Information Acquisition in Matching Markets: The Role of Price Discovery

Online Appendix – College Admission Survey

General notes and definitions

This appendix provides a survey of university admission systems in the OECD countries with a population of over 8,000,000 as well as the two most populous nations in each continent. The goal of this survey is to provide an overview of the informational issues in the assignment process, including the predictability of admission chances, as well as what information is highlighted for applicants. We are grateful to the many colleagues who helped us collect this information, as well as to Ethan Che and Anand Shah who provided invaluable RA support.

Throughout this survey, we focus on the general university admission process for domestic college-going high school students. Many admissions systems had exceptions to the overall processes we describe; most notably medical schools, and creative arts commonly have additional admission procedures (e.g. interviews) or requirements (e.g. exams, portfolios). Discussions of features unique to specific programs are omitted. In addition, some countries have multiple admission systems, or variation across regions. While this survey cannot capture all details of all such systems, we aimed to capture the main features of the university admission system in each country.

The following terms are used throughout the survey:

Program – In most of the admission systems we surveyed, students are assigned to a specific subject area in a university (in contrast to the U.S. higher education system, where students choose a major only after they have matriculated in a college). These subject areas are hereafter called programs. Unless otherwise stated, the university admission process admits students to specific programs within a university.

Score – We use score to refer to the ranking of a student by a program. In many admission systems each student is assigned a numeric score which is to known to the student. Scores

are often calculated as a weighted combination of the student's grades in national or program specific exams, and may be adjusted according to the student's demographics.

Cutoff – Universities or programs within universities calculate students' admission scores; if a student's admission score is above the cutoff for the program they applied to, they will be offered admission.

Coaching institutes – Third-party prep schools that aid applicants in the college admissions process. While the services offered by coaching institutes vary by a country's academic model and norms, coaching institutes often offer exam scoring services, access to historical data on admission cutoffs, estimates of a current year's cutoff estimates, and strategic counseling.

High School – We use high school as the convention to refer to secondary schools attended by college-going students.

GPA – We use GPA to refer to a student's grades from high school.

Applying students – We implicitly consider only students who have qualified for higher education studies, and say that programs admit all qualified applicants if they accept all such applicants.

Australia

Australia is composed of several states and territories, each with its own university admission system. The systems are very similar across states and students can apply as easily to programs outside of their state.

Students are evaluated based on their Australian Tertiary Admission Rank (ATAR). Students' ATAR scores reflect percentile performance on exams taken in the final year of high school. All graduating high school students take these exams. A small proportion of students are additionally given 'adjustment factors' to accommodate for inequity and awards, and universities offer these heterogeneously. Students receive their ATAR results before ranking programs. Universities offer multiple years of historical admissions cutoffs by program for students to estimate their own admission chances.

Admission is a centralized one-shot process through the Universities Admissions Center (UAC). Students submit rankings of their top 5 course preferences. The algorithm is deferred acceptance, but students are allowed to edit their preferences over programs after each round. Students are told doing so may "give [them] multiple offers to choose from" [UAC, 2020]. There are also many early admission schemes for the best students (which doesn't seem

prone to unraveling).

The calculation of ATAR differs slightly across states. However, it is very easy to convert between these different scores, and students have access to calculators and weights to estimate their selection ranks at different universities.

The ATAR was introduced in 2010 and has been phased in since. It has been well-received, as more universities use it every year. Universities published guaranteed selection rank cutoffs around 2017, but the guaranteed entry statistics no longer seem to apply. While this policy was in place, applicants were only eligible for the guaranteed entry cutoffs of their first-ranked program, [Blyth, 2014], [Pilcher and Torii, 2018].

Notes

Students may access historical median score and cutoff data by program through UAC's course catalog:

– https://www.uac.edu.au/course-search/undergraduate/find-a-course.html

Students may also access information on school-specific adjustment factor determination, important dates, early applications, and additional cutoff information through UAC's annual undergraduate guide. For example, the 2020-21 guide:

– https://uac.edu.au/assets/documents/uac-guide/uac-guide-2020-21.pdf

One example of a conversion calculator for students applying across states is:

– https://vce.atarcalc.com/

Austria

The majority of programs admit all qualified applicants. Some popular and competitive programs (e.g. psychology, economics, journalism) require a program-specific entrance exam. As some program-specific exams often overlap in date, students may be forced to make choices between universities before knowing their admission chances.

Admission is decentralized, with students applying separately to each university.

The general admissions structure, with open access for students who have passed high school, has been in place for over 10 years [Gesslbauer, 2020], [OECD, 2019a].

Belgium

The majority of programs admit all qualified applicants. Some engineering programs require entrance exams due to high dropout rates upon matriculation.

Admission is decentralized, with students applying separately to each university. The general admissions structure, with open access for students who have passed high school, has been in place for over 10 years [Cantillon and Declercq, 2012], [OECD, 2019b].

Brazil

Students are evaluated based on weighted subject scores of the ENEM (national matriculation exam), as well as on affirmative action criteria. All college-going students applying to public universities take the ENEM. Different universities and programs within a university have different weighting schemes of ENEM scores in determining a candidate's admission score. The weight each program uses to calculate a student's weighted score is publicly known. Students receive their exam results before ranking colleges, and can calculate their program-specific scores. Historical cutoff data is published, and there are estimations for score changes in different social groups due to affirmative action as well. Third parties and some universities offer historical cutoffs by program for students to estimate their own admission chances.

Admission is a centralized dynamic process organized through Sistema de Seleção Unificada (SISU). The mechanism is a four-step process, with three cheap-talk steps and a final binding college-proposing deferred acceptance algorithm to determine matches. On each day, the applicant ranks two choices, and a college-proposing deferred action mechanism determines cutoffs. The decisions made in the first three steps are only used to determine estimated cutoffs, which are published at the end of each day. Cutoffs are published by social group (combinations of ethnic and income characteristics eligible for affirmative action). On the final day, matches are binding [Bo and Hakimov, 2019].

While most students are allocated through SISU, some of Brazil's elite universities (e.g. ITA, IME, USP and Unicamp) have their own admission system with university-specific exams.

The centralized system outlined above was introduced in 2010. There were reforms until 2016, but the process has remained unchanged since. SISU became mandatory for public universities in 2012. Adoption of SISU was non-compulsory but widespread among non-public universities, as the government provided incentives for universities to join SISU [Machado and Szerman, 2016].

Notes

An example of a third party which provides cutoffs by program can be seen here:

- https://querobolsa.com.br/sisu/notas-de-corte

For further details and analysis of the mechanism, see [Bo and Hakimov, 2019].

Canada

Canada is composed of several provinces. The systems are very similar across provinces (with the exception of Quebec) and students can apply as easily to programs outside of their province. Students from Quebec are given an 'R score,' which ranks students' academic performance on a distribution.

Students are evaluated on the basis of their grades in high school for the majority of programs. However, some top-tier universities also evaluate students based on subjective criteria (e.g. letters of recommendation, extracurriculars, personal statements). Students know the majority of their grades before applying, and report their midterm and final grades to universities from which they have received conditional offers. Universities always offer historic admissions data, but it is usually the average GPAs of admitted students (by program) instead of cutoff data. Such universities will also often offer 'recommended' GPA ranges by program for admission. Universities which take into account subjective criteria will only offer average historical admitted students' GPA.

Another source of variation between provinces hails from differing province-level high school curricula. When determining GPA cutoffs, universities specify which courses in each province's curriculum count towards the calculation of the admission score. This specification is stable across years and similar across universities.

Admission is decentralized, with students applying separately to each university. Despite not being a central clearinghouse, the application portal for Ontario universities (OUAC) allows for the ranking of programs [OUAC, 2020].

There have been no major reforms in 10+ years. The admissions process does not appear extremely competitive, and this may be due to the high quality of state universities [Chen, 2017], [DeLuca et al., 2017].

Notes

More details on Quebec's 'R-Score' can be found here:

- https://www.bci-qc.ca/en/students/r-score/

Chile

Students are evaluated based on the Prueba de Selección Universitaria (national exam with subject scores, called PSU). All college-going students take the PSU. There are quotas for students (i) from disadvantageous environments, (ii) with special educational needs and disabilities, and (iii) with high academic performance. Students are evaluated primarily based on a weighted average of their PSU subject scores. The weights are publicly disclosed by the universities. Student high school grades and class rank may also play a role in their score; this information is also published on university websites [Ximena et al., 2019]. Students know their scores before applying. Students can calculate their program-specific scores; for most universities this can be done by entering the known exam results into calculators provided on the university website. Universities also offer historical admission cutoffs by program, allowing students to estimate their admission chances. In addition, universities prevent students from applying to programs if their score is below a minimal threshold.

Admission is a centralized process, conducted through a candidate-proposing deferred acceptance algorithm. The mechanism is strategy-proof, and students are told to rank according to their preferences [Kapor et al., 2020].

There have been two major reforms since 1960. In 1960, the top 8 colleges adopted a centralized admissions system independent of the government. In 1981, vocational and training centers were introduced, and a coalition of colleges was formally formed. Colleges were gradually included in this process, so that by 2010, the share of colleges using the centralized mechanism was 50%. Thus, in 2012, all other colleges were invited to join the mechanism and the share of centralized matches went up to 70%. The number of universities using the centralized mechanism is still gradually increasing. These reforms have had major implications for the accessibility of information available to applicants, and have made it generally easier for students to apply [Koljatic and Silva, 2020], [Rowling and Clark, 2018].

Notes

One example of a university-provided admission calculator is from the University of Chile:
- http://futuromechon.cl/ponderador/

Additionally, in 2020, the University of Chile's provided historical cutoff scores from the 2019 admissions cycle:
- https://www.uchile.cl/portal/admision-y-matriculas/admision-regular-pregrado/151681/puntajes-de-ingreso-2019

China

China is composed of many provinces, and admission is via a centralized admission systems with quotas for students from each province. There are some differences across provinces, for example different provinces offer different versions of the national Gaokao exam (but conversion methods are publicly available). Small provinces have a small quota of seats in competitive universities, resulting in more uncertainty for students from smaller provinces.

Students are evaluated on their Gaokao results (national matriculation exam). All college-going students take the Gaokao. There are two different streams of Gaokao based on the student's proposed major (STEM Gaokao and non-STEM Gaokao), which determines which subtest of the Gaokao the student takes. A student's grade in the stream-specific Gaokao test is the student's score for all programs within that stream. Students know their Gaokao grade before applying in all but five provinces. Historical cutoffs are published by third parties and universities, and are easily attainable by students.

Admission is a centralized one-shot process, conducted through the parallel mechanism. Applicants are told to rank programs according to fit. However, these students are also told to consider the ranking strategically. The parallel mechanism is not strategy-proof.

College admissions has been centralized since 1952, and the assignment mechanism was historically the Boston mechanism. In 2001, Hunan became the first province to implement the parallel mechanism; since then, uptake has been gradual but wide-spread so that by 2012, 28 out of 31 provinces use the parallel mechanism [Chen and Kesten, 2017], [Gu et al., 2019].

Notes

One example of university advice comes from Peking University. Since 2014, they have published a document which describes three strategic scenarios after describing the mechanism and telling students to rank programs according to fit. They also address misconceptions in the parallel mechanism (e.g. that the parallel mechanism offers an applicant 'multiple' first-choices):

– https://www.gotopku.cn/index/detail/93.html

Cutoff scores are widely available from third-parties. For example:

– http://college.gaokao.com/schlist/s1/

Czech Republic

Students are evaluated based on the Maturita (national matriculation exam) and some university-specific requirements. All college-going students take the Maturita. Students receive their Maturita results before applying, but not the results of their university-specific exams. Programs have a Maturita threshold to apply (passing in the relevant subject areas is often sufficient); admission is then awarded on the results of university-specific criteria. When applicable, universities offer historical admission cutoffs by program, and sometimes offer past exams for practice as well.

Admission is decentralized, with students applying separately to each university. Admissions are not very competitive outside of the top tier of universities, and it is easy for applicants to obtain admission to universities.

There have been no major reforms in over 10 years [Jurajda and Münich, 2011].

Notes

For example, Masarykova University releases school-specific practice exams along with cutoffs from previous years:

– https://www.muni.cz/uchazeci/bakalarske-a-magisterske-studium/prijimac
ky

Ethiopia

Students are evaluated based on the Ethiopian University Entrance Examinations (EUEE; national exam with choice in subjects). All college-going students take this exam. Students are given a score that is a weighted average between EUEE subject scores. Different universities and tracks (natural science, social science, and education variants for both) express capacity constraints. There are affirmative action policies by gender. Students receive their exam results before applying. Third parties and the Ministry of Education (MoE) offer historic admission cutoffs announced to everyone.

Admission is centralized through the MoE. Students can specify a preference order over program tracks and a preference order over universities (but not their full preferences over program-university pairs). The assignment is determined based on submitted preferences and affirmative action policies by an opaque algorithm.

The general admission structure, with published/common knowledge historical cutoffs and student scores as some weighted average of EUEE subject scores has been in place for

over 10 years [Varghese, 2016].

Notes

The Ministry of Education's website, which typically contains cutoff information:

– http://app.neaea.gov.et/

Third-parties supplement students with all necessary remaining information, including exam results and past cutoff data:

– http://www.neaeagovet.com/

France

Applicants are evaluated on their Baccalaureate (national matriculation exam with choice in subjects, hereafter called Bac) results, high school GPAs, and subjective criteria (internships, extracurriculars, and personal statements). All college-going students take the Bac (or an equivalent exam, such as IB). The top-scoring students are given priority through a program known as 'Meilleurs bacheliers.' These students are told of their special status upon receiving their Bac results, and are given priority if put on a waitlist. Different universities and programs within a university can have different weighting schemes in determining a candidate's admission. Students are told what criteria will be considered, but are not told the weights. Students receive their exam results before applying. Some programs offer historical admission cutoffs by program, but many do not. For many programs, students can intuit their chances of admission.

Admissions are centrally processed through Parcoursup. Students are allowed to make a maximum of 10 applications and 20 sub-applications for each application; these applications are not ranked. Universities respond to each application by offering the student admission, conditional admission (often conditional on additional preparatory classes), a waitlist spot, or a rejection. Students who hold multiple offers are required to respond and select which offers to keep by a deadline.

Students are advised to apply to multiple programs. When discussing how students apply to programs, Parcoursup recommends,

> "Tip: avoid making only one wish and think about diversifying your wishes between selective and non-selective training."

There have been several recent reforms. Parcoursup was implemented in 2018, replacing the previous centralized APB after widespread complaints. A particular concern was raised

due to the fact that APB indicated programs that would be undersubscribed and asked student to apply to such programs to guarantee their admission. This resulted in many students applying to such programs, which then became oversubscribed, causing an outcry from unmatched students [Parcoursup, 2020].

Notes

Further references on the complaints around the centralized APB mechanism include:
- https://www.digischool.fr/lycee/parcoursup/signification-pastilles-jau ne-bleue-verte-portail-apb-31499.html
- https://www.letudiant.fr/etudes/parcoursup/licences-sur-apb-voeux-grip pes-et-pastille-verte-dure-a-avaler.html

More information on the priority given to top-scoring students can be found by following 'Questions thématiques' (Thematic questions) → 'Dispositif meilleurs bacheliers' (Best bachelor's degree program) under Parcoursup's very comprehensive FAQ:
- https://www.parcoursup.fr/index.php?desc=questions

An example of a third party offering average Bac pass and mention statistics by university is:
- https://www.linternaute.com/actualite/guide-vie-quotidienne/1384263-re sultats-du-bac-2020-consultez-les-listes-par-ville-et-par-academie-rat trapage-compris/

Germany (DoSV)

Students are evaluated based on the Abitur (national matriculation exam), as well as high school performance. Seats are split into two quotas – 20% for the top 20% of applicants, and 20% for applicants with the longest wait times (i.e. returning applicants). If the quotas are not filled, the remaining available seats are added to the 60% of seats available to all applicants. Universities primarily weight Abitur results, but also use other criteria such as high school performance, GPA, and the number of Abitur certificates. Students receive their exam results before they rank programs. Students know their own rank (third parties, such as online forums, provide weights for the few universities who do not fully disclose admission criteria), and universities offer historical admission cutoffs by program for students.

Admission is a centralized dynamic process, using a dynamic variant of DA. Students can rank up to 12 programs through DoSV.

Students are told the mechanism is strategy-proof in a way that is potentially confusing for students.

> "Can I improve my chances of admission by prioritizing? This question can be answered clearly with "No". The universities do not know the priorities of their applicants. Your prioritization does not affect your chances of being admitted. So you should be completely guided by your own preferences."

The third sentence is contradicted by a later line on the page "Prioritize very carefully and consciously, since this determines the determination of the approval!" [Arnold, 2020].

The general admissions process, with a centralized dynamic process, has undergone several changes in the last 10+ years. Most importantly, while a central clearinghouse mechanism has been available in Germany since 1972, DoSV was implemented in 2012. Programs can choose whether to be part of the DoSV, and program participation in DoSV is increasing from year to year [Grenet et al., 2019], [Kübler, 2019].

Notes

For example, the Free University of Berlin describes how it calculates its admission score here:

- https://www.fu-berlin.de/studium/bewerbung/formulare/studienrelevante_t aetigkeiten_und_schulfaecher_inderadh-quote.pdf

Further, the Free University also publishes quotas and cutoffs at the conclusion of each admission cycle for use in estimating future cutoffs (along with a more in-depth explanation of the admissions process):

- https://www.fu-berlin.de/studium/docs/DOC/ncliste_staatsexamen_und_monob achelor.pdf

Hungary

Students are evaluated based on their 'admission score', which is a weighted average of the results in the Érettségi (national matriculation exam with subject scores), high school grades, and 'special points' (awarded for scores on higher-level matriculation subjects, high language skills, affirmative action policies, and athletic or academic accomplishments). All college-going students take the Érettségi. Different universities and programs within a university have different weighting schemes of Érettségi subject scores in determining a candidate's admission score. Universities disclose these program-specific weights to students. Students

receive their Érettségi results before ranking programs. Students can calculate their program-specific scores by entering the known exam results into calculators provided by the central clearinghouse. The central clearinghouse also offers historical admission cutoffs by program for students to estimate their own admission chances.

Admission is a centralized one-shot process, conducted through a candidate-proposing deferred acceptance algorithm. The mechanism is strategy-proof, and applicants are told to report their preferences truthfully. Applicants can rank as many programs as they like (although there is an extra cost per application beyond the first three).

Notably, applicants apply to an average of 3.3 programs, suggesting that students have good information about their admission chances, and that the system is working well.

There have been no major reforms in the last 10+ years. Admissions began to be centralized after 1985, and the centralized scoring method began in 2000 [Biró, 2008], [Biró, 2011].

Notes

For reference, the calculator which Hungary's centralized admission system provides:
- https://www.felvi.hu/felveteli/pontszamito

The central clearinghouse also provides historical cutoffs from 2001:
- https://www.felvi.hu/felveteli/ponthatarok_statisztikak/elmult_evek/!ElmultEvek/index.php/elmult_evek_statisztikai/ponthatarok

India

India's university system is composed of several independent higher-education systems, and Indian high school students elect into separate streams in high school. We focus on the prominent higher education system for engineers.

There are three prominent networks of engineering institutes: the Indian Institutes of Technology (IIT), the National Institutes of Technology (NIT), and the Birla Institutes of Technology and Science (BIT). IIT includes 30 engineering institutes, including the top institutes and programs in the country. The highest tier of the NIT and BIT institutes is equivalent to the second tier of IIT institutes. Therefore, some students may consider applying only to IIT programs, while other students may consider applying to programs from both IIT institutes as well as non-IIT institutes.

IITs

Students' scores are their performance on the JEE-advanced (IIT-specific exam). They qualify to take the JEE-advanced by first passing a threshold in the JEE-main (national standardized engineering exam). In addition to these exams, there is a quota system by gender and caste for the NITs. All student aiming to go to an IIT take the JEE-main and JEE-advanced. Students know their exam results and admission scores when applying. Students receive their JEE-advanced results before ranking programs (students can learn their scores earlier through third-party coaching institutes which self-grade the exams). Historic qualifying scores for the JEE-main as well as historic program-specific cutoffs for the JEE-advanced are made available to students by coaching institutes and the body which administers the JEE exams. Third-party coaching institutes also offer estimates for the current year's cutoffs for each quota group.

Admission to all programs within IIT is done through a centralized one-shot process. The process uses the candidate-proposing deferred acceptance algorithm. Applicants are told admission to seats for their quota is conducted only off their JEE-advanced scores, and there is no discussion of strategic behavior.

This admission process was redesigned in 2015 [Baswana et al., 2019].

Notes

One example of third-parties providing cutoffs is provided below. They also provide an estimate of 2020 JEE-main qualifying scores:

– https://www.shiksha.com/b-tech/jee-main-exam-cutoff

The body which oversees the exams also publishes historical cutoff data:

– https://jeeadv.ac.in/openclose.php

General (Engineering)

Students who estimate they will not obtain sufficiently high scores in the JEE-advanced (and are therefore unlikely to gain admission to the top tier of IIT universities) often consider programs outside the IIT system, notably universities within the NIT. The BIT university-specific exam takes place before the JEE-advanced, so applicants who self-scored and determined their JEE-main results were too low to obtain admission to the NITs or qualify for the JEE-advanced often opt to consider the BITs. Students also receive advice from third-parties or high school counselors on which admission systems to consider.

The NITs evaluate students according to the JEE-main. The BITs evaluate students based only on a university-specific exam. There is a quota system by gender and caste. Different universities and programs within universities have different weighting schemes of the relevant exam results in determining admission scores. Students receive their exam results before applying (students can learn their scores earlier through third-party coaching institutes which self-grade the exams and know the formulas for calculating program-specific scores). Historic program-specific cutoffs are made available to students by coaching institutes, which also offer estimates for the current year's cutoffs for each quota group.

Admission is decentralized, with students applying separately to each university. Students are given advice from coaching institutes on what admissions systems to apply to. Students who are interested in IIT, NIT and BIT programs may be forced to make choices between these systems before knowing their admission chances.

The general admission structure has been in place for 10+ years [NIT], [BIT].

Notes

Two examples of third-parties offering cutoffs are:
  – NIT: https://www.embibe.com/exams/nit-cut-off/
  – BIT: https://collegedunia.com/exams/bitsat/cutoff
Further, one example of a third party estimating the BIT cutoff is:
  – https://collegedunia.com/exams/bitsat/cutoff

Israel

Students are evaluated based on the Bagrut (matriculation exam with choice in subjects) and the Psychometric Entrance Test (national standardized exam, hereafter PET). All college-going students take these exams. Students are given a score that is a weighted average between Bagrut subject scores and the PET. Different universities and programs within a university have different weighting schemes of Bagrut subject scores in determining a candidate's admission score. Students receive their exam results before applying. Students can calculate their program-specific scores by entering the known exam results into calculators provided on the university website. Universities also offer historical admission cutoffs by program for students to estimate their own admission chances.

Admission is decentralized, with students applying separately to each university, and with each university sending admission offers to admitted students and keeping a waiting

list.

Universities advise students to check their admission chances before applying. Each university allows students to rank multiple programs (ranging from two to four), and clarifies that ranking additional programs will not hurt their chances of admission. The following example is from Tel Aviv University's 'General Requirements' page:

> "Applicants are advised to indicate second and third alternatives on their applications. Indicating a second and third alternative does not influence acceptance to the department of the applicant's first choice. Likewise, applying to only one department in no way enhances the prospect for acceptance to it. If candidates wish to keep all their options open, they must meet all the requirements that their various choices entail, such as writing departmental entrance examinations" [Tel Aviv University, 2020].

Some programs require the student to rank them as the first option (at that university). The following example is from Tel Aviv University's page on Medicine programs :

> "Candidates must apply to Medicine as their first choice only, or as a second choice if the first choice is Medicine for Holders of a BA...," [Tel Aviv University, 2018].

The general admission structure, with published/common knowledge historical cutoffs and student scores as some weighted average of the Bagrut and PET, has been in place for 10+ years. There have been some reforms both to the national standardized exams and the formulas used to determine a student's score, and universities provide students with the most up-to-date calculators of scores and cutoffs [Allalouf et al., 2020].

Notes

One example of a university-provided admission score calculator is from Tel Aviv University. The first link allows students to calculate their adjusted Bagrut score, and the second allows students to calculate their admission score:

– https://www.ims.tau.ac.il/Md/Ut/Bagrut.aspx
– https://go.tau.ac.il/calc1

Students also have access to a calculator which compares students scores to historical cutoffs in the desired program:

– https://go.tau.ac.il/b.a/calc

Italy

The majority of public programs admit all qualified applicants. Some private universities are competitive, and evaluate students on the basis of university-specific exams. As some university-specific exams overlap in date, students may be forced to make choices between universities before knowing their admission chances.

The application process is decentralized. Several top competitive universities use a secondary 'clearing' phase where they invite new applicants to compete for remaining seats.

The last reform was in 2018, which removed a subjective written component from the Maturità. In 1999, the legislature ruled that selective public universities impeded the 'right to study,' thus ensuring that all applicants would have a guaranteed acceptance to some public university [Merlino and Nicoló, 2012], [Moscati, 2009].

Notes

Examples of programs at top universities with multiple admission rounds include:
- General Admission at Bocconi University: `https://www.unibocconi.it/wps/wcm/connect/bocconi/sitopubblico_it/albero+di+navigazione/home/corsi+di+studio/lauree+triennali/ammissione/corsi+di+laurea+-+a.a.+2021-22/tempistica+e+selezione`
- Economics at University of Bologna: `https://corsi.unibo.it/laurea/EconomiaAziendale/iscriversi-al-corso`
  - For a description of the second selection round, choose 'SELEZIONE STRAORDINARIA' (Extraordinary Selection). For an overview of the second and third rounds, choose 'BANDO TOLC-E'.
- Engineering at Sapienza University: `https://www.uniroma1.it/it/pagina/corsi-ad-accesso-programmato-con-tolc-i-e-selezioni`
- Economics at the University of Milan: `https://apps.unimi.it/files/bandi/bando-2021-1-economia-e-management-%28ema%29-classi-l-18-l-33.pdf?`

Japan

Students are evaluated based on the Center exam (national exam with choice in subjects) taken by all college-going students, as well as university-specific entrance exams. For most universities, students are given a score that is a weighted average between Center exam subject scores and university-specific exams; for some universities, students are given a score

based only on scores in Center subject exams; for some elite universities, students are evaluated based only on their performance on the university-specific exams, which students qualify for by passing a program-specific threshold in the Center exam. Different universities and programs within universities have different weighting schemes of the relevant exam results in determining admission scores. Students can calculate their program-specific scores by sending their exams to third-party coaching institutes which self-grade the exams and know the formulas for calculating program-specific scores. Third parties also provide students with historic thresholds and cutoffs for the Center exam and university-specific exam, allowing students to estimate their admission chances.

Admission is decentralized, with students applying separately to each university. As some university-specific exams overlap in date, students may be forced to make choices between universities before knowing their admission chances. Furthermore, a dynamic unique to the Japanese system is that students will often take a gap year to study year-round if they determine they will not obtain admission to a top university.

The general admissions structure, with published/common knowledge historical thresholds or cutoffs and university-specific entrance exams has been in place for 10+ years. A reform was enacted this year in changing the Center exam (to include more writing assessments) [Kuramoto and Koizumi, 2018], [Ogawa, 2017], [Yamanaka and Suzuki, 2020].

Notes

One example of a third party offering self-scoring on the Center Exam is below, under the banner '大学入学共通テスト受験後' (After taking the common test for university entrance):

  – https://dn-sundai.benesse.ne.jp/dn/center/

An example of a third party offering historical cutoff data is:

  – https://passnavi.evidus.com/exam_data/low/

Further information on students who must retake exams for admission to a top-tier university (called 'Rōnin') includes:

  – https://www.japan-talk.com/jt/new/ronin-students-in-Japan
  – https://en.wikipedia.org/wiki/R%C5%8Dnin_(student)

Mexico

Students are evaluated mainly based on university-specific exams, and some programs require personal statements as well as high school GPA. Students do not receive university-specific

exam results before applying. Generally, students intuit their chances of getting into a degree based on their high school GPA. Third parties offer historical admission cutoff data for universities that employ cutoffs.

Admission is decentralized, with students applying separately to each university and each university sending admission offers to admitted students and keeping a waiting list. As students need to study for each of the university-specific exams, students may be forced to make choices between universities before knowing their admission chances.

The absence of a standardized national exam in Mexico's admissions system may not persist for long; certain national exams (like the EXANI-II) are gaining traction (for example, 419,000 applicants sat for the exam in 2006 compared to 740,000 applicants in 2017). However, uptake of national exams has not been widespread as many top universities continue to use their university-specific entrance exams.

The general admissions structure has been in place for over 10 years [Monroy and Trines, 2019].

Notes

One example of third-parties providing cutoffs is:

– https://proacademymx.com/paa-examen-de-admision-udg/carreras-udg-centr o-universitario-y-puntaje-minimo-2020a/

For schools who employ university-specific exams, there is often still historical data on the required scores on the university-specific exams. For example, the National Autonomous University of Mexico offers a calculator for students to estimate admission chances (conditional on performance in university-specific exams) based on historical cutoff scores:

– https://www.unitips.mx/universidades/unam/puntaje/aciertos-unam/

Netherlands

The majority of programs admit all qualified applicants. There have been no major reforms in the last 10 years [Jenkins et al., 2018].

Nigeria

Students are evaluated based on their results in the UTME (national matriculation exam) and high school final exams such as the SSC or O-levels. Competitive universities also require university-specific post-UTME exams to determine admission (in some cases, students will

also have had to rank the university first). Most college-going students sit for the UTME and SSC. To apply for higher education, applicants must pass a certain threshold in the UTME. Universities also employ quotas by gender and for applicants from economically-disadvantaged states. Students receive their UTME results before ranking. Most universities release weights over admission criteria, and third-parties often compile this information for many universities. Third-parties offer historical admission cutoffs by program for students to estimate their own admission chances.

Admission is a centralized dynamic process (hereafter called JAMB). The algorithm is a two-step school-proposing deferred acceptance; in the first step, the algorithm is conducted to determine whether applicants should be accepted, offered the post-UTME, or rejected. If a student passes cutoffs on the post-UTMEs, they are offered admission. Students can apply to up to six institutions: two universities, two polytechnics, and two colleges of education, with first and second choice programs for each institution type.

In 2016, the JAMB announced a number of reforms. Most significant of these was banning the use of written post-UTME exams and university-specific UTME weights. The status of the first reform is unclear, as universities have continued using post-UTME exams to rank students. In 2016, there were also widespread problems with accessing and verifying scores through JAMB [Oanda, 2020], [Onyukwu et al., 2017].

Notes

One example of a third party which offers cutoffs is:
- https://www.nigeriaschool.com.ng/jamb-cbt-utme-cut-off-mark-for-nigeria-institutions/

Poland

Students are evaluated based on the Matura exams (matriculation exams with choice in subjects). All college-going students take these exams. Students are given a score that is a weighted average of Matura subject scores. Different universities and programs within a university have different weighting schemes of Matura subject scores in determining a candidate's admission score. Students receive their exam results before applying. Universities provide applicants with these weights to calculate their program-specific scores. Students can calculate their program-specific scores by calculating the weighted-average with weights provided on the university website. Universities also offer historical admission cutoffs by

program for students to estimate their own admission chances.

Admission is decentralized, with students applying separately to each university, and with each university sending admission offers to admitted students and keeping a waiting list.

Notably, Poland has one of the fastest turnarounds in the world in college admissions processes. For example, the University of Warsaw had an admissions turnaround of one week in 2020: the last day to enter exam results was August 17, 2020 and admission results were given August 24, 2020 [University of Warsaw, 2020a]. Poland also offers 'award cutoffs' (for example, being an International Math Olympiad finalist automatically awards you the maximum admission score for University of Warsaw's math program) [University of Warsaw, 2020b].

The general admission structure, with published/common knowledge historical cutoffs and student scores as some weighted average of Matura subject scores, has been in place for 10+ years. There was a major reform in 2005 to make admissions more objective, before which applicants were assessed by teachers from their own high schools. There was also a reform in 1991 with regards to scoring; before (after) 1991, scores were given on a 2-5 (1-6) scale. Every type of degree has the cutoffs posted for the new Matura, IB, EB, and old Matura [EuroEducation, 2012], [Kwiek and Szadkowski, 2018].

Notes

An example of university-provided weights is from the Jagiellonian University. Weights are provided on each program's page:

– https://irk.uj.edu.pl/pl/offer/IiJM_P_20/registration/

An example of university-provided historical cutoff data is from the University of Warsaw:

– https://irk.uw.edu.pl/en-gb/offer/PELNE2020/

Portugal

Students are evaluated based on the Diploma de Ensino Secundário (matriculation exam with choice in subjects) and the Concurso (national exam with choice in subjects). All college-going students take these exams. Students are given a score that is a weighted average between Diploma and Concurso subject scores. Different universities and programs within a university can have different weighting schemes of scores in determining a candidate's admission score. Students receive their exam results before applying. Students can

calculate their program-specific scores by calculating the weighted average with weights provided on the university website, and the Directorate-General of Higher Education (DGES) also provides an online application simulator. The DGES also offer historical admission cutoffs by program for students to estimate their own admission chances.

Admission is a centralized process, conducted through a candidate-proposing deferred acceptance algorithm. Strategic behavior is not discussed. Students rank six programs through the central clearinghouse.

Importantly, each program has strict application minimums in the Concurso subjects required for admission to a given program. Given that there are twenty possible Concurso subject exams, students need to decide on the programs they wish to apply to when sitting for exams.

The general admissions structure, with published historical cutoffs and students scores as some weighted average of national exam scores has been in place over 10 years [Ferrão and Almeida, 2019].

Notes

DGES' application simulator:

– https://www.dges.gov.pt/online-simula/?plid=593

DGES' historical cutoff data from 1997:

– https://www.dges.gov.pt/pt/pagina/regime-geral-ensino-superior-publico
-concurso-nacional-de-acesso?plid=593

South Korea

Students are evaluated based on the College Scholastic Ability Test (national standardized exam, called CSAT), high school performance, as well as subjective criteria (e.g. a personal statement, letters of recommendation, an interview, awards), and university-specific exams. All college-going students sit for the CSAT. Students receive their CSAT results before applying, but they are not told how much each subjective component of their application is weighted. Admission to universities is often done in two steps; preliminary admission is given primarily on the basis of CSTAT and also some weighing of qualitative factors, and then final admission is determined after the interview and additional weighing of qualitative factors. Given the subjectivity in admission decision, information about admission decisions cannot be precisely conveyed through numerical cutoffs. However, third parties and forums supple-

ment by offering strategy, qualitative information on subjective criteria, and by estimating weights on application components.

Different universities have varying levels of subjectivity in their admission criteria. For example, in response to three separate questions as to how the subjective evaluations were weighed on their own forum, Korea University responded that "[t]he evaluation of documents in the Student's Comprehensive Admissions Process is a comprehensive qualitative evaluation" [Korea University, 2020]. Alternatively, at Yonsei University, students are told the standards for success on each individual subjective component, with extensive FAQ sections dedicated to making the information public [Yonsei University, 2018]. In fact, Yonsei University even offers video resources with strategies for interview preparation and essay writing [Yonsei University, 2017].

Admission is decentralized, with students applying separately to each university, and with each university sending admission offers to admitted students and keeping a waiting list.

The current university system has been in place for 10+ years, but there have been many reform discussions with respect to fairness, stress from high competition, and well-roundedness of students in the education system at large, [Avery et al., 2014], [Mani and Trines, 2018].

Notes

One example of third-parties offering strategy and estimating weights:

- http://blog.naver.com/PostView.nhn?blogId=sunnypark07&logNo=22195729228
8

Spain

Students are evaluated based on the Bachillerato (matriculation exam with choice in subjects) and the Prueba de Acceso a la Universidad (national exam with choice in subjects, hereafter called PAU). All college-going students sit for these exams. Students are given a weighted average between Bachillerato and PAU scores. Different universities and programs within a university can have different weighting schemes of PAU subject scores in determining a candidate's admission score. Students receive their exam results before applying. Students can calculate their program-specific scores by calculating the weighted average with weights provided by the universities. Third parties offer historical admission cutoffs by program for

students to estimate their own admission chances.

Admission is centralized one-shot for public universities, conducted through a candidate-proposing deferred acceptance algorithm. Students submit a rank ordered list of 8 programs in universities. Admission is decentralized for private universities, with students applying separately to each university, and with each university sending admission offers to admitted students and keeping a wait list.

The general admission structure, with published/common knowledge historical cutoffs and student scores as some weighted average of Bachillerato and Selectividad subject scores, has been in place for over 10 years. There was a reform in 2010 which split the exam into two sections, and the resulting changes in subject score weights are published/common knowledge [EuroEducation].

Notes

One example of a third party providing historical cutoffs is:

– https://notasdecorte.es/

One example of university-provided weights comes from the University of Barcelona's school system:

– http://universitats.gencat.cat/es/inici/index.html

Sweden

Students are evaluated based on their results in the Högskoleprovet (Swedish matriculation exam, also called SweSAT), subject-specific grades from high school, and university-specific criteria (e.g. program-specific exams, work experience, or interviews). All college-going students take the SweSAT. Only those who qualify for basic eligibility (passing courses in required subjects, i.e. high-level biochemistry for medicine) can be considered for selection. Different universities and programs within a university have different weighting schemes. Admission is determined by a quota system: 1/3 of students obtain admission through SweSAT, 1/3 based on grades, and 1/3 university-specific criteria (often universities use grades as their local criteria). Students are ranked within their quota groups, and can be assigned via any of the groups they qualify for. Students self-score; Sweden gives applicants time to copy down their answers onto a separate sheet and releases the answer keys the following week. The weights used to calculate program-specific scores are publicly available, and students can calculate their program-specific scores. Third parties and some universities

offer historical admission cutoffs by program for students to estimate their own admission chances.

Admission is a centralized process, conducted through a two-round college-proposing deferred acceptance where colleges offer an acceptance, reserve place (waitlist), or a rejection.

The general admissions structure, with published/common knowledge cutoffs and a centralized one-shot admissions process has been in place for 10+ years [Lyrén and Wikström, 2020].

Notes

Information on calculating admission scores comes from the central clearinghouse:

- https://www.antagning.se/sv/Det-har-galler-for-dig-som-gatt/Gymnasiesk olan/Gymnasieexamen-2014/rakna-ut-ditt-meritvarde/

One example of historical cutoff statistics comes from the central clearinghouse:

- https://www.uhr.se/studier-och-antagning/Antagningsstatistik/soka-anta gningsstatistik/

More information on the quota system can be found at:

- https://www.antagning.se/sv/Hur-du-anmaler-dig-och-haller-koll/Platsfo rdelning-och-urval/Betygsurval/

Switzerland

The majority of programs admit all qualified applicants. Admission is decentralized, with students applying separately to each university. The general admission structure has been in place for over 10 years [Nägele et al., 2018].

Turkey

Students are evaluated based on the Ösys (national matriculation exam with 4 subject scores). All college-going students take the Ösys. To apply for higher education, applicants must pass a threshold in the Ösys. Students are given a score that is a weighted average of their scores. Different universities and programs within a university have different weighting schemes in determining a candidate's admission score. Students receive their exam results before applying. Students can calculate their program-specific scores by calculating the weighted average with weights provided on the university website. Universities also offer historical admission cutoffs by program for students to estimate their own admission chances.

Admission is a centralized one-shot process, conducted through a candidate-proposing deferred acceptance algorithm. Applicants submit a ranking of up to 24 programs.

Admission is often guaranteed for lower ranked universities, but is very competitive at top-tier universities (e.g. Bilkent University, Boğaziçi University, and Koç University).

The process has been in place for over 10 years [Arslan, 2019], [Kamal, 2017].

Notes

One example of university-provided cutoffs comes from Boğaziçi University:

– https://tanitim.boun.edu.tr/istatistikler

United Kingdom

Students are evaluated based on A-Levels or International Baccalaureate exams (both are subject-specific national exams, and UCAS offers a score conversion between the two) as well as subjective criteria (e.g. personal statements, interviews, extracurriculars). Different programs will evaluate subject-specific scores differently, and generally do not disclose their criteria. Students do not receive their exam results before applying, and teachers provide 'expected scores' used in the application process.

Students can apply to a maximum of five programs through UCAS. Each application is processed separately by the respective university, and the university can decide to respond with acceptances, conditional acceptances, waitlist spots, or rejections. Student must respond to offers by a deadline. They can only accept one offer, unless the offer is conditional, in which case, the student can also keep an "insurance" offer.

UCAS conducts two additional rounds of matching (called "Extra" and "Clearing") to assign unmatched students or students who did not meet their conditional offer criteria.

The admissions system outlined above has been in place since 1993. There have been some structural reforms in the last decade, and there are currently reform proposals to move up testing dates so that exam results are obtained before students apply [Chen, 2012].

Notes

More information on UCAS's additional round of matching can be found at:

– https://www.ucas.com/undergraduate/results-confirmation-and-clearing/what-clearing

United States of America

Students apply to universities (often referred to as colleges), but often do not specify a specific program within the university. Students are evaluated based on SAT/ACT scores (national standardized exams), high school GPAs, as well as subjective criteria (e.g. essays, awards/leadership, demonstrated interest, college fit). All college-going students sit for either the SAT or ACT. Affirmative action programs generally are widespread, but colleges do not disclose how they weight race or ethnicity. Students receive their exam results before applying. The weights on any of the evaluations are not transparent and are often different for students from different high schools. Given the subjectivity in admission decision, information about admission decisions cannot be precisely conveyed through numerical cut-offs. College admission counselors provide students with information about their admission chances, which typically allows the student to target a tier of colleges. Students are commonly advised to apply to colleges within their estimated tier, as well as a 'reach' and 'safety' college.

Admission is decentralized, with students applying separately to each university, and each university sending admission offers to admitted students and keeping a waiting list. Applications are centrally handled through the Common App.

The process has been in place for 20+ years (except for the gradual increase in use of the Common App). Universities, especially top ones, offer early admissions programs that ask students to make binding decisions before receiving their full admission offers. However, thus far the admission process has not unravelled further [Loo, 2018].

Notes

One example of an extensive early admissions program is from the University of Chicago, which offers two rounds of binding early decisions and one round of non-binding early decision:

- https://collegeadmissions.uchicago.edu/apply/first-year-applicants/first-year-application-plans

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