Centralized Student Choice and Assignment Systems in Primary and Secondary Education in China*

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Abstract

The adoption of centralized student choice and assignment systems (CCAS) has been on the rise worldwide. In the past two decades, China has witnessed escalating adoption of CCAS in secondary and primary education across cities. This paper documents the existence and characteristics of CCAS in 134 major cities in China as of 2022, and traces the adoption trend over time. High school CCAS were established between 2003 and 2022, and erupted during 2010-2016. The majority primarily employ the Chinese parallel mechanism (within-batch serial dictatorship), and a much lower but still significant number execute Boston and Deferred Acceptance. New CCAS for compulsory education concentrated around 2020, after the policy of synchronized admission between public and private schools was enforced in 2019.

Keywords: Education Market, Labor, School Choice, Matching Mechanisms

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I Introduction

A Centralized Choice and Assignment System (CCAS) in the context of education is defined by the simultaneous existence of educational institutions whose enrollment is at least partially determined by an external agency or platform, applicants who submit a list of their preferences to the agency, and the agency being authorized to give the applicants a single offer, using certain criteria and allocation rules. Neilson (2019) documents the rise of CCAS in primary, secondary and tertiary education markets worldwide, and increasing research is being conducted on characteristics of existing CCAS (e.g., time of establishment, form of preference list, assignment mechanisms) and how they can be designed to promote education equity (Akbarpour et al., 2022; Arteaga et al., 2022; Kapor, Neilson and Zimmerman, 2020).

The study of worldwide CCAS encourages investigation into various school admission systems and identify more effective approaches under different socioeconomic circumstances. Constituting almost 20 percent of the world population, educating 291 million students, employing 18 million teachers (Ministry of Education of the PRC, 2022) and operating under a political regime with high governance efficacy, China is of particular research interest due to both the scope of potential impact that could be generated by educational reforms and the depth of insights its experience can provide for other parts of the world.

This is the first paper to identify the current existence and characteristics of CCAS in China on the secondary and primary education levels.[1] It complements three branches of literature on the Chinese college admission system that centers around the college entrance exam (the Gaokao), the history of Chinese education policy, and optimal matching mechanisms in education markets.

The Gaokao, a nationally centralized examination conducted annually by the government and administered at the provincial level, plays a pivotal role as the primary determinant of students' priority rankings in college admissions. In recent years, there has been a discernible upward trend in its dominance over all other factors in the ranking function. High school graduates compete with peers within the the province for seats in universities and colleges nationwide. China adopted a centralized admission system for its tertiary education in 1952, as the Ministry of Education (MoE)'s response to several weaknesses in the previous system: a low enrollment-to-admissions ratio due to non-single assignments of seats, unjust deprivation of higher education opportunities for qualified individuals caused by a manipulable mechanism, and the success of regional centralization attempts by 73 universities in 1950 (Chen and Kesten, 2017; Yang, 2007). Chen and Kesten (2017, 2019) provide detailed descriptions of the system and document the evolutionary trajectory of the Chinese college admission mechanism, focusing on the transition from "sequential" to "parallel" mechanisms towards minimizing manipulation. Due to its longevity and scope, the admission system of tertiary education has been the most thoroughly researched CCAS in China, if not the only one. Additionally, there are a myriad of studies that scrutinize the Gaokao system from

[1] In China, primary school education typically lasts 6 years, middle school 3 years, and high school 3 years. Primary and middle school education constitute 9 years of compulsory education. They are often addressed by and subject to the same policy document issued by the local Bureau of Education, therefore in this paper they are jointly discussed. Secondary education refers to both middle and high school, which can interchangeably be called junior and senior secondary school, respectively. High schools follow a separate policy document. The term "basic education" refers to 12 years of primary, middle, and high school education.

different vantage points (Liu, 2013; Gierczyk and Diao, 2021) and more that exploit the Gaokao data to estimate returns to elite higher education (Jia and Li, 2021) and other phenomena like intergenerational belief transmission (Roland and Yang, 2017). Although these studies do not directly analyze the tertiary CCAS, they often provide a detailed characterization of the college admission system and attest to the importance of CCAS research.

On the other hand, there are few papers examining the admission systems at lower education levels in China and none focusing on the admission process itself, where a CCAS would be identified should it exist. Literature on basic education comprises a comprehensive overview of the Chinese education system, including its organization, government institutions, statistics on teachers, students, curriculum and teaching, along with its recent major policies and reforms (OECD, 2016; Zhou, 2021). Guo, Huang and Zhang (2019) provide a literature review of research on education return, quality, and equity in China. However, no study has explicated extant procedures which a typical Chinese parent abides by to enroll their child (or children) in a primary, middle, or high school, and subsequently how students are matched with schools. Analyzing the establishment of CCAS over time across cities, this paper also contributes to forming an up-to-date historical narrative for education policy shifts with an emphasis on the transition from a decentralized system to a centralized one (see Appendix Section A.3 for a brief history of Chinese high school admission policy before 2010[2] and Tsang (2000) for a detailed recount of the evolution of education policies in China from 1949 to 2000).

In this paper, I trace the municipal school admission policies of 134 Chinese cities whose population exceeded 1 million in 2020. As of 2022, 129 of these cities have a CCAS for high school admission, and 114 a CCAS for primary and middle school (compulsory education) admission. A cross sectional data set documenting characteristics of existing CCAS is collected from aggregating information from municipal bureaus of education, local news and blogs.

I find that the adoption of CCAS for high school admission occurred between 2003 and 2022, and erupted between 2010 and 2016. There is some preliminary evidence for a correlation between higher gross regional product per capita or city population and an earlier adoption of a CCAS. The adoption of CCAS for primary and middle school happened later than those for high schools overall, with the first switch happening in 2010 and the majority (105 out of 114) occurring after 2019. This was stimulated by the national policy unifying public and private school admission first announced in 2018, then reemphasized in 2019.

I then summarize the cross-sectional data set documenting the characteristics of existing CCAS. At the high school level, the majority of the CCAS cover both public and private schools. List lengths vary greatly across cities. Of the 73 cities whose mechanisms I document, more than half primarily employ the Chinese parallel (within-batch serial dictatorship) mechanism, despite the proven superiority of the deferred acceptance (DA) (Gale and Shapley, 1962; Abdulkadiroğlu and Sönmez, 2003; Chen and Sönmez, 2006; Ergin and Sönmez, 2006). Boston and DA each comprise about 13 percent. A combination of SD and Boston is implemented by about 8 percent of the cities. The rest 7 percent allow students to adjust their submitted preferences before a certain

[2]This subsection is heavily drawn and translated from Zheng, Chengyue (2018).

deadline, and some, according to real-time information updated from aggregating all preference submissions. There are minor variations in break-tie rules and priority groups across cities, but they are stable and predictable on the larger scheme.

The case for primary and middle schools is quite different due to the nature of compulsory education. Cities approach the coordination between public school and private school admission heterogeneously. Students who wish to attend a public school are often required to submit one preference or none. Those who apply to private schools can indicate one desired school. If the number of students who apply to a given private school is smaller than or equal to the number of seats offered, all applicants are admitted; if greater, the school admits randomly until the seats are filled. In addition to using household registry eligibility criteria to decide the initial priority of students, a new option of tying siblings together in the assignment process is stated in response to China's recent effort to shift away from "one-child policy."

The paper proceeds as follows. Section 2 details the data structure and data collection methods. Sections 3 and 4 provide descriptive statistics and a narrative for the gradual expansion of CCAS in high school and compulsory education in 21st-century China. Sections 5 and 6 summarize characteristics of existing CCAS in the two types of education as of 2022. Section 7 concludes. Standard regulations ad procedures of basic education enrollment are explicated in the appendix.

II Data

I construct a cross-sectional data set on 134 Chinese cities documenting the existence and characteristics of CCAS in primary and secondary education in 2022.[3] These cities were selected due to their populations exceeding 1 million in 2020.[4] Variables in this data set include: existence of a CCAS, participating institutions, list length, website to apply, implementation year of the current CCAS, priority groups, and mechanisms (deferred acceptance, Boston, serial dictatorship, etc.)

City level and sub-city district level CCAS covering both public and private schools, or city level CCAS covering only public schools, all qualify for the existence of a CCAS in a given city, though they will be differentiated in further analyses. Participating institutions concern the coverage of the CCAS with respect to public and private schools. List length is the number of school choices a student can submit in their application to the centralized platform to indicate their preferences. The same length may vary in meaning according to different mechanisms. The website to apply is where a parent can log in, enter their children's required information, and submit a preference list if required. It is usually a government website, but some entries in the data set are aggregator websites that contain the destination website - this would occur when the ultimate website itself cannot be found, when

[3]There are a few exceptions where I use the policy document from 2023 or 2021 because the document for 2022 is not available.

[4]City population data were retrieved from the citypopulation website. Statistics are based on the 2020 census. I exclude the listed Wanzhou District of Chongqing and Changsha Xian of Changsha. Chongqing is a provincial-level municipality, and Wanzhou is a sub-city region. Including Wanzhou would mean also including sub-city districts with over a million population in other provincial-level municipalities like Shanghai, Beijing, and Tianjin, which would deviate from our original intention of examining the city level only. Changsha Xian was omitted for the same reason. A more important reason for this decision is that CCAS are usually organized on the level of these provincial-level municipalities, whose Chinese names end in "city" ("shi").

there are multiple sites to apply, or when the means of application is not a website but a WeChat official account or app. Including priority groups and mechanisms, the aforementioned variables are usually present in the publicly available policy documents, often termed as "Guiding Opinions on xxx City's Compulsory/High School Education Enrollment in 2022," published and distributed by the municipal Bureau of Education. Ministerial sources are supplemented by blogs and news when official sources are unavailable or deficient in detail. These sources tend to also be credible because they were mostly written by educational institutions or individuals to instruct local parents on the application procedures. There is high redundancy in content and wording among different unofficial sources, suggesting the prevalent practice of plagiarism on the internet but also a high chance that they originated from a small set of sources, which are likely official government sources.

The identification of CCAS in China's mandatory education hinges on the city's regulations governing applications across public and private schools. Specifically, whether students are permitted to apply to both public and private schools and whether the admissions processes in the two systems are independent become the key inquiries and thereby my main search terms on Baidu.[5] This simplification is made possible by the system's assurance that eligible children will be guaranteed a school seat, and they will not be assigned to more than one public school at any stage of the application process.

For high school admissions, the public/private school distinction becomes less significant. The application for both kinds of schools are often integrated into the same admission system with the only distinction being their batches, which are associated with the order in which schools admit students. Sometimes public and private schools are even pooled in the same batch altogether. Notably, the majority of policy documents explicitly state that students admitted in previous batches are no longer eligible to be considered in subsequent batches, thereby ensuring single assignments and the existence of CCAS.

The CCAS implementation year is the hardest to pinpoint, and varies slightly between high school and compulsory education in the context of this research due to different data availability and institutional details. For high schools, it is defined as the year when a city first switches from a typically decentralized system to a centralized one, while meeting the criteria that constitute a CCAS given at the beginning of Section I. However, it was not feasible to check all these criteria for each individual city given the lack of available historical record online. I obtained the switch year data mainly through searching up keywords that are combinations of "centralized platform" and some indication of a switch, like "initiated," "first time," "started." I was able to retrieve many local news reports that recorded the establishment of a centralized online application platform. If no such news was present, I would proceed to a trial-and-error manual search. For high schools, I then add another keyword that I pick from 2000-2022 because this range was the approximate ballpark of high school switch years, the guessing recurs until there comes a point where one year noted a centralized choice and assignment system while the previous year either did not have it or yielded no search results.

However, this approach has apparent compromises. In order for it to be valid substitutes for the actual imple-

[5] Baidu is the dominant search engine used in China, often referred to as "China's Google."

mentation year, it is implicitly assumed that the establishment of a CCAS is equivalent to the adoption of an online centralized platform on which parents can provide children's profiles to be verified, and that the same platform is used later for the submission of preference lists and the determination of the assignment. The single assignment criterion was not explicitly checked in my search process, so it is also assumed that since the initial switch to CCAS, its main features have remained stable over time, allowing us to justify a system being a CCAS upon its debut by showing it is a CCAS now. The first assumption is credible because for the cities that had enough information in the year of the switch, the first assumption always held. The second assumption should be checked but the difficulty lies in the lower granularity of policies details the further we travel back in time. Additionally, there is also the overarching assumption that the policies are executed as written. Given China's past rigor in implementing education policy and the fact that we examine municipal policies instead of provincial or national ones, this is not an unreasonable assumption.

For primary and middle school education, the CCAS implementation year is more narrowly defined to be the establishment date of the current CCAS, and is located by an explicit statement that represents, "This year is the first year our city enforces a fully centralized admission scheme (and executes computer-generated random assignment)." Table A1 summarizes the names of the sampled cities, their population in 2020, and the years in which they established a CCAS in high school and compulsory education admission.

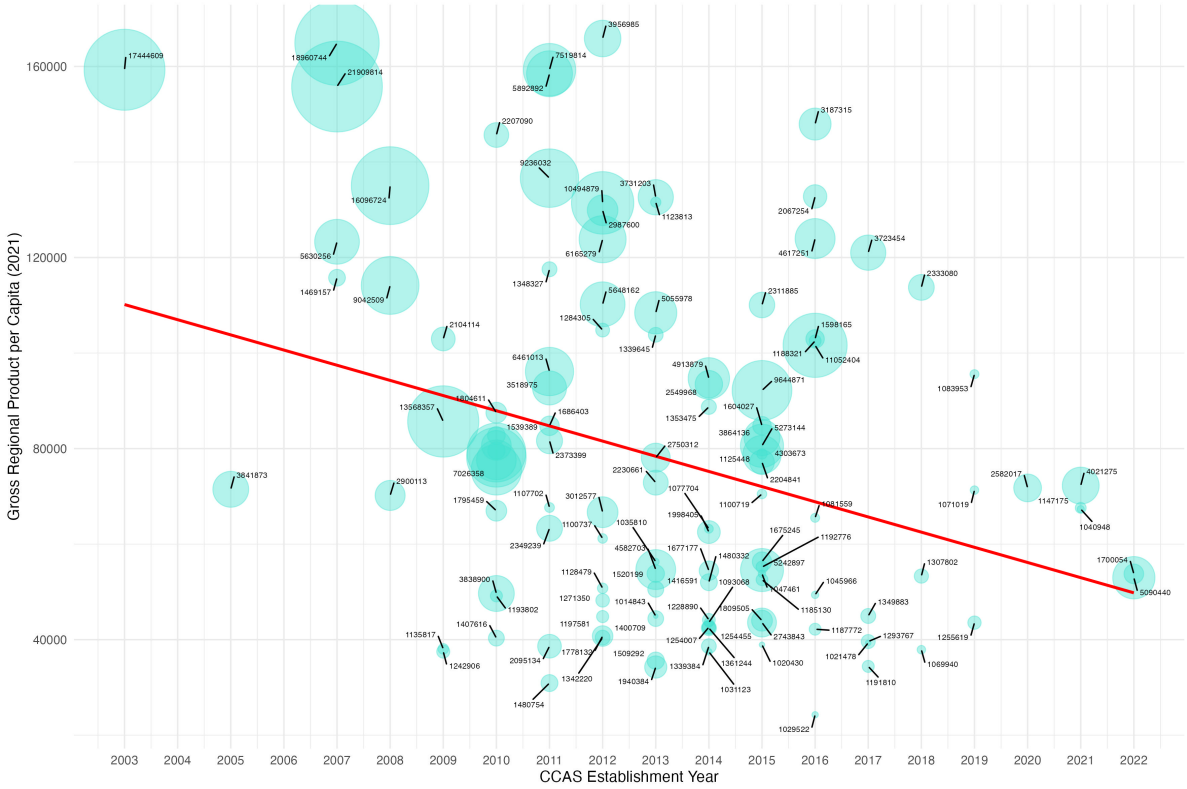
III The Adoption of CCAS over Time: High School

The adoption of CCAS at the high school level gradually occurred between 2003 and 2022. Using the method detailed in Section II, I find 129 establishment dates among 134 cities. The 5 cities whose data are missing all have a below-median population. Taizhou, Cixi and Jiangyin are in the third quartile of the population distribution, while Changshu and Zhangjiagang are in the fourth quartile. Jiangyin, Changshu and Zhangjiagang belong to Jiangsu Province, and Taizhou, Cixi belong to Zhejiang Province. Both of these provinces have large populations and each has 17 and 11 cities whose population exceeded 1 million in 2020, respectively. Therefore it is somewhat safe to assume no structural bias would occur by omitting these cities since they can be roughly represented by adjacent cities who share the same provincial government, or presumably geographical and cultural traits.

Figure 1 plots 129 cities' per capita Gross Regional Product (GRP) in 2021 against their high school level CCAS establishment year. The GRP data come from the National Bureau of Statistics's China City Statistical Yearbook.[6] The size of each bubble is proportional to the city population in 2020, which are annotated on the bubbles. The OLS regression line without controls is downward sloping, suggesting a potential negative relationship between GRP and CCAS establishment year, i.e., a higher level of regional development may indicate an earlier adoption of a CCAS. But to rigorously explore valid predictors of CCAS adoption, we need a larger sample size and data on more city characteristics than the City Statistical Yearbook can provide.

[6]Please see http://www.stats.gov.cn/sj/ndsj/2022/indexeh.htm. Data for 2022 are not yet available.

Figure 1: CCAS Establishment Year (High School)



Notes: This figure plots 129 cities' per capita Gross Regional Product (GRP) in 2021 against their high school level CCAS establishment year. The size of each bubble is proportional to the city population in 2020, which are annotated on the bubbles. The red line is an OLS regression line without controls.

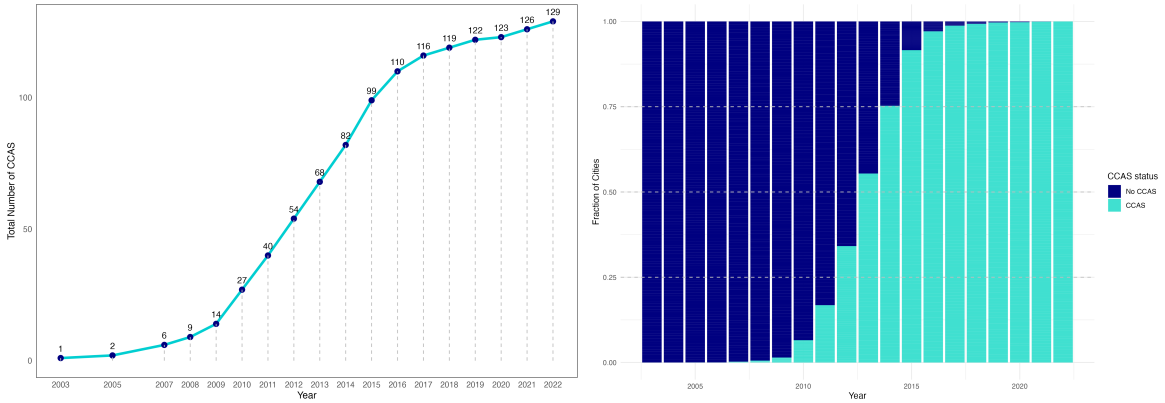
Figure 2 shows the cumulative adoption of high school CCAS over time. Together with Figure 3, we can see that 2010-2016 witnessed a surge of CCAS adoption throughout the largest cities in China, standing in stark contrast with 2003-2009 and 2017-2022 when the progress of CCAS establishment was slow. Shenzhen was the pioneer to establish the first CCAS for its high schools in 2003. Other cities in Guangdong and Fujian province quickly followed, indicating the possibility of a spillover effect. Among the cities that adopted CCAS before 2010, Beijing, Shanghai, Changsha and Chengdu were not geographically coterminous to Shenzhen but were among the most developed cities in China, presumably best equipped to be the next candidates for a switch to CCAS. New adoptions peaked in 2015. After 2018, there were sporadic adoptions of CCAS but by 2023, all 129 cities have already implemented a city-level high school CCAS.

It remains in question what stimulated the wave of CCAS adoption from 2010 to 2016. Since the adoption of a CCAS is mostly associated with the establishment of an online platform where parents can submit children's information, preferences, and receive a notification of the final school assignment result, one might surmise that technological feasibility was a driver of CCAS adoption. However, China achieved full connectivity to the Internet in 1994, and the Internet has been gradually being cultivated to bridge the government and the general public since 1999 (Liu and Pan, 2017). It is not apparent that a lack of technology was holding municipal governments back. Many news reports announcing the transition to an online school choice platform emphasize the objective

of making the school choice process simpler for parents. It seems to be a part of the government's systematic effort under the ideology to "make things more convenient for the people" ("bian min"). There might have also been pressure from parents to improve the application process, though I have found no such documentation. This partially answers why but not why 2010-2016. Further research on other policies and socioeconomic, technological, and institutional shifts in the past two decades is needed to provide a coherent explanation for the rise of high school CCAS adoption.

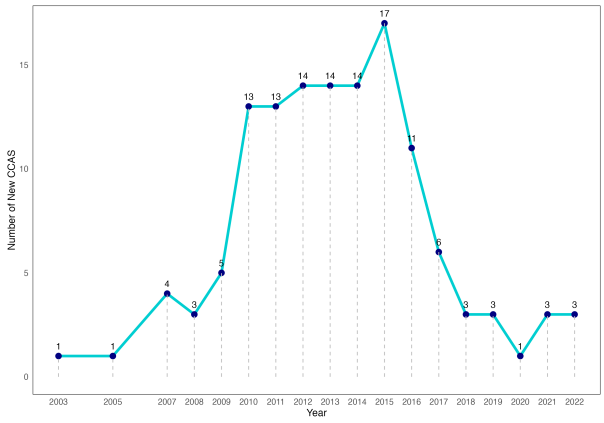
Figure 2: The Accumulation of High School CCAS over Time

(a) Number of City-Level CCAS (High School) by Year (b) Fraction of City-Level CCAS (High School) by Year



Notes: This figure describes the over time adoption of high school city-level CCAS among the 129 cities. Panel (a) presents the cumulative number of CCAS from 2003 to 2022. Panel (b) shows the fraction of cities with a CCAS verses those without a CCAS in each given year.

Figure 3: The Number of New High School CCAS over Time



Notes: This figure presents the number of newly adopted high school city-level CCAS among the 129 cities in each year.

IV The Adoption of CCAS over Time: Primary and Middle School

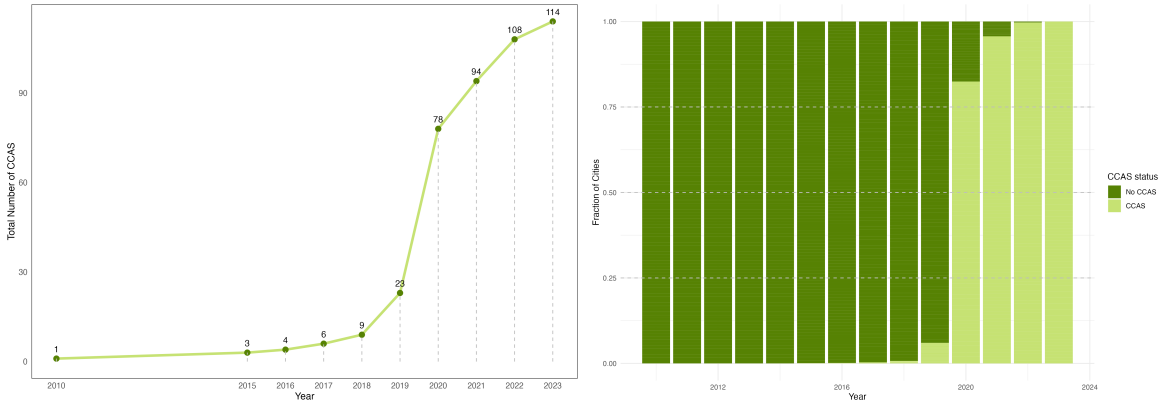
The adoption of CCAS for primary and middle schools follows a drastically different trajectory from that for high schools. In 2018, China's Ministry of Education first mandated synchronized admission of private and public

schools nation-wide in its annual guideline notice for basic education enrollment. In 2019, the regulation was restated with an additional emphasis on its main objective of eliminating the selection of students under any form for mandatory education. Unifying public and private school admission was aimed at promoting a more equitable education resource allocation and alleviate parents' stress in strategically maneuvering the system. According to the municipal policy documents, the synchronization policy was observed by all sampled cities as of 2022.

Figure 4: The Accumulation of Primary and Middle School CCAS over Time

(a) Number of City-Level CCAS (Primary and Middle School) by Year

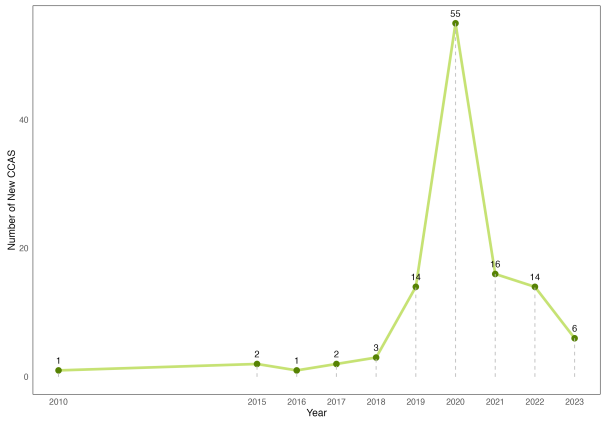
(b) Fraction of City-Level CCAS (Primary and Middle School) by Year



Notes: This figure describes the over time adoption of primary and middle school city-level CCAS among 114 cities. Panel (a) presents the cumulative number of CCAS from 2010 to 2023. Panel (b) shows the fraction of cities with a CCAS verses those without a CCAS in each given year.

Using the search method detailed in Section II, I find the city-level CCAS establishment year for 114 out of 134 cities. Figure 4 describes the over time adoption of primary and middle school city-level CCAS among 114 cities. Panel (a) presents the cumulative number of CCAS from 2010 to 2023. Panel (b) shows the fraction of cities with a CCAS verses those without a CCAS in each given year. Unsurprisingly, the adoption of a CCAS at the compulsory education level is highly concentrated on 2020, right after the MoE stressed on its enforcement in 2019. Overall, CCAS adoption on the compulsory education level happens later than that on the high school level, exhibiting a pattern of centralization "trickling down" the education tiers (tertiary-secondary-primary). Figure 5 plots the flow graph of newly adopted CCAS each year. Almost half of the sampled cities switched to a CCAS in 2020, a fair amount were established in 2019, 2021 and 2022 as well, but beyond this time window there were few CCAS adoptions.

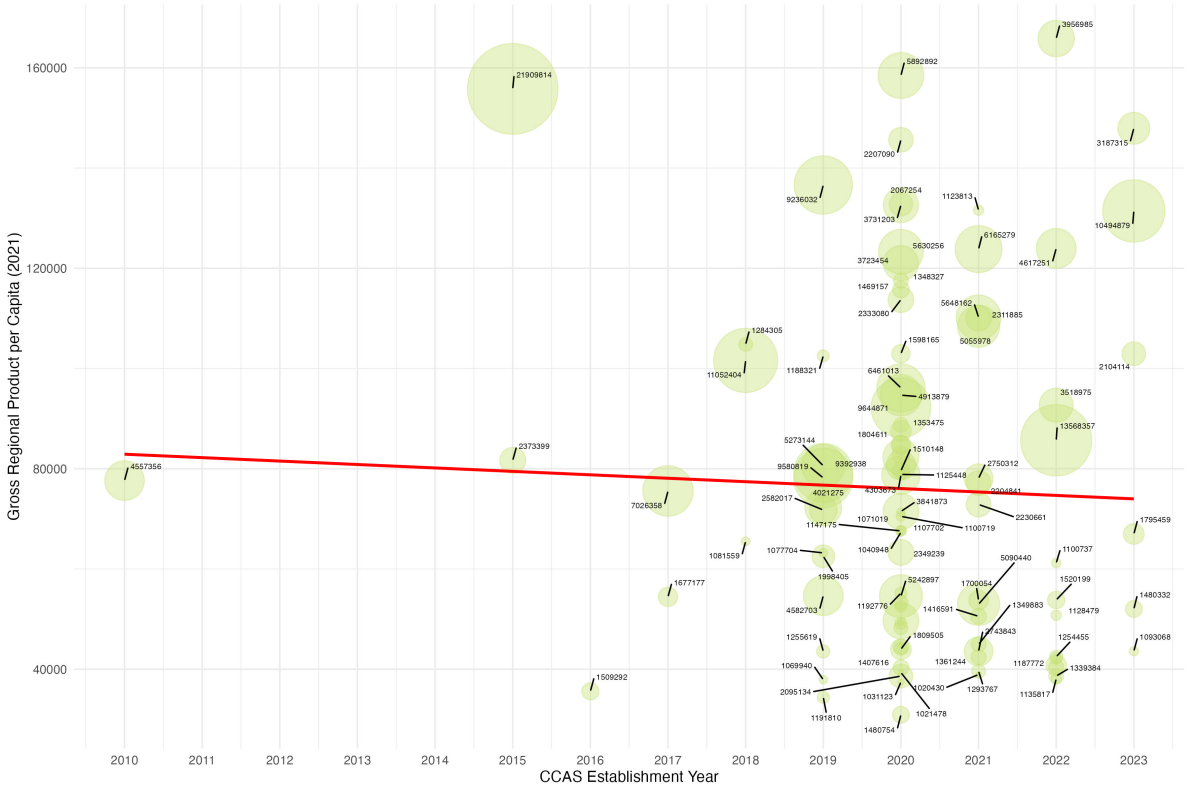
Figure 5: The Number of New Primary and Middle School CCAS over Time



Notes: This figure presents the number of newly adopted primary and middle school city-level CCAS among the 114 cities in each year.

Figure 6 explores the possible correlation between mandatory education CCAS establishment year and GRP per capita or population, but finds none. It is not obvious that cities with a lower GRP per capita or a smaller population adopt a CCAS later than others once the policy was announced. Further research is needed to determine the reasons behind a jagged adoption of CCAS despite being subject to a shared national policy.

Figure 6: CCAS Establishment Year (Primary and Middle School)



Notes: This figure plots 114 cities' per capita Gross Regional Product (GRP) in 2021 against their mandatory education level CCAS establishment year. The size of each bubble is proportional to the city population in 2020, which are annotated on the bubbles. The red line is an OLS regression line without controls.

V Current CCAS: High School

Having discussed the adoption of CCAS over the past two decades for high school and mandatory education, I will now focus on the 2022 cross-sectional data set I have collected for 134 cities and summarize the characteristics of existing CCAS.

A Participating Institutions

Though data for CCAS establishment dates are missing for 5 cities, it is clear that as of 2022, all 134 cities have a city-level CCAS for their high schools. Since high schools are also subject to the policy that "private and public schools admit together," the majority of existing CCAS cover both private and public schools. There are very few exceptions, e.g., Guilin and Rizhao's CCAS are at the city-public level because private school admission is not yet incorporated into the same regulatory system. Students or parents need to physically go to their desired private school to apply, suggesting a decentralized application process.

B List Length

Almost no two cities share the same list length. Usually, list lengths are stated according to batches. Each school belongs to a certain batch, and each batch shares one time slot to admit students. Batch number ranges from 2 to 15, and a maximum list length is set on each batch. Some batches require an indication of preference, while some are optional.

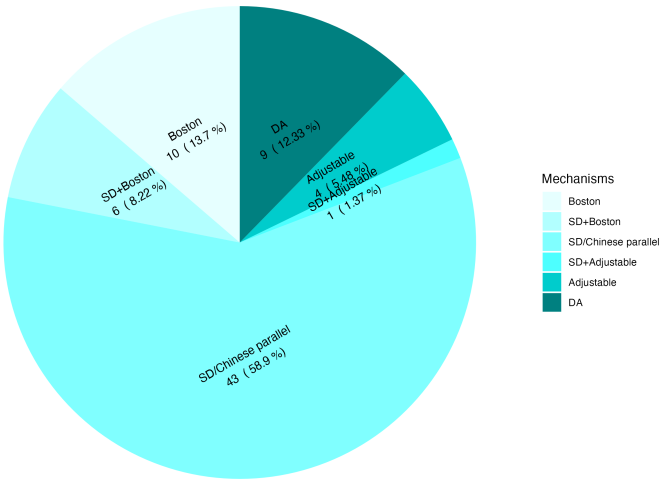
C Mechanisms

Figure 7 presents the distribution of different mechanisms among the 73 cities whose mechanisms I am able to infer from their policy documents.[7] These mechanisms only pertain to each batch, as the batches themselves follow another designated order in admission. Of the 73 cities, 43 cities predominantly employ a Chinese parallel (which is equivalent to a within-batch serial dictatorship (SD)) mechanism, 6 explicitly use a mixture of Chinese parallel and Boston across batches, and 1 uses a mixture of Chinese parallel and allowing for real-time adjustment to submitted preferences.

There are 9 cities whose mechanisms seem to be deferred acceptance (DA) with a threshold score: Zhengzhou, Luoyang, Nanyang, Xinxiang, Kaifeng, Pingdingshan, Shangqiu, Xinyang, Changsha. Note that except Changsha, which is from Hunan province, all of these candidates are from Henan province. Hunan and Henan are both known to be strong in education (with respect to student outcomes in the Gaokao) and have long been pioneers in education reforms. Changsha adopted a CCAS for its high school education in 2007, which is among the earliest 5 percent of 129 cities. These cities admit students based on an "admission score line" which is different

[7] Note that the discussion of mechanisms in this paper is preliminary and at most suggestive. More investigation is needed to ensure that these mechanisms on paper are rigorously implemented. Also, the mechanism for a given city is almost never clean-cut, i.e., it is always a combination of various mechanisms. I only discuss the main mechanism here. The 73 cities may not be representative of the population since the difficulty of retrieving mechanism information may be correlated with other factors related to the mechanism itself.

Figure 7: The Distribution of Mechanisms among High School CCAS



Notes: This pie chart plots the distribution of mechanisms found among 73 cities' high school CCAS. The name of the mechanism, the absolute number of occurrences and the percentage are annotated on the graph.

from the threshold score and varies from high school to high school, and from one type of admission to another (independent admission, unified admission, and distributive admission are the most common types[8]). All students with scores above the "admission score line" are admitted. They look like DA because the admission score line is drawn after a recursive process of comparing capacity, student scores, and the parallel preferences of students. So a student with a higher score, upon failing to be enrolled in their top choice, can potentially replace a student with a lower score who was temporarily accepted by their top choice school which happens to be the former student's second choice in the queue for that school.

There are 4 cities that allow adjustment to the choice of preference based on real-time information on current ranking and school capacity. In this case, the list length is usually 1 because a student is only allowed to tentatively pick one school at a time. These cities are Nanning, Guilin, Hohhot and Baotou. Zunyi is a special case as it employs a combination of within-batch SD and adjustments, which is allowed to happen up to 3 times before the deadline.

D Break-Tie Rules

The break-tie rules vary in detail, but all consist of comparing some combination of subject scores and "comprehensive quality evaluation results," with the latter being an invention aimed at developing a "quality education"

[8]Usually, the independent admission is for athletes, musicians, dancers, artists, etc., and comprise smaller than 10 percent of the admitted cohort. To improve educational equality, China has long been exploring the practice of distributing high school seats to specific middle schools (especially disadvantaged middle schools). In 2002, there was a ministerial document encouraging this policy. And in recent years, China has witnessed a rise in the proportion of high school seats that are assigned distributively. The goal is to eventually achieve 100 percent and make distributive admission the only means for admission, and most sampled cities in 2022 have reached over 50 percent. However, how the distributed seats for a given middle school is then assigned to students in that school varies. And whether this policy in fact improves educational equity in both the short run and the long run needs to be further studied.

(as opposed to "exam-oriented education") in China. For example, in Jieyang, if candidates have the same scores in the senior high school entrance examination, they will be sorted according to the order of single subjects and scores from high scores to low scores in the following order: Chinese, Mathematics, English, Physics, Chemistry, Morality and the Rule of Law ("Politics"), History, Biology, Geography, Physical Education. In Wurumqi, students will be sorted by, moving from one criterion to the next if needed, 1) comprehensive quality evaluation results; 2) the number of A grades in each subject in the academic proficiency test for junior high school graduates; 3) sports test grade; 4) the total score of the three core subjects: Chinese, Mathematics and English.

E Priority Groups

Priority groups are highly homogeneous across all cities since they are governed by national stipulations. The standard priority groups consist of children of martyrs, children of eligible active servicemen, children of public security heroes and disabled police officers who died on duty, children of national comprehensive fire rescue team members, and children of high-level talents. Occasionally, children of people who have significant contributions to the local economy are also prioritized. Children of medical personnel combating COVID-19 on the front line is an example of newly incorporated priority groups, and many cities are taking measures to shrink or eliminate bonus scores for children of minority ethnicity (all ethnicity except Han).

VI Current CCAS: Primary and Middle School

In 1986, 9 years of compulsory education was written into the "Compulsory Education Law." On Jan 1st, 2001, China announced that compulsory education had been "basically universally implemented" around the country. I find 114 cities have a city-level CCAS. There are 13 cities who have only district-level CCAS instead of one unified city-level CCAS. These are either oversized cities like Shenzhen, Guangzhou, and Beijing, or cities on the smaller end that have not yet unified their admission system. One major city, Nanjing, does not have a CCAS because students can be assigned both a public school and a private school, which violates single assignment. In Xining, parents still needed to enroll their children at school in person. I did not find any indicative information for Nantong, Chaozhou, Jieyang, Changshu, Huzhou, and Zhaoqing.

A Participating Institutions

The city-level CCASs in all 114 cities include both private and public schools due to the policy that synchronized public and private school admission mentioned in Section IV.

B List Length and Mechanisms

The same 2019 ministerial document that required public and private school to admit together also specified the main mechanisms for both public and private schools.

For public schools, students are assigned primarily according to their residential addresses. In 2014, the MoE passed "Implementation Opinions of the Ministry of Education on Further Improving the Enrollment of Primary School Graduates in Junior High Schools Nearby and Test-Free,"[9] forbidding the usage of tests as a means of selection. Generally, parents only need to log on to the official portal and upload their children's personal information, family residential address, and scanned documents like the house ownership certificate, household register, etc., which are used to determine a child's initial eligibility and priority in the roster. They either indicate one preferred school or do not have to submit a preference list at all.

For private schools, students are often asked to indicate one preferred school, and if the number of students who apply to a given school is smaller than or equal to the number of seats offered, all applicants are admitted; if greater, the school admits randomly until the seats are filled. Therefore implementation variation across cities mostly depends on how the cities coordinate the private school and the public school system. Some cities allow applications to both kinds of schools, some require that applicants choose one of the two; some mandate that if the student wants to apply for a private school, they must prove that they have already secured a seat in a public school so that if they fail to enter a private school, they still have a fall-back option. Some cities dictate that if a student applies to a private school, then their priority in the public school applicant pool is pushed down, while for some cities the application to private schools does not interfere with public school admission beyond a time lag.

The purpose of the "private and public admit together" policy, paired with banning selection of any kind, was to curb private schools' head-start admission aimed at "plucking the best students in advance" and to ensure education equity and alleviate parental stress. The intuition is if wealthy parents no longer have a good public school option to safely fall back upon, they would weigh this instituted trade-off more carefully be more cautious in applying for a private school in the first place, whereas before, they would first apply to private schools to try their luck and fall back on a good public school option if needed, which led them to occupy more opportunities than they needed. However, whether and how well this goal was achieved remains controversial. I plan to investigate this question in another paper.

C Priority Groups

Due to the universal nature of compulsory education, the priority groups are an extension of the eligibility rules. The highest priority often goes to children who satisfy "three consistencies": children's place of register is consistent with their parents' (or grandparents', grandparents in law's) and who are factually living together (in the school district), children's registered residence is consistent with the house ownership certificate (the nature and purpose of this property should be residential), and the house ownership certificate is consistent with the factual place of residence. The greater the extent these "three consistencies" are violated, the lower the child's initial priority in the list.

The option of tying siblings together in the school assignment process is a newly incorporated priority consid-

[9] Please see https://www.gov.cn/gongbao/content/2014/content$_2$679352.*htm*.

eration in response to China's transition away from the "one-child policy."

VII Conclusion

This paper investigates the municipal school admission policies of 134 Chinese cities whose population exceeded 1 million in 2020 to construct a cross-sectional data set documenting the existence and characteristics of CCAS in high school, middle school, and primary school admission.

As of 2022, 129 of these cities have a CCAS for high school admission, and 114 a CCAS for primary and middle school (compulsory education) admission. The adoption of CCAS for high school admission occurred between 2003 and 2022, and erupted between 2010 and 2016. Preliminary evidence suggests that there is a correlation between higher gross regional product per capita or city population and an earlier adoption of a CCAS. The establishment of CCAS for primary and middle school happened later than those for high schools, with the first switch occurring in 2010 and the majority (105 out of 114) transitioning after 2019. This was stimulated by the national policy unifying public and private school admission that was first announced in 2018 and then reemphasized in 2019.

I then summarize the cross-sectional data set documenting the characteristics of existing CCAS. At the high school level, the majority of the CCAS cover both public and private schools. List lengths vary greatly across cities. Of the 73 cities whose mechanisms I document, more than half primarily employ the Chinese parallel (within-batch serial dictatorship) mechanism. Boston and DA each comprise about 13 percent. There are minor variations in break-tie rules and priority groups across cities, but they are stable and predictable on the larger scheme.

For primary and middle schools, cities approach the coordination between public school and private school admission differently. Students who wish to attend a public school are often required to submit one preference or none. Those who apply to private schools can indicate one desired school. If the number of students who apply to a given private school is smaller than or equal to the number of seats offered, all applicants are admitted; if greater, the school admits randomly until the seats are filled. In addition to using household registry eligibility criteria to decide the initial priority of students, a new option of tying siblings together in the assignment process is stated in response to China's recent effort to shift away from "one-child policy."

Building on the CCAS characteristic data set, I also constructed a panel data set of the 134 cities' relevant characteristics ranging from 2003 to 2022, using the National Bureau of Statistics's China City Statistical Yearbook, which has a rich set of city-level socioeconomic indices.[10] The next step is to correlate city characteristics with CCAS establishment dates and build a prediction model for a when a switch to CCAS might occur in a new city. Testing a logit model of the CCAS indicator and city characteristics results in coefficients that are significant but extremely close to zero, which is not unexpected due to the small sample size and limited sets of explanatory

[10]Please see http://www.stats.gov.cn/sj/ndsj/2022/indexeh.htm. Data for 2022 are not yet available.

variables. Future research may better address this question once data points from around the world are compiled.

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A Appendix

A.1 Tables and Figures

Table A1: Sampled Cities, Population, and CCAS Establishment Years

City Name (ENG)	Population in 2020	Primary and Middle School CCAS Establishment Year	High School CCAS Establishment Year
Shanghai	21,909,814	2015	2007
Beijing	18,960,744	District-level	2007
Shenzhen	17,444,609	District-level	2003
Guangzhou	16,096,724	District-level	2008
Chengdu	13,568,357	2022	2009
Tianjin	11,052,404	2018	2016
Wuhan	10,494,879	2023	2012
Dongguan	9,644,871	2020	2015
Chongqing	9,580,819	2019	2010
Xi'an	9,392,938	2019	2010
Hangzhou	9,236,032	2019	2011
Foshan	9,042,509	District-level	2008
Nanjing	7,519,814	No CCAS	2011
Shenyang	7,026,358	2017	2010
Zhengzhou	6,461,013	2020	2011
Qingdao	6,165,279	2021	2012
Suzhou	5,892,892	2020	2011
Jinan	5,648,162	2021	2012
Changsha	5,630,256	2020	2007
Kunming	5,273,144	2019	2015
Harbin	5,242,897	2020	2015
Shijiazhuang	5,090,440	2021	2022
Hefei	5,055,978	2021	2013
Dalian	4,913,879	2020	2014
Xiamen	4,617,251	2022	2016
Nanning	4,582,703	2019	2013
Changchun	4,557,356	2010	2010
Taiyuan	4,303,673	2020	2015

Continued on next page

Table A1 – continued from previous page

City Name (ENG)	Population in 2020	Primary and Middle School CCAS Establishment Year	High School CCAS Establishment Year
Guiyang	4,021,275	2019	2021
Wuxi	3,956,985	2022	2012
Urumqi	3,864,136	2020	2015
Zhongshan	3,841,873	2020	2005
Shantou	3,838,900	2020	2010
Ningbo	3,731,203	2020	2013
Fuzhou	3,723,454	2020	2017
Nanchang	3,518,975	2022	2011
Changzhou	3,187,315	2023	2016
Lanzhou	3,012,577	District-level	2012
Nantong	2,987,600	NA	2012
Huizhou	2,900,113	District-level	2008
Xuzhou	2,845,552	2020	2010
Zibo	2,750,312	2021	2013
Linyi	2,743,843	2021	2015
Wenzhou	2,582,017	2019	2020
Tangshan	2,549,968	District-level	2014
Hohhot	2,373,399	2015	2011
Haikou	2,349,239	2020	2011
Shaoxing	2,333,080	2020	2018
Yantai	2,311,885	2021	2015
Luoyang	2,230,661	2021	2013
Zhuhai	2,207,090	2020	2010
Liuzhou	2,204,841	2021	2015
Baotou	2,104,114	2023	2009
Handan	2,095,134	2020	2011
Yangzhou	2,067,254	2020	2016
Weifang	1,998,405	2019	2014
Baoding	1,940,384	District-level	2013
Datong	1,809,505	2020	2015
Huai'an	1,804,611	2020	2010

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Table A1 – continued from previous page

City Name (ENG)	Population in 2020	Primary and Middle School CCAS Establishment Year	High School CCAS Establishment Year
Jiangmen	1,795,459	2023	2010
Ganzhou	1,778,132	2022	2012
lining	1,700,054	2021	2022
Xiangyang	1,686,403	2020	2011
Xining	1,677,177	2017	2014
Zunyi	1,675,245	District-level	2015
Yinchuan	1,662,968	2020	2012
Kunshan	1,652,159	2019	2016
Daqing	1,604,027	2020	2015
Wuhu	1,598,165	2020	2016
Mianyang	1,549,499	2022	2011
Putian	1,539,389	2020	2010
Qinhuangdao	1,520,199	2022	2013
Zhuzhou	1,510,148	2020	2010
Jilin	1,509,292	2016	2013
Taizhou	1,485,502	2020	$\leq$ 2022
Yiwu	1,481,384	2020	2022
Xingtai	1,480,754	2020	2011
Anshan	1,480,332	2023	2014
Quanzhou	1,469,157	2020	2007
Cixi	1,457,510	2020	$\leq$ 2022
Tai'an	1,416,591	2021	2013
Jinjiang	1,416,151	2020	2009
Nanyang	1,407,616	2020	2010
Zhanjiang	1,400,709	2020	2013
Guilin	1,361,244	2021	2014
Yancheng	1,353,475	2020	2014
Zaozhuang	1,349,883	2021	2017
Taizhou	1,348,327	2020	2011
Shangrao	1,342,220	2022	2012
Weihai	1,339,645	District-level	2013

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Table A1 – continued from previous page

City Name (ENG)	Population in 2020	Primary and Middle School CCAS Establishment Year	High School CCAS Establishment Year
Zhangjiakou	1,339,384	2022	2014
Jiangyin	1,331,352	2020	$\leq$ 2022
Maoming	1,307,802	2020	2018
Heze	1,293,767	2021	2017
Yichang	1,284,305	2018	2012
Xinxiang	1,271,350	2020	2012
Huainan	1,255,619	2019	2019
Nanchong	1,254,455	2022	2014
Chaozhou	1,254,007	NA	2014
Jieyang	1,242,906	NA	2009
Changshu	1,230,599	NA	$\leq$ 2021
Fushun	1,228,890	2020	2014
Qingyuan	1,197,581	District-level	2012
Kaifeng	1,193,802	2020	2010
Xianyang	1,192,776	2020	2015
Fuyang	1,191,810	2019	2017
Jiaxing	1,188,321	2019	2016
Anyang	1,187,772	2022	2016
Hengyang	1,185,130	2020	2015
Rizhao	1,147,175	2020	2021
Dazhou	1,135,817	2022	2009
Luzhou	1,128,479	2022	2012
Yueyang	1,125,448	2020	2015
Zhenjiang	1,123,813	2021	2013
Baoji	1,107,702	2020	2011
Yibin	1,100,737	2022	2012
Changde	1,100,719	2020	2015
Chifeng	1,093,068	2023	2014
Huzhou	1,083,953	NA	2019
Suqian	1,081,559	2018	2016
Bengbu	1,077,704	2019	2014

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Table A1 – continued from previous page

City Name (ENG)	Population in 2020	Primary and Middle School CCAS Establishment Year	High School CCAS Establishment Year
Lianyungang	1,071,019	2020	2019
Lu'an	1,069,940	2019	2018
Zhangjiagang	1,055,893	2020	$\leq$ 2022
Changzhi	1,047,461	District-level	2015
Pingdingshan	1,045,966	2020	2016
Jinhua	1,040,948	2020	2021
Zhaoqing	1,035,810	NA	2013
Shangqiu	1,031,123	2020	2014
Qiqihar	1,029,522	District-level	2016
Jinzhou	1,021,478	2020	2017
Liaocheng	1,020,430	2021	2015
Xinyang	1,014,843	2020	2013
Yuyao	1,013,866	2020	2017

Notes: This table summarizes the names of the sampled cities, their population in 2020, and the years in which they established a CCAS in high school and compulsory education admission.

A.2 Standard Procedures of Basic Education Enrollment

High School

1. Eligibility

   The eligibility for high school application is tied to the eligibility to sign up for the high school entrance examination ("Zhongkao"), which requires that a student "loves their motherland, abides by the law, and has good conduct," has graduated from middle (junior high) school, and is physically healthy. Cities' requirements for the student's registered residence may vary slightly in detail. A student who is already participating in high school education or its equivalent is not eligible.

2. Admission region

   Public and private high schools are only allowed to admit students from their "affiliated area," which is mandated by the government. An exception is when there is a shortage or excess of student enrollment in a particular school, then the government may intervene and reallocate students across affiliated areas. Vocational schools can admit students around the city.

3. Application Procedures

(a) Students who wish to attend high school submit their preference list on the Bureau of Education's designated website before or after they know their Zhongkao score. Of the 39 cities for which I documented this variable, 26 have the students submit their preference after knowing their scores, and 13 have the students submit their preference before knowing their scores, either before Zhongkao, or after Zhongkao but before the score is revealed to the students.

Priority groups' priority is directly manifested in bonus scores that add to students' "naked" Zhongkao scores, and this "modified score" is the primary benchmark for students' ranking in the applicant pool.

(b) The Bureau of Education provides a single assignment based on a certain mechanism, detailed in Section V subsection C.

(c) The student decides whether to attend the assigned high school.

Primary and Middle School

1. Eligibility

(a) The following school-age children and adolescents are eligible for primary and middle (junior high) schools in a given city:

i. Children and adolescents with household registration in this city;[11]

ii. Eligible accompanying children of the migrant population;

iii. Children and adolescents who are otherwise eligible as stipulated by national, provincial, and municipal policies:

A. Children and adolescents whose parents work in China's overseas agencies or are dispatched on business and work abroad long-term, or who work in the field geological survey department, so that there is no one to take care of the child or adolescent in the place their household registration, and that they need to be taken care of by relatives or fostered in this city;

B. Children of active servicemen of the given city's garrison;

C. Children and adolescents whose immediate family members or other legal guardians are registered in this city, but who are: children of martyrs, children of soldiers who died on duty, children of soldiers with disabilities of level 1 to 4, children of soldiers who have won second-class merit in peacetime or third-class merit in wartime or above; children of active-duty soldiers stationed in state-recognized difficult and remote areas and the Tibet Autonomous Region, islands of the third category or above as designated by the People's Liberation Army's headquarter, or of active-duty soldiers who work in high-risk and high-danger positions such as aviation, submarines, aerospace, and nuclear-related positions;

[11] This scenario accounts for the vast majority of cases, and under this qualification, there is often a more detailed list that dictates how applicants are ranked or initially prioritized in the school assignment system. Please see Section VI subsection C.

D. Children and adolescents of high-level talents or innovative and entrepreneurial talents in accordance with specific local policies and verified by local government departments to which this concerns.

E. Children and adolescents who are registered in Hong Kong, Macao, Taiwan, or are of foreign nationalities residing in this city.

iv. The above-mentioned children and adolescents must also meet the following requirements:

- Primary school (including the primary school section of nine-year schools, similar below): Children who were born between September 1, (current year - 7) to August 31, (current year - 6) and aged 6 or above, or children who have been approved by the urban or county (city) education administrative department to postpone their compulsory education.
- Middle school: Fresh primary school graduates.

2. Admission region

Public schools must adhere to the principle of "going to the school nearby." Public primary schools admit according to school districts, public middle schools admit according to school districts or directly from corresponding primary schools .

Private schools can only admit students within their "approved area." The private schools approved by the district and county (city) education administrative departments can only enroll students within that district, and the private schools that have leftover seats from the first round of admission can usually participate in a supplementary round of admission. Private schools approved by the city municipal education bureau should first enroll students within the district where the school is located. Those who have leftover seats from the enrollment within the district can apply for a supplementary round of admission within the city area with the approval of the city municipal education bureau.

3. Application Procedures

(a) Parents or students create an account and log in on the designated website (which are documented in my cross-sectional data set).

(b) Submit the eligibility documents (registered address, house property ownership certificate, etc.) and personal information (name, ID, age, sex, etc.).

(c) Submit a preference, with rules varying across cities. This step is sometimes optional, e.g., when this city requests no preference indication for public primary schools, or when a given primary school's graduating cohort are automatically admitted to a middle school.

(d) Some form of supplementary admission that takes place for students who have not yet been assigned to a school after the first rounds of admission.

(e) After a given date, parents or students can check their school assignment results on the website (there may also be the option of receiving a notification of the result through a text message).

A.3 A Brief History of the High School Admission Policy before 2010

For the newborn PRC, "education serves to build the nation, and schools open up to workers and peasants." In 1951, the Central People's Government promulgated the "Decision to Reform the Education System," which stated: "In order to connect different schools, an exam must be used to determine entrance to secondary education."' In the same document, secondary schools were divided into high schools (junior high schools/middle schools and senior high schools), accelerated middle schools for workers and peasants, amateur middle schools, and secondary technical schools. This formally established the policy for high school entrance exams and admission to China's secondary schools. However, the current high school admission system evolved not from 1951 but in 1977, after the restoration of the education system post-cultural revolution.

When the cultural revolution just ended, China's educational resources were scarce and unbalanced. From 1978 to 1980, MoE passed a series of decisions to encourage the establishment of focal high schools. Focal schools in the Chinese context are schools that are more resource-concentrated, possibly garner more attention from the government, are generally more prestigious than the ordinary schools, have higher admission standards, and are pursued by most students and parents. This policy helped improve the education quality in that specific historical episode, but later severely marred education equity. As a result, in 1983, MoE passed "Ten Regulations on Fully Implementing the Party's Education Policy and Correcting the Tendency of One-sided Pursuit of Enrollment Rates in Full-time Ordinary Middle Schools" and "Several Opinions on Further Improving the Quality of Ordinary Middle School Education" to correct this tendency, reduce students' stress, and alleviate the growing "score supremacy."

"Decision of the Central Committee of the Communist Party of China on the Reform of the Educational System" passed in 1985 was the document that governed education reforms throughout the 1990s. A notable trend was the gradual delegation of test administration power from the province level to more local levels of the government, such as the city level, the district level, or even the school level.

From 1998 to 2009, primary and middle school education nationwide underwent a series of reforms aimed at transitioning "exam-oriented education" to "quality education." In 2004, 17 pilot experimental areas effectively carried out the high school entrance exam ("Zhongkao") reform. In 2005, this number expanded to 55. By 2006, Zhongkao reforms spread to the rest of the country, resulting in a higher diversity of local policies tailored to the local situation.

Around the same time, China started exploring the policy of assigning a portion of high school seats directly to middle schools to provide equal opportunity to middle schools of different standing. MoE passed "Guiding Opinions on the Reform of Junior High School Graduation Examination and Ordinary High School Enrollment System Reform in the National Basic Education Curriculum Reform Experimental Area in 2004" and "Guiding

Opinions on the Reform of the Junior High School Graduation Examination and Ordinary High School Enrollment System in the Basic Education Curriculum Reform Experimental Area" in 2004 and 2005, respectively.