The Rise of Coordinated Choice and Assignment Systems in Education Markets Around the World

Christopher Neilson*

Abstract

This paper reviews current policies regulating access to education worldwide and documents the rise of platforms implementing coordinated choice and assignment systems in education markets. It reviews primary, secondary, and higher education markets in 149 countries to determine the use of coordinated systems for processing applications and assignments. The paper also documents the policy details surrounding these systems, focusing on assignment mechanisms, priority criteria, preference reporting, application timing, and information provision. The analysis reveals a substantial increase in the adoption of coordinated systems, with 60 percent of the countries reviewed implementing some form of coordinated mechanism to determine access to education. The study shows that policy choices "in the wild" exhibit significant heterogeneity and often create incentives for families to behave strategically, regardless of the specific assignment mechanism used. Finally, many of the policies reviewed do not align with best practices, presenting a unique opportunity to enhance equity and efficiency through evidence-based adjustments. The trend in adoption suggests that many low- and middle-income countries will implement digital platforms to coordinate access to education and could look to lessons from empirical market design when creating new systems, potentially leapfrogging to the frontier of systems that provide access to education.

1. Introduction

In education markets all over the world, equilibrium market prices rarely determine the allocation of education services. In the absence of the price mechanism as a coordinating device, societies have developed a variety of rules and regulations with the aim of better allocating education services. This paper provides a thorough documentation of current global policies governing educational access through the lens of mechanism design theory. It focuses on coordinated choice and assignment systems (CCAS) and the rules and regulations that determine access to education at the primary, secondary, and higher education levels in 149 countries.

The paper first documents the dramatic rise in the practical use of CCAS in both low- and middle-income and high-income countries. Systems where supply and demand are coordinated on digital platforms of applications and assignments are increasingly replacing systems that have been historically decentralized, analog, and uncoordinated. Algorithms incorporate the applications of families and implement a transparent set of rules on how to resolve excess demand. The results reveal that 60 percent of the countries reviewed currently use CCAS to determine access to education. While the adoption of these systems is positively correlated with income, urbanization, and transparency, 57 low- and middle-income countries, including some of the poorest globally, currently use some form of coordinated mechanism to determine access to education options.

This trend is important because recent research has shown that while coordinated systems can benefit both families and educational institutions (Abdulkadiroglu, Agarwal, and Pathak 2017), the policy impacts can depend on a variety of broader market design choices (Pathak 2017). A growing empirical literature on the trade-offs of different policy design features has shown that these trade-offs can significantly affect who gains access to educational opportunities and the overall efficiency and fairness of the system. Examples include the type of assignment algorithm (Agarwal and Somaini 2018; Ergin and Sonmez 2006;), the length of the application list (Haeringer and Klijn 2009), the information provided to families (Arteaga et al. 2022), the criteria used to prioritize applicants (Calsamiglia and Güell 2018), the role of the off-platform options and aftermarket frictions (Kapor, Karnani, and Neilson 2022), and the presence and implementation of quotas (Black, Denning, and Rothstein 2023), among others.

In this context, the second contribution of this data collection effort is to document the significant heterogeneity in the way policy makers implement coordinated systems "in the wild." The paper focuses on documenting the type of assignment mechanism used, the set of associated priority criteria, the methodology for collecting preferences, the existence and regulation of off-platform options, the timing of applications, and the provision or disclosure of relevant information. A host of additional features are documented but not systematically compared across systems.

The first takeaway is that in many contexts, policies implemented do not incorporate state-of-the-art knowledge about important design choices, suggesting that existing research can inform policy. These policy adjustments can potentially lead to important improvements in the equity and efficiency in education markets that are cost-effective and likely to be politically feasible.

Second, while many aspects of market and mechanism design are well understood, there are existing implementations of policy that have configurations that have not been thoroughly studied. These new policy choices can provide innovative ideas for policy makers facing new frictions and could present researchers with new opportunities to learn about market design in practice. One example is the higher education mechanism in Croatia that provides applicants with pseudo results of their applications if the

match ended then every hour for several weeks. This feature is being used to provide information on cutoffs and assignment probabilities. Another feature is the way in which many systems attempt to deal with dynamic considerations and learning, suggesting these issues are salient for policy makers.

A final observation is that in practice, there are many strategic considerations when looking at the broader game families that are seeking access to education options face. The theoretical and empirical mechanism design literatures have studied the strategic incentives created by specific algorithms such as Immediate Acceptance or the strategy proofness of certain algorithms such as Deferred Acceptance. However, the majority of systems have design features that create incentives for families to be strategic, that require them to be informed about assignment probabilities, and be capable of potentially complex cognitive tasks. From restrictions on the number of applications to penalties for rejecting assignments to aftermarket regulation, the return to participants for being informed and strategic abound "in the wild". This finding is relevant given the growing evidence documenting that students and families tend to be misinformed or have biased beliefs about their chances of admission, which can lead them to potentially make mistakes and fail to be assigned (*unmatched*) or end up in less desirable options (*undermatched*). Therefore, if these frictions are more relevant for more disadvantaged families, policy design features that create the need to be informed and strategic can enlarge existing gaps in access to educational opportunities. This is particularly relevant for low- and middle-income countries, where the population faces significant inequality, presumably in terms of capacity to interact with digital platforms and mechanisms that require strategic behavior.

Section 2 of this paper provides definitions and a description of the methodology used for data collection and analysis. Section 3 examines the extent of adoption of coordinated systems over time. Section 4 describes the main characteristics of coordinated systems. Finally, Section 5 concludes.

2. Definitions and methodology

2.1. Definitions

In order to document choice and assignment systems for primary, secondary and higher education, the following definitions were established.

Coordinated choice and assignment system (CCAS)

A country is considered to have a coordinated choice and assignment system in place at an educational level when it meets three specific conditions.

Condition 1. *Applicants are required to submit a list of preferences.*

Applicants prepare a list of all the programs they wish to apply for and rank them in strict order of preference. The list can be submitted either to an educational institution directly or to an external agency, using either online platforms or in-person channels, and may include only one program.

Condition 2. *An external agency partially or fully determines the enrollment of a group of educational institutions.*

Educational institutions fill their vacancies according to the distribution of applicants given by an external agency. The determination of enrollment does not necessarily imply that the external agency dictates the admission requirements and instruments. That is, the educational institutions themselves may establish their own admission requirements and instruments, but the external agency determines the process of filling the vacancies within the participating institutions.

This condition has several implications. First, if even one group of institutions within a country employs a CCAS, the entire country is considered to have a CCAS at that particular educational level. Additionally, the presence of a CCAS does not depend on the number of participating institutions. Lastly, the definition allows for coordination of specific segments within the assignment process rather than mandating the complete coordination of the entire process. Consequently, a country may have multiple CCAS at a given educational level—a situation that arises when different regions or groups of institutions within the country employ distinct systems for choice and assignment.

Condition 3. *The system makes a single offer to each applicant based on a predefined set of rules and criteria.*

This condition implies that the system expects each applicant to receive an enrollment offer in a single educational institution. The condition is satisfied even if the system employs multiple rounds, as long as a single offer is made to each applicant in each round. However, not all applicants may receive an offer when the demand exceeds the number of available seats.

This definition of CCAS explicitly excludes two common types of systems: those that allocate seats centrally without considering the preferences of applicants, and those that have a coordinated application process but do not make a single offer.

CCAS characteristics

Research for this paper documented key aspects of the systems if a CCAS was in place, including:

- **Year of adoption:** This is the year in which the CCAS was initially implemented. In some cases, due to limited information, only the decade of adoption was available, in which case the median year of the decade was considered as the year of adoption.
- **Participating institutions:** This refers to the options provided to students and families through the platform. These options are categorized as all types of institutions in the area, exclusively public institutions, exclusively private institutions, or a combination of different types of institutions.
- **Preference list length:** This is the maximum number of preferences that applicants can specify in their application.
- **Priority criteria:** These are the factors used to establish the order for assigning applicants, reflecting the preferences of educational institutions over students. These factors are classified as favoring family logistics, academic performance, distance from residence to educational institution, socioeconomic equity, gender equity, or special educational needs. The study documented all priority criteria used by a CCAS.
- **Assignment mechanism:** This refers to the process of handling applications and priorities in order

to allocate applicants to available seats. These mechanisms are classified as Immediate Acceptance, Deferred Acceptance, Serial Dictatorship, Top Trading Cycles, or other mechanisms (see Appendix A for the definition of each mechanism).[1]

Decisions regarding these elements were made based on available information. In cases where a CCAS had undergone changes over time, the study considered the current elements of the system, except for the year of adoption.[2] Regarding the preferred list length and assignment mechanism, the study documented aspects of the main round if a CCAS involved multiple rounds with variations in these characteristics between rounds.[3] When categorizing participating institutions and priority criteria, the study accounted for all the rounds.

2.2. Methodology

Data collection

The data collection process involved a comprehensive review of 149 countries with a population of more than 2 million inhabitants, as well as Latvia,[4] across three levels of education: primary, secondary, and higher education. Primary education corresponds to elementary education, secondary education includes upper secondary education, and higher education encompasses undergraduate programs.[5]

Because certain countries implement CCAS at the city level rather than the national level, the study included all cities with a population of more than 1 million inhabitants. Additionally, to fulfill the research objective of documenting as many CCAS as possible, the study recorded all CCAS identified in smaller cities, which encompassed more than 600 cities.

To evaluate the presence of CCAS and their specific characteristics, the study relied on various sources, including government websites, admission guides, research papers and news reports.

Auxiliary data

The cross-country regression analysis presented in section 3.1 uses the following variables from the World Bank's World Inequality Database for June 2023:the gross domestic product (GDP) per capita (adjusted for purchasing power parity), the share of government expenditure on education, the share of rural population, the share of internet use, and the sub-index measuring transparency, accountability, and corruption in the public sector from the Country Policy and Institutional Assessment index.

---

[1] Systems with a preferred list length of one were classified as having Immediate Acceptance mechanisms.
[2] The objective of this research is to identify the initial year of implementation for a CCAS, rather than the year when the current elements of the system were introduced.
[3] Understood as the round that allocates the applications of the largest number of applicants.
[4] The inclusion of Latvia was motivated by its coordinated system for admission to higher education.
[5] Lower secondary education data were not collected for this study because in many countries, there are only two levels of educational structure: primary and secondary education.

Data analysis

A country may have multiple CCAS at a given educational level. However, to facilitate country comparisons, this study focuses on analyzing the data in an aggregated manner. As a result, certain procedures have been implemented.

Regarding the status of a CCAS, if a country possesses at least one CCAS for any region or group of institutions, it is considered to have a CCAS for the corresponding educational level.

Regarding the CCAS characteristics, countries are classified based on all the documented aspects. For example, if a country has two CCAS—one employing a Deferred Acceptance mechanism and the other using an Immediate Acceptance mechanism—it is categorized in both groups. This categorization procedure applies to all characteristics, except for the year of adoption. The year of adoption specifically represents the first instance of a CCAS being implemented in the country for the respective educational level.

3. Adoption of coordinated systems

The study finds that 60 percent of countries in the sample have implemented at least one coordinated system (map 1). In addition, coordinated systems are less prevalent at the primary education level, compared with secondary and higher education, while secondary education is the education level with the highest percentage of countries with a CCAS (figure 1).

Map 1 Countries with at least one coordinated system

Coordinated
Uncoordinated
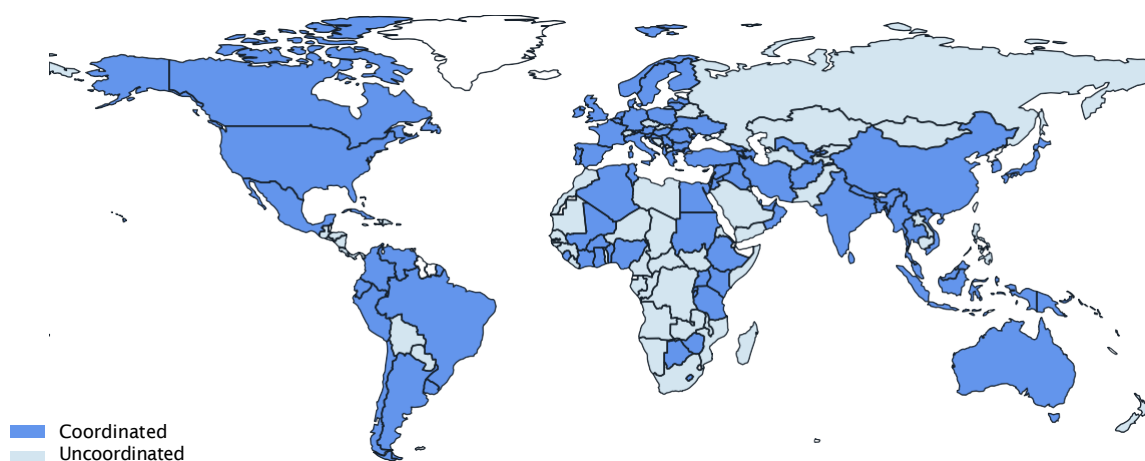
Source: Original calculations for the *World Development Report 2024.*
Note: The boundaries, colors, denominations, and other information shown on this map do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

Figure 1 Percentage of countries with coordinated systems by education level
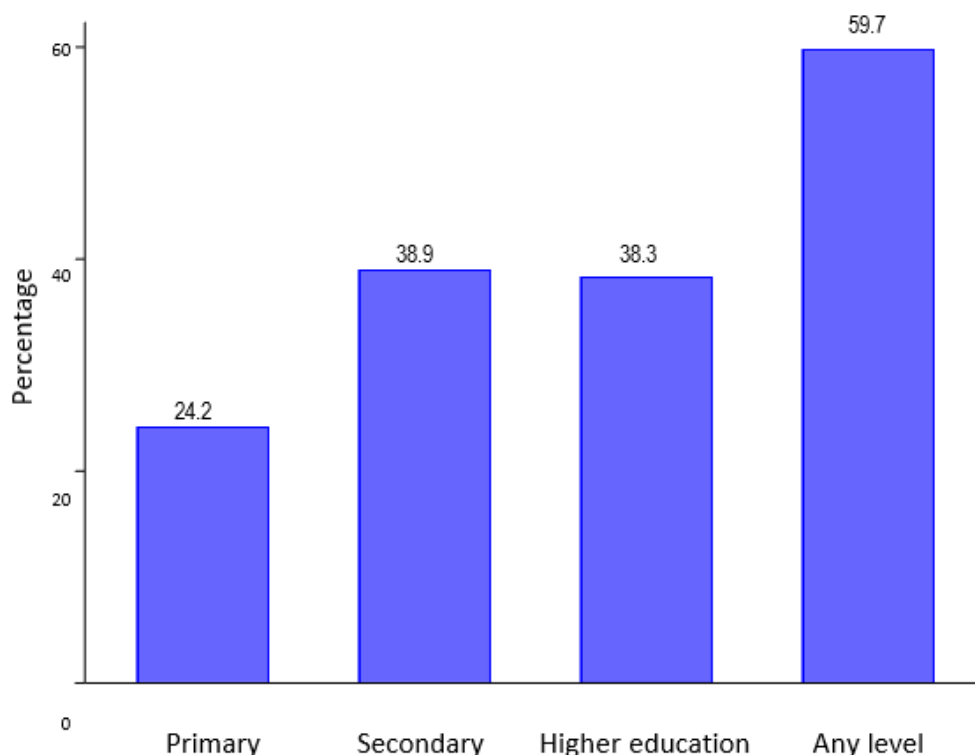
Source: Original calculations for the *World Development Report 2024.*

The findings indicate that the use of CCAS increases with higher education levels, which may be attributed to the assignment problem faced by policy makers at each level. Coordinated systems often rely on standardized test scores, which are more commonly used in the later stages of education. Consequently, the presence of standardized tests may serve as a catalyst for the implementation of coordinated systems in secondary and higher education. By contrast, primary education admissions, which often lack standardized testing, require alternative methods for prioritizing applicants. Addressing this challenge often requires the establishment of complex data-sharing agreements with other government institutions.

Despite the higher prevalence of coordinated systems at higher educational levels, there is a strong correlation in the implementation of a CCAS between primary and secondary education levels—86 percent of countries that have a CCAS in primary education also have one in secondary education. On the other hand, only 47 percent of countries with a CCAS in primary education also have a CCAS in higher education. Similarly, half of the countries that use a CCAS for secondary education also do so for higher education.

These findings may indicate that the infrastructure required for assignment between these educational levels is very similar. Conversely, it could suggest that the infrastructure needed at the higher level differs from what is needed at the primary and secondary levels.

Another possible explanation could be that primary and secondary education are typically governed under the same agency, while higher education is governed by another agency. To that effect, the study examined whether countries with a CCAS for multiple educational levels had a shared managing organization for their CCAS. In order to address the potential variation in managing organizations within countries that have city-level CCAS for a specific educational level, the analysis focused on countries where the CCAS jurisdiction

covered the entire country. Among the ten countries that met this criterion and had a CCAS in both primary and secondary education, the study found that nine of them had the same CCAS managing organization for both levels of education. By contrast, among the seven countries with a CCAS in both primary and higher education, only one shared the same CCAS managing organization for both levels of education.

There has also been a significant increase in the adoption of CCAS, with a notable increment observed over the past two decades (figure 2).[6] Notably, higher education emerged as an early adopter of coordinated systems compared to other educational levels. Conversely, the period between 2020 and 2024 saw a remarkable rise in the adoption rate for primary and secondary education levels, which can be attributed to the need for implementing online application systems during the COVID-19 pandemic, which favored the adoption of coordinated systems.

Figure 2 Number of accumulated countries with a CCAS
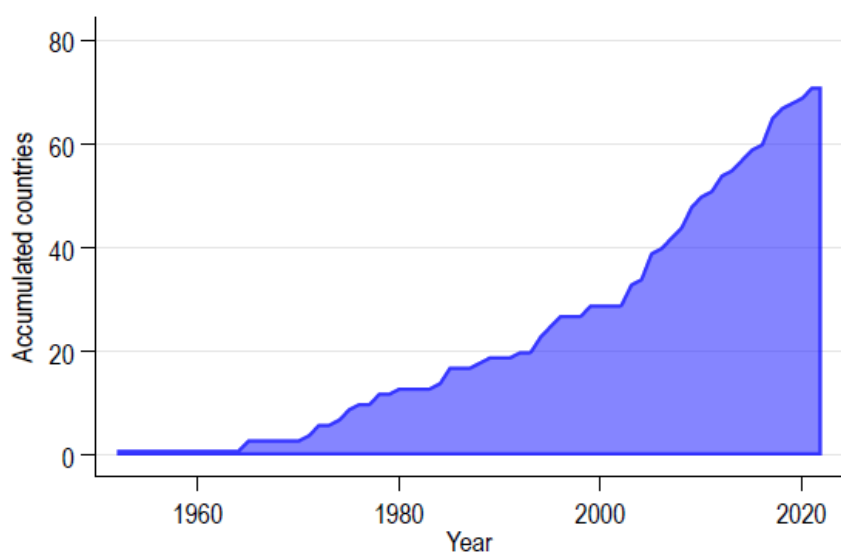
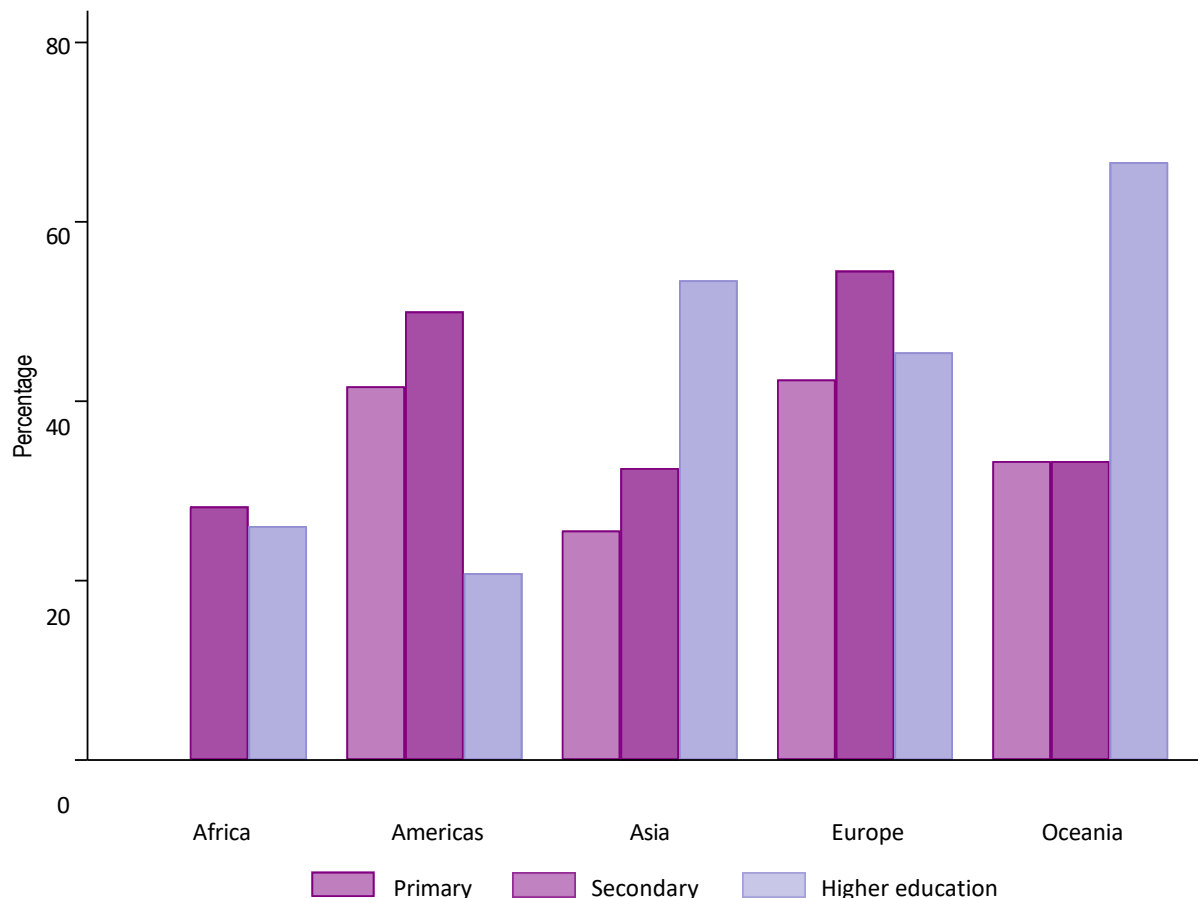*Source:* Original calculations for the *World Development Report 2024.*

There may also be regional patterns in the implementation of CCAS. That is, when one country adopts a CCAS, it influences neighboring countries to follow suit, which can be attributed to several factors. First, countries within the same region often share similarities in their education systems. Therefore, the successful implementation of CCAS in one country can serve as a model for others with comparable systems. Second, information may be more easily disseminated among neighboring countries. Membership in intergovernmental organizations such as the European Union may facilitate the exchange of information and make the implementation process more visible to neighboring countries.

Countries in North and South America have a higher prevalence of CCAS in primary and secondary education compared with higher education (figure 3). This differs from the pattern observed in other geographic regions, where the percentage of countries employing CCAS in primary education is either lower or equal

---

[6] The year of adoption of the CCAS could not be determined in 8 countries for primary education, 18 countries for secondary education, and 12 countries for higher education.

to the percentage of countries using it in secondary or higher education. In Africa, the overall use of CCAS is relatively low, as no country has a CCAS in primary education. On the other hand, in Asia and Oceania, the use of CCAS is more common in higher education.

Figure 3 Percentage of countries with a CCAS by education level

Source: Original calculations for the *World Development Report 2024.*

## 3.1. Correlation between the adoption of CCAS and country characteristics

The analysis below focuses on investigating potential associations between the adoption of CCAS and specific country characteristics, such as GDP per capita, the share public spending on education, transparency, share of the rural population, and internet use.

Figure 4 presents the results of linear regression estimations examining the relationship between the standardized value of each variable and the adoption of CCAS. The coefficients and confidence intervals were calculated individually for each variable while controlling for regional differences.[7]

---

[7] Dummy variables representing each continent were included.

For higher education, none of the coefficients are statistically significant. By contrast, both primary and secondary education exhibit consistent correlation patterns. A positive and statistically significant correlation is observed between the adoption of CCAS and both GDP per capita and the share of internet use, suggesting that countries with higher income and greater internet use are more inclined to adopt a CCAS, as coordinated systems often use online platforms. Conversely, there is a negative and statistically significant correlation between the adoption of CCAS and the share of the rural population, indicating that the adoption of CCAS is more prevalent in urban areas, where demand for education often exceeds the supply and families have multiple school options to consider. It is within these urban contexts that a CCAS can play a more prominent role.

Figure 4 Correlation between standardized variables and the adoption of CCAS by educational level
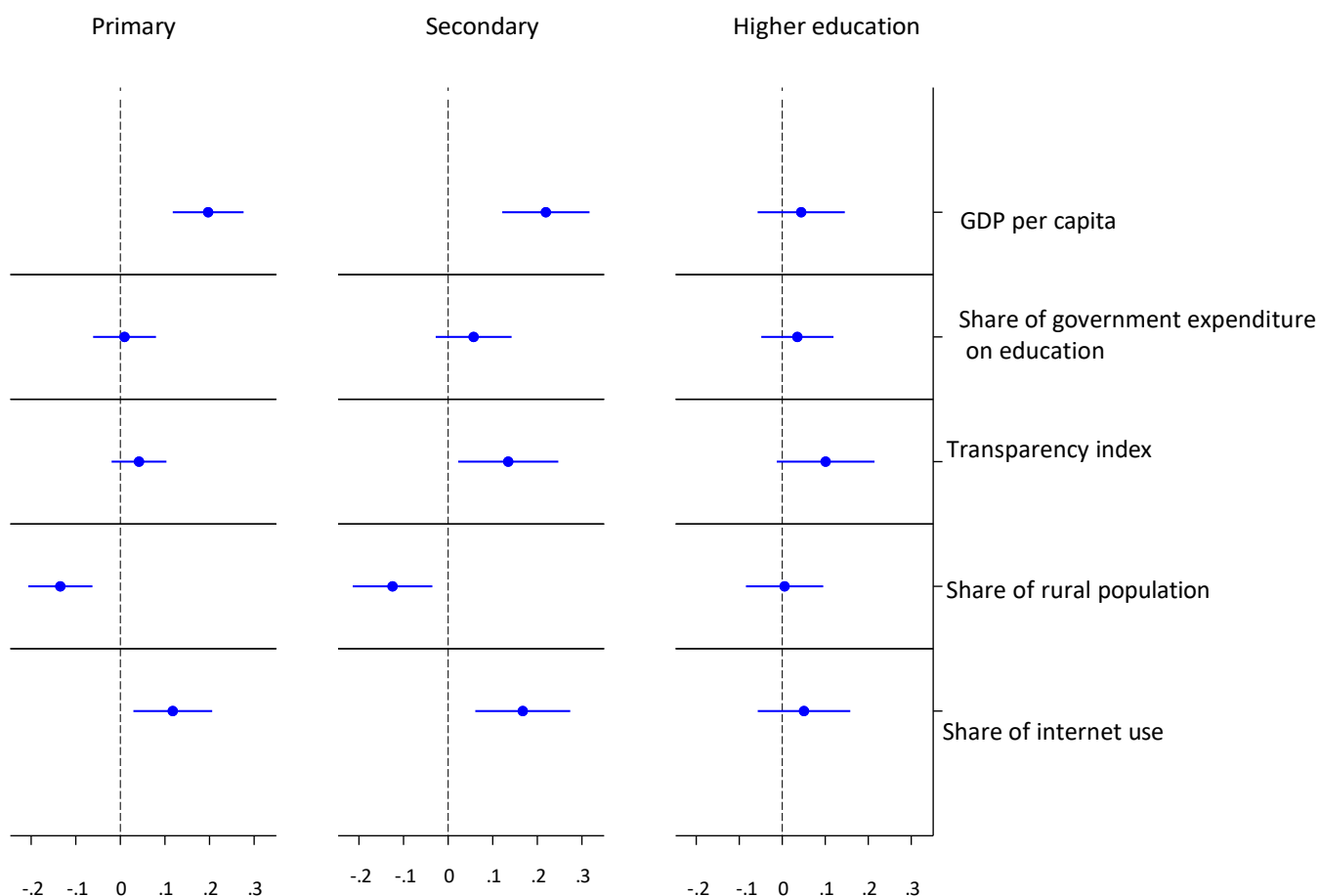
Source: Original calculations for the *World Development Report 2024.* The variables are based on the World Bank's World Inequality Database for June 2023.

Across all three levels of education, no significant association was found between adopting a CCAS and the share of government expenditure on education. In addition, a positive relationship was observed between the transparency index and the adoption of CCAS, although it was not statistically significant for primary and higher education.[8]

4. Characteristics of coordinated systems

In the implementation of a coordinated system, policy makers must carefully consider various properties and features. This section analyzes the specific properties previously outlined, along with other relevant features, all of which play a vital role in shaping the functioning of coordinated systems. Their examination provides valuable information for understanding whether countries are adopting characteristics supported by theoretical and empirical evidence.

4.1. Assignment mechanism

The assignment mechanism used in coordinated systems has been a crucial area of study. Mechanisms such as Deferred Acceptance, Serial Dictatorship, and Top-Trading Cycles have garnered substantial attention and are backed by theoretical and empirical evidence (Abdulkadiroglu, Agarwal, and Pathak 2017; Abdulkadiroglu and Sonmez 2003; Gale and Shapley 1962; Svensson 1999). These mechanisms are deemed strategy-proof, as they incentivize the truthful revelation of preferences. Under these matching mechanisms, truth-telling is a weakly dominant strategy (Dubins and Freedman 1981; Roth 1982), implying that students cannot be better off by ranking schools differently from their true preferences, irrespective of the choices of others. This property is favorable from a mechanism design perspective, ensuring strategic simplicity and a degree of equality, where more sophisticated players gain no strategic advantage over less sophisticated participants (Pathak and Sonmez 2008).

By contrast, the Immediate Acceptance mechanism (also known as the Boston mechanism) is not strategy-proof, making it susceptible to strategic manipulation. With this mechanism, the likelihood of acceptance influences how applicants rank educational institutions. Among the mechanisms that could be classified according to the available information, it is evident that the Immediate Acceptance mechanism prevails in primary and secondary education, while strategy-proof mechanisms dominate in higher education (figure 5; table 1).

The Immediate Acceptance mechanism may be favored due to its simplicity and ease of comprehension for applicants. In addition, policy makers may not be aware of the theoretical and empirical evidence supporting alternative mechanisms. Exploring these factors can provide valuable insights into the decision-making processes of policy makers in the context of coordinated systems.[9]

---

[8] Data for the transparency index were only available for 44 percent of countries in the sample.
[9] In many cases, the mechanism used is categorized as "unknown", either because it was not appropriately described or because it was a type of hybrid system that was not possible to classify.

Figure 5 Percentage of countries by type of assignment mechanism
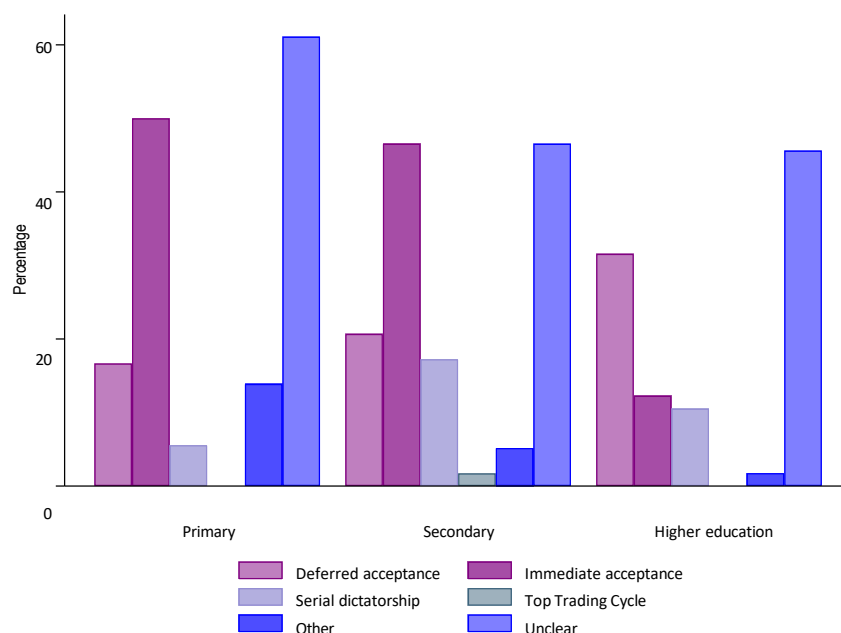
Source: Original calculations for the *World Development Report 2024.*

Table 1 Percentage of countries by type of assignment mechanism

	Full Sample			Nationwide Systems		
	Primary	Secondary	Higher ed	Primary	Secondary	Higher ed
Deferred Acceptance	17	21	32	8	17	29
Immediate Acceptance	50	47	12	58	34	13
Serial Dictatorship	6	17	11	0	14	11
Top Trading Cycle	0	2	0	0	0	0
Other	14	5	2	0	0	2
Unclear	61	47	46	33	34	45
Observations	36	58	57	12	35	55

Source: Original calculations for the *World Development Report 2024.*
Note: See Appendix A for the definition of each mechanism.

In the majority of cases, the mechanism being used generates strategic incentives to consider assignment probabilities and preferences jointly when providing the ranked ordered list to the system (ROL). Even when the mechanism is theoretically designed to encourage truthful preference revelation, strategic behavior may emerge due to other aspects of the mechanism such as limiting the number of ranked options (truncated lists) or imposing restrictions on how options are ranked. Indeed, other broader market design features can also induce strategic incentives, such as penalties for rejection of assigned offers, how non-assignment is dealt within the aftermarket, and other aspects reviewed in the following sections.

4.2. Collecting preferences and restrictions on expressiveness

Restrictions on the number of applications

The length of the preference list in coordinated systems plays a critical role in ensuring the effectiveness of strategy-proof systems. In order for a system to be truly strategy-proof, it is desirable for the preference list to be as long as possible (Calsamiglia, Haeringer, and Klijn 2010; Haeringer and Klijn 2009; Romero-Medina 1998). When applicants are constrained to applying to a limited number of institutions, it may dissuade them from revealing their true preferences, as this is no longer a dominant strategy. However, the repercussions extend beyond truth-telling; evidence suggests that the valuable properties of systems with mechanisms like Deferred Acceptance and Top Trading Cycles—stability in the former and efficiency in the latter—are compromised in a constrained setting (Haeringer and Klijn 2009). Therefore, investigating the length of the preference list is crucial for evaluating a system.

Shorter preference lists are more common in primary and secondary education, whereas higher education tends to have a higher prevalence of lists indicating ten or more preferences (figure 6). While an unlimited number of preferences would be ideal for ensuring strategy-proof systems when strategy-proof mechanisms are in place, only a few countries in the sample have preference lists of this length. In fact, among countries with nationwide CCAS, Chile is the only country with a strategy-proof mechanism and an unlimited list in primary education. Meanwhile, in secondary education, Chile, Hungary, and Romania adopt strategy-proof mechanisms with an unlimited list, while Oman, Papua New Guinea, and Sri Lanka do so for higher education.

Figure 6 Percentage of countries based on the length of the preference list
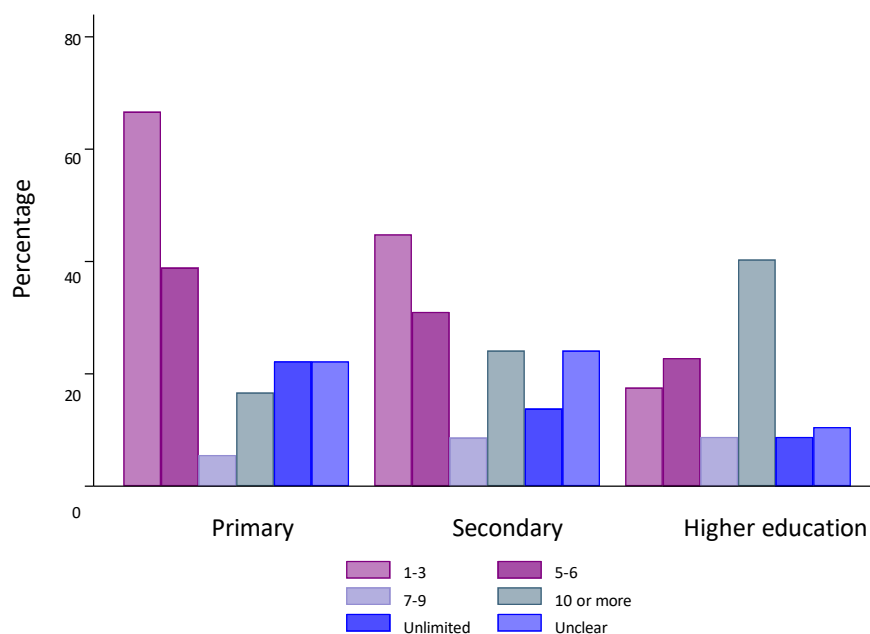
Source: Original calculations for the *World Development Report 2024.*

Restrictions on application granularity

Another design feature is the degree of granularity at which families can communicate their preferences to the mechanism. This is typically a restriction imposed when applications are confined to aggregate categories or sequences, limiting the expressiveness of preference rankings. That is, individuals are not allowed to express their preferences at the level at which they experience them.

In Bogota, Colombia, and Tacna, Peru, families applying to primary and secondary education cannot choose the specific shift for their desired program. Similarly, in Mexico City, families applying to middle school are allowed to indicate their preferences for schools but with the possibility of being assigned to another shift during the allocation process (Fabregas 2023). By contrast, China adopts a multi-step approach where applicants are initially assigned to colleges, and subsequently, each college manages the assignment of applicants to faculties (Zhu 2014).

These limitations on preference expression not only introduce strategic considerations but may also lead to inefficiencies and inequity. Despite their potential impact, the existing literature has not explored the effects of the restrictions. A comprehensive understanding of how these constraints influence the dynamics of strategy-proof mechanisms is essential for evaluating the effectiveness of the system and identifying possible refinements.

4.3. Platform coverage and off-platform options

The extent of coverage of centralized systems directly influences their efficiency, with broader coverage enabling applicants to rank all the options they genuinely consider throughout the application process. While almost all countries with a coordinated system in higher education have national coverage, there is a higher prevalence of city-level systems in primary education (table 2).

Table 2 Percentage of countries with nationwide coverage and coverage limited to specific cities, by educational level

	Primary	Secondary	Higher ed
Nationwide (%)	33	60	96
Specific cities (%)	67	40	4
Number of observations	36	58	57

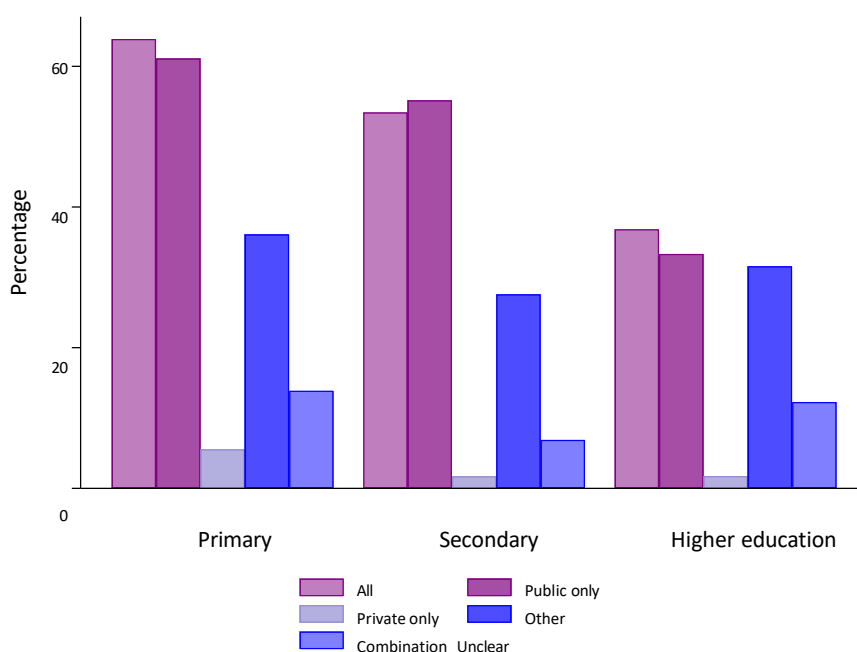*Source:* Original calculations for the *World Development Report 2024.*

When assessing the coverage of coordinated systems, it is important to consider the on- and off-platform options available. The presence of an off-platform sector can potentially limit the success of the coordinated system, as students may relinquish their assignments in favor of programs that did not participate in the coordinated process. These decisions lead to the use of wait lists and aftermarkets, which can be inefficient due to the presence of congestion and matching frictions. Kapor, Karnani, and Neilson (2022) highlight how off-platform options can create inefficiencies in the higher education sector in Chile.

To gain insights into the availability of on-platform options, the study collected information on the types of institutions participating in the CCAS. More than half of countries have at least one CCAS with full coverage,

especially in primary and secondary education (figure 7). At these educational levels, a significant percentage of countries have at least one CCAS that includes exclusively public institutions. In China and India, the CCAS in primary education only includes private institutions, while India also includes private institutions in secondary education. Similarly, in higher education, the Arab Republic of Egypt has a CCAS system that exclusively includes private institutions.

The large presence of full coverage in primary and secondary education is because a large number of countries have at least one city with full coverage CCAS. In fact, when countries with nationally coordinated systems are analyzed, the percentage of countries with full coverage decreases considerably (see Appendix B). Among countries with a CCAS with national coverage, there is increased full coverage in higher education, while primary and secondary CCAS tend to have only public institutions on the platforms. The evidence presented reveals notable variations of coordinated systems. While higher education systems commonly exhibit nationwide coverage and full institutional participation, primary and secondary education systems tend to have more limited coverage. These findings emphasize the importance of further exploring the factors that influence regional coverage and institutional participation in coordinated systems.

**Figure 7 Percentage of countries by institutional coverage**

Source: Original calculations for the *World Development Report 2024.*

4.4. Priority criteria

When there is an excess demand for educational institutions, priority criteria are used to determine the admission of students. In general, educational institutions are not allowed to define their own criteria, which are typically set by a government body.[10] However, in some cases, educational institutions are given the freedom to define the order and/or weight of each criterion. In addition, in certain scenarios, criteria are used to design affirmative action policies, implementing quotas reserved for underrepresented students with certain characteristics.

In primary education, the prevailing criteria prioritize family logistics and proximity to the institution (figure 8). The former criteria take into account factors such as already having siblings enrolled in the school or being related to school staff. Assuming that families who have existing connections to the school or live nearby value it more highly than other schools, the inclusion of these criteria allow applicants to signal the intensity of their preferences.[11] To optimize student-school allocation from a welfare standpoint, it is crucial not only to collect ordered preference lists from applicants but also to measure differences in the attractiveness of school options for different students with the same order. While prioritizing admission based on these characteristics may enhance welfare, the inclusion of distance criteria could potentially contribute to residential segregation.

Figure 8 Percentage of countries by type of priority criterion used
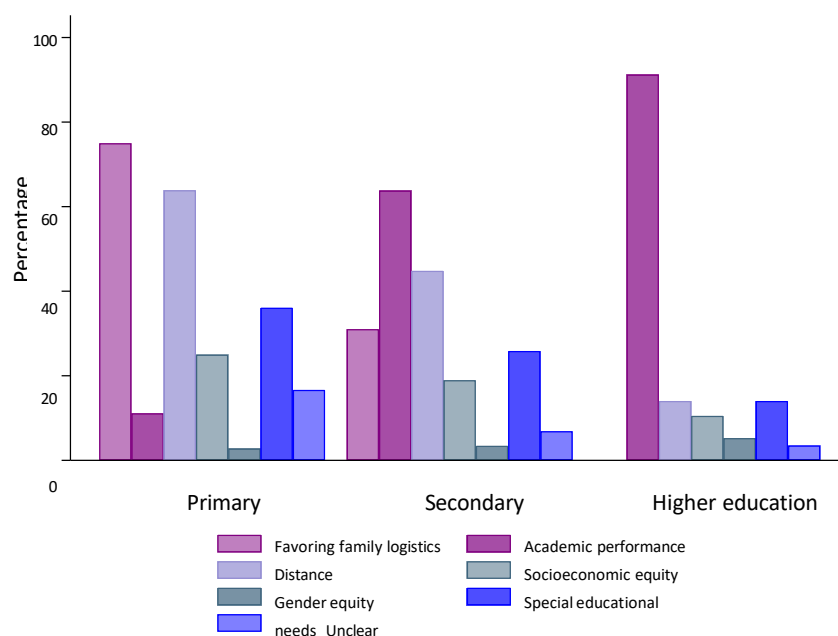
Source: Original calculations for the *World Development Report 2024.*

---

[10] There are only seven, eight, and three countries with at least one CCAS in primary, secondary and higher education, respectively, where the priority criteria are set by each institution. These CCASs are excluded from the analysis.
[11] These criteria compensate, to some extent, for the lack of ability in most school assignment systems for applicants to express the intensity of their preferences. The challenge lies in the fact that a majority of school assignment systems either lack the provision for applicants to signal the intensity of their preferences, or the systems that do so compromise on strategy-proofness.

In secondary and higher education, the primary criteria used is academic performance, which typically includes standardized test scores and grades. Academic performance is often seen as a reliable indicator of an individual's readiness and ability to succeed, especially in higher-level educational programs. Consequently, prioritizing students based on their academic performance can help ensure that the limited spaces in these institutions are allocated to those who have shown the greatest aptitude and preparation for advanced studies.

The conclusions hold when analyzing the most important priority criterion in the assignment of vacancies, among those systems where a dominant criterion could be obtained (see Appendix C).

4.5. Timing of applications and provision of information

The timing and periodicity of preference submissions is a crucial design element influencing rankings and eventual matching outcomes. While the majority of systems adhere to static mechanisms, limiting applicants to a single application, some opt for a sequential approach, allowing applicants to apply multiple times. Theoretical and experimental evidence suggests that sequential mechanisms, as observed in college admissions in Brazil (Machado and Szerman 2021), China (Chen and Kesten 2017), and Germany (Bó and Hakimov 2022), can enhance welfare compared to their static counterparts (Bó and Hakimov 2020; Klijn, Pais, and Vorsatz 2019). Despite their potential benefits, sequential mechanisms are not as prevalent, potentially due to the practical challenges of requesting parents to update preferences in multiple rounds, thereby imposing a significant burden on households.

Additionally, the temporal alignment of the application period with events determining chances of admission, typically standardized exams in secondary and higher education, plays a crucial role. In the majority of countries, students know their exam results before submitting their preferences, enabling them to assess the strength of their academic standing. However, exceptions exist where applications precede the disclosure of exam results, as seen in some Chinese provinces (Chen and Kesten 2017), Ghana (Ajayi 2022), Kenya (Makori et al. 2015), Mexico City (Bobba and Frisancho 2022), and Nigeria. Similarly, students in Victoria, Australia, apply to higher education before exam scores are revealed, with the flexibility to revise applications after scores are revealed (Artemov, Che, and He 2017). Submitting preferences before obtaining examination results introduces a significant reliance on the self-perception of applicants about their academic achievements, potentially leading to errors in the application process (Artemov, Che, and He 2017; Tincani, Kosse, and Miglino 2022).

While self-assessment of academic performance is a significant factor, beliefs about the chances of admission can shape the strategies of applicants within systems employing both strategic and strategy-proof mechanisms (Arteaga et al. 2022; Kapor, Neilson, and Zimmerman 2020). Applicants often have misconceptions about their chances of admission, particularly among individuals from less privileged backgrounds (Hoxby and Avery 2012; Kapor, Neilson, and Zimmerman 2020).

To meet these challenges, informative interventions have emerged in recent years and play a fundamental role. In Chile, Israel, and Kenya, their higher education systems publicly report cut-off scores from previous years. In Brazil and Croatia, their higher education systems simulate assignments and provide information about cut-offs before the application period concludes, empowering applicants to make informed changes. Additionally, in Chile's primary and secondary education, the system provides live feedback on the chances of admission during the application process, thereby improving students' chances of admission (Arteaga et al. 2022).

5. Conclusion

This paper provides a comprehensive documentation of how CCAS are being implemented as policy in education markets worldwide and offers two main contributions. First, it highlights the rise in the adoption of these systems, finding that as of 2023, 60 percent of the 149 countries examined in the study regulate access to education through coordinated choice and assignment mechanisms—a number that has almost doubled in the last decade. The trend towards digital platforms that coordinate supply and demand through a transparent set of rules has the potential to improve welfare and presents an opportunity to implement regulations that enhance equity and efficiency.

The prevalence of CCAS underscores the practical relevance for education researchers and policy makers to be informed about mechanism design theory and the growing empirical literature on market design in education markets. At the current rate of adoption, a simple extrapolation suggests that in the near future, the majority of the world's students will gain access to education by making choices online and interacting with algorithms that determine what, if any, options they have. Understanding how to best implement these systems in practice and how to ensure efficiency and equity is an important policy-relevant research agenda.

The paper focuses on documenting the mechanism and priorities used, as well as a subset of other common policy design choices that can introduce strategic incentives in the way families interact with the system. These include how families are allowed to communicate their preferences, such as restrictions on the number of applications or on the granularity of what they can choose. The existence of off-platform options and the rules that govern participation across platforms, as well as dynamic considerations regarding rejection, re-entry, and rules related to the aftermarket are also important policy choices that can introduce strategic incentives.

The second important contribution is to show that practical applications of market design "in the wild" display considerable heterogeneity along multiple dimensions. In many contexts, this means there are straightforward ways to improve policy outcomes simply by using the available theory and evidence. At the same time, further research is needed to better understand observed policy behaviors. The study of different designs used in practice generates valuable data for researchers and offers insights for policy makers considering adoption and implementation of best practices in their own contexts.

Finally, when looking at the broader game families face when seeking access to education options, the data show that strategic considerations are the norm and not the exception. This finding suggests the importance of implementing a robust and transparent information system that helps participants understand the rules and procedures, as well as the options and assignment probabilities.

References

Abdulkadiroglu, Atila and Tayfun Sonmez. 2003. "School Choice: A Mechanism Design Approach." *American Economic Review* 93 (3): 729–747.

Abdulkadiroglu, Atila, Nikhil Agarwal, and Parag A. Pathak. 2017. "The Welfare Effects of Coordinated Assignment: Evi- dence from the New York City High School Match." *American Economic Review* 107 (12): 3635–89.

Abdulkadiroglu, Atila, Parag A. Pathak, Alvin E. Roth, and Tayfun Sonmez. 2005. "The Boston Public School Match." *American Economic Review* 95 (2): 368–371.

Abdulkadiroglu, Atila, Parag A. Pathak, and Alvin E. Roth. 2009. "Strategy-Proofness versus Efficiency in Matching with Indifferences: Redesigning the NYC High School Match." *American Economic Review* 99 (5): 1954–78.

Agarwal, Nikhil, and Paulo Somaini. 2018. "Demand Analysis Using Strategic Reports: An Application to a School Choice Mechanism." *Econometrica* 86 (2): 391–444.

Ajayi, Kehinde F. 2022. "School Choice And Educational Mobility: Lessons from Secondary School Applications in Ghana." *Journal of Human Resources*. Available at https://jhr.uwpress.org/content/wpjhr/early/2022/03/31/jhr.0417-8714R2.full.pdf.

Arteaga, Felipe, Adam J. Kapor, Christopher A. Neilson, and Seth D. Zimmerman. 2022. "Smart Matching Platforms and Heterogeneous Beliefs in Centralized School Choice." *Quarterly Journal of Economics* 137 (3): 1791–848.

Artemov, Georgy, Yeon-Koo Che, and Yinghua He. 2017. "Strategic Mistakes: Implications for Market Design Research." Available at https://wpcarey.asu.edu/sites/default/files/documents/ach_mistakes.pdf.

Black, Sandra E., Jeffrey T. Denning, and Jesse Rothstein. 2023. "Winners and Losers? The Effect of Gaining and Losing Access to Selective Colleges on Education and Labor Market Outcomes." *American Economic Journal: Applied Economics* 15 (1): 26–67.

Bó, Inácio, and Rustamdjan Hakimov. 2020. "Iterative Versus Standard Deferred Acceptance: Experimental Evidence." *Economic Journal* 130 (626): 356–392.

Bó, Inácio, and Rustamdjan Hakimov. 2022. "The Iterative Deferred Acceptance Mechanism." *Games and Economic Behavior* 135: 411–433.

Bobba, Matteo, and Veronica Frisancho. 2022. "Self-Perceptions about Academic Achievement: Evidence from Mexico City," *Journal of Econometrics* 231 (1): 58–73.

Calsamiglia, Caterina and Maia Güell. 2018. "Priorities in School Choice: The Case of the Boston Mechanism in Barcelona." *Journal of Public Economics* 163: 20–36.

Calsamiglia, Caterina, Guillaume Haeringer, and Flip Klijn. 2010. "Constrained School Choice: An Experimental Study." *American Economic Review* 100 (4): 1860–874.

Chen, Yan, and Onur Kesten. 2017. "Chinese College Admissions and School Choice Reforms: A Theoretical Analysis." *Journal of Political Economy* 125 (1): 99–139.

Dubins, Lester E., and David Aa Freedman. 1981. "Machiavelli and the Gale-Shapley Algorithm." *American Mathematical Monthly* 88 (7): 485–494.

Ergin, Haluk, and Tayfun Sonmez. 2006. "Games of School Choice under the Boston Mechanism." *Journal of Public Economics* 90 (1-2): 215–237.

Fabregas, Raissa. 2023. "Trade-offs of Attending Better Schools: Achievement, Self-Perceptions and Educational Trajectories." *The Economic Journal* 133 (655): 2709–737.

Gale, David, and Lloyd Shapley. 1962. "College Admissions and the Stability of Marriage." *The American Mathematical Monthly* 69 (1): 9–15.

Haeringer, Guillaume, and Flip Klijn. 2009. "Constrained School Choice." *Journal of Economic Theory* 144 (5): 1921–947.

Hoxby, Caroline M., and Christopher Avery. 2012. "The Missing One-Offs: The Hidden Supply of High-Achieving, Low Income Students." NBER Working Paper 18586, National Bureau of Economic Research, Cambridge, MA.

Kapor, Adam J., Christopher A. Neilson, and Seth D. Zimmerman. 2020. "Heterogeneous Beliefs and School Choice Mechanisms." *American Economic Review* 110 (5): 1274–315.

Kapor, Adam, Mohit Karnani, and Christopher Neilson. 2022. "Aftermarket Frictions and the Cost of Off-Platform Options in Centralized Assignment Mechanisms." NBER Working Paper 30257, National Bureau of Economic Research, Cambridge, MA.

Kesten, Onur. 2012. "On Two Kinds of Manipulation for School Choice Problems." *Economic Theory* 51: 677–693.

Klijn, Flip, Joana Pais, and Marc Vorsatz. 2019. "Static versus Dynamic Deferred Acceptance in School Choice: Theory and Experiment." *Games and Economic Behavior* 113: 147–163.

Machado, Cecilia, and Christiane Szerman. 2021. "Centralized College Admissions and Student Composition." *Economics of Education Review* 85: 102184.

Makori, Andrew, Gladys Onyura, Fredrick Cheboiwo, Jane Yegon, and Joseph Kandie. 2015. "Form One Selection Process, An Encouragement or A Discouragement: Examining Parents' Perceptions in Baringo County, Kenya." *Merit Research Journal of Education and Review* 3 (7): 228–234.

Pathak, Parag A. 2017. "What Really Matters in Designing School Choice Mechanisms." *Advances in Economics and Econometrics* 1 (12): 176–214.

Pathak, Parag A., and Tayfun Sonmez. 2008. "Leveling the Playing Field: Sincere and Sophisticated Players in the Boston Mechanism." *American Economic Review* 98 (4): 1636–652.

Romero-Medina, Antonio. 1998. "Implementation of Stable Solutions in a Restricted Matching Market." *Review of Economic Design* 3: 137–147.

Roth, Alvin E. 1982. "The Economics of Matching: Stability and Incentives." *Mathematics of Operations Research* 7 (4): 617–628.

Svensson, Lars-Gunnar. 1999. "Strategy-Proof Allocation of Indivisible Goods." *Social Choice and Welfare* 16: 557–567.

Tincani, Michela Maria, Fabian Kosse, and Enrico Miglino. 2022. "Subjective Beliefs and Inclusion Policies: Evidence from College Admissions." CEPR Discussion Paper 17177, Centre for Economic Policy Research, Paris.

Zhu, Min. 2014. "College Admissions in China: A Mechanism Design Perspective." *China Economic Review* 30: 618–631.

Appendix A: Definition of mechanisms

Coordinated systems work with two types of ranking lists. On the one hand, there is the list made by the applicants where they identify the educational institutions in the order of their preference. On the other hand, the educational institutions order the applicants according to the priority criteria. A dilemma arises here: which should be considered first: the preference of the applicants or the priority criteria? The mechanisms answer this question differently.[1]

Immediate Acceptance

The Immediate Acceptance mechanism, also known as the Boston mechanism, prioritizes the preferences of the applicant. It begins by assigning—for each educational institution— only those who selected it as their first choice. If the program still has vacancies after that, it proceeds with those applicants who designated it as their second choice, and so forth until all vacancies are assigned or until all applicants are assigned, whichever occurs first.

Deferred Acceptance

The Deferred Acceptance mechanism privileges the ordering of applicants by the educational institution and assigns provisional vacancies according to this list that will be secured at the end of the process. In the first stage, the algorithm considers the application of each applicant to his or her preferred institution, ordering the ones who applied as first preference according to the priority criteria, and pre-accepting the applicants at the top of the list, until the vacancies are filled. Next, all applicants who were not pre-accepted are automatically re-considered as if they chose the institution as their second preference. Institutions then reorder their list of applicants based on the priority criteria. If second-preference applicants are ranked higher than previously pre-accepted applicants, then second-preference applicants are pre-accepted, leaving out first-preference applicants. In other words, they are reordered regardless of whether they applied to that institution as a first or second preference, which makes it a strategy-proof mechanism. The algorithm continues iterating successively until it reaches the last preference of the applicants who have no assignment.

Serial Dictatorship

The Serial Dictatorship mechanism works in a similar way to the Deferred Acceptance mechanism in that it privileges the order of applicants according to priority criteria. But under the Serial Dictatorship mechanism, all educational institutions order the applicants in the same way, which in practice generates a single list of applicants according to the priority criteria. The applicant at the top of the list is assigned first, and assigned to his or her first preference. The second applicant is then assigned on the list, and so forth, assigning each applicant to his or her highest preference that still has vacancies. The process continues until all vacancies are assigned or until all applicants are assigned, whichever occurs first.

Top Trading Cycles

The Top-Trading Cycles mechanism initially assigns applicants in the same way that the Deferred Acceptance mechanism does but it then introduces a unique twist by incorporating an iterative trading phase among students. That is, the algorithm identifies cycles of students who can mutually benefit from the exchange

---

[1] For a more detailed description of each mechanism and its properties, see Abdulkadiroglu et al. (2005), Abdulkadiroglu, Pathak, and Roth (2009); Abdulkadiroglu and Sonmez (2003); Kesten (2012); and Roth (1982).

of assignments. These cycles represent groups of students who, by exchanging their current assignments, can each secure a more preferred option. For example, a student with a low preferred assignment has the opportunity to swap with another student who prefers the first student's assignment, but he or she is not assigned there because he or she has a low priority at that school. If both students benefit from the exchange, the mechanism performs the exchange. This iterative trading continues until no further mutually beneficial exchanges can be made.

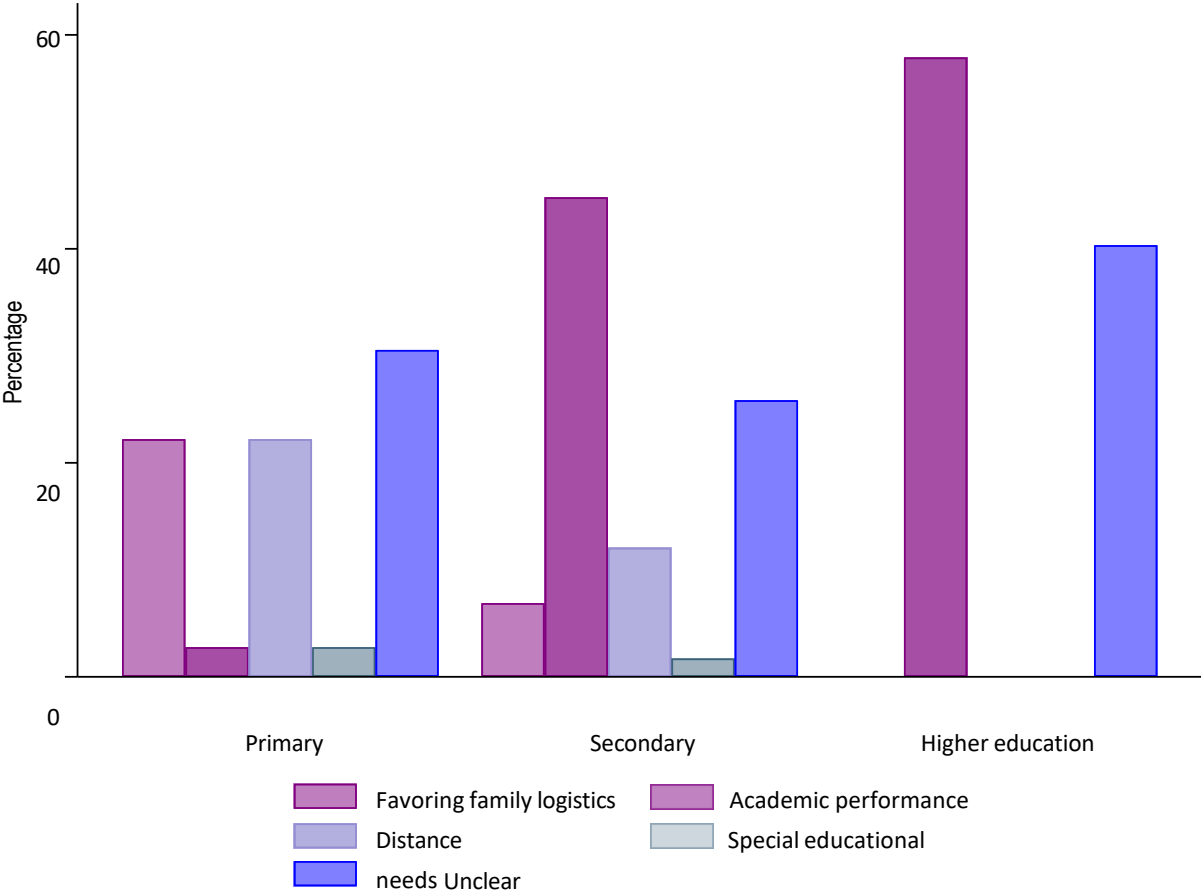# Appendix B: Institutional coverage for nationally coordinated systems

Figure B1 Percentage of countries by institutional coverage, nationally coordinated systems
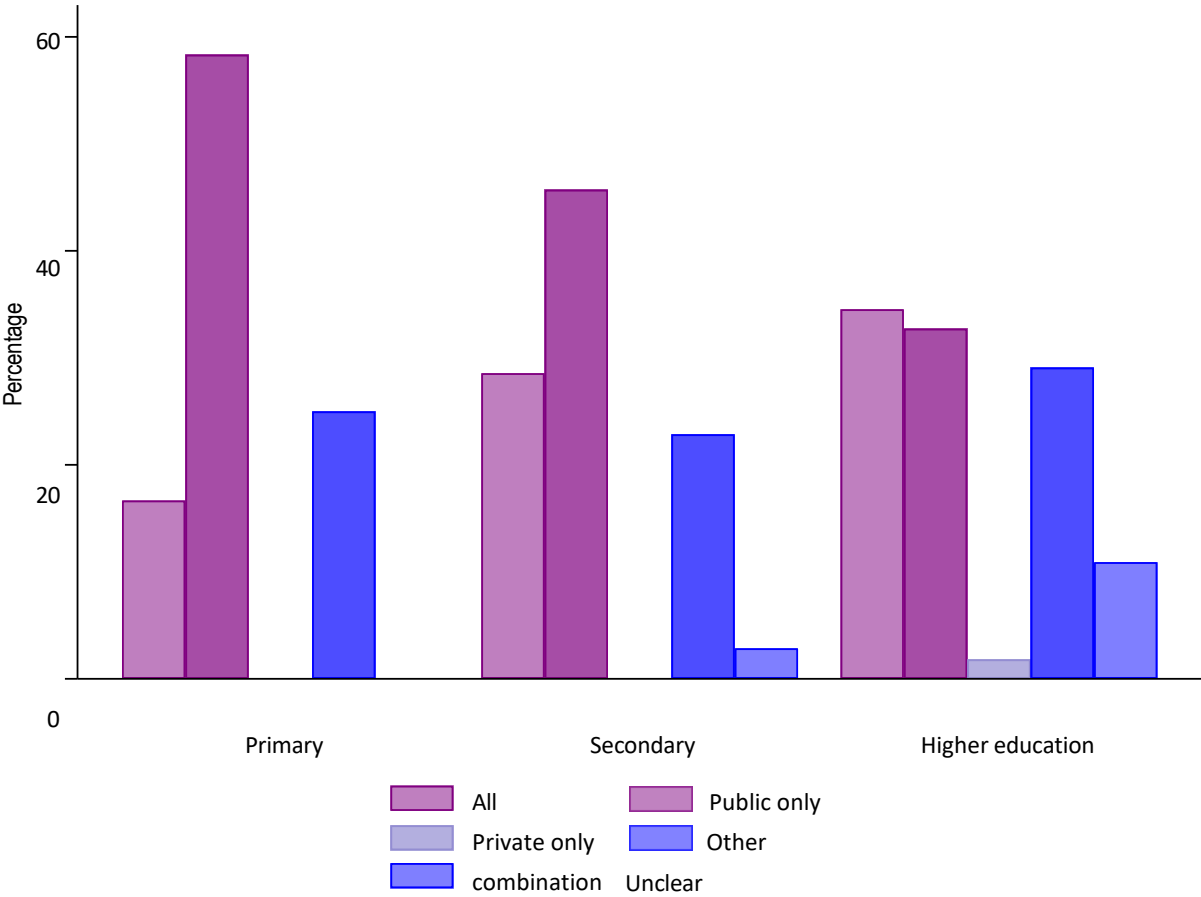
Source: Original calculations for the *World Development Report 2024.*

Appendix C: Dominant priority criteria in seat allocation

Figure C1 Percentage of countries by dominant priority criteria in seat allocation

Source: Original calculations for the *World Development Report 2024.*