# The Effect of Public Education Expenditure on Household Education Spending

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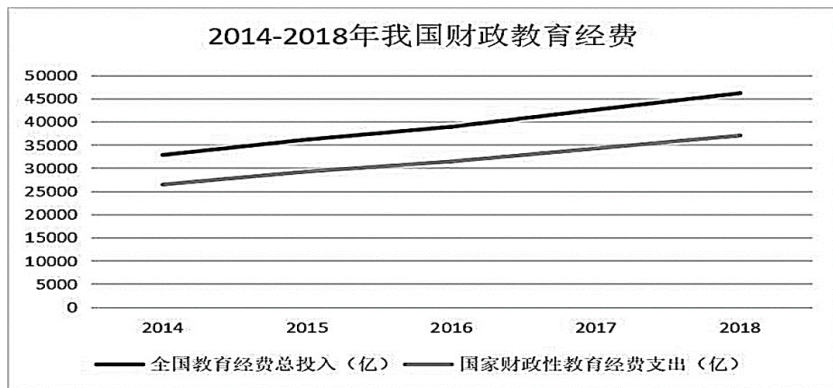
# Overview

- Introduction
- Data & Analysis
- Robustness Test
- Heterogeneity Analysis
- Conclusion

# Part 1: Introduction

# Total education investment

- Public education investment
- Social education investment
- Family funds investment



2014-2018年我国财政教育经费

全国教育经费总投入（亿）　　国家财政性教育经费支出（亿）

# Literature Review

How does fiscal expenditure affect household consumption?

- Bailey(1971) and Barro(1974)
- Aschaue(1985) and Ho(2001)：Substitution Effect
- Karras(1994) and Schclarek(2007)：Complementary Effect

# Literature Review

How does public education investment affect family education investment?

- Tilak(2002): Different income level
- Chen(2013): The difference between urban and rural areas
- Wu(2014): Substitution Effect
- Wei(2018): Complementary Effect

# Literature Review

How does public education investment affect family education investment?

- No effect
- Substitution Effect: crowd-out
- Complementary Effect: crowd-in

# Part 2: Data & Analysis

# Data Preparation

CFPS (China Family Panel Studies)

Nationally representative, annual longitudinal survey of Chinese communities, families, and individuals launched in 2010 by the Institute of Social Science Survey (ISSS) of Peking University, China. The CFPS is designed to collect individual-, family-, and community-level longitudinal data in contemporary China.

Year: 2014 2016 2018

# Data Preparation

- What we have:
  - cross-sectional CFPS data of the personal level of 2014,2016,2018
  - cross-sectional government data of investment of 2014,2016,2018
- Link:
  - family *id* in each year
  - year
- What we want:
  Panel data containing both personal level and government level data of 2014,2016,2018
- How?

## Data Description

Control Variables：

- Urban: 1:Yes 0:No
- Pri: the number of people studying in primary school in this family
- Jun: the number of people studying in middle school in this family
- Sen: the number of people studying in senior high school in this family
- Uni: the number of people studying in university or higher level in this family

# Data Description

Control Variables：

- Fml: number of family members
- Pta-pre: The proportion of public education investment last year

Dummy:

- Province : $p_x$ stands for whether belong to this province: 1 for Yes and 0 for No

# Data Description

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| edc | 30,372 | 1936.267 | 5414.964 | 0 | 191000 |
| pc_pre | 30,372 | 960.0061 | 488.409 | 111.74 | 2522.55 |
| pta_pre | 30,372 | 16.59395 | 2.253982 | 10.77 | 20.9 |
| fml | 30,372 | 3.824806 | 1.880731 | 1 | 21 |
| pri | 30,372 | .1108587 | .3427417 | 0 | 3 |
| jun | 30,372 | .0924207 | .3041521 | 0 | 3 |
| sen | 30,372 | .064566 | .2577939 | 0 | 3 |
| uni | 30,372 | .0530094 | .2342574 | 0 | 3 |

# Model Specification

$EduExpense_{it} = \beta_1 EduInvestment_{it} + \beta_2 Urban + \beta_3 Primary + \beta_4 Middle +$

$\beta_5 Senior + \beta_6 University + \beta_7 Famnumber + \beta_8 Pta + \alpha_i + \lambda_t + u_{it}$

- Dependent Variables: The family 's education during last 12 months
- Variable of Interest: Educational financial investment last year in this provinc(take the logarithm)
- Hausman test $\rightarrow$ we should use fixed effects model

# Result for Main Regression

| | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 |
|---|---|---|---|---|---|
| ln(previous year's public education investment) | 89.38207 | 228.2611*** | -480.4966*** | 1259.703*** | 800.4404** |
| | (69.5222) | (70.57044) | (172.8922) | (394.3565) | (377.0605) |
| | | | | | |
| adjusted R-square | 0.0001 | 0.2909 | 0.1755 | 0.021 | 0.1858 |
| | | | | | |
| number of family members | | 297.1399*** | 263.6613*** | 343.2714*** | 226.6461*** |
| pta_pre | | -81.17336*** | -3.020934 | 5.756746 | 13.38035 |
| pri | | 724.5491*** | -147.6921 | | -116.1768 |
| jun | | 1711.428*** | -244.188 | | -189.8925 |
| sen | | 4613.156*** | 2009.116*** | | 2072.676*** |
| uni | | 10245.28*** | 9552.281*** | | 9548.699*** |
| urban | | 355.3704*** | 12.49071* | 30.38048 | 103.1517 |
| | | | | | |
| constant | 1332.629*** | -638.449 | 3620.045*** | -8094.652*** | -5520.134*** |
| | | | | | |
| family fixed effect | × | × | √ | √ | √ |
| province fixed effect | × | × | × | √ | √ |
| year fixed effect | × | × | × | √ | √ |
| *10% significance level | | | | | |
| **5% significance level | | | | | |
| ***1% significance level | | | | | |

# Part 3:Robustness Test

# Family Income & expenditure

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| finc | 30,372 | 55247.21 | 98315.16 | 0 | 8336000 |
| fexp | 30,372 | 38746.42 | 63773.93 | 0 | 4500000 |

Family income during last 12 months
Family expenditure during last 12 months

# Family Income & expenditure

| | Test 1 |
|---|---|
| ln(previous year's public education investment) | 792.4505** |
| | (376.9249) |
| | |
| adjusted R-square | 0.186 |
| | |
| family total income | -0.001256 |
| familt total expenditure | 0.0013449** |
| number of family members | 222.417*** |
| pta_pre | 14.61528 |
| pri | -116.5267 |
| jun | -192.5342 |
| sen | 2076.743*** |
| uni | 9542.243*** |
| | |
| constant | -5509.238** |
| | |
| family fixed effect | √ |
| province fixed effect | √ |
| year fixed effect | √ |
| *10% significance level | |
| **5% significance level | |
| ***1% significance level | |

# Income

Family Income → 4 levels

- Top 25%
- Above average 25%
- Below average 25%
- Bottom 25%

# Income

| | Test 1 |
|---|---|
| ln(previous year's public education investment) | 787.1278** |
| | (377.0954) |
| | |
| adjusted R-square | 0.1861 |
| | |
| number of family members | 225.1683*** |
| pta_pre | 14.60676 |
| pri | -116.6683 |
| jun | -191.8234 |
| sen | 2071.943*** |
| uni | 9548.383*** |
| fexp | 0.001288* |
| bottom 25% | -31.11597 |
| below average 25% | -104.3571 |
| above average 25% | -67.92055 |
| | |
| constant | -5455.013** |
| | |
| family fixed effect | √ |
| province fixed effect | √ |
| year fixed effect | √ |
| *10% significance level | |
| **5% significance level | |
| ***1% significance level | |

# Region

| | Test 1 |
|---|---|
| ln(previous year's public education investment) | 639.6968** |
| | (287.5525) |
| | |
| adjusted R-square | 0.185 |
| | |
| number of family members | 232.6635*** |
| pta_pre | 24.87007 |
| pri | -112.6572 |
| jun | -186.3536 |
| sen | 2079.807*** |
| uni | 9553.229*** |
| North China | 1090.495 |
| Northeast | 1568.364** |
| East China | 478.3871 |
| Central & South China | 273.0013 |
| Southwest China | 1206.441* |
| | |
| constant | -4990.916*** |
| | |
| family fixed effect | √ |
| province fixed effect | √ |
| year fixed effect | √ |
| *10% significance level | |
| **5% significance level | |
| ***1% significance level | |

# No Logarithm

| | Test 1 |
|---|---|
| previous year's public education investment | 0.2336572 |
| | (0.3117179) |
| | |
| adjusted R-square | 0.1856 |
| | |
| number of family members | 226.1444*** |
| pta_pre | 34.66548 |
| pri | -116.4557 |
| jun | -188.9816 |
| sen | 2074.402*** |
| uni | 9554.072*** |
| | |
| constant | -941.886 |
| | |
| family fixed effect | √ |
| province fixed effect | √ |
| year fixed effect | √ |
| *10% significance level | |
| **5% significance level | |
| ***1% significance level | |

# Part 4: Heterogeneity Analysis

|  | Top 25% | Above Average 25% | Below average 25% | Bottom 25% |
|---|---|---|---|---|
| ln(Public Education Investment) | 315.4482 | 1299.5110 | 1317.0700 | 845.2863 |
| (last year) | (1090.513) | (1204.832) | (1220.672) | (738.9546) |
|  |  |  |  |  |
| Adjusted (Within) R² | 0.0735 | 0.2416 | 0.2817 | 0.2226 |
|  |  |  |  |  |
| Constant | -5334.488 | -7515.039 | -900.9055 | -6232.33 |
|  |  |  |  |  |
| Control Variables | √ | √ | √ | √ |
|  |  |  |  |  |
| Family Fixed Effect | √ | √ | √ | √ |
| Province Fixed Effect | √ | √ | √ | √ |
| Year Fixed Effect | √ | √ | √ | √ |
| *10% significance level |  |  |  |  |
| **5% significance level |  |  |  |  |
| ***1% significance level |  |  |  |  |

# Region

| | North China | Northeast | East China | Central China & South China | Southwest China | Northwest |
|---|---|---|---|---|---|---|
| ln(Public Education Investment) | -1467.629 | 1149.5260 | 326.8193 | 851.2579 | 706.827 | -1218.49 |
| (last year) | (1856.178) | (1730.691) | (1398.365) | (862.4591) | (1298.622) | (1651.264) |
| | | | | | | |
| Adjusted（Within）R² | 0.1812 | 0.1165 | 0.1496 | 0.1775 | 0.2477 | 0.2792 |
| | | | | | | |
| Constant | 7875.117 | -6373.281 | -6526.492 | -824.4563 | -8207.152 | 5075.245 |
| | | | | | | |
| Control Variables | √ | √ | √ | √ | √ | √ |
| | | | | | | |
| Family Fixed Effect | √ | √ | √ | √ | √ | √ |
| Province Fixed Effect | √ | √ | √ | √ | √ | √ |
| Year Fixed Effect | √ | √ | √ | √ | √ | √ |
| *10% significance level | | | | | | |
| **5% significance level | | | | | | |
| ***1% significance level | | | | | | |

# Urban

| | **Urban** | **Rural** |
|---|---|---|
| ln(Public Education Investment) | 862.3886 | 1280.269** |
| (last year) | (627.0403) | (502.3059) |
| | | |
| Adjusted（Within）R² | 0.1457 | 0.2446 |
| | | |
| Constant | -5577.531 | -5369.587 |
| | | |
| Control Variables | √ | √ |
| | | |
| Family Fixed Effect | √ | √ |
| Province Fixed Effect | √ | √ |
| Year Fixed Effect | √ | √ |
| *10% significance level | | |
| **5% significance level | | |
| ***1% significance level | | |

# Education Stage

| | Primary | Junior | Senior | University or above |
|---|---|---|---|---|
| ln(Public Education Investment) | 4145.468*** | 5690.358*** | 4743.128*** | 6831.986*** |
| (last year) | (242.5616) | (493.6325) | (612.0709) | (894.0526) |
| | | | | |
| Adjusted (Within) R² | 0.9077 | 0.8908 | 0.8930 | 0.8519 |
| | | | | |
| Urban | 182.717 | 80.62312 | -326.5138 | -329.21 |
| Fml | -9.346402 | -4.220768 | -14.65098 | -37.1525 |
| Pta_pre | 190.7646*** | -166.4838*** | -88.28429 | -22.02707 |
| | | | | |
| Constant | -24187.48*** | -26305.4*** | -21924.76*** | -31245.73*** |
| | | | | |
| Family Fixed Effect | √ | √ | √ | √ |
| Province Fixed Effect | √ | √ | √ | √ |
| Year Fixed Effect | √ | √ | √ | √ |
| *10% significance level | | | | |
| **5% significance level | | | | |
| ***1% significance level | | | | |

# Education Stage

Check whether the effect on each education stage performs differently between urban and rural areas

| Urban Areas | Primary | Junior | Senior | University or above |
|---|---|---|---|---|
| ln(Public Education Investment) | 3914.014*** | 5237.454*** | 4799.617*** | 7193.199*** |
| (last year) | (376.1731) | (689.1969) | (805.0242) | (1274.128) |
| | | | | |
| Adjusted (Within) R² | 0.8582 | 0.8030 | 0.8640 | 0.7275 |
| | | | | |
| Fml | -9.346402 | 70.38434 | 35.138 | -252.9567 |
| Pta_pre | 190.7646*** | 69.65277** | -88.63398 | -98.15537 |
| | | | | |
| Constant | -24187.48*** | -22573.36*** | -22549.01*** | -31492.81*** |
| | | | | |
| Family Fixed Effect | √ | √ | √ | √ |
| Province Fixed Effect | √ | √ | √ | √ |
| Year Fixed Effect | √ | √ | √ | √ |
| *10% significance level | | | | |
| **5% significance level | | | | |
| ***1% significance level | | | | |

# Education Stage

| Rural Areas | Primary | Junior | Senior | University or above |
|---|---|---|---|---|
| ln(Public Education Inves | 4143.601*** | 6230.239*** | 4998.918*** | 5904.426*** |
| (last year) | (327.8864) | (790.0898) | (1068.439) | (1151.495) |
| | | | | |
| Adjusted (Within) R² | 0.9299 | 0.9024 | 0.8578 | 0.7307 |
| | | | | |
| Fml | -27.95652 | -53.55065 | -70.79577 | 49.04829 |
| Pta_pre | 210.6887*** | -161.3791** | -115.9835 | 158.2696 |
| | | | | |
| Constant | -24606.95*** | -29574.38*** | -22595.28*** | -29314.62*** |
| | | | | |
| Family Fixed Effect | √ | √ | √ | √ |
| Province Fixed Effect | √ | √ | √ | √ |
| Year Fixed Effect | √ | √ | √ | √ |
| *10% significance level | | | | |
| **5% significance level | | | | |
| ***1% significance level | | | | |

# Education Investment

Family Education Investment last 12 months:

- Tutorial fee for children last 12 months
- School expenses for children last 12 months
- Other expenses for children last 12 months

# Education Investment

| | Tutorial Fee | School Fee | Other Cost |
|---|---|---|---|
| ln(Public Education Investment) | 376.253*** | 378.605 | 41.84697 |
| (last year) | (134.492) | (322.3137) | (63.83334) |
| | | | |
| Adjusted (Within) R² | 0.0060 | 0.2023 | 0.0432 |
| | | | |
| Urban | 32.6164 | 10.89239 | 61.73765** |
| Fml | 27.49103* | 190.3235*** | 11.01681** |
| Pta_pre | 3.291619 | 11.73093 | 1.292439 |
| Pri | 40.48356 | -152.9721 | -4.003721 |
| Jun | -12.38196 | -111.4646 | -70.40488** |
| Sen | 263.2239*** | 1651.683*** | 134.8425*** |
| Uni | -10.29515 | 8747.739*** | 880.7802*** |
| Constant | -2419.315*** | -2884.17 | -249.8933 |
| | | | |
| Family Fixed Effect | √ | √ | √ |
| Province Fixed Effect | √ | √ | √ |
| Year Fixed Effect | √ | √ | √ |
| *10% significance level | | | |
| **5% significance level | | | |
| ***1% significance level | | | |

# Part 5 : Conclusion

# Conclusion

- Generally Public education investment has crowd-in effect on family education investment.
- It shows a more crowd-in effect on urban family education investment, especially when the children are having compulsory education.
- It will show a more crowd-in effect on higher education than compulsory education.

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# Thank you for listening
## Dec 25, 2019