Regional Science and Urban Economics 58 (2016) 42–56

Contents lists available at ScienceDirect

Regional Science and Urban Economics

journal homepage: www.elsevier.com/locate/regec

School allocation rules and housing prices: A quasi-experiment with school relocation events in Singapore☆

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ARTICLE INFO

Article history:
Received 24 October 2015
Received in revised form 29 January 2016
Accepted 15 February 2016
Available online 22 February 2016

JEL classification:
D1
D4
I2
R2
R3

Keywords:
School allocation policies
School relocation events
Prioritization rule
Private housing market
Public housing market

ABSTRACT

This study uses a unique distance-based school allocation priority rule in Singapore as an identification to test school relocation effects on housing prices in the school zone. Using housing samples during the period from 1999 to 2009, our main results show that private housing prices within 1-km zone and in 1-km to 2-km zone from the old school zone decline by 2.9% and 6.0%, respectively, 6 months before the school relocation events. Larger price declines of 5.5% and 6.9% are found for houses located in 1 km and 1 km to 2 km school zones 12 months before the school relocations. In the public housing market, we find that school relocations cause significant housing price declines of between 0.7% and 1.4% for households living within the 1-km school zone. The school relocation treatment effects are amplified by the school popularity ranking. The prioritization in school allocation accorded to houses within 1-km school zone has significant economic value in the private housing market.

1. Introduction

Government schools and government-aided schools[1] collectively form the public school system in Singapore. The Ministry of Education (MOE) envisions an objective of *every school is a good school*, where every school is given resource to develop areas of excellence and every child is given an equal opportunity to develop holistically in every school. Despite the government's concerted effort in leveling the playing field for every school, parents will not stop finding ways to get their children into popular schools; the competition for admission in these schools is intense. The Singapore's Prime Minister Lee Hsien Loong acknowledged the deeply rooted rent seeking behavior of parents in his National Day Rally speech on August 18, 2013:

> *within the same housing estate, two separate schools, few hundred meters apart, parents will go to great lengths to bring their children into School A (popular school) instead of School B. … Having got a place in a good school, they want a place in another school, which in their view will be better for their kid. Sometimes they succeed, sometimes they do not. But the belief is very deep.*

He alludes to the story of Mencius's mother[2] when describing a mother who moved four times within Singapore just to increase the chance of getting her oldest child into a good primary school. In Singapore, except for children whose parents have special affiliations,[3] Singapore citizen (SC) or Singapore Permanent Resident (SPR) children are given priority admission only if they live close to schools. Like the school attendance districts in the US, families of both SCs and SPRs living within 1-km followed by a 1- to 2-km radius from a school will

☆ We would like to thank Mathew Kahn, Jaren Pope and other participants in the ASSA-AREUEA 2015 meeting for suggestions and comments on the preliminary version of the study. We would also like to thank Mi Diao for assistance with the GIS data mapping. Errors, if any, remain the responsibilities of the authors.

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[1] There are 175 primary schools consisting of 134 government schools and 41 government-aided schools as of 2012. Government schools usually have religious and/or clan affiliations. These schools are heavily funded by the government and are required to follow the syllabus and curriculum stipulated by the Ministry of Education (MOE) of Singapore, but they have some degree of autonomy in their operation.

[2] Mencius, also known as Meng Ke or Ko, was a famous Chinese philosopher and a principal interpreter of Confucianism.

[3] The affiliated parents include those, who were former students of schools; who are members in the School's management and advisory board; who work as teaching staff in schools. See Section 2 for more details.

http://dx.doi.org/10.1016/j.regsciurbeco.2016.02.003
0166-0462/

have the priority in school allocation. The home–school distance-based allocation rule has created many modern "Mencius's mothers" among Singaporeans. Housing mobility is significantly driven by wanting to live close to good schools.

We exploit the distance-based school allocation rules in Singapore in our identification strategies by sorting houses into the "treatment" groups if located within the two priority zones: within 1-km ("TREAT1") and 1- to 2-km ("TREAT2"), and other houses in the 2- to 4-km boundary into the "control" group. The 4-km cut-off boundary is used in the same spirit as Black's (1999) to reduce boundary discontinuity effects between the treatment and the control samples. If school distance rule is significantly capitalized by families into housing prices, we should expect houses located within the 2-km boundary (Treat1 and Treat2) to command positive premiums vis-à-vis the control housing samples located in the 2- to 4-km zone. If "good" schools as mentioned in the Prime Minister's speech matter, we should expect parents to be willing to pay higher premiums for houses located in the 2-km boundary to "good" schools relative to average schools. For SC and SPR families without school going age children and for foreigners who are not eligible for the distance-based allocation exercises,[4] proximity to schools may bring more negative externalities, such as noise and congestion, than possible economic benefits, if they choose to live in houses near to schools. However, the negative externalities may not affect investors, who buy houses in school zones for rental income and capital gains purposes.

Decisions to relocate schools by the social planners will have positive impact on social welfare distributions. Some residents are happy when a new school is built in the neighborhood, while others are disappointed when an existing school is moved away from the neighborhood. The school relocations are random events to parents, who should not have a-priori access to the information. In this study, we use 16 school relocation events in Singapore as a natural experiment to test significance of capitalization (discount) of the school distance rule into housing prices in new (old) school zones. In our experiment, we exploit the school relocation events as the exogenous shocks in a difference in differences (Diff-in-Diff) framework to test for variations in school distance capitalizations (discounts) between the treatment samples (houses located within the 1-km and 1-km to 2-km school zones) and the control samples (those located outside the 2-km school zone) in both the new and old school locations. The modern "Mencius's mother" story could not be rejected, if we observe a significantly positive capitalization effect in neighborhoods that gain a new school, and/or a significantly negative capitalization effect in neighborhoods that lose a school.

This study uses school relocation events and the unique 2 km home–school distance-based priority allocation rule to test the school capitalization effects in Singapore for the periods from 1999 to 2009. Our main results show that school relocation events cause significant price declines of 2.9% and 6.0% for private houses located within 1-km zone and in 1-km to 2-km zone from the old school zone, when the school relocation news were revealed 6 months before the relocation. Larger price declines of 5.5% and 6.9% associated with the loss of a school are found for houses located the 1 km and 1 km to 2 km from the school locations, when the school relocation events were revealed 12 months earlier. In the public housing market, we also find that school relocations cause significant welfare losses of between 0.7% and 1.4% for households living within the 1-km school zone.

The treatment effects of the school relocation events were amplified in the areas that are affected by relocations of schools in the top 50 popularity ranking. In the private housing market, the loss of a top 50 ranking school causes housing prices to decline by 8.5% and 12.2% for the 1-km and 1-km to 2-km old school zones, respectively. The comparable declines in public housing prices are estimated at 5.1% and 2.4% for the 1-km and 1-km to 2-km old school zone, respectively. We also empirically tests economic values associated with prioritization in the school allocation zone, which is bounded by 2 km distance to the old school location. We found that the prioritization rule as identified by the 1-km school zone to be more relevant in the private housing market than in the public housing market. We also find other distance-related effects to affect housing prices in the 1-km school zones. In the public housing estate, negative externalities associated with school noise and congestion could not be ruled out for houses located within 200 m from the schools. However, houses located within accessibility range (201 m to 200 m in the public housing market, and 301 m to 400 m in the private housing market) are also found to command positive premiums. We empirically test the school relocation events in the new school zone using the overlapping school zone, where the school allocation priority is unaffected by the school relocations, as the treatment, and find that the housing relocation events create positive treatment effects that cause price gap between the overlapping and the new school zones to disappear after 6 months of the relocation events in both the private and public housing markets.

This study contributes makes several new findings to the current literature on school capitalization effects in housing prices. First, we use the home–school distance as our identification and the school relocation events as our exogenous shocks to test for the school capitalization effects. Differences in housing prices within and outside the school priority allocation zones at the old school locations are clean verifications of the school effects in our study. Like the school redistricting policies in the US, school relocations in Singapore are also a randomized exercise that gives us a natural experiment to address potential endogeneity problems between housing prices and school distance. Second, we use sample houses in the 2 km school zone to verify that the prioritization advantage in the school allocation rule could have positive economic values, especially for houses in the private housing markets. Third, we test if welfare losses in the old school locations will be translated into welfare gains in the new school locations. We find that the housing prices in the new school zone increase significantly after the relocation, and the price gaps with the overlapping zone, which enjoys the school prioritization privilege prior to relocation, disappear following the equalization of the school allocation prioritization advantages after the school relocation events.

The remainder of the paper is organized as follows. Section 2 reviews past literature on capitalization effects of school attendance zones on housing prices and the impact of school choice and school segregation policies. Section 3 presents some institutional details on the education system, particularly the primary school allocation policies, in Singapore. Section 4 discusses data sources and descriptive statistics. Section 5 lays out the empirical strategies, and Section 6 discusses empirical results of the tests. Section 7 concludes the study.

2. Literature review

There is a long list of literature that has shown significant capitalization of school performance into housing prices.[5] Most of the studies were found in the United States (US), which used school test scores and housing prices data from different states, such as Illinois (Downes and Zabel, 2002; Bonilla et al., 2015), Connecticut (Clapp and Ross, 2004; Clapp et al., 2008; Dhar and Ross, 2012), Florida (Figlio and Lucas, 2004), Louisiana (Zahirovic-Herbert and Turnbull, 2008), Massachusetts (Hilber and Mayer, 2009; Black, 1999), Minnesota (Reback, 2005), and North Carolina (Bifulco et al., 2009). Positive effects of school performance on housing prices were also found in other developed countries such as Canada (Bogart and

[4] Please read Section 3 of this paper on the detailed discussion on the primary 1 school allocation exercise in Singapore.

[5] See Gibbon and Machin (2008), Black and Machin (2010), Nguyen-Hoang and Yinger (2011), and Machin (2011) for comprehensive reviews of recent studies on capitalization of school quality in housing prices.