Helping Your Children Soar:

Does Public Education Provision Affect Private Expenditure on Children?

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ABFER

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Outline

Parental Investment & Educational Opportunities

- Parental investment:
  - improve health, cognitive and non-cognitive skills, education attainment, and earnings
  - vary in forms, e.g., financial resource, time, and connections

- Inequality in educational opportunities:
  - arise from uneven provision of public education
  - shaped by neighborhoods and school zones

This paper:

We focus on the incentives of parental investment in children: how parents respond to changes in educational opportunities?

Motivation

1. Public education has a direct impact on children (well studied), but indirect impact mediated through parental investment?
   - Theoretical debate: complementary or substitute? (Becker & Tomes, 1976 & 1986; Goldberger, 1989)
   - Despite the theoretical importance and policy relevance, empirical evidence is limited and inconclusive (Pop-Eleches &Urquiola, 2013; Gelber & Lsen, 2013)

2. Substantial disparities in children's outcomes across neighbourhoods
   - Neighbourhood providing strong opportunities improve children's outcomes (Chatty et al., 2016; 2018; Chyn, 2018)
   - Access to high-achievement schools $\Longrightarrow$ better outcomes (Hoxby; 2008; Lavy, 2010; Deming et al., 2014)

Empirical Challenges & What This Paper Does

1. Parents' investment in children is hard to observe
   - Unique dataset: bankcard transactions of China UnionPay to trace expenditure on children
   - Capture monetary investment in children
     - Tangible skills: extra-curriculum training (EC); intangible skills: other child support expenditure (OCS)

2. Selection issue: parents who value education more choose where they live carefully
   - A quasi-experiment: a merger between two districts with substantially different educational resources in Shanghai
   - Improved education opportunities for students in the district used to have fewer and poor public schools

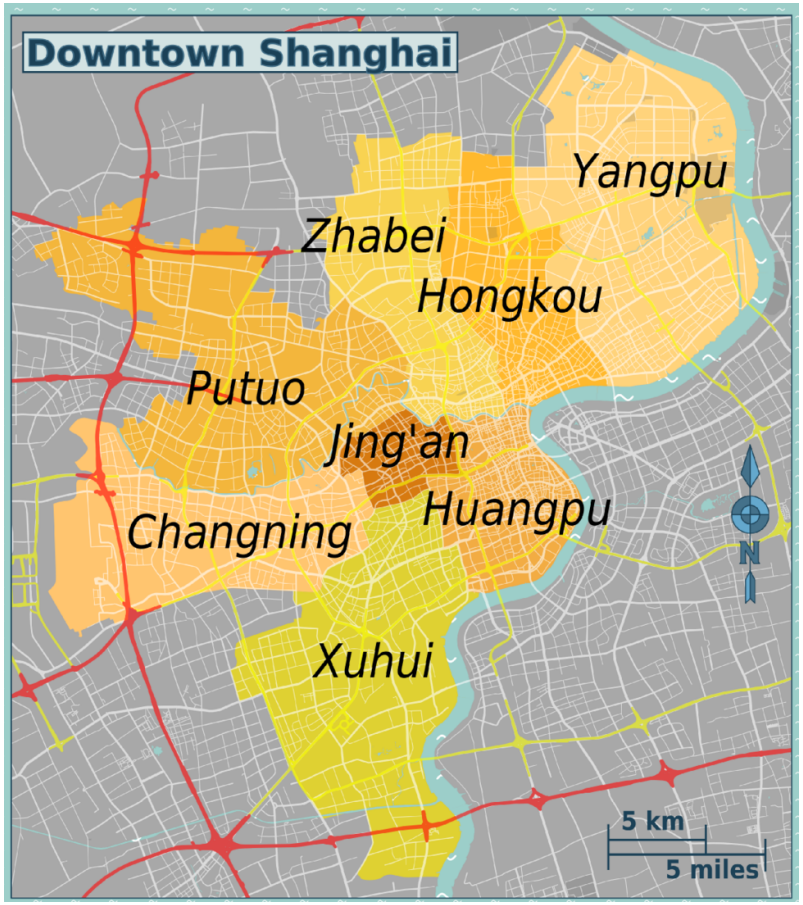
Preview of Results

1. DID baseline, compared to a control district
   - People in the district with less education resource increase expenditure on children (both EC and OCS) after the merger
   - No significant difference in total consumption
2. Stronger effect for cardholders with young children
   - A placebo on cardholders with adult children finds no result
3. Stronger effect for cardhoders who live closer to the old border
4. The effect varies across cardholders with different historical consumption levels
   - The poor increase EC, the rich increaes OCS
5. Alternative channels: competition, housing appreciation, etc

Outline

Institutional Background: Merger JA & ZB

- Jing'an (JA) and Zhabei (ZB): two districts with substantially different resources Demographic
- Suddenly announced in Sep 2015, effective from Nov 2015



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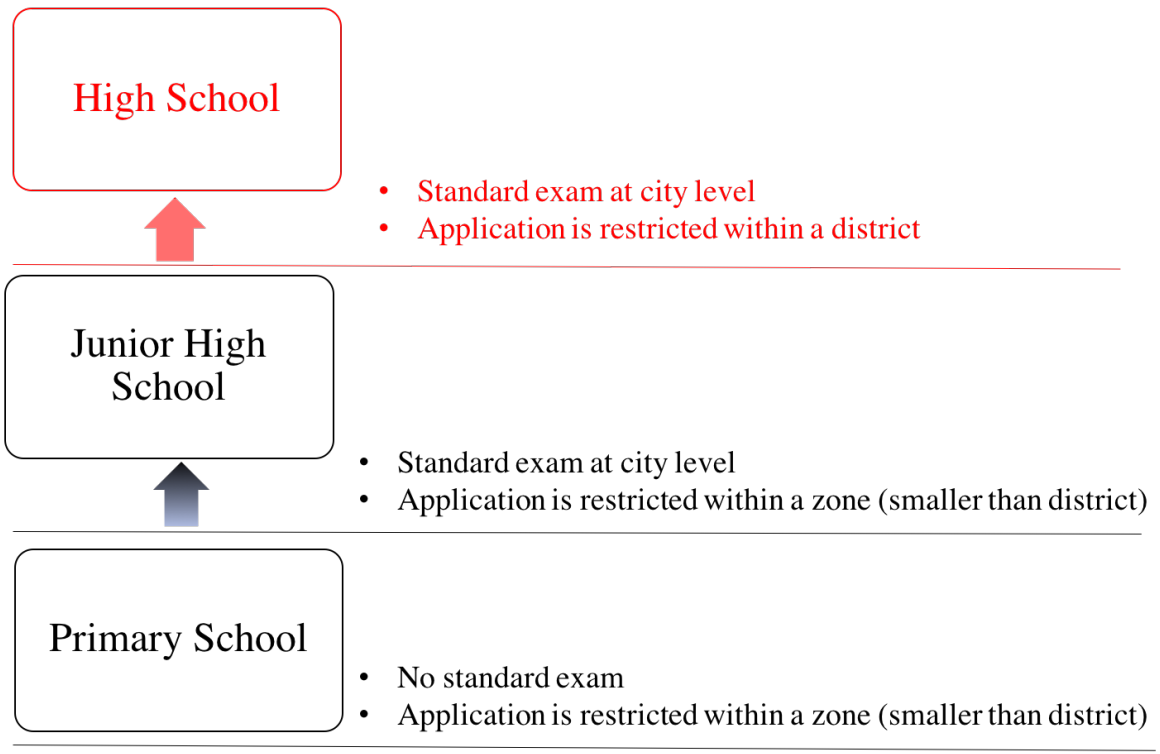
Merger JA & ZB in Shanghai

- The merger was a **centralized decision**
  - unlike school zone consolidation in the US context that is usually influenced by voters
- The merger was a decision **not driven by equalizing education resource**
  - The merger was for potential economic synergies
  - ZB: abundant land supply (land sales)
  - JA: rich cultural heritage and concentrated service industries

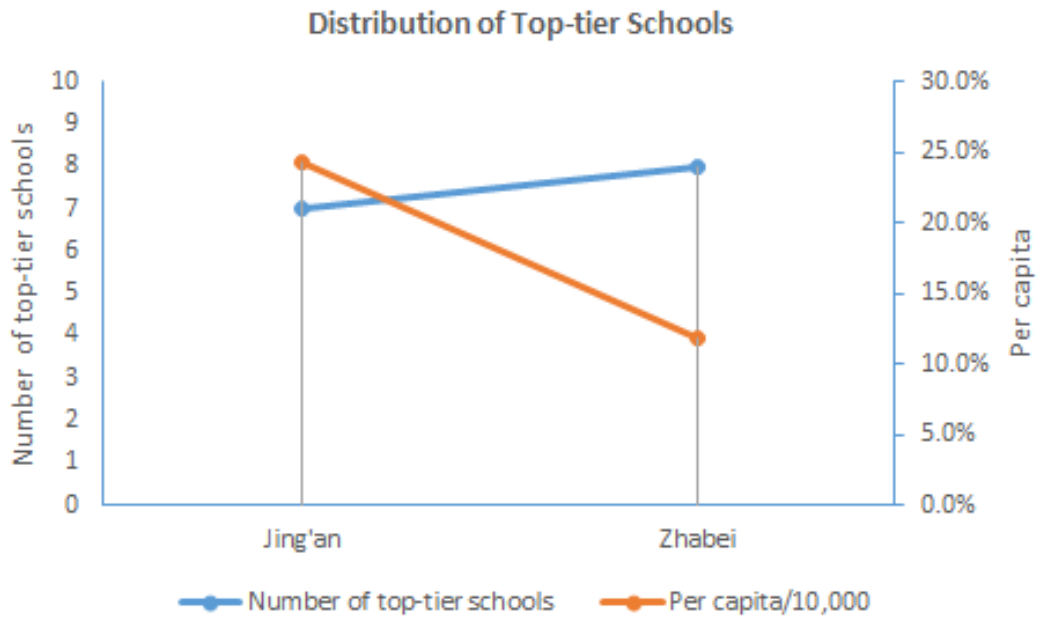
How Does The Merger Affect Public School Entrance

- JA had more and better public services than ZB
- Most not exclusive to local(e.g.hospitals), except **public high schools**
  - students cannot apply across districts before the merger
  - A "ticket", not a guarantee (exam is still required) after the merger



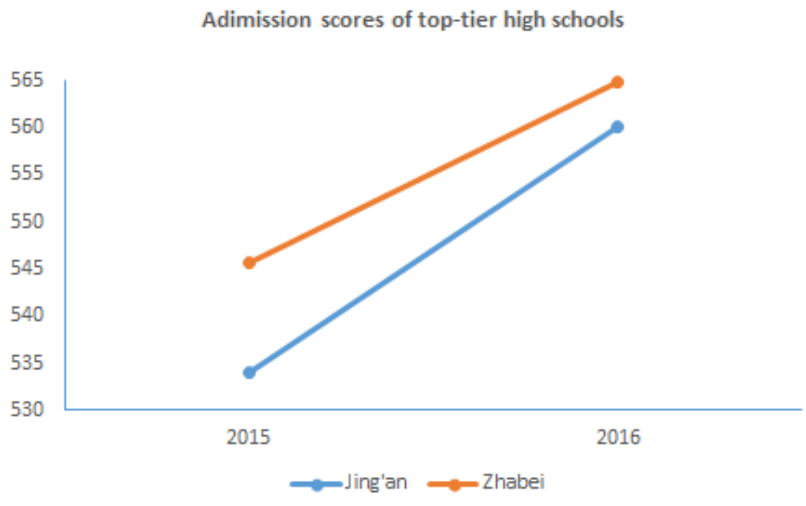
Before the Merger: Unequal Educational Opportunities

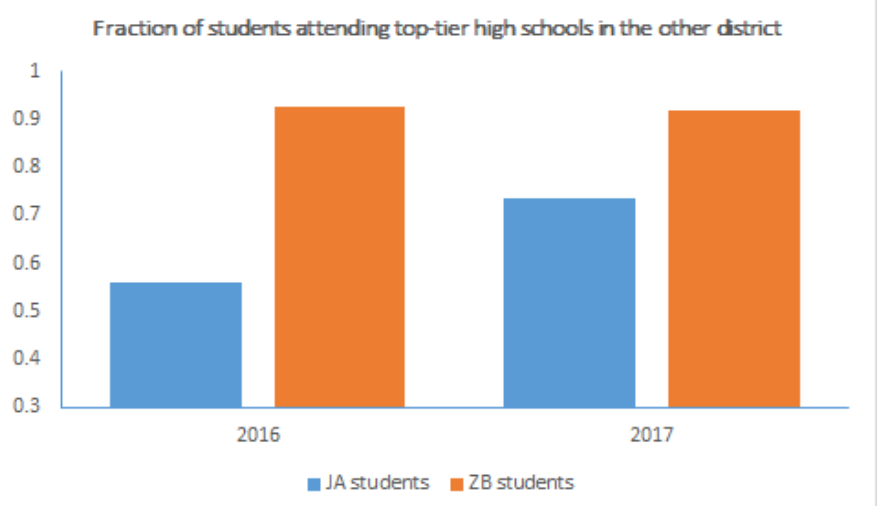
- ZB had lower high-performing school per capita $\Longrightarrow$ slimmer opportunities to get into a top-tier high school
- Private high schools 7%, best schools are mostly public ones



ZB Benefit? Admission Scores & Student Flows

- Before the merger:
  - Lower school desntiy in ZB $\Longrightarrow$ higher admission grade (cutoff)
- After the merger:
  - The gap in admission scores for top-tier high schools narrowed
  - A greater fraction of students from ZB attend top-tier schools in JA
  - $\Longrightarrow$ ZB good students seized the improved opportunity





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Outline

Data: China UnionPay

- UnionPay is the only interbank payment network in China and intermediates all card-based expenditures
- The largest network in the world in terms of both the number and value of transactions
- Universal transaction data of 1,300,690 credit and debit cards in 3 districts of Shanghai: Map
  - Coverage: Zhabei, Jing'an, and Huangpu (unaffected district)
  - Apr 2015 - Mar 2016, 6 months before and after the merger
  - What we know: transaction location, time, value, and merchant category
  - What we do not know: cardholders' demographic information, and we will use consumption history to infer demogrpahy

A Few Comments on UnionPay Data

- Card transaction data does not capture all consumption, but is still fairly complete
  - PBOC (2015): bankcard transactions account for 48% of the retail sales of consumer goods in China, expected to be higher in Shanghai
  - Total monthly consumption 1.9K yuan per card in our sample, in light of 4K income per capita and 50% of residential saving ratio in Shanghai in 2015
  - Cash withdrawal about 1/4
- Advantages of transaction data over consumer expenditure surveys:
  - Real-time actual purchases as opposed to self-reported data
  - High frequency, as apposed to annual/bi-annual observations

Identifying Expenditure on Children

- In total, 274 merchant categories:
  - car rental, travel agencies, massage shops, and etc.

- We construct two types of child-related expenditure:
  1. Extra-curriculum training (EC):
     - Private training institutions, stationary stores
     - EC could **directly** enhance children's academic performance
  2. Other child-support expenditure (OCS):
     - Child clothing, toys, zoo visits
     - OCS is associated with children's social competence; or parents use these to motivate students to work harder

Identifying Residential District

- Use the consumption history of each card to identify cardholders' primary residential district
- Underlying assumption: correlation between where to consume (merchant location) and residential location
- A score-based algorithm (1-10):
  1. A higher score to: property services, utilities, primary schools, laundry stores
  2. A lower score to: supermarkets, convenient stores, ATM
  3. For each card, aggregate the scores by districts
  4. For each card, the district that receives the highest score is viewed as the primary residence

Summary Statistics

VARIABLES	mean	sd	p50	VARIABLES	mean	sd	p50
Panel A: Full sample				*Panel C: Jing'an subsample*			
Total consumption	1,897.03	14,228.96	400.00	Total consumption	1,949.14	12,209.49	447.10
Credit	1,262.39	6,660.32	300.34	Credit	1,442.68	7,711.95	343.10
Debit	2,705.82	20,069.56	600.00	Debit	2,801.91	17,285.13	669.00
Kid consumption	11.96	415.49	0.00	Kid consumption	15.98	462.40	0.00
EC	9.71	409.25	0.00	EC	12.39	442.83	0.00
OCS	2.24	70.25	0.00	OCS	3.58	133.08	0.00
Panel B: Zhabei subsample				*Panel D: Huangpu subsample*			
Total consumption	1,792.95	14,407.52	386.50	Total consumption	3,394.49	11,247.16	1,180.50
Credit	1,123.05	6,272.79	288.56	Credit	3,127.88	10,378.80	1,005.50
Debit	2,637.36	20,453.67	569.80	Debit	3,793.17	12,422.41	1,591.62
Kid consumption	12.20	407.38	0.00	Kid consumption	8.42	518.33	0.00
EC	9.87	400.71	0.00	EC	7.43	516.70	0.00
OCS	2.33	71.83	0.00	OCS	0.99	41.16	0.00

Outline

Empirical Strategy: Difference-in-differences

- Make use of differences in expenditure between ZB and HP before and after the merger
- These intent-to-treat (ITT) estimates identify effect of being a cardholder in ZB

$$C_{it} = \alpha + \beta Zhabei_i \times After_t + \gamma_i + \omega_t + \varepsilon_{it}$$

- C_{it}: logarithm of consumption at card-month level
- $Zhabei_i$: 1 if in ZB and 0 if in HP, $After_t$: 1 if after Sep. 2015
- γ_i: card fixed effects, ω_t: month fixed effects

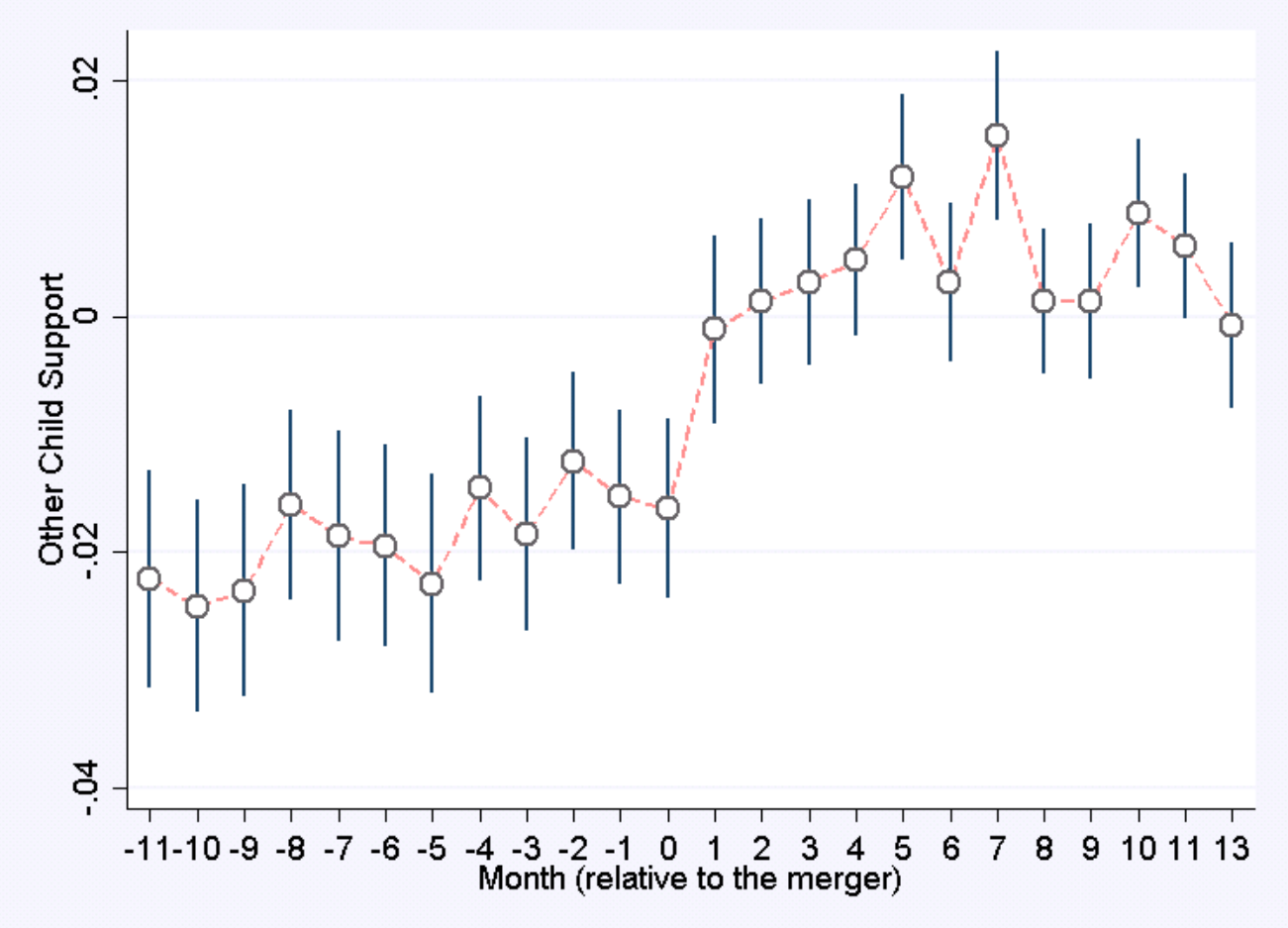
Baseline Results

Dep. Var.	(1)	(2)	(3)	(4)	(5)	(6)
	Expenditure on Children			Total Expenditure		
	Total	EC	OCS	Total	Credit	Debit
After*Zhabei	0.0256***	0.0045***	0.0213***	-0.0101	-0.0045	-0.0198
	(0.0026)	(0.0017)	(0.0019)	(0.0081)	(0.0104)	(0.0129)
Card Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,771,182	3,771,182	3,771,182	3,771,182	2,111,732	1,659,450
R-squared	0.001	0.001	0.001	0.005	0.005	0.004

- After the merge, cardholders in ZB:
  - increase expenditure on childern
  - have the same total expenditure
  - lower other expenditure (e.g., cosmetics and beauty salons)

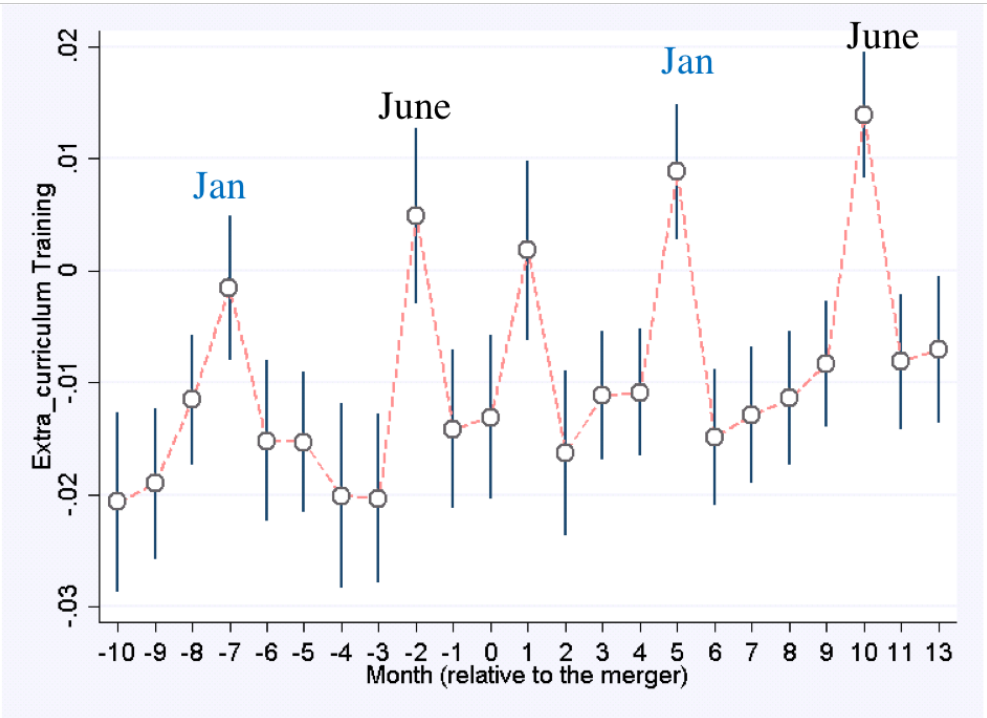
Pretrend Analysis: OCS

- We expand the sample to see whether the effect is persistent



Pretrend Analysis: EC Seasonality

- Strong seasonality (spikes in Jan, June and Sep)



Dep. Var.	EC
June'15* Zhabei	0.0042
	(0.0040)
Sep 15* Zhabei	0.0032
	(0.0048)
Jan'16* Zhabei	0.0117***
	(0.0039)
June'16* Zhabei	0.0198***
	(0.0046)
Card Fixed Effect	Yes
Month Fixed Effect	Yes
R-squared	0.0002
N	1,734,740

Subsample: Young Children

- Identify cardholders with young children $\Longrightarrow$ TOT
  - Algorithm: children hospitals, pre-high-school education, or extra-curriculum training, before the merger
- **Expenditure on children: 467-537** (for 2k total consumption)
  - EC is the first-order expenditure (22% total consumption)
  - OCS is the second-order expenditure (2% total consumption)

Variable	mean	sd	p50	Variable	mean	sd	p50
Panel A: Zhabei Sample				*Panel B: Huangpu Sample*			
Total consumption	2,069.88	8,938.48	510.00	Total consumption	2,821.38	11,329.04	548.59
Credit	1,811.65	5,595.35	483.00	Credit	2,528.10	7,718.77	482.91
Debit	4,232.47	21,946.20	1,000.00	Debit	3,714.09	18,359.01	900.00
Kid consumption	466.04	2,688.65	0.00	Kid consumption	536.56	4,787.76	0.00
EC	456.22	2,686.53	0.00	EC	535.05	4,787.81	0.00
OCS	9.83	89.05	0.00	OCS	1.51	33.80	0.00

Subsample Analysis: Young Children

Dep. Var.	(1)	(2)	(3)	(4)
	Expenditure on Childern			Total Expenditure
	Total	EC	OCS	
After*Zhabei	0.285***	0.153**	0.140***	-0.001
	(0.0777)	(0.0747)	(0.0212)	(0.0673)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	78,532	78,532	78,532	78,532
R-squared	0.011	0.035	0.037	0.006

- Within the subsample, after the merger, cardholders in ZB:
  - higher expenditure on children (0.285, baseline: 0.026)
  - have the same total expenditure
  - lower the non-kid-related expenditure

Cross-sectional: Young Children

Dep. Var.	(1)	(2)	(3)	(4)
	Expenditure on Children			Total Expenditure
	Total	EC	OCS	
After*Zhabei	0.0197***	0.0015	0.0182***	-0.0103
	(0.00221)	(0.00104)	(0.00194)	(0.00817)
After*Child	-0.0788	-0.0576	-0.0211	0.0072
	(0.0753)	(0.0724)	(0.0199)	(0.0670)
After*Zhabei* Child	0.251***	0.136*	0.122***	0.0053
	(0.0774)	(0.0743)	(0.0213)	(0.0679)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	3,771,182	3,771,182	3,771,182	3,771,1822
R-squared	0.002	0.001	0.001	0.005

Robustness

- Main concern:
  - No information on demographics, we base on **historical consumption pattern** to infer whether cardholders have kids
  - No information on intensity of treatment

- We do the following:
  1. Placebo test: adult children ⏩ placebo
  2. Different effects depending on distance to border ⏩ distance
  3. Subsample: debit cards (multiple cards for one person) ⏩ debit
  4. Suabsample: active cards ⏩ active

A Placebo Test: Adult Children

- Identify cardholders with adult children, should not be affected
  - Algorithm: attending universities, vocational schools, and correspondence schools one year before the merger

Dep. Var.	(1)	(2)	(3)	(4)
	Expenditure on Children			Total Expenditure
	Total	EC	OCS	
After*Zhabei	0.0319	-0.0169	0.0488	-0.0491***
	(0.0662)	(0.0513)	(0.0418)	(0.0800)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	238,274	238,274	238,274	238,274
R-squared	0.000	0.000	0.000	0.004

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Distance to the Old Border: Within ZB Analysis

- Intensity of treatment: distance to border
- Algorithm: identify card holders in ZB who are likely to live within 2km of underground stations based on merchant geocode
  - Hanzhong Road Station: closest to JA
  - Gongkang Road Station: farthest from JA

Distance to the Old Border: Within ZB Analysis

Dep. Var.	(1)	(2)	(3)	(4)	(5)
	Child Expenditure				Total Expenditure
	Total	EC	EC (Seasonality)	OCS	
After*Far	-0.0162***	-0.0010	-0.0091*	-0.0152***	-0.0064
	(0.0044)	(0.0022)	(0.0052)	(0.0039)	(0.0107)
Card Fixed Effect	Yes	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	405,169	405,169	137,561	405,169	405,169
R-squared	0.0014	0.0017	0.0013	0.0009	0.0049

- Far from the old border: less likely to send their children to JA
- Effects are less for people who live farther away from the border

back

Subsample: Debit Cards

- One person may hold multiple cards
  - Less incentive to hold multiple debit cards than credit cards
  - Subsample of only debit cards: smaller magnitudes

Panel A: Debit Card Sample				
Dep. Var.	Expenditure on Children			Total Expenditure
	Total	EC	OCS	
After*Zhabei	0.0111***	0.0042**	0.0070***	-0.0198
	(0.0027)	(0.0106)	(0.0020)	(0.0129)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	1,659,450	1,659,450	1,659,450	1659450
R-squared	0.0002	0.0000	0.0002	0.0043
Panel B: Debit Card & Young Children Sample				
After*Zhabei	0.4008***	0.2942**	0.1188***	0.1320
	(0.1417)	(0.1403)	(0.0227)	(0.1275)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	8,705	8,705	8,705	8,705
R-squared	0.0021	0.0005	0.0050	0.0074

back

Subsample: active cards

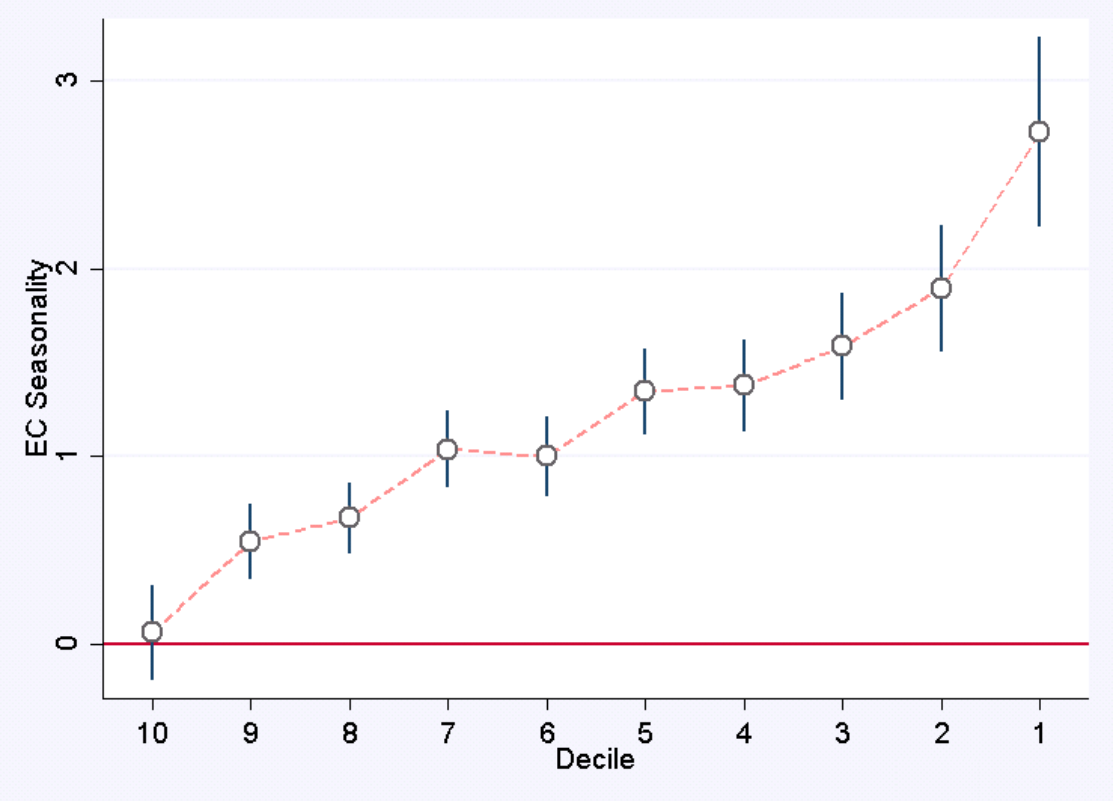
- We exclude cards that are not active

Dep. Var.	(1)	(2)	(3)	(4)
	Expenditure on Childern			Total expenditure
	Total	EC	OCS	
After*Zhabei	0.0583***	0.0240**	0.0505***	0.0074
	(0.0076)	(0.0092)	(0.0060)	(0.0142)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	3219350	3219350	3219350	3219350
R-squared	0.011	0.035	0.037	0.006

Historical Consumption Levels

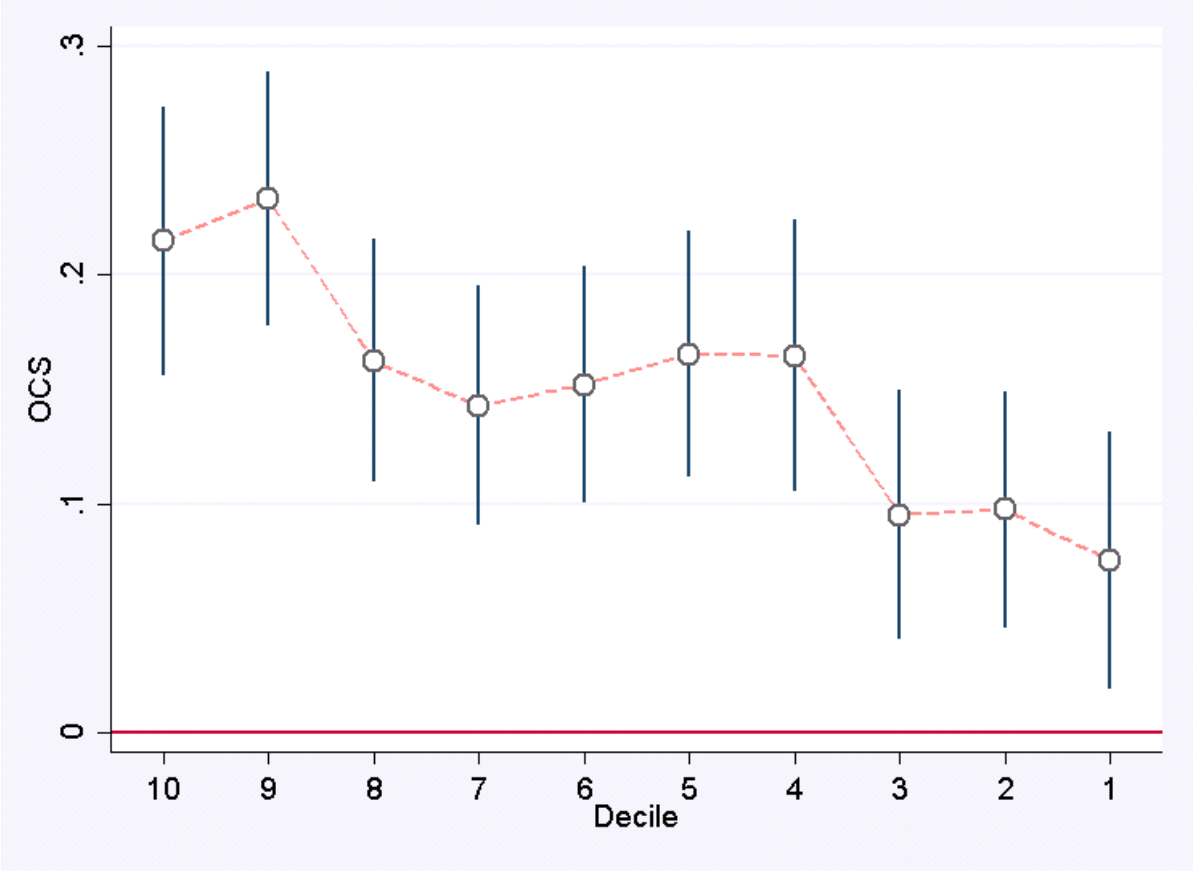
- Parental investment in children is one important source of intergenerational inequality
- Do different income groups respond to the changes in educational opportunities differently?
  - We create a proxy for income:
    average monthly total spending per card before the merger
  - We show triple interactions:
    - Parental investment in EC does not depend on income
    - Investment in OCS is more likely to be affected by income
  - We further show the effects across income deciles.

Effects Vary with Historical Consumption: EC



- The poor: responded more to the merger
- The rich: no response (better outside options for the rich, and already high EC)
- Policy implication: encourage eqaulity in education?

Effects Vary with Historical Consumption: OCS



- OCS: The rich responded more to the merger (keeping up with rich neighbours)

Outline

Alternative Mechanisms

- The district merger may also affect residents in other ways
  1. May cause more fierce competition rather than improved opportunities competition
  2. May cause housing appreciation housing
  3. "Keeping up with the Joneses" preference Joneses

Alternative Mechanism 1: Competition

1. If driven by competition, intensity of treatment should not vary with distance to the old border
2. Lookg at JA vs HP:
   - Merger makes JA rather than ZB face stronger competition Score
   - If driven by competition, effects in JA should be stronger
   - BUT: no effect on EC, much milder on OCS (1/2 - 1/3 of the magnitude in ZB)

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.:	Full Sample			Young Children Subsample		
	Total	EC	OCS	Total	EC	OCS
After*Jing'an	0.010***	0.002	0.008***	0.127*	0.077	0.051***
	(0.0027)	(0.0017)	(0.0020)	(0.0715)	(0.0695)	(0.0196)
Card Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,837,605	1,837,605	1,837,605	90,358	90,358	90,358
R-squared	0.000	0.000	0.000	0.002	0.002	0.001

3. Looking at JA vs ZB: ZB expenditure on children ↑

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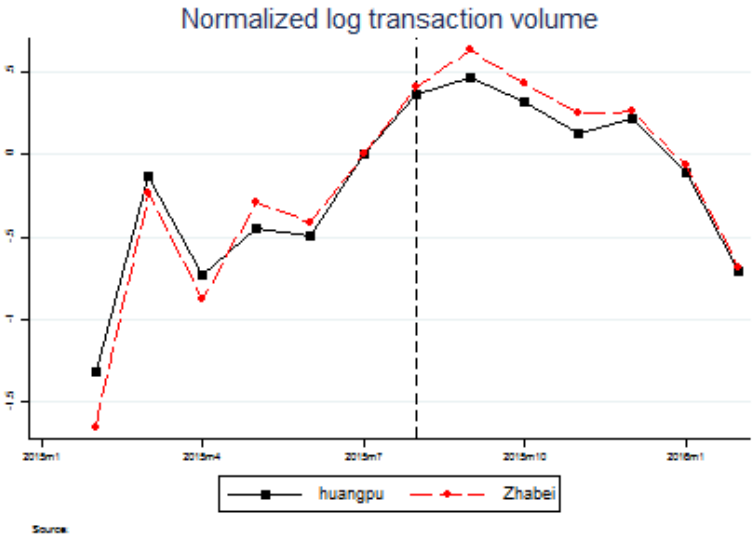
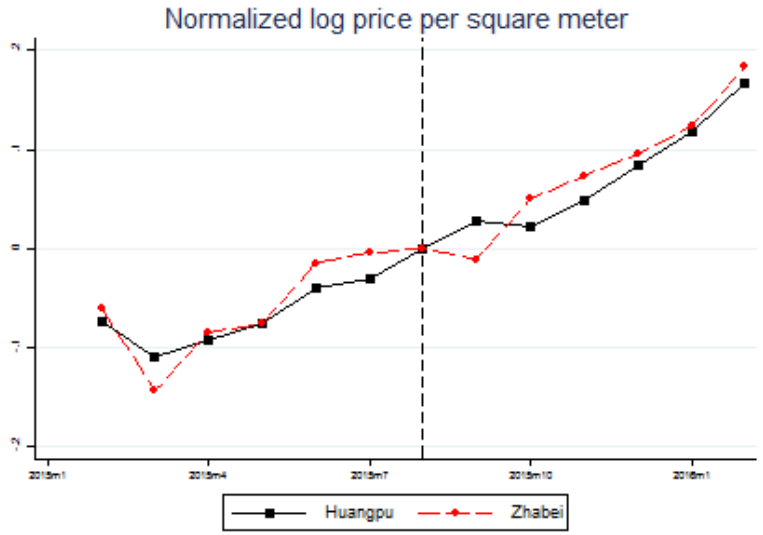
Alternative Mechanism 2: Housing Wealth





- Wealth boom for people who have houses? (they are also more likely to have kids)
- Not likely!
  - no effect on total consumption
  - no signficiant jump in housing price & transaction volumes

Alternative Mechanism 2: Housing Wealth

- Identify people who are likely to be house owners
- Algorithm: property services, real estate transactions, before the merger

Dep. Var.	(1) Expenditure on Children Total	(2) Expenditure on Children EC	(3) Expenditure on Children OCS	(4) Total Expenditure
Panel A: Triple Interaction				
After*Zhabei*House	0.192	0.176	0.016**	0.556*
	(0.1718)	(0.1717)	(0.0072)	(0.3114)
Other Interactions	Yes	Yes	Yes	Yes
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	3,771,182	3,771,182	3,771,182	3,771,182
R-squared	0.001	0.001	0.001	0.005
Panel B: Fourth Interaction				
After*Zhabei*Child*House	-0.264	-0.226	-0.031	-0.748**
	(0.220)	(0.215)	(0.047)	(0.337)
Other Interactions	Yes	Yes	Yes	Yes
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	3,771,182	3,771,182	3,771,182	3,771,182
R-squared	0.002	0.001	0.001	0.005

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Alternative Mechanism 3: Keeping up with the Joneses

- We did not find effect when looking at total consumption
- The effect should decline with wealth, but:
  - OCS (yes): dress children better to keep up with weathy neighbour
  - EC (no): effect does not depend on wealth

⏩ Heterogeneity

Concluding Remarks

- **Contribution**:
  - Empirical study measuring monetary investment in children
  - Parents respond to improvement in perceived educational opportunities
  - Sizeable effect of exposure to good neighbourhood/school on childern's outcomes: one mechanism perhpas is through parental investment

- **Policy implications**:
  - How to encourage more private expenditure on children?
    - Costless solution: more and better public education with merit-based system $\Longrightarrow$ parental investment $\uparrow$
  - Fairness: the poor responded more to better public education opportunities $\Longrightarrow$ encourage equality in education $\uparrow$

Concluding Remarks

- **Open questions**:
  - Does the evidence from China speak to other countries with different cultural values toward education?
  - Link parental input to childern's actual academic outcomes (but many other studies prove the positive association)

Institutional Background: merger JA & ZB

Districts	2012	2013	2014	2015
Year-End Resident Population(10,000)				
Jing'an	25.58	24.99	24.86	23.69
Zhabei	84.61	84.73	84.85	83.71
Density of Population(person/sq.km)				
Jing'an	33570	32795	32625	31089
Zhabei	28917	28958	28999	28609
Local Fiscal Revenue (100 million yuan)				
Jing'an	79.28	85.63	92.48	106.24
Zhabei	64.95	70.52	78.88	88.13

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Subsample Analysis: Young Children Alternative

- Another classification based on fees paid for compulsory schooling
  - Less subject to selection
  - Significant, but smaller magnitudes

Dep. Var.	(1)	(2)	(3)	(4)
	Expenditure on Children			Total Expenditure
	Total	EC	OCS	
After*Zhabei	0.1373***	0.0549*	0.0832***	-0.4478
	(0.0424)	(0.0335)	(0.0197)	(0.4310)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	5731	5732	5733	5734
R-squared	0.0123	0.0107	0.006	0.0243

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Heterogeneous Effects: Historical Consumption Levels

- Income: average monthly total spending per card before the merger

Dep. Var.	Expenditure on Children				Total Expenditure
	Total	EC	EC (seasonality)	OCS	
After*Zhabei	0.0200***	0.00138	0.0185***	0.0186***	-0.00957
	(0.00221)	(0.00104)	(0.0048)	(0.00194)	(0.00813)
After*Income	-0.174	-0.151	0.0120*	-0.0234	0.140
	(0.179)	(0.176)	(0.0070)	(0.0290)	(0.109)
After*Zhabei*Income	0.352*	0.236	-0.0059	0.124***	-0.120
	(0.180)	(0.177)	(0.0067)	(0.0299)	(0.109)
Card Fixed Effect	Yes	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	3,771,182	3,771,182	1257768	3,771,182	3,771,182
R-squared	0.002	0.001	0.004	0.001	0.005

- Parental investment in EC does not depend on income
- Investment in OCS is more likely to be affected by income

Keep up with Joneses

Pretrend Analysis: Expenditure on Children