Buy in, Opt out? The Effect of the School Choice Lottery on Parental Educational Spending and Investment Decision: Evidence from a Quasi-Experiment in China

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Motivation

- Background
  - School choice lottery has been widely used for oversubscriptions (e.g. Chabrier, Cohodes and Oreopoulos, 2016 for U.S.; Hang, 2016; Song, 2019 for China; Muralidharan and Sundararaman, 2015 for India; and many more)
    - For schools and policy makers: equity and diversity
    - For families: more control over school choice (but also confusing sometimes)

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    - For schools and policy makers: equity and diversity
    - For families: more control over school choice (but also confusing sometimes)
  - Most studies focus on students' academic achievements (after winning a school choice lottery)
    - Mixed evidence (Cullen et al., 2006; Hastings et al., 2006; Deming et al., 2014; Abdulkadiroglu et al., 2018)
    - Potential noncompliance may explain the mixed evidence (Bibler and Bilings, 2020, residential location choice; Koper et al., 2020, subjective belief about admission)

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    - Potential noncompliance may explain the mixed evidence (Bibler and Bilings, 2020, residential location choice; Koper et al., 2020, subjective belief about admission)
- Not much work on impacts of a school admission policy switch (to a lottery choice) and how families respond to such a switch

Motivation

- What we do
  - Examining how parents react to a regime shift to school lottery choice
  - Propose an alternative but more affordable noncompliance channel
    - Educational spending
  - Investigating resource of the increased educational spending
    - Spillover on other spending vs spillover on investment?

Results Preview

- Strategies
  - Using user-level categorical spending and mutual fund investment data from one of the leading mobile payment platforms in China
  - Examining effects of private school lottery reforms in 2020 in three tier-one cities
  - Difference-in-differences (DID) with Propensity score matching (PSM)

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  - Difference-in-differences (DID) with Propensity score matching (PSM)
- Findings
  - Increase in the educational spending after school hours
    - Cross-city variations: Shanghai and Guangzhou, not in Shenzhen
    - Heterogeneities:Wealth, Gender, Migrant Status, Age, and Education
  - Spillovers
    - Parents with high wealth level: cutting down mutual fund investment (investment substitution)
    - Parents with low wealth level: cutting down other spending (budget constraint)

Literature

- The effect of school choice lottery
  - Academic performance (Cullen, Jacob, and Levitt, 2006; Hastings and Weinstein, 2008; Andreyeva and Patrick, 2017; Abdulkadiroglu, Pathak and Walters, 2018; Billings, Brunner and Ross, 2018, and many others)
  - Residential sorting (Nechyba, 2000; Brunner, Cho and Reback, 2012; Dhar and Ross, 2012; Baude et al., 2014; Bibler and Billings, 2020)
- Intergenerational investment and mobility
  - Interpersonal skills (Ashraf, Bau, Low and McGinn, 2020)
  - Time (Yum, 2022)
  - Taste (Grawe and Mulligan, 2002)
  - Human capital investment (Lee and Seshadri, 2019)
- Education as consumption or investment (Weisbrod, 1962; Bonner and Lees, 1963; Schaafsma, 1976; MacLeod and Urquiola, 2019)

Outline

- Institutional Background
- Data
- Methodology
- Results
- Conclusion

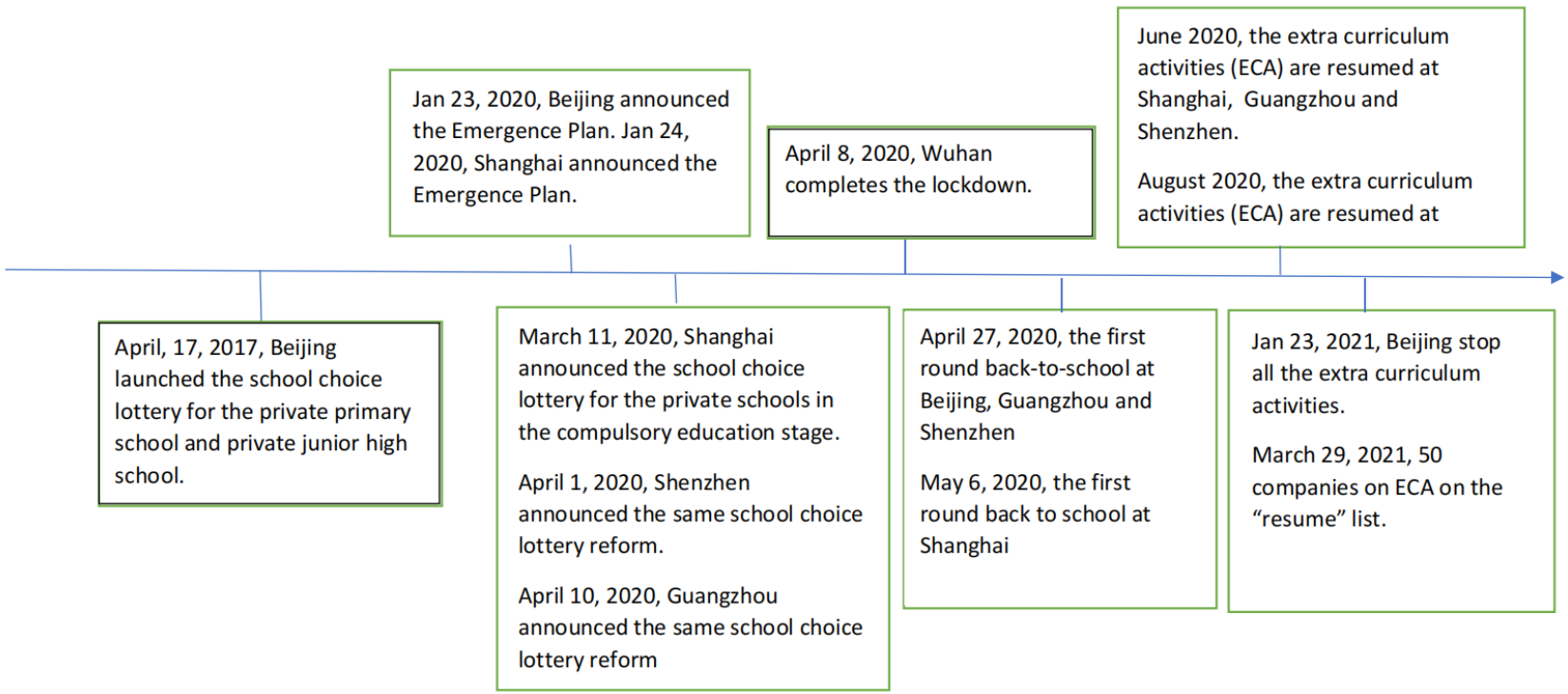
Institutional Background

- In China, the compulsory schooling is required from Year 1 to middle school (Year 9)
- There are two school systems
  - Public schools: funded by the government with a relatively large class size (40 or even more)
  - Private schools: funded by student fees and owned by individuals or companies with a small class size (often 20-40)
- After the compulsory schooling, students need to take/pass exams to be selected into high schools
  - Incentive to seek higher quality education even during the compulsory schooling (oversubscription)
    - In the past, exams, interviews and other assessments
    - Policy reforms: lotteries

School Lottery Reforms

- Beijing (2017)
  - Counter sky-high real estate prices
  - Mitigate students' educational burdens
  - Lottery for oversubscribed schools
- Shanghai, Guangzhou, Shenzhen (2020)
  - Mitigate students' pressure and educational burdens
  - Mandating lottery system for all private schools
  - Parallel admission with public schools
  - If lose the lottery
    - Shanghai: A centralized assignment; give up the priority to the public schools within the district if running the lottery
    - Guangzhou and Shenzhen: Still have chance to get into district affiliated public schools if not oversubscribed

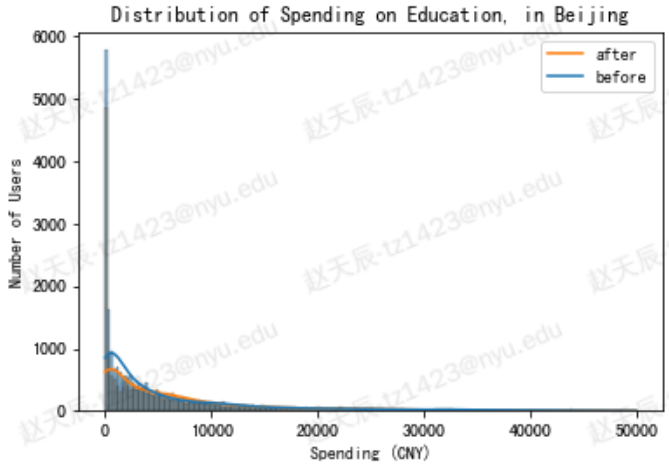
Timeline of School Lottery Reforms



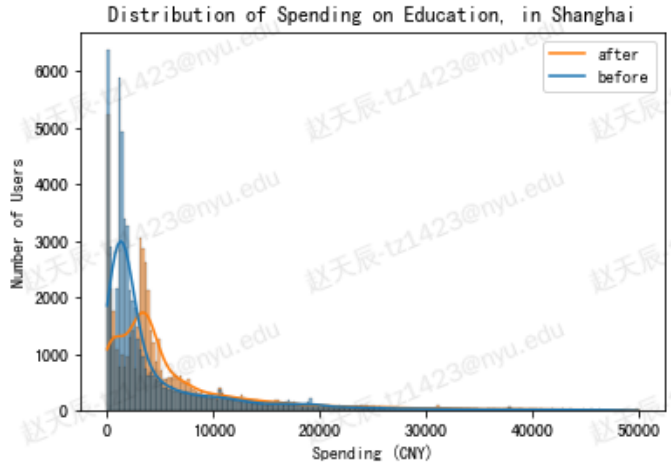
Impact of School Lottery Reforms on Parents' Educational Input

- "-": Less competition on tests, awards, and other ECAs
- "+": Uncertainty associated with the reforms
  - Chance to be admitted into good schools
  - Educational quality, peer quality under the new system

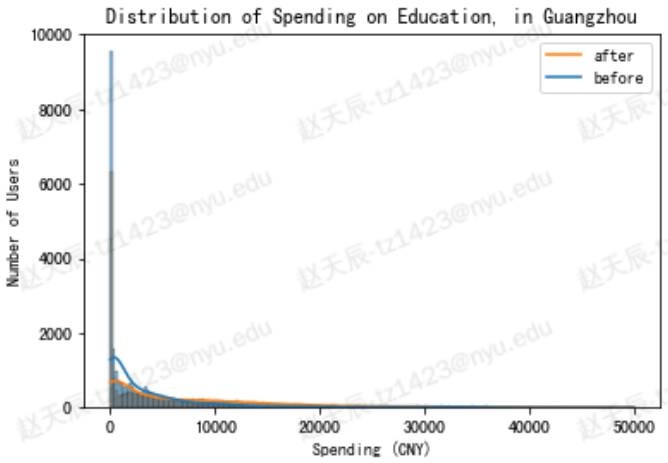
Educational Spending Changes across Cities



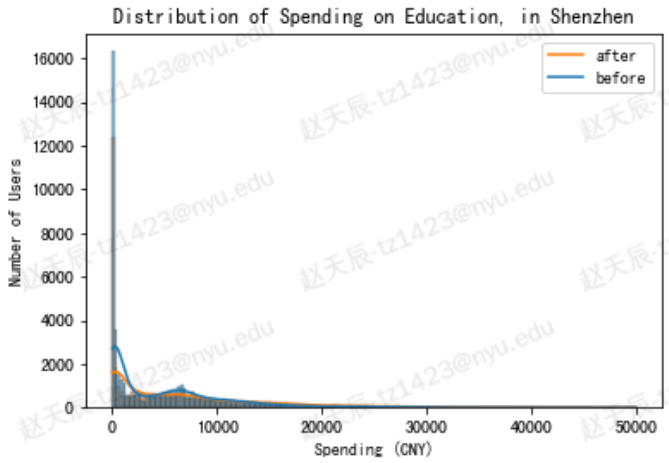
(a) Beijing



(b) Shanghai



(c) Guangzhou



(d) Shenzhen

Data

- The user account level data from one of the largest mobile payment platform in China
- Four tier-one cities: Beijing, Shanghai, Guangzhou and Shenzhen
- 200,000 users with observations at a monthly basis from Jan 2019 to Jun 2021
- Information
  - Basic demographics: gender, age, residential lcation, education, consumption level, etc.
  - Categorical spending: K12, Grocery, Clothes, Furniture, Car, Baby, Leisure, Beauty
  - Mutual fund investment: holdings, transactions, capital gains and dividends

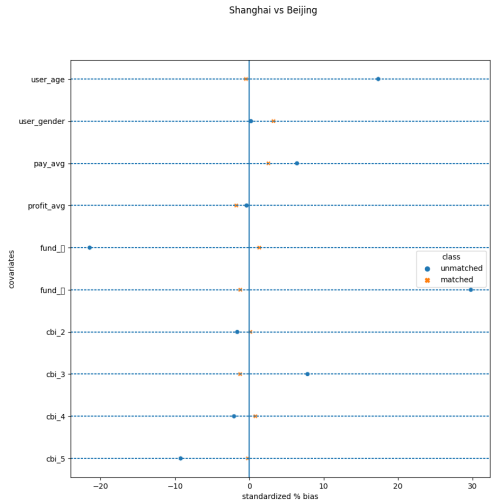
Summary Statistics

	Obs.(1000)	Mean	Median	SD	Max	Min	Obs(1000)	Mean	Median	SD	Max	Min
				2019						2020		
Users Characteristics												
Age	200	37	37	5	60	18	200	38	38	5	60	18
Gender (Male)	200	0.40	0	0.30	1	0	200	0.40	0	0.30	1	0
Consumption Profile (K12)												
Payment amount	8908	25	9	38	148	0.990	9965	26	9	39	152	0.890
Payment count	8908	0.002	0.001	0.002	0.008	0.001	9965	0.003	0.002	0.002	0.009	0.001
Consumption												
Monthly Total Payment	2380	566	304	661	2522	22	2400	608	303	756	2912	24
Monthly Total Payment Count	2380	0.039	0.029	0.031	0.114	0.004	2400	0.039	0.030	0.032	0.116	0.004
Monthly E-payment	2380	109	41	159	598	0.000	2400	125	48	180	676	0.000
Monthly E-payment Count	2380	0.009	0.006	0.009	0.033	0.000	2400	0.011	0.007	0.011	0.040	0.000
Investment												
Fund amount	954	234	1	542	2089	0.002	1867	69	3	140	968	0.001
Total Profit	954	12	0.014	34	134	-12	1867	24443	0.078	63	247	-12

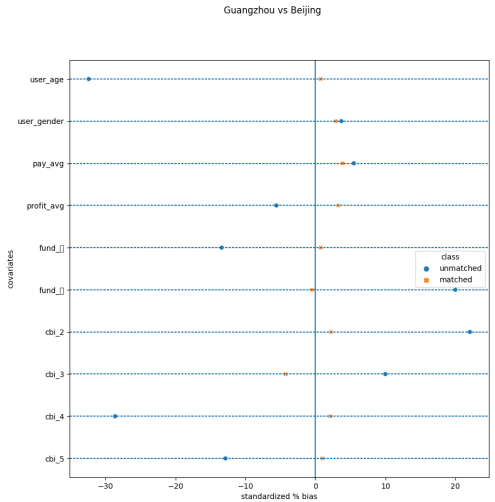
Methodology

- Using samples from Beijing as control group and apply a DID setting with samples from other three cities, respectively
  - The pandemic and lockdown
    - Assumption: The common pandemic effect is the same
    - controlling for monthly covid cases in each city
    - Robustness: Taking the period of lockdown out
  - Incompatibility at the user level
    - PSM to deal with selections on observables: Age, gender, wealth, consumption level, mutual fund holdings

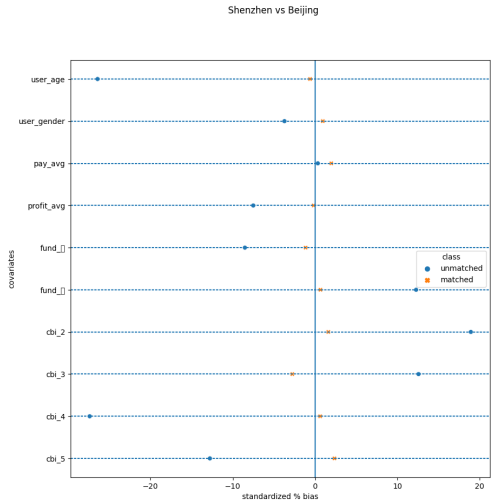
Matching Quality



(a) PSM, Shanghai



(b) PSM, Guangzhou



(c) PSM, Shenzhen

DID with PSM Design

$$ES_{ijt} = \alpha_j + \lambda_t + \beta \left(P_j \cdot T_t\right) + \varepsilon_{ijt} \tag{1}$$

where

- ES_{ijt}: the educational spending for individual i in city j during month t
- α_j: city fixed-effect
- λ_t: time fixed-effect
- P_j: Indicator of treatment/control
- T_t: Indicator of before/after the policy change

Estimates of Policy Effect on Educational Expenditures

Panel A. Non Matching Samples

	(1)	(2)	(3)	(4)	(5)	(6)
	Shanghai		Guangzhou		Shenzhen	
city*after	0.429***	0.6949***	0.6148***	0.7115***	0.2477	0.17
	(0.1269)	(0.1479)	(0.1342)	(0.1344)	(0.1629)	(0.1817)
Cases	N	Y	N	Y	N	Y
Controls	Y	Y	Y	Y	Y	Y
Time Fixed-Effect	Y	Y	Y	Y	Y	Y
City Fixed-Effect	Y	Y	Y	Y	Y	Y
Observations	3640923	3640923	1868238	1868238	3670839	3670839
R-Squared	0.2339	0.2273	0.1864	0.1793	0.1718	0.1655
Clustered SD	City	City	City	City	City	City

Panel B. Matched Samples

	(1)	(2)	(3)	(4)	(5)	(6)
	Shanghai		Guangzhou		Shenzhen	
city*after	0.4093***	0.6272***	0.5599***	0.6844***	0.1592	0.0525
	(0.1821)	(0.2045)	(0.1693)	(0.1659)	(0.2172)	(0.2403)
Cases	N	Y	N	Y	N	Y
Controls	Y	Y	Y	Y	Y	Y
Time Fixed-Effect	Y	Y	Y	Y	Y	Y
City Fixed-Effect	Y	Y	Y	Y	Y	Y
Observations	2629800	2629800	1743525	1743525	2644677	2644677
R-Squared	0.229	0.275	0.266	0.16	0.267	0.17
Clustered SD	City	City	City	City	City	City

Heterogeneities by Parent Investment, Consumption, Age and Education

Panel A. Investment		Low			Medium			High	
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.6696***	0.5439***	-0.0107	0.7112***	0.7487***	0.212	0.7456***	0.7126***	0.1299
	(0.2105)	(0.1855)	(0.2381)	(0.1717)	(0.1778)	(0.198)	(0.1597)	(0.1374)	(0.1547)
Observations	706914	352890	697059	314550	185652	334044	545562	242028	447120
Panel B. Consumption		Low			Medium			High	
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.3285***	0.4929***	-0.1444	0.6732***	0.2413	-0.3549	1.5002***	0.7209	0.6503***
	(0.1158)	(0.1135)	(0.1929)	(0.1734)	(0.1836)	(0.3853)	(0.3557)	(0.4043)	(0.2027)
Observations	1173150	1235223	2227608	460674	353916	640062	2006586	278424	802710
Panel C. Age		Low			Medium (32-48)			High	
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.5423	0.8782**	0.1126	0.8192***	0.6986***	0.2204	0.242	0.4987***	0.4722
	(0.2818)	(0.4108)	(0.1962)	(0.1897)	(0.2302)	(0.2669)	(0.2631)	(0.1961)	(0.2786)
Observations	478170	544455	870102	2773413	1226205	2599074	388611	97578	201663
Panel D. Education		Low			Medium			High	
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.3619***	0.5676	-0.2419	0.8476***	0.3649	-0.0573	0.496***	0.9368***	0.3738
	(0.0931)	(0.3168)	(0.235)	(0.2171)	(0.2188)	(0.1906)	(0.1178)	(0.1577)	(0.3099)
Observations	702216	575910	432432	2221884	759078	112806	716634	533196	3125250

Heterogeneities by Consumption Level and Gender

	Female			Male		
Panel A. Overall						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.7682***	0.7091***	0.1223	0.7904***	0.6386***	0.2575
	(0.1558)	(0.1466)	(0.1918)	(0.1529)	(0.1309)	(0.1933)
Observations	1176174	720036	1100493	770661	457515	762507
Panel B. Consumption Level: High						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.6697***	0.7399***	0.1088	0.8781***	0.8071***	0.3213
	(0.1776)	(0.1144)	(0.1856)	(0.2038)	(0.15)	(0.2325)
Observations	509166	244998	370683	280476	149526	247860
Panel C. Consumption Level: Medium						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.9312***	0.7431***	0.1941	0.9741***	0.7273***	0.3829
	(0.1387)	(0.1718)	(0.247)	(0.1429)	(0.1483)	(0.2127)
Observations	370224	229905	380349	244593	136755	258660
Panel D. Consumption Level: Low						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.8171***	0.5707***	0.0189	0.5949***	0.4125***	0.0929
	(0.1127)	(0.188)	(0.1569)	(0.1123)	(0.13)	(0.1437)
Observations	293922	242703	344412	243432	169317	253125

Heterogeneities by Consumption Level and Migrant Status

	Local			Migrant		
Panel A. Overall						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.7881***	0.6314***	0.1955	0.5079***	0.5745***	-0.0888
	(0.1683)	(0.1185)	(0.1947)	(0.157)	(0.1479)	(0.0919)
Observations	1303371	895239	1691658	643356	282204	171261
Panel B. Consumption Level: High						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.4551***	0.777***	-0.0662	0.469***	0.5251***	0.265**
	(0.1897)	(0.1189)	(0.0842)	(0.1508)	(0.0874)	(0.1237)
Observations	277074	94203	69849	512568	300321	548694
Panel C. Consumption Level: Medium						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.6575***	0.5237***	-0.0096	0.5802***	0.5016***	0.3244***
	(0.1387)	(0.1593)	(0.1379)	(0.124)	(0.107)	(0.1372)
Observations	210573	93906	55890	404244	272754	583119
Panel D. Consumption Level: Low						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.4552***	0.3434	-0.1907	0.4229***	0.3059***	0.1302
	(0.1042)	(0.2046)	(0.1163)	(0.0741)	(0.0899)	(0.0917)
Observations	154548	93204	45117	382806	318816	552420

Spillover on Investment: High-Consumption

	Female-High Comp			Male-High Comp		
Panel A. Automatic Investment Plan (AIP)						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	-0.0258	-0.0216	-0.0516**	-0.0604***	-0.0763***	-0.0777***
	(0.0207)	(0.0208)	(0.0239)	(0.0181)	(0.0227)	(0.0174)
Observations	369171	464616	787833	265545	307233	567594
Panel B. Net Inflow						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	-4541.8	-11070	-15220	-30040***	-27430***	-36690***
	(11270)	(9077.3)	(9366.8)	(7232.6)	(12800)	(5120.3)
Observations	369171	464616	787833	265545	307233	567594
Panel C. Turnover						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	-4520.9	-6703.2	-7468.7	8368	3255.4	3693.8
	(4588.6)	(4361.9)	(4330.5)	(10060)	(9110.5)	(9131.4)
Observations	369171	464616	787833	265545	307233	567594

Spillover on Investment: Low-Consumption

	Female-Low Comp			Male-Low Comp		
Panel A. Dingtou						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	0.0231	0.0629	-0.0076	-0.0062	-0.0007	0.0082
	(0.016)	(0.0624)	(0.0151)	(0.0226)	(0.0393)	(0.027)
Observations	807003	255420	312660	505116	150282	194913
Panel B. Net Inflow						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	3021.7	-31730	-10140	5179.8	-19510	-14820
	(7517.1)	(20730)	(6541.4)	(7729.9)	(12640)	(8353.3)
Observations	807003	255420	312660	505116	150282	194913
Panel C. Turnover						
	Shanghai	Guangzhou	Shenzhen	Shanghai	Guangzhou	Shenzhen
city*after	1988.1	-12000	3367.6	3579.3*	12900	-8778.3***
	(2007.7)	(6762.6)	(3447.1)	(1834.8)	(8884)	(3348)
Observations	807003	255420	312660	505116	150282	194913

Spillover on Other Categorical Spending: Low-Comp

	Shanghai		Guangzhou		Shenzhen	
Cases	N	Y	N	Y	N	Y
Panel A. Dependent Variable: Grocery						
city*after	-0.2869	-0.296	-0.1305	-0.1108	0.0438	0.0571
	(0.1604)	(0.1723)	(0.0849)	(0.0921)	(0.0872)	(0.0877)
Panel B. Dependent Variable: Clothes						
city*after	-0.0883**	-0.1468***	-0.3845**	-0.4604***	0.1077	0.0862
	(0.0042)	(0.0587)	(0.1456)	(0.1438)	(0.0888)	(0.0837)
Panel C. Dependent Variable: Furniture						
city*after	-0.1191	-0.1366**	-0.2704**	-0.3191***	0.2407	0.2311
	(0.0604)	(0.0055)	(0.1243)	(0.1208)	(0.1291)	(0.1419)
Panel D. Dependent Variable: Car Maintenance						
city*after	0.084	0.1211	-0.0396	0.0292	-0.1564	-0.1681
	(0.0943)	(0.0916)	(0.0994)	(0.0906)	(0.1038)	(0.1059)
Panel E. Dependent Variable: Baby						
city*after	-0.036	-0.0957	-0.188***	-0.1648***	-0.0637	-0.0899
	(0.085)	(0.1024)	(0.0484)	(0.0493)	(0.1098)	(0.1031)
Panel F. Dependent Variable: Leisure						
city*after	0.0908	0.1522	0.2161	0.283	0.3661***	0.3678***
	(0.1086)	(0.1259)	(0.142)	(0.1453)	(0.1109)	(0.1117)
Panel G. Dependent Variable: Beauty						
city*after	0.1612	0.1632	0.082	0.0747	0.3025***	0.3308***
	(0.1631)	(0.1722)	(0.1061)	(0.1012)	(0.0644)	(0.0655)

Robustness Checks

- Middle-aged sample only (30-48)
- Leave the lockdown period out
- Alternative classifications of wealth levels
- E-commerce spending vs other

Conclusion

- Positive educational spending response to the school choice lottery in Shanghai and Guangzhou in 2020, not much in Shenzhen
- Substantial heterogeneities regarding age, gender, education, migrant stuatus, consumption level as well as investment level
- Negative spillover on investment (AIP and net inflow) for the wealthies, especially males
- Crowding-out effect on other (durable) consumption for the poors

Implications

- Noncompliance with increased educational spending after school
- Problems from ignorance of such general equilibrium effects during the policy evaluation
- The role of household financial constraints

Discussions

- The platform-only data
- District variations in educational resources and competitions

Thank You!