

Matching Educational Resources and School District Housing Premiums under China's Multi-School Zoning Policy

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Abstract—In the context of uneven public educational resources, the quality of schools has been capitalized into housing prices, and this phenomenon has exacerbated inequality in urban China. In response to this systemic issue, the Chinese Government is gradually transitioning from rigid single-school zoning to a multiple-school zoning system. This paper presents the theoretical exploration and empirical research on the matching of educational resources and the fluctuation of school district housing premiums under this new policy paradigm. The study utilizes Market Design and Two-sided Matching theories, alongside recent quasi-experimental empirical evidence, to explore how multi-school zoning shapes housing premiums and evaluate its subsequent impact on social welfare. Multi-school zoning introduces probabilistic uncertainty and thus effectively reduces excessive speculation. However, pure random lotteries trigger ex post efficiency losses, while the introduction of voluntary applications and computer-based placement gives rise to strategic manipulation. This paper concludes that adopting a priority-based Deferred Acceptance (DA) matching mechanism is imperative to balance equity, efficiency and residential stability in the allocation of public resources.

Keywords—market design, school choice, multi-school zoning, housing premium, social welfare

I. INTRODUCTION

The equitable allocation of public educational resources is a core issue in urban governance. In China, traditional single-school zoning tightly linked property ownership to school admission, capitalizing on educational quality into real estate. This created severe “school district housing” premiums that deeply intertwine educational and economic inequality [1]. While existing literature widely adopts hedonic models to empirically assess the impacts of recent policy shifts (e.g., multi-school zoning) on housing premiums, a prominent theoretical gap still exists. Specifically, existing research fails to conduct a systematic evaluation of the efficiency and welfare distribution of such new admission policies from the perspective of market design and two-sided matching mechanisms.

To address this, this paper utilizes market design and two-sided matching theories to systematically deconstruct this structural change. Specifically, the study pursues two main objectives: first, to investigate the microeconomic mechanisms through which multi-school zoning affects house prices; and second, to examine how different centralized matching mechanisms alter welfare distribution among various income groups. By formalizing the economic logic of housing capitalization and rigorously evaluating mechanism designs, this paper aims to provide robust theoretical support and optimization strategies to improve overall social welfare and educational equity.

II. INSTITUTIONAL BACKGROUND AND THEORETICAL FOUNDATION

A. Evolution of China's Compulsory Education Admission System: From Single to Multi-School

Since the late 20th century, following the marketization of China's urban housing sector, the compulsory education admission system has heavily relied on a deterministic, single-school zoning framework. Under this inflexible system, local education authorities delineated precise catchment areas for each public school. Holding residential property and local household registration within these boundaries strictly dictated a student's school assignment.

Single-school zoning created a significant welfare dilemma through predetermined student-school matching. Functioning as an empirical Tiebout model, families “vote with their feet” to secure local public goods [2]. Micro economically, households derive utility from general consumption and zoned educational quality. Given the scarcity of high-quality public schools and the highly inelastic supply of local housing, families compete intensely for such high-value residential properties. Assuming the utility function satisfies the single-crossing property—where the marginal willingness to pay for educational quality increases monotonically with income—the housing market naturally achieves a strict wealth-sorting equilibrium [3]. Consequently, the

wealthiest households perfectly match with the highest-quality schools. This dynamic allows high-income groups to monopolize top educational resources, severely excluding low-income families and generating an unresolvable welfare dilemma.

To dismantle this rigid wealth-sorting mechanism and address the ensuing public dissatisfaction, the Chinese government initiated a systemic transition toward a “multi-school zoning” policy. This reform redefines catchment boundaries by grouping multiple schools of varying quality into a single, larger residential zone. Instead of a guaranteed one-to-one mapping between a specific house and a specific school, the new framework allocates seats through centralized matching mechanisms, such as computerized lotteries or priority-based algorithms. This reform introduces probabilistic uncertainty into school admission, thereby effectively undermining the deterministic capitalization of school quality in housing prices. By doing so, the policy shifts the educational landscape from a decentralized, price-driven Tiebout market to a centralized, mechanism-designed matching market.

B. Overview of Market Design and Two-Sided Matching Theory

The economic logic of this capitalization can be precisely quantified using the Hedonic Price Model, originally formalized by Rosen (1974) [4]. A residential property is not a monolithic good but a bundle of distinct attributes: structural characteristics (size, age), neighborhood amenities (transportation, green spaces), and institutional access (school admission rights). The natural logarithm of the price of a house, $\ln(P)$, can be expressed as a function of these attributes: $\ln(P) = \alpha + \beta_1 \text{Edu} + \sum \gamma_k X_k + \epsilon$. The coefficient associated with educational quality, β_1 , precisely captures the school district housing premium, representing the marginal implicit price of education. Recent empirical studies adopting propensity score matching have firmly proven that school quality is significantly capitalized into both housing prices and rental markets in major cities such as Beijing [5]. The strict, deterministic nature of single-school zoning ensures a 100% probability of admission, maximizing this capitalization effect. To dismantle this capitalization chain, policymakers introduced multi-school zoning, breaking the deterministic one-to-one mapping and replacing it with a one-to-many probabilistic mapping.

Therefore, allocating students to public schools under the new multiple-school model is a typical use case of market design and two-sided matching theory, which was first proposed by David Gale and Lloyd Shapley, and subsequently developed for practical school choice scenarios by Roth [6]. In the standard model of a school choice matching market, there is a group of students and a group of schools, each having a certain capacity. Students have strict preferences for schools according to distance, teaching styles, and academic reputations. On the other hand, while academic criteria are strictly forbidden by law for compulsory education in China, schools prioritize students based on non-academic criteria such as the

duration of Hukou registration, property ownership status, and proximity to residence, etc. [7].

A matching mechanism, as a mathematical organizational process, matches students with schools based on submitted preferences and predetermined priorities. The fundamental shift in the Chinese educational reform market changes the allocation rule from a decentralized model (where purchasing power brutally determines outcomes) to a centralized algorithmic matching model. The efficiency, fairness, and strategy-proofness of the chosen algorithm directly determine whether the reform will be successful and how much educational equity can be achieved.

III. ANALYSIS OF MULTI-SCHOOL ZONING MATCHING MECHANISM

This section systematically analyzes the specific centralized matching mechanisms employed under the multi-school zoning policy from the perspective of market design. The following analysis evaluates the operational logic and theoretical limitations of the two primary allocation approaches currently implemented in practice. Section III.A first examines the pure random lottery mechanism, highlighting its ex-post inefficiency arising from disregard for spatial geographic constraints and heterogeneous household preferences. Following this, Section III.B dissects the mixed approach of voluntary application combined with computerized placement—often functioning as the Boston Mechanism—revealing its inherent strategic manipulation vulnerabilities while acknowledging its fundamental role in breaking deterministic capitalization.

A. Inefficiency Loss of Pure Random Lottery Mechanism

With the implementation of multi-school zoning, the admission possibility for a premium school changes from an absolute certainty to a mathematical probability. Initially, many local educational districts adopted a pure random lottery method to allocate students to schools within the newly expanded areas. Theoretically, a pure random lottery entirely uncouples household wealth from school allocation, heavily prioritizing ex-ante equality of opportunity and fairness.

However, this mechanism completely ignores the heterogeneous preferences of families and important spatial geographic constraints, resulting in a huge loss of ex-post efficiency. Take, for example, the spatial distance between a student's home and the assigned school. A completely random lottery can randomly place a student in a school far away at the opposite end of the multi-school district. Empirical studies on the spatial spillover effects of multi-school zoning show that ignoring geographic proximity results in a substantial increase in daily travel costs, severe traffic jams, and enormous social deadweight loss [8]. Furthermore, it ignores varying intensities of preference. Families with an extremely high emphasis on certain teaching styles or extracurricular advantages of a particular school are unable to represent them quantitatively. As a result, the final allocation is Pareto

inefficient, because students could theoretically swap their placements and achieve higher mutual benefits without harming others, but such exchanges are strictly forbidden by the centralized system.

B. Mechanism Analysis of Voluntary Application and Computer Placement Combining

To reduce the spatial and preference-related efficiency losses of a pure lottery, governments often use a mixed approach that combines voluntary preference reporting with computerized placements. Families may rank the schools within their multi-school zone. Clearing is typically executed in the form of the Boston Mechanism (Immediate Acceptance).

This system ostensibly respects household preferences yet is prone to notorious strategic manipulation issues. Seminal work in market design has mathematically shown that the Boston Mechanism is inherently not strategy-proof [9]. Under this mechanism, if a parent honestly ranks a highly competitive top-tier school as their top choice and does not win a seat through the lottery, they suffer a severe penalty: losing their priority right to choose their second-choice school, which may have already been taken by students who put it at the top of their list. This creates a complex Bayesian game among parents, forcing them to infer other families' application strategies. This mechanism tends to benefit "sophisticated" parents who have sufficient time, educational backgrounds, and cognitive abilities, at the expense of "sincere" but less knowledgeable families. Although there are algorithmic flaws in this centralized approach, the sheer uncertainty of the mechanism successfully breaks the deterministic capitalization logic of the old single-school system.

IV. POSITIVE IMPACTS OF MULTI-SCHOOL ZONING POLICY

This section explores the profound socioeconomic consequences of the multi-school zoning policy. Section IV.A investigates how introducing probabilistic uncertainty alters buyers' expectations, effectively deflating housing premiums and stabilizing the real estate market. Subsequently, Section IV.B details the resulting welfare redistribution across socioeconomic strata, illustrating how dismantling high-income educational monopolies significantly enhances overall social equity and systemic fairness.

A. Changes in Buyers' Expectations and Premium Stabilization Effect

The most prominent and far-reaching impact of multi-school zoning is on the expectation system and buyer mentality within the real estate market. Previously, the housing premium was based on a guaranteed and risk-free return (absolute admission). Under multi-school zoning, the educational value of a residential property shifts from a fixed financial premium to an uncertain probabilistic entitlement.

Assuming that the quality of the premium school in the zone is high and the quality of the other schools is just average, the expected educational quality obtained by

purchasing a premium house drops mathematically, as it now equals the weighted average educational quality determined by admission probabilities for high-quality schools within the zone. This expected quality is much lower than the best possible quality, and housing buyers tend to be risk-averse people who heavily discount uncertain outcomes. Thus, the rational willingness to pay drops drastically in the market. Quasi-experimental evidence in Beijing firmly verifies this theoretical prediction. Studies examining the effect of elite school designation and changes in zoning policies show that breaking this deterministic link results in a statistically significant decline in local house prices [10]. Consequently, empirical observations in pilot cities demonstrate a significant stabilization and deflation of school district housing premiums. This can prevent overheated speculation in urban real estate markets, guide capital back to production-oriented economic fields, and avoid the risk of localized or widespread bubbles.

B. Welfare Changes for High-Income and Low-Income Families

The welfare redistribution effects of the multi-school zoning policy vary among different socioeconomic strata. High-income families generally experience a large welfare loss, as they can no longer secure a guaranteed top education for their children simply through financial means. Their consumer surplus falls when uncertainty is forcefully introduced into their large real estate investments. In addition, policies that promote equality between home tenants and owners have also weakened the monopolistic power of property owners, thus changing welfare relationships in the housing market.

On the other hand, middle- and lower-income families living in regular, cheaper housing within the newly defined multi-school districts experience a significant welfare increase. They transition from an absolute state of zero possibility of accessing premium schools to having a certain degree of probability. From a macroeconomic and societal perspective, this policy narrows the inequality in the distribution of educational access opportunities. It effectively reduces the Gini coefficient for the allocation of public educational resources, breaks down the intergenerational transmission of educational monopolies, and greatly improves overall social equity and systemic fairness.

V. OPTIMIZATION SCHEME: PRIORITY-BASED IMPROVED MATCHING MECHANISM

To address the ex-post efficiency losses of pure random lotteries and mitigate the strategic manipulation risks of the Boston Mechanism, this paper proposes establishing an improved, strategy-proof matching mechanism. This paper strongly advocates for the extensive use of a Priority-based Deferred Acceptance (DA) mechanism in Chinese school districts.

Under this optimized scheme, local schools establish priority tiers for applicants based on objective and verifiable criteria, rather than solely basing admission on real estate wealth. For example, Priority Class 1 is given

to students whose families have owned property and held a continuous Hukou in the district for more than six years; Priority Class 2 is given to recent buyers; and Priority Class 3 is given to long-term tenants. Ties within each of these three priority classes are broken uniformly at random (Single Tie-Breaker). Then, the Gale-Shapley DA algorithm is executed: students apply to their most preferred school. Schools tentatively admit applicants up to their capacity based on priority and lottery numbers, temporarily rejecting the others. Rejected students then apply to their next choice, and schools continuously re-evaluate all current and new applicants together until the market clears.

This DA mechanism is expected to deliver stable socioeconomic outcomes with clear welfare implications. First, the DA mechanism is mathematically proven to be strictly strategy-proof; truthfully ranking schools constitutes the weakly dominant strategy for all households, thereby eliminating the unfairness stemming from “sophisticated” parents and alleviating parental anxiety. Second, the priority tier system maintains a moderate level of residential stability and a sense of belonging in the community, preventing excessive neighborhood turnover. Finally, the lottery tie-breaker ensures that financial wealth cannot completely dictate public school admission.

VI. CONCLUSION

This paper systematically studies the structural institutional transformation from single-school to multi-school zoning in China’s compulsory education from the perspective of the microeconomics of educational resource allocation and the stabilization of school district house prices. The findings suggest that, by shifting from a deterministic allocation model to probabilistic uncertainty, multi-school zoning has broken the rigid wealth-based capitalization of educational resources. This structural policy adjustment directly brings down house prices, restrains wild housing speculation, and makes the quality educational resources of high-income families open to low-income families for the first time, thus enhancing overall social welfare.

However, current implementation strategies relying solely on random lotteries or the Boston Mechanism suffer

from key challenges including ex post efficiency losses and the high susceptibility to strategic manipulation by parents. For better policy results, local governments must immediately enhance the matching algorithm based on deferred acceptance with priorities. This will achieve the best and most sustainable balance among fairness, allocative efficiency, and residential stability. Further research can utilize micro-level real estate transaction data and fine-grained student assignment information to conduct deeper spatial econometric analyses, empirically identify the exact decline of the premium, and precisely trace spatial welfare redistribution effects across different urban patterns.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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