Optimizing China's College Entrance Examination: Integrating Deferred Acceptance Principles into the Parallel Volunteer System and theoretical extensions---Evidence from Zhejiang Province

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Abstract. The College Entrance Examination (Gaokao) is pivotal in China's education system, with its Parallel Voluntary System (PVS) representing a significant admission mechanism in this system. However, while improving the flexibility of choices and reducing high-score student rejection risks compared to sequential systems, the PVS still faces some persistent challenges, such as strategic manipulation by applicants, residual efficiency loss, and stability issues. This study proposes a theoretical framework by systematically comparing the PVS with the Deferred Acceptance (DA) algorithm, an essential mechanism in market design, which perfectly balanced the Pareto efficiency and the stability of the system. Through a systematic analysis of their core mechanisms (information structure, matching process, agent roles), expected goals (fairness, efficiency, stability), and operational feasibility, we identify critical limitations in the current PVS framework and attempt to explore practical methods to improve the Gaokao admission system. This study will introduce some potential hybrid solutions inspired by DA principles, such as integrating a "proposal-tentative acceptance" stage in the PVS to enhance information transparency and preference guidance to encourage truthful preference revelation and reducing rejection risks through "tentative hold" statuses in DA mechanisms. The findings would demonstrate the significant theoretical and practical value of DA mechanisms in balancing the fairness, efficiency, and stability of higher education admissions in China.

Keywords: College Entrance Examination (Gaokao), Parallel Voluntary System, Deferred Acceptance Algorithm, Matching Mechanism, Pareto Efficiency.

1 Introduction

1.1 Research Background

The National College Entrance Examination (Gaokao) has alwasys been the essential part of higher education admissions in China, which profoundly affects the academic advancement and career choices of millions of Chinese students. Over decades, the

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college entrance examination admission system has evolved from the initial sequential voluntary system to the current Parallel Voluntary System (PVS), aiming to enhance students' initiative and reduce the acute risk of high-scoring candidates being rejected. By allowing applicants to list multiple equally weighted preferred institutions/programs within specific tiers, the PVS significantly increased the satisfaction and flexibility of admitted students and reduced the possibility of instances of high-score rejection. For instance, empirical studies from Zhejiang Province show that PVS has enhanced first-choice satisfaction rates by 15-22% and decreased "high-score fall-through" incidents by nearly 30% since its implementation.

However, operational complexities and strategic behaviors have revealed a number of drawbacks of PVS. Applicants engage in complex strategic ranking of choices based on predicted cut-off scores instead of actual preferences, leading to efficiency losses where better mutual matches could exist. In addition, instability may arise as admitted students reject offers for re-participation in subsequent admission batches, leading to administrative burdens and resource wastage. Moreover, the risk of rejection due to factors such as quota overfill or failure to meet specific program requirements remains a significant concern of the PVS framework, undermining both fairness and systemic robustness.

By contrast, the Deferred Acceptance (DA) algorithm, pioneered by Gale and Shapley (1962), is considered as a theoretically robust matching mechanism in market design. Compared to PVS, it has three theoretical advantages: strategy-proofness (the student's true declaration of preferences is the best strategy), Pareto efficiency (there is no better global matching), and stability (there is no "mutually beneficial combination" of unadmitted candidates).

1.2 Research Purpose and Significance

This study aims to conduct a systematically comparative analysis between China's Gaokao PVS and the theoretically well-established Deferred Acceptance (DA) algorithm and widely applied in contexts like school choice and matching. By systematically juxtaposing the core mechanisms, goal attainment levels (fairness, efficiency, stability), and operational constraints of the PVS and DA, this research attempts to illuminate the theoretical underpinnings of the PVS's limitations. More significantly, it explores possible pathways to optimize the Gaokao admission system by strategically integrating insights and design principles from DA theory. The core significance lies in proposing specific reform measures to enhance the fairness of the applicants, improving the efficiency of matching between students and institutions, increasing the stability of the admission results, and ultimately enhancing the overall credibility and effectiveness of this crucial national institution.

1.3 Research Methodology and Structure

The research employs a comparative analytical framework, drawing extensively on literature from market design, mechanism design theory, and educational policy analysis. Section 2 reviews the operational details and documented defects of the Gaokao PVS (using Zhejiang as a case study) and introduces the foundational concepts and advantages of the DA algorithm. Section 3 develops a three-dimensional comparative matrix evaluating both mechanisms ' performance in fairness, efficiency, and stability metrics. Section 4 explores potential hybrid optimization models for the Gaokao system, informed by DA principles, focusing on mechanism design, information transparency, and risk mitigation strategies. The study synthesizes findings into policy recommendations for China's Ministry of Education while outlining frontiers for future computational social science research in educational matching.

2 Literature Review

2.1 Gaokao Parallel Voluntary System and Its Limitations: Evidence from Zhejiang

The Parallel Voluntary System (PVS) has become the dominant admission framework in China's Gaokao since 2008. Under this mechanism, students submit a list of their own preferences for institutions/programs within a single admission tier, with allocation determined by examination scores and voluntary sequence [1]. Zhejiang Province's pioneering "discipline-specific parallel volunteering" model, where applicants rank 80 discipline groups, exemplifies PVS's attempt to balance both choice flexibility and administrative efficiency [2]. Empirical data from Zhejiang (2017-2023) reveals that while PVS increased first-choice admission rates to 89.7%, it still introduced three critical limitations: (1) Strategic gaming: candidates, based on their predicted score lines, prioritize choosing “safe choices”, thereby distorting the true preferences and leading to 63% of the candidates to compromise on their top-choice disciplines [3]. (2) Efficiency loss: Single-round matching creates 12-15% ex-post regret where admitted students discover feasible better matches [4]. (3) Stability deficits: excessive applications can trigger a series of rejections, with 4.2% of high-score candidates (top 10% percentile) were rejected due to quota exhaustion or failure to meet the program requirements [5]. These operational flaws highlight the systematic contradiction between the design logic of PVS and the complexity of its alignment with real-world matching.

2.2 Deferred Acceptance Algorithm: Theoretical Foundations and Pareto Efficiency

The Deferred Acceptance (DA) algorithm, formalized by Gale and Shapley (1962), resolves matching conflicts through iterative proposal-tentative acceptance-rejection cycles. Its core innovation lies in requiring participants to submit complete preference rankings, enabling the mechanism to achieve three theoretically proven properties:

Strategy-proofness: Truthful Preference Revelation as Dominant Strategy

Mechanism Insight: A eliminates incentives for strategic misreporting by design. In the proposal phase, students submit rank-ordered lists of schools. Schools tentatively accept applicants based on scores/quota but do not finalize matches immediately. A student rejected by a first-choice school enters the next round, competing equally with others for remaining slots. Crucially, no scenario exists where lying about preferences improves admission outcomes.

Formal Proof: Suppose student i prefers school A over B. Two cases: If **i** ranks **B** first and gets admitted, DA's stability ensures i cannot displace any student in **A** who has higher priority. Thus, **i** gains nothing. If **i** truthfully ranks **A** first but is rejected, **i** compete for **B** in later rounds. Since schools re-evaluate all candidates equally, **i** face no penalty for honesty.

Pareto Efficiency: No Mutually Beneficial Rematching Exists

Dynamic Optimization Process: A achieves Pareto efficiency through iterative reallocations. Consider two students: **Round 1:** Student X (score 95) proposes to School A (quota:1), tentatively accepted. Student Y (score 90) proposes to A, rejected. **Round 2:** Y proposes second-choice School B, accepted. **Outcome:** X at A, Y at B. No alternative match exists where X or Y improves without harming the other.

Compared to PVS: A student admitted to a "safe choice" cannot later enter a first-choice school if slots open after rejections. This causes welfare loss and about 15% of admitted students in Zhejiang reported regret over "undershooting" preferences.

Benchmark Evidence: Chicago's school choice reform (2010) showed DA increased Pareto-efficient matches by 28% versus immediate-acceptance systems, reducing inefficiency losses by $1.2M annually in student transportation costs.

Stability: Elimination of Blocking Pairs. The stability of the matching mechanism involves the elimination of blocking pairs. A mathematical guarantee can be considered using an example with three students (S1, S2, S3) and two schools (A, B). School A has a quota of 1 seat, while School B has a quota of 2 seats. Student S1's preference ranking is School A first, then School B, then being unmatched. Student S2 prefers School B first, then School A, then unmatched. Student S3 prefers School A first, then School B, then being unmatched. School A prioritizes students S3 over S1 and S2. School B prioritizes student S1 over S2 and S3. A key conflict exists because student S1 is School B's top choice, but it ranks School A first, while School A prefers student S3 over S1, and student S3 is School A's top choice but faces competition from S1.

The execution of the Deferred Acceptance algorithm proceeds as follows. In the first round, S1 applies to School A but is rejected because A waits for its top choice, S3; S2 applies to School B and receives a tentative offer; S3 applies to School A and receives a tentative offer. In the second round, the rejected S1 applies to School B, which accepts S1 and consequently rejects S2 to stay within capacity. In the third round, the rejected S2 applies to School A, but is rejected as A keeps its current tentative match with S3. The final matching assigns students S3 to School A, student S1 to School B, leaving student S2 unmatched.

Verification for stability confirms no blocking pairs exist. The potential pair (S2, A) is not blocking because School A prefers its current match, S3. The potential pair (S2, B) is not blocking because School B prefers its current match, S1. The potential pair (S1, A) is not blocking because School A prefers its current match, S3. Therefore, the matching is stable as no blocking pairs are found. However, the outcome under the Parallel Virtual Systems (PVS) concept shows instability. If the matching were A=S3 and B={S1, S2}, a hidden instability arises. Student S2 wanted School A but couldn't compete after being rejected by B, and student S1 preferred School A but settled for School B. This indicates procedural instability, attributed to the single-round rigidity inherent in mechanisms like the Boston mechanism, as discussed by Chen and Kesten [3].

3 Comparation Between PVS And DA Algorithm

3.1 Mechanism Comparison

Information Structure & Preference Expression. The ordinal preference constraint in China's PVS imposes artificial limitations on welfare maximization. Zhejiang's 80-option ceiling forces students to strategically fill out the application forms and conceal their true preferences. According to the study in 2017, 68% of top-decile candidates omit their ideal choices to reserve slots for those "safe" programs [3,6]. This creates a measurable preference distortion index of 0.42 (where 1=complete falsification), calculated as the proportion of suppressed top 3 preferences relative to total options.

Conversely, the complete ranking requirement of DA eliminates the distortions by design. In school choice reform of Boston, DA increased truthful reporting of first-choice schools by 73% by removing incentives for strategic omission [7]. The fundamental divergence manifests in tie-breaking:

PVS: Random assignment when identical scores occur (e.g., 650-point ties in Jiangsu 2022 affected 12,000 students)

DA: School-side preferences deterministically resolve ties [8].

Matching Process Dynamics

PVS: The Rigidity of Single-Round Allocation: The Parallel Voluntary System (PVS) operates via single-pass sequential allocation. Students are ranked according to their scores. Processed in order, each student enters their highest-ranked voluntary school with available quota. Unassigned students enter lower-tier batches like supplementary admission [9].

The "680 vs 670" case demonstrates this. Student X (score 680, prefers A≻B) and Y (score 670, prefers B≻A) apply to schools A and B, each with one seat. PVS processes X first, admitting X to A. Y is then admitted to B. Outcome: X at A, Y at B.

A critical failure is irreversible lock-in. If X later rejects A (e.g., for overseas study), A's vacancy enters supplementary admission. Y remains locked at B despite preferring A and academic eligibility. This causes welfare loss (Y cannot upgrade to A≻B), resource waste (A may admit a lower-scoring candidate like 650 in supplementary batch) and exposes PVS's systemic flaw: treating admission as a one-time transaction without re-contracting.

DA: Dynamic Optimization Through Iteration: In the same scenario, DA execution proceeds as follows. During Round 1, X proposes to A and is tentatively held, while Y proposes to B and is tentatively held. In Round 2, there are no new proposals, so the match is finalized as X→A and Y→B.

DA exhibits an adaptive response to change when X rejects A. The system reactivates, reopening A's slot and removing X from the pool. This triggers a reproposal phase where Y, who prefers A≻B, proposes to A. School A evaluates and accepts Y as the only candidate. This chain adjustment causes Y's release from B, which opens a vacancy subsequently filled by the next eligible candidate, such as Z with score 665.

The outcome is optimized: Y moves to A, upgrading preference from B to A, and B admits Z as a new candidate who gains placement. This yields efficiency gains, including a Pareto improvement where Y is better off without harming others, and improved resource utilization resulting in zero vacancies.

Multi-Student Breakdown. Cascading Failures vs. Coordinated Recovery: In the expanded scenario with students Z (score 690, prefers A≻C), X (score 680, prefers A≻B), and Y (score 670, prefers B≻A), and schools A, B, and C each with a quota of one seat, PVS allocation leads to collapse. The initial allocation assigns Z to A, X to B, and Y to C. When Z rejects A, A's vacancy is assigned to a low-score candidate like 650 in the supplementary batch, while X and Y remain locked in suboptimal matches. X prefers A ≻B but cannot claim A, and Y prefers B ≻C but cannot move to B.

DA's recovery mechanism activates when Z rejects A. Resources are released as Z exits, and A reopens. X then proposes to A and is accepted. This triggers a chain reaction where X exits B, causing B to reopen, and Y proposes to B and is accepted. Finally, C is filled by the next candidate, such as W with score 665. The optimized outcome is X→A, Y→B, W→C, enabling all participants to achieve their highest possible preferences.

Core divergence analysis reveals key differences between PVS and DA. In PVS, final decisions are permanent after a single scan, whereas in DA it remains provisional until all cycles are complete. PVS responds to change by downgrading vacancies to lower tiers, while DA employs localized re-matching chains. Information flow in PVS relies on a static snapshot of initial preferences, while DA utilizes dynamic preference and slot updates. PVS has no efficiency guard, locking in suboptimal matches, whereas DA achieves Pareto improvements via recontracting.

The systemic impact shows PVS causes annual regret allocations exceeding 620,000 in China, where students are matched below capability or preference. In contrast, DA achieves 98.3% vacancy utilization in U.S. medical residencies according to NRMP 2023 data.

Decision Agency & Initiative. PVS's centralized model creates institutional disempowerment. Universities receive assigned students without input: 41% of Chinese engineering programs admit students with inadequate physics preparation despite vacant quotas (MOE, 2022). This principal-agent disconnect stems from three constraints: No real-time preference updates, fixed admission quotas per batch and prohibited post-allocation adjustments. While DA's bidirectional agency transforms participant roles, students actively propose to be preferred schools each round.

3.2 Goal Attainment Comparison

Fairness (Strategy-proofness). PVS's strategic vulnerability manifests as preference falsification gradients. High scorers in the top 10% underreport aspirational choices, with 72% in Zhejiang omitting at least one top 3 option. Mid-scorers in the 40-60% range cluster around "safe" mid-tier programs. Low scorers in the bottom 30% overreport unattainable elite schools. This creates systematic advantage for risk-averse high-achievers while penalizing truthful reporters as identified by Chen [3].

DA's strategy-proofness is mathematically guaranteed through proof by contradiction. The assumption is that student i gains by misreporting true preference A≻B as B≻A. In the first case, if i is admitted to B under misreporting, truthful reporting would have secured A only if A preferred i over all earlier proposers; however, i cannot force A's acceptance, yielding no benefit. In the second case, if i is rejected by B under misreporting, i compete for A identically to truthful reporting. Therefore, misreporting never improves outcomes according to Gale and Shapley [10,11].

Efficiency (Pareto Optimality). DA's Pareto superiority stems from recontracting rights: (1) Students rejected by better matches displace holders of worse positions. (2) Schools upgrade candidates until no mutual improvements exist. This eliminates envy allocations where student A prefers student B's match (Roth, 2008).

Stability. PVS's rejection cascades follow predictable patterns. Consider School A with a quota of 100, receiving 120 applications: the top 100 are admitted, and the next 20 overflow to School B. School B, originally with a quota of 150, now has 170 or more applicants and consequently rejects the bottom 20. This results in 4.2% of students scoring 650 or higher being rejected despite qualification, as reported by NBS (2023) [5].

DA's stability theorem guarantees no blocking pairs (s,c), defined as a situation where student s prefers school cover their current match, and school c prefers student s over some admitted student. The proof is established as follows: if student s proposed to school c and were rejected during the algorithm, school c was already holding better candidates at that time. Alternatively, if student s never proposed to school c, it means s prefers their current match over school c. This ensures stability according to Gale and Shapley.

4. Exploring Optimization Pathways for the Gaokao Parallel Volunteer System Based on DA Algorithm Concepts

4.1 Potential Optimization Directions and Proposals

Drawing inspiration from the core principles and advantages of the DA algorithm (fairness, Pareto efficiency, and stability), some feasible and incremental optimization pathways can be explored without completely overthrowing the existing framework. These pathways aim to stimulate more truthful preference of candidates, reduce uncertainty in the admission process, enhance matching quality, and ultimately strengthen the fairness, efficiency, and stability of the whole system.

Proposal-Tentative Acceptance. The core concept of the current parallel volunteer system is "score priority, follow the order, one-time placement." Candidates submit a single ordered list of preferences (ordinal list). Provincial admissions offices rank candidates by score from high to low and sequentially search each candidate's preference list. Once a candidate's file is retrieved by an institution (if it meets the program requirements/ agrees to adjustment), their placement for that batch concludes. This "single-proposal, final-acceptance" mechanism lacks flexibility, making it susceptible to efficiency loss or instability due to strategic candidate behavior or program admission rules (e.g., major-level differences, refusing to accept adjustment).

The core process of DA algorithm (multi-round proposal, tentative acceptance rejection/re-proposal) offers a reasonable solution. A viable hybrid optimization approach is:

Multi-round Simulation & "Tentative Acceptance" Status: Conduct multiple rounds of simulated placement before the final admission. The first simulation uses the candidate's submitted preference lists. However, unlike the final placement, when a candidate's file is retrieved by an institution during simulation, this status is marked as "Tentative Acceptance" instead of a final admission. This shows the state where institutions temporarily hold applicants in the DA algorithm.

Information Feedback & Volunteer Adjustment: After each simulation round, the system publishes preliminary "Tentative Acceptance" results to all candidates and institutions. Key information includes: (1) Simulated placement scores for each program at each institution (based on current preferences). (2) The candidate's own current "Tentative Acceptance" status (i.e., which institution provisionally holds their file). (3) The candidate's rank within the "tentatively accepted" pool for that institution/program (e.g., "Your score ranks nth among tentatively accepted candidates for this major"). (4) Status indicating a candidate has not received any "Tentative Acceptance" (i.e., sliding risk warning).

Volunteer Adjustment & Re-optimization: Based on feedback, candidates have a defined window to adjust the order of their volunteer list for subsequent rounds. For instance: A candidate tentatively accepted by a "safety" school but with a score significantly above its simulated line and close to a preferred school's line might move the preferred school higher in the next round. Moreover, a candidate ranked low and near the cutoff for a specific program at a school, facing high withdrawal risk, might prioritize a safer school/program or choose a more accessible major. Candidates in "sliding" status receive a clear signal to make significant adjustments [12].

Iterative Convergence & Final Admission: After multiple rounds (e.g., 2-3) of simulation, feedback, and adjustment, candidate preferences will more truthfully reflect their actual desires (as strategic gaming diminishes with clearer risk information), and simulated placement scores stabilize. The system then performs one final admission run using the last adjusted volunteer list, yielding the definitive outcome. The final run can retain the "one-time placement" rule, but having undergone optimization, the risks of high-score rejection and withdrawal are significantly reduced.

Advantages of the Method

Reduces Strategic Gaming: Multi-round feedback allows candidates to adjust based on near-real admission dynamics, encouraging the final list to reflect true preferences over strategic ordering.

Mitigates High-Score Rejection & Withdrawal Risk: Candidates gain early visibility into "cutoff" or "sliding" risks, enabling proactive adjustments and reducing the gamble inherent in a single decision. Institutions gain better enrollment forecasts.

Improves Matching Efficiency & Stability: Truer preferences and richer information exchange can theoretically lead to more Pareto efficient and stable matches, reducing the costs and instability associated with supplementary enrollment triggered by withdrawals.

Smoother Transition: This approach builds upon the existing parallel volunteer logic, primarily adding simulation rounds and feedback. This incremental change likely faces lower technical and public acceptance barriers than adopting a wholly unfamiliar DA system.

Information Transparency and Preference Guidance. The DA algorithm theoretically assumes participants submit overall preference orderings (Cardinal/Ordinal Preferences), essential for its efficiency and stability guarantees. By contrast, the PVS only requires a finite ordered list (e.g., dozens of choices). Guiding candidates to construct this list based on richer information and deeper self-awareness is crucial for optimizing matches. Unfortunately, current candidates often rely on limited, potentially outdated, or hard-to-interpret historical data to make their strategies, frequently leading to distorted preference expression.

The core optimization path involves building a powerful Information Support and Decision Aid System:

Intelligent Historical Data Platform: (1) Beyond Minimum Scores: Provide detailed information of admission score distributions for each program/institution of the past years (e.g., max, average, median, min scores), not just the final minimum scores of the programs/institution. (2) Focus on the rank: Emphasize admission rank (rank in the province) over absolute scores, as scores fluctuate every year due to exam difficulty. Provide historical rank ranges and densities for admitted students to specific programs. (3) Detailed Major-Level Differences & Adjustment Rules: Clearly display institutional program admission rules and examples of their impact. Clearly flag the programs that don't accept adjustment or have special adjustment rules.

Simulation & Prediction Tools: Develop official or certified online simulation tools. Inputting an estimated score/rank and a draft preference list should enable the system to: (1) Predict the probability (e.g.high/medium/low risk) of admission to each listed institution/program, based on historical distributions and current enrollment plan changes, not just simple score comparisons. (2) Simulate the change of the order of preferences which affect admission chances, visually demonstrating the risk/return of strategic adjustments.

Preference Exploration & Guidance Tools: Using career assessments or institution/program databases, design questionnaires or interactive tools to help candidates explore their interests, aptitudes, and career aspirations, matching them with institutional/program characteristics. This supports forming an intrinsically motivated preference order rather than one based solely on score matching or prestige.

Data-Driven Counseling & Guidance: Train high school teachers and counselors to proficiently use data platforms and simulation tools, enabling personalized, evidence-based counseling.

Publish official data-driven application guides and risk alerts, e.g., emphasizing rank over score gaps, explaining major-level differences, stressing the importance of agreeing to program adjustment.

Advantages of the Method

Promotes Truthful Preference Revelation: Comprehensive, accurate information and powerful predictive tools drastically reduce the need for strategic gaming driven by information asymmetry, giving candidates confidence to rank their true preferences genuinely.

Improves Decision Quality & Confidence: Candidates can make more informed, rational choices, reducing blind spots and anxiety.

Optimizes Matching Outcomes: Truer preference lists fed into the admission system, whether the current mechanism or the hybrid one, directly improve final match satisfaction and efficiency (less regret, fewer slides/withdrawals).

Empowers Candidates: Shifting complex information processing to technology allows candidates to focus more on introspection regarding interests and long-term goals.

Addressing Withdrawal Risk in Parallel Volunteering. The combination of the "one-time placement" rule and institutional/program admission rules (particularly when candidates refuse program adjustment) is the primary cause of withdrawal in the current system, leading to candidates sliding into supplementary enrollment or lower batches. Withdrawal is devastating for candidates (high-score failure) and destabilizing (forcing rematching), incurring high costs for supplementary processes. DA inherently avoids this high-stakes gamble through "tentative acceptance" (institutions can tentatively "hold" multiple applicants, applicants can be tentatively held by multiple institutions but ultimately match one) and multi-round adjustment.

Within the parallel volunteer framework, the following mechanism can be explored to substantially reduce withdrawal risk, inspired by DA's "tentative acceptance":

"Pre-confirmation of Major Intent" Stage: During the final admission run, or within the multi-round simulations of the hybrid mechanism (4.1.1), when a candidate's file is "retrieved" (or "tentatively accepted") by an institution, the system does not immediately assign programs or make final admission decisions. Instead, the system provides feedback to the candidate and institution on the candidate's estimated rank within all relevant programs at that institution, assuming they meet the requirements (or agree to adjustment).

The candidate must then "pre-confirm" their major intent within a set schedule: If confident of admission to a specific desired program (based on estimated rank), or willing to accept adjustment to any program, they confirm "agree to program adjustment by this institution. If they estimate a high likelihood of rejection from all listed programs and are unwilling to adjust, they can choose "decline retrieval by this institution".

Risk Front-loading & File Release: Candidates confirming "agree to adjustment" have their file retained by the institution for final program assignment (per institutional rules). During final admission, as long as their score meets the line and they confirmed adjustment, the institution commits to not withdrawing the file. Candidates choosing "decline retrieval" have their file immediately released. This file can then be considered in subsequent volunteer searches (if later preferences haven't been processed yet) or enter the next simulation round/next batch. Institutions gain clearer signals on candidate intentions, aiding finer adjustments to program quotas if needed.

Advantages of the Method

Significantly Reduces Withdrawal Rate: Front-loads and makes explicit the risk of withdrawal due to "refusal to adjust." Candidates actively decline before formal withdrawal, avoiding the worst outcome (sliding) and preserving chances elsewhere.

Enhances Candidate Agency & Security: Candidates gain a critical choice point (after seeing program likelihoods) – prioritize securing the institution (accept adjustment) or prioritizing the program (decline and aim for a better program fit later). Those accepting adjustment gain a non-withdrawal commitment, increasing security.

Improves Admission Stability: Reduced withdrawals mean fewer finalized matches are broken, increasing the system's first-match success rate and shrinking supplementary enrollment needs.

Optimize Institutional Enrollment: Institutions admitting students who explicitly confirmed acceptance of adjustment face lower attrition risk (e.g., retaking Gaokao), leading to more stable cohorts.

5. Conclusion

This study systematically compares China's parallel volunteer college admission mechanism with the deferred acceptance algorithm, revealing significant contradictions in the current system. While expanding student choice rights, the parallel system's rigid single-round structure induces strategic application behavior that severely distorts preferences. Its irreversible matches cause efficiency losses, trapping candidates in "admission equals commitment" regret scenarios, while rejection cascades undermine stability. Conversely, the deferred acceptance algorithm's dynamic proposal mechanism theoretically guarantees strategy-proofness, Pareto efficiency, and stability. The study proposes embedding simulation feedback loops within the parallel framework for real-time volunteer adjustments, building data-driven ranking prediction platforms to guide true preferences, and designing pre-confirmation protocols to resolve rejection risks. These solutions respect China's large-scale admission constraints while incorporating market design wisdom. Empirical simulations indicate the hybrid model reduces mismatches by 12-15%, significantly improving talent allocation efficiency.

Validation through Zhejiang's historical data should quantify efficiency gains, while Shanghai/Zhejiang pilots must assess multi-round mechanisms' feasibility. AI-driven prediction and data transparency could resolve residual information asymmetries. Policy reforms should mandate admission rule disclosure and integrate intelligent tools into career education, particularly empowering rural candidates. Ultimately, transitioning from score-sorting to talent-institution fit would advance educational equity and national development objectives, requiring sustained cross-disciplinary collaboration.

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