data

Sample includes all courses from 2013 to 21 in the 20 most popular majors. Include year, major, tariff group FEs.

The story so far

who gives u offers

lower-ranked unis
less-popular universities

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Unconditional offers increase proportion of 1st choices, eventual enrollment

	(1) 1st choice	(2) Enroll
0% - 1%	0.00405	0.00523
	(0.00450)	(0.00446)
1% - 10%	0.00405	0.00523
	(0.00450)	(0.00446)
10% - 20%	0.0122*	0.0182***
	(0.00526)	(0.00534)
20% - 50%	0.0265***	0.0326***
	(0.00590)	(0.00604)
50% - 100%	**0.0361*****	**0.0424*****
	(0.00597)	(0.00596)
Constant	0.0478***	0.0545***
	(0.00688)	(0.00678)
Observations	1099	1099
Sample Mean	0.267	0.232
Sample SD	0.133	0.117

Standard errors in parentheses.

Regressions of students' behavior (rank as 1st choice, enrollment) on bins of U-offer rate

Regression includes year + university FEs.
Baseline is 0% U/CU offers

With a U/CU offer, less likely to choose top, be unmatched

	(1) Rank top offer first	(2) Rank top offer first	(3) Unmatched in main
Has U/CU offer	**-0.048*** **	**-0.045*** **	**-0.124*** **
	(0.003)	(0.003)	(0.003)
Baseline academics	0	1	1
Observations	186,087	168,579	168,579
Mean Outcome	0.386	0.390	0.236

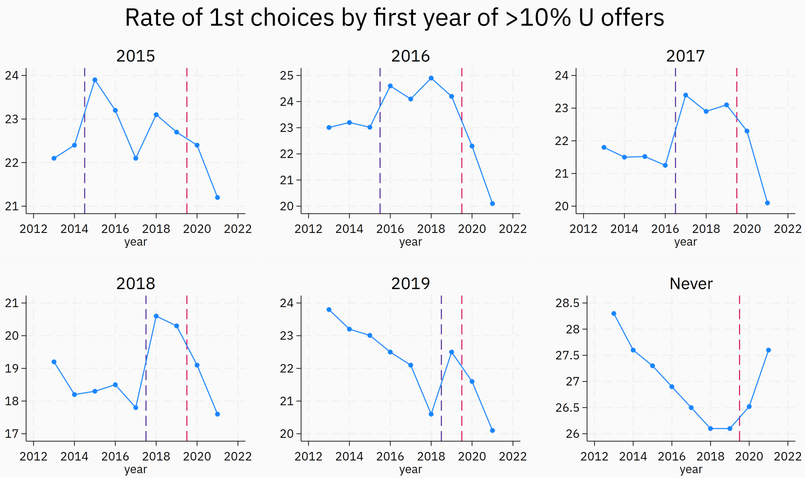
Include course, year FE, and restrict to students w/ ≥ 3 offers.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Regress student offer response (2013–21) on U/CU offer, academic characteristics

Baseline academics include GCSE scores, predicted A-level percentile, and their squares.

Yield sharply increases when courses start giving U offers



Students preferentially choose U/CU offers over “better” universities

	(1) Choose as 1st	(2) Choose as 2nd	(3) Decline
U or CU offer	**0.189*****	**-0.027*****	**-0.162*****
	(0.004)	(0.003)	(0.003)
2nd highest avg. income of offers	-0.078***	0.071***	0.007***
	(0.003)	(0.002)	(0.002)
3rd+ highest avg. income of offers	-0.155***	0.109***	0.045***
	(0.003)	(0.002)	(0.002)
Observations	1,013,741	1,013,741	1,013,741

Standard errors in parentheses. Include course, year FE, # of Us+CUs. Restrict to students w/ ≥ 3 offers.

$^{***}\ p < 0.001$, $^{**}\ p < 0.01$, $^{*}\ p < 0.05$

Regress student offer response (2013–21) on offer type, exposure to U/CU offers, and rank of uni in offer set

Rank determined by average post-course earnings of students in 2011

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Standard errors in parentheses. Include course, year FE, # of Us+CUs. Restrict to students w/ $\geq$ 3 offers.

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Regress student offer response (2013–21) on offer type, exposure to U/CU offers, and rank of uni in offer set

Rank determined by average post-course earnings of students in 2011

Students with U/CU offers “undermatch” vs. peers of same ability

	(1) GSCE ptile in enrolled course	(2) ALevel/BTEC pctile in enrolled course
Has U/CU offer	**8.386***** (0.135)	**5.438***** (0.122)
Observations	127,572	127,572
Mean Outcome	47.028	47.610

Include course, year FE, and restrict to students w/ ≥ 3 offers.

$^{***}\, p < 0.001$, $^{**}\, p < 0.01$, $^{*}\, p < 0.05$

Regress student characteristics at their enrolled university on U/CU offer, academic characteristics

The story so far

who gives u offers	lower-ranked unis less-popular universities
student response	rank U offers higher decrease in match quality increase in match rate

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Ability is the strongest predictor of CU/U offers

	(1) CU offer	(2) U offer	(3) C offer
Low-SES neighborhood	-0.002***	0.000	0.001**
	(0.000)	(0.000)	(0.001)
Female	0.009***	0.003***	-0.014***
	(0.001)	(0.000)	(0.001)
GCSE core ptile	**0.154*** **	**0.052*** **	-0.223***
	(0.007)	(0.003)	(0.007)
A-level pctile (achieved)	**0.181*** **	**0.070*** **	-0.252***
	(0.006)	(0.003)	(0.007)
Observations	1,913,966	1,913,966	1,913,966
R-squared	0.293	0.289	0.263

Regress offer type on student characteristics

Restricted to offers in 2014–19 from courses that ever give $> 10\%$ U-offers. SEs clustered at course level. All regressions include FEs for year, course, school, race indicators, and disability indicators.

means

Admitted classes have higher predicted scores, lower achieved scores

	(1) A-level pctile (pred.)	(2) A-level pctile (act.)
0% - 10%	0.00149	-0.00697***
	(0.00135)	(0.00133)
10% - 25%	**0.0111*** **	**-0.00646*** **
	(0.00181)	(0.00179)
25% - 50%	**0.0136*** **	**-0.0113*** **
	(0.00207)	(0.00198)
50% - 75%	**0.0157*** **	**-0.0162*** **
	(0.00279)	(0.00274)
75% - 100%	**0.00771* **	**-0.0228*** **
	(0.00391)	(0.00393)
Constant	0.465***	0.495***
	(0.000481)	(0.000461)
Observations	65499	65718
Sample Mean	0.468	0.492
Sample SD	0.184	0.190

Standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Regress academic characteristics of enrolled students on bins of U-offer rate

- Moral hazard: U/CU students no longer try on A-levels
- Adverse Selection: U/CU students have low private signal

Regression includes course, year FEs. Baseline is 0% U-offer.

Admitted classes become more advantaged as well

	(1) Female	(2) Low-SES neighborhood	(3) White
0% - 10%	0.00151	-0.00164	0.00198
	(0.00313)	(0.00327)	(0.00277)
10% - 25%	0.00693	-0.00286	0.00284
	(0.00432)	(0.00448)	(0.00364)
25% - 50%	0.00493	**-0.0150****	**0.0140*****
	(0.00468)	(0.00497)	(0.00415)
50% - 75%	0.00476	**0.00268**	**0.0183*****
	(0.0061)	(0.00663)	(0.0054)
75% - 100%	0.00842	**-0.0296*****	**0.0337*****
	(0.00828)	(0.00878)	(0.00701)
Constant	0.545***	0.304***	0.778***
	(0.00115)	(0.00121)	(0.001)
Observations	67397	67373	67397
Sample Mean	0.547	0.302	0.78
Sample SD	0.35	0.276	0.281

Standard errors in parentheses.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Regress enrolled student demographic characteristics on bins of U-offer rate

Regression includes course, year FEs. Baseline is 0% U-offer.

Unis who give out U offers increase in popularity+HS grades, but A-levels drop

	(1) Frac. U offers	(2) Frac. U offers > 0
Avg. GCSE ptile	**.0596*** **	**.0842**
	(.0176)	(.0590)
Avg. A-level ptile	**-.164*** **	**-.302*** **
	(.0168)	(.0502)
Yield rate, 1st (lowest) quintile	**-.0852*** **	**-.148*** **
	(0.00627)	(.0179)
2nd quintile	-.0575***	-.110***
	(0.00564)	(.0168)
3rd quintile	-.0339***	-.0702***
	(0.00516)	(.0160)
4th quintile	-.0231***	-.0530***
	(0.00421)	(.0140)
Observations	16115	16115

Regress fraction of U offers on course characteristics of that year's admitted class

Sample includes all courses from 2013 to 2021 in the 20 most popular majors. Include year, major, tariff group FEs, and controls for 2012 admit class characteristics/quintile of yield rate.

Adoption of U offers occurs in response to peer institutions

	(1) U offers > 10%	(2) U offers > 10%
1 U-giving peer	0.0509**	0.0462**
	(0.0172)	(0.0143)
2 U-giving peers	0.0815**	0.0904***
	(0.0297)	(0.0264)
3 U-giving peers	0.147**	0.136**
	(0.0529)	(0.0421)
4 U-giving peers	0.364***	0.274***
	(0.0969)	(0.0757)
5 U-giving peers	0.359***	0.292***
	(0.103)	(0.0818)
6 U-giving peers	**0.549*****	**0.486*****
	(0.101)	(0.0892)
7 U-giving peers	**0.910*****	**0.658*****
	(0.0190)	(0.0299)
Extra FEs	0	1
Observations	28332	28332

Regress whether use U-offers on whether peers do

Peers if >5% of c's offers admitted to b, and ratio ranking c 1st vs. b is in $[0.5, 1.33]$

All regressions include Year FE. Extra FEs are those for uni, major, and dummies for the number of peers.

The story so far

who gives u offers	lower-ranked unis less-popular universities
student response	rank U offers higher decrease in match quality increase in match rate
uni response	give U offers to (at baseline) higher-ability students increase in enrollment, baseline scores decrease in achieved scores occurs in response to peers

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Model based on Kapor (2024); work backwards from students' final rankings

Let student i's utility for course s (including outside option 0) after receiving offers be

$$u_{is} = U_{is} + \varepsilon_{is}^{\text{enroll}}$$

where

U_{is}	i's ex-ante utility for s (i.e., before receiving offers)
$\varepsilon_{is}^{\text{enroll}}$	a nested logit shock with parameter λ comparing outside option (0) and "inside" options (courses where i admitted)

Students then rank offers to maximize utility

Following Agarwal and Somaini (2018), let students have (accurate) beliefs L_{R_i} about admissions to each course if they submit ranklist R_i

Incur cost $c_i^{\text{test}} = \gamma_z^{\text{test}} z_i^{\text{prefs}}$ when studying EOY exams, 0 if exams not required, where z_i^{prefs} is a vector of student characteristics impacting preferences

Students choose ranklist R_i to maximize expected utility; implies MLE estimator

$$\hat{\theta} = \arg\max_{\theta} \sum_{i=1}^{N} \log \mathbb{P}\left[R_i = \arg\max_{R_i} u_{is} L_{R_i} - \gamma_z^{\text{test}} z_i \middle| z_i; \theta \right]$$

Course give offers to their cohort of most-preferred students

Course j's utility for student i is

$$\pi_{is} = z_i^{\text{admit}} \gamma^{\text{admit}} + q_i + r_i + \mu_{is}^{\text{admit}}$$

z_i^{admit}	vector of student characteristics used for admission (predicted A-levels, GCSEs, SES)
q_i	ability parameter commonly observed by all courses (i.e., teacher recs, extenuating circumstances)
r_i	ability parameter which courses observe only via EOY test
s_i^q, s_i^r	signals observed by students; jointly normal with q_i, r_i, respectively
μ_{is}^{admit}	is an iid $N(0,1)$ course-specific shock to s of admitting i, observed only by courses

Course s gives C offer (resp. U offer) if $\pi_{is} \geq \underline{\pi}_s^C$ (resp. $\pi_{is} \geq \underline{\pi}_s^U$). C offers come with additional threshold $\underline{r}_s^C$ which must be met to be admitted.

Courses set cutoffs to maximize expected utility, generating

Course s believes student of type z_i^{admit}, q_i with a C offer will attend with probability

$$\mathbb{P}\left[i \text{ attends } s \mid U\right] = \left(1 + \exp\left(\beta_s^{z,U} z_i^{\text{admit}} + \beta_s^{q,U} q_i\right)\right)^{-1}$$

From this, back out per-year aggregate "outside option" utility for each student type (treating true student utility for s as comparison as known)[1]

Use years with C and U offers to estimate "value" of a U offer, from s's perspective

[1] This is done because courses are unaware of a students' exact application portfolio.

Students apply to courses to maximize expected utility

Let student ex-ante utility for course s be

$$U_{is} = \delta_s + w_s\beta_i^w + x_{is}\beta_i^x + z_{is}^{\text{admit}}\beta_i^z + \nu_{is}^{\text{admit}}$$

δ_s	school-specific quality term
w_s	vector of school characteristics, with random coefficients $\beta_i^w \sim N(0, \sigma^w)$
x_{is}	preference shifters (distance to college, indicator for nearby college, Russell Group$\times z_i^{\text{admit}}$
z_{is}^{admit}	vector of student characteristics used for admission (predicted A-levels, GCSEs, SES)
ν_{is}^{admit}	is an iid $N(0, \sigma_s^2)$ course-specific shock, $\perp z_i, x_{is}$

Students then choose portfolio given expected utilities

Expected value of portfolio A is

$$V_i(A) = \sum_{B \subseteq A} P_i(B; A) \log \left(1 + \left(\sum_{s \in B} \exp\left(u_{is}/\lambda\right) \right)^{\lambda} \right)$$

where $P_i(B; A)$ gives the probability of being admitted to only the subset $B \subseteq A$.[2]

Students choose an application portfolio A to maximize $V_i(A) - C(|A|)$, where C is a cost function for the size of the application portfolio

[2] Kapor(2024) provides a way to compute these probabilities quickly, using only $P(B; B)$ for every subset $B \subseteq A$.

What pins down what?

Student preferences, costs	Pre-existing partnerships between universities and secondary schools, contextual admissions Choice decisions between cohorts before/-during/after era with unconditional offers
Admission parameters	Distance to colleges, characteristics $\times$ university type, differential exposure to competitors

Computational procedure for estimation

- Aggregate courses by major $\times$ tariff group, allowing students to apply to a tariff group multiple times
- Use GMM to maximize the likelihood of observed application sets, admissions decisions, and choices
- Estimate per-course effects on outcomes, including wages, college graduation
- Compute counterfactuals in absence of unconditional offers

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High-SES, higher-achieving students receive more U/CU

Table shows mean applicant characteristics for courses, split by offer type.[3]

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	Receive CU		Receive U		Receive C	
	Mean	N	Mean	N	Mean	N
Low-SES neighborhood	**0.27**	229,089	**0.35**	110,141	**0.34**	1,902,831
Female	0.60	229,285	0.60	110,254	0.55	1,904,804
Low-SES parent occ.	**0.19**	229,285	**0.24**	110,254	**0.22**	1,904,804
White	0.77	229,285	0.80	110,254	0.75	1,904,804
Black	0.05	229,285	0.05	110,254	0.06	1,904,804
Disabled	0.09	229,285	0.10	110,254	0.08	1,904,804
Only A-level tests	0.89	194,230	0.82	81,451	0.86	1,593,058
Only BTEC tests	0.13	222,549	0.22	104,283	0.14	1,842,258
GCSE core ptile	0.55	228,276	0.45	109,535	0.45	1,890,153
Alevels/BTEC ptile	**0.56**	217,589	**0.49**	100,236	**0.42**	1,791,337

[3] IMD is the SES quintile, 1 the lowest.