**Social Inclusion (ISSN: 2183-2803)
2020, Volume, Issue, Pages X–X
DOI: 10.17645/si.vXiX.3606**

Article

**Residential Segregation and Unequal Access to Schools**

Author(s)

**Abstract**

Socio-spatial inequality and school inequality are strongly related. Where people live affects the opportunities individuals have in life, such as the opportunity to send your children to a good school. The level of urbanization is related to the number of options people have to choose good schools, so it is likely that more urbanized areas have more options for good schools. However, the families that are able to choose good schools are likely the families with high income or education levels. Data for this study comes from two waves of the Taiwan Youth Project (N=2,893), which consists of two cohorts of students from 162 classrooms in 40 junior high schools in northern Taiwan. When school quality is proxied by socioeconomic status (SES), the results show that, in general, students from the most urbanized areas, richer parents, and higher educated parents, are more likely to go to higher SES schools. However, the strongest effects are for higher income and higher educated parents in the most urbanized areas. This suggests that in the most urbanized areas, families have the most choice of schools, and richer and more educated families are better able to circumvent school catchment areas, either because they can afford an address in a better catchment area or because they understand the importance of school choice.

**Keywords**

catchment areas; parental socio-economic status; school quality; segregation; urbanization

**Issue**

© YYEAR by the author(s); licensee Cogitatio (Lisbon, Portugal). This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

# 1. Introduction

School quality plays a crucial role in chances for a good education. Good schools provide students with higher learning outcomes and nonmaterial resources, such as the social and cultural capital to succeed in a work environment (Bourdieu, 1977; Lareau, 1987). Education is known as the most effective way to upward social mobility for disadvantaged children by creating an equitable distribution of learning outcomes (Downey & Condron, 2016). However, educational inequality has persisted over time in many countries and been widely discussed again since the neoliberal education reforms (Alon, 2009; Tam & Jiang, 2014; Yang, Huang, & Liu, 2014). In this study, we focus on the case of Taiwan, where educational inequality is also emphasized as a concern by several studies (L.-J. Chen, 1993; L.-J. Chen & Chen, 2009; Y. G. Chen, 2001; Mao, 2015), but which is understudied when it comes to spatial processes (Nieuwenhuis, 2020; Nieuwenhuis & Hooimeijer, 2016).

School quality can be operationalized in different ways, all with their own limitations. We suggest that the idea of school quality is partly socially constructed through parental perceptions. Certain schools are perceived to be of higher quality than others and parents use their resources to ensure their child’s admission to those schools. This will ultimately lead to a sorting of children from different socioeconomic background into different schools, with schools that are perceived as high quality having a, on average, higher socioeconomic status (SES) population than schools that are not perceived as high quality. Therefore, we proxy school quality with average school income. Schools’ quality has more often been linked to the SES of its population (Condron & Roscigno, 2003; Perry & McConney, 2010), and higher SES schools have been shown to positively impact students’ educational achievement (Nieuwenhuis, 2018; Portes & MacLeod, 1996). Schools with a higher SES population provide more social and cultural capital, which can further benefit students’ achievement (Cheadle & Amato, 2011; Lareau, 1987). When higher parental SES is reflected in school expenditure, higher SES schools are able to afford better teachers, activities, and facilities (Elliott, 1998; Greenwald, Hedges, & Laine, 1996; Hochschild & Scovronick, 2003), as well as enhance the teacher-student ratio (Wenglinsky, 1997). Although most public primary and secondary schools in many areas receive equal government funding (Butler & van Zanten, 2007), good schools are unequally spatially distributed (Oberti, 2007; Wilson & Bridge, 2019). Generally, more developed urban areas have more higher SES families and more educational resources, so schools in urbanized areas have higher SES populations and often of better quality than in less urbanized areas (L.-J. Chen & Chen, 2009; Owens & Candipan, 2019; Parsons, Chalkley, & Jones, 2000). Thus, urban children are likely to have better access to good schools.

Also within urban areas, the distribution and access opportunities of good schools are unequal because of school segregation, which is strongly connected to residential segregation (Bernelius & Vaattovaara, 2016; Oberti, 2007; Taylor & Gorard, 2001). Many countries set school catchment areas that link place of residence to a selection of nearby schools available to children in that area (e.g., in the UK: Mayet, 1996; Parsons et al., 2000; in Germany: Noreisch, 2007; in France: Oberti & Savina, 2019; in Australia: Rowe & Lubienski, 2017; in China: Wen et al., 2017; Wu, 2012). And because of residential segregation by socioeconomic status (Nieuwenhuis, Tammaru, van Ham, Hedman, & Manley, 2020), some school catchment areas are wealthier than others and consequently have schools with higher average income levels. When, as described above, perceived school quality is what attracts high income families to certain catchment areas, a correlation between school quality and the school’s population’s income is suggested. For example, in the US, public schools’ quality was found to be shaped by the amount of wealth in a school district (Kozol, 1991; Slavin, 1999).

Family background is considered a strong predictor of educational differentiation (Marjoribanks, 1979; Nieuwenhuis, Hooimeijer, van Dorsselaer, & Vollebergh, 2013). Studies show that parental income and education influence children’s ability to do well in education (Cheadle & Amato, 2011; Lareau, 1987). Some argue that working-class parents with low income and educational levels pay less attention to school choice and long term educational strategies (Ball, 2002). Others say, although parents of each class have the same educational expectations for children, they have vastly different abilities and economic resources to attain those (Chin & Phillips, 2004; Votruba-Drzal, 2003). High-income parents are able to afford houses in urban areas with better schools, and higher educated parents may be better equipped with knowledge about good schools (Webber & Butler, 2007). Therefore, to understand the relation between parents’ income and education and school quality in areas with different levels of urbanization, we examine the interaction between urbanization and parental SES in Taiwan. This will shed light on whether high SES parents are better able to exploit the opportunities of urbanized areas than low SES parents. In sum, our research question is: How are urbanization and the interrelation between urbanization and parental socioeconomic background related to students’ differential access to schools? By studying the Taiwanese case, we include an East Asian perspective to the mostly Western-based body of literature.

# 2. Factors shaping access opportunities to good schools

Both urbanization (Parsons et al., 2000) and family SES (Cheadle & Amato, 2011; Marjoribanks, 1979) make differences to children’s chances for good schooling, and the two factors are intertwined as family SES tends to be related to spatial residential choice (Nieuwenhuis & Hooimeijer, 2016). High SES families tend to aggregate in urban areas where dense population and developed economies give rise to more well-paid, high-skilled jobs (Hacker, Klaesson, Pettersson, & Sjölander, 2013). Besides, due to residential sorting based on income, not only between areas of different levels of urbanization, but also within areas, the spatial distribution of households with different SES is uneven (Nieuwenhuis et al., 2020; Oberti & Savina, 2019). Much of the existing literature investigates access opportunities to good schools in terms of urbanization and family SES separately. But their combined impact lacks sufficient exploration. We will therefore review the existing research from each of these two perspectives first and then propose our hypotheses.

## 2.1 Urbanization and residential segregation causing educational inequality

Education is socio-geographically unequal, because economically developed urban areas tend to have more resources for infrastructure like schools (Logan, Minca, & Adar, 2012; Roscigno, Tomaskovic-Devey, & Crowley, 2006). Take the US as an example, poorly performing schools are located in the most disadvantaged rural areas that suffer high poverty rates (Lichter & Brown, 2011; Lichter, Cornwell, & Eggebeen, 1993). Noreisch (2007) reported that in Germany, there are far more school options in urban areas than in rural areas. In some places (e.g., in Taiwan) the central government provides disadvantaged public schools with subsides according to a uniform national standard, but studies show that educational funds are still unequal (L.-J. Chen, 1993; L.-J. Chen & Chen, 2013). In addition, many countries allow private schools to encourage competition for quality development in public schools (Broccolichi & van Zanten, 2000; Lubienski, 2005; Rowe & Lubienski, 2017). These private schools reinforce the educationally advantaged position of urbanized areas. For example, in Chile, private schools located closer to the city center have better teaching quality, student-teacher ratio, and educational test results than more peripherally located schools (De la Fuente, Rojas, Salado, Carrasco, & Neutens, 2013). In sum, urbanized areas have a greater variety of schools both in quality and quantity than less urbanized areas, suggesting between-area inequality in opportunities for good schooling.

Also within urbanized areas schools are unequally distributed. Generally, the best performing and most attractive schools are concentrated in the most advantaged urban neighborhoods, while the less developed schools are located in mostly working-class neighborhoods (Oberti, 2007). This is partly because high- and low-income families cluster in separate neighborhoods within the city, which appears as economic residential segregation (Nieuwenhuis et al., 2020). Residential segregation and school segregation are thought to be mutually reinforcing factors (Bernelius & Vaattovaara, 2016; Frankenberg, 2013; Taylor & Gorard, 2001; Waslander & Thrupp, 1995). High performing schools are likely to be located in affluent neighborhoods (Oberti & Savina, 2019), where there are school catchment areas with higher levels of income (Rowe & Lubienski, 2017). The amount of wealth in a school catchment area shapes its school’s quality (Kozol, 1991; Slavin, 1999). Consequently, the housing market around popular schools will be hot and thus hard for low-income parents to afford, further restraining their school choices. The more wealthy parents try to move into areas with desirable schools, the more expensive popular areas become (Butler & van Zanten, 2007; Wen et al., 2017), resulting in expensive gentrified areas only available to a wealthy few (Butler, Hamnett, & Ramsden, 2013; Wilson & Bridge, 2019). So this actually forms a vicious circle where wealthy parents cluster in wealthy catchment areas of popular schools and make these schools and areas even more attractive and expensive (Bernelius & Vilkama, 2019).

## 2.2 Parental SES and school choice causing educational inequality

High SES parents are able to evade school catchment area restrictions by moving into other catchment areas with better schools or by some illicit means like using false addresses (Boterman, 2019; McGinn & Ben-Porath, 2014). Considering the school choosing needs from parents, many countries adopt school choice policies that allow choosing schools across catchment areas, with the hope to promote school quality through competition (Hadderman, 2002; McGinn & Ben-Porath, 2014). However, such policies have been controversially debated since implementation. Some argue that they can improve the quality and equity of education, especially by allowing disadvantaged parents to choose schools across districts (Manno, Finn, Chester, & Bierlein, 1998; Viteritti, 2003). But more studies show that school choice policy exacerbates educational inequality because parents of different classes do not have the same ability to choose schools (Cheng, 2002). Parents who have the ability of school choice are highly educated with occupational prestige, compared to lower SES families forced to accept the school catchment assignment (Echols & Willms, 1992; Willms & Echols, 1993). Thus students from high SES families may benefit more from this education market of school choice (Robert, 2010).

Attitudes towards education also matter towards school choice, albeit restricted by available resources. Middle-class parents are found to regard education as a negotiable system, while working class parents just accept the school arrangement (Webber & Butler, 2007; Willis, 1977). Lower class parents may not be aware of the benefits of education, as they have not benefitted much from education themselves. However, Chin and Phillips (2004) argue that parents of different SES all have high educational expectations for children and apply similar parenting strategies, but disadvantaged families are restricted by a lack of resources, which means it is not attitudes but rather attitudes in the context of the range of available options that matters (Boterman, 2019). In summary, different attitudes and abilities between parents of different SES affect children’s chances of good schooling.

## 2.3 School access in the Taiwanese context

The education system of Taiwan provides a crucial case to explore how urbanization and parental SES act together predicting unequal school access opportunities. Taiwan has implemented nine-year centrally controlled education since 1968. With compulsory education until middle school, the government aims to ensure equal opportunities (Ministry of Education, 2020b). Although from the late 1980s to the early 1990s, Taiwan relaxed central government control and enhanced the local autonomy of education under the influence of neo-liberal ideology (Mao, 2015), public middle schools still dominate, with recent statistics showing that 98.2% of middle schools are public (Ministry of Education, 2020a). Public schools are mainly financed by local governments (L.-J. Chen, 2006). The central government only provides financial subsidies if local educational funds are not up to the national standards, in order to ensure equal conditions for public middle schools in all regions. Such a system would theoretically ensure similar funding and qualities among public schools. Nevertheless, studies show that the disparity in economic development across Taiwan leads to a large financial inequality in education (L.-J. Chen, 2006). Local educational spending in urbanized areas is much higher than in less urbanized areas (L.-J. Chen & Chen, 2013).

In Taiwan, public middle schools students attend are determined by the system of catchment areas set up by administrative education authorities (Mao, 2015). Students generally go to the nearest middle school according to their family’s residence in the catchment area. But under the pressure of the high school entrance exam, some parents believe that only the informally ranked “superstar schools”—junior high schools with a high percentage of graduates gaining admission to prestigious public senior high schools (Mao, 2015)—will better prepare their children for the entrance exams of elite high schools. Contrasting with some Western cases, these prestigious public schools are generally perceived as higher status schools than private schools (Chu & Yeh, 1995), which is comparable to the situation in Japan (Aizawa, 2016). So if there are no such “superstar schools” in a given school catchment area, some may gain access to schools across the catchment boundary by changing their home address (Mao, 2015). As a result, the access opportunity to middle schools of various qualities is unequal in reality. The differences in school popularity leads to fierce competition to gain access to perceived high quality schools. Such competition needs parents to spend a lot of energy and resources on choosing schools and deciding where to live, which means middle-class parents with more available resources are more likely to win. This inequality of access to schools is more severe in densely populated areas than in less populated areas (Chang, 2000; Lin, 2000), from which we can infer that more urbanized areas with large populations have more access to good schools but also more severe competition for entrance.

The unequal access to schooling is reflected in the distribution of SES in our study area (i.e., northern Taiwan): Figure 1 shows that more urbanized centers such as Taipei City contain higher shares of highly educated individuals, and shows variation with urbanized areas as well. Much of this image can be explained by urban areas being the areas where higher paying jobs cluster that require highly educated people, but the image also aligns with the idea that in terms of schooling, some areas are more attractive than others, potentially causing the spatial variation of high SES individuals. When comparing educational and occupational segregation in our study area with other areas in Taiwan (Table 1), it shows that segregation is on the lower end compared to the rest of Taiwan. In the case of Taiwan, most of the variation in SES is within, rather than between districts. Taipei is comparable to a city like Tokyo in its low level of urban segregation (Maloutas & Fujita, 2012). The relatively low levels of segregation can be related to Taiwan’s relatively low income inequality compared to the region. With a disposable household income Gini index of 31.1 in 2010, income inequality is lower than in Mainland China (42.8), Hong Kong (40.7), and Singapore (39.3), and comparable to Japan (31.8) and South Korea (31.4) (Solt, 2020). We aim to examine how, in a situation of relatively low segregation and inequality, families seek educational distinction for their children.

Figure 1. Proportion of higher educated individuals in northern Taiwan, by township, city, and district.



Note: The map shows the proportions of individuals aged 15 years and over with junior college, university, or higher education in 2010. The spatial scale is townships/cities/districts, which are nested in Taipei City, New Taipei City (which roughly corresponds to Taipei County in our data, which was renamed New Taipei City in 2010), and Yilan County. Source of data: 2010 Population and Housing Census (DGBAS, 2010).

Table 1. Residential segregation by education and occupation in counties and cities.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *HR* education | *RR* education | *HR* occupation | *RR* occupation |
| Hualien County | .054 | .066 | .031 | .038 |
| Yunlin County | .044 | .056 | .028 | .035 |
| Taitung County | .044 | .055 | .022 | .025 |
| Chiayi City/County | .043 | .053 | .044 | .055 |
| Penghu County | .035 | .045 | .019 | .025 |
| Pingtung County | .033 | .040 | .034 | .042 |
| Miaoli County | .033 | .040 | .030 | .036 |
| Tainan City | .031 | .039 | .034 | .042 |
| Nantou County | .029 | .035 | .019 | .022 |
| Taichung City | .028 | .035 | .033 | .041 |
| Hsinchu City/County | .027 | .036 | .036 | .043 |
| Changhua County | .023 | .028 | .028 | .035 |
| Kaohsiung City | .022 | .027 | .028 | .033 |
| Yilan County\* | .021 | .026 | .027 | .033 |
| Taipei City\* | .019 | .027 | .020 | .024 |
| New Taipei City\* | .019 | .023 | .017 | .020 |
| Taoyuan County | .014 | .018 | .017 | .020 |
| Kinmen County | .010 | .012 | .017 | .020 |
| Keelung City | .004 | .005 | .006 | .007 |
| Lienchiang County | .000 | .001 | .009 | .012 |

Note: Segregation indices *HR* and *RR* stand for the rank-order information theory index and the rank-order variance ratio index, respectively (see Reardon, 2011 for more specific descriptions of these measures). Both can be interpreted as proportions of the variation in education and occupation that lies between rather than within townships/cities/districts. Educational segregation is based on four categories: “Elementary and lower”, “Junior high”, “Senior high and vocational”, and “Junior college, university and higher”. Occupational segregation is based on nine categories: “Legislators, senior officials and managers”, “Professionals”, “Technicians and associate professionals”, “Clerical support workers”, “Service and sales workers”, “Skilled agricultural, forestry and fishery workers”, “Craft and related trades workers”, “Plant and machine operators, and assemblers”, and “Elementary laborers”. The segregation measures for education and occupation use the first and sixth polynomial, respectively. The list is ordered from highest to lowest segregation based on *HR* education. Source of data: 2010 Population and Housing Census (DGBAS, 2010).

\* Yilan County, Taipei City, and New Taipei City (Taipei County) are the sample areas.

## 2.4 Hypotheses

Previous studies have pointed out that urbanization and family SES both affect access opportunities to schools. Because high income schools and high SES families both cluster in urbanized areas, parents of higher socioeconomic backgrounds have better school choices. Based on the previously established connection between these two factors, we formulated the following two hypotheses:

* Hypothesis 1: Students in more urbanized areas have access to (a) higher income schools and (b) more variation in school average income levels than students in less urbanized areas.
* Hypothesis 2: In more urbanized areas, students with higher family SES have access to higher income schools than students with lower family SES, but not in less urbanized areas.

# 3. Data and methods

## 3.1 Data

We used the Taiwan Youth Project (TYP), a panel dataset of students and parents from Northern Taiwan, collected since 2000. The original sample consisted of 5,541 students from a 7th and 9th grade cohort, aged around 13 and 15, respectively. Respondents were sampled from 162 classrooms, within 40 schools, within three regions (Taipei City, Taipei County, and Yilan County). We used both student- and parent-reported information, from survey waves 1 and 4 (in wave 4, students were in the first and final year of high school for the younger and older cohort, respectively). The final sample with all relevant information was 2,893.

## 3.2 Measurements

Average school income was measured using parental income from survey wave 4. For the older cohort, household income was measured as a parent-reported continuous variable (0 to 155 in NT$1,000). For the younger cohort, the measure consists of a student-reported categorical variable. We used the middle of the NT$10,000 categories as our value. The average school income was measured by taking the average household income for each of the 146 schools students attended at wave 4. Descriptive statistics are available in Table 2.

Table 2. Descriptive statistics (N=2,893).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Mean | SD | Min. | Max. |
| Average school income | 57.48 | 19.01 | 15 | 125 |
| Household income | 59.66 | 34.31 | 0 | 155 |
| Parental education | 3.45 | 1.63 | 1 | 7 |
| Years lived in the neighborhood | 8.73 | 7.34 | 0 | 18 |
|  | Prop. |  |  |  |
| Urbanization: Core city | .48 |  |  |  |
| - General city | .31 |  |  |  |
| - Emerging town | .12 |  |  |  |
| - General and aging township | .08 |  |  |  |
| Female | .50 |  |  |  |
| 9th grade cohort | .44 |  |  |  |
| Ethnicity: Minnan | .78 |  |  |  |
| - Hakka | .07 |  |  |  |
| - Mainland | .13 |  |  |  |
| - Aboriginal/other | .02 |  |  |  |

The level of urbanization of respondents’ place of residence was measured with the following categories: core city, general city, emerging town, and general and aging township. This classification was specifically designed to best capture urbanization in Taiwan (Hou, Tu, Liao, Hung, & Chang, 2008). The classification was calculated using Ward’s minimum variance method, including six categories that capture urbanization in Taiwan: the percentage of service industry population, the percentage of industry population, the percentage of 15 to 64 years old population, the percentage of above 65 years old, the percentage of college degree of above population, and population density (Hou et al., 2008).

Household income was measured in wave 1 as a parent-reported continuous variable (0 to 155 in NT$1,000). In the few cases parent-reported income was missing, we substituted with a categorical student-reported household income. We used the middle of the NT$10,000 categories as our value.

Parental education was measured continuous as parents’ highest level of education in the following order: elementary school, middle school, vocational high school, academic high school, junior college, university, and graduate school.

We included four control variables: sex (0=male; 1=female) and cohort (0=7th grade; 1=9th grade). Ethnicity has been shown to play a role in education in Taiwan, where especially Mainlanders have an advantage over other groups (Chiang & Park, 2015; Jao & MacLeever, 2006). Ethnicity was measured as father’s ethnic background (1=Minnan; 2=Hakka; 3=Mainlander; 4=Aboriginal/other). Finally, because the residential environment might be more important when students have lived there longer (Nieuwenhuis et al., 2016), we included the years someone lived in his/her neighborhood at wave 4.

## 3.3 Analyses

To test our hypotheses, we examined the relation between urbanization, parental education, household income at wave 1 (age 13/15) and average school income at wave 4 (age 16/18) using a regression analysis. Because respondents who attend the same school are not independent of each other, we clustered standard errors in schools, to avoid underestimating p-values. We present three models, the first including all relevant covariates, and the second and third including an interaction between urbanization and household income and parental education, respectively. Additionally, we calculated the marginal effects of parental education and household income for the different levels of urbanization.

To calculate average school income we only used schools that had 10 or more students from the sample enrolled, in order to ensure the precision of the estimate. Additional robustness checks using only schools with 20 or more students show the same results (available on request), further indicating good precision. Because of this limit we had to omit 880 respondents from the analyses. Further attrition between waves reduced our sample from the original 5,541 to 2,893. To test whether attrition could affect our outcomes, we performed a number of t-tests to examine whether the probability of missingness is associated with school average income. We test how different the used sample is from the sample with missing values, on a number of key variables (Allison, 2002). The tests showed that parental education (t=.54, df=5,403, p=.591) and urbanization (t=-1.09, df=5,539, p=.274) are missing at random. Respondents coming from households with lower household income are more likely to be missing (t=3.24, df=5,368, p=.001). The higher attrition from lower income households could potentially influence our results.

# 4. Results

Table 3 shows the descriptive results of average income levels in schools by level of urbanization. More urbanized areas have higher average and maximum levels of school income and also a wider range of school income than less urbanized areas, in line with hypothesis 1. Next, we tested how urbanization, family SES, and average school income are related (Table 4). Model 1 also shows that students from less urbanized areas are more likely to attend lower income schools, which is in line with hypothesis 1a and the descriptive results from Table 3. Besides, children from higher educated and income parents are more likely to attend higher income schools. Models 2 and 3 present the interaction between urbanization and household income and parental education, respectively. The models show, in line with hypothesis 2, that the relation between parental income and education and school income levels is stronger for children in the areas with high levels of urbanization (core and general city), and weaker in emerging towns and townships. The likelihood ratio tests show that both models are an improvement over the models without interactions. Marginal effects show that both household income and parental education only have a significant effect in the most urbanized areas (Income: core city: b=.11; s.e.=.02; p<.001; general city: b=.06, s.e.=.02, p=002; emerging town: b=.04, s.e.=.02, p=.116; township: b=.04, s.e.=.04, p=.276; Education: core city: b=2.90, s.e.=.48, p<.001; general city: b=1.59, s.e.=.57, p=.006; emerging town: b=-1.19, s.e.=.50, p=.019, township: b=-.52, s.e.=.73, p=.475). The amount of time respondents lived in their neighborhood did not change the relation between urbanization, parental SES, and attending higher income schools. Finally, control variables gender, cohort, and ethnicity did not play a role in predicting average income in schools. Only Mainlanders did seem to end up on higher income schools, however, because the significance level hovered around *p*=.05, depending on the model, this evidence is very weak.

Table 3. Descriptive statistics of average school income by level of urbanization.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Mean | SD | Min. | Max. |
| Core city | 63.11 | 12.45 | 43.74 | 87.95 |
| General city | 59.65 | 9.44 | 48.40 | 77.22 |
| Emerging town | 46.87 | 4.80 | 39.59 | 52.99 |
| General and aging township | 42.93 | 5.99 | 34.00 | 49.01 |

Table 4. Regression results for school income level (N=2,893).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Model 1 | Model 2 | Model 3 |
|  | B | SE | p | B | SE | p | B | SE | p |
| Urbanization (ref. Core city) |  |  |  |  |  |  |  |  |  |
| (2) General city | -3.47 | 2.07 | .095 | -.30 | 2.54 | .905 | 1.32 | 3.11 | .672 |
| (3) Emerging town | -9.15 | 2.32 | <.001 | -5.08 | 2.84 | .076 | -3.99 | 3.22 | .218 |
| (4) General and aging township | -14.52 | 2.71 | <.001 | -10.75 | 3.22 | .001 | -7.52 | 3.80 | .049 |
| Household income (in NT$1,000) | .08 | .01 | <.001 | .11 | .02 | <.001 | .08 | .01 | <.001 |
| Parental education | 2.17 | .35 | <.001 | 2.12 | .34 | <.001 | 2.90 | .48 | <.001 |
| Interaction household income with urbanization |  |  |  |  |  |  |  |  |  |
| (2) |  |  |  | -.05 | .03 | .058 |  |  |  |
| (3) |  |  |  | -.08 | .03 | .015 |  |  |  |
| (4) |  |  |  | -.07 | .04 | .085 |  |  |  |
| Interaction parental education with urbanization |  |  |  |  |  |  |  |  |  |
| (2) |  |  |  |  |  |  | -1.31 | .69 | .059 |
| (3) |  |  |  |  |  |  | -1.70 | .72 | .019 |
| (4) |  |  |  |  |  |  | -2.37 | .92 | .011 |
| Female | 1.69 | 1.37 | .220 | 1.63 | 1.36 | .232 | 1.62 | 1.35 | .232 |
| 9th grade cohort | 3.18 | 3.68 | .389 | 3.15 | 3.66 | .391 | 2.94 | 3.67 | .425 |
| Ethnicity (ref. Minnan) |  |  |  |  |  |  |  |  |  |
| - Hakka | .60 | 1.38 | .665 | .64 | 1.38 | .643 | .62 | 1.37 | .649 |
| - Mainland | 2.44 | 1.20 | .044 | 2.39 | 1.20 | .048 | 2.28 | 1.19 | .058 |
| - Aboriginal/other | -.93 | 2.24 | .678 | -.98 | 2.22 | .659 | -.99 | 2.18 | .652 |
| Years lived in the neighborhood | .26 | .14 | .071 | .26 | .14 | .072 | .27 | .14 | .060 |
| Intercept | 43.53 | 2.72 | <.001 | 41.91 | 2.81 | <.001 | 40.99 | 2.96 | <.001 |
| R2 | .2276 |  |  | .2305 |  |  | .2317 |  |  |
| Likelihood ratio test with Model 1 (chi2 (df)) |  |  |  | 10.87 (3) | .012 | 15.45 (3) | .002 |

# 5. Conclusions

School inequality has a crucial influence on educational outcomes and life opportunities. This article aims to identify how urbanization and family SES are related to children’s access opportunities to good schools. Our results show that both factors make differences and that the two are intertwined. Students with higher family SES backgrounds from more urbanized areas have more opportunities to access higher income schools. But this relation between family SES and school inequality is only prominent in the most urbanized areas and does not appear in less urbanized areas. It suggests that in the most urbanized areas, higher income and higher educated parents enjoy more school choices, like high income public schools or private schools. They may have more economic resources and knowledge to choose good schools despite school catchment area limitations, because they can either afford addresses in an affluent catchment with high quality schools or put more effort into children’s educational planning and school choice. However, when it comes to less urbanized areas like towns or townships, schools are generally poorer and fewer. So the relation between parental SES and school income level is not present, which underlines the socio-spatial inequality of school distribution. This also adds to the understanding that school quality is a pathway through which residential segregation can reproduce educational inequality (Galster, 2011; Nieuwenhuis & Hooimeijer, 2016; Nieuwenhuis, Hooimeijer, & Meeus, 2015).

The Taiwanese case in this article verifies the relation between socio-spatial inequality and school inequality, and the relation between family SES and school inequality in previous studies. Furthermore, we extend this literature by demonstrating how urbanization and family SES interact together when predicting children’s school access opportunities. When a place is more urbanized, there will be more high-income jobs and economic resources, which will attract higher educated parents. On the other hand, such places will be difficult to afford for low SES parents, thus fostering residential segregation. Together with school segregation, such socio-spatial inequality exacerbates educational inequality. Because levels of residential segregation in our study areas are lower than in many other counties and cities in Taiwan, it is possible that school quality is more stratified by family SES in other areas. Placing Taiwan in the East Asian region is more difficult: Taiwan’s and South Korea’s educational inequality are decreasing, Japan’s and culturally similar Mainland China’s educational inequality are increasing (Hannum, Ishida, Park, & Tam, 2019). How the differences in residential inequality in these regions relate to changes in the educational climate still needs more rigorous and comparative study.

We identified three limitations to this study which can contribute to the development of future studies on this topic. First, it is unclear if our findings are generalizable to areas with free school choice. In many European countries, school choice policy has been implemented, but its impact on educational equity is controversial (Cheng, 2002; Viteritti, 2003; Willms & Echols, 1993). In the United States, there are many publicly funded but privately managed charter schools that have no eligibility restrictions. While charter schools give some minority students extra school choices, these schools may draw away funding from public schools, but have uncertain educational outcomes (Bifulco & Ladd, 2006) and even increased school segregation (Rotberg, 2019). The effect of these school choice policies on educational equity also depends on the local education system and the perception of parents of public vs. private schools (the former being considered higher status in Taiwan, but not necessarily in other places), so more research is needed for accurate comparisons. It is reasonable to speculate that high SES parents will always be able to access better schools by calling on the economic and cultural resources they have. In cases with school district restrictions, they can purchase houses in better school catchment areas to qualify for admission. With a free school choice policy, they can choose more expensive and competitive schools, because they can afford the cost of commuting long distances to other school districts. Besides, higher SES parents can afford supplementary education, even further exacerbating educational stratification. While low SES parents, on the one hand, may be able to avoid bad schools within their catchment when there are no school district restrictions. But on the other hand, they may still only be able to afford the closest school regardless of its quality, as they have fewer enough resources for commuting. Furthermore, they may not be as aware as higher SES parents of the importance of and diversity in school quality. Thus, whether the effects of parental SES and urbanization are different under the two school choice systems may await future comparative studies.

Second, we only had access to data about average parental income for schools, which we used as a proxy for school quality. With this proxy, we refer to the social constructive process describing how parental perceptions of school quality is reflected through wealthier parents being able to put more resources to use to get into these perceived good schools, resulting in a clustering of a higher income population in perceived higher quality schools. Of course, this proxy is not perfect, and future studies may improve on this by using more comprehensive measures of school wealth and quality, which could include school funding and donations, teacher-student ratio, or measures for teacher quality.

Third, the informed assumption of a positive correlation between school wealth and quality still needs further examination. What are the mechanisms and conditions for this relation? High SES households can potentially bring in more donations that contribute to school quality, as well as social and cultural capital that help students development and chances. Future research into this topic may want to study indicators of school wealth and school quality simultaneously, to more specifically understand what parents base their school decisions on.

In conclusion, even when school populations are mostly reflections of the catchment area population, it is the high SES parents who are best able to avoid catchment areas. Taiwan’s uniform public school funding and catchment area limitations still leave room for unequal school access opportunities. For educational policymakers, this article, combined with those about school choice policies, suggest that the educational outcomes of school choice policy and catchment areas are not as clear-cut, and are strongly linked to geography. Where people live, both in terms of between different cities, as within cities, is associated with the opportunity structure faced by parents, with some parents being better able to deal with this structure than others.

# References

Aizawa, S. (2016). A comparative sociological study of Japanese and Taiwanese upper secondary education. *Educational Studies in Japan, 10*, 33–48.

Allison, P. (2002). *Missing data*. Thousand Oaks, Sage.

Alon, S. (2009). The evolution of class inequality in higher education: Competition, exclusion, and adaptation. *American Sociological Review*, *74*(5), 731–755.

Ball, S. J. (2002). *Class strategies and the education market*. London: Routledge Falmer.

Bernelius, V., & Vaattovaara, M. (2016). Choice and segregation in the “most egalitarian” schools: Cumulative decline in urban schools and neighbourhoods of Helsinki, Finland. *Urban Studies*, *53*(15), 3155–3171.

Bernelius, V., & Vilkama, K. (2019). Pupils on the move: School catchment area segregation and residential mobility of urban families. *Urban Studies*, *56*(15), 3095–3116.

Bifulco, R., & Ladd, H. F. (2006). The impacts of charter schools on student achievement: Evidence from north Carolina. *Education Finance and Policy, 1*(1), 50–90.

Boterman, W. R. (2019). The role of geography in school segregation in the free parental choice context of Dutch cities. *Urban Studies*, *56*(15), 3074–3094.

Bourdieu, P. (1977). Cultural reproduction and social reproduction. In J. Karabeland & A.H. Halsey (Eds.)*, Power and ideology in education* (pp. 487–511). New York: Oxford University Press.

Broccolichi, S., & van Zanten, A. (2000). School competition and pupil flight in the urban periphery. *Journal of Education Policy*, *15*(1), 51–60.

Butler, T., Hamnett, C., & Ramsden, M. J. (2013). Gentrification, education and exclusionary displacement in East London. *International Journal of Urban and Regional Research*, *37*(2), 556–575.

Butler, T., & van Zanten, A. (2007). School choice: A European perspective. *Journal of Education Policy*, *22*(1), 1–5.

Cheadle, J. E., & Amato, P. R. (2011). A quantitative assessment of Lareau’s qualitative conclusions about class, race, and parenting. *Journal of Family Issues*, *32*(5), 679–706.

Chen, L.-J. (1993). Study on the fairness of opportunity in the allocation of national education funding: Considering the financial situation of cities and counties. *Educational Review*, *10*, 225–259. (In Chinese)

Chen, L.-J. (2006). From equity to adequacy: The present and prospect of school resources allocation policy in Taiwan. *Educational Policy Forum*, *9*(4), 101–118. (In Chinese)

Chen, L.-J., & Chen, M. Y. (2013). The reforms and prospects of Taiwan’s education finance policy. *Taiwan Education Review*, *6*, 2–12. (In Chinese)

Chen, L.-J., & Chen, T. S. (2009). An inquiry into the relationship between local fiscal capacity and education expenditure: A fiscal neutrality perspective. In *A study of the development of local education* (pp. 28–53). Taipei: Higher Education and Culture Enterprise Co. (In Chinese)

Chen, Y. G. (2001). The division of senior high school/vocational school and the change of the inequality in education opportunities in Taiwan. *Bulletin of Educational Research*, *7*(47), 253–282. (In Chinese)

Cheng, X. (2002). The effects of “School-Choosing” policy on the equality of educational opportunity. *Journal of Jiangsu Institute of Education*, *18*(5). (In Chinese)

Chiang, Y.-L., & Park, H. (2015). Do grandparents matter? A multigenerational perspective on educational attainment in Taiwan. *Social Science Research, 51*, 163–173.

Chin, T., & Phillips, M. (2004). Social reproduction and child-rearing practices: Social class, children’s agency, and the summer activity gap. *Sociology of Education*, *77*(3), 185–210.

Condron, D. J., & Roscigno, V. J. (2003). Disparities within: Unequal spending and achievement in an urban school district. *Sociology of Education*, *76*(1), 18–36.

Chu, C. C., & Yeh, C. (1995). Taiwan’s private education. *Chinese Education & Society, 28*(4), 66–96.

De la Fuente, H., Rojas, C., Salado, M. J., Carrasco, J. A., & Neutens, T. (2013). Socio-spatial inequality in education facilities in the Concepción metropolitan area (Chile). *Current Urban Studies*, *1*(4), 117–129.

DGBAS (2010). *2010 Population and Housing Census*. Directorate General of Budget, Accounting and Statistics. https://census.dgbas.gov.tw/PHC2010/english/rehome.htm (Accessed 2020/11/25).

Downey, D. B., & Condron, D. J. (2016). Fifty years since the Coleman report: Rethinking the relationship between schools and inequality. *Sociology of Education*, *89*(3), 207–220.

Echols, F., & Willms, J. D. (1992). Alert and inert clients: The Scottish experience of parental choice of schools. *Economics of Education Review*, *11*(4), 339–350.

Elliott, M. (1998). School finance and opportunities to learn: Does money well spent enhance students’ achievement? *Sociology of Education*, *71*(3), 223–245.

Frankenberg, E. (2013). The role of residential segregation in contemporary school segregation. *Education and Urban Society*, *45*(5), 548–570.

Galster, G. C. (2011). The mechanism(s) of neighbourhood effects: Theory, evidence, and policy implications. In M. van Ham, D. Manley, N. Bailey, L. Simpson, & D. Maclennan (Eds.), *Neighbourhood effects research: New perspectives* (pp. 23–56). Dordrecht: Springer.

Greenwald, R., Hedges, L. V., & Laine, R. D. (1996). The effect of school resources on student achievement. *Review of Educational Research*, *66*(3), 361–396.

Hacker, S. R., Klaesson, J., Pettersson, L., & Sjölander, P. (2013). Regional economic concentration and growth. In J. Klaesson, B. Johansson, & C. Karlsson (Eds.), *Metropolitan regions* (pp. 117–139). Berlin: Springer.

Hadderman, M. (2002). *Charter schools. Trends and Issues* (ERIC Document Reproduction Service No. ED472997). Washington: Office of Educational Research and Improvement.

Hannum, E., Ishida, H., Park, H., & Tam, T. (2019). Education in East Asian Societies: Postwar Expansion and the Evolution of Inequality. *Annual Review of Sociology, 45*, 625–647.

Hochschild, J., & Scovronick, N. (2003). *The American dream and the public schools*. New York: Oxford University Press.

Hou, P.-C., Tu, S.-H., Liao, P., Yung, Y.-T., & Chang, Y.-H. (2008). The typology of townships in Taiwan: The analysis of sampling stratification of the 2005-2006 “Taiwan Social Change Survey”. *Survey Research – Method and Application, 23*, 7-32. (In Chinese)

Jao, J.-C., & McKeever, M. (2006). Ethnic inequalities and educational attainment in Taiwan. *Sociology of Education, 79*(2), 131–152.

Kozol, J. (1991). *Savage inequalities*. New York: Crown.

Lareau, A. (1987). Social class differences in family-school relationships: The importance of cultural capital. *Sociology of Education*, *60*(2), 73–85.

Lichter, D. T., & Brown, D. L. (2011). Rural America in an urban society: Changing spatial and social boundaries. *Annual Review of Sociology*, *37*(1), 565–592.

Lichter, D. T., Cornwell, G. T., & Eggebeen, D. J. (1993). Harvesting human capital: Family structure and education among rural youth. *Rural Sociology*, *58*(1), 53–75.

Logan, J. R., Minca, E., & Adar, S. (2012). The geography of inequality: Why separate means unequal in American public schools. *Sociology of Education*, *85*(3), 287–301.

Lubienski, C. (2005). Public schools in marketized environments: Shifting incentives and unintended consequences of competition‐based educational reforms. *American Journal of Education*, *111*(4), 464–486.

Maloutas, T. & Fujita, K. (2012). *Residential segregation in comparative perspective*. Burlington: Ashgate.

Manno, B. V., Finn, Jr., C. E., Bierlein, L., & Gregg, V. (1998). How charter schools are different. *Phi Delta Kappan*, *79*(7), 489–500.

Mao, C.-J. (2015). Choice as a global language in local practice: A mixed model of school choice in Taiwan. *The International Education Journal*, *14*(2), 12.

Marjoribanks, K. (1979). *Families and their learning environments*. London: Routledge and Kegan Paul.

Mayet, G. (1996). Admissions to schools: A study of local education authorities. In R. Glatter, P. Woods & C. Bagley (Eds)*. Choice and diversity in schooling*. London: Routledge.

McGinn, K. C., & Ben-Porath, S. (2014). Parental engagement through school choice: Some reasons for caution. *Theory and Research in Education*, *12*(2), 172–192.

Ministry of Education. (2020a). Education statistics inquiry network-number of existing schools. Retrieved July 22, 2020, from <http://stats.moe.gov.tw/qframe.aspx?qno=MQAxAA2>. (In Chinese)

Ministry of Education. (2020b). Comprehensive planning department-Introduction to the current situation of education in Taiwan. Retrieved July 22, 2020, from <https://depart.moe.edu.tw/ED2100/Content_List.aspx?n=09E8A4EDA021E1E5>. (In Chinese)

Nieuwenhuis, J. (2018). The interaction between school poverty and agreeableness in predicting educational attainment. *Personality and Individual Differences, 127*, 85-88.

Nieuwenhuis, J. (2020). Neighborhood social capital and adolescents’ individual health development. *Social Science & Medicine, 265*, 113417.

Nieuwenhuis, J., & Hooimeijer, P. (2016). The association between neighbourhoods and educational achievement, a systematic review and meta-analysis. *Journal of Housing and the Built Environment*, *31*(2), 321–347.

Nieuwenhuis, J., Hooimeijer, P., & Meeus, W. (2015). Neighbourhood effects on educational attainment of adolescents, buffered by personality and educational commitment. *Social Science Research, 50*, 100–109.

Nieuwenhuis, J., Hooimeijer, P., van Dorsselaer, S., & Vollebergh, W. (2013). Neighbourhood effects on school achievement: The mediating effect of parenting and problematic behaviour? *Environment and Planning A, 45*(9), 2135–2153.

Nieuwenhuis, J., Tammaru, T., van Ham, M., Hedman, L., & Manley, D. (2020). Does segregation reduce socio-spatial mobility? Evidence from four European countries with different inequality and segregation contexts. *Urban Studies*, *57*(1), 176–197.

Nieuwenhuis, J., Yu, R., Branje, S. Meeus, W., & Hooimeijer, P. (2016). Neighbourhood poverty, work commitment and unemployment in early adulthood: A longitudinal study into the moderating effect of personality. *PLoS ONE, 11*(12), e0167830.

Oberti, M. (2007). Social and school differentiation in urban space: Inequalities and local configurations. *Environment and planning A*, *39*(1), 208–227.

Oberti, M., & Savina, Y. (2019). Urban and school segregation in Paris: The complexity of contextual effects on school achievement: The case of middle schools in the Paris metropolitan area. *Urban Studies*, *56*(15), 3117–3142.

Owens, A., & Candipan, J. (2019). Social and spatial inequalities of educational opportunity: A portrait of schools serving high- and low-income neighbourhoods in US metropolitan areas. *Urban Studies*, *56*(15), 3178–3197.

Parsons, E., Chalkley, B., & Jones, A. (2000). School catchments and pupil movements: A case study in parental choice. *Educational Studies*, *26*(1), 33–48.

Perry, L., & McConney, A. (2010). School socio-economic composition and student outcomes in Australia: Implications for educational policy. *Australian Journal of Education*, *54*(1), 72–85.

Portes, A., & MacLeod, D. (1996). Educational progress of children of immigrants: The roles of class, ethnicity, and school context. *Sociology of Education, 69*(4), 255–275.

Reardon, S. F. (2011). Measures of income segregation. CEPA Working Paper. Stanford: Stanford University, Center for Education Policy Analysis. Available at: http://cepa.stanford.edu/content/measures-income-segregation (Accessed 2020/11/27).

Robert, P. (2010). Social origin, school choice, and student performance. *Educational Research and Evaluation*, *16*(2), 107–129.

Roscigno, V. J., Tomaskovic-Devey, D., & Crowley, M. (2006). Education and the inequalities of place. *Social Forces*, *84*(4), 2121–2145.

Rotberg, I. C. (2019). Backtalk: The social costs of proliferating charter schools. *Phi Delta Kappan*, 100(7), 80–80.

Rowe, E. E., & Lubienski, C. (2017). Shopping for schools or shopping for peers: Public schools and catchment area segregation. *Journal of Education Policy*, *32*(3), 340–356.

Slavin, R. E. (1999). How can funding equity ensure enhanced achievement? *Journal of Education Finance*, *24*, 519–528.

Solt, F. (2020). Measuring income inequality across countries and over time: The Standardized World Income Inequality Database. *Social Science Quarterly, 101*(3), 1183-1199. SWIID Version 9.0, October 2020.

Tam, T., & Jiang, J. (2014). The making of higher education inequality: How do mechanisms and pathways depend on competition? *American Sociological Review*, *79*(4), 807–816.

Taylor, C., & Gorard, S. (2001). The role of residence in school segregation: Placing the impact of parental choice in perspective. *Environment and Planning A*, *33*(10), 1829–1852.

Viteritti, J. P. (2003). Defining equity: Politics, markets, and public policy. In *A Wolfe (Ed.) School choice: The moral debate* (pp. 13–30). Princeton: Princeton University Press.

Votruba-Drzal, E. (2003). Income changes and cognitive stimulation in young children’s home learning environments. *Journal of Marriage and Family*, *65*(2), 341–355.

Waslander, S., & Thrupp, M. (1995). Choice, competition and segregation: An empirical analysis of a New Zealand secondary school market, 1990‐93. *Journal of Education Policy*, *10*(1), 1–26.

Webber, R., & Butler, T. (2007). Classifying pupils by where they live: How well does this predict variations in their GCSE results? *Urban Studies*, *44*(7), 1229–1253.

Wen, H., Xiao, Y., & Zhang, L. (2017). School district, education quality, and housing price: Evidence from a natural experiment in Hangzhou, China. *Cities*, *66*, 72–80.

Wenglinsky, H. (1997). How money matters: The effect of school district spending on academic achievement. *Sociology of Education*, *70*(3), 221.

Willis, P. (1977). *Learning to labour.* Aldershot: Gower.

Willms, J. D., & Echols, F. H. (1993). The Scottish experience of parental school choice. In E. Rasell & R. Rothstein (Eds.), *School choice: Examining the evidence.* Washington: Economic Policy Institute.

Wilson, D., & Bridge, G. (2019). School choice and the city: Geographies of allocation and segregation. *Urban Studies*, *56*(15), 3198–3215.

Wu, X. (2012). School choice with Chinese characteristics. *Comparative Education*, *48*(3), 347–366.

Yang, J., Huang, X., & Liu, X. (2014). An analysis of education inequality in China. *International Journal of Educational Development*, *37*, 2–10.