

Education Funding Inequality and Academic Performance Disparity between Migrant and Local Students in China

Jiayi Zou

MA Program in the Social Sciences, University of Chicago

Author Note

This project is the final assignment for Data to Manuscript in R (D2MR) instructed by Dr. Natalie Dowling. It also serves as an interim result of Jiayi Zou's MA thesis project. The author is grateful Dr. Dowling for supporting this project and offering guidance throughout the quarter.

Correspondence concerning this article should be addressed to Jiayi Zou, MA Program in the Social Sciences, University of Chicago, 1155 E 60th St., Chicago, IL 60637, USA, Email: jiayizou@uchicago.edu

Abstract

This document is a template demonstrating the apaquarto format. It includes examples of how to create figures and tables, as well as how to reference them in the text. The document is written in Quarto, a system for creating documents with R Markdown. The apaquarto extension provides a template for creating APA7-formatted manuscripts.

Keywords: education inequality, internal migration, education funding, fiscal decentralization

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Introduction

Internal migration in China has accelerated along with urbanization since the implementation of Reform and Opening Up policy in the early 1980s. Statistics from the 7th National Census in 2020 show that over 70 million children in China have migration status, which means one fourth of Chinese child population move interprovincially or intraprovincially with their parents ¹. Education and sociology research focusing on internal migrant students found that these children have a relatively lower school achievement compared to local students without migrant status, and suffer from academic and financial difficulties, as well as alienation in public education system (Chen & Feng, 2013; Huang, 2017).

Previous studies offered policy explanations for migrant students' underachievement. Li (2018) indicated that central governments have less educational funding distributed to provinces containing more migrant population due to fiscal decentralization. On the other hand, the *Hukou* policy ² has a history of limiting policy supports for internal migrants including subsidies, fee standards, and other financial accesses, which contributes migrant students' underperformance in school (Lu, 2023).

However, both perspectives have failed to identify an integrated framework: if we can discover the impact of differentiated financial supports and per student funding appropriated to two groups of students, then it is plausible to assume that fiscal decentralization is producing local-migrant educational inequity through the lens of *Hukou* status.

In this study, I seek to understand **how governments' differentiated provision of education fundings affects the academic performance disparity between migrant students and local students in China** . My hypothesis is **when the government provides migrant**

¹ See in [Promoting reunion and avoiding separation - China's migrant children development report 2024](#).

² The *Hukou* Policy is a population management policy that restrains non-local residents from/uplifts the threshold of enjoying the same social, medical, and educational public services as local households do.

students with limited fundings, and less-supportive charging standards and subsidy policies, the academic performance gap between the two groups of students is likely to widen.

Beyond measuring educational disparities created by the complexity of fiscal decentralization and population management system, this research has practical significance for addressing the ongoing migrant problems in China's urban governance and the institution of compulsory education ([National Bureau of Statistics of China et al., 2023](#)). Last but not least, this study can also offer indications for how educational finance and policies provided by government interacts with structural inequality in other social contexts (e.g., areas with higher poverty level or racial disparities, see in studies by Baird ([2008](#)) and Hyman ([2017](#))).

Literature Review

In this study, we define *provision of education fundings* as a combination of three elements: (1) the amount of funding, including per-student funding, subsidies, and charging standards; (2) the proportion of funding, which is separated into central/provincial and county/district level; and (3) the indicator of differentiation, which is whether migrant students enjoy the equal educational financial resources as locally-registered students in terms of funding, subsidies, and charging standards. Inspired by Knoepfel and Della Sala ([2015](#)), we consider that education funding, influenced by fiscal decentralization and *Hukou* system, affects migrant and local students in the same schools through context for schooling, which results in unequal academic performances between two student groups.

Education Funding and Academic Achievement

Scholarship in education funding suggests that students of color have been continuously underfunded by federal and state, and the discrepancy between their and higher-SES/white counterparts' academic performance persists ([Darling-Hammond, 2004](#); [Gaddis & Lauen, 2014](#); [Lafortune et al., 2018](#); [Ryan, 1999](#)). In China, researchers found similar patterns and disparities among migrant students and local-*Hukou* students. Evidence from China Education Panel survey indicates that local students outperform migrant students at higher quantile point, and increasing total education expenditure is likely shrink the academic achievement gap ([Fang & Zhang, 2024](#)).

However, the association between other aspects of education expenditure (e.g. per student funding, central and local government appropriation ratio) and local-migrant academic outcome equity requires further exploration, as most studies center on how funding expands spatial education inequity rather than disparities between different *Hukou* statuses in cities (Wei et al., 2022).

Fiscal Decentralization and Discriminatory Policies against Internal Migrants

Beyond education finance disparities, education policies also differ for migrant and local students in many provinces, which means students without local registration (*hukou*) may have no government subsidies or face different charging standards. Researchers refer this phenomenon as deflecting internal migrants' demands and using education to control urban population influx (Chan & O'Brien, 2019; Friedman, 2018). The disadvantage encountered by migrant students varies in different city scenarios: if local education policy background is more *Hukou*-based discriminatory, then migrant students are more likely to receive lower school performance than local students (Ma, 2020). Deflecting education resources away from the underprivileged students occurs in U.S. schools to avoid losing fundings under school accountability, as the minority subgroups have a higher possibility to fall short of the average academic target (Hanushek & Raymond, 2005; O'Day, 2009). Similarly, turning down education fundings for migrant students is also a strategy for Chinese local governments to decrease overall financial stress due to fiscal decentralization (Jin et al., 2005; Long et al., 2017).

As migrant students represent social minorities with limited or without *Hukou*-related rights in urban spaces, exploring their education achievements influenced by government funding and financial supports can demonstrate the dynamic and diverse efficiency of providing public services, offering empirical evidence for the development of decentralization theory (Oates, 2005, 2008).

Data and Methods

Data

In this project, we use the follow-up (2014-2015) dataset from the China Education Panel Survey [CEPS](#). CEPS is conducted by National Survey Research Center at Renmin University of

China and it is the most used dataset in studies of Chinese internal migrant students. Data includes 1769 migrant students and 7960 non-migrant students who have were at 9th Grade as in the final year of Junior High. We will merge datasets based on student, class, and school id, and remove values without valid information of hukou status.

Measures

The dependent variable in our study is the academic performance, which is measured by three indexes: score (percentage) of Chinese, Mathematics, and English exams. In Figure 1, a primary investigation into the follow-up dataset suggests that the medium and average of all three test scores for migrant students are all less than the equivalents for non-migrant students. Additionally, migrant students performances in Chinese and English exams are more concentrated than local students, but possibly due to different sample size. More outliers in Chinese exam scores appeared in migrant student group than their local counterparts, suggesting migrant students might experience greater difficulty in achieving in Chinese exams.

As for the independent variable, we take three aspects into account: the amount of per-student funding; the proportion of funding sources, which is separated into central/provincial level and county/district level; and whether migrant students enjoy the equal funding, subsidies, and charging standards as locally-registered students do.

Table 1

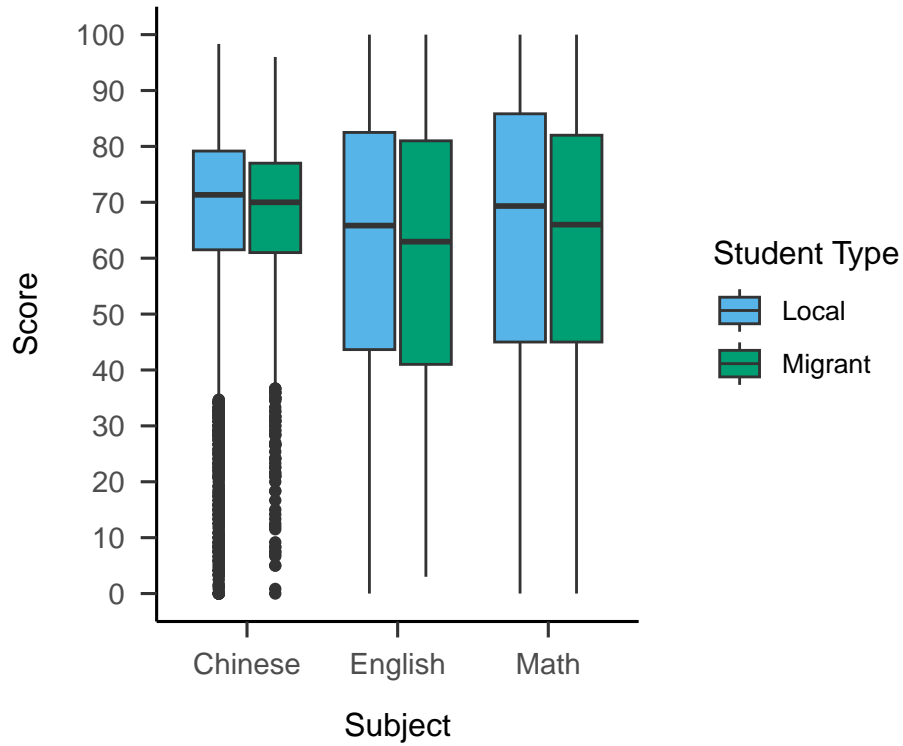
	Statistic (t)	df	P-value	Mean (Local students)	Mean (Migrant students)
t	-11.6108	2369.945	0	1044.407	1280.291

Methods

We employ a **Multilevel Model (MLM)** to see the effect of independent variables on the academic performance gap between migrant students and local students. Since migrant students and local students are clustered in different schools, MLM can provide a hierarchical model fitness that can take cluster effect into account ([Antonoplis, 2023](#)). We will implement random

Figure 1

Comparison of the distribution of Chinese, Mathematics, and English exam scores (Migrant vs. Local students)



intercept, fixed slope model to examine the research question primarily. When analyzing data in later procedures, MLM can be adjusted with improvement in significance tests and improvement in fit. The two-level model can be put in an incorporated formula:

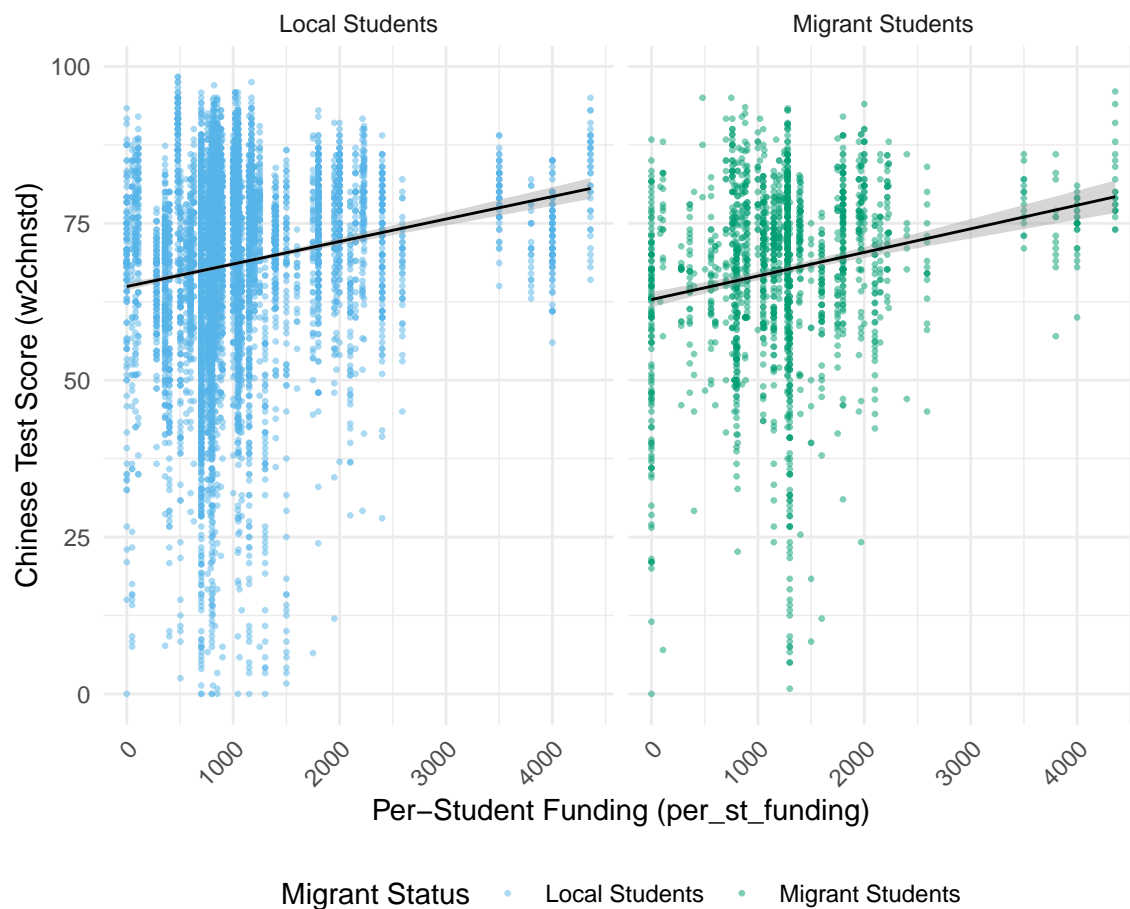
$$\begin{aligned}
 examscore_{ij} = & \beta_0 + \beta_1 \cdot mig_status + \beta_2 \cdot centgov_fund_pct_j + \beta_3 \cdot prefgov_fund_pct_j \\
 & + \beta_4 \cdot countgov_fund_pct_j + \beta_5 \cdot per_st_funding_j + \beta_6 \cdot mig_funding_j + \beta_7 \cdot same_charge_std_j \\
 & + \beta_8 \cdot mig_subsidy_j + \beta_9 \cdot (mig_status_{ij} \times centgov_fund_pct_j) \\
 & + \beta_{10} \cdot (mig_status_{ij} \times prefgov_fund_pct_j) + \beta_{11} \cdot (mig_status_{ij} \times countgov_fund_pct_j) \\
 & + \beta_{12} \cdot (mig_status_{ij} \times per_st_funding_j) + \beta_{13} \cdot (mig_status_{ij} \times mig_funding_j) \\
 & + \beta_{14} \cdot (mig_status_{ij} \times same_charge_std_j) + \beta_{15} \cdot (mig_status_{ij} \times mig_subsidy_j) + u_j + \epsilon_{ij}
 \end{aligned}$$

In this function, we denote i as the individual student and j as the school. The estimate for the fixed effect are as follows: (1) β_0 is the overall intercept; (2) β_1 stands for the effect of being a migrant student; (3) β_2 to β_8 estimate the effects of independent variables; (4) β_9 to β_{15} estimate the interaction effects of independent variables and migrant status; (5) u_j is the random intercept for school j ; and (6) ϵ_{ij} represents the residual error.

Analysis Results

Figure 2

The linear relation between per-student funding and average Chinese exam scores across two student groups



Conclusion

Table 2*The effect of education funding on average Chinese exam scores differences within schools*

term	Estimate	Std. Error	df	t value	p.value
(Intercept)	61.576	3.582	119.001	17.193	0.000
mig_status2	3.806	1.801	9491.442	2.113	0.035
per_st_funding	0.003	0.001	113.648	2.828	0.006
centgov_fund_pct	-0.017	0.030	137.953	-0.578	0.564
prefgov_fund_pct	-0.036	0.034	165.192	-1.079	0.282
countgov_fund_pct	0.014	0.026	157.789	0.542	0.589
mig_funding2	1.463	9.566	96.829	0.153	0.879
mig_funding3	0.945	3.386	102.311	0.279	0.781
mig_funding4	4.872	2.648	100.764	1.840	0.069
mig_fundingmissing	3.373	3.687	98.670	0.915	0.362
same_charge_std1	3.192	2.578	100.672	1.238	0.219
same_charge_stdmissing	-3.248	4.379	100.761	-0.742	0.460
mig_subsidy1	-1.194	4.799	98.712	-0.249	0.804
mig_subsidymissing	3.268	4.482	101.070	0.729	0.468
mig_status2:per_st_funding	0.000	0.001	9697.198	-0.859	0.390
mig_status2:centgov_fund_pct	-0.018	0.017	8222.243	-1.080	0.280
mig_status2:prefgov_fund_pct	-0.022	0.015	7063.107	-1.464	0.143
mig_status2:countgov_fund_pct	-0.001	0.015	4101.584	-0.059	0.953
mig_status2:mig_funding2	-3.368	4.829	9650.535	-0.698	0.486
mig_status2:mig_funding3	-0.226	1.428	9682.045	-0.158	0.874
mig_status2:mig_funding4	-4.285	1.226	9699.225	-3.494	0.000
mig_status2:mig_fundingmissing	-1.187	1.292	9632.857	-0.919	0.358
mig_status2:same_charge_std1	-1.469	1.177	9679.108	-1.248	0.212
mig_status2:same_charge_stdmissing	3.088	1.735	9702.955	1.780	0.075
mig_status2:mig_subsidy1	-0.590	2.302	9689.675	-0.256	0.798
mig_status2:mig_subsidymissing	-3.839	2.172	9546.821	-1.767	0.077

Table 3*The effect of education funding on average Mathematics exam scores differences within schools*

term	Estimate	Std. Error	df	t value	p.value
(Intercept)	53.626	5.159	115.555	10.394	0.000
mig_status2	0.865	3.269	9466.250	0.265	0.791
per_st_funding	0.007	0.002	112.174	4.280	0.000
centgov_fund_pct	-0.029	0.044	123.893	-0.671	0.504
prefgov_fund_pct	-0.090	0.050	142.108	-1.803	0.074
countgov_fund_pct	-0.014	0.039	135.688	-0.357	0.722
mig_funding2	13.397	13.458	96.793	0.995	0.322
mig_funding3	3.670	4.805	104.988	0.764	0.447
mig_funding4	4.472	3.745	101.323	1.194	0.235
mig_fundingmissing	6.086	5.203	99.880	1.170	0.245
same_charge_std1	4.709	3.650	102.782	1.290	0.200
same_charge_stdmissing	-1.444	6.199	102.857	-0.233	0.816
mig_subsidy1	-4.189	6.774	100.061	-0.618	0.538
mig_subsidymissing	5.546	6.351	103.917	0.873	0.385
mig_status2:per_st_funding	0.001	0.001	9701.457	1.054	0.292
mig_status2:centgov_fund_pct	-0.006	0.030	8670.598	-0.213	0.831
mig_status2:prefgov_fund_pct	-0.016	0.027	7798.592	-0.589	0.556
mig_status2:countgov_fund_pct	-0.005	0.026	5005.892	-0.207	0.836
mig_status2:mig_funding2	-15.439	8.816	9646.822	-1.751	0.080
mig_status2:mig_funding3	-2.507	2.597	9572.566	-0.966	0.334
mig_status2:mig_funding4	-3.857	2.234	9697.296	-1.726	0.084
mig_status2:mig_fundingmissing	-0.627	2.349	9669.096	-0.267	0.790
mig_status2:same_charge_std1	0.057	2.141	9663.886	0.027	0.979
mig_status2:same_charge_stdmissing	7.233	3.160	9702.243	2.288	0.022
mig_status2:mig_subsidy1	0.523	4.186	9575.585	0.125	0.901
mig_status2:mig_subsidymissing	-8.362	3.944	9511.590	-2.120	0.034

Table 4*The effect of education funding on average English exam scores differences within schools*

term	Estimate	Std. Error	df	t value	p.value
(Intercept)	47.440	5.287	118.517	8.973	0.000
mig_status2	1.523	2.919	9490.931	0.522	0.602
per_st_funding	0.008	0.002	113.803	4.466	0.000
centgov_fund_pct	-0.045	0.045	132.647	-1.010	0.314
prefgov_fund_pct	-0.037	0.050	155.902	-0.726	0.469
countgov_fund_pct	0.021	0.040	148.610	0.521	0.603
mig_funding2	-1.239	13.981	97.859	-0.089	0.930
mig_funding3	5.468	4.965	104.331	1.101	0.273
mig_funding4	3.586	3.878	102.025	0.925	0.357
mig_fundingmissing	5.143	5.394	100.155	0.953	0.343
same_charge_std1	6.135	3.776	102.494	1.625	0.107
same_charge_stdmissing	0.696	6.414	102.567	0.108	0.914
mig_subsidy1	0.289	7.022	100.258	0.041	0.967
mig_subsidymissing	13.336	6.567	103.177	2.031	0.045
mig_status2:per_st_funding	0.000	0.001	9701.670	0.165	0.869
mig_status2:centgov_fund_pct	-0.028	0.027	8415.033	-1.059	0.289
mig_status2:prefgov_fund_pct	-0.028	0.025	7407.079	-1.143	0.253
mig_status2:countgov_fund_pct	0.000	0.023	4443.649	-0.002	0.999
mig_status2:mig_funding2	-5.058	7.844	9649.350	-0.645	0.519
mig_status2:mig_funding3	-2.131	2.316	9655.448	-0.920	0.358
mig_status2:mig_funding4	-3.902	1.991	9702.788	-1.961	0.050
mig_status2:mig_fundingmissing	0.197	2.095	9652.163	0.094	0.925
mig_status2:same_charge_std1	-0.842	1.909	9676.482	-0.441	0.659
mig_status2:same_charge_stdmissing	3.193	2.815	9702.920	1.134	0.257
mig_status2:mig_subsidy1	-3.508	3.734	9664.035	-0.940	0.347
mig_status2:mig_subsidymissing	-7.679	3.521	9542.046	-2.181	0.029

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