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Local Public Expenditure, Public Service Accessibilities and Housing Price in Shanghai, China

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Abstract

Residents in different communities have different levels of public service accessibilities. Existing literature documents effects of public services on housing prices with fragmented local governments. Few studies have examined how public service provision impacts housing prices under Chinese centralized governance system. Using data on housing price at the community level, socioeconomic characteristics at the neighborhood level, and public expenditure at the City district level, this study examines how public service provision is associated with housing prices in Shanghai. Results show that, public service accessibility is capitalized into housing prices. While the total expenditure at the City district level is not related to housing prices, government redistributive expenditure is positively associated with housing price and developmental expenditure is on the opposite. The expenditure effects are further mediated by accessibility to public facilities. The findings suggest that decentralized fiscal system with relatively centralized government structure may have reinforced urban polarization in Shanghai.

Introduction

With an annual production of 10 million new housing units and a market value as high as US$1 trillion, China real estate market has grown into the world's largest housing market (Chen and Han 2014). The average housing price based on a 35-city index in 2012 is 2.5 times of that in 2003. House prices of the 100 Chinese cities surveyed in October 2013, with a 17th consecutive monthly rise, reached to an average of US$ 1,742 per square metre (China Index Academy 2013). The prices and growth rates in the megacities are even higher. For instance, from 2005 to 2014, the average housing price in Shanghai central city area (not including the suburbs) increased 287%, from 13.3 thousands RMB per square meter to 38.2 thousands per square meter[1]. There is an accumulation of literature to examine the dramatic growth of housing prices in China (Chen and Funke 2013 ; Cheng *et al.* 2014; Deng, Morck *et al.* 2011; Fawley and Wen 2013; Ren *et al.* 2012; Wang 2011; Wang etal 2012; Wu *et al.* 2012). However, with very few exceptions (Li et al. 2012; Li et al.2015; Wu 2004; Zheng and Kahn 2008), the relationship between public service provision and housing price has received extremely limited attention.

Based on experiences of U.S. cities, Tiebout (1956) states that residents with heterogeneous preference of public services would vote by feet to choose the communities with their favorable package of public service provision. Local governments compete for high-income residents to maintain tax-base. Thus, government expenditure on public services is associated with higher property values, and schools, public transit facilities, crime and environment

[1] http://www.askci.com/chanye/2015/03/02/1059206f23_2.shtml

quality are important determinants of housing values (Fack and Grenet 2010; Clark and Herrin 2000; Gibbons et al. 2013; Garcia et al. 2010; Oates 1969). While these existing studies have provided significant insights, the theoretical framework has seldom been applied to a more centralized government structure in Chinese cities. Therefore, this study is to examine the effect of public service provision on housing prices in Shanghai which has undergone gradual but continuous decentralization in both political and fiscal governance system since 1980s.

Using a hedonic framework, we examine public service provision in two dimensions, public expenditure from local governments and the spatial accessibility to public service facilities by local residential communities. We employ a three-level modeling strategy to examine the hierarchical nature of impacts from public service provision on housing prices, since the residential communities (*xiaoqu*, where are housing prices are measured as level-1) are nested in Streets (*jiedao*, level-2), and streets are nested in Urban Districts (*shiqu*, which is the local governments directly controlling public expenditure, level-3) in Shanghai Municipality. We also interviewed the officials from urban district governments and the fiscal bureau to validate the model results. We find that redistributive expenditure from the district governments is positively associated with housing prices, while the developmental expenditure from the district governments is negatively associated with housing prices. At the same time, both effects on housing price are related to accessibility to existing local public facilities in each residential community.

Through an interesting case of a global city in an emerging economy, our study contributes to understanding the relationship between public service provision and urban stratification from both supply and demand side. Such a relationship has long been debated since 1950s. As mentioned earlier, in Tibout's (1956) model, local government fragmentation is a presumption, residential differentiation is a natural and constant product under market forces, and urban stratification is thus benign and will disappear under market equilibrium. However, other scholars argue that the decentralized and fragmented local governments reinforce the association between public services and housing prices. Our study suggests that governance decentralization in Shanghai may have significantly contributed to residential stratification through public service provision and pricing of housing markets. Therefore, in addition to the theoretical contribution to the long-term debate, our study will also contributes to housing studies through the perspective of governance structure, public service provision, and accessibility to public service facilities. While marketization and governance decentralization may have significantly facilitated economic growth in China (e.g., Li and Kung 2012; Jin et al. 2005; Weingast 2009, 2014), this study calls for more attention paid to the social and economic stratification effect in cities that have already undergone magnificent polarization during China's transition and globalization.

Public Services and Housing Prices

The relationship between public service provision, housing market and urban stratification has been heavily influenced by Tiebout's (1956) model, which envisions fragmented metropolis as a market place where residents shop for different tax and service packages

offered by numerous local governments. Those with different preferences of services can "vote by their feet" to reside in the jurisdictions where the service and tax packages can match their preferences. Oates (1969) finds rational consumers weigh the benefits from local public services against the cost of their tax liability in choosing of a residential community. People do appear willing to pay more to live in a community which provides a high-quality program of public services. Thus public services such as availability and quality of schools, proximity to transport facilities, crime and environmental factors are important locational attributes of housing values (Bowes and Ihlanfeldt, 2001; Fack and Grenet 2010; Gibbons 2004; Gibbons et al.2013; Zheng and Kahn 2008), thereby increasing government expenditure per capita with higher property values (Garcia et al. 2010).

Different from the public choice theory, social stratification and government inequality thesis (SSGI) proposed that local government fragmentation allows the advantaged classes in the metropolitan communities to maximize control over scare resources and maintain homogeneity in their communities (Hill 1974; Lowery 2000; Schneider and Logan 1981, 1982). They establish independent jurisdictions to pass local zoning, building codes, subdivision, and other regulations that raise the costs of housing high enough to exclude low-income people, and to avoid certain externalities regulated by broader governments to affect them (Downs, 1994). Thus the competition among the fragmented local governments facilitates urban hierarchy through uneven distribution of public resources and constraints of free choices in housing market (Bischoff 2008; Lewis and Hamilton 2011; Miller 2002; Rusk 1995).

Consumer choices for different package of local public goods are not completely exogenous across metropolitan areas with residential segregation and uneven public service distribution, which contrasts the assumption in public choice theory (Howell-Moroney 2008). Instead, municipal boundaries not only reflect clusters of similar population, but also restrict access to opportunities. For example, in the U.S. cities, African Americans are constrained in communities with high poverty concentration, low quality of public services, and limited job opportunities (Jargowsky 2002; Kain 1968; Korsu and Wenglenski 2010; Massey and Denton 1993). Poor urban communities concentrated with crime, teenage pregnancy and drug use interactively restrain the intellectual and social development for children and provide slim chances for their future success (Galster and Keeney 1988; Powel, 2002; Wilson 1987). The segregated urban landscape thus exacerbates social stratification and also deteriorates the welfare of the whole population, poor and rich, black and white (Li et al. 2013). SSGI proposed government consolidation as the answer to the urban stratification problem, although there is no adequate evidence showing its effectiveness (Jimenez and Hendrick 2010).

As suggested by these different perspective, whether optimized by market forces or causing socioeconomic inequality, public service provision seems significantly related to residential differentiations. Therefore, we hypothesize that:

- *Communities with more public services are associated with higher housing price* (Ha).

Local Public Expenditure and Housing Prices

Peterson (1981) characterized local public expenditure into three groups according to the cost-benefit ratio and their effects on local economy: developmental, redistributive, and allocational. Developmental policies basically pay for themselves and lead to investment increase, economic growth and tax-base expansion. Redistributive services transfer income from the well-off to low-income residents, which increase the tax burden of the high-income without benefiting them and improving the economic growth. Allocational services refer to the housekeeping functions benefiting all members and have neutral economic effects. Under the fixed budget line, how to allocate public expenditure among the three areas has huge impacts on the public service provision.

Generally speaking, the competition among local governments forces all communities to invest on developmental services to attract investment and high-income households. For instance, through the study of 709 US sample cities with population of 25,000 or greater, Basolo (2000) suggests that intercity competition incrinds more spending on economic development than on affordable housing. Jimenez (2014) found that with competition among fragmented local governments, both poor and wealthy communities across US metropolitan areas are associated with higher developmental and lower redistributive expenditure. Redistributive policies will only be pursued when the community/city can comfortably afford them. This creates the paradox that poor areas cannot pursue redistributive policies because of their limited tax revenue. Because residents do not perceive adequate marginal returns

from increased allocational expenditure, communities or cities have neutral attitudes toward the allocational services. For example, Jimenez (2014) does not find significant relationship between community income and allocational services.

Overall, these existing studies based on U.S. experiences suggest that different types of government expenditure are significantly associated with residential segregation. Redistributive expenditure is positively associated with housing prices because only rich communities can afford it. Developmental expenditure might negatively associate with housing prices because poor communities are forced by governmental competition to spend more on developmental services. Allocational expenditure will not be associated with housing prices because residents in either poor communities or rich communities do not pay much attention for it.

Different from most U.S. cities, the administrative structure in Shanghai is much more centralized. Its centralized governance system is comprised of a municipal government and 17 urban districts with administrative and financial independence. The urban districts have attained complete fiscal independence and gained a whole array of administrative powers over the past several decades, including planning, public works maintenance, approval of local foreign trade and commercial administration.

The autonomy of the urban district governments has considerable impacts on the city

landscape and public service provision through public expenditures[2]. The municipal government and the urban district governments have both shared and separate sources of revenue; however, they spend public expenditure according to their own revenue (Hu 2009). Revenue for urban districts is mainly from corporate taxes including value-added tax, operation tax, and corporate income tax. These three business taxes contribute to about 75 percent of revenue for the urban district governments[3]. Thus, each urban district is motivated to set up their own commercial centers and development zones to draw businesses to their jurisdictions (Wu 2002). They compete fiercely for investments to boost the local economic growth with a focus on urban growth rather than public service provision. Naturally, urban districts with less revenue face more constraints of expenditure on public services while district governments with sufficient revenue often have surplus (Hu 2009). As a result, the decentralized government structure may have amplified public service disparity among urban districts. Since government revenue is mainly from corporate taxes, not directly from residents, the mechanisms of "voting by feet" as suggested by Tiebout do not actually exist. However, if accessibility to public services is capitalized into housing prices, residents in Shanghai may pay the public services through housing purchases (García et al. 2010; Gibbons et al. 2013; Zheng and Kohn 2008).

Also different from the U.S. cities, Shanghai does not have local political jurisdictions associated with residential communities (Wu 2002). There are 207 Street Offices (and towns)

[2] An interview with an officer from the Fiscal bureau in Yangpu District revealed to us that the fiscal reform in 1994 endowed the urban district government tremendous fiscal independence. According to the public expenditure data in 2008 and 2009, about 70 percent of public expenditure in Shanghai is from the urban district governments.
[3] The information is from the Tax Bureau of Shanghai Municipal Government.

in Shanghai, functioning as “representative agencies” of urban districts at the residential community level. The municipal governments devolve to the Street Offices a number of regulatory functions, including approval of the residential plan, the housing development plan and the completion of housing projects, site occupation licensing, outdoor advertisement management, the licensing of restaurants etc. The Street Office is also responsible for the nomination and evaluation of leaders in public security, housing management, business and retail administration (Wu 2002). While management at the Street level is closely related to the daily lives of community residents and quality of life in general, these Street Offices are not one level of government. In other words, there is no political jurisdiction associated with each residential community to provide local public services and levy taxes. Instead, the district government is the major power to promote economic development at the local level and to provide financial source of public services.

Therefore, unlike cities in the U.S., when residents in Shanghai choose where to live by housing prices which vary across residential communities (managed by Street Office), they do not have options of different public service packages unless they choose different urban districts (who govern public service provision). Thus the urban districts are similar to the consolidated governments. Because local government expenditure depends on their tax revenue, and residents do not pay for the redistributive and developmental programs, residents in Shanghai would prefer both services ideally; however, only district governments with sufficient revenue ensure redistributive spending. Districts with less government revenue have to spend more on developmental programs to attract businesses due to pressure

from economic conditions and severe competition among the districts. Therefore, we further hypothesize that:

- *Overall, the total public expenditure from district governments is not related to housing prices of residential communities* (Hb);

However, if other conditions are the same, we hypothesize that the housing prices are associated with different types of public expenditure at the district level. Specifically,

- *Housing prices are higher when their communities belong to district governments with higher redistributive expenditures* (Hc1).
- *Housing prices are lower when their communities belong to district governments with higher developmental expenditure* (Hc2).
- *Housing prices do not significantly differ by their district governments' allocation expenditure* (Hc3).

Data and Variables

Dependent Variable

Using data from Le Zhi Real Estate Market Research and Consulting Co., Ltd, the dependent variable is the log value of the average housing price per square meter for each residential community. [4] Price per square meter of a community is calculated for each transaction occurred from January 2010 to June 2012 in Shanghai. To reduce the noise from price

[4] Due to the high population density and high-rise nature of communities in Shanghai, the structure and unit price of housings are homogeneous within each community.

fluctuation, the housing price is adjusted by the ICBC-Shanghai University of Finance and Economics Real Estate Price index[5].

Public Expenditure from Urban Districts

Public expenditure from urban district governments includes general public service, public security, education, science and technology, culture and media, social security and unemployment insurance, health, environment protection, community development, transportation, business development, and post-disaster rebuilding. Total public expenditure is measured by the total public expenditure per capita. Following Peterson (1981), we categorize public expenditure into three groups: developmental expenditure including transportation and industrial and commercial management[6]; redistributive expenditure including health service, community development, and social security and unemployment insurance; and allocation expenditure consisting of general administrative service[7]. Each group of public expenditure is measured by percentage: percent of redistributive expenditure of total expenditure, percent of developmental expenditure of total expenditure and percent of allocation expenditure of total expenditure. Data of public expenditure from each district is from the internal fiscal report of the Public Finance Bureau of Shanghai City from 2003-2009.

[5] Shanghai University of Finance and Economics provided the "ICBC-SHUFE" housing index. "ICBC-SHUFE" housing price index adopts the hedonic model containing 16 attributes based on full sample data. It reflects the fluctuation of monthly prices of new and used houses in Shanghai. Shanghai municipal government utilizes this index to supervise the real estate market. The evaluation system of property values in ICBC for loans is based on this index. Li et al. (2015) adopted this index to adjust the nominal housing price to examine community clusters.

[6] Expenditure on technology might also be developmental expenditure, we tested the measurement with technological expenditure and the results are the same.

[7] Education can be categorized into developmental and redistributive expenditure. We tested measurements with education and the results remain the same.

Public Facilities Surrounding the Communities

Existing literature in the U.S. context has suggested four location attributes fundamental for housing values: the availability and quality of schools (Haurin and Brasington, 1996; Borgart and Cromwell, 2000; Downes and Zabel, 2002; Raymond, 2002; Fack and Grenet, 2010; Gibbons et al.2013); proximity of dwellings to transportation facilities (Cheshire and Sheppard, 1995; Haider and Miller, 2000; Bowes and Ihlanfeldt, 2001); crime factors (Gibbons, 2004), and environmental factors (Farber, 1998; Smith and Huang, 1995). Shanghai is a city with a relatively low crime rate. Although environmental quality is an important issue at the municipality level, air quality does not significantly differ by individual community because community units are extremely dense in Shanghai. Thus, neither crime rate nor air quality is considered in the current study. In Shanghai and probably most cities in China, quality of public schools is one of the most important factors for residential location choice, especially for the households with children (Clark & Herrin 2000; Haurin & Brasington 1996). Therefore, we include access to public schools and transportation facilities in the current study.

To measure the spatial accessibility of primary schools of a community, we first search the primary schools located within a two-kilometer buffering area that is centered by the community. The distance of 2km for the buffer is chosen based on the criteria adopted by Shanghai Planning Bureau (give references or any study or report that have used this). Suppose we find N primary schools within the buffer, that is, a_1, a_2, … a_n. . The accessibility of the community to the i^{th} school is: $f_i = F \times (1 - \frac{d_i}{D})^2$ where d_i is the geographical

distance from the ith school to the community. D equals 2km, F is a constant to keep f_i stay in a reasonable boundary, instead of being an extreme value. The spatial accessibility of a community is the summary of all the school's accessibility in that community: $F_d = f_1 + f_2 + \cdots + f_n$. This measurement integrates both the number and distance of schools. The value will be higher if there are more schools in a community or the schools are closer to it or both, which means it is easier for the residents to access the schools within a certain distance. To measure the quality of education service, we particularly include the distance from a community center to the "Key School" (*Zhongdian Xuexiao*) because it is the education resource that most residents care the most.

Existing studies measure transportation accessibility by traveling time, cost of travel, convenience, and availability of different transportation modes (Adair, Greal, Smyth, Cooper, & Ryley 2000; So, et al. 1997). The positive influence of good public transport services on housing prices has been empirically examined. For example, So et al.'s (1996) study on Hong Kong suggests that buyers are willing to pay more for properties with easy accessibility to public transportation. Shyr et al. (2013) also find the positive impact of transportation accessibility on housing price is inverse to the size and popularity of the transit system. In our study, spatial accessibility of public transit facilities is measured the same way as school accessibility, except that different radius is chosen for the buffering areas. The radius of the buffering area for subway station is 1km and 0.8km for bus stops. Similar to the adoption of 2km buffer for school accessibility, these distances are chosen according to the criteria adopted by Shanghai Planning Bureau.

Control Variables

Location Factors

Traditionally, value of land that is closer to Central Business District (CBD) is higher (Alonso 1960). Thus, distance from each community to CBD is included in the model. Given the areas located between two urban districts could be neglected by both district governments in public service provision, we measured the distance from a community to the district center and that from the community to the district boundary. A community is in the central city or suburban area is also indicated.

Proximity to shopping complexes and the size of shopping centers, have both been found to exert an influence on the value of the surrounding residential properties (Des Rosiers, et al.1996; Sirpal 1994). Proximity to a shopping centre could indicate easy access to facilities, and reduced traveling costs, but this also might provide disadvantages in terms of noise pollution and congestion. In this study, we calculate the spatial accessibility of supermarket and shopping malls by each community. Methods are the same with the school accessibility. The radius for supermarket and shopping malls are 2km and 5km respectively.

Socioeconomic Characteristics

Social class of the neighborhood and occupation of inhabitants have important impact on property values (Ketkar, 1992; Richardson, et al. 1974). Vast literature has identified that people prefer living in neighborhoods occupied primarily by households with incomes equal

to or higher than their own, with similar cultural values, outlooks, and similar racial or ethnic backgrounds (Berry 1975, Downs 1994, Evans 1973). Desirability is translated into home prices, property values and capital values (Thorns 1981). Higher social class of residents then is associated with higher property value.

Because households' social-economic status is not available for each community, we use the information at the street level in our model. Percent of population with four year college degree and percent of float population within each street are calculated to capture the social-economic neighborhood effect. Under the *Hukou* system, the majority of the float population in Shanghai is low-skilled and concentrates at the lowest socioeconomic hierarchy. Data is from the sixth Census of China in 2010.

Structural attributes

Ball (1973) points out, if a house has more desirable attributes than others do, the valuation of these attributes will be reflected in higher housing price. Researchers have documented that the number of rooms and bedrooms (Fletcher, et al.2000; Mingche & Brown 1980), the number of bathrooms (Garrod & Willis 1992; Linneman 1980), and the floor area (Carroll, Clauretie, & Jensen 1996; Rodriguez & Sirmans 1994) are positively related to the sale price of houses. Building age is negatively related to property prices (Clark & Herrin 2000; Kain & Quigley 1970; Rodriguez & Sirmans 1994; Straszheim 1975). Because our unit of analysis is residential community instead of single houses, structural variables in our model are the average floor area, age (measured by the complete year of the community), the total built area

which measures the size of the entire community, and the floor area ratio. Communities composed of apartments are usually priced lower than those with single houses. We thus include the variables indicating whether the community is mainly composed of apartments or villas.

Modeling Strategy

Because residential communities are nested in Streets (*jiedao*), and Streets are nested in urban districts (*shiju*), we employ a three-level hierarchical linear regression analysis. The multilevel modeling strategy allows a decomposition of the variation in the dependent variable across the three levels (Raudenbush and Bryk 2002; Snijders and Bosker 1999): The first level is the residential community, the second level is the Street, and the third level is the urban district. The variables at each level with correspondent coding strategies are provided by Table 1. The community-level model (level 1) is given by

Equation 1: $y_{ijk} = \beta_{0jk} + \beta_{1jk}x_{ijk} + r_{ijk}$ $\quad r_{ijk} \sim N(0, \sigma^2)$

where y_{ijk} is the housing price per square meter for community *i* within street *j* and urban district *k*. r_{ijk} is the level-one random effect. x_{ijk} is the community-level variables on housing price with associated effects β_{1jk}. All community-level variables are centered around their street means. Thus the intercept is interpreted as average street level of housing price for urban district k (Raudenbush and Bryk 2002). The definition of the intercept is critical in hierarchical analyses because the intercept at the second level is a function of street-level, and it is a function of urban district level at the third level.

At the second level,

Equation 2: $\beta_{0jk} = \beta_{00k} + \beta_{01k}w_{1jk} + \mu_{0jk}$ $u_{0jk} \sim (0, \tau_{00}^{(2)})$

$\beta_{1jk} = \beta_{10k}$

β_{0jk} is the random intercept across streets, and μ_{0jk} is the second-level error term associated with variation across streets. β_{01k} represents the extent that street-level variables (w_{1jk}) predict average housing price across streets.

At the third level,

Equation 3: $\beta_{00k} = \gamma_{000} + \gamma_{001}w_{2k} + \mu_{00k}$ $\mu_{00k} \sim (0, \tau_{00}^{(3)})$

$\beta_{01k} = \gamma_{010}$

$\beta_{10k} = \gamma_{100}$

where β_{00k} is the random intercept across urban districts, μ_{00k} is the third-level error term associated with variation across urban districts, and γ_{001} represents the effects associated with the district-level variables(w_{2k}). To differentiate the variance components at level two and level three, we use the superscripts (2) and (3) respectively. This model assumes the residuals are uncorrelated across levels, including the assumption that the random effect at level three is uncorrelated with the random effect at level two and the residuals at level one.

Putting all three levels together, the full model can be expressed as following:

Equation 4: $y_{ijk} = (\gamma_{000} + \gamma_{001}w_{2k} + \gamma_{010}w_{1jk} + \gamma_{100}x_{ijk}) + \left(\mu_{00k} + \mu_{0jk}\right) + r_{ijk}$

Descriptive Statistics

Table one describes the variables across three levels. In Shanghai, from 2003 to 2009, the average total expenditure of urban district governments was 8094[8] RMB per capita. Redistributive expenditure from 2007-2009[9] was about 2502 RMB per capita, 39% of the total public expenditure. 18% of total expenditure goes to developmental programs, about 1594 RMB per capita. In contrast, allocation expenditure takes only 10% of the public expenditure from urban district government, about 861RMB per capita. The major public expenditure from district governments is redistributive instead of developmental. It might be due to the regulation from the Municipal government that local governments must ensure a certain level of investments on the redistributive services to "guarantee" citizens' quality of life[10]

At the street level, there was about 37 % of float population within each street. Population holding four-year college degree shared about 21% in each street. Of the 9731 communities with housing transactions 2010-2012 in our dataset, the average housing price per square meter of each community was 19,140 RMB.

The average spatial accessibility of schools was .37, and the distance from a community to the closest Key School was 3.86 kilometers. The spatial accessibility of bus stops and subway stations were .2 and .1 respectively. Schools then were more accessible than public transit according to our measurements. Buses were more spatially accessible than subways to

[8] The value is adjusted by CPI with the base year =2003.
[9] The government accounting statistics system changed significantly in 2006, thus we cannot use the historical data before 2006 to construct these three variables.
[10] This information is from the informal interview of an officer at Shanghai fiscal bureau.

residents.

On average the distance from a community to CBD was 13 kilometers. It was about 6.12 kilometers from a community to the associated urban district center and about 2.52 kilometers to the district boundary. Thus most residential communities in Shanghai were actually closer to the district boundary than to the district center. About 30% communities were located in central city area and 27% communities were in the outer suburban area in each urban district. The spatial accessibility of supermarkets was .39 which implies that residents might be easy to get groceries close to their home. The spatial accessibility of shopping malls was .17, much lower than that of supermarkets. It is understandable because large shopping malls usually serve larger areas.

The average size of each community was about 88 square meters and the total built area of a community was about 1586 square meters. On average the communities in Shanghai were 15 years old and the floor area ratio was 2.41. Most communities (80%) in Shanghai were residential only and did not include commercial properties. Only 1% of communities consisted of single houses, which in most cases are the luxurious villas located further away from the inner city.

Table one is about here

Public Service Accessibilities

Table two presents the results from the three-level hierarchical linear regression models. If

the spatial accessibility of schools increases one unit, the housing price of the community would increase about 11%-14%, which is about 2100 Yuan-2680 Yuan. With the key school located one kilometer father way, the community housing price would decrease 3% (about 574 yuan). The results are consistent with the empirical findings about the impact of school availability and quality on property values (Haurin and Brasington, 1996; Borgart and Cromwell, 2000; Downes and Zabel, 2002; Fack and Grenet, 2010; Gibbons et al.2013). The results also show that if the accessibility to subway stations increases one percent, the housing price increases one percent. However, accessibility to bus stops does not affect housing price. It might indicate that different types of public transit (light rails or subways vs. bus) have different impacts on property values. Therefore, the results confirm Hypotheses Ha that communities with better accessibility to public services are associated with higher housing prices.

Effects of Public Expenditure on Housing Prices

Model 1 tests the relationship between total public expenditure and housing price (Hb). The non-significant coefficient indicates total expenditure per capita from district governments is not associated with community housing prices. Or, residents do not show strong preferences for communities located in the urban districts receiving more total public expenditure. Therefore, Hypothesis Hb is supported.

Table two is about here

Model 2, model 3 and model 4[11] test Hypotheses Hc - the effects of redistributive, developmental, and allocation expenditure by their relative size of total expenditure (i.e. percentage). Each type of expenditure from the district governments explains about ten percent variation in housing price. First, the coefficient of redistributive expenditure percent is 1.10. It indicates that one percent of spending increase on redistributive programs at the district is associated with 110 percent housing price increase (model 2). The result confirms hypothesis Hc1. Second, the coefficient of developmental expenditure is -1.56 in model 3. It suggests that if a district government increases one percent of developmental expenditure, the housing prices will be 156 percent lower, when holding other variables at their means. The result supports hypothesis Hc2 and is consistent with evidence under the American context (Jimenez 2014; Peterson 1981). Third, Model 4 indicates that the allocation expenditure do not affect housing price, thus confirms our hypothesis Hc3.

To test the robustness of the results, we also measure the three public expenditure types by the absolute value, i.e. expenditure per capita (in thousand RMB yuan). The results are presented by Appendix 1. The overall findings from this different measurement are consistent with our findings using the percentage (presented in Table 2). For instance, the coefficient of redistributive expenditure per capita is .007. It indicates that if a district government increases 1000 yuan to spend on redistributive programs, housing price in the district would experience 133 yuan per square meter. The coefficient of developmental expenditure is -.01 in model 2. If developmental expenditure increases one thousand yuan per capita, the housing price in the

[11] Jing'an District is excluded in the models because it is the outlier of the 17 districts, with extremely higher developmental and redistributive expenditure than other districts. The significance level of the model is lower if including Jing'an District, but the signs of the coefficients remain the same.

district would decrease 1 percent, which is about 191 yuan on average. The allocation expenditure per capita remains non-significant.

Model 2a adds the interaction item between redistributive expenditure and the spatial accessibility to schools surrounding a community[12]. The negative coefficient of the interaction term indicates the positive effect of district redistributive expenditure is mediated by school accessibility. Residents would compete by paying higher housing price to live in a district with good school accessibility and high redistributive expenditure. The better the school accessibility is, the fiercer the competition. The intense competition might result in communities with high redistributive expenditure and high school accessibilities unaffordable. Then, this will crowd poorer people out of these expensive communities. Likewise, existing public service infrastructure also mediates the effect of developmental expenditure from district governments. The coefficients of the interaction term between developmental expenditure and school accessibility are positive in model 3a. High school accessibilities reduce the negative association between developmental expenditure and housing prices. Compared with districts with high spending on developmental programs and poor school accessibility, residents prefer the districts with good school accessibility.

The results seem consistent with the findings from the experiences of U.S. Cities. In the US metropolitan areas, most residents in the communities with middle and higher socioeconomic status are against redistributive expenditure from the local government because these

[12] Schools are the most important public services surrounding a community. We thus choose spatial accessibility of schools to interact with the district expenditure

programs mainly benefit the lower income (Summers 2000) Due to the competition among the fragmented local governments, only residential communities that can afford the redistributive expenditure will invest on the redistributive services, as poor communities have to spend more on developmental programs. Residents in Shanghai would still prefer more of both redistributive and developmental services since they do not need to pay the services directly as revenue of urban districts is mainly from business taxes. However, the public expenditure of district government has to be constrained by their revenue. The intergovernmental competition forces districts with less revenue to spend more on developmental services. Our interviewee from the fiscal bureau in Yangpu District, states that, "The public spending is based on our revenue… and in recent years we have prioritized the expenditure on people's livelihood (*min sheng*), which is mainly the redistributive programs. We do not pay a lot on developmental programs unless we see the urgent need… districts with lower tax revenue usually have to scarify their priority on people's livelihood to spend more money on business or developmental programs, because they have to build/rebuild the basic infrastructure." Therefore, the low-income households have to stay in the districts which have invested their limited revenue on developmental services, as the higher housing prices have prevented the poorer residents moving to the richer districts with better redistributive programs.

Other Variables

Location has been viewed traditionally as the most important determinant of housing prices. Our results show that with one kilometer further away from the CBD, the community housing

price per square meter will be 30 percent (or 5742 yuan) lower. Distance to the district center also makes differences. With one kilometer further way from the district center, the community housing price will be 3 percent (or 574 yuan) lower; however, distance to the district boundaries does not influence housing prices. While being located in central city area within the inner ring does not affect housing price significant, locating in suburbs is associated with 10 percent lower of housing prices. The results confirm that housing values are much lowers in outer suburbs where also have a lower accessibility to public service facilities.

Accessibility to supermarket is negatively associated with community housing prices. With one unit of increase in supermarket accessibility, the community housing price per square meter will decrease by about 20% (3828 yuan). Accessibility to shopping malls, however, is not significantly associated with housing prices.

Neighborhood socioeconomic attributes are perceived to be vital factors for property value. Habitants with higher socioeconomic status are associated with higher property value. If the highly educated population increases one percent in one street, the housing price of communities located in the street will increase by 1% (or 191 yuan). Percent of float population (who do not have a *Hukou* in Shanghai) has a slightly positive effect. It could be because many highly educated and high income population that work in Shanghai may not have *Hukou*.

We do not find the age of the community associated with housing price; however, the structure of community and design of housing units matter. Consistent with the previous literature, the housing units with a larger footage and bigger community are more expensive. Specifically, one percent increase of unit area is associated with 3 percent increase of housing prices, and one percent increase of community built area is associated with 5 percent increase of housing prices. One percent increase of floor area ratio is associated with 3 percent decrease in housing prices. Compared with commercial property, residential housing price is 4 percent lower. On average, communities composed of single houses have prices 72 percent higher than those concentrated with apartments.

Conclusion

The housing markets in China have been prosperous for about twenty years. Most existing studies have examined the relationship between the rapidly increasing housing price, economic growth and urbanization. Some scholars have paid attention to the emerging segmentation and spatial differentiation in large cities. However, very few studies have investigated the impact of public service provision on housing price and residential stratification in Chinese cities.

Our study finds that communities with better accessibility to public services tend to have higher housing prices. While the total public expenditure at the urban district level is not associated with community housing prices, the spending structure makes significant differences. Specifically, communities located in districts with a higher redistributive

expenditure (measured by the absolute value or by the share in the total expenditure) tend to have higher housing prices, and communities in districts with higher developmental expenditure tend to have lower housing prices. Furthermore, the effects of these two categories of public expenditure on housing prices are mediated by the accessibility to existing public service infrastructure. For communities surrounded by high-quality public facilities, the association between redistributive expenditure and housing prices tends to be negative. For communities close to public services with good quality, higher developmental expenditure is associated with higher housing prices.

Public expenditure on both developmental and redistributive services affects housing prices, which ultimately lead to uneven distribution of public services and reinforce urban polarization between the rich and the poor. The high-income households stay in the districts with good public facilities and better redistributive services by paying higher housing prices. The districts with more poor households are limited in generating more revenues and have to spend on developmental programs to attract more businesses. Thus, the lower-income, who may need redistributive service the most, has to live in the districts which have limited resource for restrictive expenditure on public service provision.

The findings under a centralized government structure are similar to that from the U.S. cities with fragmented local governments. The results in Shanghai could be attributed to the unique fiscal system. Revenue of urban districts in Shanghai mainly comes from business taxes instead of property tax from households. Households prefer more of both redistributive and

developmental programs when they do not need to pay for public services. Given public expenditure of district governments is based on their revenue, districts with sufficient revenue can ensure expenditure on redistributive services, while districts with less revenue have to support developmental programs on public infrastructure or business as the priority due to the intergovernmental competition for economic growth. When public service accessibility is built into housing prices, public expenditure is then directly linked to the housing market. The coefficients of the interaction items between redistributive expenditure and public facility accessibility, and that between developmental expenditure and public facility accessibility support this interpretation.

Neither Tibout's framework nor the SSGI theory can fully address the urban stratification issues. Although there was a traditional socialist centralized allocation system of both public services and housing, there is clearly no consensus in current public service provision through a regionalism perspective among the local governments. Instead, with increasingly autonomous administrative and fiscal power, local governments are in the frantic competition for more resources and opportunities for development within each juridical kingdom. At the same time, privatization of housing market has relentlessly displaced most residents out of their comfort zones and stratified significantly between the rich and the poor. Interaction between these two forces has further reinforced each other and polarized the socioeconomic space in this global city.

References

Adair Alastair, McGreal, Stanley, Smyth Austin, Cooper James, Ryley Tim. 2000. House prices and accessibility: The testing of relationships within the Belfast urban area. *Housing studies*, 15(5): 699-716

Alonso, W. 1960. A Theory of the Urban Land Market. Papers and Proceedings, Regional Science Association, 6: 149-157.

Ball Michael J (1973) Recent empirical work on the determinants of relative house prices. *Urban studies*, 10(2): 213-233

Basolo, V. 2000. CitySpending on Economic Development versus Affordable Housing: Does Inter-City Competition or Local Politics Drive Decisions? *Journal of Urban Affairs* 22(3):317-332

Berry, B JL. 1975. The Decline of the Aging Metropolis: Cultural Bases and Social Processes, in G Sternlieb and J Hughes (ed.) *Post-Industrial America: Metropolitan Decline & Inter-Regional Job Shifts*, Rutgers: Center for Urban Policy Research, p. 175-185

Bischoff, K.(2008. School District Fragmentation and Racial Residential Segregation: How do Boundaries Matter? *Urban Affairs Review* 44(2): 182-217

Bogart, WT and B A. Cromwell (2000) How Much Is a Neighborhood School Worth?.*Journal of Urban Economics* 47(2): 280-305

Bowes D R and KR. Ihlanfeldt (2001) Identifying the impacts of rail transit stations on residential property values. Journal of Urban Economics 50(1): 1-25

Carroll T, M Terrence, M Clauretie, and J Jensen.1996. Living next to godliness: Residential property values and churches. *The Journal of Real Estate Finance and Economics*, 12(3): 319-330

Chen J and X Han. 2014. The Evolution of Housing Market and Its Socio-economic Impacts in Post-Reform China: A Survey of the Literature. *Journal of Economic Survey* 28(40):652-670

Cheshire P and S Sheppard. 1995. On the price of land and the value of amenities. *Economica* 62(246): 247-267

Chen, X. and M. Funke. 2013. Real-time warning signs of emerging and collapsing Chinese house price bubbles institute for economies in transition. *National Institute Economic Review* 223(1): R39–R48

China Index Academy. 2013. *China real estate index system 100 city price index report*

Cheng, Y., J.K. Dagsvik, and X. Han. 2014. Real estate market policy and household demand for housing.*Pacific Economic Review* 19(2): 237–253.

Clark, D E, W E Herrin. 2000. The impact of public school attributes on home sale prices in California. *Growth and change*, 31(3): 385-407

Deng, Y., R. Morck,, J. Wu, and B. Yeung. 2011. Monetary and fiscal stimuli, ownership structure, and China's housing market. NBER Working Paper 16871

Des Rosiers, François, M Thériault, and Paul-Y Villeneuve. 1996. Shopping centres and house values: An empirical investigation. *Journal of Property Valuation & Investment* 14(4): 41-62

Downes, T A, J E Zabel. 2002. The impact of school characteristics on house prices: Chicago 1987–1991. *Journal of Urban Economics*, 52(1): 1-25

Downs A. 1994. *Links Between Central Cities and Suburbs, in New Visions for Metropolitan America*, Washington DC. The Brookings Institution

Evans, A W. 1973. *The Economics of Residential Location*. New York: Macmillan & Co. Ltd

Fack, G and J Grenet. 2010. When do better schools raise housing prices? Evidence from Paris public and private schools. *Journal of Public Economics*, 94(1): 59-77

Farber, S. 1998. Undesirable facilities and property values: a summary of empirical studies. *Ecological Economics*, 24(1): 1-14

Fawley,B.W. and Y. Wen. 2013. The great Chinese housing boom. *Federal Reserve Bank of St. Louis Economic Synopses* (13), May 3, 2013.

Fletcher, M, P Gallimore, J Mangan (2000) Heteroscedasticity in hedonic house price models. *Journal of Property Research* 17(2): 93-108

Galster, G. C. and W. M. Keeney (1988) Race, residence, discrimination, and economic opportunity: Modeling the nexus of urban racial phenomena. *Urban Affairs Quarterly* 24(1): 87-117

García, J, D Montolio, J and M Raya. 2010. Local public expenditures and housing prices. *Urban Studies* 47(7): 1501-1512

Garrod, G D and KG Willis. 1992. Valuing goods' characteristics: an application of the hedonic price method to environmental attributes. *Journal of Environmental management* 34(1): 59-76

Gibbons, S.2004. The Costs of Urban Property Crime. *The Economic Journal* 114(499): F441-F463

Gibbons, S Stephen M, and O Silva. 2013. Valuing school quality using boundary discontinuities. *Journal of Urban Economics* 7: 15-28

Haider, M, and Ec J Miller. 2000. Effects of transportation infrastructure and location on residential real estate values: application of spatial autoregressive techniques. Transportation Research Record: *Journal of the Transportation Research Board*, 1722(1): 1-8

Haurin, D R, and D Brasington (1996) School quality and real house prices: intra- and inter-jurisdictional effects, Journal of Housing Economics, 5, pp. 351–368

Hill R.C. 1974. Separate and unequal: governmental inequality in the metropolis. *American Political Science Review* 68: 1557-68

Howell-Moroney M. 2008. The Tiebout hypothesis 50 years later: Lessons and lingering challenges for metropolitan governance in the 21st century. *Public Administration Review*, Jan/Feb : 97-109

Hu, Yijian. 2009. The Model of Urban Fiscal System Reform: The Case of Shanghai. *Public Finance Research* 5: 40-42 (in Chinese)

Jargowsky P. 2002. Sprawl, concentration of poverty and urban inequality. In *Urban Sprawl: Causes, consequences and Policy Responses*. Edited by Gregory D. Squires, 39-72. Washington, DC: Urban Institute Press

Jimenez B S. 2014. Separate, Unequal, and Ignored? Interjurisdictional Competition and the Budgetary Choices of Poor and Affluent Municipalities. *Public Administration Review*, 74(2), 246-257

Jimenez BS and R Hendrick. (2010) Is government consolidation the answer? State and Local Government Review 42: 258-270

Jin Hehui, Y Qian, , andB R Weingast,.2005. Regional decentralization and fiscal incentives: Federalism, Chinese Style. *Journal of Public Economics* 89: 1719-1742.

Kain JF. 1968. Housing Segregation, Negro Employment and Metropolitan Decentralization. *Quarterly Journal of Economics*, 82(2): 175-197

Kain J F, and J M Quigley. 1970. Measuring the value of housing quality. *Journal of the American Statistical Association* 65(330): 532-548

Ketkar, K. 1992. Hazardous waste sites and property values in the state of New Jersey. *Applied Economics*, 24(6): 647-659

Korsu E, and S Wenglenski. 2010. Job accessibility, residential segregation and risk of longterm unemployment in the Paris region, *Urban Studies*, 47, pp. 2279–2324

Lewis J H. and D K Hamilton. 2011. Race and Regionalism: The Structure of Local Government and Racial Disparity. *Urban Affairs Review* 47(3): 349–84

Li, H., H. Campbell, and S. Fernandez. 2013. Residential segregation, spatial mismatch and economic growth across US metropolitan areas. *Urban Studies* 50(13) 2642–2660

Li, H., & J. K. S. Kung. 2012. *Fiscal incentives and policy choices of local governments: evidence from China*. Hong Kong University of Science and Technology Working Paper.

Li, H., Q. Wang, W. Shi, Z. Deng, & H. Wang. 2015. Residential clustering and spatial access to public services in Shanghai. *Habitat International*, *46*, 119-129.

Li, Q, W. Zhang, J. Yu, J. Cao, Y. Dang. 2012. Research on the Residential Segregation in Beijing. *Progress in Geography* 31(6): 693-700. (In Chinese)

Linneman P. 1980. Some empirical results on the nature of the hedonic price function for the urban housing market. *Journal of Urban Economics*, 8(1): 47-68

Lowery D. 2000. A Transactions Costs Model of Metropolitan Governance: Allocation versus Redistribution. *Journal of Public Administration Research and Theory* 10(1): 49–78

Massey DS and NA Denton. 1993. *American apartheid: segregation and marking of the underclass*. Cambridge, MA: Harvard University

Miller D.2002. *The Regional governing of metropolitan America*. Boulder. CO: Westview Press

Mingche, ML, Brown JH. 1980. Micro-neighborhood externalities and hedonic housing price. *Land Economics* 56(2): 125-141

Oates, Wallace E. 1969. The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis. *The Journal of Political Economy* 77, no. 6: 957

Powell, JA. 2002. Sprawl, fragmentation, and the persistence of racial inequality: limiting civil rights by fragmenting space. In *Urban sprawl: causes, consequences and policy responses,* edited by G. D. Squires, 73-118. Washington, DC: Urban Institute Press

Raudenbush, SW. and A S. Bryk. 2002. *Hierarchical linear models: Applications and data analysis methods* (Vol. 1). London:Sage

Raymond, Y. C. 2002. Estimating neighbourhood effects in house prices: towards a new hedonic model approach. *Urban studies*, 39(7): 1165-1180.

Ren, Y., C. Xiong, and Y. Yuan. 2012. House price bubbles in China. *China Economic Review* 23(4): 786–800.

Richardson, H.W, J. Vipond, and R.A Furbey. 1974. Determinants of urban house prices. *Urban Studies* 11(2): 189-199

Rodriguez, M., and CF Sirmans. 1994. Quantifying the value of a view in single-family housing markets. *Appraisal Journal* 62, 600-603

Rusk, D. 1995. *Cities without suburbs*. Washington, DC: Woodrow Wilson Center Press

Schneider, M., and J Logan. 1981. Fiscal implications of class segregation: inequalities in the distribution of public goods and services in suburban municipalities. *Urban Affairs Review* 17(1):23-36

Shyr, O., D. E. Andersson, J. Wang, T. Huang, and O. Liu. 2013. Where Do Home Buyers Pay Most for Relative Transit Accessibility? Hong Kong, Taipei and Kaohsiung Compared. *Urban Studies* 50(12): 2553-2568

Sirpal, R. 1994. Empirical modeling of the relative impacts of various sizes of shopping centers on the values of surrounding residential properties. *Journal of Real Estate Research* 9(4): 487-505

Smith, V. K, and Ju-Chin Huang. 1995. Can markets value air quality? A meta-analysis of hedonic property value models. *Journal of political economy*, 209-227

Snijders T, and R. Bosker. 1999. *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. London: Sage

So, HM, RY Tse, S. Ganesan. 1997. Estimating the influence of transport on house prices: evidence from Hong Kong. *Journal of Property Valuation and Investment*, 15(1): 40-47

Straszheim, M. R. 1975. An econometric analysis of the urban housing market. NBER Books.

Summers, A. 2000 Regionalization Efforts Between Big Cities and Their Suburbs, in *Urban- Suburban Interdependencies*, R. Greenstein and W. Wiewel, eds., Cambridge: The Lincoln Institute of Land Policy, p. 181-193.

Thorns ,D. 1981. The implications of differential rates of capital gain from owner-occupation for the formation and development of housing classes. *International Journal of Urban and Regional Research* 5: 205 – 217

Tiebout, C. M. 1956. Pure Theory of Local Expenditures. *Journal of Political Economy* 64: 416-424

Wang, S.-Y. 201) Statemisallocation and housing prices: theory and evidence from China. *American Economic Review* 101(5): 2081–2107.

Wang, Y.P., L., Shao, A. Murie, and J. Cheng. 2012. The maturation of the neo-liberal housing market in urban China. *Housing Studies* 27(3): 343–359.

Weingast BR. 2009. Second generation fiscal federalism: THE implications of fiscal incentives. *Journal of Urban Economics*, 65,279–293

Weingast BR. 2014 Second generation fiscal federalism: political aspects of decentralization and economic development. *World Development* 53, 14–25

Wilson, WJ. 1987. *The truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. Chicago: University of Chicago Press

Wu, F. 2002. China's changing urban governance in the transition towards a more market-oriented economy. *Urban Studies* 39(7): 1071-1093

Wu, F. 2004. Intraurban Residential relocation in Shanghai: modes and stratification. *Environment and Planning A* 36(1): 7–25

Wu, J., J. Gyourko,andY. Deng. 2012. Evaluating conditions in major Chinese housing markets. *Regional Science and Urban Economics* 42(3): 531–543

Zheng Siqi, and M. E Kahn. 2008. Land and residential property markets in a booming economy: New evidence from Beijing. *Journal of Urban Economics*, 63(2), 743-757

Table 1: Means and Standard Deviations of Variables

Variables	Definition	Mean	Std.Dev.
Urban District Level (N=17)			
Total expenditure per capita	total public expenditure of each district per capita (2005-2009)	8094.99.	3624.1
Developmental expenditure per cap	expenditure on transport and business per capita(2007-2009)	1594.05	849.37
Redistributive expenditure per capit	expenditure on social and unemployment insurance, health services, and comm	3502.43	1999
Allocation expenditure per capita	expenditure on general administrative services and culture (2007-2009)	861.27	340.19
Percent of developmental expenditu	developmental expenditure/total expenditure(2007-2009)	0.18	0.07
Percent of redistributive expenditure	redistributive expenditure/total expenditure(2007-2009)	0.39	0.1
Percent of allocation expenditure	allocation expenditure/total expenditure(2007-2009)	0.1	0.02
Street level (N=177)			
Percent of float population		37.25	19.46
Percent of population get higher edu	Population get university education/total population of a street (2010)	20.76	13.54
Dependent Variable			
Housing price per square meter of each community		19140.06	21324.99

Table 1: Means and Standard Deviations of Variables (continue)

Variables	Definition	Mean	Std.Dev.
Community Level (N=9237)			
Unit area	Square meters of one apartment (or single house)	87.6	101.5
total area	Total square meters of a community	1586.3	5629.22
Floor area ratio	Built Area/total land area of the project	2.41	2.4
Complete year of the community	The year when the community was built	1998	8.85
Spatial accessibility of schools	Spatial accessibility of schools surrounding a community	0.37	0.3
Distance to key schools	Kilometers of the community to key schools	3.86	6.36
Spatial accessiblity of busstation	Spatial accessibility of bus stops surrounding a community	0.2	0.17
Spatial accessiblity of subway station	Spatial accessibility of subway station surrounding a community	0.1	0.14
Distance to CBD	Kilometers of the community to CBD	13.08	12.1
Distance to district boundary	Kilometers of the community to urban district boundary	2.52	6.42
Distance to district center	Kilometers of the community ot urban district center	6.12	5.1
Central city	Central city=1 if the community is within the internal ring	0.3	0.46
Suburbs	Suburbs=1 if the community is outside of the outer ring	0.27	0.44
Spatial accessibility of supermarkets	Spatial accessibility of supermarkets surrounding a community	0.39	0.19
Spatial accessibility of shoppingmalls	Spatial accessibility of shoppingmalls surrounding a community	0.17	0.17
Residence	Residence=1 if the community is for residence	0.8	0.4
Housing	Housing=1 if the community consists of single houses	0.01	0.12

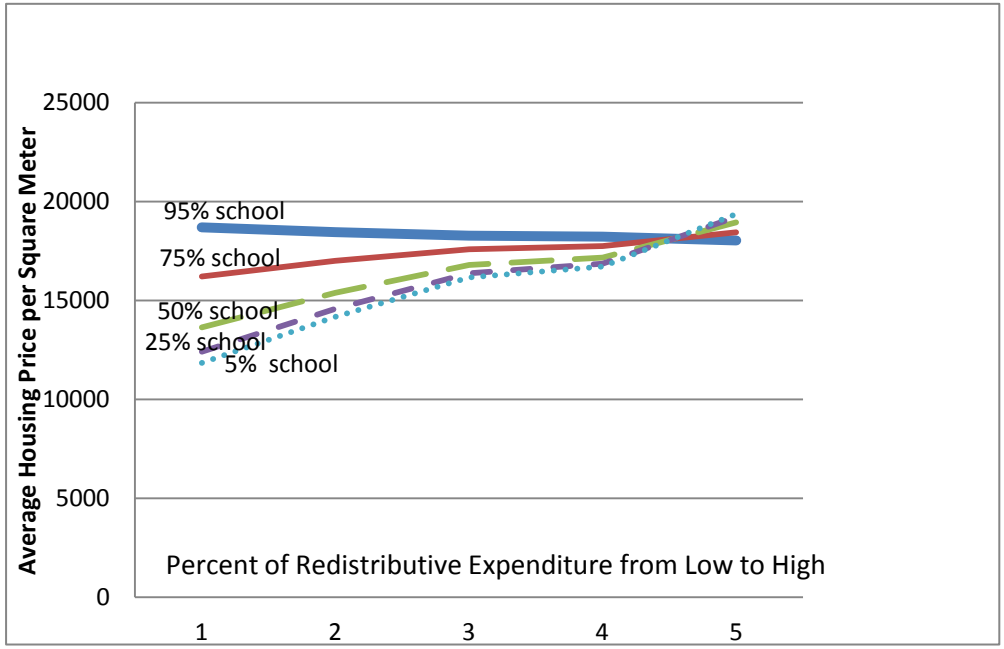
Table 2: Coefficients of Hierarchical Linear Modeling on percent of public expenditure of three categories

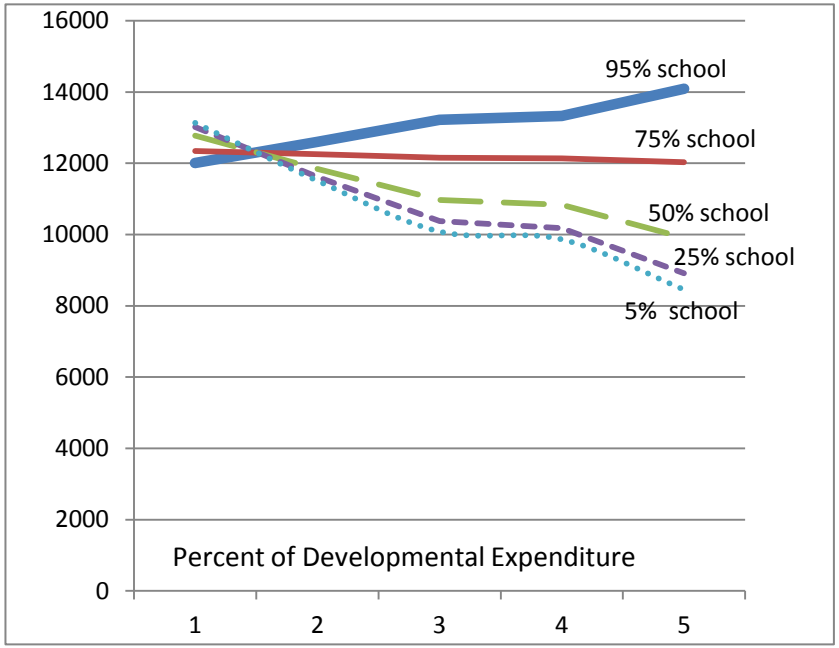
Variables	Model1		Model 2		Model 2a		Model 3		Model 3a		Model 4	
Urban District Level (N=17)												
Intercept	9.31(.12)	***	9.64(.12)	***	9.57(.13)	***	8.92(.14)	***	9.01(.15)	***	9.59(.20)	***
Total expenditure per capita	0.00(.00)											
Percent of redistributive expenditure							1.10(.33)	**	1.68(.37)	***		
Percent of developmental expenditure			-1.56(.52)	**	-2.27(.57)	***						
Percent of allocation expenditure											-2.46(1.91)	
Street level (N=177)												
Percent of Float population	.002(.001)	+	.002(.001)	+	.002(.001)	+	.002(.001)	*	.002(.001)	*	.002(.001)	*
Percent of population get higher education	.01(.00)	***	.01(.00)	***	.01(.00)	***	.01(.00)	***	.01(.00)	***	.01(.00)	***
Percent of redistributive expenditure*spatial accessibility of schools									-2.02(.54)	***		
Percent of developmental expenditure *spatial accessibility of schools					3.45(.96)	***						
N	9728		9728		9728		9728		9728		9728	
Variance due to community characteristics	0.73		0.77		0.76		0.75		0.77		0.74	
Vairance due to differences among streets	0.13		0.14		0.14		0.14		**0.14**		0.13	
Variace due to differences among urban districts	**0.14**		**0.09**		0.10		**0.11**		0.08		**0.13**	
Standard errors are in the parentheses												
* <=.05, ** <=.01, *** <=.001												

Table 2: Coefficients of Hierarchical Linear Modeling on percent of public expenditure of three categories (continue)

Variables	Model1		Model 2		Model 2a		Model 3		Model 3a		Model 4	
Community Level (N=9237)												
Spatial accessibility of schools	.14(.06)	**	.14(.06)	*	-.31(.13)	*	.14(.06)	*	1.07(.27)	***	.14(.06)	*
Distance to key schools	-.03(.01)	***	-.03(.01)	***	-.03(.01)	***	-.03(.01)	***	-.03(.01)	***	-.03(.01)	***
Spatial accessiblity of subway station	.007(.003)	**	.007(.004)	**	.007(.003)	**	.007(.003)	**	.007(.003)	**	.007(.003)	**
Spatial accessiblity of busstation	.00(.00)		.00(.00)		-.00(.00)		.00(.00)		-.00(.00)		.00(.00)	
Distance to CBD	-.29(.04)	***	-.28(.04)	***	-.27(.04)	***	-.28(.04)	***	-.28(.04)	***	-.29(.04)	***
Distance to district boundary	-.00(.00)		.00(.00)		.00(.00)		.00(.00)		.00(.00)		-.00(.00)	
Distance to district center	-.03(.01)	*	-.02(.01)	+	-.02(.01)		-.03(.01)	*	-.02(.01)		-.03(.01)	*
Central city	.03(.02)		.03(.02)		.04(.02)	+	.03(.02)		.04(.02)	+	.03(.02)	
Suburbs	-.10(.03)	**	-.10(.03)	**	-.09(.03)	**	-.10(.03)	**	-.08(.03)	*	-.10(.03)	**
Unit area	.03(.01)	***	.03(.01)	***	.03(.01)	***	.03(.01)	***	.03(.01)	***	.03(.01)	***
total area	.05 (.00)	***	.05 (.01)	***	.05 (.00)	***	.05 (.00)	***	.05 (.00)	***	.05 (.00)	***
Floor area ratio	-0.03(.00)	*	-.04(.01)	*	-.03(.01)	**	-.03(.01)	*	-.03(.01)	**	-.03(.01)	*
Complete year of the community	.00(.00)		.00(.00)		.00(.00)		.00(.00)		.00(.00)		.00(.00)	
Spatial accessibility of supermarkets	-.19(.04)	***	-.19(.04)	***	-.21(.04)	***	-.19(.04)	***	-.21(.04)	***	-.19(.04)	***
Spatial accessibility of shopping malls	-.00(.11)		-.01(.11)		-.02(.11)		-.01(.11)		-.02(.11)		-.00(.11)	
Residence	-.04(.01)	***	-.04(.01)	***	-.04(.01)	***	-.04(.01)	***	-.04(.01)	***	-.04(.01)	***

Figure 1: The interaction between public expenditure and school accessibilities





Appendix 1: Coefficients of Hierarchical Linear Modeling on public expenditure per capita of three categories

Variables	Model 1		Model 5		Model5a		Model 6		Model6a		Model7	
Urban District Level (N=17)												
Intercept	9.31(.12)	***	9.54(.11)	***	9.53(.11)	***	9.11(.13)	***	9.13(.13)	***	9.45(.16)	***
Total expenditure per capita (1,000 yuan)	0.00(.00)											
Redistributive expenditure per capita							.007(.004)	*	.1(.04)	**		
Developmental expenditure per capita			-.01(.006)	*	-.2(.06)	***						
Allocation expenditure per capita											.01(.02)	
Street level (N=177)												
Percent of Float population	.002(.001)	+	.002(.001)	+	.002(.001)	+	.002(.001)	+	.002(.001)	+	.002(.001)	+
Percent of population get higher education	.01(.00)	***	.01(.00)	***	.01(.00)	***	.01(.00)	***	.01(.00)	***	.01(.00)	***
Redistributive expenditure per capita*spatial accessibility of schools									-.08(.04)	*		
Developmental expenditure per capita*spatial accessibility of schools					.03(.09)	**						
N	9728		9728		9728		9728		9728		9728	
Variance due to community characteristics	0.73		0.75		0.75		0.74		0.74		0.72	
Vairance due to differences among streets	0.13		0.14		0.13		0.14		0.14		0.13	
Variace due to differences among urban di	0.14		0.11		0.11		0.12		0.12		0.14	
Standard errors are in the parentheses												
* <=.05, ** <=.01, *** <=.001												

Appendix 1: Coefficients of Hierarchical Linear Modeling on public expenditure per capita of three categories (continue)

Variables	Model 1		Model 5		Model5a		Model 6		Model6a		Model7	
Community Level (N=9237)												
Spatial accessibility of schools	.14(.06)	**	.11(.06)	+	-.13(.10)		.11(.04)	+	.40(.15)	**	.12(.06)	*
Distance to key schools(log)	-.03(.01)	***	-.03(.01)	***	-.03(.01)	***	-.03(.01)	***	-.03(.01)	***	-.03(.01)	***
Spatial accessiblity of subway station(log)	.007(.003)	**	.01(.003)	**	.01(.003)	**	.007(.003)	**	.007(.003)	**	.008(.003)	**
Spatial accessiblity of busstation(log)	.00(.00)		.00(.00)		-.00(.00)		.00(.00)		.00(.00)		.00(.00)	
Distance to CBD(log)	-.29(.04)	***	-.29(.04)	***	-.27(.04)	***	-.28(.04)	***	-.28(.04)	***	-.29(.04)	***
Distance to district boundary(log)	-.00(.00)		-.00(.00)		-.00(.00)		-.00(.00)		.00(.00)		-.00(.00)	
Distance to district center(log)	-.03(.01)	*	-.03(.01)	*	-.02(.01)	*	-.03(.01)	*	-.02(.01)	+	-.03(.01)	*
Central city	.03(.02)		.03(.02)		.03(.02)		.03(.02)		.03(.02)		.03(.02)	
Suburbs	-.10(.03)	**	-.10(.03)	**	-.10(.03)	**	-.10(.03)	**	-.09(.03)	**	-.10(.03)	**
Unit area(log)	.03(.01)	***	.03(.01)	***	.03(.01)	***	.03(.01)	***	.03(.01)	***	.03(.01)	***
total area(log)	.05 (.00)	***	.05(.00)	***	.05(.00)	***	.05(.00)	***	.05(.00)	***	.05(.00)	***
Floor area ratio(log)	-0.03(.00)	*	-.03(.01)	*	-.03(.01)	*	-.03(.01)	*	-.03(.01)	**	-.03(.01)	**
Complete year of the community	.00(.00)		.00(.000)		.00(.000)		.00(.000)		.00(.000)		.001(.0001)	
Spatial accessibility of supermarkets	-.19(.04)	***	-.18(.04)	***	-.21(.04)	***	-.17(.04)	***	-.17(.04)	***	-.18(.04)	***
Spatial accessibility of shopping malls	-.00(.11)		.01(.11)		-.02(.11)		-.01(.11)		-.00(.11)		.01(.11)	
Residence	-.04(.01)	***	-.04(.01)	***	-.04(.01)	***	-.04(.01)	***	-.04(.01)	***	-.04(.01)	***
Housing	.73(.03)	***	.73(.03)	***	.72(.03)	***	.72(.03)	***	.72(.03)	***	.72(.03)	***