

Opening Doors, Widening Gaps?

The Distributional and Intergenerational Effects of China's Higher Education Expansion

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- 1 Motivation & Background
- 2 Conceptual Framework & Data
- 3 Empirical Strategy
- 4 Main Results
 - College Attendance Effects
 - Distributional & Income Effects
- 5 Mechanisms: Intergenerational Channels
- 6 Robustness Checks
- 7 Policy Implications & Conclusion



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- Countries worldwide have dramatically expanded higher education access
- Two competing views on distributional consequences:
 - ▶ **Equalizing**: Relaxing supply constraints lowers barriers for disadvantaged groups
 - ▶ **Stratifying**: Advantaged households better positioned to capture new slots
- China's 1999 expansion is one of the **largest and fastest** supply-side reforms in history
 - ▶ Enrollment quotas nearly doubled overnight: 1.08M (1998) → 1.59M (1999)
 - ▶ Total tertiary enrollment more than tripled between 1998 and 2008

Core Questions:

- Who benefits from large-scale higher education expansion?
- Does it reduce or amplify intergenerational inequality?
- What is the asymmetric role of maternal vs. paternal education?



- Pre-1999: Higher education extremely limited and selective
 - ▶ Enrollment capped by centralized national planning
 - ▶ Admission determined almost exclusively by the **Gaokao** (NCEE)
 - ▶ Enrollment rate < 10% in 1998
- The 1999 Reform:
 - ▶ Three goals: raise human capital, alleviate youth unemployment, foster growth
 - ▶ Immediately implemented: 47% year-over-year quota increase in year 1
 - ▶ Massive public investment in university infrastructure
 - ▶ Hundreds of new higher education institutions established
- **Key feature for identification:**
 - ▶ Cohorts born **in 1981 or later** were first exposed to the reform
 - ▶ Earlier cohorts already enrolled/graduated before the reform
 - ▶ Sharp, cohort-based quasi-experimental cutoff



- 1 Causal evidence on the **heterogeneous distributional effects** of large-scale expansion
 - ▶ Urban-rural gaps: urban cohorts saw 21.3% larger enrollment gains
 - ▶ Each additional parental education level: 6.5% larger college attendance gain
- 2 Unpacks the **gendered intergenerational mechanism**
 - ▶ Maternal education has **nearly twofold larger** impact than paternal education
 - ▶ Reform amplified this maternal advantage
- 3 Documents **income distributional effects** via quantile regression
 - ▶ Modest equalizing effect, gains concentrated at median
- 4 Combines DID, Event Study, **Fuzzy RD**, Heckman, Bootstrap Mediation



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An individual attends college if $U_i = R_i - C_i > 0$, where:

- R_i : expected lifetime labor market return to college
- C_i : total cost of college (monetary + non-monetary)

Family background X_i (urban hukou, parental education) affects both:

$$R_i = R(X_i), \quad C_i = C(X_i, S_c)$$

where S_c = aggregate college supply for birth cohort c .

The expansion increases S_c , lowering admission thresholds for all. But the effective cost reduction is heterogeneous across family background.

Three testable hypotheses:

- 1 Expansion raises average college attendance probability
- 2 Effect is larger for advantaged family backgrounds
- 3 Educational gains translate to income gains, with similar heterogeneity



- **China Family Panel Studies (CFPS)**, Peking University
 - ▶ Nationally representative longitudinal household survey
 - ▶ Covers 25 provinces; primary wave: 2022; merge 2010–2020 waves
 - ▶ 27,001 individuals in final sample

Key Variables:

- **Policy exposure:** Binary, born 1981 or later
- **Childhood urban hukou:** Non-agricultural status at age 12
- **Parental education:** Highest parental education (1–8 scale); separate maternal/paternal
- **Outcome – Education:** Ever attended college (junior college or above)
- **Outcome – Income:** Within-cohort percentile income rank

Variable	N	Mean	Std.Dev.	Min	Max
Post-expansion cohort	27,001	0.43	0.50	0	1
Urban hukou at age 12	14,557	0.13	0.34	0	1
Parental highest education	18,570	2.43	1.26	1	8
Within-cohort income rank	10,082	0.50	0.29	0.01	1.00



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Three complementary frameworks, all exploiting the 1981 cohort cutoff:

1 Baseline DID:

$$Y_{ic} = \alpha + \beta_1 \text{Post}_c + \beta_2 X_i + \underbrace{\beta_3 (\text{Post}_c \times X_i)}_{\text{key coefficient}} + \gamma_c + \delta Z_{ic} + \varepsilon_{ic}$$

β_3 : differential effect for advantaged vs. disadvantaged background

2 Event Study: Replace Post_c with cohort dummies $\tau \in [-10, +10]$

- ▶ Tests parallel trends pre-reform
- ▶ Documents dynamic evolution of effects

3 Fuzzy RD: Running variable = birth year – 1981

- ▶ Uses 1981 cutoff as instrument for actual college attendance
- ▶ Robust bias-corrected LATE estimator (Calonico et al., 2014)
- ▶ Bandwidth: 5 years; SE clustered at cohort level



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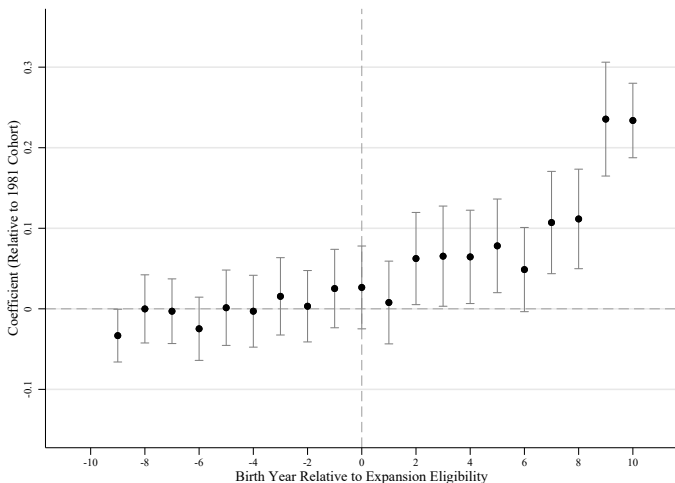


Figure: Dynamic Effects of Higher Education Expansion on College Attendance

Regression Discontinuity: Causal Validation

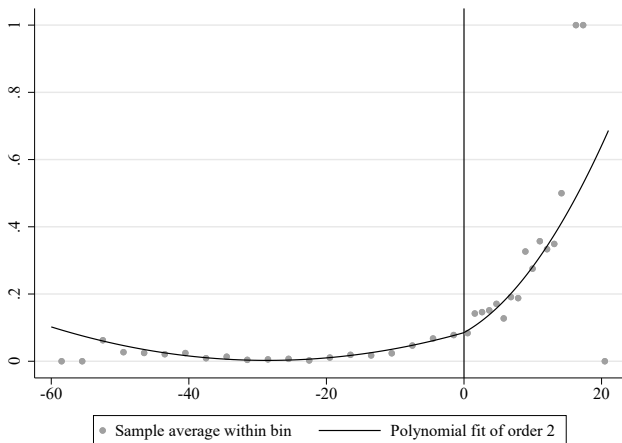


Figure: RD in College Attendance at the 1981 Cohort Cutoff

- McCrary density test p-value = 0.76 \Rightarrow no manipulation of birth year



Table: Main Effects of Higher Education Expansion

	College Attendance		RDD	Income Rank	
	(1) Baseline	(2) Parental Edu	(3) Attend.	(4) Baseline	(5) Non-Gov
Post × Urban	0.213*** (0.026)			0.052** (0.023)	0.045*** (0.015)
Post × Parental Edu		0.065*** (0.009)			
Urban	0.052*** (0.014)	0.122*** (0.017)		0.033*** (0.010)	0.026*** (0.009)
Post-expansion	-0.011* (0.006)	-0.152*** (0.016)		0.946*** (0.023)	0.956*** (0.007)
RD LATE			-0.024** (0.009)		
Cohort FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	9,019	9,019	14,227	4,356	4,322
R ²	0.225	0.212		0.269	0.283

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. SE clustered at cohort level.

Urban cohorts: +21.3% college attendance; each parental edu level: +6.5%



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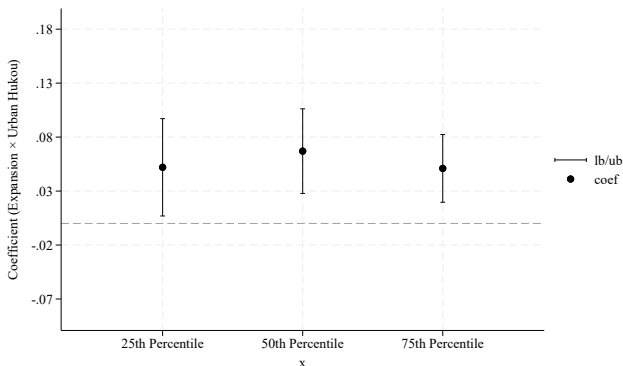


Figure: Distributional Effects on Within-Cohort Income Rank

- Q25: +0.052** ; Q50: +0.067*** ; Q75: +0.051***
- Largest gains at median \Rightarrow modest **equalizing effect** on income inequality
- But urban-rural income rank gap persists even after controlling for education

Heterogeneous Effects by Family Background

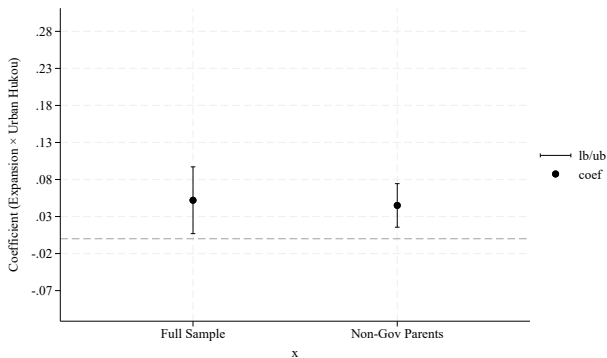


Figure: Heterogeneous Effects by Family Background Subgroups

- High parental education: effects more than **twice as large** as low parental education
- Non-government parents: income rank +4.5% (significant at 1%)
- Government-sector parents: insufficient variation to identify effect ($N = 34$)





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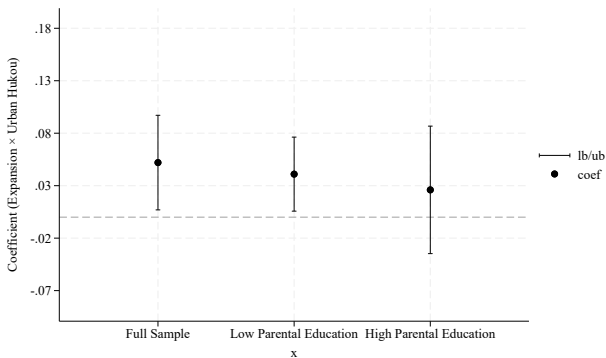


Figure: Expansion Effects on Income Rank by Parental Education

- High parental education: larger and more precisely estimated income gains
- Mechanism: information about admissions, academic preparation, higher expectations
- Not purely financial constraints it's the **non-monetary channels** that matter

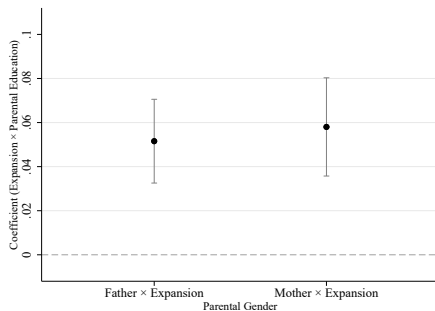


Figure: Interaction Effects: Expansion and Parental Education

- **Maternal education:** +5.8% college attendance per level (post-expansion)
- **Paternal education:** +5.2% college attendance per level (post-expansion)
- Asymmetry statistically significant at 10%; maternal effect **nearly twofold larger**
- Consistent with literature: mothers shape study behavior, aspirations, expectations

Heterogeneous Effects by Parental Education (Table)



Table: Heterogeneous Effects by Paternal and Maternal Education

	(1) Father Base College Att.	(2) Father Interact College Att.	(3) Mother Base College Att.	(4) Mother Interact College Att.
Post-expansion	-0.017** (0.008)	-0.128*** (0.015)	-0.036*** (0.009)	-0.149*** (0.019)
Post × Father Edu		0.052*** (0.009)		
Post × Mother Edu				0.058*** (0.011)
Urban	0.080*** (0.022)	0.175*** (0.021)	0.069*** (0.021)	0.152*** (0.020)
Cohort FE	Yes	Yes	Yes	Yes
Obs.	5,472	5,472	5,472	5,472
R ²	0.220	0.206	0.224	0.215

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. SE clustered at cohort level.

Maternal education: +5.8% vs. Paternal: +5.2% per level post-expansion

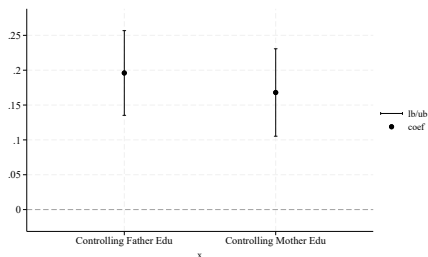


Figure: Urban Hukou Advantage by Parental Education

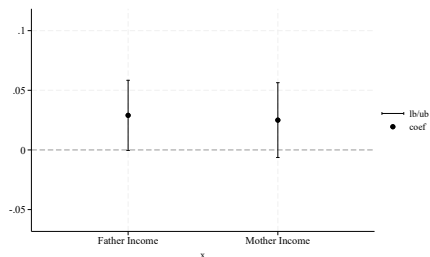


Figure: Income Gains by Parental Education

Bootstrap Mediation (1,000 reps):

- Indirect effect (via college attendance): 0.041*** [0.023, 0.059]
- Direct effect: 0.011 (insignificant)
- 78.2% of total income effect operates through college attendance



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Table: Robustness Checks for Baseline DID Estimates

	(1) Baseline	(2) Donut	(3) Bachelor's+	(4) Probit AME	(5) Heckman
Post × Urban	0.107** (0.043)	0.132*** (0.043)	0.030** (0.015)	0.199 (0.245)	0.025 (0.017)
Inv. Mills Ratio (λ)					-0.213*** (0.063)
Cohort Trend × Urban Obs.	Yes 9,019	Yes 8,070	Yes 9,019	Yes 8,099	Yes 9,019

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

(2) Donut design: excludes cohorts born 1979–1983.

(3) Outcome = bachelor's degree or above.

(4) Average marginal effects from Probit model.

(5) Heckman two-step: λ significant, but core interaction remains.



Probit Average Marginal Effects

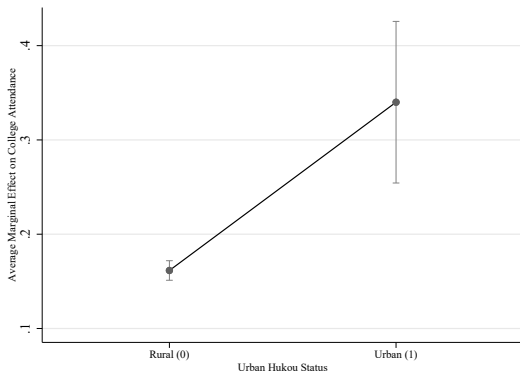


Figure: Average Marginal Effects of Expansion by Hukou Status (Probit)

- Urban: clearly positive and significant marginal effect
- Rural: smaller, statistically insignificant
- Pattern nearly identical to baseline LPM \Rightarrow robust to functional form



- 1% Winsorization** of parental education
 - ▶ Interaction remains positive, significant at 5%, nearly identical magnitude
- Narrow window:** restrict to cohorts born 1980–1982
 - ▶ Eliminates confounding from 1977 Gaokao restoration
 - ▶ Effect remains significant at 1%, larger magnitude
- Bootstrap standard errors** (1,000 reps)
 - ▶ Core interaction: significant at 1%, unchanged magnitude
- Permutation placebo test** (1,000 random treatment assignments)
 - ▶ 93% of placebo coefficients smaller than true estimate
 - ▶ One-sided p-value = 0.07 \Rightarrow results not due to chance

All robustness checks confirm the heterogeneous effects of the expansion



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1 Supply-side expansion alone is insufficient to equalize opportunity

- ▶ Reform raised aggregate attainment but amplified intergenerational persistence
- ▶ Policy must address *distribution* of access, not just *quantity* of slots

2 Target pre-college barriers faced by disadvantaged households

- ▶ Key mechanism: informational and academic barriers (not just financial)
- ▶ Need: better rural education quality, free college counseling, early childhood programs
- ▶ Maternal education most critical lever — target low-maternal-education households

3 Complementary labor market policies are essential

- ▶ Urban-rural income rank gap persists even after controlling for education
- ▶ Eliminate hukou-based labor market discrimination
- ▶ Targeted job placement for rural and first-generation college graduates



Positive welfare gains:

- Dramatic increase in total college enrollment and national human capital
- Income gains concentrated in lower and middle parts of the distribution
- Absolute attainment gains for all groups (even disadvantaged)

Equity costs:

- Largest gains accrued to already-advantaged urban, high-parental-education households
- Strengthened persistence of socioeconomic status across generations
- May limit long-run social mobility and aggregate talent development

Net welfare effect depends on the social welfare function:

- Prioritizes aggregate growth \Rightarrow unambiguously welfare-improving
- Prioritizes equal opportunity \Rightarrow net gain substantially smaller

Education policy must balance aggregate access and equitable utilization



Three core findings:

- 1 Highly unequal reform benefits:** Urban cohorts +21.3% vs. rural; each parental education level +6.5%
- 2 Maternal education is the key intergenerational channel:**
 - ▶ Maternal effect (5.8%) > Paternal effect (5.2%) per additional level
 - ▶ Reform amplified this gendered asymmetry in intergenerational transmission
- 3 Modest income equalizing effect, but persistent intergenerational gaps:**
 - ▶ Income gains significant at Q25, Q50, Q75
 - ▶ 78.2% of income effect flows through college attendance channel

Key lesson for education policy:

Large-scale higher education expansion raises aggregate human capital but does not equalize opportunity without complementary interventions targeting academic, informational, and institutional barriers faced by disadvantaged households.

Thank you!

Questions and comments are welcome.