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Who may enter? Qualification and ranking in centralized admission systems to higher education

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Admission systems play a critical role in shaping educational opportunities by determining what choices are available to whom. Policy makers and institutions must balance multiple, often conflicting, goals which requires trade-offs between competing values. In this paper, we present core values for admission to higher education alongside a novel framework for centralized admission systems, addressing two central questions: (1) Who is eligible to apply? and (2) Who gains entry when there are more eligible applicants than seats available? Using the framework in combination with examples and ongoing policy discussions, we offer key insights into the complexities of admission systems.

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Who may enter? Qualification and ranking in centralized admission systems to higher education*

Sarah Cohodes†, Astrid M. J. Sandsør‡and Siv-Elisabeth Skjelbred§

Abstract

Admission systems play a critical role in shaping educational opportunities by determining what choices are available to whom. Policy makers and institutions must balance multiple, often conflicting, goals which requires trade-offs between competing values. In this paper, we present core values for admission to higher education alongside a novel framework for centralized admission systems, addressing two central questions: (1) Who is eligible to apply? and (2) Who gains entry when there are more eligible applicants than seats available? Using the framework in combination with examples and ongoing policy discussions, we offer key insights into the complexities of admission systems.

Keywords: qualification, ranking, higher education, admission systems, eligibility

1 Introduction

Educational choices are crucial for individuals' human capital accumulation, income and other non-pecuniary outcomes (Bhuller et al., 2017; Oreopoulos and Salvanes, 2011; Angrist and Krueger, 1992). However, it is not just about choice, as admission systems serve as gatekeepers in determining what choices are available to whom, and who gets through the gate. At the individual level, gaining admission to specific institutions (Hoekstra, 2009; Cohodes and Goodman, 2014; Zimmerman, 2014; Chetty et al., 2020; Bleemer, 2021, 2022) and study programs (Hastings et al., 2013; Kirkebøen et al., 2016; Ketel et al., 2016; Heinesen, 2018; Andrews et al., 2017; Bleemer and Mehta, 2020; Daly et al., 2022) increases the likelihood of program completion and future earnings. At the societal level, admission processes have the potential to

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affect both educational inequality and allocative efficiency (Bleemer, 2021; Sandsør et al., 2021; Gandil and Leuven, 2022; Gandil, 2024).

Admission to higher education is either decentralized, with decisions made by the individual institutions or programs (e.g. the United States), or centralized, where a separate entity handles admission for multiple institutions or programs (e.g. national admission systems in Scandinavia). There are various degrees of centralization, ranging from some institutions cooperating with each other, to a fully centralized system where all institutions participate. The use of centralized admission has risen steadily across countries in the past decades (Neilson et al., 2019).

Admission systems allocate students to institutions and/or programs by answering two central questions: (1) Is the applicant eligible to apply? and (2) if there are more eligible applicants than available seats, who gains entry? In decentralized systems, where institutions or study programs themselves determine the criteria for admission, the process is often complex and opaque. Applications typically combine grades, exams, essays, CV's, recommendation letters or personal statements. How these components determine eligibility and who gains entry are often unknown, unclear and/or subjective.

In centralized admission systems, however, students are simultaneously assessed for admission to multiple institutions and/or study programs. This requires coordination and transparency. The eligibility requirements are clearly communicated and students are ranked with a numeric score based on predefined criteria. In the admission process itself, offers are made sequentially: The highest-ranked applicant gets their preferred choice for which they are eligible, the second-highest ranked applicant gets the preferred choice for which they are eligible that is still available, and so on (Kirkebøen et al., 2016; Daly et al., 2022). This creates unique cutoffs for each institution and study program which may be publicly disclosed upon completion of the admission process. Centralized admissions systems increase transparency and equal treatment, but may increase stratification, that is, intensify the separation between students based on academic performance (Hafalir et al., 2018; Tanaka et al., 2020; Machado and Szerman, 2021).

Since centralized admissions systems are often under government control, they are shaped by broader societal values and goals. The design of the admission process, driven by these goals, significantly influences who gains access to educational opportunities. For example, some centralized admissions systems offer "second chance" pathways to gain access to higher education,

while others do not. Ultimately, the interplay between admission system design and societal goals underscores the importance of thoughtful policy-making. By carefully considering how admission criteria and processes align with societal goals and values, policymakers can create an admission system that advances the collective good. However, reconciling these competing values and objectives is a complex task, as may require solutions that are inherently conflicting.

In this article, we present five core values that are considered in an admission system: allocative efficiency, fairness in assessment, fairness in opportunities, representation and diversity, and broadening access. We then present a novel framework for understanding centralized admission systems, making a clear distinction between who is eligible and how eligible applicants are ranked. The framework is used to discuss trade-offs related to achieving broader societal values and goals via higher education. We illustrate the tension between these objectives using examples from centralized admission in the Scandinavian context and show how they are related to ongoing policy development.

The Scandinavian admission systems to higher education provide an ideal context to illustrate conflicts between competing values. Norway, Sweden, and Denmark all have national centralized admission systems where completion of an academically-oriented upper secondary education is the main eligibility requirement for applying to higher education. While the admission systems are broadly similar, they differ along some key dimensions, e.g. in their use of quotas and ranking criteria. Moreover, at the current time, these countries all have ongoing policy discussions about whether to implement changes to their admission systems (e.g. Ministry of Education and Research, 2022; Ministry of Higher Education and Science, 2022).

This article is primarily related to research seeking to understand admission systems and the trade-offs embedded within them. While Orr et al. (2017), OECD (2019), and Ministry of Education and Research (2022) give overviews of various higher education admissions schemes in the OECD, we focus on the Scandinavian countries. Sandsør et al. (2021) and Gandil and Leuven (2022) investigate specific aspects of Scandinavian higher education admissions systems in Norway and Denmark, respectively, to show that age may be overvalued in the Norwegian system and GPA in the Danish system. While these studies focus on specific characteristics in the admissions systems, they each highlight that the social decisions embedded in admissions systems involve trade-offs. In Norway, the value of second chances (awarding greater chance of

admission as applicants age) is traded off with delayed entry into the labor market (Sandsør et al., 2021). In Denmark, the simplicity and transparency of GPA as an admission metric is traded off with more efficient (self-)selection when alternative metrics are used (Gandil and Leuven, 2022). In this paper, we show how these types of trade-offs and decisions are embedded throughout centralized admission systems.

As we highlight above, the design of admissions systems is highly consequential, as access to particular programs affects the earnings trajectories of students. For example, Kirkebøen et al. (2016) find earnings payoffs to STEM and professional degree programs in Norway and Ketel et al. (2016) find that access to medical school in the Netherlands has very large impacts on lifetime earnings. In contrast, Heinesen (2018) finds that admission to a first-choice program in Denmark increases the likelihood that individuals finish their degree but does not affect earnings. However, Daly et al. (2022) claims that this is likely due to the focus on first-choice program rather than a specific field, since they observe large impacts on earnings in the same admissions system when instead studying large differences in field choice. Outside of Europe, Hastings et al. (2013) finds improved earnings for selective admissions programs in Chile and several studies in the United States show beneficial impacts on earnings from selective schools or programs (Hoekstra, 2009; Zimmerman, 2014; Chetty et al., 2020; Andrews et al., 2017; Bleemer and Mehta, 2020; Bleemer, 2021, 2022). Examining the outcomes of individual programs is beyond the scope of this paper, but these studies illustrate the motivation for focusing on the design of admissions.

This paper complements the small but growing literature on the general equilibrium effects of the adoptions of, or changes within, centralized higher education admissions systems.[1] In Brazil, centralized higher education admissions led to decreased enrollment of low-SES students and increased stratification (Machado and Szerman, 2021; Mello, 2022). However, systematic affirmative action policies were able to counteract increased stratification through the policies themselves and applicants' behavioral responses(Mello, 2022; Otero et al., 2021). In the United States, Bleemer (2023) contrasts different affirmative action schemes, showing that affirmative action (as opposed to other forms of preferences or holistic admission) result in the greatest

[1]There is a related literature on the impact and implications of such systems in allocating elementary and secondary education seats, including Abdulkadiroğlu and Sönmez (2003); Abdulkadiroğlu et al. (2009, 2017).

enrollment of underrepresented students. Finally, Tanaka et al. (2020) follow multiple reforms in Japan over time, finding that centralizing admissions increased the admission of high ability individuals but at the expense of regional and rural representation.

Our paper is organized as follows: Section 2 presents core values for admission systems and Section 3 presents a framework for discussing admission systems to higher education. Section 4 briefly introduces the admission systems in Scandinavian countries before Section 5 discusses the trade-offs that arise in the tension between competing values using examples and ongoing policy discussions from centralized admission systems. Finally, Section 6 concludes.

2 Core values in admission systems

We begin by examining the societal values embodied in higher education admissions systems. We use the terminology and categorization from Brighouse et al. (2016), which divides such values into three groups: *educational goods* (knowledge, skills, dispositions and attitudes), *distributive values* (adequacy, equality, and benefiting the less advantaged) and *independent values* (other societal goals that neither are educational goods nor distributive values).

Allocative efficiency: Allocative efficiency can be thought of both in terms of educational goods and as an independent value. Higher education allow students to develop the educational good of capacity for economic productivity, benefiting both individuals and the society. From the perspective of independent values, higher education aims to match labor market needs by ensuring that the supply of graduates aligns with economic demands, contributing to a productive economy. Allocative efficiency includes optimizing the aggregate supply of study seats and ensuring an efficient allocation across institution and/or study program level to use resources efficiently.

Fairness in assessment: Fairness in assessment aligns with the distributive value of equality. A transparent and predictable admission process ensures that applicants understand how to apply, the requirements for admission, and how they will be assessed in competition with other applicants, ensuring that *access* to higher education is determined via equal treatment.

Fairness in opportunities: Fairness in opportunities corresponds directly to the distributive value of benefiting the less advantaged. It means valuing a system where applicants have

equal admission opportunities regardless of background and socioeconomic status. This is not only about aiming for the measures used in admission to be fair, but also to consider whether the admission system itself should compensate if they are not. Thus, fairness in opportunity may conflict with fairness in assessment.

Representation and diversity: Representation and diversity reflect both distributive values and educational goods. Representation aims to ensure equality by reflecting broader population demographics within institutions and study programs, which helps balance social inequalities. Diversity enhances educational goods by fostering the capacity for students to engage with others from different backgrounds, contributing to democratic participation and mutual understanding. The composition of students affects the composition of the labor market, and representation and diversity are therefore valued also for their longer term implications.

Broadening access: Broadening access reflects the distributive value of benefiting the less advantaged by creating alternative pathways for students who may have faced academic challenges or who come from different educational backgrounds. These pathways ensure that individuals who have experienced setbacks still have the opportunity to pursue higher education, i.e., provide individuals with a second chance. Broadening access also includes providing alternatives to students who face barriers to traditional education. This may overlap with representation and diversity, but refers more to academic preparation rather than individual characteristics.

The framework provided by Brighouse et al. (2016) helps us understand how different aspects of the admission system reflect varying societal goals. The main goal of higher education admissions systems is to provide access to educational goods; however, the manner in which that access is provided reflects the societal values of equality and benefiting the less advantaged, which can sometimes contradict each other. The list above is not inclusive of all considerations for an admissions system. Admissions systems may also attempt to encourage behaviors that benefit both individuals and society such as emphasizing particular subjects or promoting particular extracurricular activities.

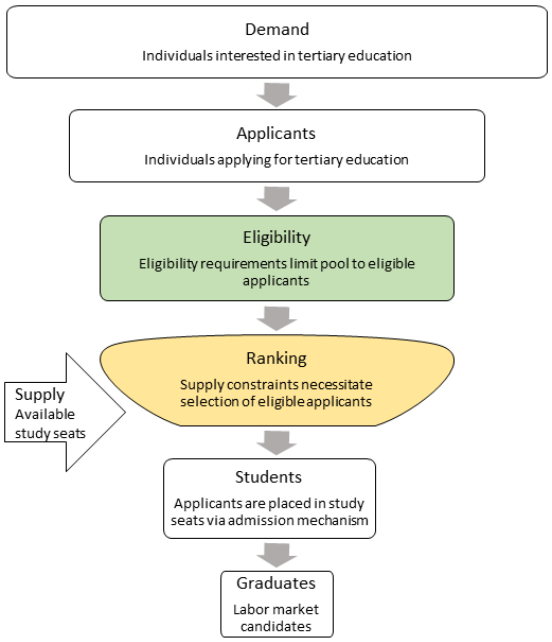


Figure 1: Centralized admission system with supply constraint

3 A framework for admission to higher education

In this section we present a novel framework for understanding centralized admission systems. The framework illustrates the admission processes in the pathways from individuals' demand for higher education, through eligibility assessments and ranking procedures, culminating in their enrollment as students and eventual graduation.

3.1 Admission system with supply constraints

We begin with a benchmark model, Figure 1, illustrating a simplified admission system with supply constraints. Below we describe each of the components in detail.

3.1.1 Demand

Demand for education is determined by those interested in tertiary education. The main source of demand for higher education has traditionally been recent upper secondary graduates, but could also include students desiring to change from one institution/study program to another, employed individuals desiring further or different education, and individuals not currently employed or in education or training. Demand for education can change as a result of the education

and admission system, but will also change due to demographic and macroeconomic factors, such as through changes in the size of birth cohorts or labor market conditions.

3.1.2 Applicants

There could be a discrepancy between those who want to apply to higher education and those who actually do. First, people who are interested in higher education could be discouraged from applying if they believe that they will not, or might not, be able to gain entry. Second, there may be barriers to application which engender a discrepancy between demand for education and application, such as financial barriers or difficulties navigating the admission system. These forces drive the reduction from demand to actual applicants, as illustrated in Figure 1.

3.1.3 Eligibility

A central feature of an admission system is an assessment of whether the applicant meets the eligibility requirement(s). Eligibility requirements serve as gate-keeping mechanisms which prevent applicants from gaining admission by reducing the pool of applicants to the pool of eligible applicants, even in the case when there are seats available. This assessment channel is illustrated by a reduction from applicants to eligibility in Figure 1. Eligibility can be considered a lower bound for admission. The eligibility requirements can be either known or unknown to the applicants, either because they are not made clear by the institutions/study programs or because applicants are not well informed.

The main role of an eligibility requirement is to identify people that should, for some reason, be excluded from the education. The intention is to identify preparedness for further academic study, the potential for a student to benefit from admission, and fit for an institution/study program. Within a centralized system as a whole, the eligibility requirement will typically consist of having a diploma from upper secondary education or an equivalent credential. For countries with vocational upper secondary education, it is usually also a requirement that this diploma is from an academically oriented upper secondary program. The impact of such requirements may be mixed: Increasing high school graduation requirements in the United States increased high school drop out, but increased college graduation for some groups, indicating that a rigorous high school diploma may be an effective screening mechanism for college (Plunk et al., 2014).

Institutions/study programs can also add further eligibility requirements beyond the main requirement, such as requiring certain upper secondary subjects, passing an entry test, having a clean criminal record or knowing the language of instruction. It is particularly common to require that applicants have passed certain STEM subjects in order to be eligible for STEM studies. In the United States, Bleemer and Mehta (2021) find that restrictions to access certain majors result in less access of underrepresented students in such majors, with later detrimental consequences for their earnings trajectories. This highlights the trade-off inherent in such requirements. They may ensure prepared students but at the expense of access to opportunity.

As there is no perfect measure of study preparedness, potential to benefit from higher education and educational fit, there will always be some degree of error in eligibility requirements. Some students who do not meet the eligibility requirement could still have been successful in the study, particularly if the requirements are set high. Similarly, students who meet the requirement, could still be unsuccessful, particularly if the requirements are set low. The admission system must make a trade-off between admitting some individuals who may be unsuccessful, *false positives*, against not admitting some individuals who could be successful, *false negatives*. The trade-off between these two types of errors represents the policy challenge of whether to have an ex-ante screening policy and, if there is one, what it should consist of. To the best of our knowledge, all institutions responsible for making higher education admission decisions have a set of requirements that indicate whether an individual is eligible for entry, but there is substantial variation in how demanding these requirements are.

The treatment of eligible applicants varies substantially across countries, institutions and study programs. In pure eligibility-based admission systems, anyone who meets the eligibility requirement will be admitted. Such systems are often referred to as open access, open admission, open enrollment or non-selective admission. These systems often attend to capacity constraints with high drop out rates. If there are constraints on the number of seats available, however, this requires a decision on how to allocate seats, which we turn to below.

3.1.4 Supply

Supply of study seats is determined by several forces. Market demand, government and private funding, and labor market needs, all play a role in determining the number of study places

available. Both from an individual and a societal perspective, a good match between the needs of the labor market and the production of graduates with different education levels and degrees is desirable. Some education systems thus adjust the supply of study seats, and in turn the production of graduates, to labor markets needs. Other systems have open admission, i.e. do not have supply constraints, but instead restrict study progression. The adjustment in supply can be both at the aggregate level, restricting/increasing the supply of higher education study seats in general, or at the institution/study program level, restricting/increasing the number of study seats in particular study programs.

Institutions' autonomy over which programs to offer and the number of seats made available may differ across countries and education levels. In centralized admissions systems, the number of study seats available in each institution and/or study program is a decision that can be made at the national level, institutional level, or jointly, and can be achieved through mandates, encouragements and/or financial incentives. The cost of providing education, capacity constraints at institutions/study programs, the willingness for students and/or society to pay for education, students desires, labor market needs and policy considerations all affect how the supply for study seats is determined.

When supply is lower than demand there is a need to select students among eligible applicants. When supply decreases, more institutions and/or study programs will need to select students, and the ones already using selection processes will have to admit fewer eligible applicants. In countries where rankings are used, institutions or programs may want to restrict supply to improve their selectivity ranking.

3.1.5 Ranking

In systems where the supply of study seats for institutions/study programs is lower than demand, eligibility is a necessary, but not sufficient, condition for admission. The pool of eligible applicants are moved forward to a subsequent competitive evaluation process that determines the allocation of study seats among the eligible applicants. The admission system needs rules for the set of criteria used to rank applicants, i.e. finding some way to sort eligible students in the order in which they should be considered for admission.

Due to the high number of applicants to higher education each year it is desirable that the

admission system is able to process and rank applicants in an efficient manner. The efficiency argument favors quantitative measures that can be easily calculated and machine processed, such as grades or test scores. Quantitative measures also contribute to transparency, ensuring that the criteria are clearly defined and communicated and that the process is consistent and without bias. Transparency in admission systems is essential for ensuring accountability and maintaining public trust (Hakimov and Raghavan, 2022). Clear communication of the ranking criteria and the outcome of previous year's admission fosters confidence in the fairness of the system.

Other criteria that can be used for ranking and require a qualitative assessment include interviews, essays or letters of recommendation. It can be much harder to agree on criteria for qualitative assessments for an admission system as a whole, and these types of criteria are therefore more likely to be used at the institution/study program level. The criteria can either be assessed for all qualified applicants or effort can be concentrated on assessing marginal candidates that are closer to the likely cutoff, eliminating the need for assessing candidates at both extremes. How such qualitative criteria are assessed and how they translate into ranking is often a less transparent process than what is the case for quantitative criteria. Thus all of the centralized admissions systems in Scandinavia rely heavily on quantitative criteria for ranking.

One of the primary motivations behind the use of a given measure for ranking is its ability to predict student outcomes, i.e. its predictive validity. If a measure predicts the applicant's ability, the applicant's preparedness for the study and/or the applicant's likelihood of progressing and graduating, it is reasonable to use it as a criteria for access to the program. If the measure is not successful in predicting such outcomes for all or certain students, this can lead to a mismatch between applicants and institutions/study programs. The predictive validity of SAT/ACT test scores has been the foundation of post-Covid policy conversations in the United States over test optional college admissions as institutions decide whether or not to require standardized tests for admission. Recent work finds that admissions test scores are highly predictive of post-graduate success at elite universities (Chetty et al., 2023), however other work at a broader range of institutions shows that test-optional policies increase diversity (Bennett, 2022). This implies that predictive validity is an important consideration for admissions systems but not the only thing to take into consideration when choosing admissions metrics.

Evidence from Sweden (Karlsson and Wikström, 2022)and the United States (Bowen et al., 2018; Allensworth and Clark, 2020) indicates that grades are more predictive of college success than test scores. This corresponds well with a large portion of study seats being allocated based mainly on GPA in the Scandinavian countries. However, evidence from Denmark (Gandil and Leuven, 2022) suggests that some of the more qualitative criteria set by each individual institution in an alternative quota, including CV's and essays, are more effective in identifying program matches. These matches increase within-program completion but have little predictive power in terms of college completion. The effectiveness of the qualitative criteria seems to be primarily driven by sorting into this quota through the additional application costs borne by the individual (i.e., effort), rather than any advantage in screening.

Performing well on the measures used for ranking (obtaining good grades, doing well on a tests) tends to be costly to the individual, and an important aspect is thus whether the effort spent improving the measure has benefits beyond improving their rank in the admission, such as increasing the knowledge and productivity of students (human capital). Alternatively, the metrics could simply be a signal of a students (unobserved) characteristics, e.g. ability to work hard or motivation. Signaling could still be an efficient sorting mechanism, but if the effort does not increase the applicant's productivity, there is an individual and societal cost not paid back by increased productivity.[2]

Irrespective of the criteria used for ranking, the ultimate goal in a centralized admission system is to give each applicant a number that represents the order in which their application should be processed. Whenever there are multiple assessment criteria these are also combined into a single number that determines the applicant's rank. This rank is then used to differentiate between students when multiple students seek a limited number of study seats. Depending on the crudeness of the score, tie-breaking rules may be necessary.

3.1.6 Admitted students

The centralized admissions system thus coordinates students' preferences, available seats and ranking within each institution and/or study program to result in an allocation of admitted

[2]There is a large literature in the economics of education on the human capital vs. signaling value of a college degree. Much of it finds that college does increase human capital but that there are some cases where signaling plays an important role. See Lange and Topel (2006) andDeming (2022) for an overview and Arteaga (2018) for an exemplar of this literature.

students to study seats. There are different allocation mechanisms available, such as giving preference to first choices, but centralized systems typically implement a strategy-proof deferred acceptance mechanism to ensure that students' ranking of fields truthfully reflects their preferences. In such a system, the highest-ranked applicant gets their preferred choice for which they are qualified, the second-highest ranked applicant gets the preferred choice for which they are qualified that is still available, and so on, until all available seats are filled. This model is both Pareto efficient and strategy-proof (Svensson, 1999) and creates unique and known cutoffs for each institution/study program. When study seats are allocated, there is no student who preferred another study program above the one they were accepted into for which they were i) eligible and ii) ranked above the cutoff.

3.1.7 Graduates

Not all students who are admitted to a study will eventually graduate, and the organization of admission to higher education involves difficult trade-offs. On the one hand, governments aim to ensure broad access to a large number of students. On the other hand, they want to allocate resources efficiently and minimize dropout or delays. This highlights an important underlying assumption: the goal of admission systems may not only be to admit students, but also to ensure that those students successfully graduate.

Eligibility and ranking serve as ex-ante screening policies that may reduce the wedge between admitted students and graduates. However, educational systems may also have ex-post selection mechanisms, which limit the opportunity for further progression or degree completion based on the students' performance during their studies. It is important to recognize that admission systems with open access to all qualified applicants do not necessarily produce more graduates than admission systems with supply constraints. Instead, a selection process may take place at the institution/study program level potentially leading to a larger share of admitted students who do not graduate.

3.2 Admission system with quotas

Admission systems may reserve some study seats for specific purposes, known as a quota. There are generally two types of quotas: quotas with eligibility requirements (eligibility quotas) and

quotas that rank applicants using different ranking criteria (ranking quotas).

An eligibility quota reserves some study seats for a subgroup of students, also called target students. Eligibility quotas will ensure a minimum number of admitted students with a given trait as long as there are sufficiently many applicants with that trait. Such quotas are typically tied to individual characteristics such as gender, disadvantaged background, geography, minority status, age or having a specific educational background.

For the admission process itself, students within each eligibility quota need to be ranked in cases where there are more eligible applicants than seats available. When seats in targeted quotas are processed, they are assigned to the targeted applicants with the highest rank. When nontargeted quotas are processed, seats are assigned to all applicants based on their rank, irrespective of whether they also qualify for the targeted quota.

Ranking quotas are used when there is a desire to rank applicants based on multiple criteria or ranking mechanisms, without wanting to compound these criteria into one single numeric value for ranking. An example is an admission system that has one quota where applicants are ranked using a standardized test score and one quota where applicants are ranked based on grades from upper secondary education. In this example, the same applicant will be able to compete in both quotas as long as they meet the general eligibility requirements and have valid test scores and grades.

If the aim is to address systematic disparities in admission metrics, such as those related to gender and social background, providing a ranking advantages that corresponds to these disparities may be more appropriate. A ranking advantage provides the applicant with a relative advantage, as opposed to eligibility quotas which provide the applicant with an absolute advantage. With ranking advantages, non-targeted students may still secure study seats if they outperform the targeted student with more than the ranking advantage. In contrast, eligibility quotas limit study seat allocation to targeted applicants, unless there are insufficiently many applicants with the designated characteristic.

When a student qualifies for multiple quotas, the admission rules must specify which seats are processed first. The order of processing matters for the composition of admitted students. Typically, a targeted quota will be filled first among applicants who meet the requirement. The other seats are then filled by remaining applicants using the ranking rules in the non-targeted

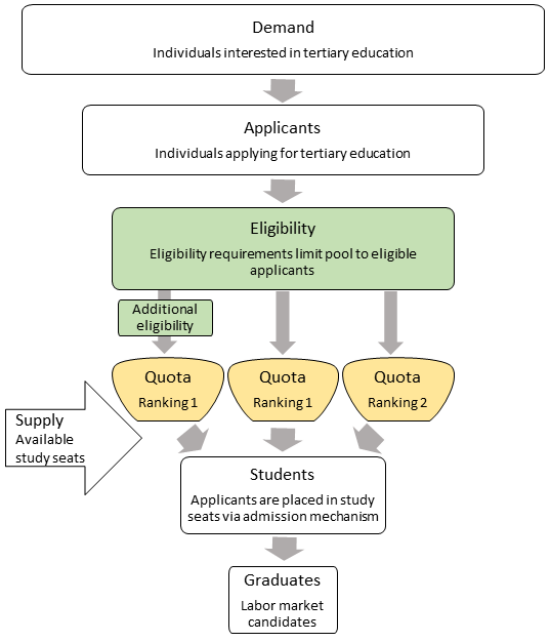


Figure 2: Admission system with supply constraint and quota

quota. This is what is referred to in the literature as horizontal reservation, where reserved seats are processed first (Sönmez and Yenmez, 2022). The alternative is vertical reservation, which is when the non-reserved seats are processed first.

Figure 2 provides a graphical representation of an admission system with both eligibility quotas and ranking quotas. The figure illustrates a system with general eligibility requirements that apply to all applicants (big green box, as in Figure 1) and three quotas (yellow boxes). The middle and right quota differ in their ranking criteria (Ranking 1 and Ranking 2), e.g. in their choice of using grades or test scores. The left quota has an additional eligibility requirement, e.g. minority status (small green box) while it shares the same ranking criteria as the middle quota (Ranking 1). Applicants who meet the additional eligibility requirements may thus compete in three quotas, while applicants who do not meet the additional eligibility criteria may only compete in two quotas. Applicants are in all cases only eligible for quotas where they have obtained the ranking criteria.

4 Scandinavian examples of centralized admissions

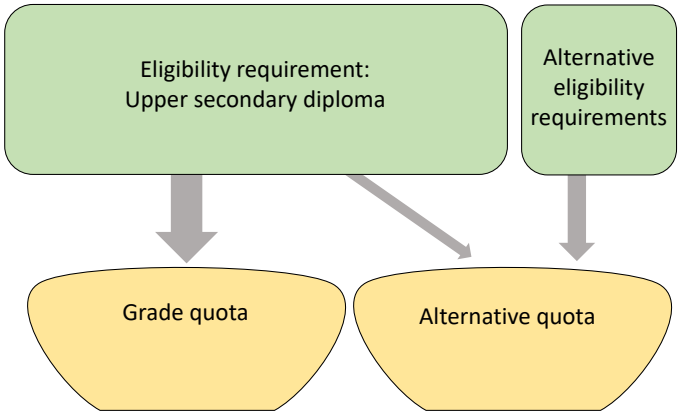
Before we begin our discussion of policy choices and their trade-offs, we briefly introduce the admissions systems of Denmark, Norway, and Sweden. Higher education in the Scandinavian countries are characterized by mainly public institutions that charge virtually no tuition fees. Moreover, all three countries have generous student financing policies that offer universal basic support.

Figure 3 illustrates a simplified model of the three admission systems that align with our framework, highlighting eligibility and ranking since this is where the systems diverge from our general model. All three systems have a main eligibility requirement (upper secondary diploma), but also allow for alternative ways of gaining eligibility (i.e, real competence evaluation, folk high school[3] or vocational higher education). The countries differ in their use of quotas. While all three have at least one grade quota, where the ranking mechanism is grade point average from upper secondary education, Denmark and Sweden have an alternative quota, where institutions/study programs themselves determine the ranking criteria. Sweden additionally has a quota where the ranking mechanism is a standardized test. In Norway there are two grade quotas. The first quota has an additional eligibility requirement, an age restriction, and uses the original diploma for ranking. Points for subjects, across all study programs, and gender, for some study programs with underrepresented genders, are also applied to the ranking. In the second quota, there is no age restriction, and applicants can improve their diploma by taking new subjects or retaking subjects. This quota also adds points for age and experience. For further details, see Appendix A.

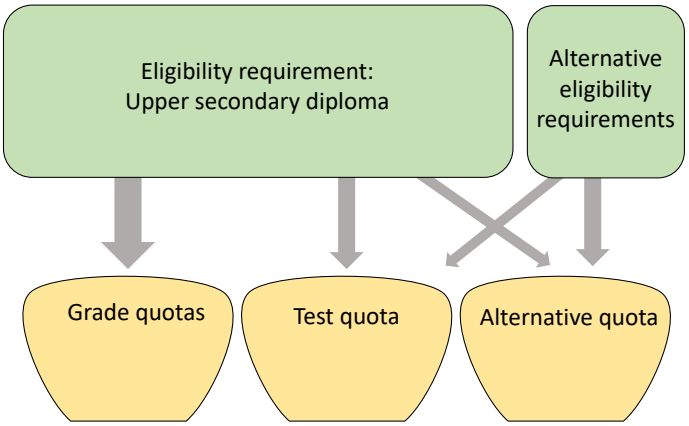
5 Discussion

Admission systems world wide, whether centralized or decentralized, all face trade-offs. Designing an effective admission system for higher education involves navigating between complex and often conflicting societal values. After outlining the goals and values that policy makers and institutions might consider when designing admissions systems, presenting the framework for admission systems, and describing three examples of admission systems, we now turn to a

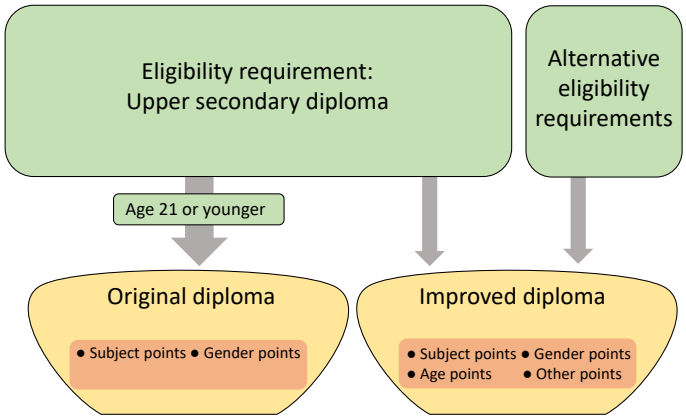
[3]Folk high schools are common in the Nordic countries and are institutions for adult education that generally do not grant academic degrees. The extent of their academic orientation differs somewhat across the countries.



(a) Denmark



(b) Sweden



(c) Norway

Figure 3: Scandinavian admission systems

discussion of the these inherent trade-offs.

We do so by discussing five policy considerations and the values trade-offs within them. These include deciding the supply of study seats, determining the metrics used for ranking criteria, deciding whether to give an advantage to targeted groups, allowing for ranking improvements, and incentivizing non-academic efforts. To illustrate the inherent conflict in admission policies, we use the centralized Scandinavian admission systems as a lens, highlighting how these specific examples underscore broader universal issues.

How many and which type of study seats should be supplied? Determining the supply of study seats involves navigating the trade-offs between individual preferences, institutional autonomy and labor market demands. Scandinavian systems balance these priorities through a combination of government financial incentives and institutional discretion. Governments typically finance a set number of students and reward institutions for graduation rates, while allowing institutions some autonomy in deciding how many study seats to offer and in which fields.

To highlight inherent trade-offs in the supply of study seats, we discuss two key examples. The first is a recent reform in Denmark seeking to reduce the number of university seats by 8 percent, particularly in the humanities and social sciences. The aim is to reallocate students towards fields with higher labor market demand, such as nursing and teaching, thereby optimizing the alignment between education and economic needs (Danish Ministry of Higher Education and Science, 2023). This justification reflects the value of allocative efficiency, as the reform prioritizes the supply of graduates in fields that address labor shortages. However, restricting seats in popular fields risks reducing overall access to higher education, potentially pushing students out of the system entirely. This creates a tension between optimizing resources for economic productivity and ensuring broad access, a distributive value aimed at providing opportunities to a wide range of students.

A contrasting example is from Norway, where policy makers instead seek to meet the labor market's need for nurses and teachers by expanding educational opportunities in these fields. The aim is to reach students who may face barriers to traditional education by offering alternative study formats, such as part-time enrollment, remote learning and opening study places in new geographical areas (Norwegian Ministry of Education and Research, 2023). This approach

broadens access by accommodating diverse student needs and reflects the value of fairness in opportunities. However, the creation of new programs may compete for the same students as existing programs, potentially affecting program quality and resource allocation, and may thus come at the cost of allocative efficiency.

Both examples highlight how changes to the supply of study seats must balance efficiency and equity. Governments aim to address labor market demands while also ensuring broad access by offering pathways for students who might otherwise be excluded. Yet, the ripple effects of reallocating applicants and resources can lead to unintended consequences, such as undermining educational quality or decreasing overall graduation rates. Ultimately, adjustments to the supply of study seats reflect the trade-offs between productivity and the broader societal goal of creating a workforce that meets the needs of both individuals and the economy.

What metrics should be used to rank applicants? Admissions systems must use metrics for ranking students to ensure the distributive value of fairness in assessment in the higher education admissions systems. Such metrics should consist of objective, reliable and accurate measures that predict applicants' potential (predictive validity), central to the core value of equal treatment. But what if such metrics are themselves biased? This represents a trade-off between clear and transparent metrics that apply to everyone vs. acknowledging that any metric will include some societal biases preventing equality of opportunity.

Teacher-assessed grades and/or standardized tests play a central role in admission systems, including the Scandinavian systems. Denmark, Sweden and Norway all have a grade quota using grade point average as the ranking metric. Sweden and Denmark additionally have quotas where standardized tests are used.

Grades, when given by teachers, allow students to be assessed over time and for teachers to measure student performance along various dimensions. However, grading biases have been observed in non-anonymous evaluations (Hinnerich et al., 2015; Lavy, 2008), potentially undermining the extent to which grades provide equal opportunities to all students and can be perceived as fair. Teacher-assessed grades typically favor girls (Lavy, 2008; Adriana Di Liberto and Pau, 2022), to a greater extent than exams or standardized tests. Relative grading (a.k.a. grading on a curve) can also affect the opportunities for students of similar ability levels who attend different schools.

Standardized tests treat individuals equally in the sense that the same test is available to all applicants and scoring is typically blind. There is, however, increasing debate about the extent to which standardized tests capture individual differences in knowledge, or rather other factors such as knowledge of how to prepare and the opportunity to hire tutors. Inequality may also arise if standardized tests are biased against certain groups, as has been documented by socioeconomic status (Miller et al., 2014; Ellison and Pathak, 2021) and gender (Fryer Jr and Levitt, 2010; OECD, 2015; Falch and Naper, 2013; Graetz and Karimi, 2022; Arenas Jal and Calsamiglia, 2023). Following the pandemic, several US institutions made submission of SAT and ACT scores voluntary. In the years after the pandemic, many of these institutions, including MIT and Stanford, reinstated standardized tests requirements, citing the predictive validity of the exams, whereas others, such as the University of Michigan, committed to additional years of test optional policies.

The strong correlation between these admission metrics and traits beyond individual control highlights the trade-off between fairness in assessment and fairness in opportunities, both of which are rooted in distributive values. Metrics like grades and standardized tests are designed to ensure fairness in assessment by providing objective, transparent measures that reflect applicants potential for acquiring educational goods. However, when these metrics are influenced by societal biases, such as those tied to gender, socioeconomic status or school quality, they undermine fairness in opportunities, as they disproportionately advantage certain groups.

To uphold the distributive value of benefiting the less advantaged, admissions systems may need to move away from strict equality in assessment by offering targeted benefits to underrepresented or disadvantaged subgroups (e.g. quotas or ranking advantage). This would align with the goal of providing equal opportunities for all applicants, regardless of background but necessarily contradicts the value of fairness in admissions. Alternatively, structural reforms aimed at reducing educational inequalities in grades and test scores—such as revising the criteria used for grading or the design of standardized tests—could serve to promote both fairness in opportunities and fairness in assessment. Improving K-12 educational opportunities for disadvantaged students could also balance the tradeoffs between fairness in assessment and in opportunity. These approaches attempt to ensure that the admission system more accurately reflects both distributive values and educational goods.

Should admissions systems have an advantage for target groups? The government or educational institutions may also want to take representation, diversity, regional concerns or ethical/principal considerations into account when allocating seats to applicants. This can be achieved either through eligibility requirements for targeted students, or through giving some students an advantage in the ranking critera.

The quota for the indigenous population of Sami people and the regional quota for applicants from Northern Norway, exemplify Norway's strategy of using eligibility requirements to ensure representation and address regional concerns. The Sami quota, which reserves study seats to students with Sami language competence, aims to safeguard the rights of the Sami population to foster their language, culture and community as an indigenous people, reflecting the values related to fairness in opportunities and representation and diversity. The regional quota is justified by the necessity to provide educational opportunities and facilitate labor market recruitment in Northern Norway, which reflects both the allocative efficiency and fairness in opportunity values.

The implementation of eligibility quotas and ranking advantages as a means to promote representation and diversity entails trade-offs between several core values. First, such policies contradict the value of fairness in assessment. Should policies strive for equity, providing additional support to disadvantaged groups, or equality, treating all applicants uniformly? Such questions are at the heart of debates over affirmative action and similar policies, as reflected in the extensive literature on their effects, particularly in the US context (summarized by Arcidiacono et al. (2015) and extended by recent comprehensive work by Bleemer (2022; 2023)). Moreover, there is a trade-off between those who benefit from such policies and those displaced by them (e.g., Otero et al., 2021).

Second, such policies alter incentives for performance on admission metrics and may consequently attenuate study effort among targeted students in upper secondary education, while intensifying it for non-targeted peers (though the evidence on this is mixed, see Haraldsvik (2014) and Akhtari et al. (2024)). Third, the policies may affect allocative efficiency if the differences between targeted and nontargeted students lead to a less optimal allocation of applicants to study seats, thereby affecting the efficiency of the admission system.

Should applicants get an opportunity to improve their ranking? In a centralized

admission system where grades from upper secondary education are used for ranking, a choice has to be made about whether applicants are given the opportunity to improve their grade point average after graduation. Sweden and Norway allow applicants to improve their ranking through taking new or retaking subjects from upper secondary education. Denmark, however, only allows applicants to take subjects they have not yet completed, and the grade acquired only counts in the ranking if they lower the applicant's grade point average.

Providing the opportunity to improve ranking may, however, have some unintended consequences. First, it may influence the incentives student have to perform well during upper secondary education as receiving a low grade or failing may be less consequential. Second, it raises questions about fairness across cohorts of upper secondary graduates, as older cohorts have more time to improve their grades. Allowing for grade-improvements thus creates a trade-off between broadening access and incentives for effort in upper secondary education, and between broadening access and fairness in assessment.

Norway and Sweden have separate quotas for original and improved transcripts. This results in two distinct cut-offs: one for students with original transcripts and another for students with improved transcripts. However, the presence of a quota for improved transcripts raises the admission cut-off also for the original transcripts, since fewer study seats remain to compete for. Given capacity constraints, there is no way for the cut-offs to be fully independent. It is thus a vital question whether the policy allows for broader access to higher education, or whether the system instead creates admission delays.

Should admissions systems incentivize non-academic efforts? Countries differ in the extent to which they include measures other than academic performance in their admission metrics and how these interact with the admissions system. Including such measures can incentivize nonacademic activity, either because it is thought to increase the probability of success in higher education and generate educational goods or because the activity has other benefits for the society (accomplishing independent values via the educational system).

In Norway, the admission system is used to compensate for the burden of completing military service and to increase the recognition of and motivation for military service. Norway has two policies related to military service in place. The first is to allow applicants who have gained admission, but have been drafted into military service, to reserve their study seat until after their

service is completed. This policy enables those who have been drafted to compete for admission on equal footing with their peers when applying directly after upper secondary education. The second is to award additional points in the ranking system when applying to higher education after completed military service, thereby increasing their chances of admission relative to other applicants.

A key question is whether the admission system should be used to provide incentives for nonacademic efforts. Ultimately, the question is whether the best way to accomplish societal goals—for example, military service—is via the higher education admissions system, or via more direct mechanisms, for example a paid bonus for enlistment.

6 Conclusion

Over the past decades we have seen a vast increase in the enrollment in higher education. Amidst this expansion, it has become increasingly evident that not all higher education institutions/study programs offer the same returns (see, for example Zimmerman (2014) and Kirkebøen et al. (2016)). This realization underscores the significance of the gate-keeping mechanisms that regulate access to higher education, determining not only who gains entry, but also which educational paths individuals are able to pursue.

While there exists a substantial body of literature on the topic of higher education admissions and outcomes of these regimes, few studies have comprehensively addressed the intricate interactions and potential trade-offs or conflicts inherent within the admission system. In this paper, we present a novel framework where we highlight how the pursuit of one societal value often conflicts with another.

We make an important distinction between two key mechanisms that determine access to an institution/study program: eligibility, the requirements that allow the applicant to apply to the institution/study program, and ranking, the criteria used to select between eligible applicants when the supply of study seats is lower than the demand. While eligibility requirements are intended to identify those with a sufficient level of ability or study preparedness to benefit from higher education, ranking criteria aim to allocate limited resources efficiently and fairly. Achieving a balance between fairness, transparency and other societal concerns is essential to

ensuring equitable access to higher education while maximizing societal benefits.

Through the lens of Scandinavian admission systems, we illuminate the various conflicts inherent within these systems. We illustrate how governments may use supply of study seats to contribute to economic productivity by countering over- or under-supply of graduates, as well as a means to broadening access. This may involve trading off student preferences for government goals. We also discuss how quantitative measures, such as grades and test scores, play a vital role in many admission systems. While such measures provide clear and transparent admission cut-offs, they may be biased measures of individual differences in knowledge. A key question in admission systems is thus whether, and if so how, to attenuate such differences.

One way admission systems attempt to address biased admissions metrics is via policies to increase representation and diversity. These policies also serve to benefit the least advantaged, as recompense for historical wrongs and to expose members of society to each other. However, in a system with capacity constraints, such policies trade off access for the targeted group with reduced access for others, juxtaposing fairness in assessment with fairness in opportunity. Similarly, many admissions systems offer alternative entry pathways with a goal of increasing access for the least advantaged. However, alternative pathways may undermine the main admissions pathways by creating incentives to under-perform. Moreover, they create a trade-off between cohorts of applicants with different opportunities to improve their ranking, and between second chance applicants and the applicants they displace. Finally, admissions systems are sometimes implicated in broader policy making representing independent societal values, a consideration we illustrate with the presence of an admissions boost for military service in Norway. Policies like these may serve government goals but risk creating inefficiencies.

Admissions systems aim to meet multiple goals at once, though often, by definition, they cannot. They should provide an efficient and transparent means of accessing higher education, while also allowing governments to prioritize societal goals such as representation and/or benefit to the least advantaged. As we discuss in this paper, the decisions around how to design an admissions system inherently trade off these priorities and perhaps reveal why admissions systems can be so complex. As countries contemplate changes to their admissions systems, such as the recent policy initiatives in Denmark, Norway, and Sweden, governments must ultimately decide the extent to which admissions systems can or should be responsible for societal benefits.

While these systems are useful tools for societal change, in order to successfully meet all the values they are tasked with addressing, admissions policies must be accompanied by broader societal policies targeting the same values.

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Appendix

A Admission systems in Scandinavia

Denmark, Sweden and Norway all have national centralized admission systems where admission to higher education is administered by a common governmental body for all public higher education institutions. In all three countries, students apply through the same application portal and with a common mechanism for offering study seats to applicants. Moreover, admission is at the program level, which is defined as a specific field-of-study at a given institution, for example business administration at Norwegian School of Economics.

Many of the admission criteria for eligibility and ranking are common across the countries and institutions and are determined by legislation at the national level. For instance, all three countries require completion of upper secondary education as the primary eligibility criteria. Students that complete academic tracks fill the basic eligibility requirement, while students completing vocational tracks have to supplement with academic subjects in order to qualify. All three countries also use students' average grades from upper secondary education as an important ranking criterion.

While the admission systems are broadly similar, they differ along some key dimensions, such as their use of quotas and alternative assessment methods. Moreover, the countries differ in the extent to which the higher education institutions have flexibility in determining the eligibility and ranking criteria and the size of the different quotas. Below we illustrate a simplified model of the admission system for each country, discussing the main elements of each system.

A.1 Denmark

Eligibility: The main eligibility criteria in Denmark is having an academic track upper secondary diploma. There are four types of academically oriented diplomas that qualify for higher education, each with it's own professional profile and compulsory subjects(Commission, 2024).[4] To offer an alternative route for vocational graduates and upper secondary drop outs, each institution and/or study program may use alternative eligibility criteria, e.g. relevant work ex-

[4]The programs are the three-year Higher General Examination Programme (STX), the three-year Higher Commercial Examination Programme (HHX), the three-year Higher Technical Examination Programme (HTX) and the two-year Higher Preparatory Examination Programme (hf).

perience. In addition, certain studies have supplementary eligibility requirements, e.g. specific subject requirements or suitability requirements.

Quotas: There are two quotas, the grade quota (denoted Quota 1) and the alternative quota (denoted Quota 2). Nationally set guidelines state that a minimum of 10% of the study seats must be reserved for the alternative quota, but the quota can be as large as 100%. The size of the quota is determined centrally, but with input from the institutions. At universities, the quota is typically the minimum size, 10%, while it is commonly 50% at other higher education institutions. The size of the alternative quota affects how competitive the grade quota is.

Only applicants with an upper secondary diploma are eligible to apply in the grade quota. In the alternative quota, both applicants with an upper secondary diploma and applicants that fill alternative eligibility criteria can apply.

Ranking in the grade quota: Students are ranked using their grade point average from upper secondary education. The diploma consists of teacher-assessed grades for each subject as well as a some grades from externally-assessed exams. For each subject, the teacher-assessed grades and exams grades jointly determine whether the student has achieved a passing grade, required for the diploma. Some subjects (A-level subjects) are considered more demanding and students receive a higher ranking score for completing these. Specifically, the grade point average receives an additional weight of 1,03 for having one A-level subject, and 1,06 for having two A-level subjects.

If students take new subjects after upper secondary in order to meet subject specific eligibility requirements for certain studies, their grade point average will only be recalculated if the subject lowers their average grades. This is done to encourage students to take difficult elective subjects during upper secondary education rather than postponing them.

Ranking in the alternative quota: The institutions themselves determine the ranking criteria for the alternative quota, and do not need to be similar across institutions for the same study program. These criteria can for instance include a combination of a subset of the high school grades, standardized tests, relevant experience, written assignments or interviews (Gandil and Leuven, 2022; Danish Ministry of Higher Education and Science, 2020). All applicants can be assessed, or only a subset of applicants that meet additional requirements (e.g. interviewing only the applicants that are above a threshold on an admission test). Regardless of type of

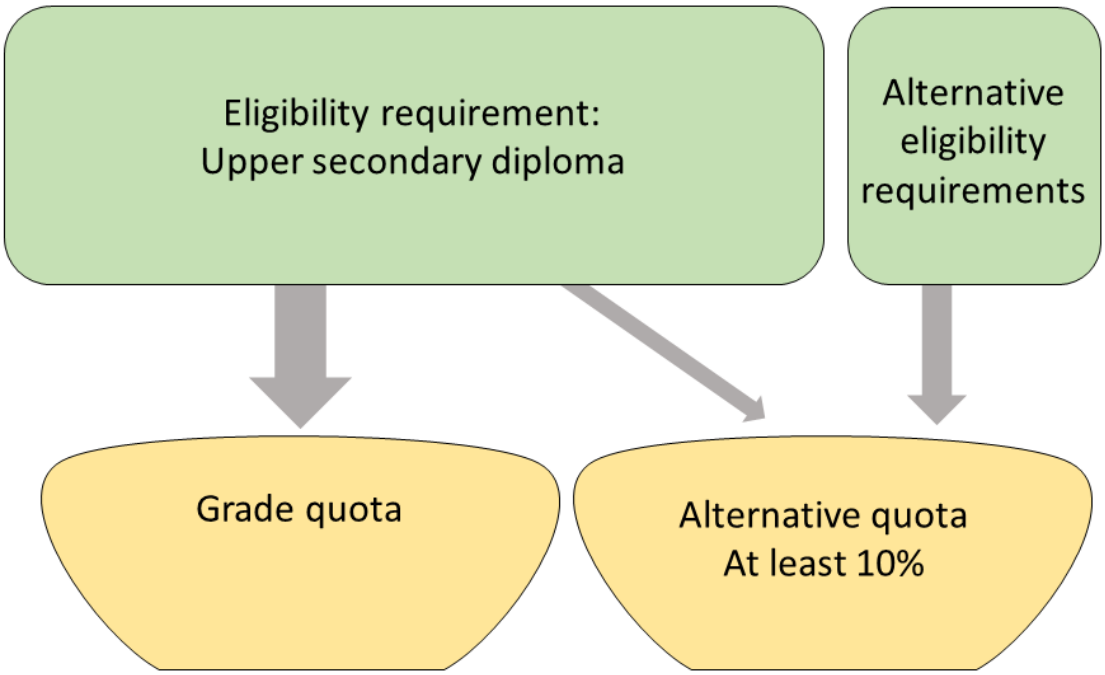

Figure 4: Admission system in Denmark

assessments, all applicants in this quota are ranked, by receiving a (combined) numeric value of the criteria used for the admission process. While the categories of criteria are known for applicants, information on the way these translate into a numeric value for ranking is usually not made available.

A.2 Sweden

Eligibility: The main eligibility criteria is having an academic track upper secondary diploma. There are six academically oriented programs that qualify for higher education.[5] Vocational track upper secondary diplomas can qualify for higher education, but only if students take academic subject requirements as electives (Bryntesson and Börjesson, 2021, p.17). Many studies have supplementary eligibility criteria, most commonly subject specific requirements, but also suitability requirements. Unlike Denmark, where students are required to take such subjects at the upper secondary education level, Sweden offers a "base-year" at a university level that also fills the subject requirements. Admission to this "base-year" requires an academically oriented

[5]The programs are Business Management and Economics, Arts, Humanities, Natural Science, Social Science and Technology. Each program has the same eight core subjects.

upper secondary diploma.

For students who do not have an upper secondary diploma, it is possible to gain the necessary qualification through taking subjects at a folk high school, an institution which provides non-formal education. Swedish municipalities also offer the opportunity for adults to take education at the secondary education level through separate programs.

Sweden is currently running a trial to investigate whether a standardized eligibility test can serve as a substitute for the academic track upper secondary diploma requirement.

Quotas: There are three quotas: the grade quota, the test quota and the alternative quota. At least one third of study seats are reserved for the grade quota and the test quota. It is up to the institutions whether they want to use the alternative quota. If this quota is not used, these seats are typically added to the grade quota. Institutions can apply to the central government to use more than one third of the seats in the alternative quota.

Ranking in the grade quota: Within the grade quota, there are three separate sub-quotas. The first and second quota include students with upper secondary diplomas, where the difference is mostly related to whether they took the required subjects during upper secondary education or after graduating. The last quota is for applicants who qualify through the folk school education program. The size of each sub-quota is proportional to the number of applicants applying within each category, and the size of the sub-quotas can thus fluctuate somewhat each year (Antagning.se, 2024).

Students are ranked using their grade point average, weighted by a value that approximate the size of the course. Students receive additional points for advanced language courses, English and mathematics, but only for subjects that are not a requirement for the study they are applying to (Antagning.se, 2023).

Ranking in the test quota: The test quota uses the Swedish Scholastic Aptitude Test (SweSAT) to rank applicants (for Higher Education, 2023). The test is given in Swedish and consists of a verbal and a quantitative component, where the verbal component also has an English reading comprehension section.

The test is given twice a year, there are no restrictions on retaking the test, and applicants can take the test starting the year they turn 18. Any applicant who has a SweSAT score and meets the eligibility requirement will automatically compete in the test quota (in addition to

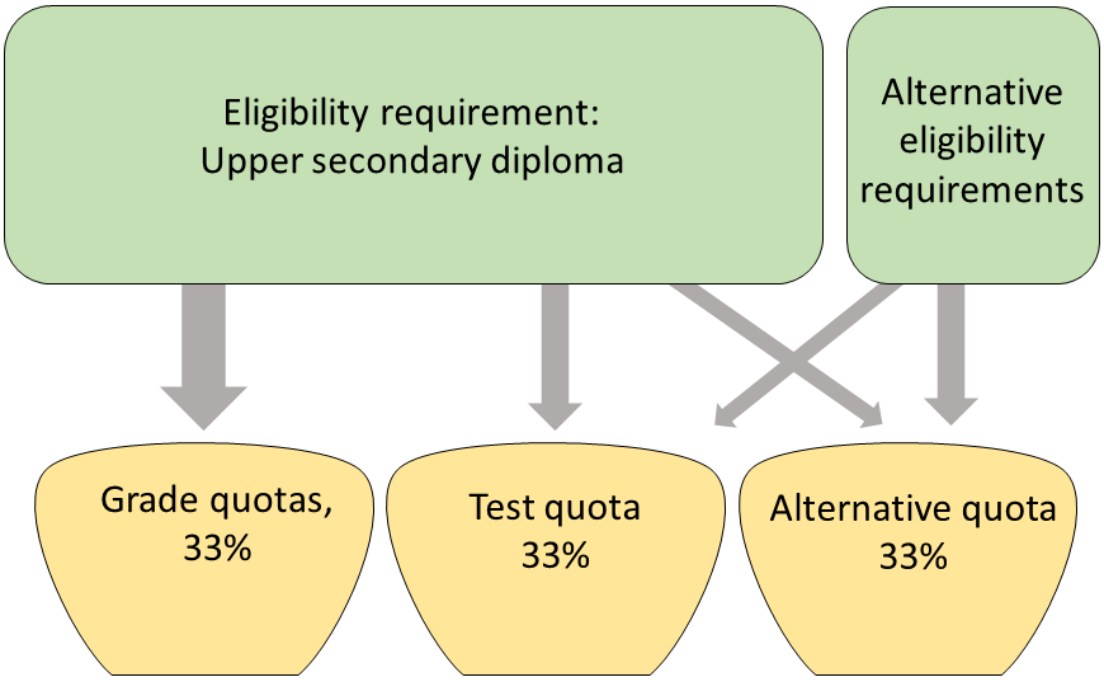

Figure 5: Admission system in Sweden

any other quota they are eligible to compete in).

Ranking in the alternative quota: The institutions themselves determine the ranking criteria for the alternative quota. These criteria can include a combination of grades, general or field specific standardized tests, relevant experience, written assignments or interviews. As in Denmark, all applicants can be assessed, or only a subset of applicants that meet additional requirements (e.g. interviewing only the applicants that are above a threshold on an admission test).

A.3 Norway

Eligibility: The main eligibility criteria in Norway is an academic track upper secondary diploma. There are five academically oriented studies that qualify for higher education.[6] Some studies additionally have supplementary requirements, including suitability, subject specific requirements or grade requirements.

An alternative eligibility requirement route exists for applicants who are at least 23 years old,

[6]The programs are Specialization in general studies, Sports and physical education, Art, design and architecture, Media and communication and Music, dance and drama.

denoted the 23/5-rule. If the applicant can document five years of relevant experience[7] they only need to have completed six core subjects from upper secondary education: Norwegian, English, science, mathematics, history and social studies.

Quotas: There are two quotas of equal size: the age restricted quota and the ordinary quota. The age restricted quota is reserved for applicants who are 21 years or younger and who have completed upper secondary education. The ordinary quota is for all applicants, including those that are deemed eligible through alternative eligibility requirements, such as the 23/5-rule.

Ranking in the age restricted quota: Ranking in the age restricted quota is based on the grade point average from the original upper secondary education diploma. The diploma mainly consists of teacher-assessed grades, with some externally graded written and oral exams. Subject points are added to the grade point average if the applicant has taken STEM-subjects and third-language subjects as electives. The intention behind these points is to stimulate students to take these subjects in upper secondary education and to choose related education paths in higher education. Some study programs in higher education also give gender points to applicants of the underrepresented gender.

Ranking in the ordinary quota: In the ordinary quota, applicants who have retaken or taken new subjects can apply with an improved diploma where the highest grade obtained counts. In addition to subject points, and gender points when applicable ,applicants receive age points (yearly increase from age 20 to 23) and other points related to experience (one year of higher education, vocational higher education, folk school education, military service or civil service).

Applicants who meet eligibility requirements through the 23/5-rule compete with the grade point average of the six core subjects. Applicants who have an academic upper secondary diploma, can also be assessed using the 23/5-rule if they meet the criteria, in which case they will compete with the highest of the two scores.[8]

[7]The definition of relevant experience is very wide as it includes work experience, care taking, military and civil service and education. Thus, in practice most applicants will fill this criteria.

[8]If applying with the 23/5-rule grade point average, age points increase yearly from age 24 to 27.

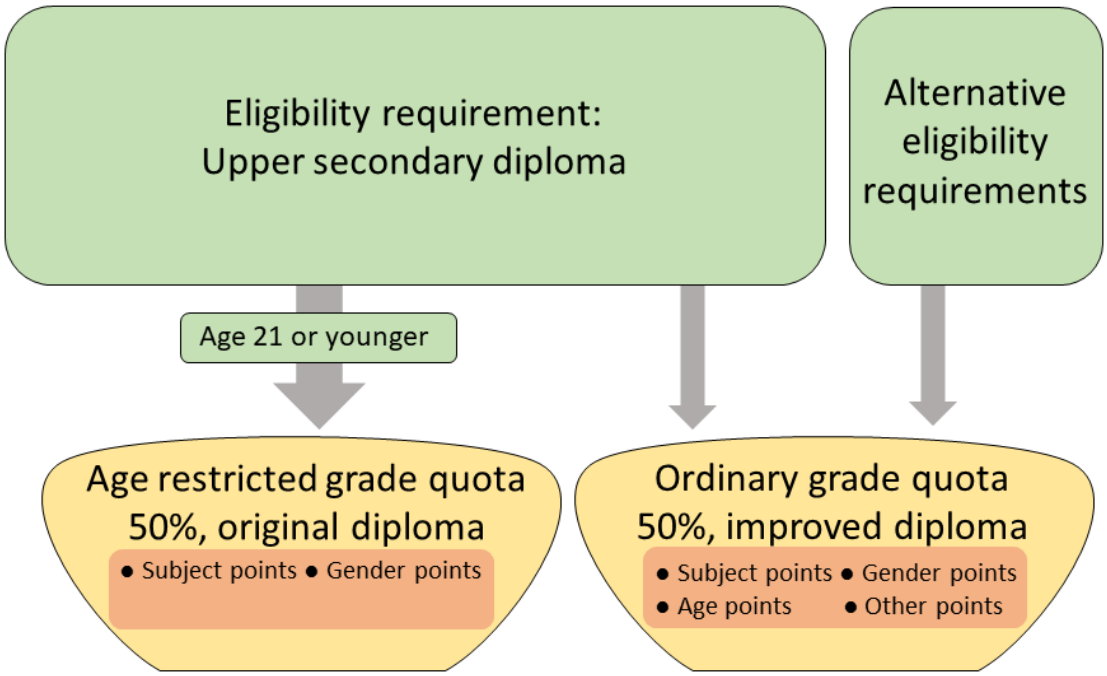

Figure 6: Admission system in Norway