Analysis of Urban-Rural Differences in College Admission under the Immediate Acceptance Mechanism and Parallel Admission Mechanism in China

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Abstract. Over a few decades, the admission system in China has experienced a change from sequential mechanism to parallel admission mechanism, with 28 out of 31 provinces completing the transformation by 2012. However, the existing models ignore the differences in information between rural and urban areas, which the effectiveness of mechanisms should take into account asymmetry information and re-evaluate the benefits and drawbacks. This paper will extend the theory of "effective e-value" and "information loss coefficient θ" based on the parametric framework. Besides, by using authoritative statistics, different student groups are set according to various factors (e.g., regions, effective e-values, mechanisms applied), then analyzing by contrasting and comparing the rates between rural students and urban students, such as slip-down rates. After researching, three conclusions are found: (1) When e is equal to 1, rural-urban students have the lowest strategic space, which minimizes the gaps caused by information asymmetry. (2) When under the parallel admission mechanism, where e is between 2 and 8, rural students face more significant information loss, while urban students can enhance their outcomes. (3) When also under the parallel admission mechanism, where e is larger than 8, the rural-urban gaps narrows, with diminishing effect of the e-value. This study will integrate information heterogeneity into various mechanisms and provides policies considering to promote the information balance in order to improve the social welfare and urban-rural equity.

Keywords: Market design, College application, Urban-rural differences, Parallel admission mechanism, Immediate acceptance mechanism.

1 Introduction

Over the past decades, China's college admission system has changed from sequential mechanism to the parallel admission mechanism. By 2012, 28 out of 31 provinces had completed this reform. The parallel admission mechanism allows students to apply to several colleges in one round, which reduces the risks of high-scoring students failing to be admitted. However, there are large differences between rural and urban students. Rural students often lack information, good application guidance and support. As a result, they tend to operate safer strategies: they are less likely to list "reach" colleges

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among their top choices, more likely to be admitted to lower-tier schools despite having high scores, and are less in elite universities. These gaps not only harm educational fairness but also reduce social welfare. Many studies have examined China's admission reforms, but most have not fully considered the information gaps between rural and urban students. Chen & Kesten provided a theoretical analysis of the shift to parallel mechanism, building a parametric family of e values, and demonstrating the trade-off between stability and efficiency among mechanisms [1]. Li et al. showed that a policy change, the introduction of an English listening test in Gaokao, disproportionately harmed rural students due to their lack of access to quality English instruction, highlighting how information and resource gaps can be transformed to admission disadvantages [2]. Ha et al. studied matching stability in a natural experiment and found that parallel mechanism reduces "justified envy", which are formed between batches [3]. Meng & Wang (2023) showed that having too many choices can actually hurt rural applicants due to the difficulties to process all the information under more complicated mechanisms and systems [4]. Overall, existing models often assume that all students have the same ability to understand and make use of information efficiently. This assumption misses the real differences between rural and urban applicants. Therefore, a new framework that considers information loss is needed to re-evaluate how different admission mechanisms work for both groups. This paper will fill this gap by building an extended framework that includes the effects of information loss. Based on the parametric model, two concepts are introduced: the "information loss coefficient θ" and the "effective e value", which allows us to measure information loss of rural students compared to urban students, then comparing the immediate acceptance mechanism (IA) and the parallel admission mechanism in terms of strategy space, slip-down rates, and college ranks. This paper also divides the e value into different intervals to observe its non-linear effects. Theoretically, this paper adds information heterogeneity to market design theory and provides a method to evaluate effective e values. Practically, the outcome suggests that when e is greater than 10, the rural-urban gap is smallest. Policies are also proposed, such as better guidance services in rural schools and a free recommendation system to reduce information loss and improve fairness. This study helps to understand the rural-urban gap in China's college admission system and offers useful insights for other countries facing similar information problems.

2 The Performance of Urban-rural Differences

2.1 Rural Students Are More Conservative in College Choices

Students in rural areas use more conservative strategies than students in urban areas. The specific performance is that there is a lower percentage of applicants in rural areas who list their "reach" college at the top three rankings. When under the parallel admission mechanism, the top three choices of 78% urban students are at least one "reach" colleges which the admission threshold is above their Gaokao scores, which indicates that they operate more aggressive strategies. However, there are only 52%

of rural students who put their "reach colleges" in the prior positions, demonstrating the conservativeness of their strategies [5].

2.2 Rural Students with Higher Scores Have a Greater Likelihood of Being Admitted to Lower-Tier Schools

There is a more common phenomenon in rural areas that it is more possible to be accepted by a lower-tier school, even though students have high Gaokao scores. According to the data, the probability of being "undermatched" for rural applicants is 12% higher than students in urban areas with the same Gaokao score, which is highly related to the mismatch between their score tiers and the tiers of colleges being applied [6].

2.3 Rural Students Are Admitted to Colleges that Are Ranked Lower

After the reform of Gaokao system, the New Gaokao system increases the number of applications while using the parallel admission mechanism, comparing to the previous system. However, after the conduction of New Gaokao system, the rankings of admitted colleges in rural areas are 12 positions behind those in urban areas on average, which is equivalent to larger urban-rural differences [4].

2.4 Lower Proportion of Rural Students in Elite Colleges

A lower percentage of rural applicants can be observed in qualified colleges, which might due to the failure in application strategies. During the period from 2011 to 2013, approximately 45% of applicants were from rural regions. However, the students in Peking university only accounted for 18.5% to 21.2% [7].

2.5 More Loss to College Seats as Change in Specific Policy for Rural Students

Specifically, the introduction of English listening examination in Gaokao was detrimental to students from the countryside. Result from the lack of English classes in rural areas, rural students often got lower scores in Gaokao, which caused over 54,000 rural examiners lost their seats to their preferred colleges during the period from 1999 to 2003, amplifying the gaps in education resources [2].

3 Related Reasons of Urban-Rural Differences

3.1 Slower Pace for Rural Students to Adapt to New Gaokao System

After changing to parallel admission mechanism, it takes longer time and more effort to adapt to it. It is mainly due to the information failure in rural areas. One reason is that the speed of information being transmitted to the countryside is lower than passing to urban areas attributing to technology factors, level of interest etc. As a result, rural applicants need more time to comprehend the strategy and adjust their

application strategies than applicants from cities, which makes the effective e-value of rural applicants lower than that of urban examiners.

3.2 Lack Professional Strategies for Rural Applicants in Non-Key High Schools

The type of high schools is highly associated with the possibility of access to elite universities. More students from the countryside often study in non-key high schools, which lack professional college counseling's about school choices and admission strategies, increasing the information loss and enlarging information asymmetry [8].

3.3 The Differences in Cultural Capital of Families Between Rural and Urban Regions

Urban families often have more cultural capital that can be converted to provide to students in those families, giving them better understanding of college information, and better strategies. By contrast, rural families usually fail to offer guidance to make more successful strategies under new mechanisms, which also increases the information loss.

4 The Analysis of Urban-Rural Difference Under IA Mechanism and Parallel Admission Mechanism

Before analyzing the differences under two mechanisms, some values will be reviewed and extended, followed by the introduction of a new coefficient θ.

4.1 Nominal E Value

Matching mechanisms can be modeled by using a parameter e in the parametric family. e refers to the number of choices that applicants can apply in one round [1]. Hence, the IA mechanism, parallel admission mechanism and the deferred acceptance mechanism (DA mechanism) can be described as following:

When e is equal to 1, applicants can only apply to one college per round, and can only apply to the second choice if and only if being rejected in the first round, which is the IA mechanism. When e is equal to or larger than 2, applicants can apply to multiple colleges in one round, but all students are admitted in multiple rounds, which is the parallel admission mechanism. When e tends to infinity, all applications are processed in one round, with all choices in one row, which is the DA mechanism.

Besides, the blocking pair will always exist as long as e is less than infinity, where unstable matching will appear between rounds. Blocking pair appears when two agents prefer each other than their own current matching. Under admission problem, for example, a student with a Gaokao score above the line of dream college, however, admits this college in latter rounds. If this college has reached full capacity in previous rounds, the blocking pair appears because the college prefers this student to the others and the student prefers this college to current matching. As a result, it

causes "justified envy". Increasing the e value improves stability and Pareto efficiency, reducing "justified envy".

4.2 Information Loss Coefficient θ

There are general gaps in the ability of obtaining information, cultural capital and education resources in high schools between rural areas and urban areas. As a consequence, the quality of information of rural students is lower, which some choices might be ineffective, contributing to higher possibilities of failing in application. In order to better evaluate the extent of information loss, the coefficient θ, measured by college rankings and the proportion of ineffective applications, can be defined as:

$$\theta_i = \frac{Rank_{admit,i}}{K} \times \left(1 + \frac{Share_{\ ineffective\ application,i}}{2}\right) \tag{1}$$

Where some variables need to be declared: i represents an applicant and belongs to I. $Rank_{admit,i}$ is the ranking of the final accepted college of student i, which has the range of $[1, K]$. K is the number of choices that can be applied to. $Share_{\ ineffective\ application,i}$ is the percentage of college applications which the score lines are unmatched with student's Gaokao scores. The proportion can be calculated as:

$$\frac{Ineffective\ application_i}{K} \tag{2}$$

Theoretically, the coefficient θ should has a range of $[0,1]$ because effective e value, discussed in later sections, cannot be larger than its nominal e value. In order to address it, the coefficient θ should be normalized after calculation, which means that:

$$\theta_{norm} = min\ (\theta, 1) \tag{3}$$

The coefficient θ has several implications: The first part of the equation indicates that the efficiency loss on application results, which the larger the former part is, the bigger shortcomings there are in the application strategies; the second part indicates the efficiency loss on application process, which the larger the latter part is, the bigger shortcomings there are in the information of preferred colleges.

Over 11,000 rural applicants who could have admitted to elite colleges ended up in non-elite colleges from 1999 to 2003, with lower college rankings than urban students. However, there are only approximately 35% of urban applicants who face this situation [2]. Moreover, the cutoff lines of colleges applied by over 60% of rural students are unmatched with their Gaokao scores, which indicates lack of information in rural areas and more serious information loss compared to those in urban.

4.3 Effective E Value

Combining the nominal e value with the information loss coefficient θ, effective e value, with the notation e^* can be defined as:

$$e^* = (1 - \theta_{norm}) \times e \tag{4}$$

The effective e value measures the number of choices that are effective, as well as the number of colleges with matched cutoff lines for applicants. Therefore, the performance and stability of mechanisms can be better evaluated after accounting for information loss. In this formula, $(1- \theta_{norm})$ is the information retention coefficient.

4.4 Analysis of Immediate Acceptance Mechanism

Feature. Under immediate acceptance mechanism, as well as IA mechanism, e equals to 1, students can only apply to one college in each round. If students fail in the first round, they will move to the second automatically and apply to their second choices until they are successfully accepted by colleges, or will leave the batch and fail the application. However, most of the elite schools have reached full capacity in the previous round, causing a huge amount of "justified envy". As a result, decisions in the first round are critical.

Influence of Information Loss. When e is 1, the formula of effective e value can be simplified as:

$$e^* = (1 - \theta_{norm}) \times 1 = 1 - \theta_{norm} \tag{5}$$

Because all students can only fill in one application in each round, information asymmetry cannot be amplified by using "multiple applications". Under the same system, both rural and urban students have one common strategy, which is to apply for colleges with lower cutoff lines below own Gaokao scores, as well as safety options, to avoid leaving the current batch.

Performance under IA Mechanism. Because effective e value under IA mechanism is calculated as $1 - \theta_{norm}$, the urban-rural difference in effective e value is small statistically. By contrast, the whole matching efficiency is inefficient, which a huge amount of high-scores applicants from all regions have to go to lower-tier colleges ultimately, hence "justified envies" widely exist.

4.5 Analysis of Parallel Admission Mechanism

Feature. Under parallel admission mechanism, $2 \leq e < K$, students can apply to 2 to (K-1) colleges in each round. Students can rank colleges according to their real preferences, putting their reach colleges in the first batch, realistic choices and safety choices in subsequent batches. The insurance effect, a key feature of parallel admission mechanism, gives applicants opportunities to operate this strategy. However, Matthew effect occurs under this mechanism, enlarging urban-rural differences.

Insurance Effect. Insurance effect means that outcomes under parallel admission mechanism are not worse than outcomes under IA mechanism, also named as

monotoncity of mechanism. Combing with e value, it indicates that as e value increases, the stability and welfare of applicants will not get worse off [9]. Changing from IA mechanism to parallel admission mechanism has stronger impacts on provinces which have wider choices in the first round, and the correlation between e value and improvements is not linear [10].

Matthew Effect. Matthew effect means that the benefit of Insurance effect is unequally distributed between urban and rural students, and the extent of improvements for urban applicants are larger than rural applicants.

The absolute difference between them is measured by evaluating effective *e* values of both sides. When changing to parallel admission mechanism, the nominal *e* value changes from 1 to e with a range of [2, *K*). As a consequence, the effective *e* value of urban students becomes:

$$e_u^* = e(1 - \theta_u) \tag{6}$$

The effective *e* value of urban students becomes:

$$e_r^* = e(1 - \theta_r) \tag{7}$$

Hence, their absolute difference can be calculated as:

$$\Delta_{abs} = e(\theta_r - \theta_u) \tag{8}$$

Because θ of rural students is larger than that of urban students. As a result, the absolute difference increases linearly with the nominal *e* value. With larger differences, urban applicants have higher intention to apply for reach choices and higher possibilities of entering elite colleges. By contrast, rural students face higher proportion of ineffective applications and higher possibilities of entering low-tier colleges with high scores at 12%.

4.6 Segmented Analysis of Nominal E Value

As further researches, the relationship between effects of improvements in mechanisms and the nominal *e* value is not linear. This section will discuss the relative urban-rural difference.

The relative urban-rural difference is the disadvantage ratio of rural students compared to urban students, and can be statistically described as:

$$\Delta_{rel} = \frac{e\times(\theta_r(e) - \theta_u(e))}{e\times(1-\theta_r(e))} = \frac{\theta_r(e) - \theta_u(e)}{1-\theta_r(e)} \tag{9}$$

In this formula, θ changes as the change in nominal e value because the range of ranking of final applied colleges changes. At the same time, change in nominal *e* value will affect ability to process information, which also causes a change in the information loss coefficient.

As analyzed, the curve of relative difference presents an inverted U-shaped value. Nominal e values can be divided into five intervals: e is equal to 1, between 2 and 3, between 4 and 6, between 7 and 10 and larger than 10. When e equals to 1, as previously discussed, advantages in information cannot be amplified under IA mechanism, hence all the students prioritize their safety options. Both of their θ are relatively low, however, these of rural students are slightly larger. As a consequence, the relative difference is low because these two coefficients are close. When e is between 2 and 3, the Insurance effect starts to appear. In this situation, strategies between urban students and rural students are differentiated. Urban students start to try the combination of reach and safety option. They put their favorite college and a safety college, which the θ of urban applicants starts to decrease. However, due to lack of information in rural areas, students still tend to apply to safer options and suing more conservative strategies. Hence, the ranking might be lower if applying blindly. The coefficient might increase owing to information overload and might decrease at a slower rate. For relative differences, the Δ_{rel} will increase as $\theta_r(e)$- $\theta_u(e)$ increases at a higher rate. When e is between 4 and 6, different levels of reach, stable, and safety choices appears. Urban applicants have fully mastered efficient strategies and put their different colleges with different levels into different batches, which has a extremely low percentage of ineffective applications. While the information disadvantages of rural students are amplified, which they do not fully understand which schools are reachable and which schools are stable to choose. As a consequence, they might try reach options blindly, be over-stable, or randomly order, leading to either an increase or a slower decline in their θ. As a result, $\theta_r(e)$- $\theta_u(e)$ reaches the maximum and 1-$\theta_r(e)$ closes to zero, which the relative difference is the largest with the most significant Matthew effect. When e is between 7 and 10, some spare choices appear. For urban students, they perfectly take advantage of 6 choices to form application levels, which additional choices make less marginal improvement, causing the θ decreases but at a lower rate. For rural students, it is more beneficial for them because additional applications can be used for safety if they fail to use efficient strategies in previous rounds, which reduces the proportion of ineffective applications, moving rankings forward, hence their coefficient decreases significantly. For relative difference, $\theta_r(e)$- $\theta_u(e)$ decreases and 1-$\theta_r(e)$ closes to 1, causing it to decline from the peak point. Finally, when e is larger than 10, the coefficient for urban applicants tends to be stable as their ranking of applied colleges keep at 1-5, which the marginal improvement closes to zero. From the rural side, students tend to prioritize their preferred colleges due to several safety options behind. As a result, the rankings improves rapidly and θ decreases dramatically [11]. Overall, the relative difference continues to decline, contracting urban-rural differences and minimize the effects of information asymmetry.

In conclusion, to reduce urban- rural differences, the nominal e value should be relatively low or high. However, when e is from 1 to 3, the social welfare, as well as the levels of overall rankings, is reduced due to more “justified envies”. By contrast, higher e value reduces “justified envies” between batches simultaneously as it reduces rounds and chances to appear, which leads to bigger social welfare, allocating educational resources more equally.

5 Suggestions to Reduce Urban-Rural Differences

Suggestions to reduce urban-rural differences can be classified according to their principles: to modify the nominal e value of parallel admission mechanism and to reduce θ.

5.1 Improvement to Parallel Admission Mechanism

As previously analyzed, the smallest urban-rural gaps occurs when nominal e value is larger than 10. Some provinces have transformed to New Gaokao Mechanism by increasing the nominal e value to 96 such as Shandong province. As a consequence, the difference of successful application rate between the provinces has decreased, emphasizing the effectiveness of higher e value [3]. To improve the overall situation, the New Gaokao system should to be applied to expand the number of choices that can be applied in more regions and provinces, with the combination of closing information asymmetry.

5.2 Improvements to Reduce Information Loss of Rural Students

First of all, application guidance service should be improved in rural regions. Specifically, there should be at least one qualified teacher in each rural high school to give interpretation of Gaokao policies and guidance for application. The guidance service can provide official information by establishing an information platform for rural applicants, which gives them opportunities to fill information gaps hence decrease information loss.

Besides, taking advantage of big data technology and artificial intelligence (AI), a free application-recommendation system should be developed, facing to rural applicants. The system can automatically generate application lists including "reach-stable-safety" levels, improving their strategies and reducing ineffective applications. However, it should be matched with conditions of networking in rural areas and should be easy to operate, instead of increasing information burdens.

For the feasibility, the cost of developing new recommend system might be higher, however, it improves social welfare in the long-term compared to temporary costs. For assignment of application guides, it faces lower costs but the balance of education resources should be considered. Overall, both of suggestions will make significant influence in minimizing urban-rural differences.

6 Conclusion

This paper studied how information differences between rural and urban students can affect college admission outcomes under the immediate acceptance mechanism and the parallel admission mechanism. Two concepts are introduced: the information loss coefficient θ and the effective e value. By using these, the paper compared the two mechanisms and found three main results. First, when e is equal to 1, the strategic space is smallest, so information gaps between rural and urban students are also

smallest. Second, under the Parallel mechanism with e between 2 and 7, urban students benefit more from the insurance effect, while rural students suffer from greater information loss, which widens the urban-rural gap and strengthens the Matthew effect, followed by the peak point of urban-rural differences in the interval from 7 to 10.Third, when e is larger than 10, the gap narrows significantly because additional choices serve as safety options for rural students. Based on these findings, this paper suggested two types of policies: increasing the nominal e value above 10, applying New Gaokao system in a wider range, and reducing θ through better guidance services and a free AI-based recommendation system for rural students.

However, this study has some limitations. First, the analysis relies on statistical data rather than real-time experimental data, which may limit the generalizability of the results. Second, the information loss coefficient θ is estimated using simplified assumptions; more refined measures could be developed in future research. Thirdly, some other factors such as household income or regional policy differences should be considered to get a more comprehensive outcome. Future work could combine field experiments or survey data to better measure θ and test the predictions in real admission settings.

References

1. Chen, Y., & Kesten, O.: Chinese college admissions and school choice reforms: A theoretical analysis. Journal of Political Economy 125(1), 99–139 (2017)
2. Li, H., Meng, L., Mu, K., & Wang, S.: English language requirement and educational inequality: Evidence from 16 million college applicants in China. Journal of Development Economics 171, 103271 (2024)
3. Ha, W., Kang, L., & Song, Y.: College matching mechanisms and matching stability: Evidence from a natural experiment in China. Journal of Economic Behavior & Organization 175, 206–226 (2020)
4. Meng, L., & Wang, S.: Too many choices? The impact of expanded college application options on rural students in China. The Chinese University of Hong Kong (2023) (working paper)
5. Ye, X.: Improving college choice for the poorest students: Examining what works in centralized admissions systems using randomized experiments. National Academy of Education (2017)
6. Chen, S., Ding, Y., & Liu, X.: Rural students' "high score but low admission" phenomenon: Evidence from Ningxia. China Economic Quarterly 17(3), 1055–1074 (2018)
7. Wen, W., Zhou, L., Zhang, M., & Hu, D.: Urban/rural disparities in access to elite higher education: The case of Tsinghua University. International Journal of Chinese Education 12(1) (2023)

8. Song, Q., & Tan, C.Y.: The association between family socioeconomic status and urban–rural and high-school attainment gaps: A logistic regression analysis of the China Family Panel Studies data. British Educational Research Journal 48(6), 1102–1124 (2022)
9. Li, M.: The effect of the parallel mechanism on college admissions: Evidence from China. Economics of Education Review 66, 1–10 (2018)
10. Xie, Z., & Ma, J.: The impact of the new college entrance examination reform on students' college choices: Evidence from Zhejiang. China Economic Review 72, 101751 (2022)
11. Liu, Q., & Li, T.: When decentralization reduces regional disparity: Analyzing access to college in China. SAGE Open 14(1), 1–14 (2024)

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