



The political economy of housing prices: Hedonic pricing with regression discontinuity

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ABSTRACT

This paper uses hedonic pricing to empirically estimate the value of publicly provided local goods and services in the constituencies of the ruling party relative to those of the opposition parties. To improve control for omitted variables that change smoothly over space, we use a regression discontinuity design to restrict the sample to houses that are near the electoral boundaries. Using resale market prices of public flats in Singapore, in some cases we find a moderate but highly statistically significant difference in housing prices across the electoral boundaries that separate the constituencies of the ruling party and the opposition parties.

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1. Introduction

Because the ruling party tends to have more control over resources and their allocation, it can provide more benefits – in the form of more publicly provided goods and services – in its constituencies. This paper empirically investigates the political economy of housing prices in Singapore: it estimates the value of goods and services provided in the constituencies of the ruling party (relative to those of the opposition parties) through its public housing program. The People Action's Party (PAP) that has ruled Singapore since independence started a public housing program that achieved near universal home ownership.¹ The program is so successful that it has been used to generate legitimacy for the ruling government in election campaigns. More importantly, the ruling party has promised

priority for public housing upgrading and higher quality estate management services in its constituencies. Some argued that “the cost in material life within the residential environment was raised so high that to vote against the PAP was tantamount to voting against one’s own material interests” (Chua, 2000, p. 57).

Because an individual is unlikely to be the pivotal voter in an election and because the ruling party cannot distinguish between supporters and non-supporters in its constituencies, these benefits can be regarded as a set of pre-determined locational characteristics for individual home buyers and they can be valued using the standard hedonic price model. However, the hedonic price estimate may be biased if the model fails to fully control for some unobserved characteristics. To better control for the omitted variable bias, we use a regression discontinuity (RD) design: by restricting our sample to apartment blocks that are close to the electoral boundaries, we effectively control for any unobserved variations in neighborhood and housing characteristics that change smoothly across the electoral boundaries. Because eligibility to these benefits changes discontinuously at the electoral boundaries, we can

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¹ According to the Census of Population 2000 (Statistical Release 5 – Households and Housing), 92.3% of the households owned the dwelling units they occupied in year 2000.

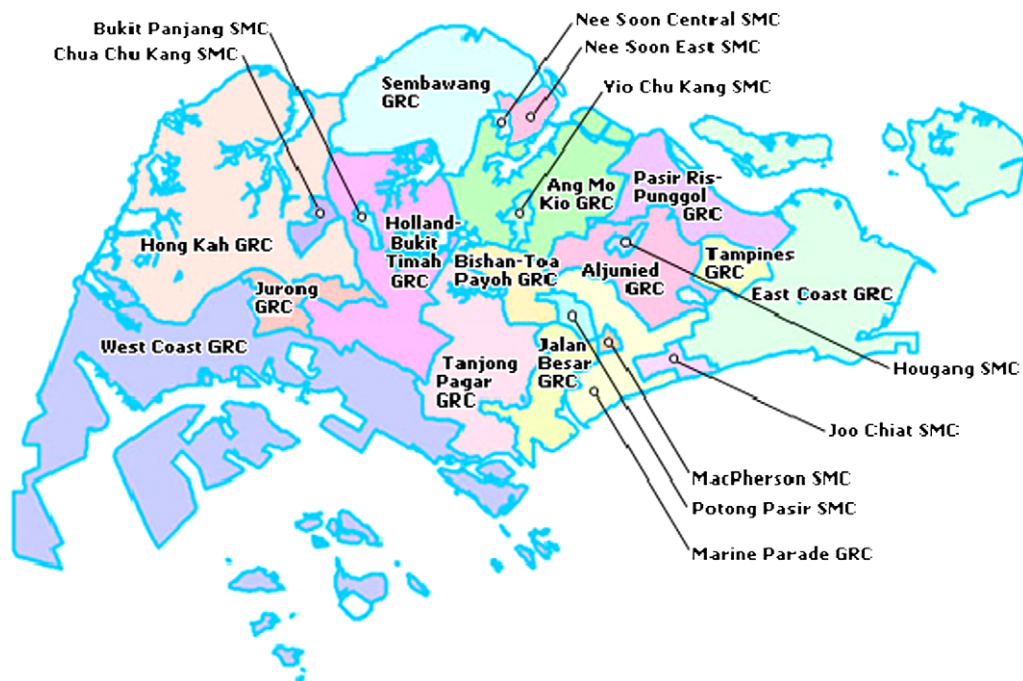


Fig. 1. The electoral map of all constituencies in Singapore. *Source:* Elections Department of the Prime Minister's Office, Republic of Singapore http://www.elections.gov.sg/elections_map_electoral.html. For more information on the different types of electoral constituencies in Singapore, see http://www.elections.gov.sg/elections_type_electoral.html.

attribute any remaining difference in mean housing prices across the electoral boundaries to the valuation of these benefits. If housing prices have a political economic component, then they should be higher in the PAP constituencies than the adjacent opposition constituencies, *ceteris paribus*.

There are two long-standing opposition constituencies in Singapore: Hougang and Potong Pasir. They were also the only two opposition constituencies during our sample period. Fig. 1 shows an electoral map with all constituencies in Singapore. Using resale market prices of flats built by the government – commonly known as the Housing and Development Board (HDB) flats, we find a statistically significant price premium for flats located in the PAP constituency over those in the opposition constituency in Hougang, where the observable characteristics corroborate the validity of an RD design: they become more similar as we move closer to the electoral boundaries. In addition, flats that have been selected for the Main Upgrading Program were also priced higher. In contrast, we do not find any price effects in Potong Pasir, where flats on opposite sides of the electoral boundaries remain quite different in their observable locational and physical flat characteristics.

Before proceeding, it is worth emphasizing that this paper is primarily interested in the positive analysis of the valuation of these benefits. The normative questions are beyond the scope of this paper.

1.1. The benefits enjoyed by residents in the PAP constituencies

The public housing program in Singapore is unique: over 80% of the Singaporeans live in the HDB flats that they own. This widespread ownership of public flats is the re-

sult of deliberate government policy to promote social stability, by giving citizens a stake in the economy. These public flats are commonly known as the HDB flats because they were built by the HDB, the public housing authority in Singapore and a statutory board under the Ministry of National Development.

In 1990, the PAP government initiated a number of programs to upgrade old public housing estates to the standard of new estates to keep these older estates desirable and the residents' investment in their flats intact. Among these programs, the Main Upgrading Program (MUP) is the most important and most comprehensive: it makes improvements to residents' precincts, blocks and even individual flats (HDB, 2006).² The ruling party had been sending a clear message to the voters: the government would give priority for upgrading to PAP constituencies over the opposition constituencies.³ In the 1997 election campaign, the ruling party delivered this message in an open letter to the voters

² These upgrading programs are undertaken by HDB on a cost-sharing basis with the residents. On 9 August 1995, Straits Times reported that the Minister of Finance saw the upgrading program as "a means of redistributing government 'budget surpluses in ways which would increase the assets of Singaporeans, and the HDB upgrading programme was a tangible way of doing so" (quoted in Chua, 1997, p. 146). There is anecdotal evidence that some voters are attracted by the priority in upgrading (Today, 5 May 2006b).

³ The upgrading programs are never completely denied to an opposition constituency. Rather, priority is given to the constituencies of the ruling party (Straits Times, 11 June 2006). The government's stand has been to place the opposition constituencies "at the end of the queue" for the upgrading programs. It was only until July 2009 that the government finally selected HDB flats in these two opposition constituencies for the Lift Upgrading Program (LUP) for the first time (Straits Times, 14 July 2009, "Opposition Wards in LUP").

(Sunday Times, 29 December 1996). In the most recent 2006 election campaign, the PAP candidate for the Hougang constituency announced that the HDB “will approve a \$100 million estate redevelopment plan for Hougang should he win the seat” (Today, 4 May 2006a).⁴ There was a similar \$80 million plan for the Potong Pasir constituency should the PAP candidate win the seat. An observer noted that in Potong Pasir, almost all apartment blocks on the side of the PAP constituency in Toa Payoh town have been upgraded, while “across the invisible constituency line, neighboring blocks built at the same time looked dilapidated” (George, 2000).

Chua (1997) suggests that similar tactics to gather political support were used in the dispensing of the smaller ‘community improvement’ budget, a government fund that supports community-level activities, including community centers. Chua (1997) reports that “between January 1992 and April 1995, constituting more than half the term of office of the elected parliament, all but four wards have received funds from the Project Committee. The four that were left out were the four opposition wards in a parliament of 81 MPs” (Chua, 1997, p. 146).

Furthermore, PAP has long prided itself for its ability to select professionals with good track records to be its electoral candidates. Because the Members of Parliament (MPs) chair the town councils that in turn manage the public housing estates, there may be a perception that the PAP constituencies provide better estate management services than the opposition constituencies and that the PAP MPs are more effective in servicing their constituencies because they are more experienced or have more resources at their disposal.

The PAP has emphasized that these benefits are unique to its constituencies and are in fact unavailable to its supporters in the opposition constituencies, in part because it is difficult, if not impossible, to distinguish true supporters from non-supporters. Instead, they are given collectively to the entire constituency where the ruling party wins the election. It is therefore reasonable to assume that eligibility to these benefits changes discontinuously at the electoral boundaries.

2. Methodology and data

Our methodology follows Black (1999), who investigates the parental valuation of elementary education by comparing the prices of houses located on opposite sides of attendance district boundaries – the geographic lines that determine which school a child attends within a school district. The standard hedonic price model assumes that there is an inelastic supply of housing and the consumers differ in their tastes for housing characteristics. “In equilibrium, all consumers with identical preferences and income can achieve the same level of satisfaction; price compensates for greater amenities” (Black, 1999). As a result, the price of the property is a function of its housing characteristics:

$$\ln(\text{price}_i) = \alpha_0 + X_i'\alpha_1 + T_i'\alpha_2 + \alpha_3 Z_i + \varepsilon_i, \quad (1)$$

where price_i is the real resale price of flat i , X_i is a column vector of variables that describe the physical characteris-

tics of the flat, including its age, area, floor level, flat type and an upgrading dummy that equals 1 if the flat has been selected to undergo the Main Upgrading Program (MUP).⁵ T_i is a vector of locational characteristics of flat i , including the proximity to good primary schools, industrial estates, expressways, public bus interchanges and Mass Rapid Transport (MRT) stations.⁶ Finally, Z_i is a dummy variable that equals 1 if flat i is located in a PAP constituency, and 0 otherwise. It measures other benefits – other locally provided goods and services – in the constituencies of the ruling party relative to those of the opposition parties, in addition to those already provided under the Main Upgrading Program. It is not a valuation of the ruling party at the national level because national policies, such as tax rates, apply to everybody.

Unfortunately, a simple hedonic regression such as Eq. (1) tends to suffer from omitted variable bias. Some factors that affect property values may be unobservable.⁷ If the omitted variables change smoothly over space, then flats that are close together are likely to share the same values for the omitted variables. Hence, to improve control for these omitted variables, we use a regression discontinuity design to restrict the sample to flats that are close to the electoral boundaries and further include a set of boundary dummies for flats that share the same electoral boundaries:

$$\ln(\text{price}_i) = \alpha_0 + X_i'\alpha_1 + T_i'\alpha_2 + \alpha_3 Z_i + B_i'\alpha_4 + \varepsilon_i, \quad (2)$$

where B_i is a column vector of boundary dummies that indicate the closest electoral boundary to flat i . Thus, we use the boundary dummies to improve control for all locational and neighborhood characteristics that are shared by flats located on opposite sides of the electoral boundaries. We keep controlling for the vector of locational characteristics T_i because some of these characteristics could change discontinuously across space by construction. If this design fully controls for the omitted variable bias, then α_3 – the difference in mean resale prices of flats across the electoral boundaries – can be interpreted as the value of publicly provided local goods and services in the constituencies of the ruling party relative to those of the opposition party. The RD design is valid if the omitted characteristics change continuously over the electoral boundaries, while the

⁵ There are three other upgrading programs: the Lift Upgrading Program (LUP), the Interim Upgrading Program (IUP) Plus, and the Selective En-bloc Redevelopment Scheme (SERS). Under the LUP, new lifts are added and existing lifts are upgraded to serve every floor. The IUP Plus includes an LUP component. Under the IUP, covered walkways linking blocks are built and letter boxes are replaced with new ones. The exterior of the blocks are also repainted. The LUP and IUP are not included because the opposition constituencies also have IUP-like upgrading program that is carried out by the town councils chaired by the opposition MPs – so they may not be unique to the constituencies of ruling party – and because it is difficult to collect comparable data for the opposition constituencies. Under the SERS, selected old low-rise flats are redeveloped to optimize land use. Residents who are offered SERS get the chance to upgrade to new and better flats nearby with a fresh 99-year lease. During the sample period, no flats in the electoral districts considered were affected by the SERS. As a result, our paper considers only the MUP.

⁶ MRT is the subway in Singapore.

⁷ For example, household income and ethnic concentration of different ethnic groups may change across neighborhoods. Unfortunately, census data at the micro level are not publicly available and therefore we cannot control for these variables directly.

⁴ The Singapore dollar was worth about USD 0.64 at the time.

quantity or quality of publicly provided goods and services change discontinuously at the boundaries.

2.1. Related literature

In addition to Black (1999), similar regression discontinuity designs based on borders identification strategies have been used to investigate a number of different issues. For example, by comparing manufacturing activity across state borders, Holmes (1998) estimates the effect of probusiness state policies on the location of manufacturing. Similarly, by comparing approved mortgage applications across state borders, Pence (2006) identifies the effect of defaulter-friendly state foreclosure laws on the size of approved mortgage loans. Furthermore, by exploiting discontinuities in the selection rules for policy interventions, Chay and Greenstone (2005) and Greenstone and Gallagher (2006) demonstrate that “it is possible to identify research designs that mitigate the confounding that has historically undermined the credibility of conventional hedonic approaches to valuing non-market goods” such as clean air and environment. This paper contributes to this growing body of research by applying the design to value the public provision of goods and services that is politically motivated.⁸

Even though the PAP has ruled Singapore continuously since independence, this seeming lack of political competition did not lead to corruption and economic stagnation. Some researchers have tried to explain this and other growth miracles in East Asia with “ruling-party institutionalization” that allows larger groups of citizens to act collectively to limit the discretionary decisions by political leaders and to hold them accountable for their actions. For example, the World Bank’s (2009) development report for Middle East and North Africa argues that some East Asian countries achieved good governance and fast economic growth despite the absence of strong opposition parties because they institutionalized the ruling party, the civil service, or other organizations.⁹ Specifically, Gehlbach and Keefer (2009) argue that ruling-party institutionalization allows the governments in these countries to make credible commitments to investors to encourage investment, and to bureaucrats to induce effort.

Similarly, Keefer (2004b, 2005) and Keefer and Vlaicu (2008) argue that some young democracies cannot attain good governance and economic development because of political market imperfections such as the lack of credibility of pre-electoral political promises by politicians and incomplete information by voters. These political market imperfections lead to the under-provision of public goods, excessive transfers to narrow groups of voters and

rent-seeking. Singapore was very fortunate that the PAP has been able to establish strong credibility early on. Being a small city-state without any natural resources has actually attenuated the problem of incomplete voter information in Singapore; voters could clearly attribute early economic success to the PAP and its policies. Therefore, it is no coincidence that the PAP government has made voting compulsory and it has been exempt from short-sighted “pork-barrel” policies and clientelism.¹⁰ Instead, it has opted for policies with longer run payoffs to win political support, such as the HDB upgrading programs that are costly in the short-run but yield capital appreciation in the long-run. Thus, to the extent that Singapore has an institutionalized ruling party, this paper can be regarded as a case study of how ruling-party institutionalization affects policy choice with effects on long-term housing prices when political market imperfections such as lack of political credibility and incomplete voter information are absent.¹¹

2.2. The data

Housing data come from the HDB and include the resale price, address, floor area, floor level, age and HDB flat types of all resale transactions between February 2001 and April 2006.¹² Unless stated otherwise, flat prices refer to real resale prices, which are resale prices deflated to 2001 dollars using the HDB quarterly Resale Price Index.¹³ By 2001, the Hougang and Potong Pasir constituencies have been the opposition constituencies for 10 and 17 years, respectively.¹⁴ The electoral boundaries of both constituencies have remained unchanged ever since they became opposition constituencies in the 1991 and 1984 elections, respectively (Election Department (2006) and White Paper (1984, 1988, 1991, 1996, 2001)). Thus, these boundaries are in fact pre-determined and any impact of being an opposition constituency should have been fully capitalized into property

¹⁰ Voters who do not vote at an election will lose their right to vote at any subsequent election, and they will be disqualified from being a candidate at any subsequent election. For more details, see: http://www.elections.gov.sg/voters_compulsory.html

¹¹ We thank an anonymous referee for suggesting the link to this literature.

¹² The original data set contains data on sale date and lease date of each resale flat. The age of a flat can be calculated as the difference between these two dates. A 3-room flat has only 2 bedrooms while a 4-room flat has 3 bedrooms. A 5-room flat also has 3 bedrooms. However, unlike a 4-room flat, it has separate living and dining rooms. The difference between an executive flat and a 5-room flat is that the former has one more room and is generally larger. We consider only the following types of flats: 2-room, 3-room, 4-room, 5-room, and executive flats. We omit the other types because they are few in number and non-representative. For example, the 1-room flats are typically rented, not owned, by very low income families, tend to be very old because the HDB stopped building them long ago. Dummies are used to indicate the floor level on which the flat is located because the HDB data provide only intervals of floor levels between which the resale flats are located, i.e., between first and fifth floors, sixth and tenth floors, and so on.

¹³ For example, we deflate 2003 quarter 3 prices using 2001 quarter 3 prices as the base.

¹⁴ These constituencies have been held by two different opposition parties in Singapore. The Hougang constituency has been held by Mr. Low Thia Khian of the Worker’s Party since the 1991 election. On the other hand, the Potong Pasir constituency has been held by Mr. Chiam See Tong of the Singapore Democratic Alliance since the 1984 election.

⁸ Lee (2008) has used a discontinuity design to study a different political economy issue: by comparing districts where a party’s candidate barely won an election to districts where a party’s candidate barely lost, Lee (2008) estimates the electoral advantage of incumbency in the United States House of Representatives.

⁹ Keefer (2004a) defines governance as “the extent to which governments are responsive to citizens and provide them with certain core services, such as property rights and, more generally, the rule of law; and the extent to which the institutions and processes of government give government decision makers an incentive to be responsive to citizens.”

prices. Data for precincts which were selected for the Main Upgrading Program (MUP) and the dates when they were selected were retrieved online from the HDB infoWEB (<http://www.hdb.gov.sg/>) and annual reports.¹⁵

We focus on the HDB flats for a few reasons. First, most Singaporeans live in HDB flats that they own; as of March 2001, an estimated 82% of the population lived in HDB flats that they own (HDB, 2004). Second, as discussed above, the provision of goods and services by the ruling party centers around the HDB neighborhoods. Third, the interior characteristics of HDB flats are relatively homogeneous because they are all developed by the HDB. Fourth, because they are high-rise apartments, there are more observations within a certain distance from the electoral boundaries. Finally, we expect the demographic characteristics of flat dwellers to be relatively homogenous, because under the HDB's Ethnic Integration Policy, "limits for each ethnic group are set to achieve a balance of the various communities in a neighborhood and housing block" (HDB, 2006).¹⁶ This policy prevents drastic changes in ethnic concentration across HDB blocks and estates. Because these flats are subsidized by the government in the primary market, we use only resale prices in the secondary market to reflect market valuation.

There are a number of locational characteristics that are measured at the block level. We include a set of dummies to indicate whether a flat is located within 1 km or between 1 km and 2 km of a good primary school. There are multiple phases in the primary school registration exercise that give priority to children who satisfy different criteria, such as having siblings studying at the school or parents who were alumni. At every phase, if the demand for vacancies at a school exceeds supply, then balloting will be held first among children who live within 1 km of the school, then among those living between 1 km and 2 km. Every year, the Ministry of Education (MOE) recognized primary schools that showed significant improvement (schools with good progress) or sustained outstanding performance (schools with good performance) in the Primary

School Leaving Examinations (PSLE).¹⁷ These are considered good primary schools in our sample. The data come from Wong (2008), who exploits the distance-based balloting rules in primary one registration exercise to empirically identify the parental valuation of good primary schools and educational choices in Singapore.

We include a set of dummies to indicate whether the flats are within a pre-determined distance from the expressways, industrial estates, and public bus interchanges. For expressways and industrial estates, the dummies equal 1 if the block is located within 400 m of expressways and industrial estates, respectively, and 0 otherwise. This distance is determined based on the evidence in Waddell et al. (1993).¹⁸ Industrial estates refer to estates of industrial buildings which are explicitly named as an industrial park or estate.¹⁹ The public bus interchange dummy equals 1 if the block is located within 300 m of an interchange, and 0 otherwise.²⁰ We also include the distance of the flats to the nearest subway station, commonly known as the Mass Rapid Transit station (MRT station) in Singapore. These data come from the online street directory at <http://www.streetdirectory.com>.

To implement regression discontinuity, we first identify sections of the electoral boundaries that have flats nearby on both sides. For each constituency, we create three subsamples, which contain flats within 1000, 750, and 500 m of the electoral boundaries, respectively.²¹

To create the boundary dummies, we assign a flat to its nearest electoral boundary. To be consistent, we divide the electoral boundaries into sections with length that is up to twice the distance used for sample restriction (extending as long as there are flats on both sides of the electoral boundaries). For instance, when we restrict the sample to flats that are located with 500 m of the electoral bound-

¹⁵ For the Main Upgrading Program, residents have to indicate their support for upgrading at a polling exhibition and upgrading will proceed only if 75% or more of the eligible households in the precinct are in favor of the standard package offered. We use the day after the polling day to indicate when the HDB blocks in the precinct were selected for the upgrading program.

¹⁶ The government introduced the Ethnic Integration Policy (EIP) on 1 March 1989 to prevent the formation of ethnic enclaves in HDB estates and to ensure that the buildings' demographics reflects Singapore's racial balance. Under the EIP, the following upper limits were set on the proportion of races in every HDB neighborhood and apartment block: Chinese 84% (neighborhood) and 87% (block); Malay 22% (neighborhood) and 25% (block); Indian and others 10% (neighborhood) and 13% (block). These limits apply not only to flats sold directly by HDB to first-time home owners, 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%, Malays 13.9%, and Indian and other minorities 9.3% of total population (Census of Population 2000, Singapore Department of Statistics). Lum and Tan (2003) find that the EIP has resulted in a more 'balanced racial mix' in most of the housing estates by 1998.

¹⁷ In our 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 MOE drastically changed the criteria used to identify these schools in 2004, while maintaining the same criteria to identify schools with good progress. No comparable data existed after 2004 for schools with good performance because the underlying data used to classify schools (i.e., examination scores of students in each school) were kept confidential by MOE. The criteria used to classify schools into good progress and good performance schools are available online under annual press releases on the MOE webpage at <http://www.moe.edu.sg>.

¹⁸ Although there is no expressway near the HDB town of Hougang, the Central and Pan-Island Expressways run very close to the HDB towns of Bishan and Toa Payoh.

¹⁹ They are Defu Industrial Estate, Ang Mo Kio Industrial Park 2, Toa Payoh Industrial Estate, Toa Payoh West Industrial Estate, Toa Payoh Industrial Park and Sin Ming Industrial Estate. We do not include standalone industrial buildings in our definition of industrial estates.

²⁰ There are three public bus interchanges involved: Toa Payoh, Bishan, 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. In any case, the use of regression discontinuity reduces any bias arising from this change.

²¹ We use maps from <http://www.streetdirectory.com>, which are drawn close to scale from satellite images.

Table 1

Regression results for the Hougang constituency. Dependent variable = ln (flat prices).

	[1] Full sample	[2] Within 1 km	[3] Within 750 m	[4] Within 500 m
Dummy for flats in PAP ward	0.032 [0.006]***	0.031 [0.007]***	0.022 [0.007]***	0.015 [0.008]**
Age of flat	-0.031 [0.002]***	-0.029 [0.002]***	-0.028 [0.002]***	-0.027 [0.003]***
Age of flat ²	0.001 [0.000]***	0.001 [0.000]***	0.001 [0.000]***	0.001 [0.000]***
Floor area	0.023 [0.002]***	0.026 [0.002]***	0.025 [0.001]***	0.024 [0.002]***
Floor area ²	0 [0.000]***	0 [0.000]***	0 [0.000]***	0 [0.000]***
4-room flat	-0.016 [0.011]	-0.027 [0.010]***	-0.024 [0.009]***	-0.02 [0.011]*
5-room flat	0.069 [0.014]***	0.067 [0.013]***	0.053 [0.013]***	0.06 [0.017]***
Executive flat	0.173 [0.022]***	0.205 [0.020]***	0.17 [0.022]***	0.197 [0.024]***
MUP upgrading	-0.022 [0.019]	-0.023 [0.023]	0.007 [0.020]	0.046 [0.015]***
Between levels 6 and 10	0.033 [0.002]***	0.036 [0.002]***	0.037 [0.003]***	0.038 [0.003]***
Between levels 11 and 15	0.047 [0.003]***	0.051 [0.003]***	0.051 [0.003]***	0.051 [0.004]***
Between levels 16 and 20	0.068 [0.007]***	0.075 [0.007]***	0.074 [0.010]***	0.072 [0.013]***
Good performance school (≤ 1 km)	0.025 [0.008]***	0.005 [0.008]	0.012 [0.018]	0.027 [0.020]
Good performance school (1–2 km)	-0.002 [0.004]	-0.004 [0.004]	0.011 [0.015]	0.019 [0.013]
Good progress school (≤ 1 km)	0.003 [0.005]	0 [0.006]	-0.002 [0.008]	0.022 [0.013]*
Good progress school (1–2 km)	0.007 [0.009]	0.009 [0.009]	0.013 [0.009]	0.016 [0.010]
Bus interchange (≤ 300 m)	0.085 [0.013]***	0.069 [0.014]***	0.05 [0.015]***	0.043 [0.017]**
Industrial estate (≤ 400 m)	-0.011 [0.007]	-0.017 [0.014]	0.002 [0.022]	0.018 [0.019]
Distance to nearest MRT station	-0.042 [0.029]	-0.186 [0.041]***	-0.308 [0.063]***	-0.321 [0.118]***
Distance to nearest MRT station ²	-0.02 [0.017]	0.082 [0.027]***	0.172 [0.044]***	0.173 [0.087]**
Constant	10.972 [0.096]***	10.826 [0.091]***	10.885 [0.086]***	10.87 [0.100]***
Locational variables	Yes	Yes	Yes	Yes
Boundary fixed effects	-	Yes	Yes	Yes
No. of boundary dummies	-	2	3	3
Time trend and quarter dummies	Yes	Yes	Yes	Yes
N	10,510	8529	6940	4605
R ²	0.93	0.93	0.93	0.93

The dependent variable is the logarithm of resale flat prices deflated to 2001 dollars for the quarter. Standard errors in the parentheses are adjusted for clustering at the apartment block level.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

aries, we divide the electoral boundaries into a series of non-overlapping sections, each with length up to 1000 m, and denote each section with a different boundary dummy. We then draw circles from these electoral boundaries using the respective radius and include all flats that lie within at least one circles in the respective sub-sample.

If the electoral boundaries are delineated by expressways, we drop these boundaries from our sample because unobserved characteristics are likely to change discretely across the expressways, violating the identifying assumption of regression discontinuity. Similarly, if flats on

opposite sides of the electoral boundary are clearly divided by river, industrial buildings, private housing estates and sports stadiums, we also drop them from our sample.²²

²² As Fig. 1 reveals, Hougang is surrounded by one big constituency of the ruling party (the Aljunied GRC), whereas Potong Pasir is surrounded by a few different constituencies of the ruling party. Nevertheless, in the data used in the cross-border design, the opposition Potong Pasir constituency is only compared to the Bishan–Toa Payoh GRC. This is because Potong Pasir's electoral boundaries with the other constituencies of the ruling party (the Jalan Besar GRC and MacPherson SMC) are separated by expressways, and etc. Hence they are excluded from the cross-border design.

Table 2
Differences in means for the Hougang constituency.

	Full sample		Within 1 km		Within 750 m		Within 500 m	
	Diff. in means	T-stats	Diff. in means	T-stats	Diff. in means	T-stats	Diff. in means	T-stats
ln (flat price)	0.11	1.97	0.08	1.51	0.03	0.49	-0.04	-0.66
Age of flat	-5.15	-5.18	-4.34	-4.31	-2.81	-2.80	-1.08	-1.08
Floor area (m ²)	5.21	1.50	3.76	1.07	0.62	0.17	-3.35	-0.89
Type of flat	0.15	1.24	0.10	0.84	0.003	0.03	-0.07	-0.53
MUP upgrading	0.03	2.87	0.04	2.88	0.05	2.90	0.09	2.98
<i>Locational characteristics</i>								
1 km of good progress schools	-0.33	-5.06	-0.17	-2.63	-0.10	-1.55	-0.13	-1.71
2 km of good progress schools	0.07	2.42	0.07	2.28	0.07	2.09	0.05	1.43
1 km of good performance schools	0.22	9.21	0.19	7.21	0.16	5.81	0.05	2.21
2 km of good performance schools	0.30	4.67	0.27	4.10	0.24	3.56	0.29	3.89
300 m from bus interchange	-0.15	-3.06	-0.14	-2.95	-0.14	-2.8	-0.11	-2.23
400 m from industrial estates	0.19	3.92	0.07	1.57	0.05	0.96	0.07	1.21
Distance to MRT (km)	0.26	7.99	0.18	5.52	0.14	4.08	0.05	1.49

Difference in means refers to the mean value of flats in the PAP constituency minus the mean value of flats in the opposition constituency. T-statistics are for the null hypothesis that the difference in means across the boundary equals zero. They are adjusted for clustering at the apartment block level.

3. Empirical results

3.1. Hougang constituency

Table 1 reports the OLS estimates for the Hougang constituency.²³ All regressions include physical flat characteristics (area, age and their squares, dummies for flat type, floor level, and whether the flat has been selected to undergo MUP), locational variables (distance to the nearest MRT station and its square, dummies indicating proximities to industrial estates, bus interchanges, good progress and good performance primary schools), a linear time trend and quarter dummies.²⁴ The standard errors are adjusted for clustering at the HDB block level, allowing the error terms to be correlated among flats located in the same apartment block but assuming that they are uncorrelated across flats in different apartment blocks.

Column (1) reports the results using the full sample.²⁵ The results suggest that newer flats, larger flats, and flats located on higher floors have higher resale prices and the price premiums are statistically significant at the conventional levels. After controlling for area, 5-room flats and executive flats still cost more: their resale prices are 6.9% and 17.3% higher than the 3-room flats, respectively. However, consistent with the findings of Lum et al. (2004), there is no statistically significant difference in the resale prices of 4-room and 3-room flats. It turns out that flats that have been selected to undergo the Main Upgrading Program (MUP) do not enjoy significantly higher resale prices. Finally, *ceteris paribus*, flats located in the neighboring PAP constituencies appear to enjoy a 3.2% price premium over those in the opposition Hougang constituency, which translates into \$7629 (in base year HDB prices in 2001) at the average real resale price of \$238,398 for the full sample in Hougang.²⁶

This price premium is statistically significant at the conventional levels.

The remaining columns use a regression discontinuity design to improve control for possible omitted variable bias by restricting the sample to flats that are closer and closer to the electoral boundaries. Columns (2–4) report the OLS estimates for the within-1 km, within-750 m, and within-500 m sub-samples, respectively. We keep all individual flat characteristics and locational variables used in the regression in column (1). In addition, we include a set of boundary dummies to control for characteristics that are common to flats that share the same electoral boundary but are located on opposite sides of it.

As we move closer to the electoral boundaries, the hedonic prices for physical flat characteristics remain quite stable. However, the coefficient on the PAP dummy becomes smaller in magnitude. For example, for the within-500 m sub-sample, flats located in the neighboring PAP constituencies enjoy a 1.5% price premium over those in the opposition Hougang constituency, which translates into \$3222 (in base year HDB prices in 2001) at the average real resale price of \$214,824 for this sub-sample in Hougang.²⁷ Nevertheless, it always remains statistically significant at the 5% level. On the other hand, as we move closer to the electoral boundaries, the coefficient on the MUP upgrading dummy turns positive and ultimately becomes highly statistically significant at the 1% level for the within-500 m sub-sample. For this last sub-sample, there is a sizable 4.6% price premium for flats that have been selected for the Main Upgrading Program.²⁸

Table 2 reports differences in means of the observable characteristics across the electoral boundaries for the full sample and the sub-samples. As we restrict our sample to flats that are closer to the boundaries, the differences

²³ The Hougang constituency is located within the HDB town of Hougang, which also contains flats in the PAP constituencies.

²⁴ No flat in this sample is located within 400 m of an expressway.

²⁵ For the Hougang constituency, the full sample in the HDB town of Hougang contains 10510 observations with a mean resale price of \$238,398 and a standard deviation of \$81,874. The median resale price is \$233,072.

²⁶ All amounts are in Singapore dollars. The average exchange rate between US dollars and Singapore dollars in 2001 was US\$1 = S\$1.79.

²⁷ The average real resale prices for the within-1 km and the within-750 m sub-samples in Hougang are \$233,983 and \$223,432, respectively.

²⁸ Using data from a different time period and different HDB towns but without using a regression discontinuity design, Lum et al. (2004) find that flats that have completed the MUP enjoy a price premium of about 5.8–8.6%.

in means of the observable characteristics generally become smaller in magnitude and less statistically significant, except for the main upgrading dummy. As we get closer to the boundaries, the proportion of flats that have been selected for upgrading rises modestly on the PAP side relative to the opposition party's side. This difference is always statistically significant at the conventional levels. Some locational characteristics remain significantly different across the boundaries at the conventional significance levels even in the within-500 m sub-sample.²⁹ Thus we continue to control for the observable locational characteristics in all regressions. Nevertheless, the overall evidence suggests that an RD design is likely to provide better control for possible omitted variable bias.

3.2. Potong Pasir constituency

Table 3 presents the OLS estimates for Potong Pasir. Column (1) uses the full sample.³⁰ Again, newer, larger flats located on higher floors have higher resale prices and the price premiums are statistically significant at the 5% level. Relative to those in the opposition constituency, we find a 5.5% price premium for flats in the PAP constituency, which is statistically significant at the conventional levels. It is economically large, corresponding to \$14,423 and \$12,925 at the mean and median resale prices, respectively. We also include an additional town dummy to indicate whether the flat is located in the HDB towns of Bishan or Toa Payoh. The estimate suggests that flats in Bishan are priced higher, even after controlling for all observable characteristics.

However, it turns out that flats that have been selected for the Main Upgrading Program (MUP) are priced significantly lower by 6.9% in the full sample. There are a few possible reasons for the finding of a price discount. First, it may be due to the disturbance caused by construction works for upgrading: about 8 of the 17 precincts of HDB blocks that have been selected for the upgrading program in the town of Toa Payoh were undergoing the construction work during the sample period.³¹ Second, the flats selected for upgrading may have other unmeasured undesirable characteristics that

made them candidates for the upgrading program in the first place. If these characteristics change smoothly over space, then we expect the price discount to shrink in magnitude or even reverse in sign as we move closer to the electoral boundaries.

Thus, we re-estimate the hedonic regression using flats that are near the electoral boundaries.³² Columns (2–4) report the OLS estimates for the within-1 km, within-750 m, and within-500 m sub-samples, respectively. Again, as we move closer to the electoral boundaries, the hedonic prices for physical flat characteristics remain quite stable. However, the coefficients on the PAP dummy and the MUP upgrading dummy both become smaller in magnitude and statistically insignificant at the conventional levels.³³

Table 4 reports differences in means of the observable characteristics across the electoral boundaries for the Potong Pasir constituency. In contrast to the Hougang constituency, as we move closer to the boundary, the differences in means for a number of the observable characteristics remain statistically different from zero at the conventional levels of significance. For example, flats in the opposition constituency are significantly older but are less likely to have been selected for the Main Upgrading Program. Most locational characteristics also remain significantly different across the electoral boundaries. Overall, the evidence suggests that for this long-standing opposition constituency, flats across the electoral boundaries have quite different characteristics.

Nevertheless, it is worth noting that most of the locational characteristics reported in Table 4 are dummies that equal one if an apartment block falls within a fixed distance from some amenities or inconveniences; by construction, these are binary variables that will exhibit discontinuity across space, even though the linear distance to these amenities must change continuously across the electoral boundaries.³⁴ Furthermore, for distance to MRT station, the only continuous locational variable reported in Table 4, the evidence suggests that flats in the PAP constituencies are significantly nearer to an MRT station than those in the opposition Potong Pasir constituency for all of the cross-border samples. But this makes sense because new transport facilities like the MRT are local public goods

²⁹ Nevertheless, it is worth noting that for variables such as the within 1 km or 2 km of school dummies (which remain statistically different across the electoral boundary in the narrowest sub-sample), they are supposed to change discontinuously across space by construction.

³⁰ For the Potong Pasir constituency, the full sample contains 9079 observations from the HDB towns of Bishan and Toa Payoh with a mean resale price of \$262,245 and a standard deviation of \$108,476. The median resale price is \$235,000. The Potong Pasir constituency is located just inside the edge of the HDB town of Toa Payoh. However, flats in the HDB town of Bishan are also included in the sample (and indicated with a town dummy) because one of the electoral boundaries separates the HDB town of Toa Payoh from the HDB town of Bishan.

³¹ Using classified data from a different time period and different HDB towns but without using a regression discontinuity design, Lum, Koh and Ong (2004) find that flats that are undergoing the MUP are priced lower by 1–2.7%. On the other hand, they find that flats that have completed the MUP enjoy a price premium of about 5.8–8.6%. Unfortunately, the dates of completion for the upgrading works in different precincts are not publicly available.

³² For this constituency, the regression discontinuity design includes only one electoral boundary, which is located along Toa Payoh Lorong 8. Thus, with an intercept term already included in the regressions, there is no need to include additional boundary dummies. The design excludes the other electoral boundaries because they happen to be major expressways: the Central Expressway (CTE) and Pan Island Expressway (PIE). In addition to the expressways, the HDB flats on opposite sides of these electoral boundaries are far from each others because they are further divided by industrial estate (the Toa Payoh Industrial Park), river (Kallang River), or private housing estates.

³³ Other locational characteristics generally have the expected results, except for the negative price effects associated with proximity to the good performance schools, which is puzzling.

³⁴ As noted earlier, we use 1 km and 2 km as the fixed distance to good primary schools because of the balloting rules governing primary one registration in Singapore. It is quite possible that the academic reputations of schools, and whether there are good progress or good performance schools nearby, may depend on many factors such as history and the schools' academic tradition.

Table 3
Regression results for the Potong Pasir constituency. Dependent variable = ln (flat price).

	[1] Full sample	[2] Within 1 km	[3] Within 750 m	[4] Within 500 m
Dummy for flats in PAP ward	0.055 [0.017]***	0.027 [0.018]	0.017 [0.026]	−0.004 [0.019]
Age of flat	−0.036 [0.002]***	−0.037 [0.002]***	−0.038 [0.002]***	−0.037 [0.002]***
Age of flat ²	0.001 [0.000]***	0.001 [0.000]***	0.001 [0.000]***	0.001 [0.000]***
Floor area	0.018 [0.001]***	0.019 [0.002]***	0.019 [0.002]***	0.014 [0.002]***
Floor area ²	0 [0.000]***	0 [0.000]***	0 [0.000]***	0 [0.000]***
3-room flat	0.198 [0.018]***	0.173 [0.027]***	0.207 [0.021]***	0.22 [0.025]***
4-room flat	0.292 [0.028]***	0.248 [0.039]***	0.263 [0.034]***	0.309 [0.039]***
5-room flat	0.401 [0.033]***	0.325 [0.040]***	0.341 [0.036]***	0.375 [0.045]***
Executive flat	0.496 [0.037]***	0.387 [0.042]***	0.389 [0.040]***	0.416 [0.056]***
MUP upgrading	−0.069 [0.018]***	−0.043 [0.017]**	−0.024 [0.024]	0.009 [0.021]
Between levels 6 and 10	0.034 [0.002]***	0.036 [0.003]***	0.037 [0.004]***	0.032 [0.006]***
Between levels 11 and 15	0.057 [0.004]***	0.057 [0.005]***	0.058 [0.005]***	0.052 [0.006]***
Between levels 16 and 20	0.093 [0.005]***	0.092 [0.006]***	0.09 [0.006]***	0.074 [0.007]***
Between levels 21 and 25	0.122 [0.007]***	0.118 [0.008]***	0.109 [0.007]***	0.092 [0.009]***
Between levels 26 and 30	0.086 [0.021]***	0.093 [0.014]***	0.102 [0.011]***	0.119 [0.015]***
Good performance school (≤1 km)	−0.104 [0.023]***	−0.006 [0.006]	−0.013 [0.007]*	−0.02 [0.008]**
Good performance school (1–2 km)	−0.088 [0.025]***			
Good progress school (≤1 km)	0.026 [0.007]***	−0.003 [0.012]	0.01 [0.011]	0.006 [0.011]
Good progress school (1–2 km)	0.052 [0.011]***	0.008 [0.013]	0.017 [0.012]	0.011 [0.013]
Expressway (≤400 m)	0.019 [0.009]**	−0.002 [0.014]	0.003 [0.010]	0 [0.010]
Bus interchange (≤300 m)	−0.002 [0.012]	0.012 [0.010]	0.017 [0.009]*	
Industrial estate (≤400 m)	−0.021 [0.005]***	−0.018 [0.007]**	−0.013 [0.008]	−0.008 [0.009]
Distance to nearest MRT station	−0.263 [0.033]***	−0.259 [0.042]***	−0.221 [0.045]***	−0.231 [0.070]***
Distance to nearest MRT station ²	0.103 [0.019]***	0.098 [0.032]***	0.088 [0.032]***	0.108 [0.045]**
Constant	11.396 [0.067]***	11.318 [0.092]***	11.311 [0.093]***	11.488 [0.094]***
Dummy for flats in Bishan town	0.023 [0.014]*	0.059 [0.011]***	0.056 [0.015]***	0.064 [0.014]***
Locational variables	Yes	Yes	Yes	Yes
Boundary fixed effects	–	Yes	Yes	Yes
No. of boundary dummies	–	1	1	1
Time trend and quarter dummies	Yes	Yes	Yes	Yes
N	9079	5645	4620	2323
R ²	0.95	0.95	0.96	0.95

The dependent variable is the logarithm of resale flat prices deflated to 2001 dollars for the quarter. Standard errors in the parentheses are adjusted for clustering at the apartment block level.

With only one boundary dummy, the intercept term effectively captures the common boundary fixed effect.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

that the ruling party may differentially provide. In fact, this last observation may itself be a reflection of Potong

Pasir's status as the longest standing opposition constituency in Singapore.

Table 4
Differences in means for the Potong Pasir constituency.

	Full sample		Within 1 km		Within 750 m		Within 500 m	
	Diff. in means	T-stats	Diff. in means	T-stats	Diff. in means	T-stats	Diff. in means	T-stats
ln (flat price)	0.17	4.68	-0.01	-0.22	0.02	0.29	-0.05	-0.71
Age of flat	-1.42	-1.49	-4.57	-5.55	-5.74	-6.22	-4.33	-3.82
Floor area (m ²)	3.34	1.37	-7.77	-1.60	-5.82	-1.18	-7.38	-1.40
Type of flat	0.14	1.46	-0.61	-4.21	-0.54	-3.63	-0.56	-3.44
MUP upgrading	0.36	12.57	0.45	13.17	0.41	10.44	0.48	8.74
<i>Locational characteristics</i>								
1 km of good progress schools	0.26	2.86	-0.34	-9.00	-0.33	-8.17	-0.35	-6.31
2 km of good progress schools	0.33	3.93	-0.02	-2.55	-0.03	-2.56	-0.03	-2.23
1 km of good performance schools	0.04	0.40	-0.29	-8.88	-0.26	-8.06	-0.12	-3.68
2 km of good performance schools	-0.20	-2.28	0.29	8.88	0.26	8.06	0.12	3.68
300 m from bus interchange	0.08	5.14	0.07	4.82	0.06	3.84	-	-
400 m from expressway	-0.21	-2.40	0.12	1.59	0.07	0.93	0.06	0.79
400 m from industrial estates	0.02	0.20	-0.43	-11.66	-0.47	-11.60	-0.35	-6.39
Distance to MRT station (km)	0.14	2.25	-0.32	-7.84	-0.29	-6.96	-0.17	-3.67

Difference in means refers to the mean value of flats in the PAP constituency minus the mean value of flats in the opposition constituency. T-statistics are for the null hypothesis that the difference in means across the boundary equals zero. They are adjusted for clustering at the apartment block level. Sub-samples that do not contain observations with a particular characteristic are coded as “-”.

Table 5
Regression results for the Hougang constituency – Robustness check (single boundary dummy). Dependent variable = ln (flat prices).

	[1] Full Sample	[2] Within 1 km	[3] Within 750 m	[4] Within 500 m
Dummy for flats in PAP ward	0.032 [0.006]***	0.031 [0.007]***	0.021 [0.007]***	0.011 [0.007]
MUP upgrading	-0.022 [0.019]	-0.025 [0.022]	0.007 [0.021]	0.048 [0.016]***
Locational variables	Yes	Yes	Yes	Yes
Boundary fixed effects	-	Yes	Yes	Yes
No. of boundary dummies	-	1	1	1
Time trend and quarter dummies	Yes	Yes	Yes	Yes
N	10,510	8529	6940	4605
R ²	0.93	0.93	0.93	0.93

Standard errors in the parentheses are adjusted for clustering at the apartment block level. With only one boundary dummy, the intercept term effectively captures the common boundary fixed effect.

*** Significant at 1%.

3.3. Robustness checks

3.3.1. Hougang – assuming identical boundary fixed effects

For the Hougang constituency, we arbitrarily divide the electoral boundaries into multiple sections, and denote each section with a different boundary dummy. It is natural to ask whether the results depend sensitively on how we divide the boundaries. One way to answer this question is to investigate whether the results change drastically if we use only a single boundary dummy to capture the boundary fixed effects, i.e., if we assume identical boundary fixed effects for different sections of the electoral boundaries. Table 5 does that and reports the OLS estimates for the PAP constituency dummy and the MUP upgrading dummy. It turns out that the estimates are essentially the same as before, except that the price premium enjoyed by the PAP constituency is not statistically significant at the conventional levels for the narrowest within-500 m sub-sample. Thus, overall, the above findings seem robust to this sensitivity check.

3.3.2. Potong Pasir – including only flats in the same HDB town

For the Potong Pasir constituency, part of an electoral boundary separates two different HDB towns (of Toa Payoh

and Bishan) and we have found that flats in the HDB town of Bishan generally have higher resale prices, holding housing characteristics constant. Thus, a natural question is whether the assumption of regression discontinuity – that unobservable characteristics change smoothly across the electoral boundaries – may be violated here.³⁵ To check robustness, we re-estimate previous regressions by using only flats that are located in the same HDB town of Toa Payoh, i.e., excluding flats in the town of Bishan (that belong only to the PAP constituency). Table 6 reports the OLS estimates for the PAP constituency dummy and the MUP upgrading dummy. Except for the within 1 km sub-sample, the estimates from the RD design suggest that both estimates are still not statistically significant at the conventional levels. Thus, the above findings do not seem to be much affected by this sensitivity check.

4. Conclusion

Using hedonic pricing with regression discontinuity, this paper provides a positive analysis of the valuation of publicly provided local goods and services in Singapore

³⁵ This electoral boundary falls on Braddell Road.

Table 6

Regression results for the Potong Pasir constituency – Robustness check (only Toa Payoh). Dependent variable = ln (flat prices).

	[1] Full sample	[2] Within 1 km	[3] Within 750 m	[4] Within 500 m
Dummy for flats in PAP ward	0.021 [0.014]	0.051 [0.022]**	0.033 [0.027]	0.012 [0.019]
MUP upgrading	–0.028 [0.015] [†]	–0.038 [0.018]**	–0.016 [0.022]	0.001 [0.022]
Locational variables	Yes	Yes	Yes	Yes
Boundary fixed effects	–	Yes	Yes	Yes
No. of boundary dummies	–	1	1	1
Time trend and quarter dummies	Yes	Yes	Yes	Yes
N	5407	4114	3127	1661
R ²	0.95	0.95	0.96	0.95

Standard errors in the parentheses are adjusted for clustering at the apartment block level. With only one boundary dummy, the intercept term effectively captures the common boundary fixed effect.

[†] Significant at 10%.

** Significant at 5%.

that are politically motivated. Specifically, assuming that these values are fully capitalized and that unobservable characteristics change continuously over space, we compare housing prices between the constituencies of the ruling and opposition parties for flats that are near the electoral boundaries to improve control for omitted variable bias. In addition to controlling for as many observable physical and locational attributes as data availability permits, we also include a set of boundary fixed effects to further control for omitted variable bias.

With this design, we find a political economic component to resale prices of government built high-rise apartments in one of the two long-standing opposition constituencies in Singapore. In the Hougang constituency, in addition to a price premium for flats that have been selected for the Main Upgrading Program (for which priority has been given to the constituencies of the ruling party), there is also a price premium for flats that are located in the ruling PAP constituency, compared to those in the adjacent opposition constituency. Both price effects are generally statistically significant in this constituency and the evidence tends to support an RD design: the observable characteristics tend to become more similar as we move closer to the electoral boundaries. In contrast, both of these effects are generally not statistically significant for the other opposition constituency in Potong Pasir, where the evidence reveals that the observable characteristics remain quite different even for flats that are close to the electoral boundaries.

It is worth emphasizing that these two opposition constituencies have been held by different people from different opposition parties. So there could be a party-specific or a person-specific component in the valuation. After all, the goods and services provided by different parties or different people are likely to be differentiated, not homogenous, products. It is also possible that the ruling party did not reward all its constituencies or penalize all opposition constituencies to the same extent. Even assuming that the ruling party can perfectly coordinate the distribution of local public spending, given government budget constraints, the ruling party may also vary spending in different constituencies to maximize the chance of getting re-elected in its constituencies and the chance of winning back the opposition constituencies. Any of the above reasons may lead to different price premiums in different

constituencies. Unfortunately, we cannot empirically distinguish these alternative interpretations given the data available. Nevertheless, whether there are housing price differentials due to political reasons is ultimately an empirical question. Using a unique data set from Singapore and a cross-border design to control for omitted variables that vary smoothly across space, the evidence suggests that such price differentials exist at the local constituency level in the case where there is strong support for an RD design.

Finally, it is natural to ask whether the results generalize to other countries. In countries where there is a dominant ruling party that can significantly and persistently tie the local provision of goods and services to the electoral support they receive in different constituencies, we expect the results to generalize. However, what makes Singapore a particularly interesting case study for the hedonic price model is the provision of local goods and services through the public housing program, the prevalence of public housing in Singapore with more than 80% of the population residing in public flats that they own, and the openness with which the ruling party claims to tie the allocation of resources with its local electoral support. These unique features make the hedonic price model particularly relevant and applicable in our investigation.

Disclaimer

The analyses and conclusions in this paper are solely those of the authors' and do not reflect the institutions they are affiliated with.

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Appendix A. Supplementary data

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