The Effect of Education on Health and Mortality: Evidence from a Schooling Expansion in Romania

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Motivation

- There is substantial evidence showing that education is associated with better health and longer life-expectancy
- Recent papers use compulsory schooling requirements:
  - US: Lleras-Muney (2005) and Mazumder (2008)
  - UK: Oreopoulos (2006) and Clark and Royer (2013)
  - Denmark: Arendt (2008)
  - France: Albouy and Lequien (2009)
  - Netherlands: van Kippersluis et al. (2011)
  - Sweden: Meghir, et al. (forthcoming)
- But findings are mixed and sometimes contradictory
- Limited evidence from developing/transition countries
  - Previous papers focused on US and Western Europe
  - Lower margins of education more relevant to developing nations

This paper

- Explores a school expansion in Romania during 1950s-60s
- Research design: compare across cohorts using school entry cutoffs with a regression discontinuity approach
- Data: death certificates in Vital Statistics records from 1994-2016 and self-reported health in the 2011 Census
- Results: The schooling expansions led to:
  - significant increases in years of schooling…
  - but no effects on mortality or self-reported health

Outline

- Motivation
- Schooling expansion
- Empirical strategy
- Data
- Results
- Discussion

Romania's schooling expansion

- After a successful campaign to provide basic literacy in the 1940s and early 1950s, the Communist Party focused its attention on increasing enrollment beyond 4th grade.

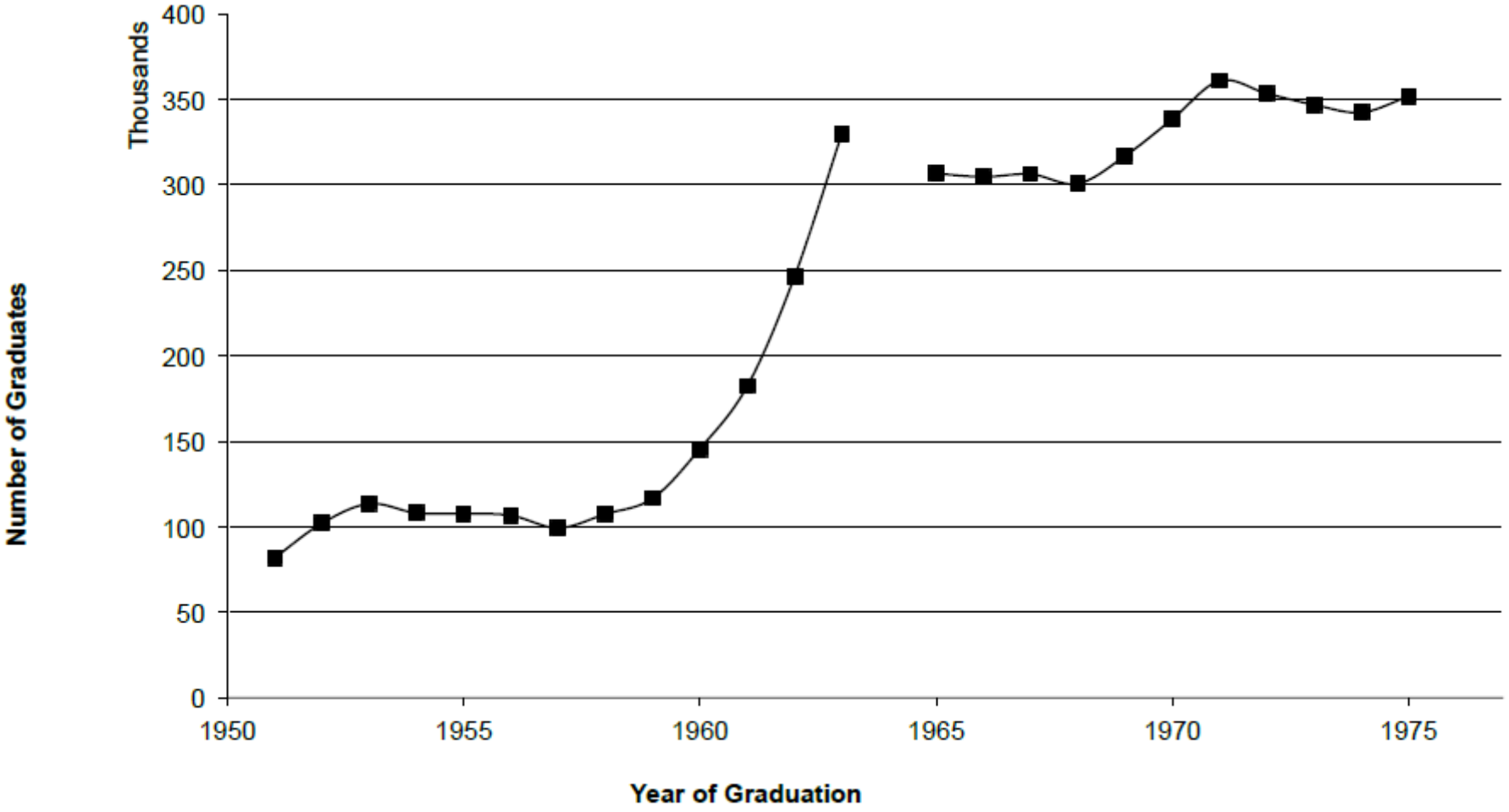
- The second five year plan of 1955-1960 specified that the extension of **compulsory schooling to 7 years** was to be given special attention by the party and government.
  - According to Braham (1963) the Communist Party's Second Congress of 1955 envisioned that "by 1960-1961, the fifth grade would enroll 90 percent of the 4-year school graduates, and under which, according to the Third Five Year plan, the **7-year [gymnasium] school would be universal and compulsory**".

Romania's schooling expansion

- However, progress was gradual due to a lack of gymnasium schools offering 7 years of compulsory schooling
  - The "governmental action applied only to places where 7-year schools already existed…[and] the lack of detailed planning to elevate their schools to the 7-year compulsory level has left an irregular pattern of schooling in the provinces." (Braham, 1963)

- Filipescu and Oprea (1972) also confirm the gradual process of expanding education at the "gymnasium" level:
  - Began in 1956 within towns and larger villages that already had schools beyond the 4th grade
  - Gradually expanded until it was close to universal by 1961-1962.

Graduates from 7th grade (gymnasiums)

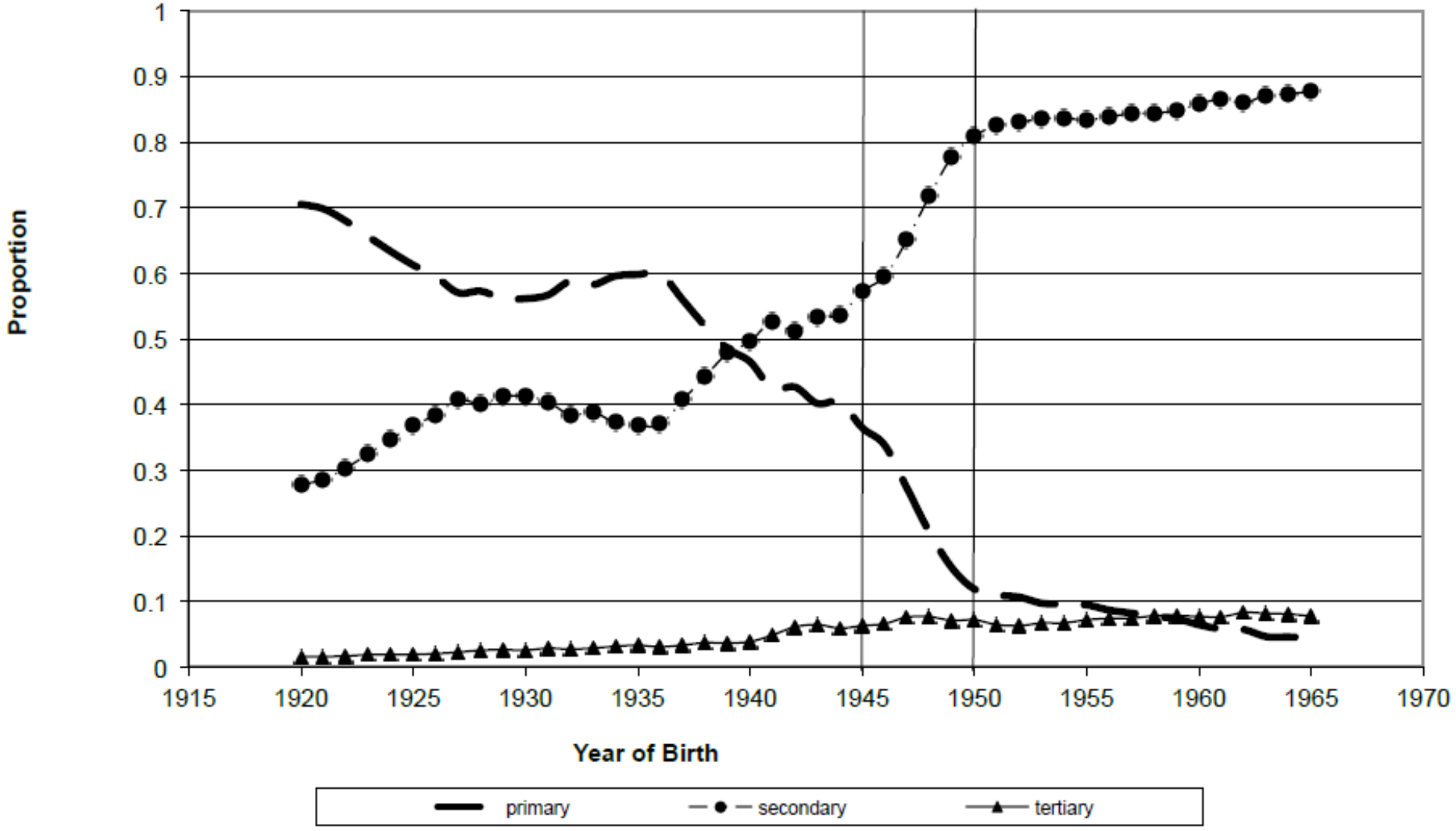


Educational attainment by year of birth

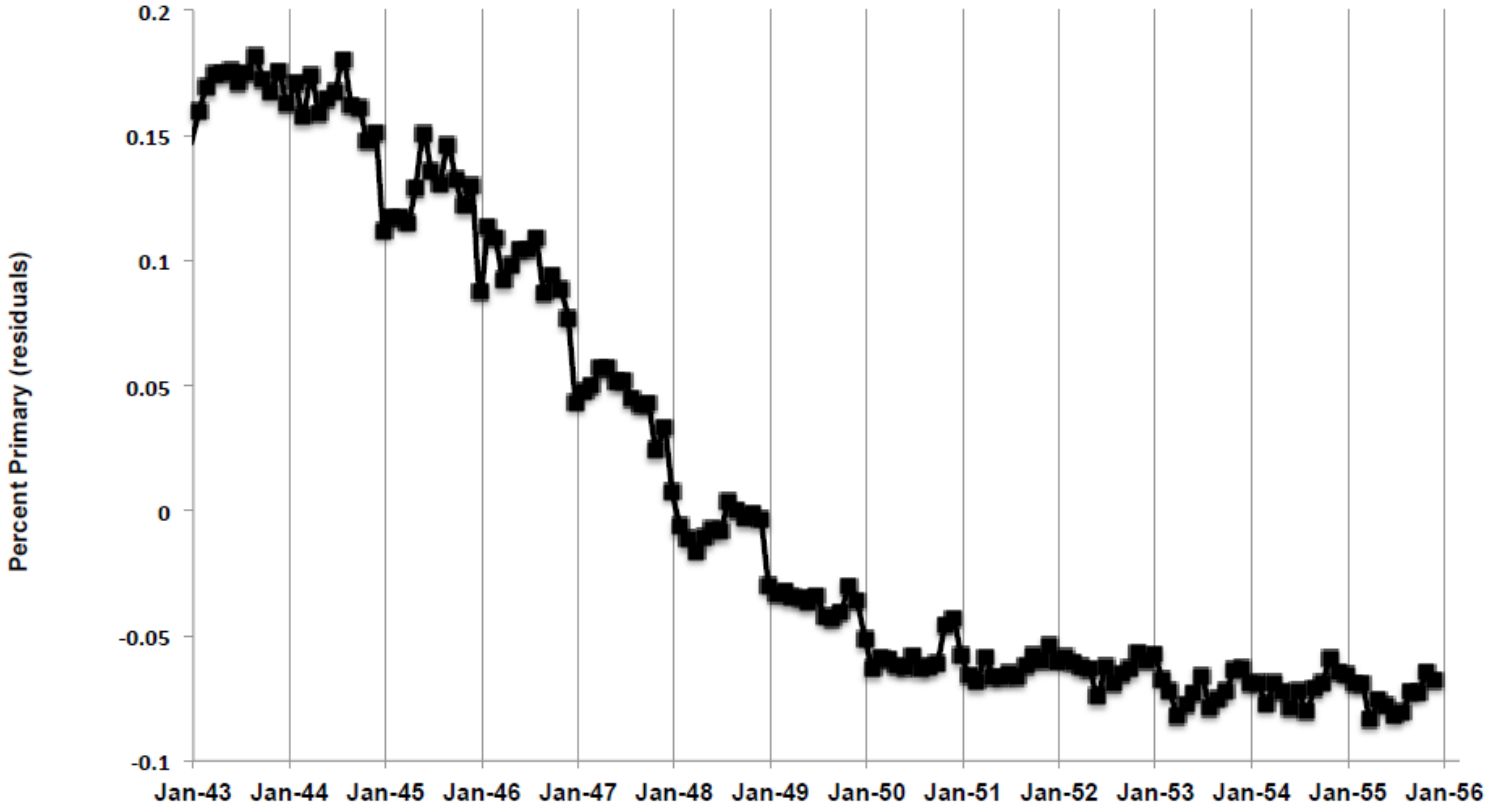
- By law, students entered grade 1 in September of year following *the calendar year* they reached 6 years of age:

- Children born in 1945 (first cohort affected by expansion)
  - Entered 1st grade in the fall of 1952
  - Entered 5th grade in the fall of 1956
  - Graduated 7th grade in the spring of 1959
- Children born in 1950 (last cohort affected by expansion)
  - Entered 1st grade in the fall of 1957
  - Entered 5th grade in the fall of 1961
  - Graduated 7th grade in the spring of 1964

Educational attainment by year of birth



Preview of RD design: Education by month of birth



- School cutoff date is January 1
- Advantage to be young: government can build more schools
- Creates a “step” function: a number of RDs (Jan 1945-Jan 1950)

Empirical Strategy: RD design

- Estimate differences across successive cohorts between 1945 and 1950 affected by educational expansions by exploiting the discontinuities around January 1st cutoffs:

$$y_i = \beta' X_i + \alpha AFTER_i + f(day_i) + \varepsilon_i$$

  - y_i – outcome such as education or mortality for individual *i*
  - X_i – set of control variables
  - $AFTER_i$ – dummy for birth on or after January 1st
  - *f(day)* – parametric or non-parametric function of the day of birth which serves as our running variable
- Coefficient on *AFTER* captures impact of expansions
  - Always estimated within 180 days of January 1 cutoff

Empirical Strategy: RD design

- Key assumptions for estimating the impact of education on mortality using this RD design:
  - individuals are "effectively" randomly assigned to being born around the January 1 school cutoff
  - being born after the January school cutoff affects mortality only through educational attainment
- Potential issue in our setting:
  - heaping - more births on Jan. 1; fewer on the days just before
  - individuals born just after school entry cutoff are generally the oldest children in their grade *and* relative age may have an independent effect on education and mortality

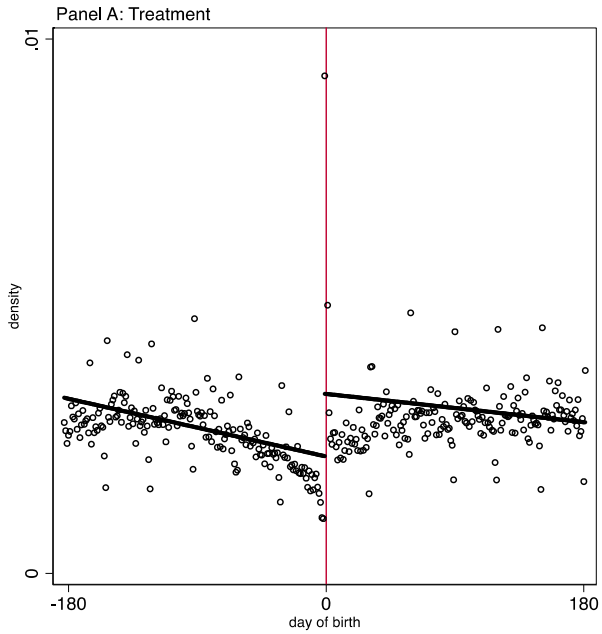
Empirical Strategy: RD design

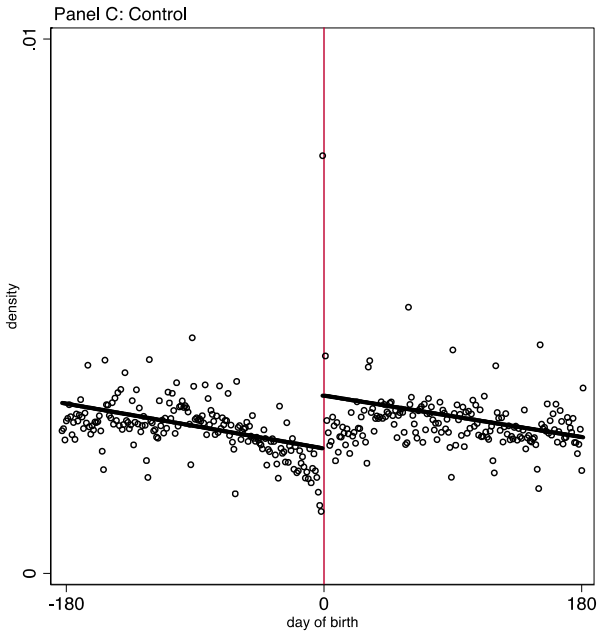
- To deal with these concerns:
  - Estimate RD specification for successive cohorts born between 1950 to 1953 ("control cohorts")
  - Interact $AFTER_i$ with $TREAT_i$ – an indicator for "treated" cohorts born 1945-50 vs. "control" cohorts in 1950-53

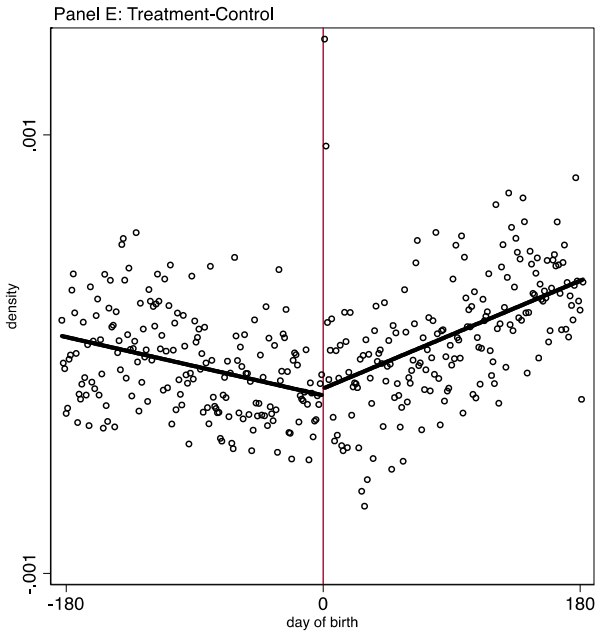
$$y_i = \beta' X_i + \alpha AFTER_i + \gamma TREAT_i + \delta AFTER_i * TREAT_i + f(day_i) + \varepsilon_i$$

  - We also implement "donuts RDs" (drop week around Jan 1)

Density of observations







Density of observations (full sample)

Bandwidth (days)	180	120	90	60	30	IK
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Treated years						
After	**0.167****	**0.224****	**0.262****	**0.337****	**0.519*****	**1.005*****
	[0.073]	**[0.100]**	**[0.122]**	**[0.150]**	**[0.179]**	**[0.119]**
Sample size	233,596	150,586	108,797	68,738	32,116	8,743
R-squared	0.139	0.188	0.227	0.305	0.502	0.843
Panel B: Control years						
After	0.134***	0.174**	0.200**	0.249**	0.388**	0.823***
	[0.050]	[0.070]	[0.088]	[0.114]	[0.148]	[0.111]
Sample size	135,524	89,614	65,819	42,014	19,661	5,003
R-squared	0.157	0.199	0.223	0.280	0.455	0.828
Panel C: All years						
After	0.134***	0.174**	0.200**	0.249**	0.388**	0.823***
	[0.050]	[0.070]	[0.088]	[0.114]	[0.148]	[0.111]
After*Treatment	**0.033**	**0.050**	**0.063***	**0.088****	**0.131*****	**0.182*****
	[0.024]	**[0.030]**	**[0.034]**	**[0.037]**	**[0.032]**	**[0.012]**
Sample size	369,120	240,200	174,616	110,752	51,777	13,746
R-squared	0.144	0.191	0.226	0.299	0.492	0.842

Density of observations (1 week donut)

Bandwidth (days)	180 (7)	120 (8)	90 (9)	60 (10)	30 (11)	IK (12)
Panel A: Treated years						
After	**0.064*** **	**0.072*** **	**0.060*** **	**0.049*** **	**0.076*** **	-
	[0.011]	**[0.013]**	**[0.013]**	**[0.011]**	**[0.018]**	-
Sample size	224,853	141,843	100,054	59,995	23,373	-
R-squared	0.210	0.284	0.312	0.352	0.473	-
Panel B: Control years						
After	0.069***	0.078***	0.069***	0.055***	0.067**	-
	[0.010]	[0.011]	[0.012]	[0.012]	[0.026]	-
Sample size	130,521	84,611	60,816	37,011	14,658	-
R-squared	0.172	0.286	0.337	0.405	0.446	-
Panel C: All years						
After	0.069***	0.078***	0.069***	0.055***	0.067**	-
	[0.010]	[0.011]	[0.012]	[0.012]	[0.026]	-
After*Treatment	**-0.005**	**-0.006**	**-0.009**	**-0.006**	**0.009**	-
	[0.006]	**[0.007]**	**[0.008]**	**[0.010]**	**[0.018]**	-
Sample size	355,374	226,454	160,870	97,006	38,031	-
R-squared	0.199	0.288	0.326	0.378	0.481	-

Data

- 1992 Census sample (15% sample): cohorts in their 40s
  - Education outcomes
  - Employment and fertility outcomes
- 2011 Census sample (100% sample): cohorts in their 60s
  - Self reported health problems (yes/no)
  - Specific problems: (i) vision, (ii) hearing, (iii) movement, (iv) memory/concentration, (v) self-care or (vi) communication
- Death certificates in Vital Statistics data from 1994-2016
  - Compute mortality by dividing total deaths from 1994-2016 by number of people alive in 1992 (based on the 1992 Census)
  - Detailed information on cause of death
- Household survey data 2001-2009: additional outcomes

Summary statistics

Table 1: Summary Statistics

	Mean	S.D.	Obs
Panel A: Census data			
Female	0.506	0.500	375,103
Age	42.224	2.575	375,103
Ethnicity			
Romanian	0.893	0.309	375,103
Hugarian	0.073	0.261	375,103
Roma	0.015	0.122	375,103
Other	0.018	0.134	375,103
Years of schooling	9.578	3.660	373,980
Self-reported health index (2011)	0.076	0.265	2,058,787
Panel B: Mortality data			
Overall mortality	0.260	0.081	3,284
Mortality by category			
Cancer	0.077	0.026	3,284
Circulatory	0.105	0.039	3,284
Preventable	0.059	0.018	3,284
Treatable	0.039	0.014	3,284

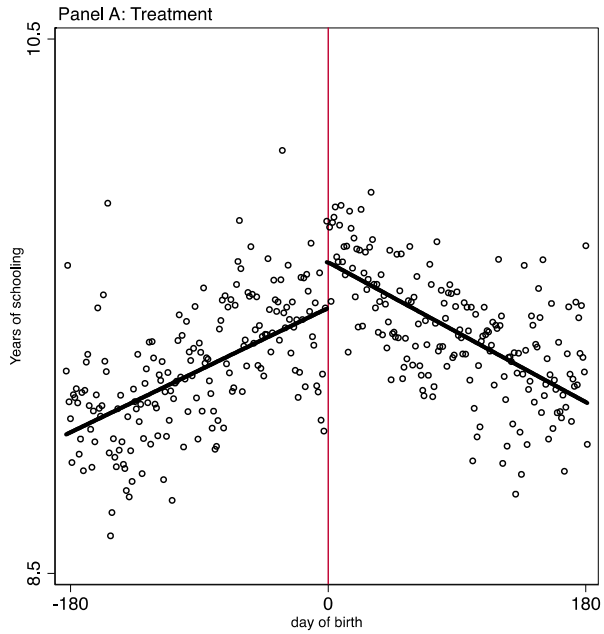
Results: Years of Schooling (full sample)

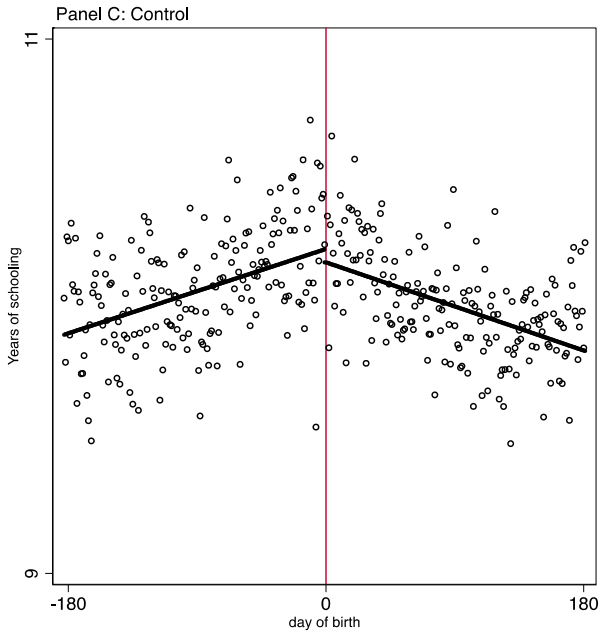
Bandwidth (days)	180	120	90	60	30	IK
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Treated years						
After	**0.209*** **	**0.299*** **	**0.395*** **	**0.517*** **	**0.669*** **	**0.644*** **
	[0.048]	**[0.058]**	**[0.067]**	**[0.082]**	**[0.124]**	**[0.115]**
Sample size	232,899	150,135	108,458	68,527	32,013	36,820
R-squared	0.020	0.019	0.019	0.018	0.018	0.018
Panel B: Control years						
After	-0.025	-0.005	0.030	0.062	0.079	0.073
	[0.049]	[0.064]	[0.078]	[0.102]	[0.156]	[0.146]
Sample size	135,114	89,330	65,606	41,882	19,599	22,519
R-squared	0.001	0.001	0.001	0.000	0.000	0.000
Panel C: All years						
After	-0.025	-0.005	0.030	0.062	0.079	0.073
	[0.049]	[0.064]	[0.078]	[0.102]	[0.156]	[0.146]
After*Treatment	**0.234*** **	**0.304*** **	**0.365*** **	**0.455*** **	**0.590*** **	**0.572*** **
	[0.056]	**[0.072]**	**[0.085]**	**[0.103]**	**[0.126]**	**[0.122]**
Sample size	368,013	239,465	174,064	110,409	51,612	59,339
R-squared	0.022	0.021	0.020	0.019	0.018	0.018

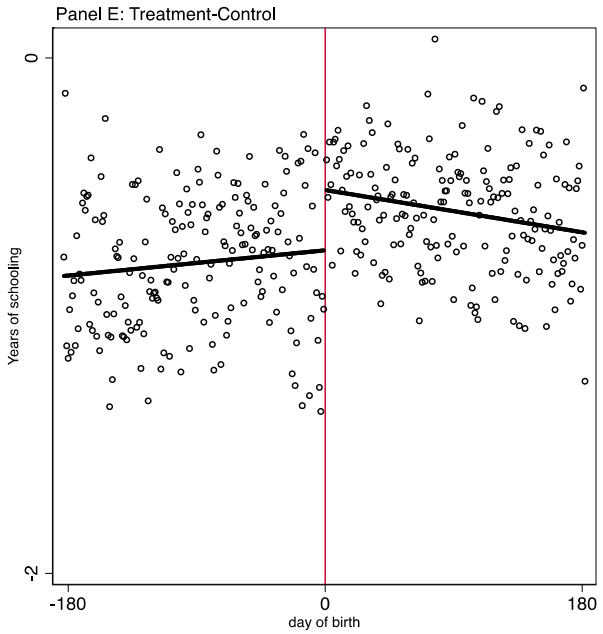
Results: Years of Schooling (1 week donut)

Bandwidth (days)	180	120	90	60	30	IK
	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Treated years						
After	**0.104*** **	**0.160*** **	**0.242*** **	**0.336*** **	**0.329** **	**0.344*** **
	[0.039]	**[0.049]**	**[0.059]**	**[0.077]**	**[0.125]**	**[0.082]**
Sample size	224,186	141,422	99,745	59,814	23,300	53,167
R-squared	0.020	0.019	0.019	0.018	0.016	0.017
Panel B: Control years						
After	-0.056	-0.042	-0.004	0.023	-0.094	0.016
	[0.045]	[0.060]	[0.074]	[0.100]	[0.172]	[0.108]
Sample size	130,133	84,349	60,625	36,901	14,618	32,849
R-squared	0.001	0.001	0.000	0.000	0.000	0.000
Panel C: All years						
After	-0.056	-0.042	-0.004	0.023	-0.094	0.016
	[0.045]	[0.060]	[0.074]	[0.100]	[0.172]	[0.108]
After*Treatment	**0.160*** **	**0.202*** **	**0.246** **	**0.313** **	**0.423***	**0.328** **
	[0.057]	**[0.077]**	**[0.096]**	**[0.129]**	**[0.214]**	**[0.139]**
Sample size	354,319	225,771	160,370	96,715	37,918	86,016
R-squared	0.022	0.021	0.020	0.019	0.018	0.019

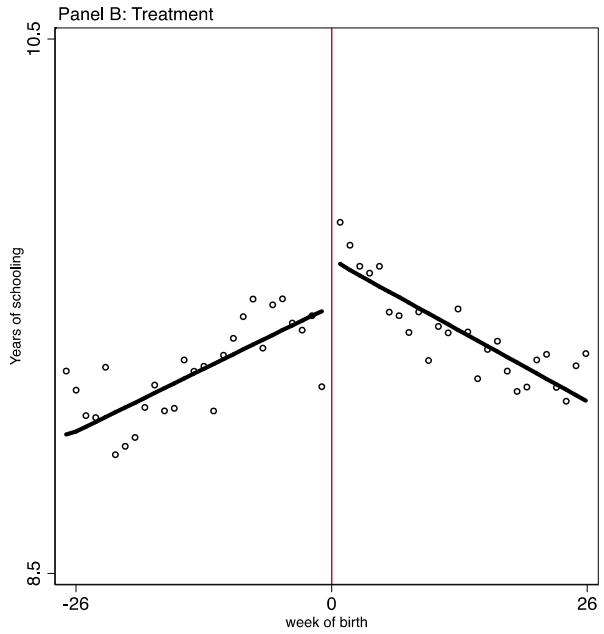
Results: Years of Schooling (by day of birth)

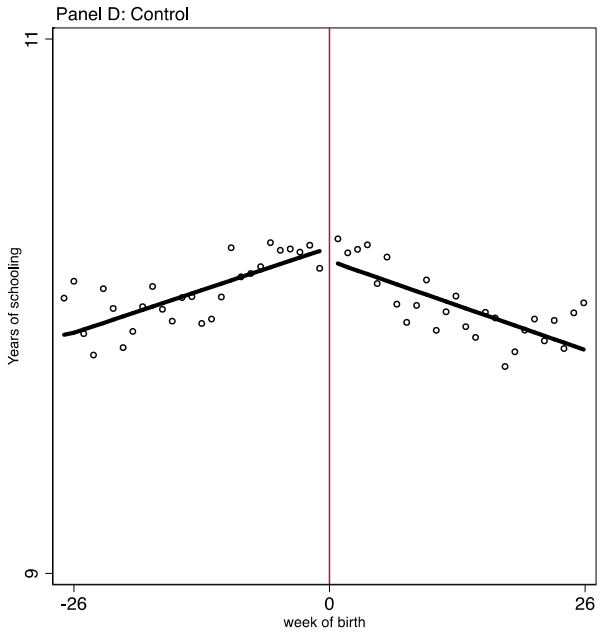


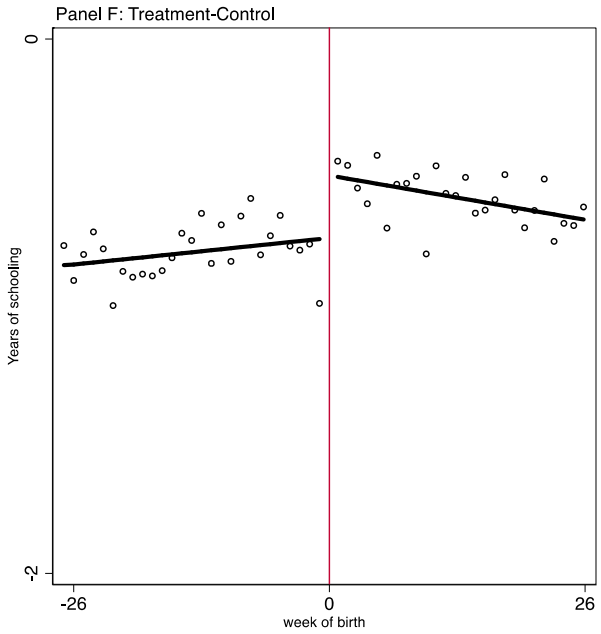




Results: Years of Schooling (by week of birth)







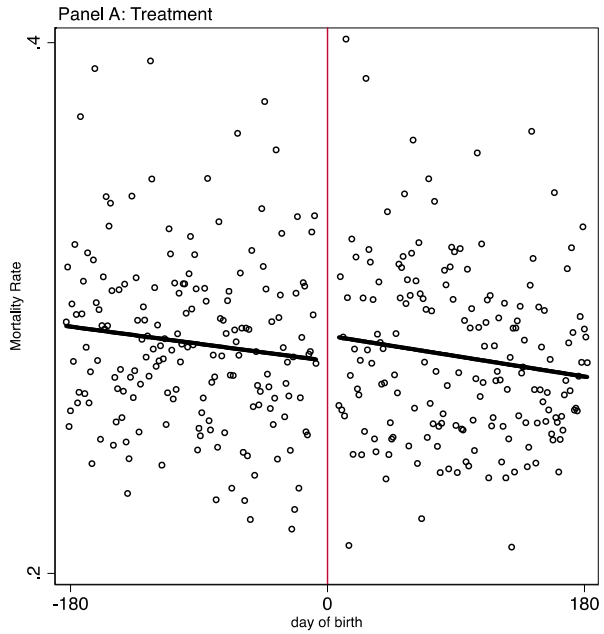
Results: Mortality (full sample)

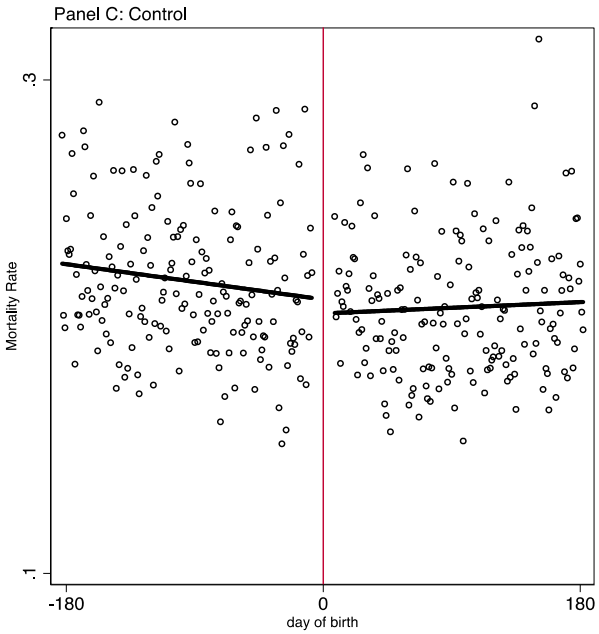
Bandwidth (days)	180	120	90	60	30	IK
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Treated years						
After	**0.010**	**0.006**	**0.003**	**0.003**	**-0.006**	**0.003**
	[0.009]	**[0.011]**	**[0.013]**	**[0.015]**	**[0.016]**	**[0.012]**
Sample size	2,154	1,434	1,074	714	354	1,152
R-squared	0.118	0.112	0.105	0.108	0.130	0.106
Panel B: Control years						
After	-0.011	-0.012	-0.015	-0.020*	-0.046***	-0.014
	[0.007]	[0.008]	[0.009]	[0.011]	[0.015]	[0.009]
Sample size	1,077	717	537	357	177	576
R-squared	0.071	0.073	0.079	0.082	0.146	0.078
Panel C: All years						
After	-0.011	-0.012	-0.015	-0.020*	-0.046***	-0.014
	[0.007]	[0.008]	[0.009]	[0.011]	[0.015]	[0.009]
After*Treatment	**0.021***	**0.018**	**0.018**	**0.023**	**0.040***	**0.017**
	[0.012]	**[0.014]**	**[0.016]**	**[0.019]**	**[0.020]**	**[0.016]**
Sample size	3,231	2,151	1,611	1,071	531	1,728
R-squared	0.253	0.242	0.232	0.219	0.223	0.234

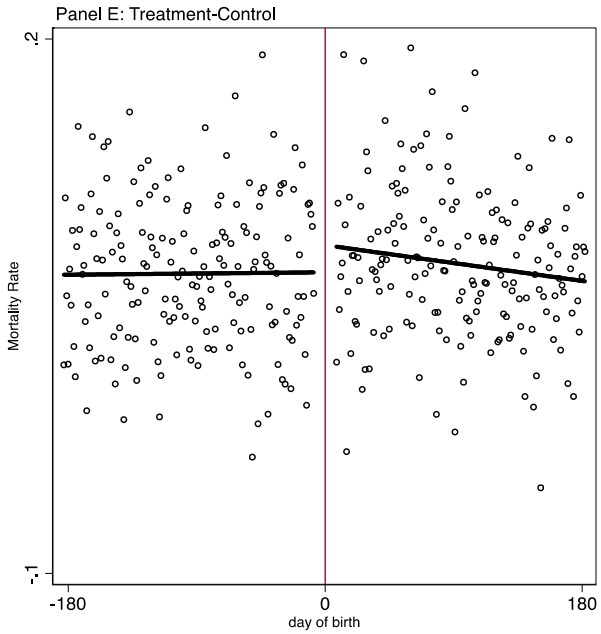
Results: Mortality (1 week donut)

Bandwidth (days)	180 (7)	120 (8)	90 (9)	60 (10)	30 (11)	IK (12)
Panel A: Treated years						
After	**0.011**	**0.007**	**0.003**	**0.004**	**-0.016**	**0.011**
	[0.010]	**[0.014]**	**[0.018]**	**[0.026]**	**[0.053]**	**[0.010]**
Sample size	2,070	1,350	990	630	270	2,105
R-squared	0.124	0.119	0.113	0.118	0.147	0.124
Panel B: Control years						
After	-0.002	0.004	0.006	0.013	-0.001	-0.002
	[0.007]	[0.009]	[0.010]	[0.012]	[0.022]	[0.007]
Sample size	1,035	675	495	315	135	1,053
R-squared	0.058	0.055	0.055	0.046	0.042	0.059
Panel C: All years						
After	-0.002	0.004	0.006	0.013	-0.001	-0.002
	[0.007]	[0.009]	[0.010]	[0.012]	[0.022]	[0.007]
After*Treatment	**0.013**	**0.003**	**-0.003**	**-0.009**	**-0.014**	**0.013**
	[0.014]	**[0.018]**	**[0.023]**	**[0.032]**	**[0.062]**	**[0.013]**
Sample size	3,105	2,025	1,485	945	405	3,158
R-squared	0.261	0.252	0.242	0.229	0.228	0.261

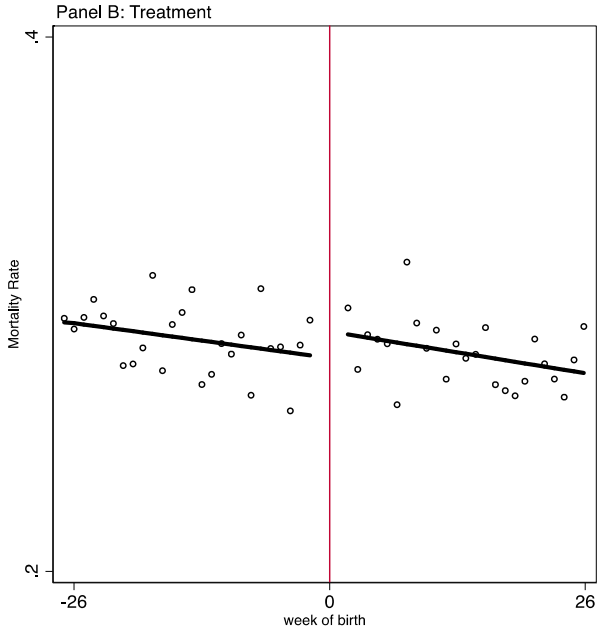
Results: Mortality (by day of birth)

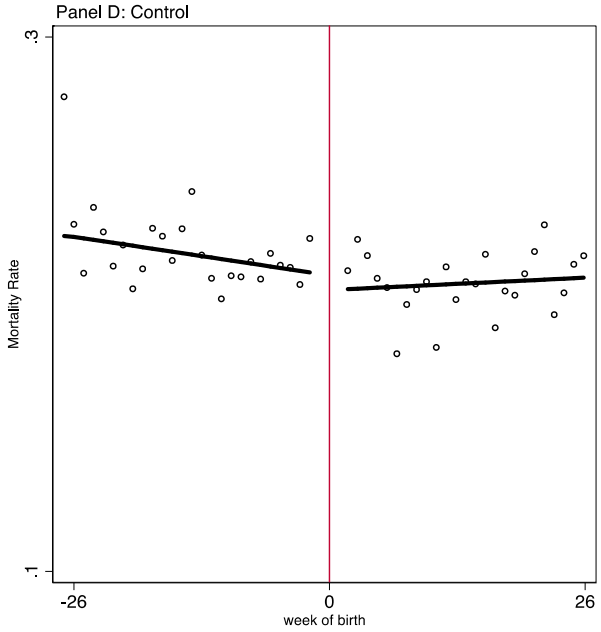


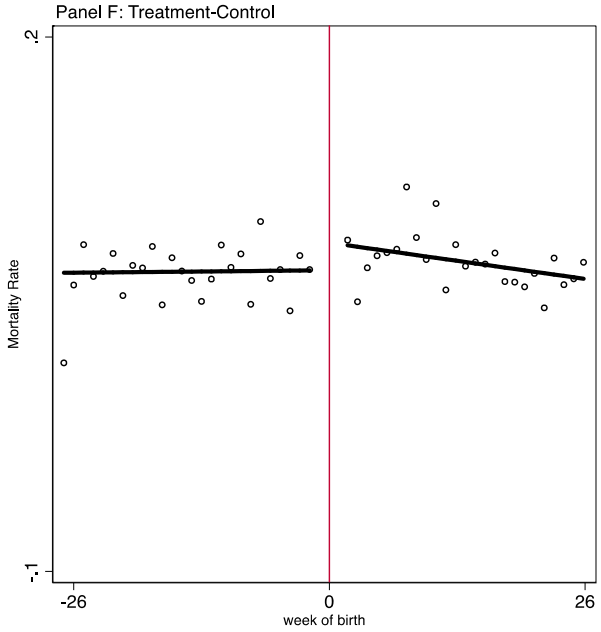




Results: Mortality (by week of birth)







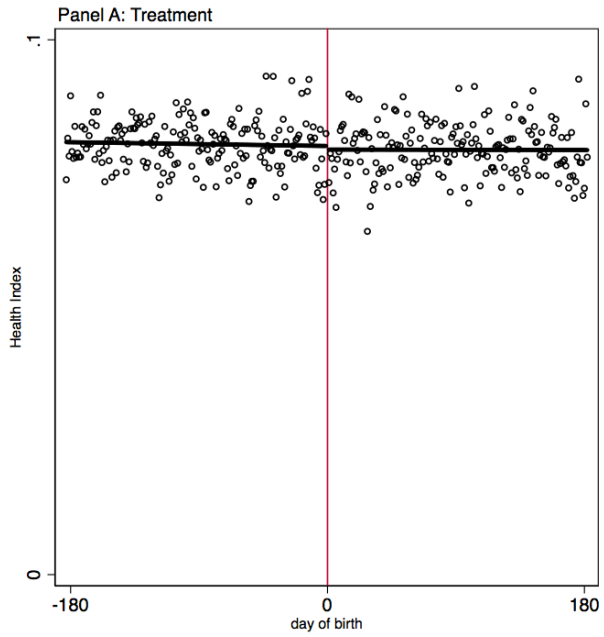
Results: Self-reported Health (full sample)

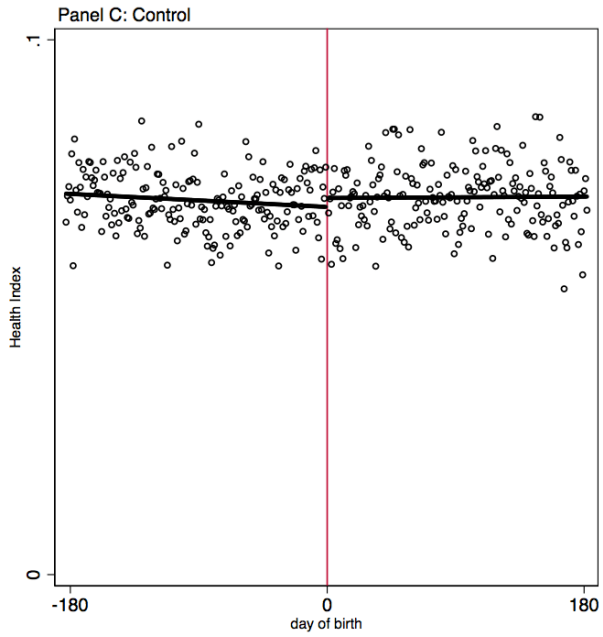
Bandwidth (days)	180	120	90	60	30	IK
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Treated years						
After	**-0.001**	**-0.001**	**-0.001**	**-0.001**	**-0.000**	**-0.001**
	[0.001]	**[0.002]**	**[0.002]**	**[0.002]**	**[0.002]**	**[0.002]**
Sample size	1,247,056	808,952	586,032	370,857	171,204	331,445
R-squared	0.013	0.013	0.012	0.012	0.012	0.012
Panel B: Control years						
After	0.001	-0.000	-0.001	-0.002	-0.001	-0.002
	[0.001]	[0.001]	[0.002]	[0.002]	[0.003]	[0.002]
Sample size	777,000	515,459	379,783	242,941	113,725	217,098
R-squared	0.011	0.011	0.011	0.011	0.011	0.011
Panel C: All years						
After	0.001	-0.000	-0.001	-0.001	-0.000	-0.002
	[0.001]	[0.001]	[0.002]	[0.002]	[0.003]	[0.002]
After*Treatment	**-0.002**	**-0.001**	**-0.001**	**-0.000**	**-0.000**	**0.000**
	[0.002]	**[0.002]**	**[0.002]**	**[0.003]**	**[0.003]**	**[0.003]**
Sample size	2,024,056	1,324,411	965,815	613,798	284,929	548,543
R-squared	0.012	0.012	0.012	0.012	0.012	0.012

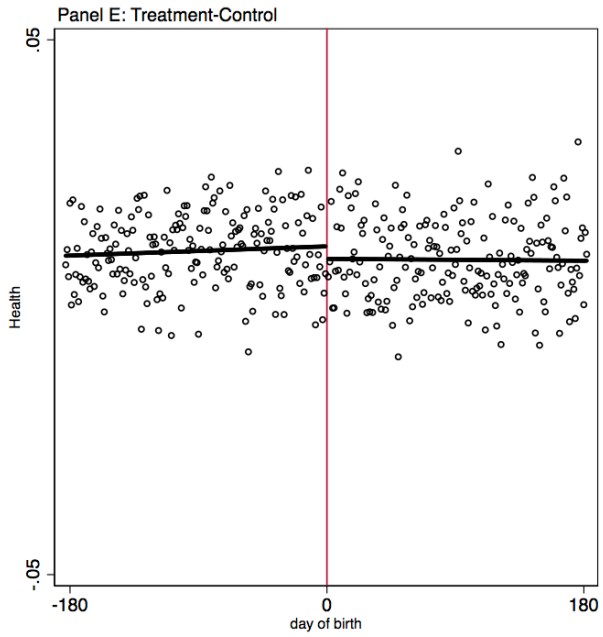
Results: Self-reported Health (1 week donut)

Bandwidth (days)	180	120	90	60	30	IK
	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Treated years						
After	**-0.000**	**-0.001**	**-0.001**	**-0.001**	**0.000**	**0.000**
	[0.001]	**[0.002]**	**[0.002]**	**[0.002]**	**[0.004]**	**[0.003]**
Sample size	1,202,917	764,813	541,893	326,718	127,065	287,306
R-squared	0.013	0.013	0.013	0.013	0.013	0.013
Panel B: Control years						
After	0.001	-0.000	-0.002	-0.004	-0.007	-0.005*
	[0.001]	[0.002]	[0.002]	[0.003]	[0.005]	[0.003]
Sample size	749,024	487,483	351,807	214,965	85,749	189,122
R-squared	0.011	0.011	0.011	0.011	0.011	0.011
Panel C: All years						
After	0.002	-0.000	-0.002	-0.003	-0.006	-0.005
	[0.001]	[0.002]	[0.002]	[0.003]	[0.005]	[0.003]
After*Treatment	**-0.002**	**-0.001**	**0.001**	**0.003**	**0.006**	**0.005**
	[0.002]	**[0.002]**	**[0.003]**	**[0.004]**	**[0.008]**	**[0.005]**
Sample size	1,951,941	1,252,296	893,700	541,683	212,814	476,428
R-squared	0.012	0.012	0.012	0.012	0.012	0.012

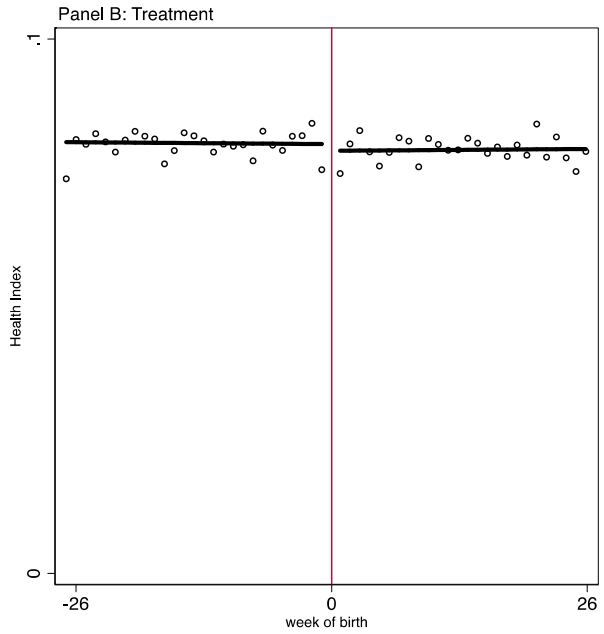
Results: Self-reported Health (by day of birth)

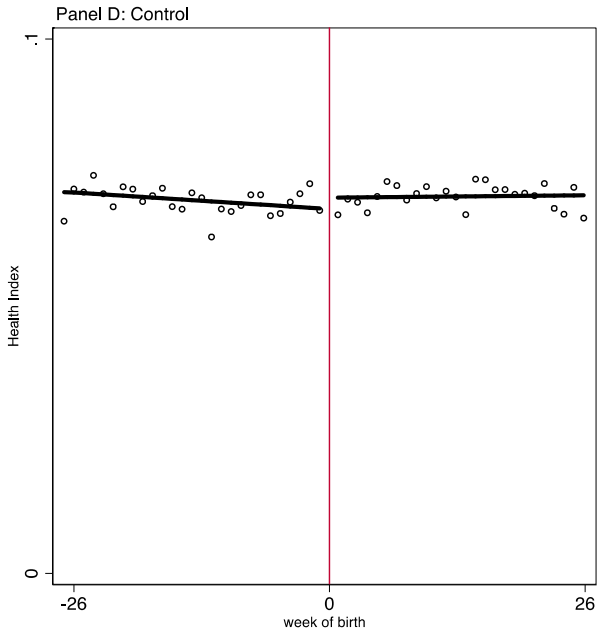


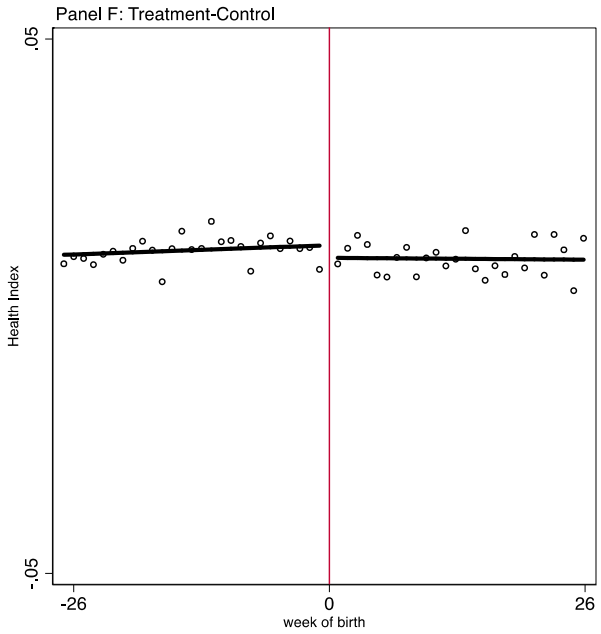




Results: Self-reported Health (by week of birth)







Summary of main findings

The schooling expansions:

- Increased education by approx. ¼ to ½ year of schooling
- No significant effects on mortality or self-reported health

- So we can rule out that an additional year of school reduces mortality by more than 1.6 percentage points using our full sample between 1994-2016 (during which the average mortality rate was 27 percent)
  - Even more precise estimates for self-reported health!

Additional specifications

- Specific cause of death
  - Common causes of death
    - Cancer
    - Circulatory (heart) diseases
  - Preventable and treatable causes of death
    - Preventable: Lung cancer, Cirrhosis of liver, External causes
    - Treatable: Tuberculosis, Asthma, Appendicitis, Hypertension, etc.

- Self-reported health index
  - Looked separately at specific problems: (i) vision, (ii) hearing, (iii) movement, (iv) memory or concentration, (v) self-care or (vi) communication with their peers.

Robustness

- Additional robustness checks
  - Parametric specifications that include higher order polynomials in day of birth (linear, quadratic, and cubic splines)
  - Smoothness of main covariates: gender, ethnicity, region of birth

- Accounting for migration
  - Vital Statistics cover Romanian residents/citizens who die abroad (i.e. temporary emigrants that constitute 90% of migrants)
- Still, we examine international migration in 2011 census
- Also look at attrition between 1992 and 2011 census

=> no evidence of significant effects

Why no effects?

- Did the schooling expansion have any "real" effects?
  - **Yes, we observe impacts on employment and fertility**!
- Did education lead to higher incomes? **Unclear**
  - Higher income may enable the purchase of better healthcare
  - Higher income may also allow for unhealthy behaviors (such as smoking and drinking) – **no strong evidence for this**!
- Did education affect the occupational structure? **Yes**
  - Shifts out of manual occupations may lower fatality rates
  - Shifts into professional occupations may increase stress, etc.

Results: Employment

Bandwidth (days)	180	120	90	60	30	IK
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Treated years						
After	**0.010*** **	**0.017*** **	**0.021*** **	**0.027*** **	**0.037*** **	**0.034*** **
	[0.004]	**[0.004]**	**[0.005]**	**[0.005]**	**[0.007]**	**[0.007]**
Sample size	233,402	150,439	108,658	68,721	32,116	40,385
R-squared	0.002	0.002	0.002	0.002	0.003	0.003
Panel B: Control years						
After	-0.005	0.001	0.007	0.011	0.022**	0.022**
	[0.005]	[0.006]	[0.006]	[0.008]	[0.010]	[0.009]
Sample size	135,396	89,500	65,692	42,013	19,661	24,801
R-squared	0.000	0.000	0.000	0.000	0.000	0.000
Panel C: All years						
After	-0.005	0.001	0.007	0.011	0.022**	0.022**
	[0.005]	[0.006]	[0.006]	[0.008]	[0.010]	[0.009]
After*Treatment	**0.015*** **	**0.016** **	**0.015***	**0.016***	**0.015**	**0.012**
	[0.005]	**[0.007]**	**[0.008]**	**[0.009]**	**[0.012]**	**[0.011]**
Sample size	368,798	239,939	174,350	110,734	51,777	65,186
R-squared	0.002	0.002	0.002	0.002	0.003	0.002

Results: Fertility

bandwidth (days)	180	120	90	60	30	IK
	(1)	(2)	(3)	(4)	(5)	(6)
Treated years						
After	-0.034	-0.061**	-0.089***	-0.118***	-0.119***	-0.120***
	[0.023]	**[0.027]**	**[0.030]**	**[0.033]**	**[0.032]**	**[0.034]**
Sample size	119,118	76,505	55,473	35,243	16,431	28,114
R-squared	0.001	0.001	0.001	0.001	0.001	0.001
Control years						
After	0.048	0.084*	0.096*	0.123*	0.171*	0.150**
	[0.036]	[0.046]	[0.054]	[0.065]	[0.088]	[0.072]
Sample size	67,719	44,737	32,800	20,860	9,724	16,608
R-squared	0.001	0.001	0.001	0.001	0.002	0.002
All years						
After	0.048	0.084*	0.096*	0.123*	0.171*	0.150**
	[0.036]	[0.046]	[0.054]	[0.065]	[0.088]	[0.072]
After*Treatment	-0.082**	-0.145***	-0.185***	-0.241***	-0.290***	-0.270***
	[0.038]	[0.047]	[0.055]	[0.065]	[0.088]	[0.072]
Sample size	**186,837**	**121,242**	**88,273**	**56,103**	**26,155**	**44,722**
R-squared	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**

Results: Smoking (household surveys)

Bandwidth (months)	6	5	4	3	2
	(1)	(2)	(3)	(4)	(5)
Treated years					
After	**0.0092***	**0.0092***	**0.0095****	**0.0117****	**0.0067**
	[0.0051]	**[0.0044]**	**[0.0040]**	**[0.0041]**	**[0.0045]**
Sample size	113,367	94,611	73,720	53,302	32,486
R-squared	0.003	0.003	0.003	0.003	0.003
Control years					
After	0.0017	-0.0006	0.0007	0.0031	-0.0004
	[0.0060]	[0.0064]	[0.0071]	[0.0058]	[0.0030]
Sample size	64,852	54,126	42,289	30,730	19,048
R-squared	0.001	0.001	0.001	0.001	0.001
All years					
After	0.0017	-0.0006	0.0007	0.0031	-0.0004
	[0.0060]	[0.0064]	[0.0071]	[0.0058]	[0.0030]
After*Treatment	**0.0075**	**0.0097**	**0.0088**	**0.0086**	**0.0071**
	[0.0066]	**[0.0073]**	**[0.0085]**	**[0.0089]**	**[0.0075]**
Sample size	178,219	148,737	116,009	84,032	51,534
R-squared	0.006	0.006	0.006	0.006	0.006

Discussion

- The schooling expansions:
  - Increased schooling and affected labor market outcomes
  - No significant effects on mortality or self-reported health

- First credible evidence outside of US or Western Europe

- Why no effects?

=> Need more work to understand this!

Additional Slides

Results: Chronic conditions (household surveys)

Bandwidth (months)	6	5	4	3	2
	(6)	(7)	(8)	(9)	(10)
Treated years					
After	**0.0099****	**0.0101***	**0.0107***	**0.0116***	**0.0151****
	[0.0044]	**[0.0050]**	**[0.0054]**	**[0.0054]**	**[0.0050]**
Sample size	113,367	94,611	73,720	53,302	32,486
R-squared	0.001	0.001	0.001	0.001	0.001
Control years					
After	0.0017	0.0016	0.0040	0.0032	0.0087
	[0.0063]	[0.0060]	[0.0051]	[0.0047]	[0.0054]
Sample size					
R-squared	64,852	54,126	42,289	30,730	19,048
	0.001	0.001	0.000	0.001	0.001
All years					
After	0.0017	0.0016	0.0040	0.0032	0.0087
	[0.0063]	[0.0060]	[0.0051]	[0.0047]	[0.0054]
After*Treatment	**0.0082**	**0.0084**	**0.0068**	**0.0083**	**0.0064**
	[0.0079]	**[0.0081]**	**[0.0083]**	**[0.0074]**	**[0.0093]**
Sample size	178,219	148,737	116,009	84,032	51,534
R-squared	0.001	0.001	0.001	0.001	0.001

Smoothness of covariates (1)

bandwidth (days)	180 (1)	120 (2)	90 (3)	60 (4)	30 (5)	IK (6)
Female						
After	-0.025*** [0.009]	-0.038*** [0.012]	-0.050*** [0.014]	-0.073*** [0.017]	-0.104*** [0.022]	-0.104*** [0.022]
After*Treatment	**-0.013** **[0.008]**	**-0.022**** **[0.010]**	**-0.028**** **[0.011]**	**-0.024*** **[0.014]**	**-0.026** **[0.020]**	**-0.026** **[0.020]**
Sample size	368,798	239,939	174,350	110,734	51,777	51,777
R-squared	0.001	0.001	0.002	0.003	0.006	0.006
Ethnic Romanian						
After	0.015*** [0.005]	0.024*** [0.006]	0.029*** [0.006]	0.032*** [0.007]	0.033*** [0.011]	0.032*** [0.008]
After*Treatment	**-0.008** **[0.005]**	**-0.011** **[0.007]**	**-0.012** **[0.008]**	**-0.012** **[0.010]**	**-0.007** **[0.014]**	**-0.010** **[0.011]**
Sample size	368,798	239,939	174,350	110,734	51,777	90,026
R-squared	0.001	0.001	0.001	0.001	0.002	0.001
Ethnic Hungarian						
After	-0.013*** [0.003]	-0.019*** [0.004]	-0.021*** [0.005]	-0.023*** [0.005]	-0.022*** [0.007]	-0.023*** [0.006]
After*Treatment	**0.006** **[0.004]**	**0.009** **[0.006]**	**0.010** **[0.007]**	**0.012** **[0.008]**	**0.011** **[0.012]**	**0.012** **[0.008]**
Sample size	368,798	239,939	174,350	110,734	51,777	104,061
R-squared	0.001	0.001	0.001	0.001	0.001	0.001

Smoothness of covariates (2)

bandwidth (days)	180 (1)	120 (2)	90 (3)	60 (4)	30 (5)	IK (6)
Ethnic Roma						
After	-0.000	-0.002	-0.004	-0.004	-0.005	-0.004
	[0.002]	[0.002]	[0.003]	[0.003]	[0.005]	[0.003]
After*Treatment	**0.001**	**0.000**	**0.000**	**-0.001**	**-0.005**	**-0.002**
	[0.002]	**[0.003]**	**[0.003]**	**[0.005]**	**[0.008]**	**[0.005]**
Sample size	368,798	239,939	174,350	110,734	51,777	105,028
R-squared	0.000	0.001	0.001	0.001	0.001	0.001
Ethnic Other						
After	-0.002	-0.004*	-0.004*	-0.004	-0.006	-0.004*
	[0.002]	[0.002]	[0.003]	[0.003]	[0.004]	[0.002]
After*Treatment	**0.001**	**0.002**	**0.002**	**0.001**	**0.001**	**0.002**
	[0.002]	**[0.003]**	**[0.003]**	**[0.004]**	**[0.006]**	**[0.003]**
Sample size	368,798	239,939	174,350	110,734	51,777	238,075
R-squared	0.000	0.000	0.000	0.000	0.000	0.000
Born in Bucharest						
After	-0.009***	-0.011***	-0.012***	-0.011**	-0.014**	-0.012**
	[0.003]	[0.003]	[0.004]	[0.005]	[0.007]	[0.005]
After*Treatment	**0.002**	**0.003**	**0.003**	**0.001**	**0.003**	**0.001**
	[0.003]	**[0.004]**	**[0.005]**	**[0.006]**	**[0.009]**	**[0.006]**
Sample size	368,798	239,939	174,350	110,734	51,777	115,361
R-squared	0	0	0.001	0.001	0.001	0.001

International migration (from 2011 Census)

bandwidth (days)	180	120	90	60	30	IK
	(1)	(2)	(3)	(4)	(5)	(6)
Treated years						
After	**-0.000**	**-0.000**	**-0.000**	**-0.001**	**0.000**	**-0.000**
	[0.000]	**[0.000]**	**[0.000]**	**[0.001]**	**[0.001]**	**[0.000]**
Sample size	2,170	1,448	1,085	718	354	1,430
R-squared	0.182	0.191	0.195	0.197	0.202	0.191
Control years						
After	-0.000	-0.000	-0.001	-0.001	-0.002**	-0.000
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Sample size	1,080	719	538	357	177	710
R-squared	0.090	0.096	0.096	0.089	0.119	0.096
All years						
After	-0.000	-0.000	-0.001	-0.001	-0.002**	-0.000
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
After*Treatment	**-0.000**	**-0.000**	**0.000**	**0.000**	**0.002****	**-0.000**
	[0.001]	**[0.001]**	**[0.001]**	**[0.001]**	**[0.001]**	**[0.001]**
Sample size	3,250	2,167	1,623	1,075	531	2,140
R-squared	0.364	0.367	0.371	0.382	0.420	0.367

Attrition between 1992 and 2011 Census

bandwidth (days)	180	120	90	60	30	IK
	(1)	(2)	(3)	(4)	(5)	(6)
Treated years						
After	**-0.008**	**-0.017**	**-0.020**	**-0.015**	**-0.026**	**-0.020**
	[0.025]	**[0.031]**	**[0.035]**	**[0.040]**	**[0.043]**	**[0.036]**
Sample size	2,155	1,435	1,075	714	354	1,045
R-squared	0.017	0.023	0.030	0.038	0.075	0.031
Control years						
After	-0.058**	-0.060*	-0.064*	-0.071*	-0.156***	-0.065*
	[0.026]	[0.031]	[0.035]	[0.039]	[0.054]	[0.035]
Sample size	1,078	718	538	357	177	523
R-squared	0.015	0.023	0.027	0.023	0.061	0.027
All years						
After	-0.058**	-0.060*	-0.064*	-0.071*	-0.156***	-0.065*
	[0.026]	[0.031]	[0.035]	[0.039]	[0.054]	[0.035]
After*Treatment	**0.050**	**0.043**	**0.044**	**0.057**	**0.130****	**0.045**
	[0.039]	**[0.047]**	**[0.053]**	**[0.059]**	**[0.060]**	**[0.053]**
Sample size	3,233	2,153	1,613	1,071	531	1,568
R-squared	0.022	0.028	0.036	0.045	0.088	0.037

Results: Employment