Intergenerational mobility of education in Vietnam: Evidence from the Vietnam War

Khoa Vu[1,2] Maria Lo Bue [2]

[1]University of Minnesota

[2]UNU-WIDER

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Vietnam's students perform mysteriously well on tests, and researchers have figured out why

Chloe Pfeiffer Jul. 14, 2016, 3:12 PM

Vietnam is one of education's biggest outliers: It's basically the only low-income country that performs at the same level as rich countries on international academic tests.

Kham/Reuters

There's a clear positive relationship between a country's economic strength and how well its students perform on

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Vietnam's Exceptional Learning Success: Can We Do That Too?

APRIL 9, 2018

Maryam Akmal

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In the last international PISA assessment for math and science, Vietnam outperformed many developed countries, including the UK and the US. Yet Vietnam only has a small fraction of the GDP of these countries. No other low-income country performs at the same level or better than developed countries on an international assessment.

This "Vietnam effect" shows that high education quality is possible even with lower income levels, and appears to reveal revolutionary possibilities. Should other countries with similar income levels, such as Indonesia, be asking themselves: "Why not me?"

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ASIA LIFE

Vietnam's PISA Surprise

How has the country been able to overcome socioeconomic disadvantages to perform so well?

By M Niaz Asadullah and Liyanage Devangi Perera
November 01, 2015

Image Credit: Vietnamese students via zeber / Shutterstock.com

Vietnam's performance in the latest round of the Program for International Student Assessment (PISA) has created a stir among education experts and policymakers around the world. The country's 15-year olds participated for the first time in the 2012 assessment and ranked 17th in mathematics, 8th in science, and 19th in reading among 65 participating nations, placing Vietnam above the OECD average. At a time when Western countries are striving to replicate East Asia's success in education, Vietnam has outranked the United States, Australia, and the United Kingdom. In doing so, it has become an exception to the argument that educational excellence is not possible without a high level of economic development.

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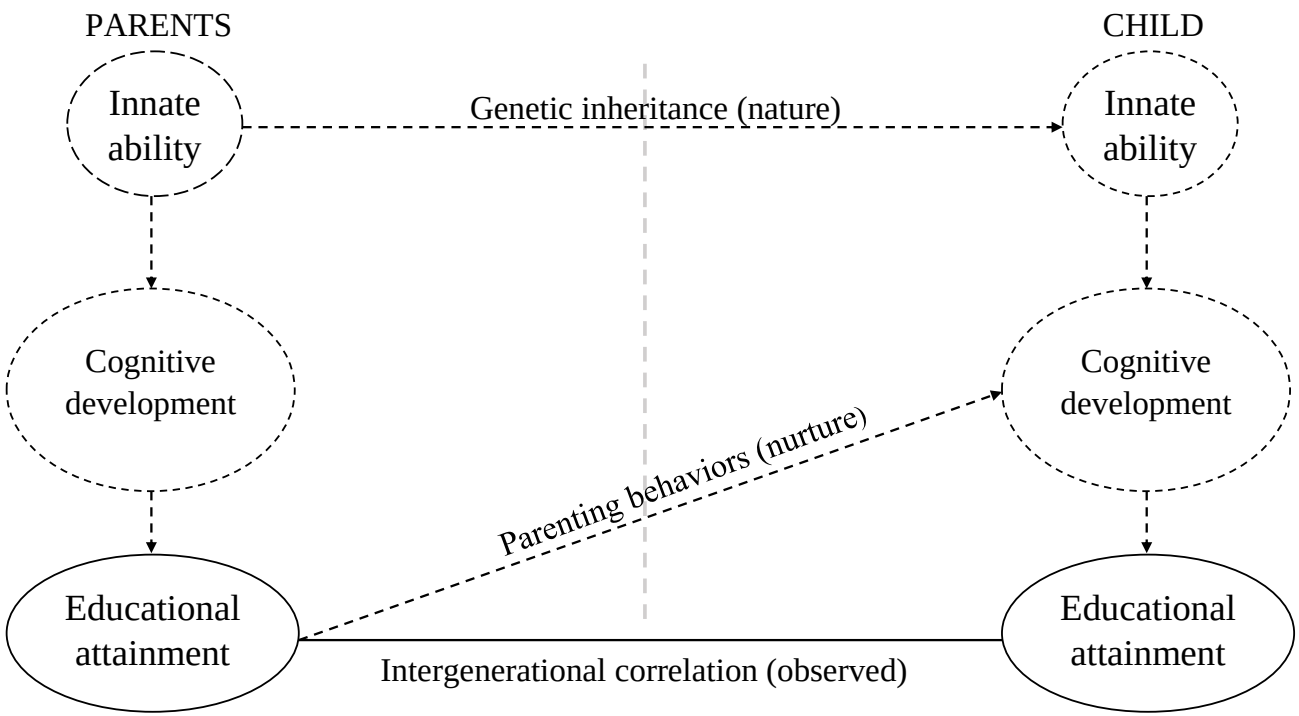
Research motivation

- Did Vietnam get it right? Important implications for other low-income countries.
- Previous work with Glewwe, Lee (UMN) and Dang (WB) suggest that parental education plays an important role.
- Policy relevant: Can improving education for one generation also benefit the next generation?

Correlation between parent's and child's education

Measuring causal relationship between parental education and child's education is challenging



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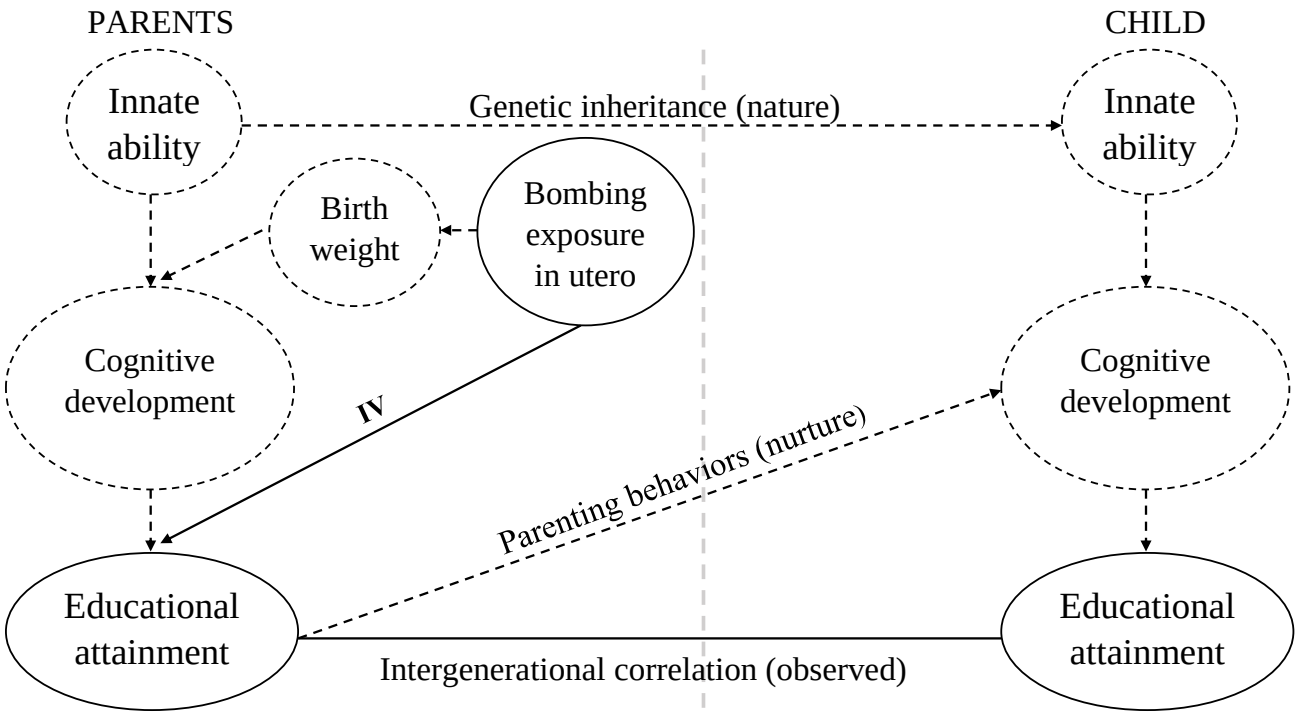
Research question and design

- Research question: measuring causal impact of parental education on child's educational attainment.

- Using parental exposure in utero to aerial bombing during the Vietnam War as instrument for parents' education:
  1. Some parental cohorts conceived during or after the War.
  2. Exposure in utero to stress caused by war and conflicts leads to low birth weight which affects cognitive development (e.g. Lee 2014; Quintana-Domeque & Rodenas-Serrano 2017).
  3. This damage is not genetically inheritable to the next generation.

Research design: Causal graph



Background

- The US directly entered in the Vietnam War in late 1964. The War ended in 1975.

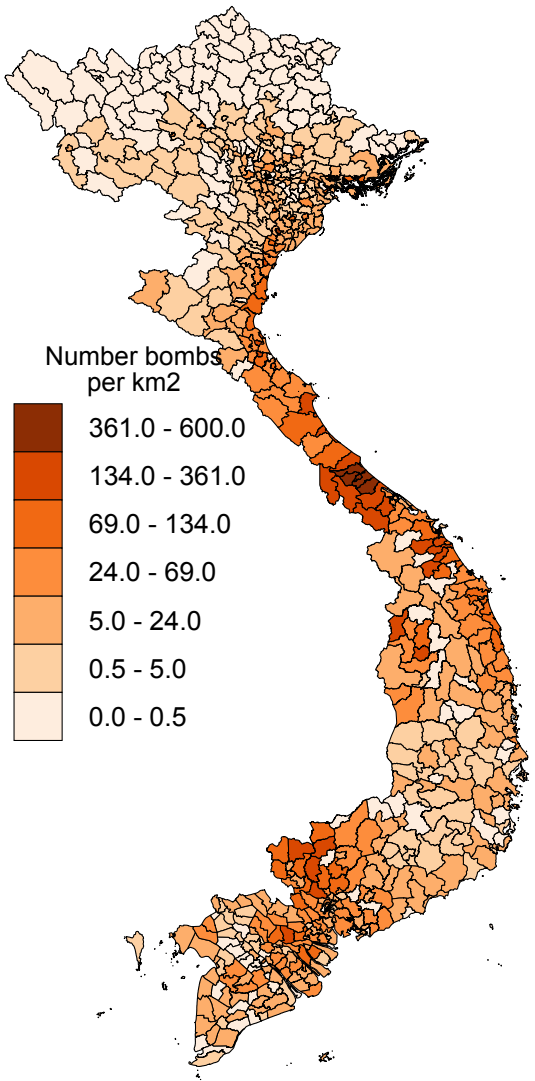
- The two major bombing periods:

  1. The Rolling Thunder operation: 1965-1968
  2. The Linebacker I and II operations: 1972

- Total aerial bombing tonnage exceeded that in World War II and in the Korean War.

Variation in bombing intensity

- District-level data provided by Miguel & Roland (2011).
- Used in Miguel & Roland (2011), Noce et al (2016), Saurabh (2018).
- Intensity concentrated at the 17th Parallel (boundary between the Communist Party and the Vietnam Republic).



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Data

- Main sample from 2014-2016 Vietnam Household Living Standard Survey (VHLSS). Bombing data is merged to parental province of birth.
- Selecting parental sample: Individuals born between 1965 and 1980. Restrict to household's heads and spouse (90%).
- Child sample: Age 7+ born to the parental sample. Main unit of analysis. ▸ Summary stat
- Main independent var: Parental years of schooling.
- Main outcome: child's age-for-grade indicator ($= 1$ if child on track compared to peers at same age).

Model

For child i whose parents born in province p and (conceived in) year c:

$$Educ_i = \alpha.Y_i^{parent} + \delta.age_i + \theta.\mathbf{X}_i^{parent} + \kappa_p^{parent} + \gamma_c^{parent} + \epsilon_i$$

$$Y_i^{parent} = \beta(bomb_p^{parent} \times Exposed_c^{parent}) + \eta.age_i + \mu.\mathbf{X}_i^{parent} + \kappa_p^{parent} + \gamma_c^{parent} + u_i$$

where $Educ_i$ is child's education, Y_i^P is parental years of schooling, $bomb_p$ is bombing intensity in province p, and $Exposed_c = 1$ if conceived in 1993 or later.

$\mathbf{X_i^{parent}}$ and age_i are vector of parental characteristics and child's age indicators. κ_p^{parent} and γ_c^{parent} are province of birth and cohort FE for parents.

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Effect of father's education on child's education

	OLS	First stage	IV	Reduced form
Education of:	Child	Father	Child	Child
Panel A: Baseline model				
Father's education	0.029***		0.004	
	(0.001)		(0.027)	
Bombing exposure		-0.267***		-0.001
		(0.077)		(0.007)
1st stage F-stat			24.6	
Olea and Pflueger F-stat			12.0	
Weak IV robust p-value			0.88	
Panel B: Controls for province-cohort trends				
Father's education	0.029***		-0.008	
	(0.002)		(0.028)	
Bombing exposure		-0.504***		0.007
		(0.135)		(0.013)
1st stage F-stat			29.0	
Olea and Pflueger F-stat			13.0	
Weak IV robust p-value			0.61	
Dep. var mean	0.710	7.416		

Effect of mother's education on child's education

	OLS	First stage	IV	Reduced form
Educational outcome of:	Child	Mother	Child	Child
Panel A: Baseline model				
Mother's education	0.035***		-0.053	
	(0.002)		(0.075)	
Bombing exposure		-0.118*		0.006
		(0.069)		(0.007)
1st stage F-stat			1.6	
Olea and Pflueger F-stat			2.9	
Weak IV robust p-value			0.37	
Panel B: Controls for province-cohort trends				
Mother's education	0.035***		-0.031	
	(0.001)		(0.081)	
Bombing exposure		-0.082		0.004
		(0.135)		(0.013)
1st stage F-stat			0.2	
Olea and Pflueger F-stat			0.4	
Weak IV robust p-value			0.77	
Dep. var mean	0.710	6.935		

Assumptions

Main assumptions:

1. IV relevance
2. IV exogeneity
3. IV excludability
4. IV monotonicity

Remaining issues (discussed later if time permits):

1. Alternative measures of outcomes.
2. Sample selection - unobserved outcomes for child moving out of household.
3. Changes in spouse's characteristics (assortative marriage) and educational investment.

IV relevance: First-stage results

Impacts of bombing exposure on parental education are negative and significant. Bombing exposure passed the weak IV test for father's, not mother's education.

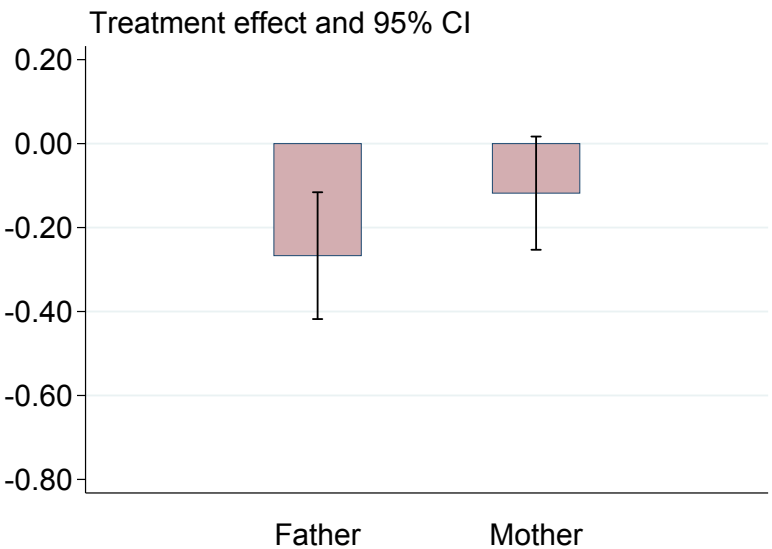
Outcome	Father's education	Mother's education
Bombing exposure	-0.27***	-0.12*
	(0.08)	(0.07)
F-stat (nonrobust)	24.57	1.56
F-stat (Olea & Pflueger)	12.01	2.95
Dep. mean	7.42	6.94
N	10488	11289

Exogeneity (first stage)

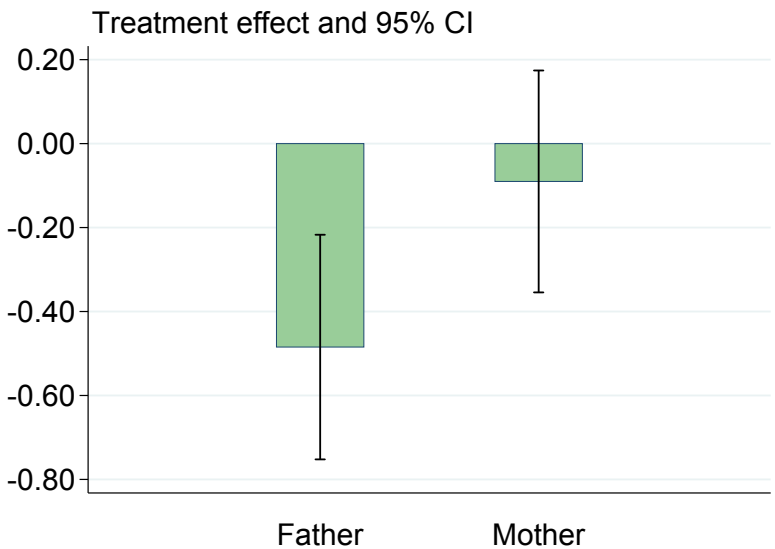
- Bombing intensity is likely strategic, not random.
- Difference-in-differences model accounts for unobserved heterogeneity across province and cohorts.
- Assumption: No unobserved confounding factor with differential impacts on education across parental cohorts (parallel trends).
- Checks:
  1. Adding province-cohort trends controls (allowing differential trends across provinces)
  2. Event study analysis
  3. Instrumenting bombing intensity
  4. Bombing exposure and grandparents' death

Re-estimate first-stage with province-cohort trend controls

Estimate for impact on father is robust to inclusion of province-cohort trends.



Baseline

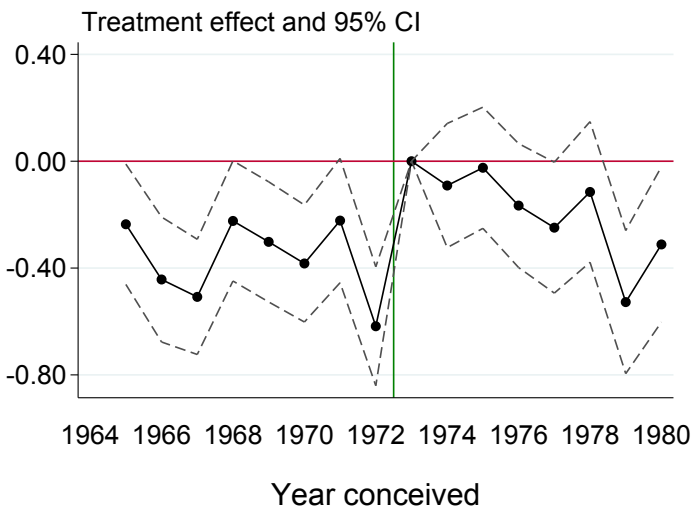


Province-cohort trends controls

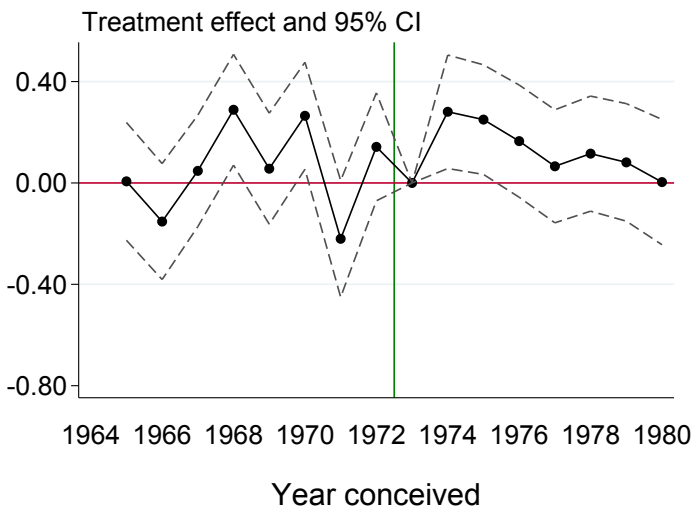
Re-estimate first-stage with event study setup

Impacts of parental bombing exposure on parental years of schooling by parental cohort:

$$Y_i^{parent} = \sum_{e=1965}^{1972} \beta_e (bomb_p^{parent} \times T_e^{parent}) + \sum_{u=1974}^{1980} \beta_u (bomb_p^{parent} \times T_u^{parent}) + \text{controls}_i + \epsilon_i$$



Father's exposure

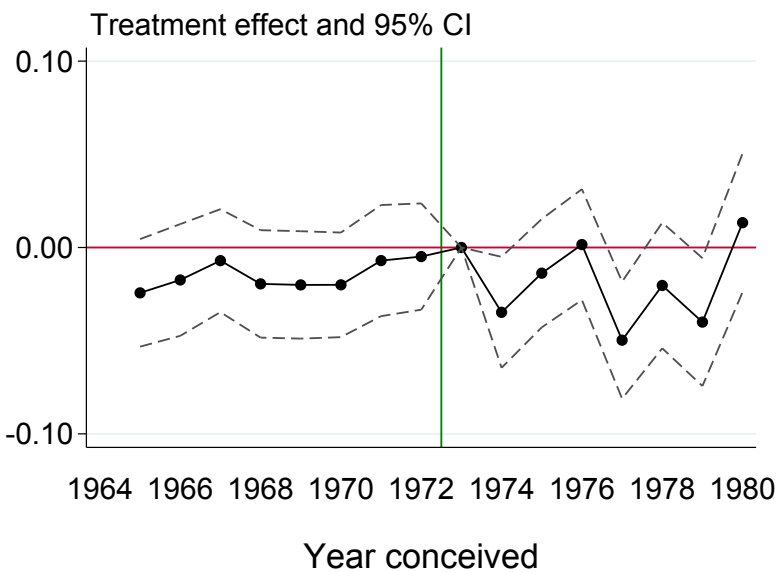


Mother's exposure

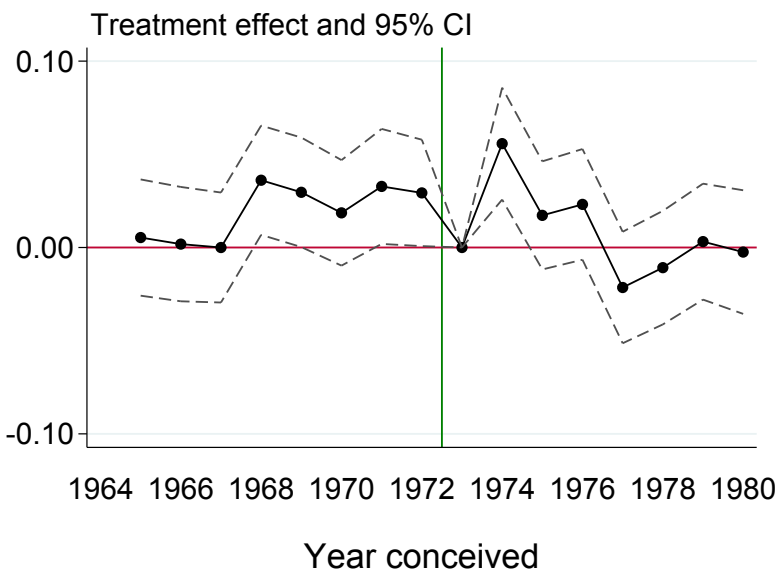
Reduced form event study

Impacts of parental bombing exposure on child's educational attainment by parental cohorts:

$$Educ_i = \sum_{e=1965}^{1972} \beta_e(bomb_p^{parent} \times T_e^{parent}) + \sum_{u=1974}^{1980} \beta_u(bomb_p^{parent} \times T_u^{parent}) + \text{controls}_i + \epsilon_i$$



Father's exposure

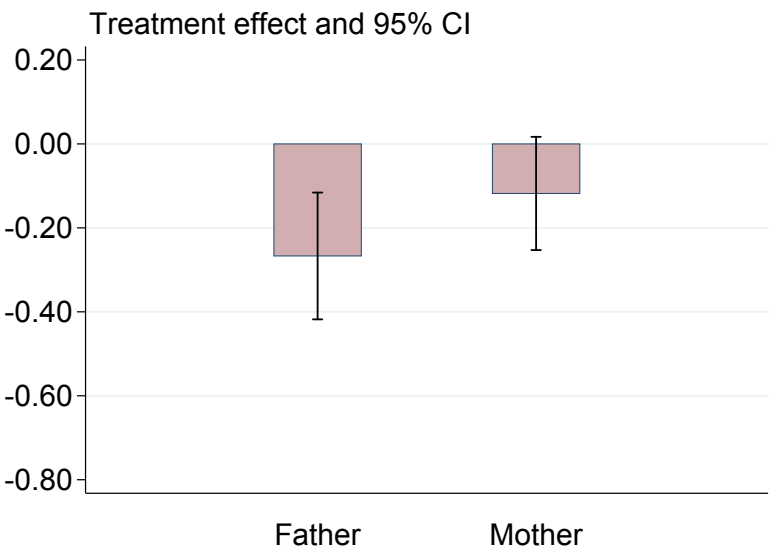


Mother's exposure

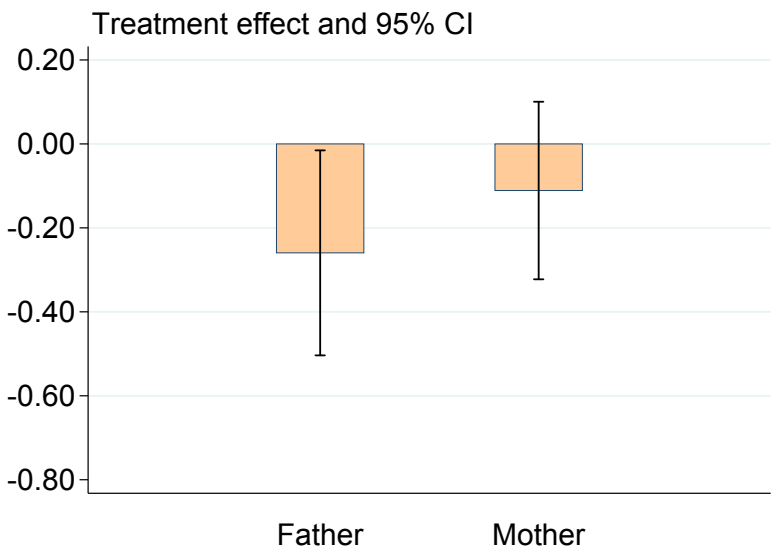
Re-estimate first-stage with instrumented bombing

Previous studies instrumented bombing intensity with distance to the 17th Parallel. Re-estimate first-stage separately with instrumented bombing intensity does not change the results:

$$Y_i^{parent} = \beta(\hat{bomb}_p^{parent} \times Exposed_c^{parent}) + \eta.age_i + \mu.\mathbf{X}_i^{parent} + \kappa_p^{parent} + \gamma_c^{parent} + u_i$$



Baseline



IV

Bombing direct impact on grandparents

- Grandparents (0th generation), exposed directly to bombing, who gave birth during the War might have been more likely to die.
- Main findings might have been driven by grandparental deaths, e.g. parents missing their own parents might done worse in school,
- Test this with VLSS 1998 data: estimate impacts of bombing exposure on reported parental death among 1965-80 cohorts (age 18-33 in 1998):

$$Death_j^{parent} = \beta(bomb_p \times Exposed_c) + \theta.\mathbf{X_j} + \kappa_p + \gamma_c + u_j$$

for individual j born in province p, conceived in year c.

Bombing exposure impacts on 0th generation's death

No evidence of correlation between parental exposure and grandparents' deaths:

Outcome	Father's death	Mother's death
Estimates	-0.011	-0.015
SE	(0.013)	(0.014)
p-value	0.36	0.29
Dep. mean	0.476	0.240
N	2841	2302

Excludability

- Bombing exposure only affects child's education through parental education, even through another intermediate channel ▸ Graph
- Potential violation: Bombing exposure may also affect parental disability (Elder et al 2019) and subsequently affect child's education. ▸ Graph

Checks for excludability

- Use 1st-stage setup to check for exclusion restriction:

$$\begin{aligned}\text{Outcome}_i^{parent} =& \beta(bomb_p^{parent} \times Exposed_c^{parent}) + \eta.age_i \\ &+ \mu.\mathbf{X}_i^{parent} + \kappa_p^{parent} + \gamma_c^{parental} + u_i\end{aligned}$$

- Results:
  - Census 2009: generally no impact on disability.
  - 2014-2016 VHLSS: No evidence of impact on type of work (agriculture, production, non-salary), and wage and salary.
- No evidence of excludability violation so far.

Effects of bombing on parental disability

Analysis on the Census 2009 relies on bombing intensity of province of current residence. Extremely small point estimates suggest no impact on disability.

Parental outcome	Male	Female
Disability status	0.0000	-0.0000
	(0.0001)	(0.0001)
Dep. mean	0.0053	0.0044
Blind or vision-impaired	-0.0003	-0.0003*
	(0.0002)	(0.0001)
Dep. mean	0.0063	0.0070
Deaf or hearing-impaired	-0.0001	0.0001
	(0.0002)	(0.0001)
Dep. mean	0.0050	0.0041
Mental disability	-0.0005***	-0.0000
	(0.0002)	(0.0001)
Dep. mean	0.0078	0.0062
N	1386769	1857730

Effects of bombing on parental work

Analysis on the 2014-2016 VHLSS sample. No evidence of impacts on occupational choice.

Parental outcome	Father	Mother
Outcome: Agricultural work		
Estimates	-0.024	-0.010
	(0.016)	(0.015)
Dep. mean	0.636	0.626
Outcome: Production work		
Estimates	0.024	0.016
	(0.016)	(0.018)
Dep. mean	0.231	0.314
Outcome: Non-salary work		
Estimates	-0.004	0.020
	(0.017)	(0.016)
Dep. mean	0.576	0.690
N	10488	11289

Effects of bombing on parental wage

Analysis on the 2014-2016 VHLSS sample restricting to parents with wage or salary employment. No evidence of impacts on (log) wage or household income per capita.

Parental outcome	Father	Mother
Outcome: Wage		
Estimates	0.054	-0.236*
	(0.145)	(0.122)
Dep. mean	3.429	2.122
Outcome: HH income per capita		
Estimates	0.004	-0.032
	(0.025)	(0.025)
Dep. mean	9.981	10.031
N	10487	11288

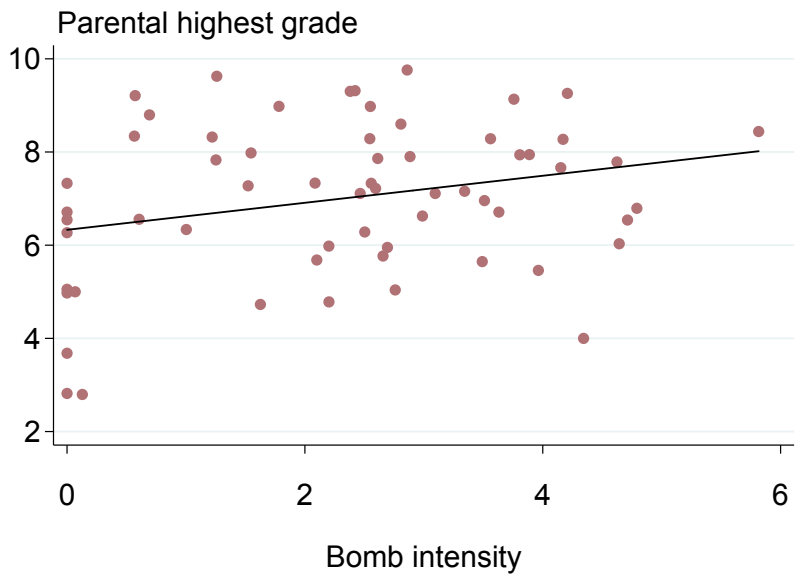
Effects of bombing on parental migration and fertility

Analysis on the 2014-2016 VHLSS sample. No evidence of impact on migration status and number of children in household.

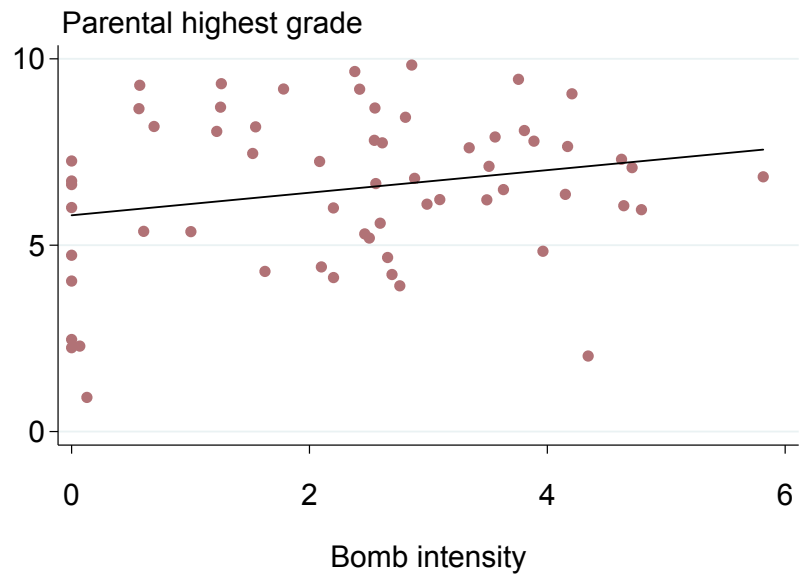
Parental outcome	Father	Mother
Outcome: Migrated from province of birth		
Estimates	0.026**	0.004
	(0.013)	(0.013)
Dep. mean	0.147	0.148
Outcome: Children in household		
Estimates	-0.074	-0.047
	(0.050)	(0.050)
Dep. mean	2.493	2.480
N	10488	11289

Monotonicity

Bombing has monotonic effect on parental education.



Father



Mother

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Effects of bombing on parental education (first-stage)

1. Exposure to bombing has large negative impact on educational attainment of first generation
2. Largest effects on lower secondary completion ▸ Grade completion
3. Exposure in utero to bombing appears to only affect father's education (implying that bombing exposure is a weak instrument for mother's education)

Effects of parental education on child's education

Father:

- OLS estimates are positive and significant.
- IV estimates are very small, insignificant, consistent with reduced form estimates.
- Findings are in line with previous studies (e.g. Black et al. 2005).

Mother:

- OLS estimates are positive and significant.
- IV estimates are not reliable because of weak and irrelevant instrument.

▸ End

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Alternative measure issue

- Previous literature uses child's years of schooling.
- Some children are still attending school, and age fixed effects may not fully account for this issue
- Results are generally consistent when using child's years of schooling as outcomes.

Effect of father's education on child's years of schooling

	OLS	First stage	IV	Reduced form
Education of:	Child	Father	Child	Child
Panel A: Baseline model				
Father's education	0.118***		-0.071	
	(0.006)		(0.117)	
Bombing exposure		-0.267***		0.019
		(0.077)		(0.029)
1st stage F-stat (nonrobust)			24.6	
Olea and Pflueger F-stat			12.0	
Weak IV robust p-value			0.51	
Panel B: Controls for province-cohort trends				
Father's education	0.117***		-0.014	
	(0.006)		(0.105)	
Bombing exposure		-0.504***		0.022
		(0.135)		(0.050)
1st stage F-stat (nonrobust)			29.0	
Olea and Pflueger F-stat			13.0	
Weak IV robust p-value			0.66	

Effect of mother's education on child's years of schooling

	OLS	First stage	IV	Reduced form
Education of:	Child	Mother	Child	Child
Panel A: Baseline model				
Mother's education	0.143***		-0.624	
	(0.007)		(0.500)	
Bombing exposure		-0.118*		0.074**
		(0.069)		(0.029)
1st stage F-stat (nonrobust)			1.6	
Olea and Pflueger F-stat			2.9	
Weak IV robust p-value			0.01	
Panel B: Controls for province-cohort trends				
Mother's education	0.143***		-0.546	
	(0.006)		(0.543)	
Bombing exposure		-0.082		0.106**
		(0.135)		(0.054)
1st stage F-stat (nonrobust)			0.2	
Olea and Pflueger F-stat			0.4	
Weak IV robust p-value			0.05	

Sample selection issue

- Only observed children who stay with parents: those who already left might be systematically different,
- Parents from earlier cohorts might be less likely to stay with children,
- Using earlier VHLSS data could help (parents were younger), but
- No place of birth. Place of current residence as substitute may lead to biased results.

Province of birth vs current residence

No substantial difference in IV estimates using parental province of birth (PoB) and province of current residence (PoCR):

Parental education	Father		Mother	
	PoB	PoCR	PoB	PoCR
Panel A: Baseline model				
Bombing exposure	-0.01	0.00	-0.22	-0.05
	(0.03)	(0.03)	(0.35)	(0.08)
F-stat (nonrobust)	24.6	23.8	1.6	1.3
F-stat (Olea & Pflueger)	12.0	11.2	2.9	2.3
N	10488	10488	11289	11289
Panel B: Controls for province-cohort trends				
Bombing exposure	-0.01	-0.03	-0.54	-0.02
	(0.03)	(0.04)	(1.97)	(0.17)
F-stat (nonrobust)	29.0	17.9	0.2	0.2
F-stat (Olea & Pflueger)	14.1	7.4	0.4	0.4
N	10488	10488	11289	11289

VHLSS 2006-2016 sample: Father's education

	OLS	First stage	IV	Reduced form
Educational outcome of:	Child	Father	Child	Child
Panel A: Baseline model				
Father's education	0.031***		0.0001	
	(0.001)		(0.0286)	
Bombing exposure		-0.159***		-0.00001
		(0.048)		(0.00456)
1st stage F-stat (nonrobust)			19.1	
Olea and Pflueger F-stat			11.1	
Weak IV robust p-value			1.00	
Panel B: Controls for province-cohort trends				
Father's education	0.031***		-0.0424	
	(0.001)		(0.0560)	
Bombing exposure		-0.181**		0.00766
		(0.083)		(0.00849)
1st stage F-stat (nonrobust)			8.9	
Olea and Pflueger F-stat			4.7	
Weak IV robust p-value			0.37	

VHLSS 2006-2016 sample: Mother's education

	OLS	First stage	IV	Reduced form
Educational outcome of:	Child	Mother	Child	Child
Panel A: Baseline model				
Mother's education	0.036***		-0.082	
	(0.001)		(0.064)	
Bombing exposure		-0.096**		0.008*
		(0.042)		(0.004)
1st stage F-stat (nonrobust)			3.0	
Olea and Pflueger F-stat			5.2	
Weak IV robust p-value			0.05	
Panel B: Controls for province-cohort trends				
Mother's education	0.036***		0.250	
	(0.001)		(2.019)	
Bombing exposure		0.021		0.003
		(0.081)		(0.008)
1st stage F-stat (nonrobust)			2.0	
Olea and Pflueger F-stat			0.1	
Weak IV robust p-value			0.74	

Other issues being worked on

- Did bombing exposure lead to assortative marriage (among parents)?
- Did bombing exposure lead to changes in parental investment in child's education?
- Province of birth is used as substitute for province of conception: pregnant (grand)mother might have moved out of provinces being bombed.

Impacts on spouse's characteristics

Parental outcome	Father	Mother
Outcome: Spouse's wage		
Estimates	-0.264**	-0.067
	(0.122)	(0.144)
Dep. mean	2.145	3.342
Outcome: Spouse's years of schooling		
Estimates	-0.215*	-0.043
	(0.126)	(0.131)
Dep. mean	6.733	7.397
N	10488	11289

Reduced-form impacts on educational investment

$$\text{Educ spending}_i = \beta(bomb_p^{parent} \times Exposed_c^{parent}) + \eta.age_i + \mu.\mathbf{X}_i^{parent} + \kappa_p^{parent} + \gamma_c^{parent} + u_i$$

Parental outcome	Father	Mother
Outcome: Educational spending		
Estimates	0.002	-0.000
	(0.021)	(0.020)
Dep. mean	6.862	6.862
Outcome: Nontuition educational spending		
Estimates	-0.005	-0.003
	(0.021)	(0.020)
Dep. mean	6.745	6.745
N	20397	22826

End

Thank you!

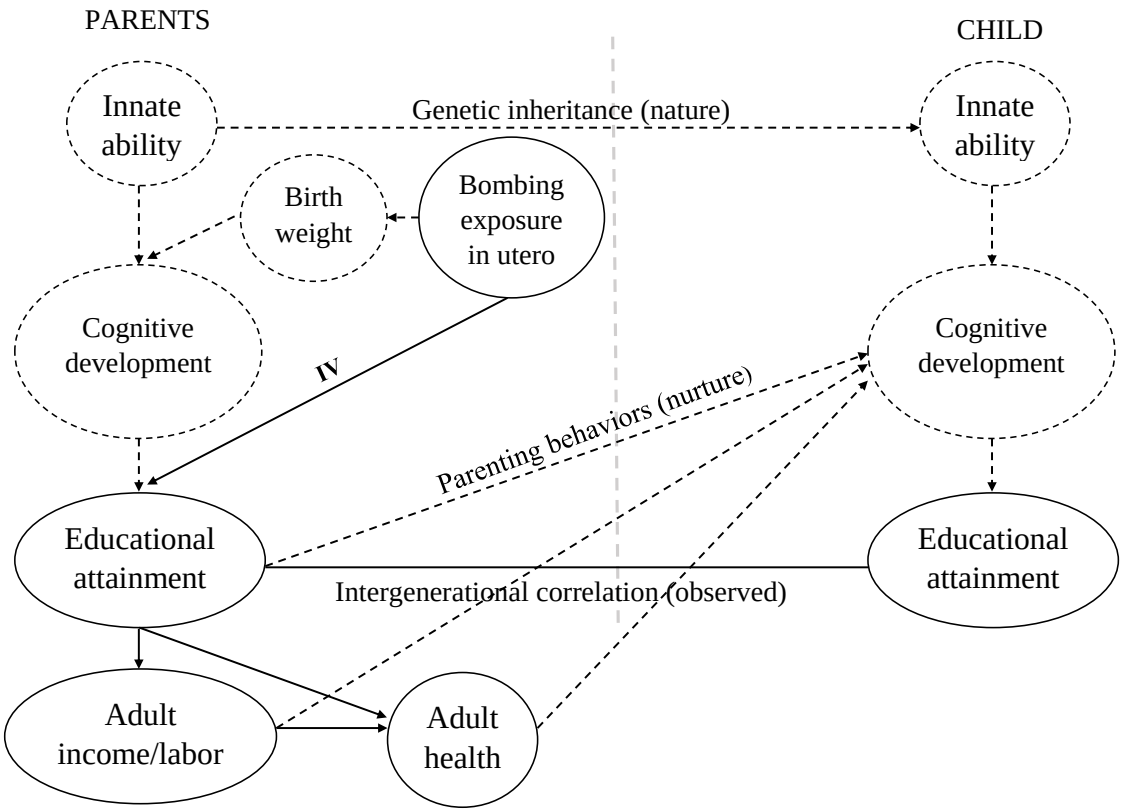
Descriptive statistics

Characteristics	Child			Father			Mother		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Age	15.3	7.0	34.0	42.1	32.0	50.0	41.4	32.0	56.0
Years of schooling	7.4	0.0	12.0	7.2	0.0	12.0	6.8	0.0	12.0
Complete primary	0.8	0.0	1.0	0.8	0.0	1.0	0.7	0.0	1.0
Complete lower sec.	0.4	0.0	1.0	0.5	0.0	1.0	0.4	0.0	1.0
Complete upper sec.	0.2	0.0	1.0	0.2	0.0	1.0	0.2	0.0	1.0
Obs		12592			10488			11289	

▸ Data section

Excludability

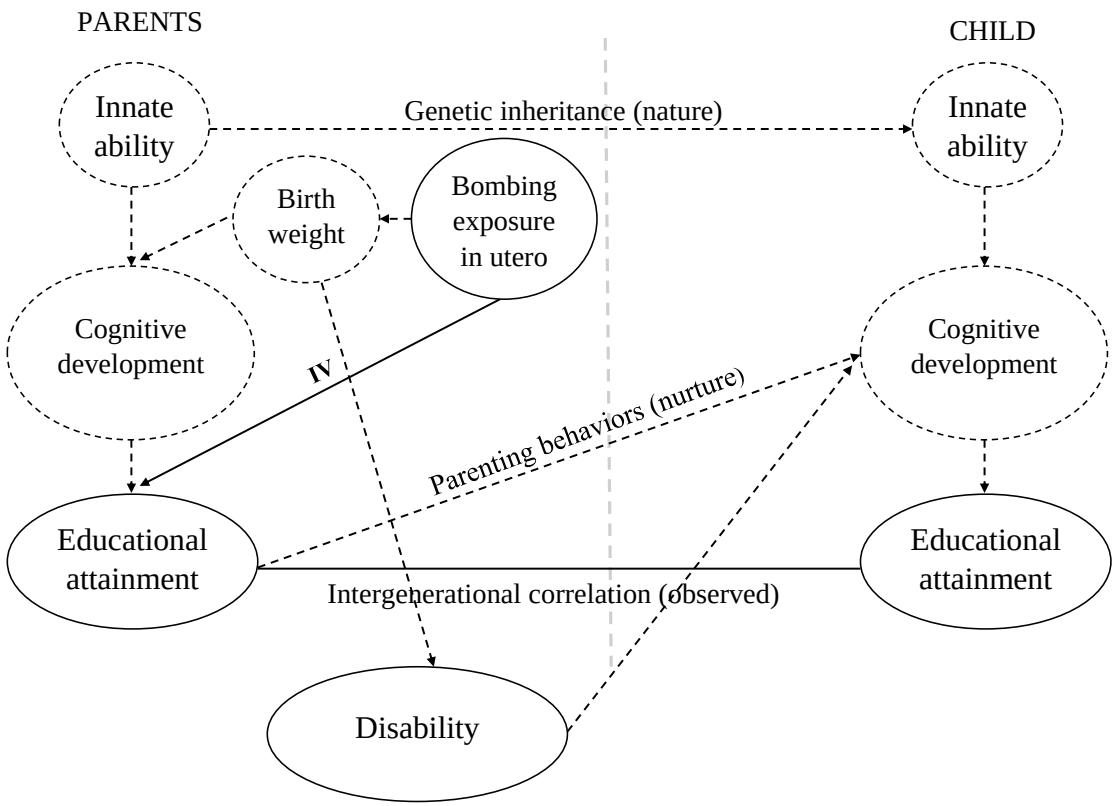
Parental exposure only affects child's education through parental education (even through another mechanism, e.g. income, labor decision).



▸ Excludability

Excludability

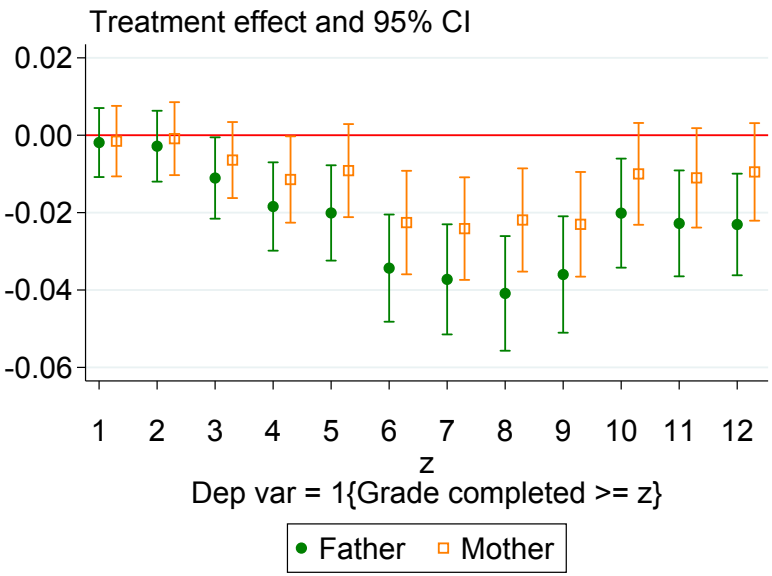
Violation if parental exposure also affects child's education through a separate channel.



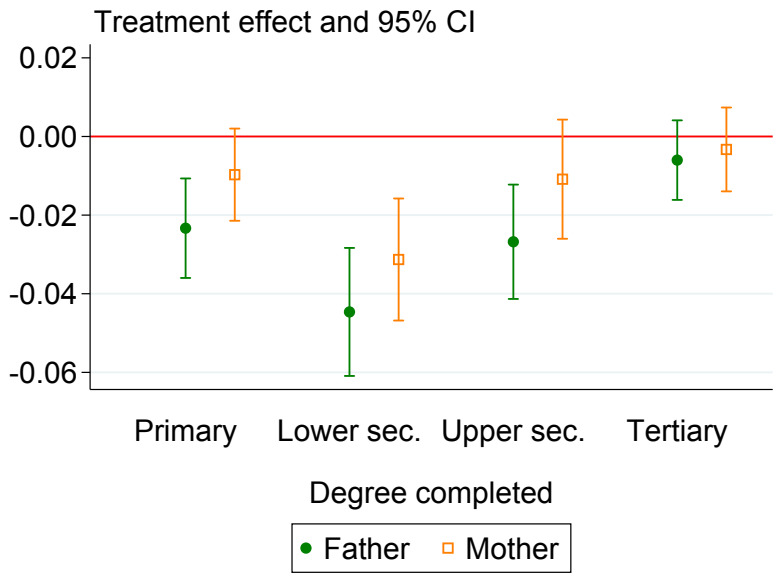
▸ Excludability

Effects on grades and degrees completed

Largest impacts on lower secondary completion



Highest grade



Highest degree

▸ Result summary