Parental Valuation of Priority Admission to Elementary Schools: The Effects of Academic Reputation and Choices

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Abstract

This paper estimates the value of priority admission to primary schools with different academic reputations. For identification, it exploits a balloting rule governing primary one registration in Singapore. The rule creates a discontinuous change in admission probability at fixed distances from schools, in neighborhoods where government policies prevent drastic variations in ethnic composition and neighborhood design. Using resale market prices of public flats where most Singaporeans live in, the evidence suggests that parents value schools with good performance or good progress in academic achievement. Restricting the sample to neighboring blocks near the boundaries of good schools results in similar conclusions.

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Introduction

This paper uses the hedonic price model to estimate the parental valuation of priority admission to primary schools with different academic reputations as school choice increases. For identification, it exploits a balloting rule that is enforced in the primary one registration exercise in Singapore whenever there is excess demand for vacancies at any primary schools. *Ceteris paribus*, this rule gives priority first to prospective students residing within 1 km of the school, then to those residing between 1-2 km by balloting places in that order.[2] Thus, this rule results in a discontinuous change in admission probability at the 1-km and 2-km perimeters of popular primary schools. Neighboring apartment blocks on opposite sides of the perimeters share similar spatial characteristics, but their residents enjoy different priorities in primary school admission.

Using resale market prices of public flats that are owned and occupied by more than eighty percent of Singaporeans, the evidence indicates a price premium for flats that are located within the 1-km and 2-km perimeters of good primary schools, i.e., primary schools that have won official recognition with good performance or good progress in academic achievement, holding constant observable apartment and location characteristics. This evidence is consistent with parental valuation of both outstanding level and change in academic achievement. In contrast, the evidence shows either no price premium or a price discount for flats that are located within the 1-km and 2-km perimeters of other schools without such reputations as the number of other schools in the vicinity increases. The evidence is also consistent with residential valuation of school amenities because proximity to a school tends to raise resale prices even after controlling for eligibility for priority admission.

In this sample of public flats on resale in the competitive market, omitted variable bias is likely to be mitigated by government policies that guard against drastic spatial variations in ethnic concentration or neighborhood design. To check robustness, I restrict the sample to neighboring apartment blocks near the 1-km and 2-km perimeters of schools with good performance or good progress, include fixed effects for these perimeters, and re-estimate the hedonic regression. This results in smaller hedonic estimates in most cases but higher estimates in some cases. Nevertheless, most estimates for schools with good performance or good progress remain positive and statistically significant at the conventional levels. On the other hand, the estimates for other schools without such reputations become statistically insignificant.

[2] 1 km equals approximately 0.62 miles.

Related Literature

Many researchers have used the hedonic regression to estimate the value of good schools. However, because good schools are more likely to be found in good neighborhoods, it is crucial to control for omitted variable bias. To this end, some researchers include an extensive list of school and neighborhood attributes in the hedonic regression (Downes and Zabel, 2002). Others use a regression or boundary discontinuity design to compare prices of neighboring houses on opposite sides of long-established school attendance district boundaries (Black, 1999; Gibbons and Machin, 2003; Kane, Staiger, and Riegg, 2005) or recently redrawn boundaries (Bogart and Cromwell, 2000; Kane, Staiger, and Riegg, 2005), controlling for boundary fixed effects and individual housing characteristics.

To effectively control for omitted variable bias, the regression discontinuity design requires uncontrolled characteristics to change smoothly across the attendance district boundaries. This requirement may be violated if the attendance district boundaries are endogenously determined to separate different neighborhoods.[3] This design also requires the boundaries to be well defined and non-porous so that there is a discontinuous change in the access to schools across clearly defined boundaries. However, in some countries like the U.K. the attendance district boundaries are porous and do not result in a discontinuous change in access to schools across the boundaries. Instead, proximity to schools tends to correlate with access to schools (Gibbons and Machin, 2006).

While the school perimeters in Singapore do not lead to a binary change in access to schools, they are also not completely porous. These perimeters are arbitrarily and uniformly defined at 1 km and 2 km of all primary schools. They are not endogenously determined to separate different neighborhoods. By construction, spatial characteristics should change continuously across these perimeters. Furthermore, the balloting procedures do lead to a discontinuous change in admission probability across the perimeters of popular schools,

[3] Bayer, Ferreira, and McMillan (2007) highlight the problem of residential sorting across the boundaries. Using restricted-access Census data from the San Francisco Bay Area that allow them to construct sociodemographic measures at the census block level, they find that higher-income, better educated households tend to sort onto the side of the boundary with higher school quality, leading to a discontinuous change in the characteristics of the households across even exogenously-determined boundaries. They show that the inclusion of detailed sociodemographic measures further reduces the estimated hedonic prices for school quality in a boundary discontinuity design, suggesting that ignoring this sorting is likely to lead to an overstatement of demand for schools versus the characteristics of immediate neighbors, except "in an idealized setting – one in which researchers were able to compare a vast number of houses facing each other directly but on opposite sides of the same boundary" because "these differences in sociodemographics would then be of little import (p.591)."

providing the identification needed for estimation. Finally, the high density housing data in Singapore allow the robustness check to restrict the sample to housing blocks that are within 100 m (or 0.062 miles) of each other in and out of the 1-km and 2-km perimeters of good schools only, providing the closest approximation to the idealized setting defined by Bayer et al. (2007), where differences in sociodemographics across the boundary should not matter because the comparison is between houses next to each other but on opposite sides of the same boundary.[4]

The Primary Schools and Primary One Registration Exercise in Singapore

The primary one registration exercise was first introduced in 1972 to provide an orderly system of admission in popular primary schools where the demand for vacancies exceeded supply. The exercise has a few phases. In each phase, children who satisfy the criteria will be given priority in registration. The number of phases and the criteria for each phase have changed over time, often reflecting changes in the national fertility policy.[5] The latest changes were announced in 1998 and became effective in 1999.[6] Admission is only guaranteed in the first phase for a child who has a sibling studying in the school of choice. Subsequently, priority is given first to a child whose parent is a former student of the school and who has joined the alumni association as a member, or whose parent is a member of the School Advisory/Management Committee, then to a child whose parent or sibling has studied in the school of choice, or whose parent is a staff member of the school of choice, and finally to a child whose parent has volunteered at least forty hours of services to the school, or whose parent is a member endorsed by the church/clan directly connected with the school, or whose parent is endorsed as an active community leader.[7]

There are quotas for all subsequent phases of the registration exercise. If demand exceeds the quota in any phase, places will be balloted first among children who live within 1

[4] The neighboring apartment blocks that are being compared in this paper may even be located on the same side, instead of opposite sides, of the road.

[5] See Saw (2005) for a good review of changes in fertility policy and eligibility criteria for priority admission over the years.

[6] This was the latest change that is relevant for our sample period (February 2001 – April 2006). On 20 December 2009, the government announced a change in the balloting rules to differentiate Singapore citizens and permanent residents. Previously, both were given one ballot slip each during the balloting exercise. Effectively from 2010, citizens will be given an additional ballot slip (i.e., two chances instead of one), while permanent residents will retain one ballot slip whenever any school conducts balloting during the primary one registration exercise. For details, see http://www.moe.gov.sg/media/press/2009/12/measures-to-further-differenti.php

[7] Different documents are needed to prove eligibility in different phases. For more details, see http://www.moe.gov.sg/education/admissions/primary-one-registration/phases/.

km of the school, then among those who live 1-2 km away, and finally among those who live farther than 2 km. Because neighborhood and other spatial characteristics change continuously across the 1-km and 2-km perimeters of schools, any difference in housing prices across these perimeters after controlling for other housing characteristics would capture the parental valuation of priority admission.[8]

To decide whether an address falls within 1 km or 2 km of a primary school, the Ministry of Education literally draws circles with 1 km and 2 km radii around the school using official maps produced by the Singapore Land Authority.[9] These maps are displayed publicly for inspection at the respective schools during the primary one registration exercise. Parents can also call the schools to check whether their home address is within 1 km or 2 km of the schools. Balloting is done in public and parents are welcome to witness the balloting. Hence, the entire process is completely transparent. Lying about one's address is an offense that is prosecutable by law and there have been reported cases of prosecution. If convicted, the punishment is up to six months' jail, a fine of S$1000, or both.[10] Anecdotal evidence abounds that parents place great importance on the primary schools their children attend[11] and the distance to a good primary school looms large in their home purchase decision because of these balloting rules.[12] It is worth emphasizing that these distance-based balloting rules are unique to primary one registration and no such rules exist for admission to secondary schools

[8] Parents could incur other costs to gain priority, most notably by becoming a parent volunteer at the school of choice and contributing at least forty hours of volunteer service before the primary one registration exercise. However, it is straightforward in principle to incorporate these additional costs: they are simply the opportunity costs of time spent doing volunteer service at the schools. In practice, the schools never disclose the profiles of their parent volunteers. Thus, it is difficult to directly estimate the opportunity cost incurred. It is also worth noting that volunteering is not always feasible because the more popular primary schools have so many parents volunteering their services that many have to be turned away. See for example, Straits Times, "Parent-Volunteer Programme a Huge Success" (26 July 1999).
Most importantly, parent volunteers are not guaranteed a place for their children because they are also subject to the balloting rules and they belong to the same phase of the registration exercise as children whose parent is a member endorsed by the church/clan directly connected with the school and children whose parent is endorsed as an active community leader. See for example, Straits Times, "No More Places in Five Primary Schools" (21 July 2001), Straits Times, "16 Schools Conduct Balloting for Primary One Places Under Phase 2B" (27 July 2005).
Thus the hedonic estimates are the common component in all parental valuations.
[9] See for example, Straits Times, "Primary 1 places - It's all in the maps" (19 June 1995).
[10] See for example, Straits Times, "P1 exercise: Schools suspect cheats" (18 August 2000). Currently S$1,000 roughly equals US$730.
[11] See for example Straits Times, "Parents get hit by pre-balloting blues" (5 August 2000).
[12] See for example Straits Times, "Pri 1 registration: Parents also use `moving house' ploy" (30 July 1993), "Proximity to schools affects Singapore prices, too" (20 May 1996), "Some parents go the distance for their kids; They move to homes near choice primary schools," (14 July 2003), "Pri 1 places: Proximity to school is important" (25 July 2005).

or beyond; the latter is based strictly on the students' academic achievement without any regard to their proximity to the schools.

Comparable data on the test scores of individual schools are not publicly available. There is also no official ranking of the primary schools. Nevertheless, the Ministry of Education did officially identify two types of good schools based on the schools' overall performance in the national Primary School Leaving Examination (PSLE). This examination is taken by all students at the end of their primary education. These schools were officially known as "schools with good performance" [13] and "schools with good progress" respectively. [14] They were respectively well-established schools that had sustained outstanding performance in the PSLE and schools that had made significant improvement.

Out of a total of about 180 primary schools in Singapore, the Ministry identified an average of 10 schools as schools with good performance and 11 schools as schools with good progress every year. Not surprisingly, the list of schools with good performance had been quite stable over time with many repeated winners because the criteria emphasized sustained good performance and tended to favor well-established schools. In comparison, the list of schools with good progress showed more variations and most schools appeared in this list only once because the criteria emphasized significant recent improvement and it is difficult to repeat the feat of significant improvement. Schools on both lists are considered schools with good academic reputations, but their hedonic prices are allowed to differ. On the one hand, schools with good performance may be valued more highly for their more established and consistent reputations. On the other hand, schools with good progress may be valued more highly because a significant improvement may signal higher value-added at the schools rather than self-selection of brighter students to attend the schools based on the schools' established reputations.

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[13] Schools with good performance are schools that satisfy the following criteria:
(a) The percentage of pupils eligible for secondary schools must be at least or above the national average;
(b) The school must have at least 80% of its pupils who are eligible for Special and Express courses;
(c) The percentage of pupils eligible for N(A), Express and Special courses must not dip by more than two percentage points compared to the results last year;

[14] Schools with good progress are schools that satisfy the following criteria:
(a) The percentage of pupils eligible for secondary schools must be at least or above the national average;
(b) The school must register at least a five-percentage point improvement in the percentage of pupils who qualify for Special/Express courses compared to the results last year;
(c) The school must register positive improvement in the percentage of pupils eligible for N(A), Express and Special courses compared to the results last year.

This distinction reflects the disagreement in the literature on the appropriate indicator of school quality in a hedonic regression: whether it should be level or change. For example, Hanushek (1986) argues for the use of value-added, or the change over time in performance on a standardized test. On the other hand, Brasington and Haurin (2006) find little support for the value-added model. Instead, they find that it is the level of test scores that gets capitalized into housing prices, probably because more information is available about test score outcomes than about any value added measure of school quality in their sample. This paper contributes to this debate by comparing the extent of capitalization between schools with good performance (that have sustained outstanding level of academic achievement) and schools with good progress (that have shown superior change in academic achievement). Their hedonic prices may therefore be viewed as proxies for the valuation of outstanding level and change in school achievement respectively.[15] Since the Ministry announced both lists of good schools in the same press release, this would attenuate the information asymmetry between the level of school quality and change.

Public Housing in Singapore: Some Unique Features

Public housing in Singapore is unique: over 80% of the Singaporeans live in public flats that they own. These flats are commonly known as the HDB flats, named after the Housing and Development Board (HDB), a government statutory board that has been responsible for planning and developing high-rise public housing in Singapore since 1960.[16] Since 1964, a national policy "Home Ownership for the People Scheme" has been actively encouraging home ownership to promote social stability by giving citizens a stake in the economy. Since 1968, the scheme was augmented by the Central Provident Fund (CPF) Approved Housing Scheme, whereby home buyers could use their contributions to CPF – a national compulsory defined contribution retirement saving plan – to pay for the purchase of HDB flats and their monthly installments. Because the government subsidizes the purchase of new flats in the primary market, I use only resale prices of HDB flats in the secondary market to ensure that the hedonic estimates reflect market valuation.

[15] Although the test scores of individual schools are not used in the hedonic regression, this is not a shortcoming for the hedonic regression because they are also unknown to the public and only publicly available information can get capitalized into housing prices.

[16] During 2000-2004, an estimated 84 to 85 percent of the resident population (including Singaporean and permanent residents) lived in these HDB flats and an estimated 82-83 percent of the resident population lived in HDB flats that they owned (HDB Annual Reports, various years).

A few unique features of the data help control for omitted variable bias. First, because these apartments are all planned and developed by the HDB, they tend to be more similar in apartment design and amenities than private properties. Second, since the boundaries for priority admission are set arbitrarily and uniformly at 1 km and 2 km around all primary schools, it is clear that these boundaries are exogenously imposed, not endogenously drawn to reflect different neighborhood or apartment characteristics across the boundaries. Third, data density is much higher for these high-rise HDB flats than landed properties, thus providing better control for omitted variables that vary across space. Finally, in contrast to private properties, the ethnic composition of HDB dwellers has been regulated by HDB's Ethnic Integration Policy (EIP), under which limits for each ethnic group are set for both HDB town and HDB apartment block to prevent the formation of ethnic enclaves in HDB estates and to ensure that the buildings' demographics reflect Singapore's racial balance.[17]

Basic Methodology

Under the hedonic hypothesis, housing properties are valued for their desirable attributes, including access to good schools. Thus, hedonic prices – the implicit prices of attributes – can be estimated by regressing sales prices of homes on their attributes (Rosen, 1974). Specifically, I estimate the following hedonic regression:

$$(1) \qquad \ln(price_{ik}) = \alpha + X_{ik}'\beta + Z_k'\delta + S_k'\gamma + \varepsilon_{ik},$$

where $price_{ik}$ is the market price of flat i in apartment block k, X_{ik} is a column vector of the physical characteristics of flat i in apartment block k (including area, age, flat type, and floor level), Z_k is a column vector of the location characteristics of apartment block k (including

[17] The Singapore government introduced the Ethnic Integration Policy (EIP) on 1 March 1989. Under the EIP, the following upper limits were set on the proportion of races in every HDB town and apartment block: Chinese 84 per cent (HDB town) and 87 per cent (HDB block); Malay 22 per cent (HDB town) and 25 per cent (HDB block); Indian and others 10 per cent (HDB town) and 13 per cent (HDB block). These limits apply not only to flats sold directly by HDB to first-time homeowners, but also to resale flats. The policy does not in fact force existing tenants to move out from those estates where the respective ethnic limits have been reached. Instead, it gradually restores racial balance in the community by prohibiting the further resale of flats to those ethnic groups whose approved limits have been reached. According to the Census of Population in 2000, Chinese constitutes 76.8 percent, Malays 13.9 percent, and Indian and other minorities 9.3 percent of total population (Census of Population 2000, Singapore Department of Statistics). Lum and Tan (2003) argue that the EIP has resulted in a more `balanced racial mix' in most housing estates by 1998.
Sharp variations in ethnic concentration could directly affect housing prices. However, Bayer et al. (2007) argue that neighborhood race is not capitalized directly into housing prices; instead, the apparent negative correlation between neighborhood race and housing prices is due entirely to the fact that some races live in unobservably lower quality neighborhoods. While it would be interesting to directly control for ethnic profiles across the HDB blocks, detailed census or HDB data are not available.

proximity to amenities like bus interchange, Mass Rapid Transit or MRT station[18], shopping center, market or food center, school, and to disutility like industrial estate), S_k is a column vector of the number of primary schools of different academic reputations that are within 1 km and 1-2 km of apartment block *k*, and ε_{ik} is an error term.[19] I use robust standard errors and adjust the standard errors for clustering at the apartment block level – allowing the error terms to be correlated between flats in the same block but assuming that they are uncorrelated across flats in different blocks. I also control for the quarter and year of sale in all regressions.

Data and Sample

The data on resale prices and the flats' physical characteristics come from the HDB.[20] I use real resale prices, which are resale prices deflated to 2001 dollars using the HDB Resale Price Index. The sample includes all resale transactions from February 2001 to April 2006 in five contiguous HDB towns located in the heartland of Singapore: Ang Mo Kio, Bishan, Toa Payoh, Serangoon, and Hougang. Figure 1 shows their locations in Singapore. I choose these HDB towns because they are the representative, mature HDB housing estates with no or very few new HDB flats. Consequently, virtually all transactions in these HDB towns are resale transactions, which are included in my sample. Most importantly, there is a good distribution of primary schools of different academic reputations in these towns. There were 36 primary schools located in these HDB towns and 45 primary schools within 2 km of these towns, out of a total of 177 primary schools in Singapore in 2006. Among them, five schools have appeared in the list of schools with good performance and fourteen in the list of schools with

[18] MRT is the equivalent of subway in Singapore although the railroad is not always underground.

[19] The school variables are measured at the apartment block level because for the primary one registration exercise, the Ministry of Education does not distinguish between different flats in the same apartment block. For example, if the map shows that part of an apartment block falls within the 1-km perimeter of a school, then all flats in the entire block are considered to be within the 1-km perimeter.

[20] The data set contains the usual apartment characteristics, such as flat type, floor area, floor level (in categories), and the resale date and lease date of the apartment (whose difference gives the age of the apartment). I include only 3-room, 4-room, 5-room, and executive HDB flats. I exclude other flat types because they are very few in number and non-representative in the characteristics of its residents. In particular, I exclude the 1-room, 2-room, HUDC and multi-generation HDB flats. According to the HDB Sample Household survey in 2003, only 2.0% and 3.2% of the HDB residents lived in 1-room and 2-room HDB flats respectively. There are even fewer HUDC and multi-generation flats. Furthermore, residents in 1-room and 2-room HDB flats are older and they tend to belong to the economically disadvantaged group: in 2003, they had an unemployment rate of 24.2% and 20.2% respectively, compared to the survey average of 7.8% for all HDB dwellers; their average age was 52.4 and 44.1 respectively, compared to the survey average of 34.2 for all HDB dwellers.

good progress at least once.[21] I refer to schools that had never appeared in either list as "other schools". These HDB towns are densely populated. They occupy a total land area of 38.04 km^2, with residential area constituting 11.75 km^2 of the total land area, housing an estimated 565,700 persons or 19.1% of the resident population in Singapore as of 31 March 2006 (HDB Annual Report 2005/2006).[22] On average, there were 48,145 persons per km^2 of the residential area.

The primary schools are located near each other; on average, there are 3 primary schools per km^2 of the residential area. To further illustrate the proximity of these primary schools, consider the linear distance between a primary school and its closest neighbor. For the 36 primary schools located in these HDB towns, the average distance is 0.76 km, with a standard deviation of 0.18, a minimum distance of 0.37 km, and a maximum distance of 1.16 km.[23] In other words, because many primary schools of different academic reputations occupy a relatively small land area, their 1-km and 2-km perimeters divide the housing estates into many small segments with different admission priorities to the primary schools.[24]

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[21] In my data set, schools with good performance and good progress are schools that have been identified under the respective lists at least once during 1999-2003 and 1999-2005 respectively. The lists for both types of schools were available since 1999. We use an earlier end date (year 2003) for schools with good performance because the Ministry of Education drastically changed the criteria used to identify these schools in 2004, while maintaining the same criteria to identify schools with good progress. Comparable list of schools with good performance cannot be constructed after year 2003 because the Ministry keeps the underlying data used to classify schools (i.e., students' test scores) confidential. See the appendix for the lists of schools that are classified under each category.
It is extremely rare for a school to have appeared in both lists. In the sample, only one school (i.e., Ai Tong School) has appeared in both lists. This school was listed as a school with good performance in 1999, good progress in 2001, and good performance again in 2002 and 2003. Thus, the good progress in 2001 appeared to be a come back, after falling short of the criteria for good performance in 2000, instead of a new improvement. Thus, the announcement of good progress for this school in 2001 is unlikely to be interpreted in the same way as the announcement of good progress for the other schools in the sample. Furthermore, having appeared more often as a school with good performance than as a school with good progress and the former's criteria being more stringent, the former reputation is likely to precede the latter. Because of these reasons, this school was simply designated as a school with good performance and no separate distinction was made.

[22] See http://www.hdb.gov.sg/fi10/fi10221p.nsf/Attachment/AR0506/$file/statistics-and-charts.pdf. 1 square kilometer equals 0.39 square miles.

[23] Not surprisingly, measured distance may be higher if the calculation includes primary schools that are located outside these HDB towns but within 2 km of these towns. Specifically, for all 45 primary schools within 2 km of these HDB towns, the average distance between a primary school and its closest neighbor is 0.76 km, with a standard deviation of 0.22, a minimum distance of 0.37 km, and a maximum distance of 1.59 km.

[24] Similarly, for schools with good performance, the average distance to their closest neighbors (regardless of the academic reputations of the neighboring schools) is 0.77 km, with a standard deviation of 0.29, a minimum distance of 0.37 km, and a maximum distance of 1.16 km. For schools with good progress, the average distance to their closest neighbors (regardless of the academic reputations of the neighboring schools) is 0.76 km, with a standard deviation of 0.09, a minimum distance of 0.63 km and a maximum distance of 0.89 km. Finally, for the other schools, the average

The data on location characteristics come from Streetdirectory.com.[25] Following Waddell, Berry and Hoch (1993), the industrial estate dummy equals 1 if an apartment block is located within 400 meters of an industrial estate,[26] whereas the public bus interchange dummy equals 1 if an apartment block is located within 300 meters of an interchange.[27] For the distance to the nearest shopping center, I consider the two largest shopping centers in these HDB towns: Bishan Junction 8 and Hougang Mall.[28] For the distance to the nearest school, I consider all schools – primary schools, secondary schools, and junior colleges[29] – to investigate whether proximity to a school is valuable for reasons unrelated to priority admission. For example, proximity to a school may provide easier access to school amenities but it may also create negative externalities such as noise and traffic.

I compile the list of primary schools that are within 1 km and 1-2 km of an apartment block from official maps that were publicly displayed at the individual schools during the primary one registration exercise in 2004.[30] For schools where these maps were not available for public viewing, I purchased the data from the Singapore Land Authority's Integrated Land Information Service.[31]

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distance to their closest neighbors (regardless of the academic reputations of the neighboring schools) is 0.76 km, with a standard deviation of 0.19, a minimum distance of 0.37 km and a maximum distance of 1.12 km.

[25] Streetdirectory.com was the most popular site for Singapore maps. The linear distances between an apartment block and different places of interest were available online at: http://www.streetdirectory.com.

[26] Industrial estates refer to estates of industrial buildings which are explicitly named as industrial parks or estates. They are Defu Industrial Estate, AMK Tech 1, AMK Techplace 1, AMK Techplace II, AMK Ang Mo Kio Industrial Park 1, Ang Mo Kio Industrial Park 2, Ang Mo Kio Industrial Park 3 (though no flats are within 400m of it), Toa Payoh Industrial Estate, Toa Payoh West Industrial Estate, Toa Payoh Industrial Park, Sin Ming Industrial Estate, Serangoon North Industrial Estate. Standalone industrial building is not considered to be an industrial estate.

[27] There are five public bus interchanges involved: Ang Mo Kio, Bishan, Toa Payoh, Serangoon, and Hougang Central Bus Interchanges. We exclude the Hougang South Bus Interchange because it had ceased operations on 13 February 2004. Since the closure of the Interchange was announced much earlier and Hougang Central Bus Interchange has been serving the residents at the new, permanent town center located further north for the past decade, the closure of the Hougang South Bus Interchange should have been expected and should have minimal impact on property prices.

[28] In results not reported here, I also include two smaller regional shopping centers: Novena Square and Thomsom Plaza in the set, in addition to the two larger ones considered above. The estimation results are quite similar.

[29] The junior colleges in Singapore offer a 2-year pre-university education that prepares students for the GCE "A" Level examination.

[30] Previous works, such as Kwame and Tan (2005), have investigated this issue using 1-km and 2-km perimeters estimated from maps that were not drawn to scale. So there were measurement errors. They also did not consider the perimeters for all schools or the cross-border design.

[31] Some schools do not put up these maps for public viewing because demand for their vacancies never exceeds supply and they never have to resort to balloting to allocate vacancies. The Integrated Land Information Service was available at:

Estimation Results

Table 1 reports the OLS estimates of the hedonic regression, using the number of schools with good performance and good progress, as well as other schools within 1 km and 1–2 km of an apartment block to measure choices for priority admission.

Column [1] controls for the flat's physical and location characteristics in the hedonic regression. The estimates suggest that on average, every school with good performance raises resale prices by 6.8% if it is located within 1 km and by 7.6% if it is located 1-2 km away. The average resale price for the full sample in Columns [1] and [2] is S$239,241. Thus, at the average resale price, a 1% price premium is equivalent to S$2,392 or US$1,746. Similarly, every school with good progress raises resale prices by 1.7% if it is located within 1 km and by 2.4% if it is located 1-2 km away. In contrast, every other school without such reputations decreases resale prices by 2.3% if it is located within 1 km, but raises resale prices by 0.6% if it is located 1-2 km away. All hedonic prices for priority admission are highly statistically significant at the one percent level.

Column [2] also controls for town fixed effects. Because HDB towns correspond to planning areas that the government used for land use planning, there may be uncontrolled spatial characteristics that vary by HDB towns.[32] It turns out that including town fixed effects leads to smaller premiums for priority admission. Some hedonic estimates become statistically insignificant at the conventional level though the signs remain unchanged. Specifically, every school with good performance raises resale prices by 0.5% if it is within 1 km (not statistically significant) and by 1.2% if it is 1-2 km away (statistically significant at the one percent level). Similarly, every school with good progress raises resale prices by 0.8% if it is within 1 km and by 1.6% if it is 1-2 km away (both statistically significant at the one percent level). On the contrary, every other school without such reputations lowers resale

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http://www.inlis.gov.sg/PSLS/PSLS-DC.aspx?strService=PSLS&strProduct=DC
This service has been renamed as the OneMap School Query Service, now available at http://www.onemap.sg/index.html. The data purchased here should be the same as those used by the primary schools because the Ministry of Education has officially referred parents to this service (see http://www.moe.gov.sg/education/admissions/primary-one-registration/faqs/#proximity).

[32] There are 55 planning areas in Singapore. The five towns included in the sample correspond to 5 of the planning areas. The Urban Redevelopment Authority (URA), the national land-use planning agency, drew up a detailed land-use plan for each planning area between 1993 and 1998 to shape Singapore's physical development over the short to medium term. The size of each planning area varies depending on land uses, proximity to the Central Area, and existing physical separators such as expressways, rivers, major open spaces and other demarcators. Each plan laid down the planning objectives for the area that it covered and specified its land-use zoning (e.g., residential, commercial, recreation), development intensity (i.e., the ratio of built-up area to site area), and etc.

prices by 0.3% if it is within 1 km (statistically significant at the ten percent level), though it has virtually no effect on resale prices if it is located 1-2 km away.

Ceteris paribus, flats in different HDB towns have different resale values; specifically, those in Bishan are the most valuable (8.6% higher than the benchmark), followed by those in Toa Poyah (4.9% higher), Ang Mo Kio (the benchmark), Serangoon (7.4% lower) and Hougang (14% lower). This price pattern may partly reflect the location of many good secondary schools and junior colleges with strong academic reputations in the former HDB towns, especially Bishan.[33] Although admission to secondary schools and junior colleges is based strictly on the students' academic achievement, proximity to these schools may still be valuable because it lowers the students' travel costs.

To approximate the idealized setting where researchers compare a vast number of houses next to each other but on opposite sides of the school boundary, Column [3] restricts the sample to neighboring apartment blocks that are within 100 meters (or 0.062 miles) of each other in and out of the 1-km and 2-km perimeters of schools with good performance or good progress. Because of the high concentration of schools in these housing estates, the restricted sample still retains more than half of the full sample even with this stringent requirement. Admittedly, with circular and possibly overlapping school perimeters, it is unclear how the perimeter or boundary fixed effects should be defined.[34] Nevertheless, it seems sensible to allow the fixed effects to vary by HDB towns, perimeter's distances from schools, and academic reputations of schools.[35] Thus, for each HDB town, the regression controls for four fixed effects for the 1-km and 2-km perimeters of schools with good performance and schools with good progress respectively.[36] The regression also controls for their interactions to account for possible overlaps between these perimeters.[37]

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[33] For example, Raffles Institution and Raffles Junior College.

[34] In contrast, in the existing literature that uses a boundary discontinuity design to control for omitted variables that change smoothly across space, the school attendance districts are contiguous and more angular in shape. As a result, the common boundary fixed effects are defined by dividing the attendance district boundaries into different sections, then assigning houses on opposite sides of the boundaries to the nearest section.

[35] In other words, the fixed effects may vary by school reputations (good performance versus good progress), distances of perimeters from school (1 km versus 2 km), and HDB towns (Ang Mo Kio, Bishan, Toa Payoh, Serangoon, and Hougang).

[36] In other words, I assume that all flats near the 1-km perimeters of schools with good performance and in the same HDB town share identical fixed effect. Similarly, I assume that all flats near the 2-km perimeters of schools with good performance and in the same HDB town share common fixed effect, and likewise for the 1-km and 2-km perimeters of schools with good progress. Thus, flats near the same school perimeters but located in different HDB towns are allowed to have different fixed effects.

[37] In other words, the four interaction terms in each HDB town are:
1-km perimeter of school with good performance × 1-km perimeter of school with good progress,

Column [3] probably has the best control for omitted variable bias. The estimated hedonic prices for schools with good performance are moderate in magnitude but always statistically significant, while those for schools with good progress are smaller in magnitude but statistically significant when the estimate is positive. In contrast, the estimated hedonic prices for the other schools are both economically small and never statistically significant at the conventional levels.

In particular, every school with good performance raises resale prices by 1.9% if it is within 1 km (statistically significant at the one percent level) and by 1.3% if it is 1-2 km away (statistically significant at the one percent level). The average resale price for the restricted sample is S$237,328. Thus, at the average resale price, a 1% price premium is equivalent to S$2,373 or US$1,732. Similarly, every school with good progress reduces resale prices by 0.1% if it is within 1 km (not statistically significant at the conventional levels), but raises resale prices by 0.6% if it is 1-2 km away (statistically significant at the five percent level). On the contrary, other schools located within 1 km have virtually no effect on resale prices, while every other school located 1-2 km away raises resale prices by 0.3% (not statistically significant at the conventional levels).

In summary, although the hedonic prices of good schools vary in magnitude across different specifications, they are almost always positive and tend to be statistically significant. Thus, priority admission to good primary schools (i.e., being located within 1 km or 1-2 km of more primary schools with good performance or good progress) tends to raise resale prices significantly. As explained earlier, to the extent that good performance is a proxy for outstanding *level* of school achievement and good progress a proxy for superior *change* in school achievement, the evidence suggests that both are valued by parents and capitalized into housing prices. In contrast, the results for other schools without such reputations are somewhat mixed; Nevertheless, their hedonic prices are generally smaller, often negative or statistically insignificant.

The flat's physical characteristics generally have the expected signs and their hedonic prices remain quite stable across different specifications.[38] In particular, larger flats, newer flats, or flats located on higher floors have higher resale prices, and the effects are statistically

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1-km perimeter of school with good performance × 2-km perimeter of school with good progress,
2-km perimeter of school with good performance × 1-km perimeter of school with good progress,
2-km perimeter of school with good performance × 2-km perimeter of school with good progress.

[38] The hedonic prices for location on higher floors (16th storey and above) do change significantly with the inclusion of fixed effects. However, these very high-rise flats are only located in selected HDB towns, so the fixed effects that vary by HDB towns may have soaked up some of the premiums for location on higher floors.

significant at the conventional levels. Moreover, 4-room, 5-room and executive flats have successively higher resale prices than 3-room flats because they tend to have more bedrooms, bathrooms, or separate living and dining rooms.

The location characteristics tend to be statistically significant at the conventional levels when they have the expected signs.[39] People generally pay a premium for flats that are near an MRT station, a bus interchange, a shopping center, a market or food center, or a school. The last finding suggests that proximity to a school is valuable even after controlling for eligibility for priority admission. Thus, there is some empirical support for residential valuation of school amenities. The hedonic estimates of location characteristics tend to vary more across different specifications, suggesting that they are more sensitive to the controls for fixed effects. Because some location characteristics may be more prevalent in some HDB towns, it may be difficult to disentangle the hedonic prices of these location characteristics from fixed effects that are allowed to vary by HDB towns.[40]

By using the number of schools to measure school choices, Table 1 restricts parental valuation to vary linearly with the number of choices. To check robustness, I next estimate specifications that relax this restriction by using a list of dummy variables to measure school choices. Table 2 reports the OLS estimates, excluding the dummies for one other school within 1 km and one other school within 1-2 km from all regressions and using them as benchmark. Columns [1], [2], and [3] in Table 2 use the same control variables as those in the corresponding columns in Table 1 and generally find similar hedonic prices for physical and location characteristics. Thus, the following discussions focus on the hedonic prices of priority admission.

Column [1] shows that without any controls for fixed effects, a school with good performance raises the resale prices of flats within 1 km by 7.5%, while two raise prices by 14.6%.[41] Similarly, at a distance of 1-2 km, a school with good performance raises resale prices by 7.4%, while two raise prices by 17.4%. These estimates indicate no diminishing marginal valuation for schools with good performance. On the other hand, a school with good progress raises the resale prices of flats within 1 km by 1.9%, two by 4.2%, and three by 3.7%. At a distance of 1-2 km, a school with good progress has no significant effect on resale

[39] For example, the coefficient on proximity to industrial estates has the wrong sign in column [1], though it is not statistically significant at the conventional levels.

[40] For example, distance to the nearest shopping center has the wrong sign in column [3], though it is not statistically significant at the conventional levels. The two largest shopping centers in this region are located in two HDB towns (Bishan and Hougang).

[41] The average resale price for the full sample in Columns [1] and [2] is S$239,241. Thus, at the average resale price, a 1% price premium is equivalent to S$2,392 or US$1,746.

prices, while two raise resale prices by 1.8%, three by 5.7%, four by 10.8%, and five by 11.7%. Most estimates are statistically significant at the conventional levels. There is little evidence for diminishing marginal valuation for schools with good progress within the sample range except perhaps at the upper end.

Relative to the benchmark, two other schools reduce the resale prices of flats within 1 km by 2.4%, three by 0.8%, four by 9.7%, and five by 11.2%. At a distance of 1-2 km and again relative to the benchmark, two other schools reduce resale prices by 1.2%, three by 1.6%, four by 3%, five by 1.1%, whereas six raise resale prices by 0.8% and seven by 2.8%. About half of the above effects are not statistically significant at the conventional levels. Nevertheless, there is some evidence that having more of the other schools in close proximity is deemed undesirable.

Column [2] shows that controlling for town fixed effects tends to reduce the hedonic prices for schools with good performance like in Table 1, but it has more ambiguous effects for schools with good progress and other schools. Specifically, the estimates suggest that one school with good performance has no significant effect on the resale prices of flats within 1 km, but two raise prices by 4.4% (statistically significant at the one percent level). Similarly, at a distance of 1-2 km, a school with good performance also has no significant effect on resale prices, but two raise resale prices by 3.3% (statistically significant at the one percent level). On the other hand, for schools with good progress, a school within 1 km raises resale prices by 0.8%, two by 1.8%, and three by 3.9%. At a distance of 1-2 km, a school with good progress raises resale prices by 3.8%, two by 4.1%, three by 6.6%, four by 7.5%, and five by 8.3% (all highly statistically significant).

For other schools, relative to the benchmark, two or three schools within 1 km have no statistically significant effect on resale prices. However, four schools within 1 km reduce resale prices by 1.3% (statistically significant at the ten percent level) and five by 3.8% (statistically significant at the one percent level). At a distance of 1-2 km, two schools reduce resale prices by 3.2%, three by 3.5%, four by 4.1%, five by 3.4%, six by 3.7%, and seven by 3.9% (all statistically significant at the one percent level). *Ceteris paribus*, the flats in the town of Bishan are again the most valuable (9.8% higher), followed by those in Toa Poyah (5% higher), Ang Mo Kio (the baseline), Serangoon (7% lower) and Hougang (13.8% lower).

Column [3] again restricts the sample to neighboring apartment blocks near the perimeters of good schools only, controlling for fixed effects that vary by school reputations, perimeter's distances from schools, HDB towns, and their interactions. This yields moderate but statistically significant price premiums for schools with good performance. Specifically,

a school with good performance raises the resale prices of flats within 1 km by 1.8% and two by 3.6% (both statistically significant at the one percent level).[42] At a distance of 1-2 km, a school with good performance raises resale prices by 1% and two by 2% (both statistically significant at the five percent level).

For schools with good progress, Column [3] yields lower hedonic prices compared to Columns [1] and [2], but some estimates remain statistically significant. Specifically, schools with good progress seem to have no statistically significant effects on the resale prices of flats within 1 km. However, at a distance of 1-2 km, a school with good progress raises resale prices by 2.2%, two by 2.3%, three by 3.5% (all statistically significant at the one percent level), four by 2.6% (statistically significant at the five percent level), and five by 1.2% (not statistically significant). The hedonic prices for other schools are economically small and statistically insignificant at the conventional levels.

The results are generally as expected, except that the price premiums for flats within 1 km of schools with good progress are often smaller in magnitude and less statistically significant than those for flats 1-2 km away even though residents in the former enjoy priority over the latter in school admission balloting. The precise reason for this finding is unclear. Nevertheless, this is the finding in the specifications with better control for omitted variable bias. One possibility is that given the geographical distribution of schools as well as the circular and overlapping school perimeters, being closer to schools with good progress means being farther away from schools with good performance, i.e., schools that have more well-established academic reputation and longer history of academic excellence – a complication that would not arise if the school attendance districts were contiguous and mutually exclusive. So risk-averse homebuyers may prefer to stay close to schools with good performance while remaining within moderate distance from schools with good progress. The extent to which the schools' capacity constraints have been binding and actual balloting history at the schools' 1-km and 2-km perimeters may also matter. However, without historical data on actual balloting in different schools, this is just a conjecture.

Conclusions

Using the distance-based balloting rule governing primary one registration in Singapore and its high-density housing data, this paper estimates the value of priority admission to primary schools of different academic reputations. The results suggest that

[42] The average resale price for the restricted sample in Column [3] is S$237,328. Thus, at the average resale price, a 1% price premium is equivalent to S$2,373 or US$1,732.

parents value priority admission to primary schools that have sustained good performance or shown good progress in academic achievement: home buyers pay a price premium for flats that fall within 1 km and 2 km of these schools because whenever there is excess demand for vacancies, places will be balloted first among children who live within 1 km, and then among those who live between 1-2km from these schools. Most estimates for schools with good performance or good progress remain positive and statistically significant at the conventional levels in the robustness checks that restrict the sample to neighboring apartment blocks just in and out of their 1-km and 2-km perimeters.

To the extent that good performance proxies for superior level of academic achievement and good progress for change, the evidence suggests that parents value both level and change. In contrast, parents do not value having more choices for other schools without such reputations. Finally, after controlling for eligibility for priority admission to primary schools, proximity to a school still tends to raise resale prices. This suggests that proximity is valuable for reasons unrelated to school admission.

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Appendix

The Lists of Schools with Different Academic Reputations

Schools with Good Performance: CHIJ St. Nicholas Girls', Ai Tong, Maris Stella High, Pei Chun Public, and Rosyth.

Schools with Good Progress: Anderson Primary, Kuo Chuan Presbyterian Primary, Guangyang Primary, CHIJ Primay (Toa Payoh), Da Qiao Primary, Marymount Convent, Zhonghua Primary, CHIJ Our Lady of the Nativity, Parry Primary, Punggol Primary, Anglo-Chinese School (Primary), St. Michael's, Rivervale Primary, and Nan Chiau Primary.

The Other Schools: Ang Mo Kio Primary, Jing Shan Primary, Mayflower Primary, Teck Ghee Primary, Townsville Primary, Catholic High, Cedar Primary, First Toa Payoh Primary, Kheng Cheng, St. Andrew's Junior, CHIJ Our Lady of Good Counsel, St. Gabriel's Primary, Serangoon Garden South School, Yangzheng Primary, Holy Innocents' Primary, Hougang Primary, Montfort Junior, Paya Lebar Methodist Girls' School (Primary), Xinghua Primary, Xinmin Primary, Yio Chu Kang Primary, Balestier Hill Primary, Compassvale Primary, Fernvale Primary, North Spring Primary, and Seng Kang Primary.

Criteria for Schools with Good Performance and Good Progress

Schools with good performance were schools that satisfied the following criteria:

(a) The percentage of pupils eligible for secondary schools must be at least or above the national average;
(b) The school must have at least 80% of its pupils who are eligible for Special and Express courses;
(c) The percentage of pupils eligible for N(A), Express and Special courses must not dip by more than two percentage points compared to the results last year;

Schools with good progress were schools that satisfied the following criteria:

(a) The percentage of pupils eligible for secondary schools must be at least or above the national average;
(b) The school must register at least a five-percentage point improvement in the percentage of pupils who qualify for Special/Express courses compared to the results last year;
(c) The school must register positive improvement in the percentage of pupils eligible for N(A), Express and Special courses compared to the results last year.

Note: I use the list of schools with good performance from 1999-2003 and the list of schools with good progress from 1999-2005. The reason that the former list ended earlier was because the announcement of schools with good performance was discontinued in 2004 (the criteria MOE used for good performance changed significantly). Thus, no comparable data on schools with good performance exist after 2004.

Table 1 – Hedonic Prices of Priority Admission (Assuming Linearity in Valuation)

Dependent Variable = ln (Real resale prices)	[1]	[2]	[3]
ln (area of flat)	0.97	0.943	0.973
	[0.025]***	[0.015]***	[0.018]***
ln (age of flat)	-0.115	-0.137	-0.134
	[0.006]***	[0.004]***	[0.006]***
Dummy for 4-room flat	0.04	0.049	0.039
	[0.009]***	[0.006]***	[0.006]***
Dummy for 5-room flat	0.133	0.144	0.119
	[0.014]***	[0.009]***	[0.011]***
Dummy for executive flat	0.178	0.21	0.193
	[0.020]***	[0.013]***	[0.015]***
Dummy for 6-10th storey	0.038	0.035	0.035
	[0.002]***	[0.001]***	[0.002]***
Dummy for 11-15th storey	0.053	0.05	0.05
	[0.002]***	[0.002]***	[0.002]***
Dummy for 16-20th storey	0.142	0.096	0.096
	[0.007]***	[0.004]***	[0.005]***
Dummy for 21-25th storey	0.21	0.134	0.123
	[0.008]***	[0.006]***	[0.010]***
Dummy for 26-30th storey	0.222	0.122	0.084
	[0.022]***	[0.015]***	[0.032]***
Dummy for within 300 m of a bus interchange	0.018	0.021	0.024
	[0.008]**	[0.006]***	[0.008]***
Dummy for within 400 m of an industrial estate	0.003	-0.017	-0.002
	[0.006]	[0.004]***	[0.005]
ln (distance to the nearest MRT station)	-0.081	-0.067	-0.062
	[0.004]***	[0.003]***	[0.006]***
ln (distance to the nearest shopping center)	-0.023	-0.01	0
	[0.005]***	[0.004]**	[0.006]
ln (distance to the nearest market or food center)	-0.06	-0.02	-0.01
	[0.004]***	[0.003]***	[0.004]**
ln (distance to the nearest school)	-0.017	-0.012	-0.006
	[0.005]***	[0.003]***	[0.004]
Number of schools with good performance < 1 km	0.068	0.005	0.019
	[0.006]***	[0.004]	[0.005]***
Number of schools with good performance 1-2 km	0.076	0.012	0.013
	[0.005]***	[0.003]***	[0.004]***
Number of schools with good progress < 1 km	0.017	0.008	-0.001
	[0.005]***	[0.003]***	[0.005]
Number of schools with good progress 1-2 km	0.024	0.016	0.006
	[0.003]***	[0.002]***	[0.003]**
Number of other schools < 1 km	-0.023	-0.003	0
	[0.003]***	[0.002]*	[0.002]
Number of other schools 1-2 km	0.006	0	0.003
	[0.002]***	[0.001]	[0.002]
Sample restriction to 1-km and 2-km boundaries	No	No	Yes
Town Fixed Effects	No	Yes	No
Town Fixed Effects * Perimeter Distance Dummies	No	No	Yes
Town Fixed Effects * School Reputation Dummies	No	No	Yes
Town Fixed Effects * Interaction between Perimeter Distance and School Reputation Dummies	No	No	Yes

N	32637	32637	18375
R^2	0.9	0.93	1

Notes: All regressions include year of sale and dummies for quarter of sale. Robust standard errors are in brackets. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

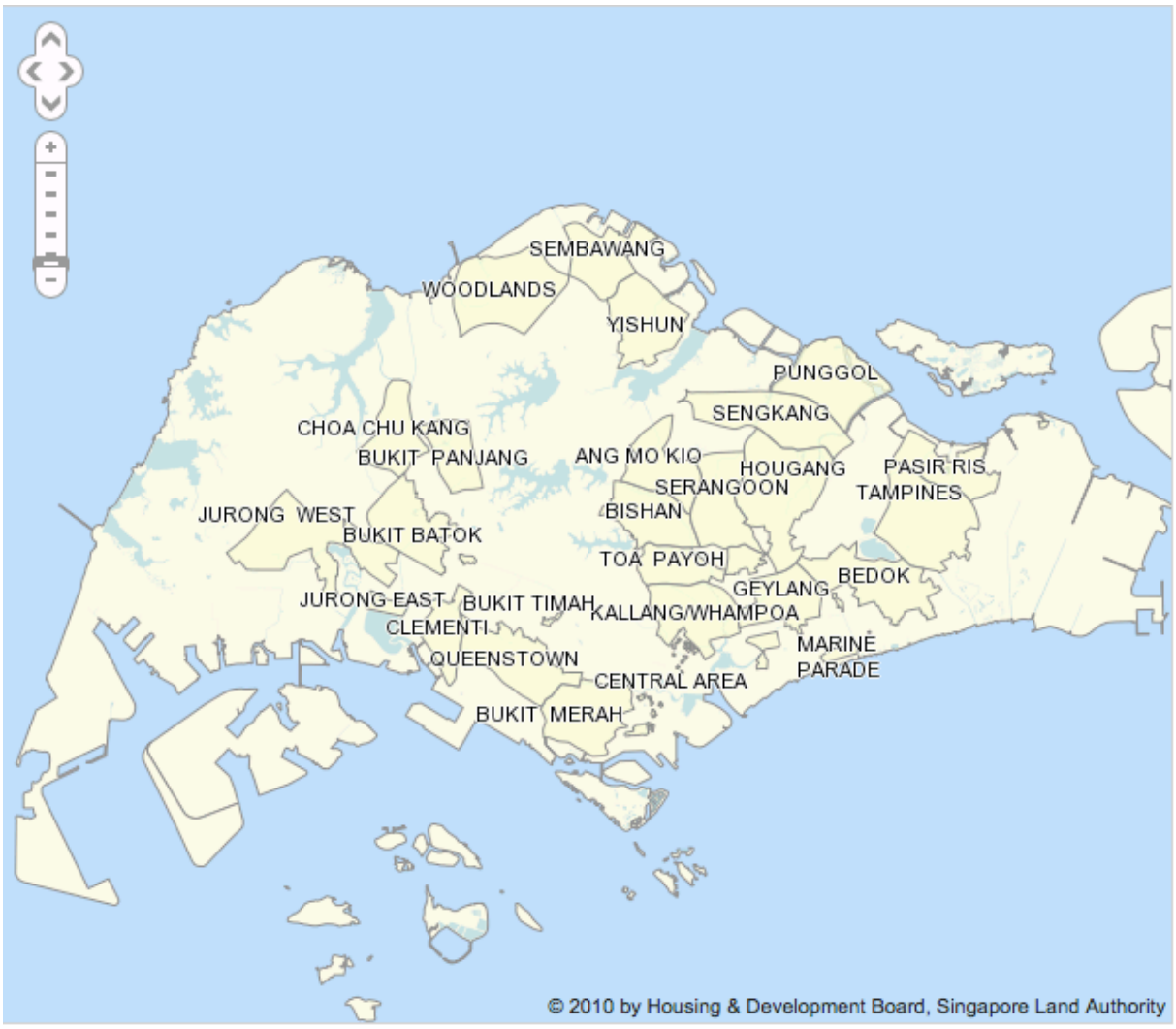
Table 2 – Hedonic Prices of Priority Admission (Allowing for Non-linearity in Valuation)

Dependent Variable = ln (Real resale prices)	[1]	[2]	[3]
ln (area of flat)	0.965	0.928	0.971
	[0.024]***	[0.015]***	[0.017]***
ln (age of flat)	-0.114	-0.138	-0.134
	[0.006]***	[0.004]***	[0.006]***
Dummy for 4-room flat	0.04	0.052	0.039
	[0.009]***	[0.006]***	[0.006]***
Dummy for 5-room flat	0.134	0.152	0.12
	[0.014]***	[0.009]***	[0.010]***
Dummy for executive flat	0.179	0.219	0.196
	[0.019]***	[0.013]***	[0.015]***
Dummy for 6-10th storey	0.037	0.035	0.035
	[0.002]***	[0.001]***	[0.002]***
Dummy for 11-15th storey	0.053	0.05	0.049
	[0.002]***	[0.002]***	[0.002]***
Dummy for 16-20th storey	0.138	0.095	0.093
	[0.007]***	[0.004]***	[0.005]***
Dummy for 21-25th storey	0.201	0.133	0.12
	[0.008]***	[0.006]***	[0.010]***
Dummy for 26-30th storey	0.204	0.114	0.08
	[0.024]***	[0.017]***	[0.031]***
Dummy for within 300 m of a bus interchange	0.019	0.021	0.023
	[0.008]**	[0.006]***	[0.008]***
Dummy for within 400 m of an industrial estate	0.002	-0.023	-0.006
	[0.006]	[0.004]***	[0.005]
ln (distance to the nearest MRT station)	-0.079	-0.066	-0.064
	[0.004]***	[0.003]***	[0.006]***
ln (distance to the nearest shopping center)	-0.031	-0.007	0.004
	[0.007]***	[0.004]	[0.007]
ln (distance to the nearest market or food center)	-0.057	-0.018	-0.009
	[0.004]***	[0.003]***	[0.004]**
ln (distance to the nearest school)	-0.026	-0.017	-0.007
	[0.005]***	[0.003]***	[0.004]
Dummy for 1 school with good performance < 1 km	0.075	0.001	0.018
	[0.006]***	[0.005]	[0.005]***
Dummy for 2 schools with good performance < 1 km	0.146	0.044	0.036
	[0.018]***	[0.013]***	[0.014]***
Dummy for 1 school with good performance 1-2 km	0.074	-0.002	0.01
	[0.006]***	[0.004]	[0.005]**
Dummy for 2 schools with good performance 1-2 km	0.174	0.033	0.02
	[0.011]***	[0.007]***	[0.010]**
Dummy for 1 school with good progress < 1 km	0.019	0.008	-0.007
	[0.006]***	[0.003]**	[0.005]
Dummy for 2 schools with good progress < 1 km	0.042	0.018	-0.002
	[0.012]***	[0.006]***	[0.010]
Dummy for 3 schools with good progress < 1 km	0.037	0.039	0.017
	[0.020]*	[0.015]***	[0.020]
Dummy for 1 school with good progress 1-2 km	-0.001	0.038	0.022
	[0.008]	[0.005]***	[0.007]***
Dummy for 2 schools with good progress 1-2 km	0.018	0.041	0.023
	[0.008]**	[0.006]***	[0.009]***

Dummy for 3 schools with good progress 1-2 km	0.057	0.066	0.035
	[0.010]***	[0.008]***	[0.011]***
Dummy for 4 schools with good progress 1-2 km	0.108	0.075	0.026
	[0.011]***	[0.009]***	[0.011]**
Dummy for 5 schools with good progress 1-2 km	0.117	0.083	0.012
	[0.027]***	[0.017]***	[0.024]
Dummy for 2 other schools < 1 km	-0.024	0.001	0.003
	[0.006]***	[0.004]	[0.005]
Dummy for 3 other schools < 1 km	-0.008	0.003	0.005
	[0.008]	[0.005]	[0.007]
Dummy for 4 other schools < 1 km	-0.097	-0.013	-0.005
	[0.011]***	[0.007]*	[0.010]
Dummy for 5 other schools < 1 km	-0.112	-0.038	0.009
	[0.019]***	[0.013]***	[0.020]
Dummy for 2 other schools 1-2 km	-0.012	-0.032	0.007
	[0.011]	[0.008]***	[0.011]
Dummy for 3 other schools 1-2 km	-0.016	-0.035	-0.004
	[0.011]	[0.007]***	[0.012]
Dummy for 4 other schools 1-2 km	-0.03	-0.041	0.006
	[0.011]***	[0.008]***	[0.014]
Dummy for 5 other schools 1-2 km	-0.011	-0.034	0.009
	[0.011]	[0.008]***	[0.015]
Dummy for 6 other schools 1-2 km	0.008	-0.037	0.009
	[0.012]	[0.009]***	[0.016]
Dummy for 7 other schools 1-2 km	0.028	-0.039	0.013
	[0.016]*	[0.010]***	[0.017]
Sample restriction to 1-km and 2-km boundaries	No	No	Yes
Town Fixed Effects	No	Yes	No
Town Fixed Effects * Perimeter Distance Dummies	No	No	Yes
Town Fixed Effects * School Reputation Dummies	No	No	Yes
Town Fixed Effects * Interaction between Perimeter Distance and School Reputation Dummies	No	No	Yes
Observations	32637	32637	18375
R-squared	0.91	0.93	1

Notes: All regressions include year of sale and dummies for quarter of sale. Robust standard errors are in brackets. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Figure 1: HDB Towns in Singapore



Source: http://services2.hdb.gov.sg/web/fi10/emap.html