Higher Education and Mortality: Legacies of an Authoritarian College Contraction

Teaching Material

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Roadmap of Talk

Introduction

Data and Empirical Strategy

College Enrollment and Mortality

Underlying Mechanisms

Concluding remarks

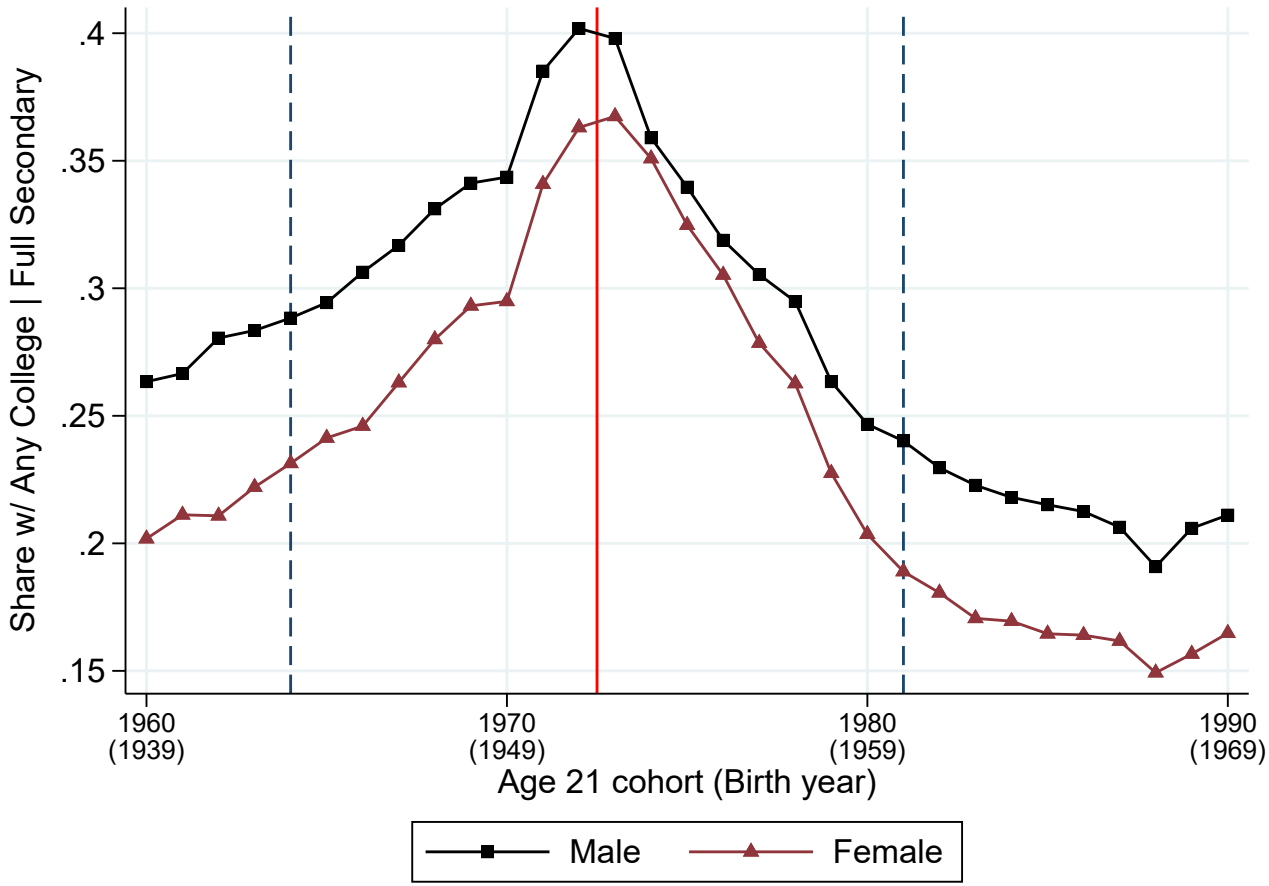
The relationship between education and health

- More educated people live longer lives, but research on the *causal effect* of education on mortality has provided largely null findings (Galama et al., 2018; Xue et al., 2021)
- Most of the existing research has studied changes to compulsory schooling laws affecting education at the primary or secondary level, but little is known about the impact of *higher education* on mortality (Buckles et al., 2016; Taylor, 2017)
- The effect of education on mortality is likely to vary across different levels of educational attainment (Cutler and Lleras-Muney, 2008; Montez et al., 2012)

We provide new evidence on the causal effect of higher education on mortality

- We study the case of Chile, where higher education was expanding rapidly before the military coup led by Augusto Pinochet in 1973
- The Pinochet regime assumed control of all universities and reduced public subsidies to higher education, which led to a steady reduction in the number of openings offered to incoming students
- As a result, college-age cohorts experienced a sharp downward kink in college enrollment after 1973

College enrollment steadily decreased after the coup



The kink in college enrollment was supply-driven

- The secondary completion rate remained on trend ▸ Secondary
- The share of the government educational budget allocated to universities fell from 47% in 1974 to 29% by 1980 (a 38% decrease) ▸ Budget
- College applicants greatly exceeded openings throughout this period (i.e., # seats was the binding constraint) ▸ Openings
- The centralized admission system did not change $\rightarrow$ students with lower test scores, who disproportionately came from less affluent family backgrounds, were the ones who failed to gain admission

Health insurance and provision operates under a dual system in Chile

- Health insurance includes a public provider FONASA (80%) and several private alternatives ISAPRES (15%)
- FONASA serves lower-income and higher-risk individuals, while ISAPRES serve a richer, healthier, and younger segment of the population (Pardo and Schott, 2012)
- FONASA only covers services by public providers; additional payment is required to access private providers. Generally, public providers are more crowded and have longer wait times

Roadmap of Talk

We rely on four main data sources

Primary records:

- Mortality files (vital statistics) for the period 1994-2017: record cause of death, basic demographic information, and educational attainment
- Population censuses in 1992 and 2002: record basic demographic information and educational attainment

We complement these data with:

- Universe of hospital discharge summaries for the period 2002-2018
- Individual responses in all thirteen waves of the CASEN household survey between 1990 and 2017

Analysis sample

- We restrict the sample to individuals born between 1943 and 1960, who reached age 21 (the average age of first-year college students in 1970) between 1964 and 1981
- To ensure a relevant counterfactual for college enrollment, we further restrict our baseline sample to individuals reporting four or more years of secondary education
- Since we cannot link our data sources at the individual level, we aggregate the data into cohort-gender-region cells (to account for differences in mortality across genders and regions)

▸ Descriptive Statistics

We exploit the kink in college enrollment in the spirit of a regression kink design

We estimate the following reduced-form specification:

$$\overline{D}_{krt} = \alpha_{j(k,t)} + \alpha_{rt} + \gamma\ Z_k + \nu_{krt}$$

- $\overline{D}_{krt}$ is the risk-adjusted mortality rate of cohort k in region r and year t (gender subscript omitted)
- We set $k = 0$ for the 1951 birth cohort (which turns 21 in 1972), $k = 1$ for the 1952 birth cohort, and so on ($k \in [-8, 9]$)
- The excluded instrument Z_k is defined as $[1(k > 0) \times k]$. The parameter γ captures the linear trend break (i.e., kink) of interest
- We include age ($\alpha_{j(k,t)}$) and region-by-year (α_{rt}) fixed effects and cluster the error term ν_{krt} at the region-year level

Empirical strategy to identify the effect of college on mortality

- We can similarly estimate the following first-stage specification:

$$\overline{C}_{krt} = \omega_{j(k,t)} + \omega_{rt} + \theta\ Z_k + \mu_{krt},$$

  where $\overline{C}_{krt}$ is the college enrollment rate and θ captures the kink in college enrollment for the affected cohorts (we expect $\hat{\theta} < 0$)

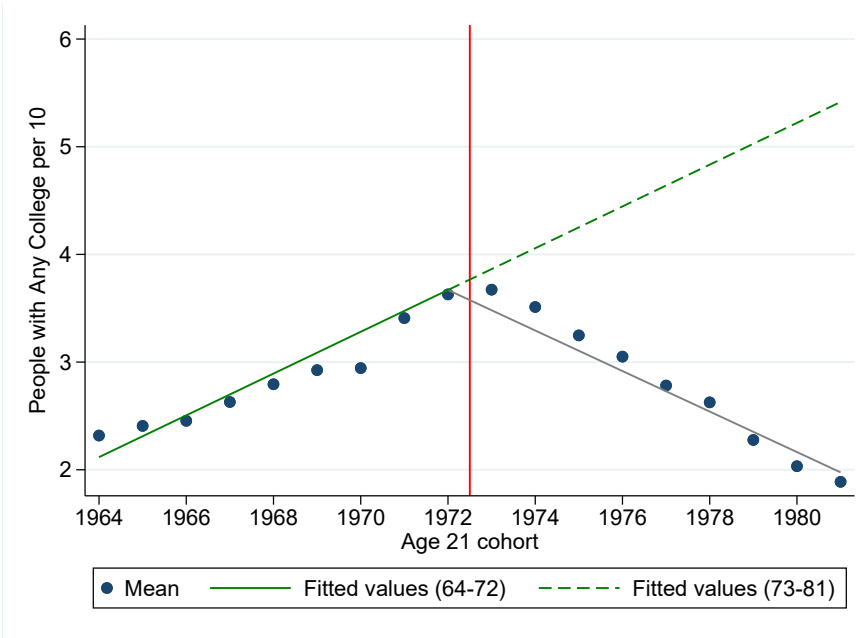
- The corresponding second-stage regression is:

$$\overline{D}_{krt} = \phi_{j(k,t)} + \phi_{rt} + \beta\ \overline{C}_{krt} + \eta_{krt}$$

- Under the four assumptions of (i) relevance, (ii) monotonicity, (iii) smoothness, and (iv) exclusion restriction, β identifies the local average treatment effect (LATE) of college enrollment on mortality (Imbens and Angrist, 1994; Card et al., 2015; Dong, 2018)

Roadmap of Talk

Kink in college enrollment



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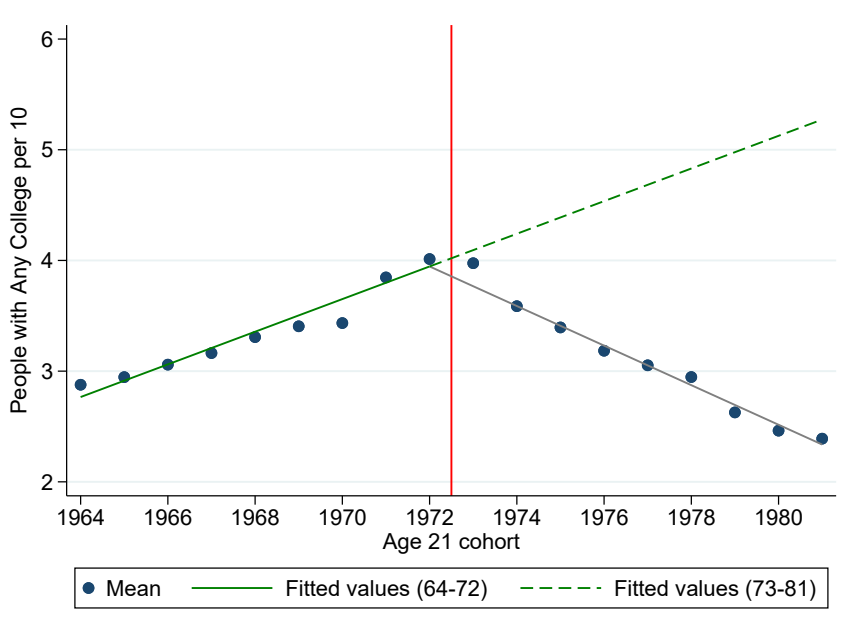
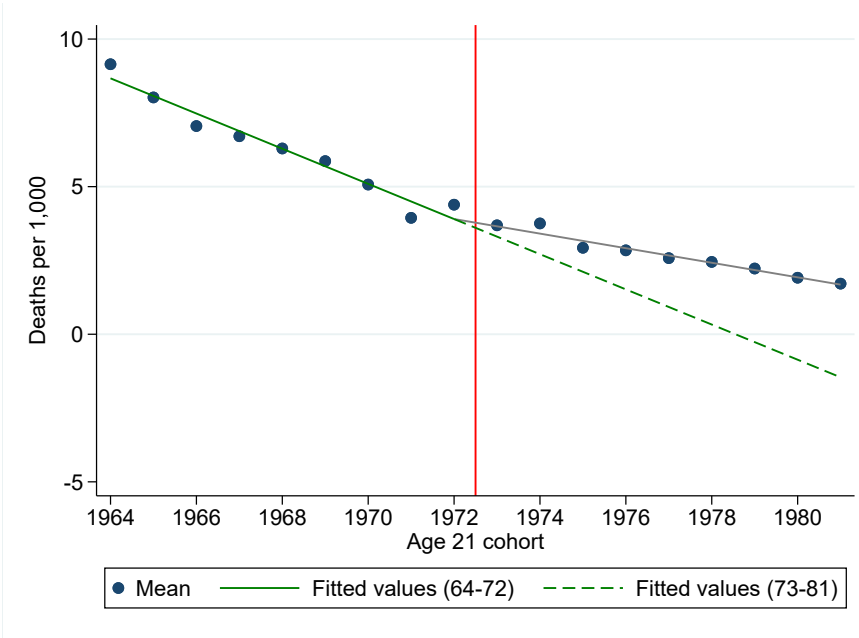


Male

Kink in mortality rate



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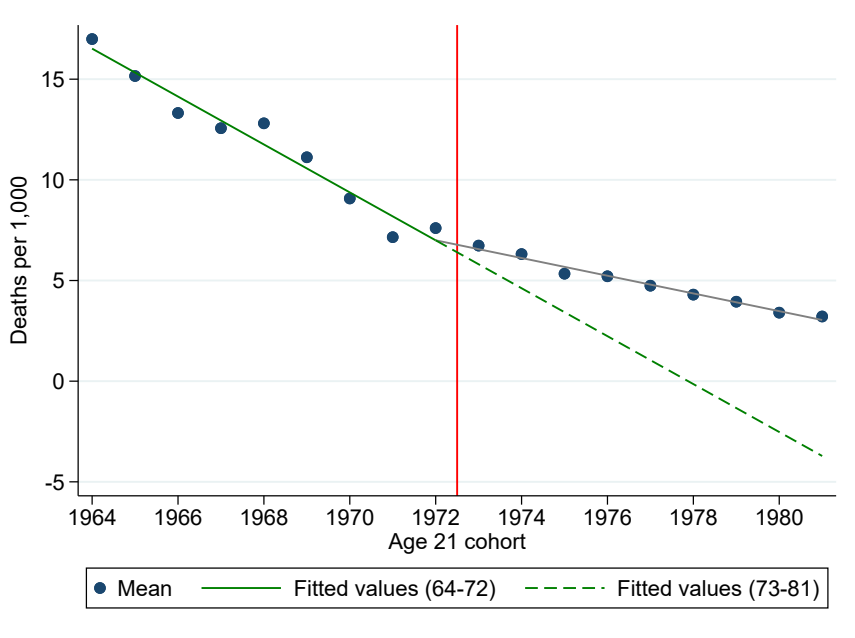


Male

Impact on Mortality

	Dependent variable: Deaths per 1,000							
	Female				Male			
	Main specification	+ cohort-region trends	without regional variation	without education restriction	Main specification	+ cohort region trends	without regional variation	without education restriction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Reduced form								
Cohort trend × After 1973	0.110***	0.114***	0.107***	0.094***	0.311***	0.316***	0.302***	0.196***
	(0.022)	(0.021)	(0.024)	(0.012)	(0.042)	(0.037)	(0.040)	(0.021)
	[0.071]	[0.062]	[0.079]	[0.244]	[0.001]	[0.001]	[0.001]	[0.081]
Panel B: IV								
Share with college per 10 people	-0.268***	-0.278***	-0.258***	-0.710***	-0.911***	-0.923***	-0.882***	-1.491***
	(0.051)	(0.049)	(0.058)	(0.089)	(0.116)	(0.104)	(0.117)	(0.149)
	[0.087]	[0.067]	[0.096]	[0.273]	[0.001]	[0.001]	[0.001]	[0.146]
Panel C: OLS								
Share with college per 10 people	-0.197***	-0.229***	-0.221***	-0.426***	-0.799***	-0.809***	-0.853***	-0.857***
	(0.045)	(0.043)	(0.051)	(0.073)	(0.102)	(0.094)	(0.109)	(0.134)
	[0.083]	[0.052]	[0.098]	[0.198]	[0.001]	[0.001]	[0.001]	[0.081]
Year-by-region fixed effects	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Year fixed effects	No	No	Yes	No	No	No	Yes	No
Age fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,480	6,480	432	6,480	6,480	6,480	432	6,480
R-squared (panel A)	0.760	0.765	0.972	0.912	0.853	0.859	0.979	0.928
R-squared (panel C)	0.760	0.765	0.972	0.912	0.853	0.859	0.979	0.927
Avg. dependent variable	3.751	3.751	3.751	4.265	6.984	6.984	6.984	7.720
Kleibergen-Paap F-stat (panel B)	4231	4435	4369	6236	8548	9102	6594	6622
Exclusion restriction test (% of RF)	70.5	72.4	67.8	77.1	79.6	81.5	80.3	82.9
H_0 : OLS = IV (p-value)	0.164	0.320	0.523	0.002	0.338	0.272	0.802	0.000

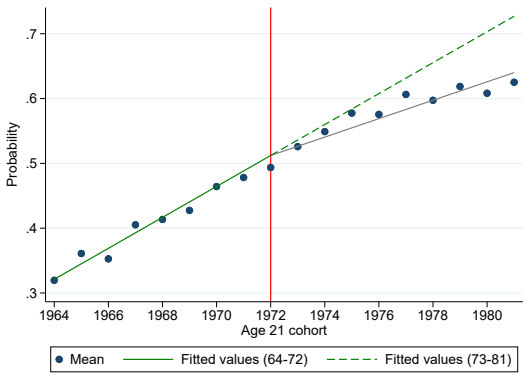
Validation of the identifying assumptions and robustness checks

- Affected cohorts do not exhibit a kink in age-specific mortality before reaching college age
- There is no kink in cohort size in the 1960 census (i.e., no manipulation of the *running variable*)
- Our results are robust to shorter bandwidths of as few as eight cohorts
- There is no kink in mortality among people with incomplete secondary education who were ineligible for college but were exposed to other changes
- Other relevant outcomes do not exhibit a linear kink after 1973

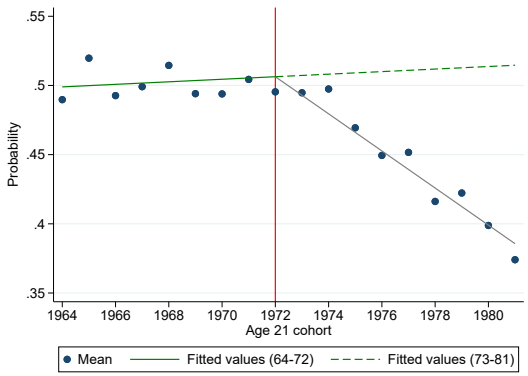
Roadmap of Talk

Labor market outcomes

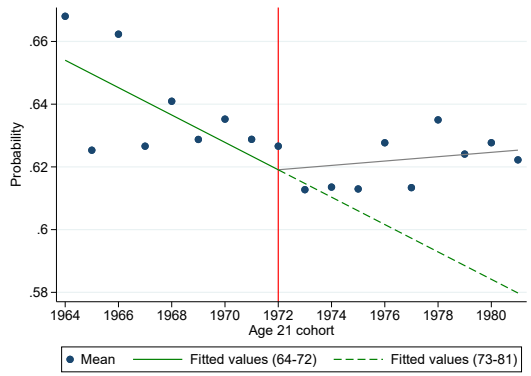
- Using data from thirteen waves of a large household survey called CASEN between 1990 and 2017; we show that lower college enrollment decreases labor force participation, the quality of occupation, and monthly income



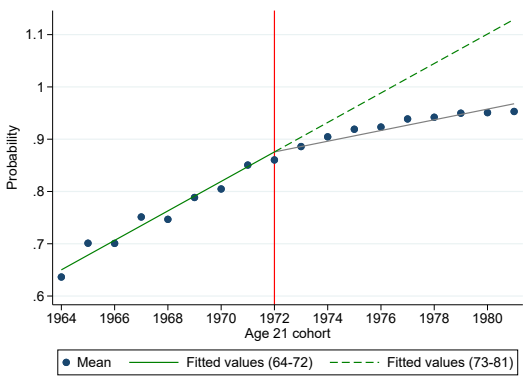
Female: In labor force



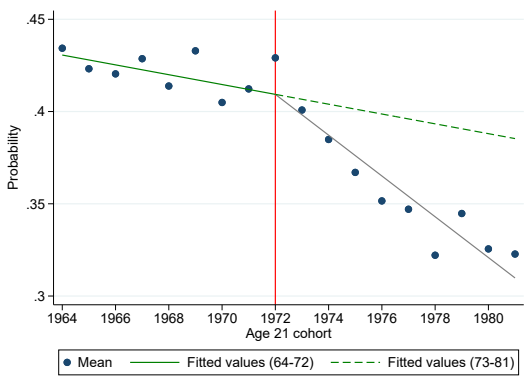
Female: White-collar



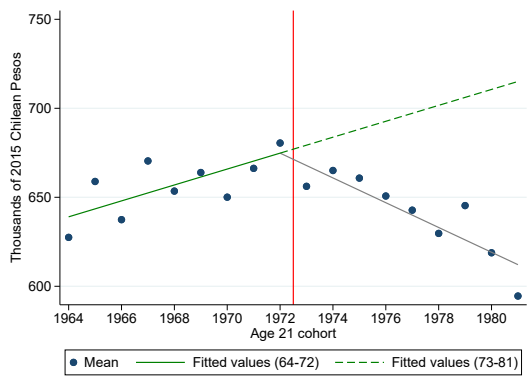
Female: Income



Male: In labor force



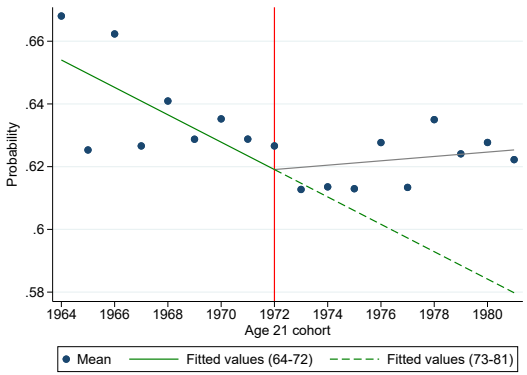
Male: White-collar



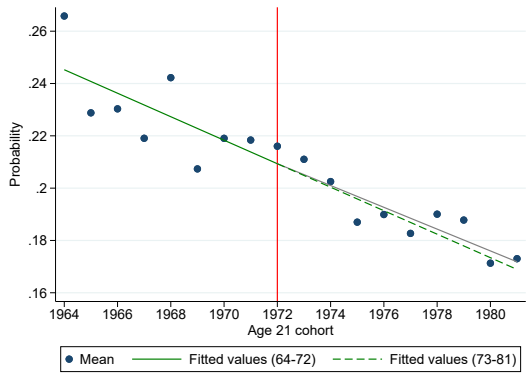
Male: Income

Consumption of health services

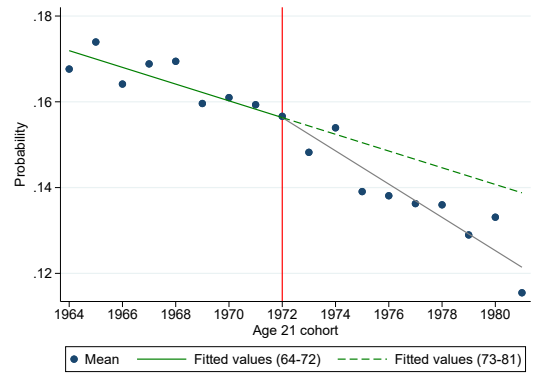
- Fewer college opportunities also increase reliance on the more congested public health system and lead to lower consumption of health services



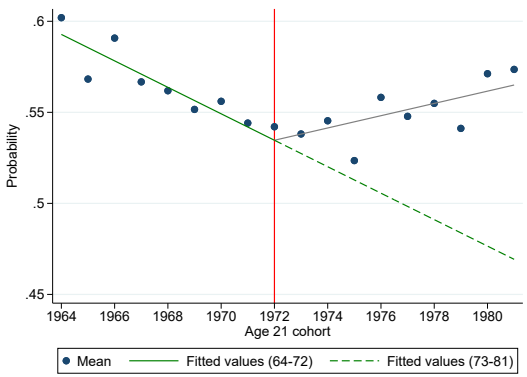
Female: Public insurance



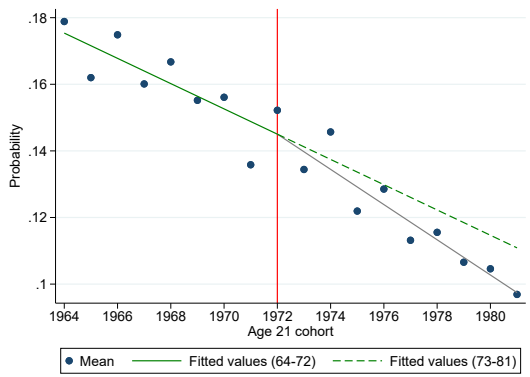
Female: Primary care



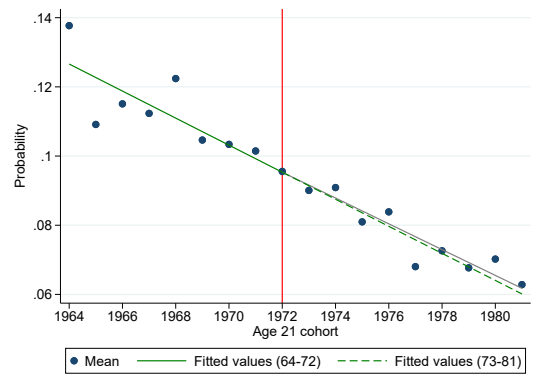
Female: Specialist



Male: Public insurance



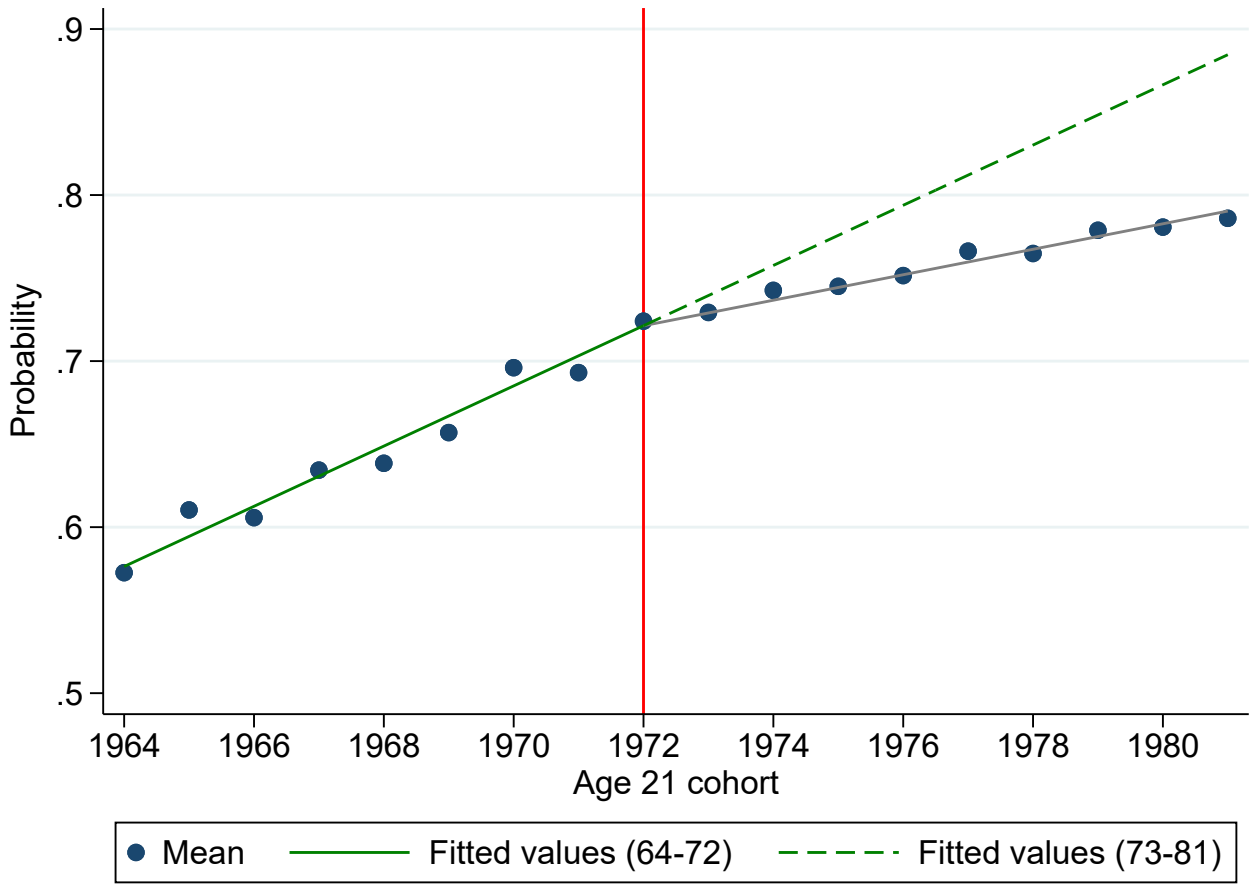
Male: Primary care



Male: Specialist

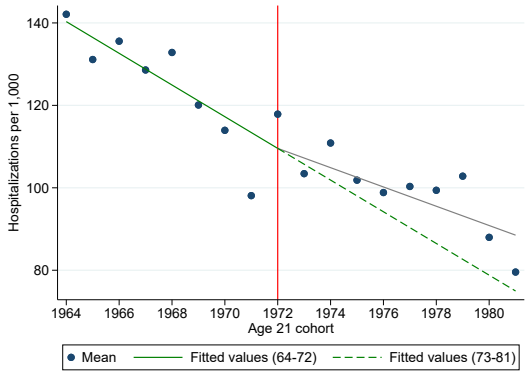
Consumption of health services (continued)

◦ Reduced consumption of health services includes preventive care, i.e., Pap smear for women

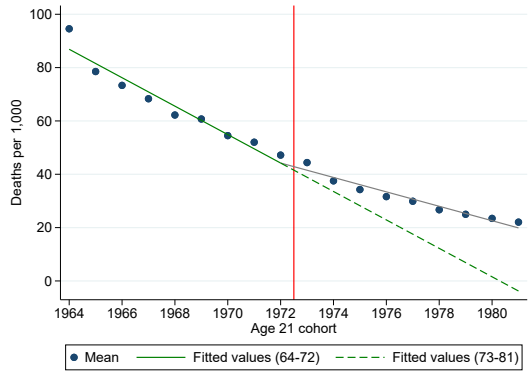


Hospitalizations

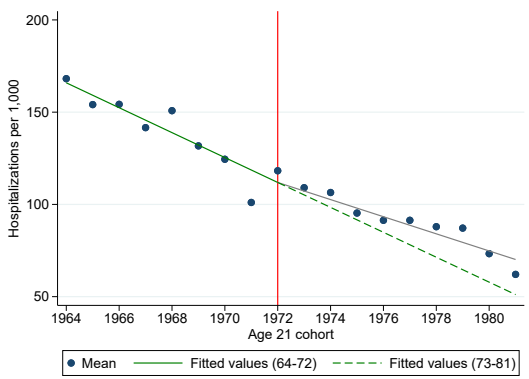
- Hospital discharge summaries linked with the mortality files at the individual level further show that hospitalized patients in the affected cohorts exhibit an upward kink in mortality



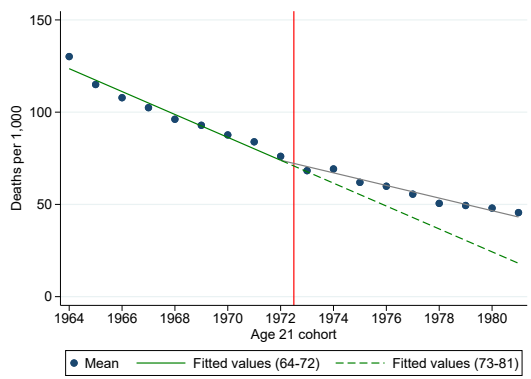
Female: Hospitalizations



Female: 1-year mortality



Male: Hospitalizations



Male: 1-year mortality

Roadmap of Talk

Higher education decreases mortality

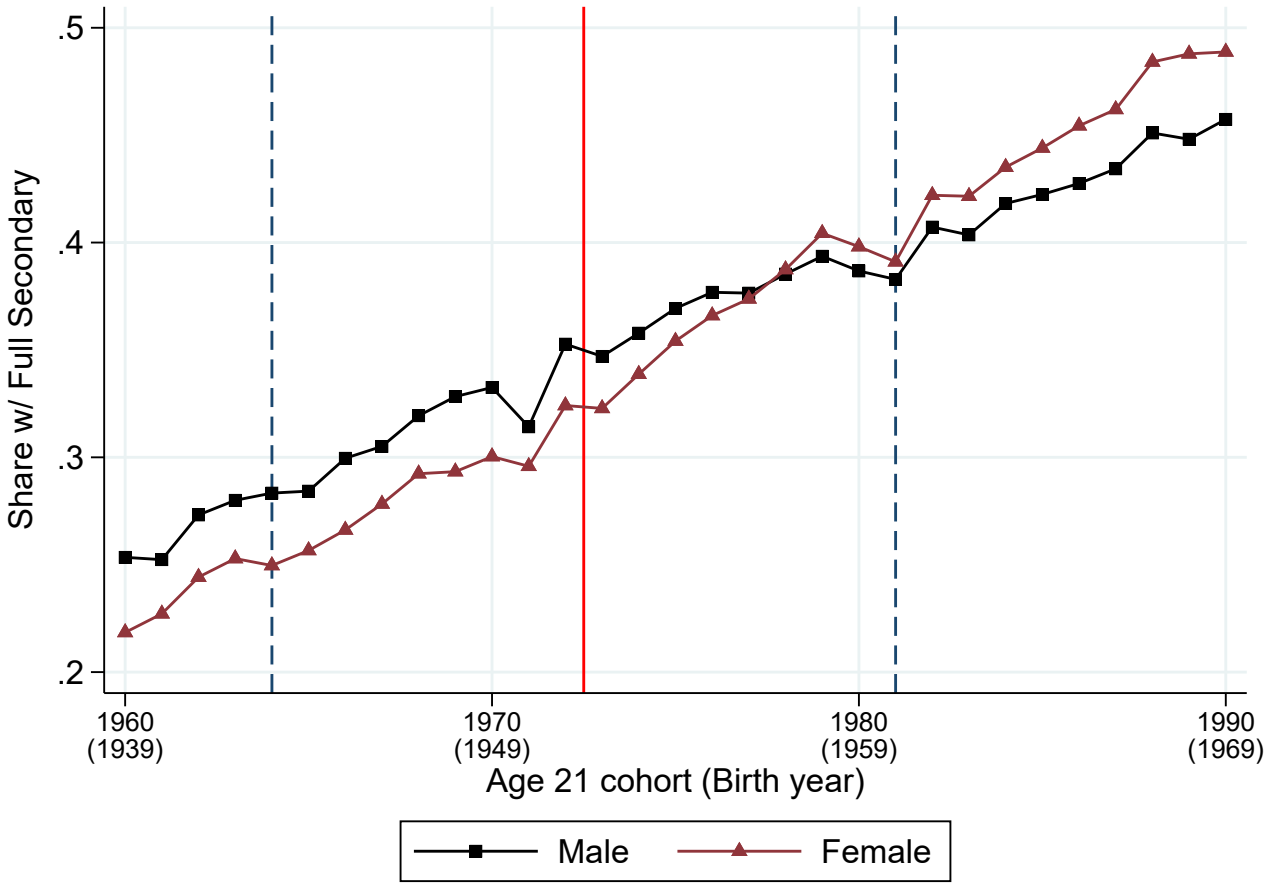
- We document an upward kink in mortality between ages 34-74 among Chilean cohorts that reached college age shortly after the 1973 military coup, who exhibit a downward kink in college enrollment
- These cohorts have worse labor market outcomes, are more reliant on the public health system, and consume health services at lower rates
  $\Rightarrow$ Economic disadvantage and limited access to care seem to play an important mediating role in the causal link between higher education and mortality

Relation to previous literature

- Our results contribute to the literature on the non-pecuniary effects of education and indicate a sizable health return to college (Grossman, 2006; Lochner, 2011; Oreopoulos and Salvanes, 2011)
- Previous work has largely struggled to find evidence of a causal effect of education on mortality (Galama et al., 2018; Xue et al., 2021)
  - Existing research has mostly exploited changes in compulsory schooling laws that (i) take place at lower levels, (ii) induce people to obtain education beyond what they wanted, (iii) cause small increases in educational attainment
  - We exploit a reduction in college seats in a setting where individuals wanted to attend college but failed to gain admission because of the dictatorship's policies, with sizable socioeconomic consequences

Additional Material

A growing number of graduates from secondary education competed over a decreasing number of spots



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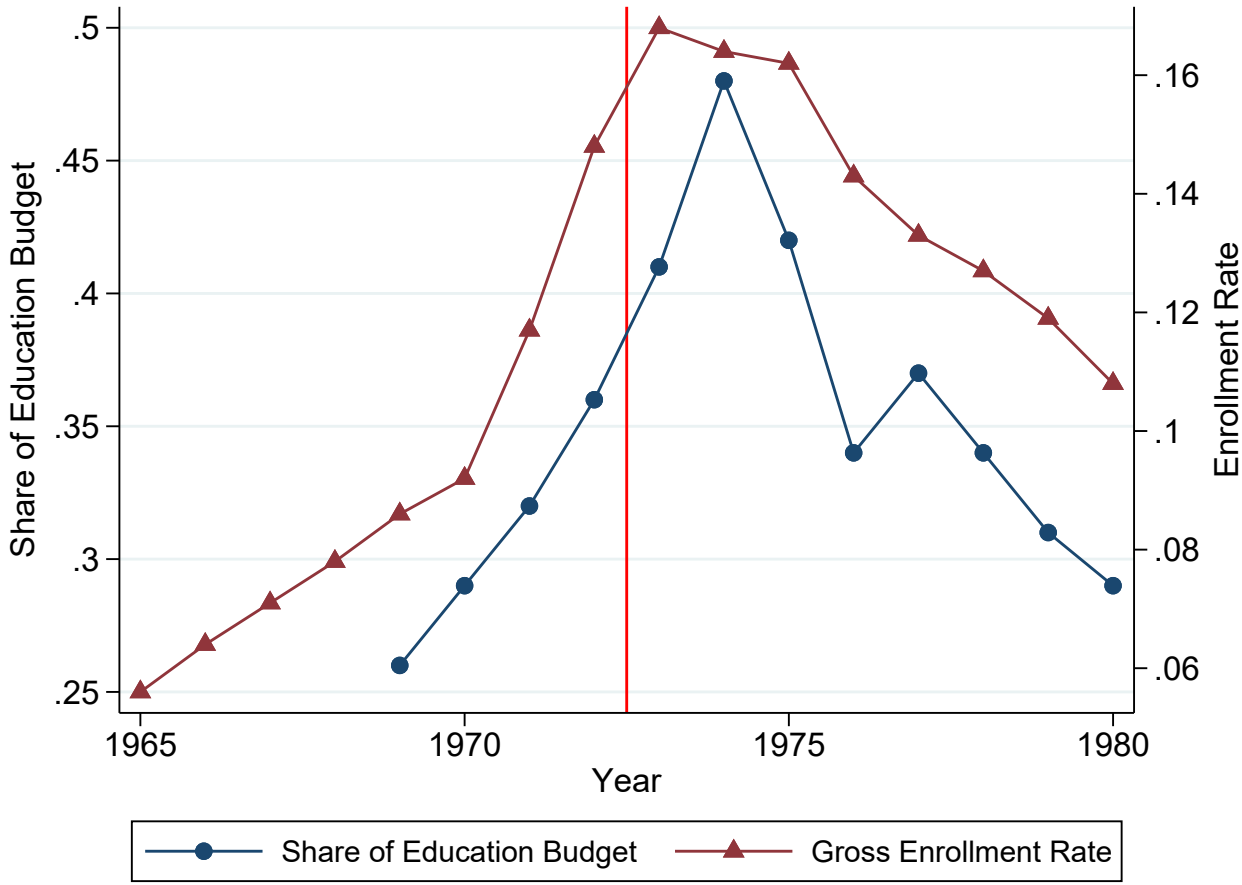
Government subsidies and college enrollment decreased after the coup



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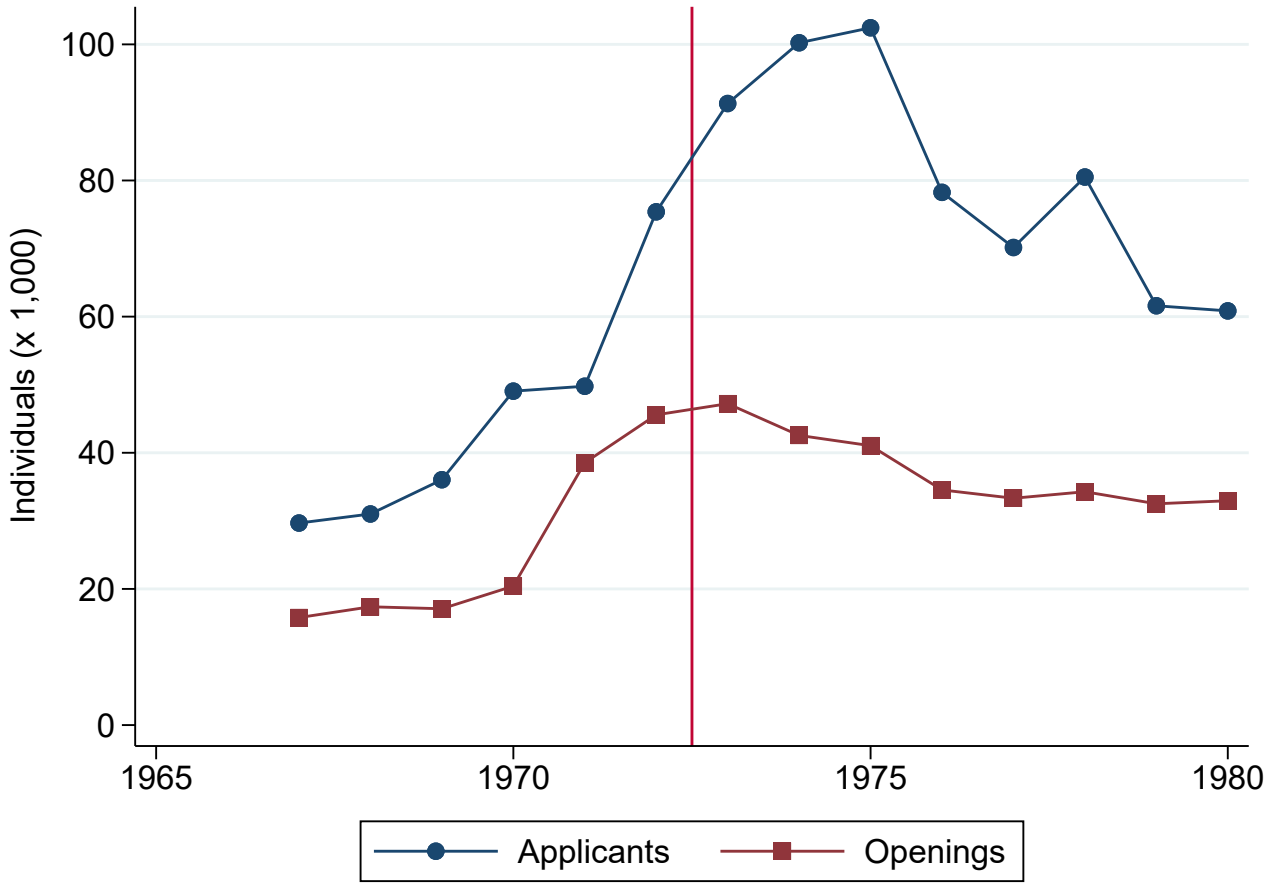
There were more college applicants than available seats throughout the whole period



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Descriptive statistics

	Female		Male	
	1964-72	1973-81	1964-72	1973-81
	(1)	(2)	(3)	(4)
Panel A: Education (Share per 10)				
Any primary	9.482	9.757	9.614	9.809
Any secondary	4.683	5.744	4.949	5.875
Complete secondary	2.850	3.728	3.137	3.760
Any college	0.826	1.001	1.064	1.127
Any college | complete secondary	2.898	2.686	3.392	2.997
Panel B: Health				
One-year mortality rate (per 1,000)	6.002	2.562	11.189	4.624
Primary care visit in past 3 months (=1)	0.225	0.187	0.158	0.117
Specialist visit in past 3 months (=1)	0.164	0.135	0.109	0.075
One-year hospital visit rate (per 1,000)	80.945	67.401	86.581	59.241
Panel C: Labor Market				
In labor force (=1)	0.423	0.592	0.773	0.932
White-collar high-skill occupation (=1)	0.500	0.434	0.421	0.348
Avg. monthly income	302.024	302.862	658.650	637.981
Public health insurance (=1)	0.636	0.622	0.562	0.552
Individuals in 1992 census	632,127	889,685	598,778	844,349
Individuals in 1992 census | full secondary	180,167	331,672	187,859	317,464
Deaths in 1994-2017 | full secondary	24,707	19,989	46,080	33,969

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