Democratizing Opportunity: The Effects of the U.S. High School Movement

NBER Summer Institute

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The High School Movement

- The fastest increase in schooling in American history
- Between 1890 and 1945, the number of public high schools in the United States increased from 2,771 to 23,757 (Goldin 1994, 1996, 1998)
- 15- to 18-year-olds' high school enrollment increased from 18% in 1910 to 73% in 1940
- High school graduation rate increased from 9% of 18-year-olds in 1910 to 50% in 1940
- Women graduated at higher rates than men until the 1940s (Goldin 2008, 2021)

Claudia Goldin, *Career and Family* (2021)

Youths flocked to the new high schools. But in the 1920s **girls attended and graduated at greater rates than boys did, in every state in the nation.** Females had superior aptitude in high schools and higher graduation rates, just as they have greater college enrollment and graduation rates than do males today. Girls, it seems, do better at school when allowed to excel at it.

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- the share of employed chemists increased by 600%; engineers by 700% (Goldin and Katz, 1999)

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- the share of the U.S. population living in urban areas grew from 30 to 58% (Boustan et. al, 2013)
- the share of employed chemists increased by 600%; engineers by 700% (Goldin and Katz, 1999)
- the U.S share of world industrial output grew from 13 to 35%, surpassing the UK and Germany to be #1 in both aggregate and per-capita terms (Wright, 1990)

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1. Need data on local access to schools
   - → Important variation within states/counties
2. Need consistent data on long-run outcomes
   - → Completed education not tracked until the 1940 census, and even then high school graduation information measured with error (Goldin, 1998)
   - → In the recent past it was nearly impossible to link large samples of women forward from childhood to their adult outcomes during this period

This project

We construct a new panel of all U.S. high schools pre-1945 and when they were built

We then estimate the effect of local HS opening on:

1. Short-run enrollment
2. Medium-run labor market outcomes
3. Marriage, fertility, and geographic mobility

Preview of results

We find striking heterogeneity in access to high schools, even within otherwise-similar, narrow geographic units

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We estimate that high school construction:

1. Increases self-reported enrollment at high school ages (“first-stage”)
2. Shifts women into the workforce
3. Shifts men (and women) into more lucrative occupations
4. Delays marriage and induces geographic mobility

Contributions

What happened during the US High School Movement?

Reese (1995); Goldin (1998, 1999, 2021); Goldin and Katz (2008)

What are the effects of increased investment in local schools?

Duflo (2001); Aaronson and Mazumder (2011); Schmick and Shertzer (2020); Jackson and Mackevicius (2023); Cascio and Lewis (2024)

What factors have influenced women's increased labor force participation?

Greenwood et al. (2005); Bailey (2006); Albanesi and Olivetti (2016); Goldin (2021); Rashid (2025)

Background

Data

Short-run enrollment impacts

Medium-run labor market impacts

Mechanisms

Robustness

What did high schools do?

Barbara McClintock (b. 1902), 1983 winner of Nobel Prize in Physiology/Medicine

At Erasmus Hall High School, she discovered science. It was there that the pleasure of solving difficult problems began to grow. “I would solve some of the problems in ways that weren’t the answers the instructor expected....It was a tremendous joy, the whole process of finding that answer, just pure joy.” (Keller, 1983)

What did high schools do?

Lucy Gambol (b. 1875), the first Black teacher in Omaha, Nebraska public schools

“I am the oldest of eight children… I started to attend Omaha high school, and graduated from there in 1893. During this time there was a Normal Training school…and I attended it for two years finishing in 1895…which in turn afforded me the opportunity to teach in the public schools of Omaha…[My daughters] are both graduates of the University of Nebraska.” (American Life Histories, 1939)

High school curriculum

- Pre-1890 a typical high school (especially on East Coast) was aimed at college preparation, mostly for men
  - → Classics curriculum (e.g., Latin, Greek, Literature, Formal Math)

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- Pre-1890 a typical high school (especially on East Coast) was aimed at college preparation, mostly for men
  - → Classics curriculum (e.g., Latin, Greek, Literature, Formal Math)
- Shifts in late 1890s toward more practical classes, including applied science
- Some vocational training introduced (e.g., 17 percent of students report taking typing in 1934) but purely industrial training tracks failed (Goldin, 1998)

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High School Data

We construct the first complete panel of high schools in the U.S. pre-1945, based on:

1. Censuses of all public and private high schools, collected by the Bureau of Education every 1-2 years from 1873 to 1905; and in 1912 and 1951.
2. Lists of accredited high schools published by the Bureau of Education every 2-6 years from 1911 through 1944.
3. Patterson's American Educational Directories, providing names of high schools in each county for seven years between 1906 and 1924.
4. Private School Universe Surveys produced by the National Center for Education Statistics, including founding dates of high schools reported in the 1989 and 1995 academic years.

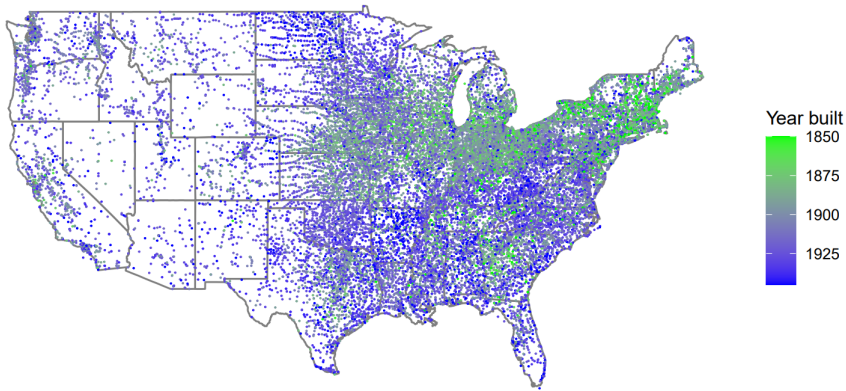
State and post-office.	Name.	Principal.	Classification of public high schools.	Secondary instructors.		Students.							
						Secondary students.		Elementary students.		Preparing for college.			
										Classical course.		Scientific courses.	
				Men.	Women.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
OHIO—continued.													
Cincinnati	West Evening High School.	W. C. Washburn	Dept.	5	6	290	125	0	0	....	....	....	....
do	Woodward High School	Augustus M. Van Dyke	Dept.	11	15	292	393	0	0	....	....	....	....
Circleville	Everts High School	T. Otto Williams	Dept.	2	3	55	75	0	0	4	2	1	0
Claridon	High School*	Arthur N. Thomas	Dist.	1	0	10	10	10	13	....	....	....	....
Clarington	do	Samuel V. Cox	Ind.	2	0	27	26	0	0	....	....	....	....
Clarksburg	Deerfield Township High School.	E. C. Hedrick	Twp.	1	0	16	16	0	0	1	0	....	....
Clarksville	High School	Robt. Burton	Dist.	1	0	7	16	0	0	1	5	....	....
Claysville	Westland Township High School.	Samuel R. Coulter	Twp.	1	1	3	9	7	15	1	1	....	....
Cleveland	Central High School	Edward L. Harris	Dept.	26	30	828	890	0	0	168	237	275	253
do	East High School	B. U. Rannells	Dept.	21	21	560	618	0	0	23	17	35	0
do	Lincoln High School	James W. McLane	Dept.	14	10	284	316	0	0	2	0	10	6
do	South High School	Gustavus A. Ruetenik	Dept.	11	11	205	226	0	0	85	54	90	0
do	West High School	Charles P. Lynch	Dept.	24	7	312	394	0	0	....	....	....	....
Cleveland Heights	High School	Chas. A. Tilden	Dist.	2	2	17	18	0	0	5	5	3	0

High School Data

Combine sources to create standardized panel

1. Scan PDFs manually or find scans already digitized by libraries
2. Digitize and fix errors by hand
3. Result: 360,000 year-by-high school observations in 26,877 unique geocoded places
4. Data ranges from only accreditation status in some years to detailed enrollment and financial statistics in other years

Figure: Map of cities by year of first high school constructed



Notes: This map shows the founding dates of the first high school built in each of 26,877 places that we map to a valid longitude-latitude.

Figure: Map of cities by year of first high school constructed, Ohio

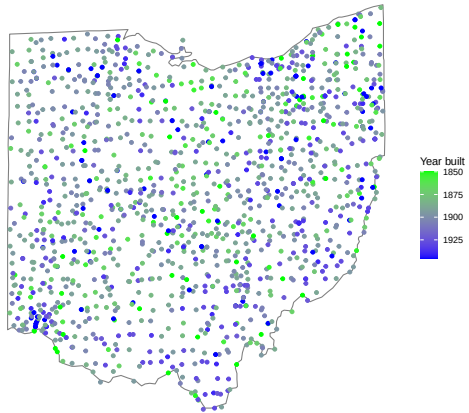


Figure: Map of cities by year of first high school constructed, Massachusetts

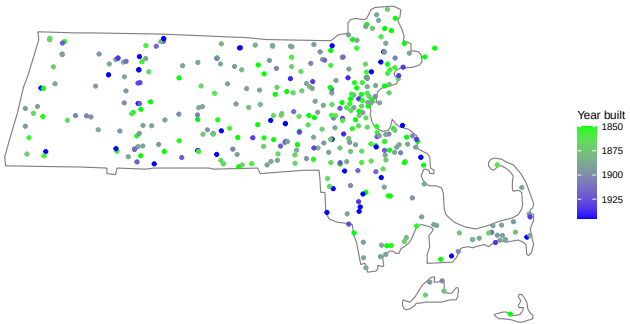


Figure: Map of cities by year of first high school constructed, Tennessee

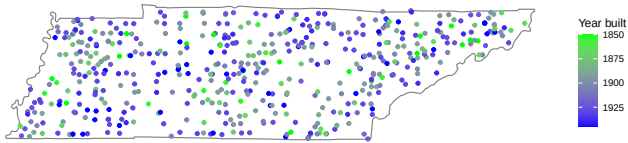
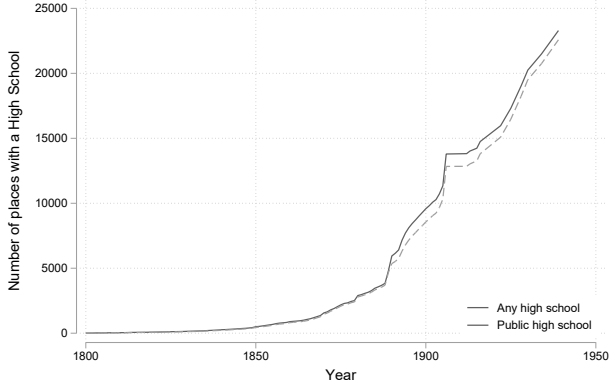


Figure: Number of towns in the U.S. with high schools, by year



Notes: This plot shows the number of towns and cities with any high school (the solid line) and with any public high school (the dashed line) from 1800 to 1950.

Linking high schools to the census

Geocode all the high schools and match via lat-lon to individual data from the complete count decennial censuses for 1850 to 1940

Use the Census Place Project (Berkes, Karger, Nencka, 2023) to geocode small towns in the historical census

Link both men and women forward from their childhood homes to see age 20s and 30s outcomes using the Census Tree (Buckles, Haws, Price, Wilbert, 2023)

Background

Data

Short-run enrollment impacts

Medium-run labor market impacts

Mechanisms

Robustness

Estimation intuition

*For students from the **same birth cohort**, whose nearest school opened in the **same year**, how do outcomes differ between those living with a high school in their town vs their peers living in a town a few miles away?*

- Assign youth to the closest high school that opened near them. If multiple schools within 1 mile, pick the one that opened earliest (treatment group). Further away, pick the closest one and record the opening date (control group)
- Trace out impacts for both treatment and control groups relative to age at high school opening after partialling out birth cohort by school opening year fixed effects
- Analogous to a “stacked” difference-in-difference – **event time is defined for all units**

Enrollment effects

$$Y_{ictk} = \sum_{a=-30}^{60} \beta_a (Treated_i \times \mathbf{1}[\text{age} = a]_{ictk}) + \lambda_b + \delta_c + \gamma_{st} + \eta_t + \phi_{kb} + \epsilon_{ictk}$$

- Y_{ictk}: Enrollment for person i, living in childhood city c, in year t whose nearby high school opened in year k.
- $Treated_i$: An indicator equal to 1 if c is ≤ 1 mile from a high school.
- $\mathbf{1}[\text{age} = a]_{ictk}$: An indicator for person i being age a when a school opened in year k.
- λ_b, δ_c, η_t, and γ_{st}: birth year, city, year, and state-by-year FEs
- ϕ_{kb}: **School Opening Year** $\times$ **Birth Cohort FE**. Controls for trends common to a birth cohort exposed to a school that opened in a specific year.

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- Plot β_a, which track the average effect of **proximate access** (≤ 1 miles) to a high school by age at HS opening.

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- Cluster standard errors at the high school level

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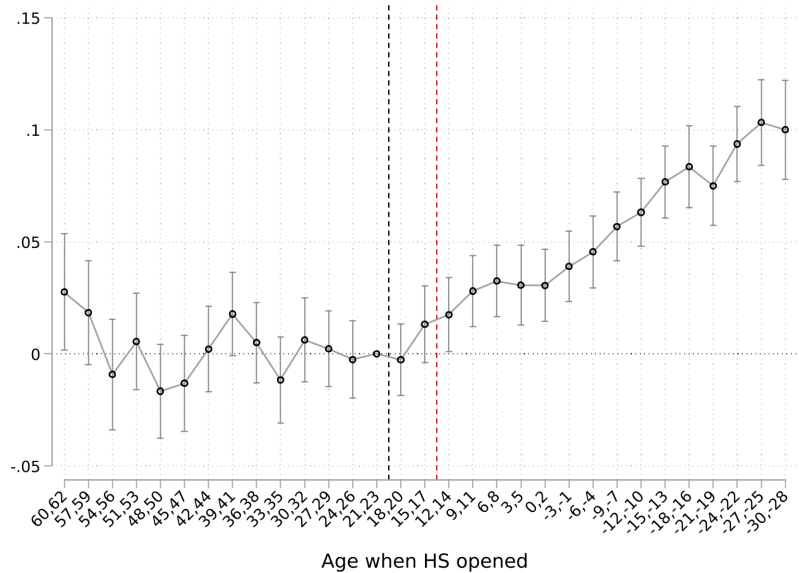

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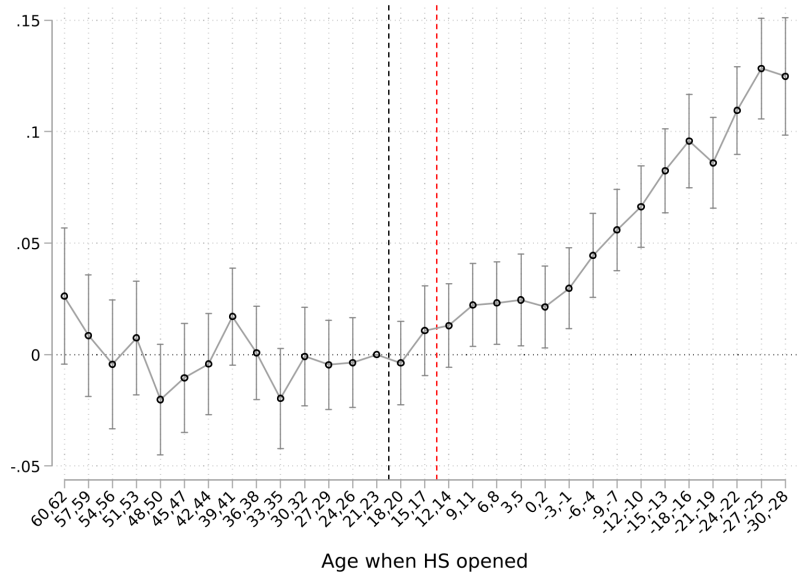


Figure: Effect of high school entry on 16–18-year-old female school enrollment

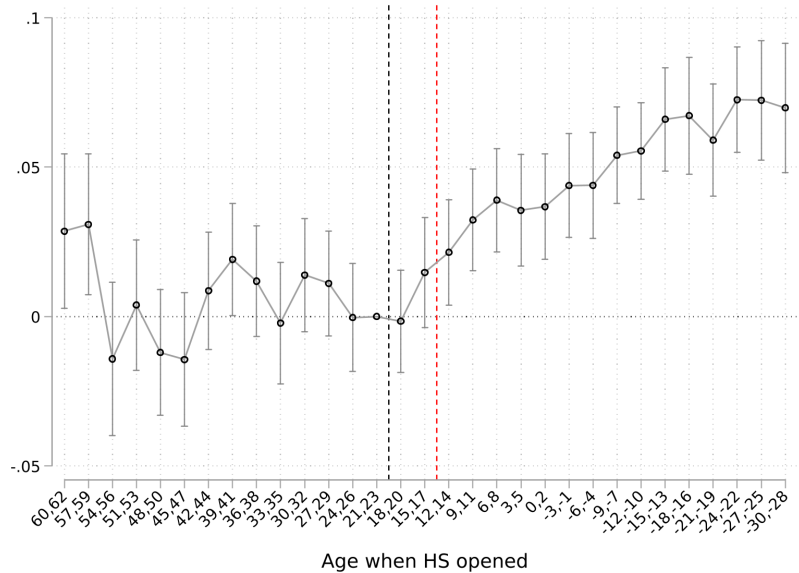


Figure: Effect of high school entry on Age 10 school enrollment

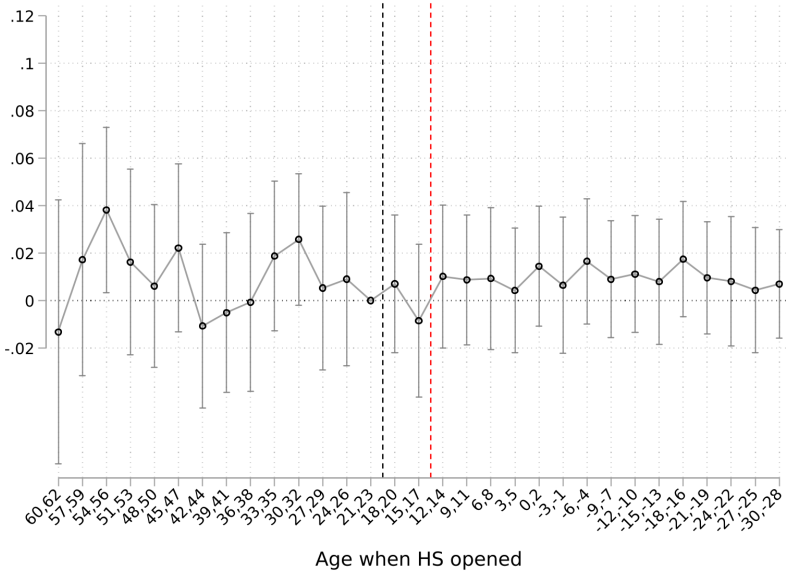
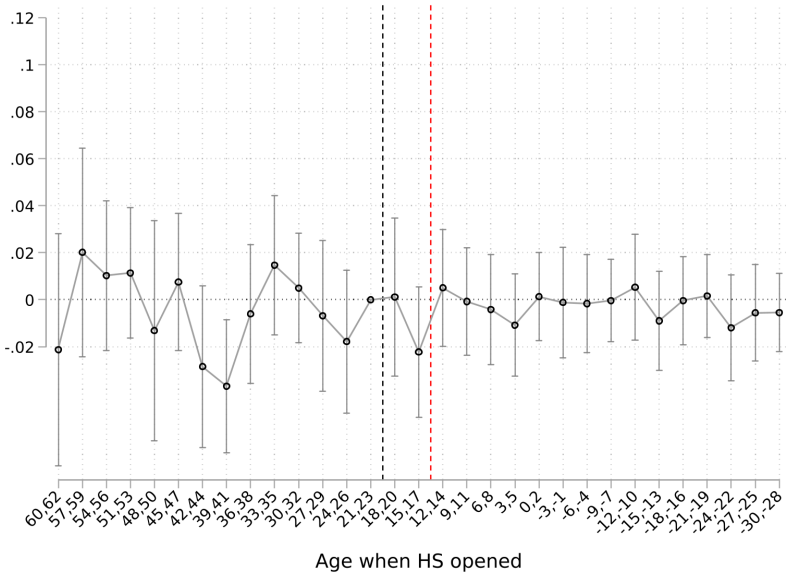


Figure: Effect of high school entry on Age 11 school enrollment



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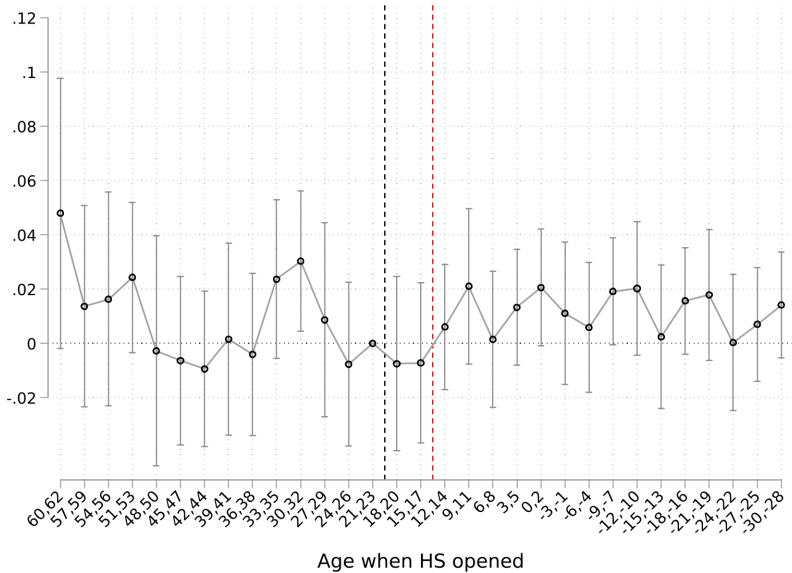


Figure: Effect of high school entry on Age 13 school enrollment

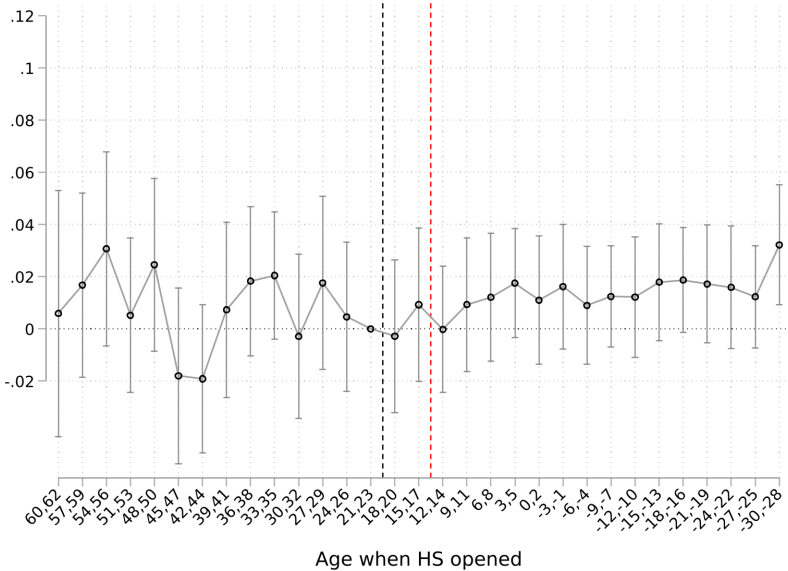


Figure: Effect of high school entry on Age 14 school enrollment

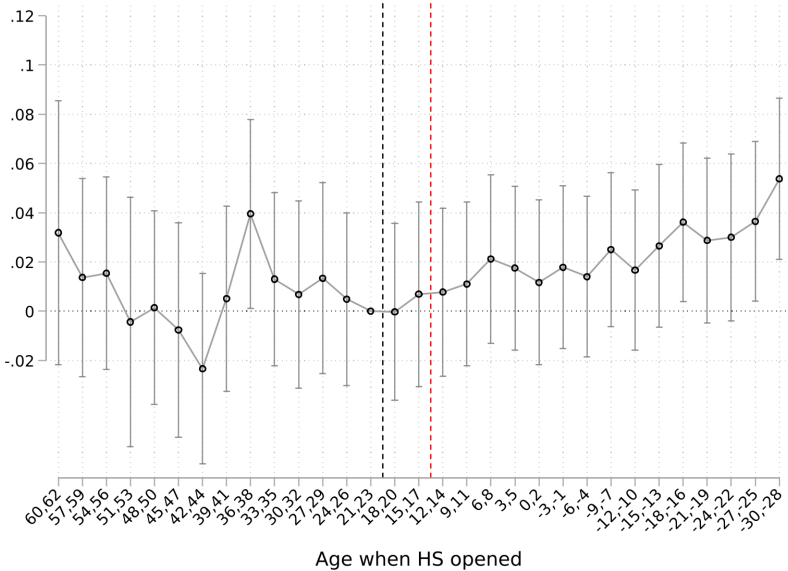


Figure: Effect of high school entry on Age 15 school enrollment

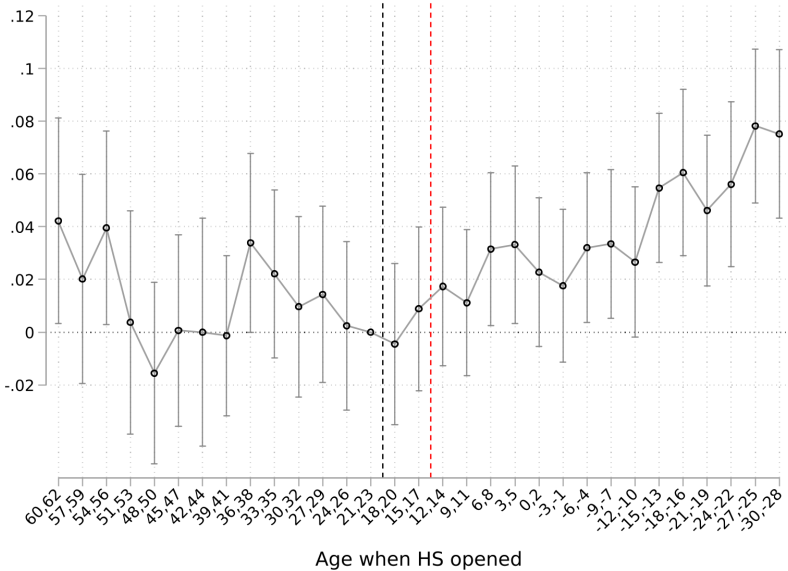


Figure: Effect of high school entry on Age 16 school enrollment

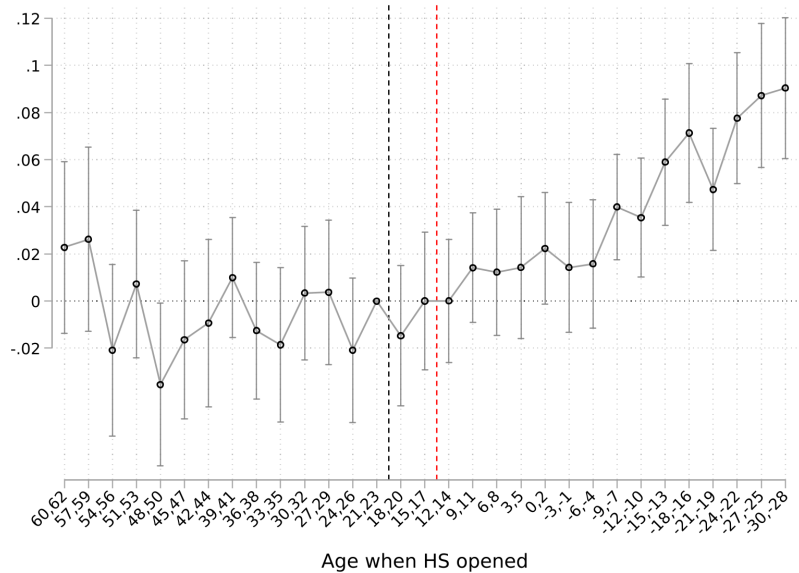


Figure: Effect of high school entry on Age 17 school enrollment

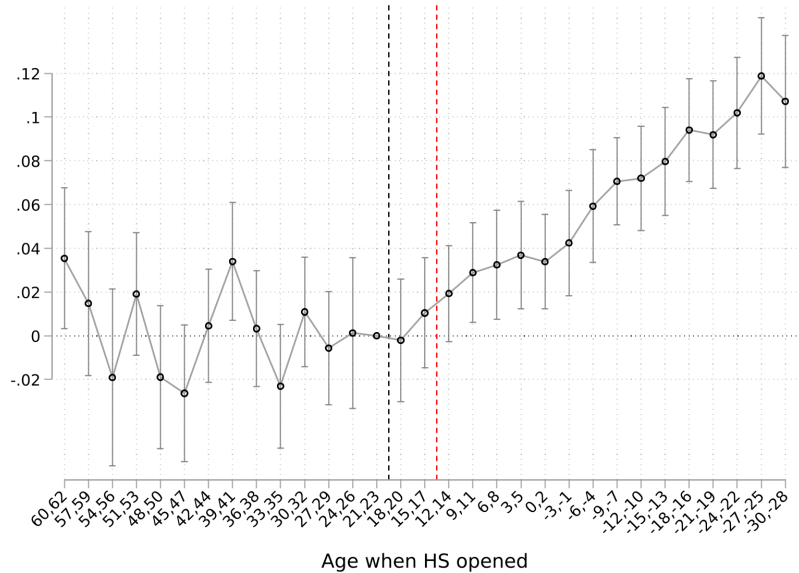
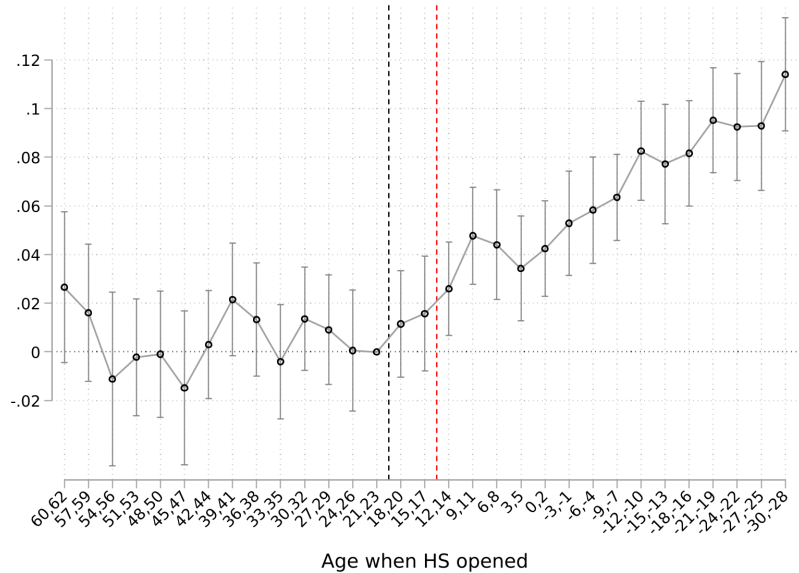


Figure: Effect of high school entry on Age 18 school enrollment



Background

Data

Short-run enrollment impacts

Medium-run labor market impacts

Mechanisms

Robustness

Medium-run effects

Measure labor market and demographic outcomes at age 26-28 and 36-38 by linking forward from childhood outcomes using the Census Tree (Buckles, Haws, Price, Wilbert, 2023)

Estimate identical event-study regressions as we did for enrollment

Results are at the individual level, not the place level. We assign treatment based on childhood home and birth-year but measure outcomes wherever we see people at later ages

Identification

Were cities that established high schools trending differently?

- Test directly using pre-trends
- No pre-trends in enrollment data

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Were there other time-varying differences between treated and control cities?

- Other institutions starting at similar times?
- Differential migration?

Figure: Effect of high school entry on age 26–28 labor force participation, women

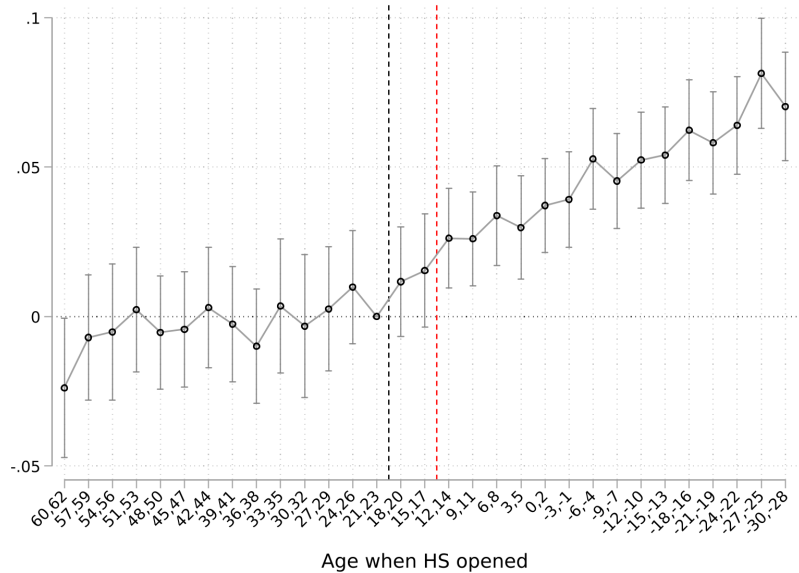


Figure: Effect of high school entry on age 26–28 labor force participation, men

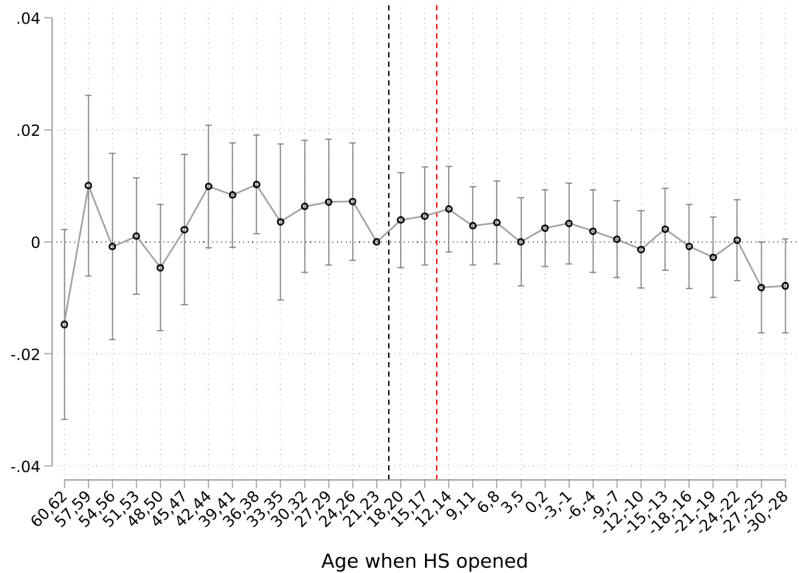


Figure: Effect of high school entry on being in a professional occupation at age 26-28, women

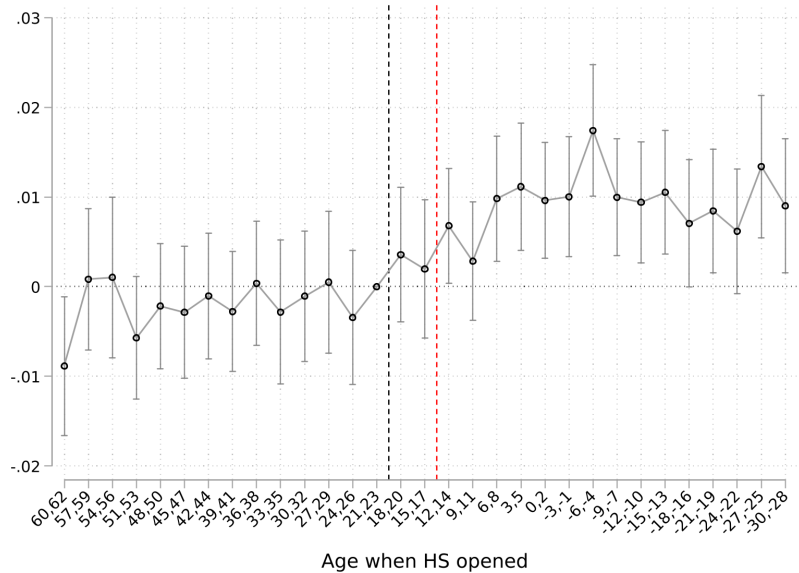


Figure: Effect of high school entry on being in a professional occupation at age 26-28, men

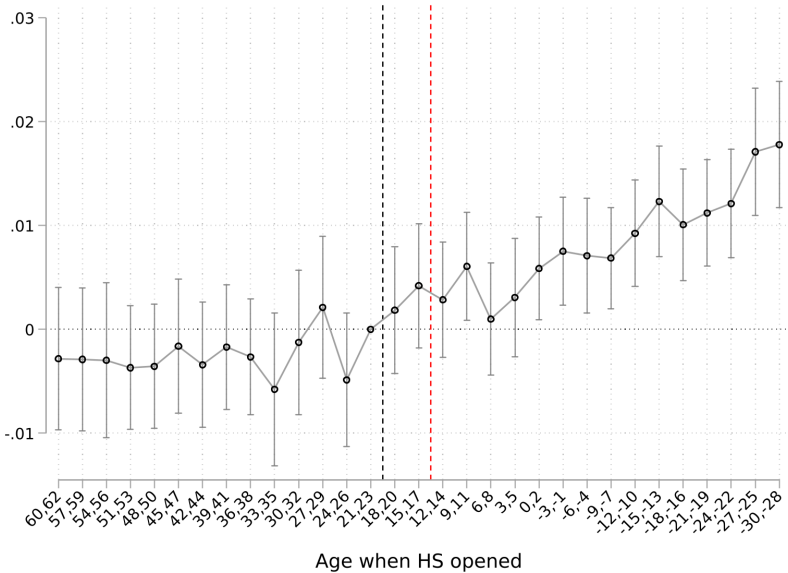


Figure: Effect of high school entry on being in a clerical occupation at age 26-28, women

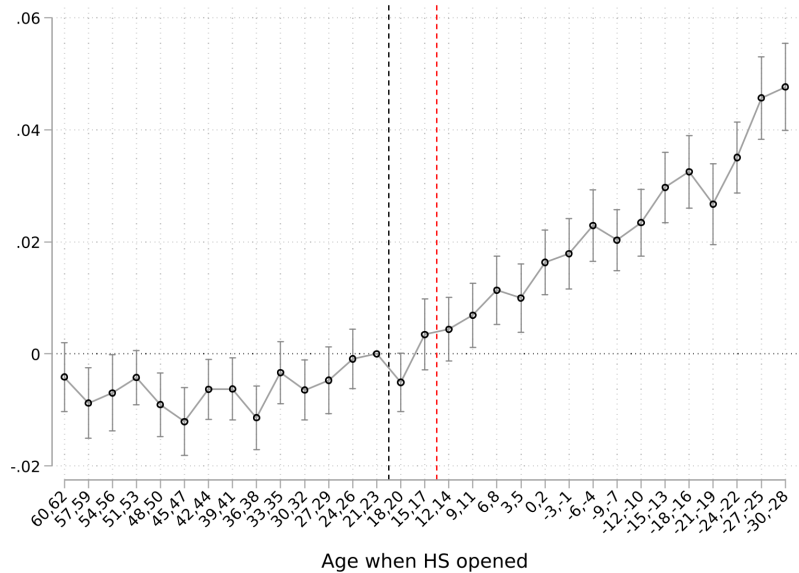


Figure: Summary of age 26-28 labor force and occupation effects, men

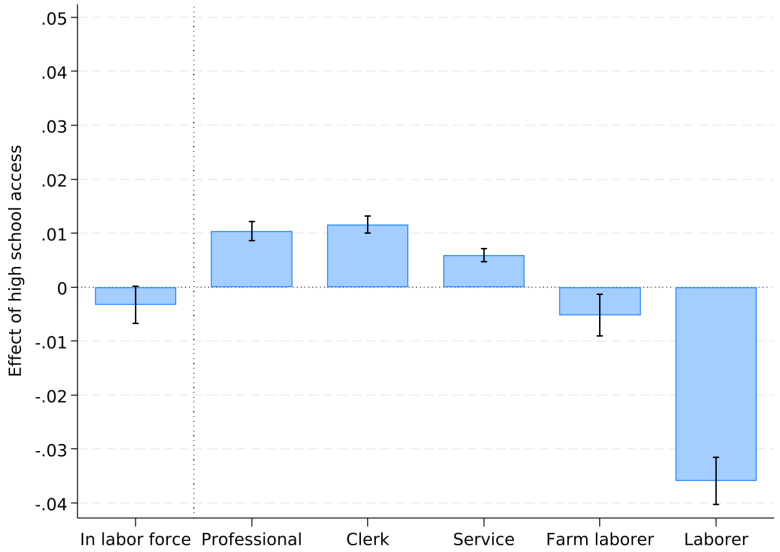


Figure: Summary of age 26-28 labor force and occupation effects, women

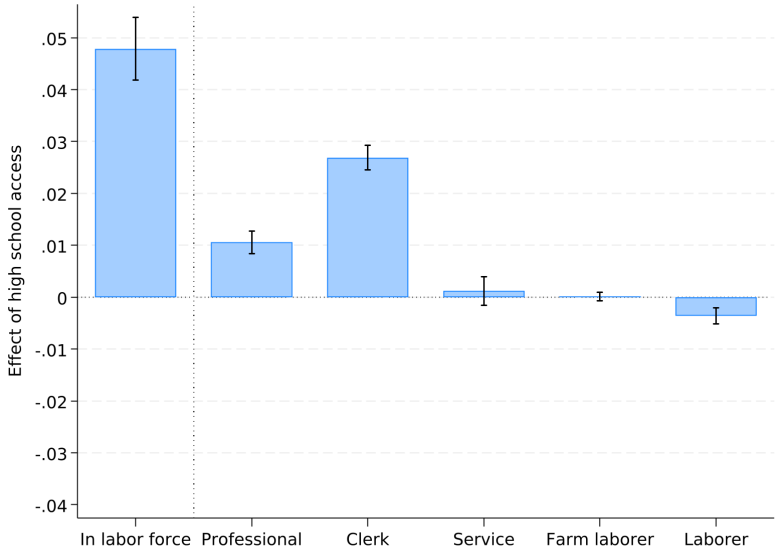
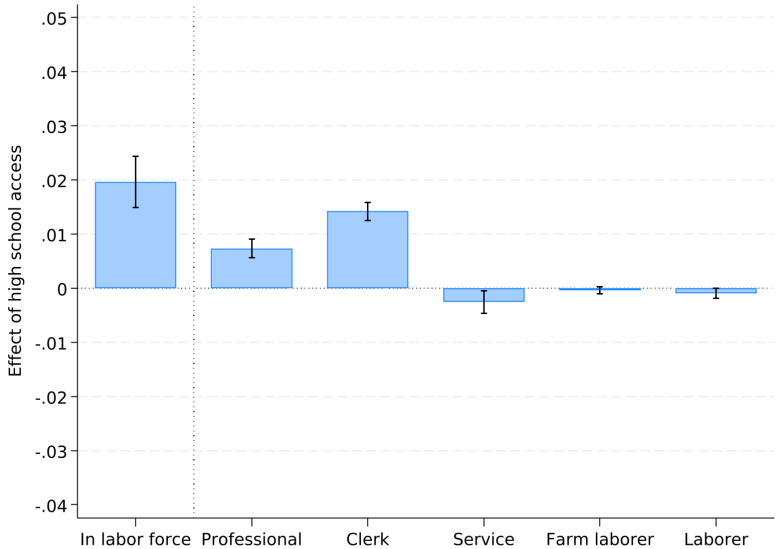


Figure: Summary of age 36-38 labor force and occupation effects, women



Background

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Medium-run labor market impacts

Mechanisms

Robustness

Figure: Effect of high school entry on being married at age 26-28, women

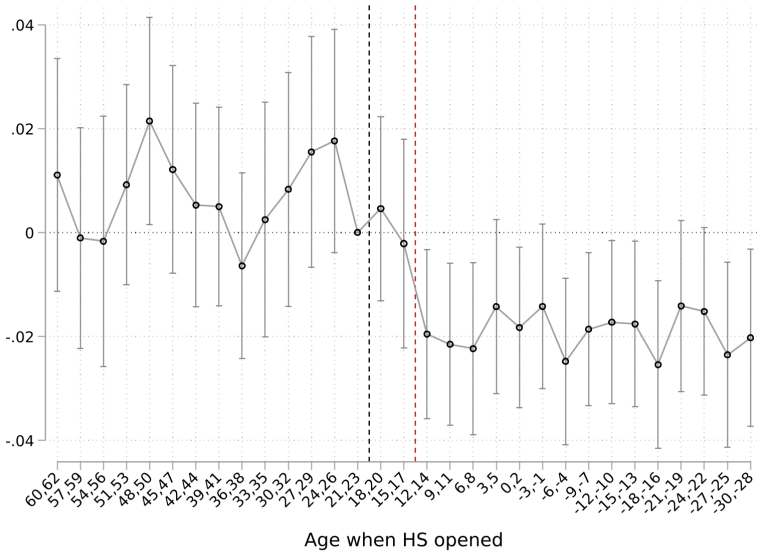


Figure: Effect of high school entry on being married at age 36-38, women

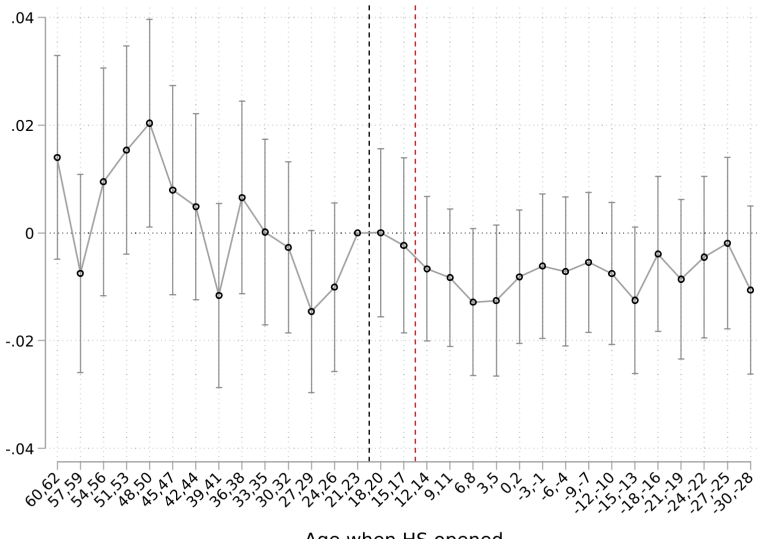
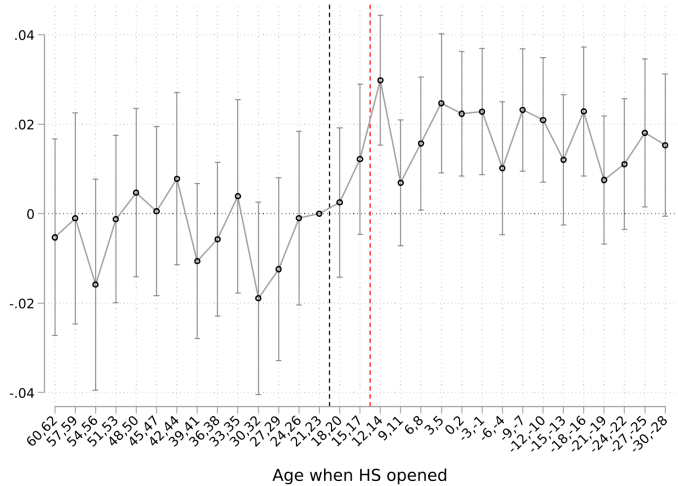
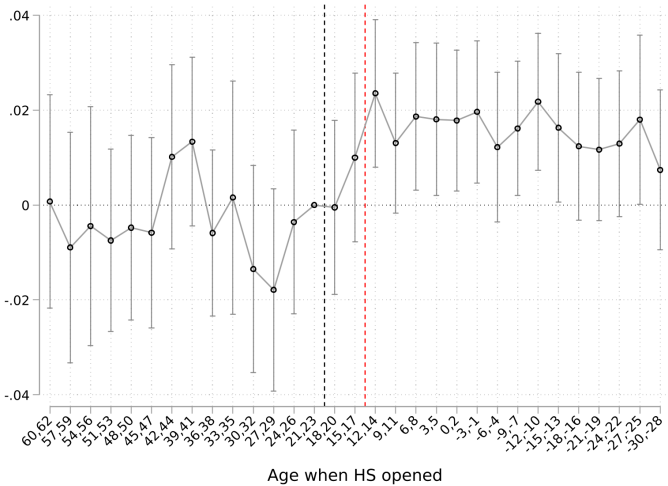


Figure: Effect of high school entry on geographic mobility, women



Notes: Outcome is an indicator for living $\geq$ 50 miles from childhood home

Figure: Effect of high school entry on geographic mobility, men



Notes: Outcome is an indicator for living $\geq$ 50 miles from childhood home

Background

Data

Short-run enrollment impacts

Medium-run labor market impacts

Mechanisms

Robustness

Figure: Baseline female LFP result (2+ mile control group)

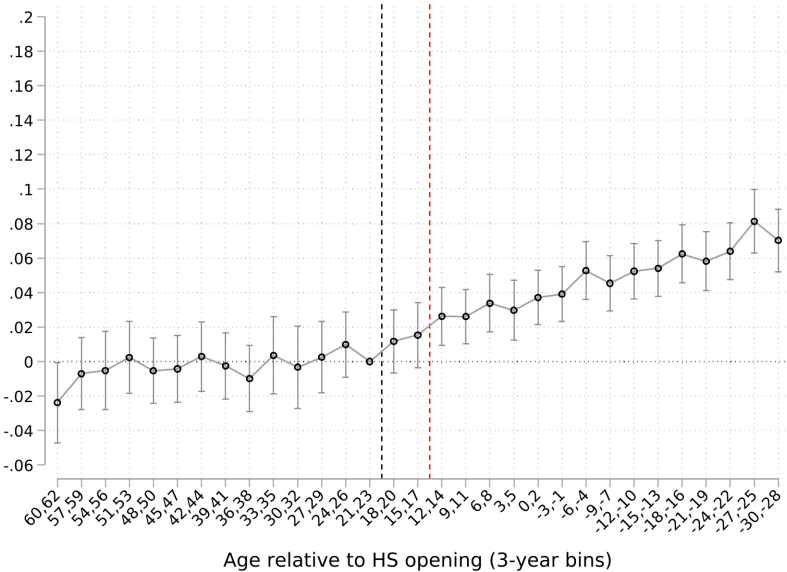


Figure: Baseline female LFP result (4+ mile control group)

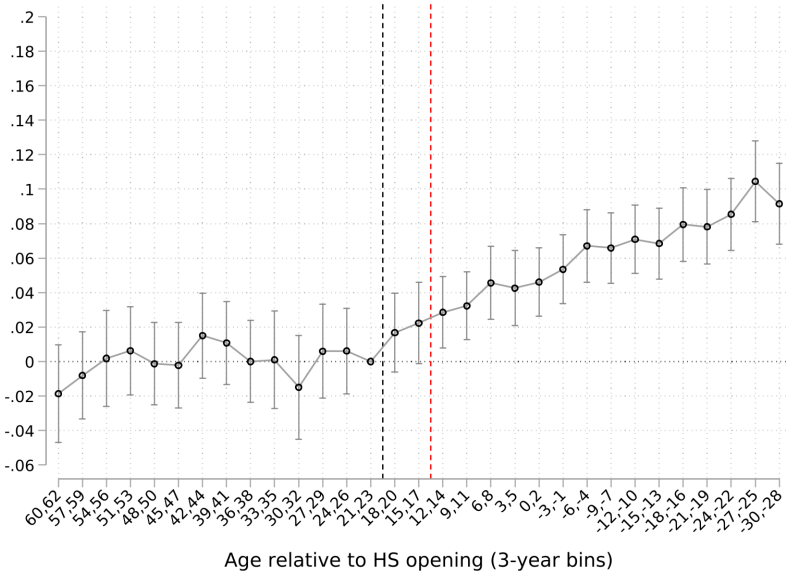
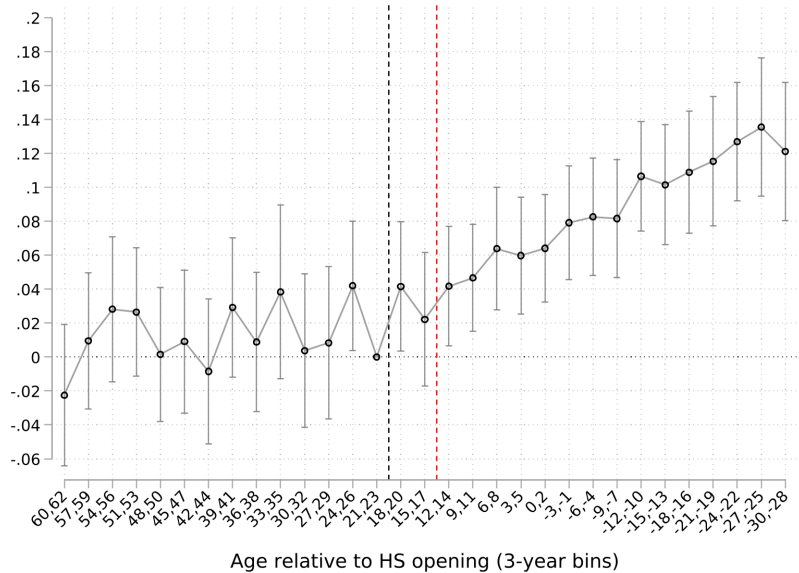


Figure: Baseline female LFP result (6+ mile control group)



Other robustness

Results robust to

1. Controlling for county-by-year fixed effects
2. Excluding birthyr-by-state and birthyr-by-treatment cohort FEs
3. Conditioning on interacted town-level 1860 characteristic by birthyr controls (for the subsample of post-1860 HS locations)
4. Limiting the sample to youth who were in the same location in their high school years and early childhood (to exclude the potential of endogenous movers)
5. Expanding the age ranges

Graphs

Conclusion

- Tremendous variation in access to high schools, even within counties
- High schools increase local school attendance, but only for high-school aged students
- High school access leads to occupational upgrading for men
- High school access shifts women into the workforce, into higher-paying occupations, and delays marriage

Thank You!

Please email us at adoxey@uchicago.edu or nenckap@miamioh.edu if you have any questions or comments!

Figure: Women LFP, Baseline model

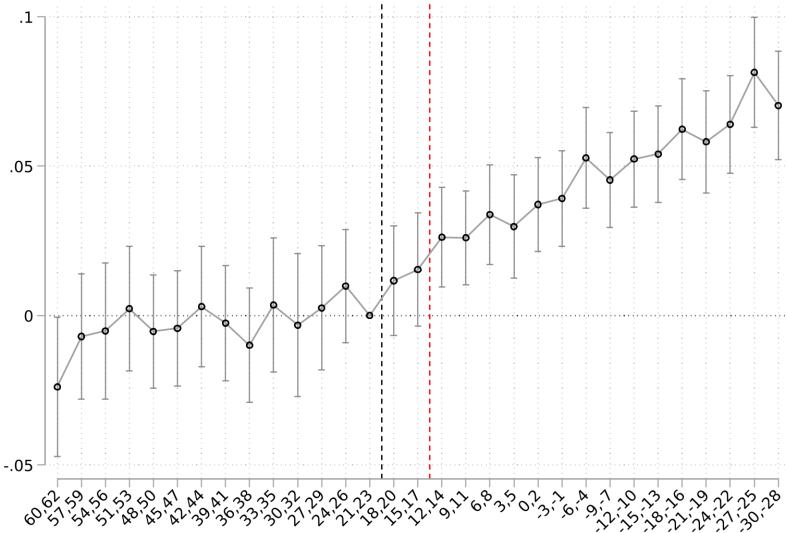


Figure: Women LFP, Birthyear-by-county-FEs

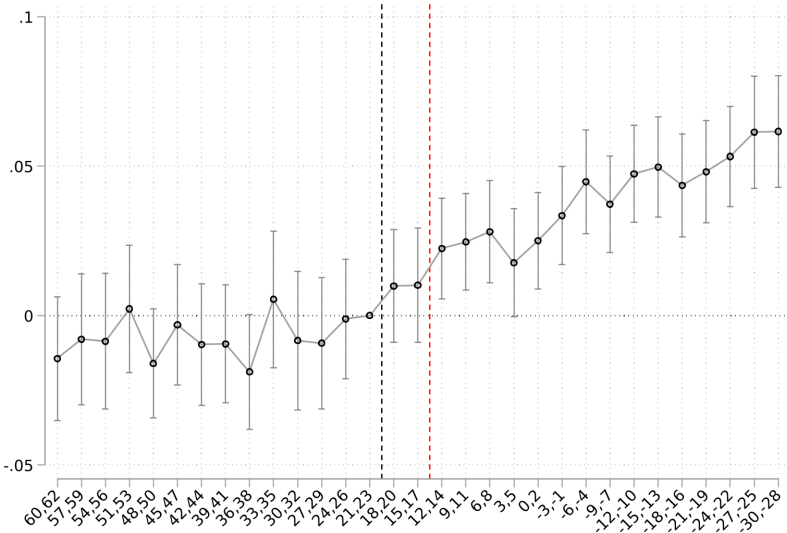


Figure: Women LFP, exclude interacted FEs

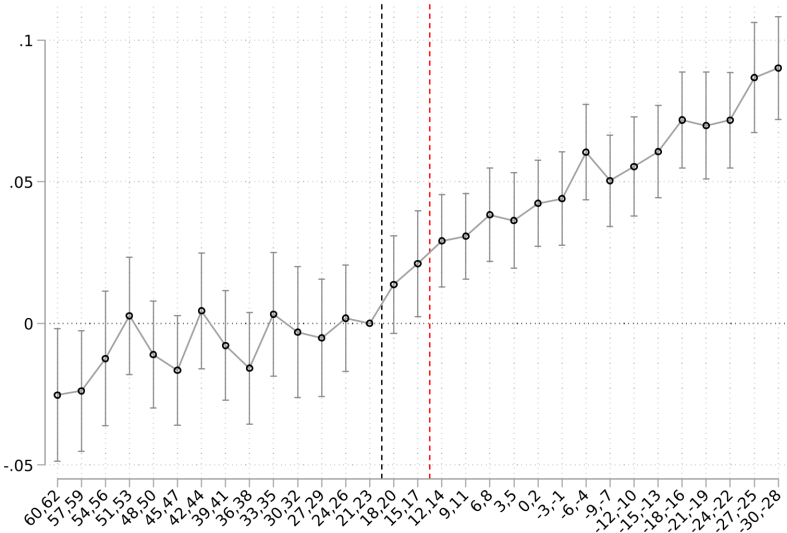


Figure: Women LFP, available control sample

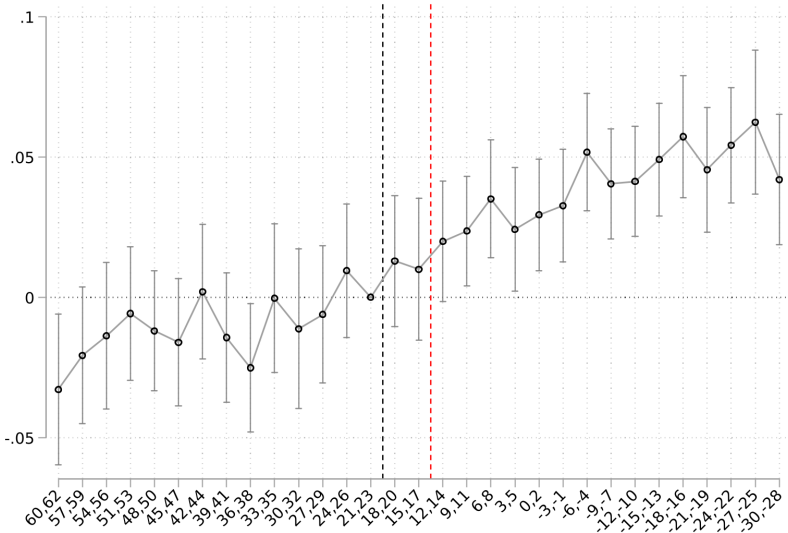


Figure: Women LFP, conditional on interacted 1860 controls

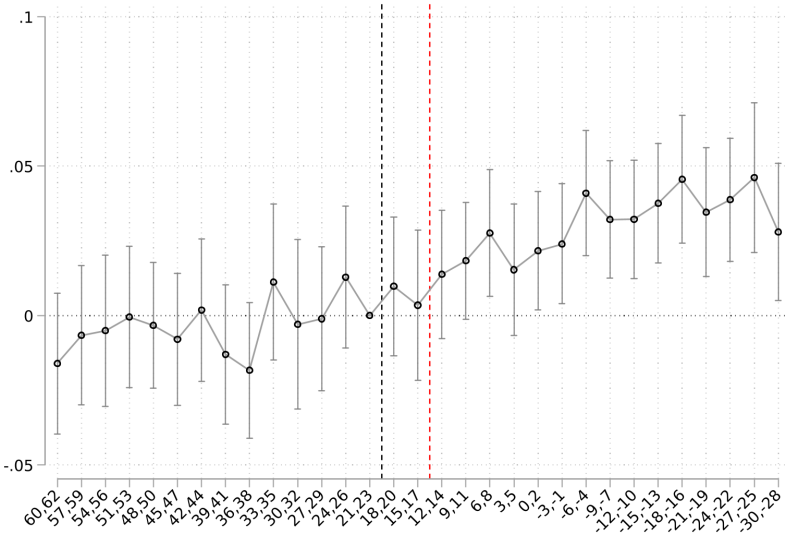


Figure: Women LFP, Non-movers

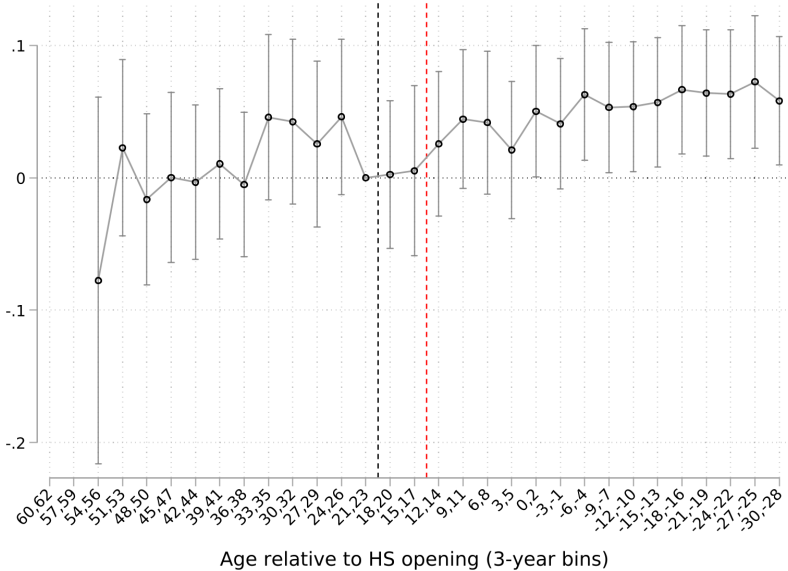


Figure: Women LFP, 14-18 year old sample

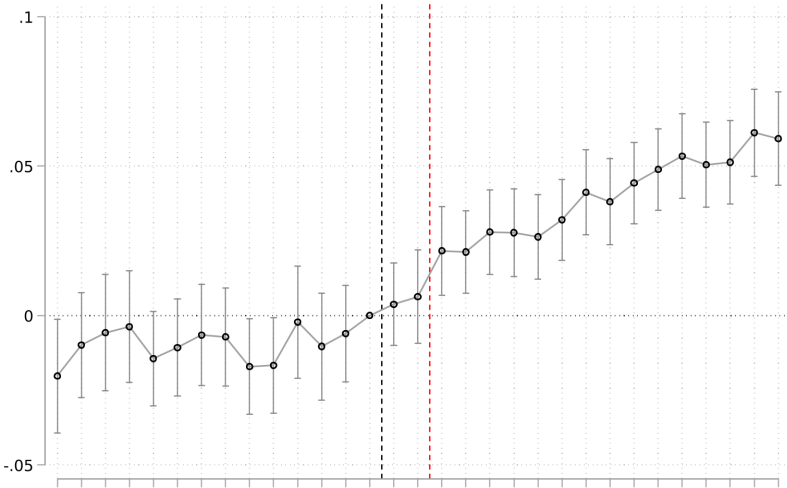


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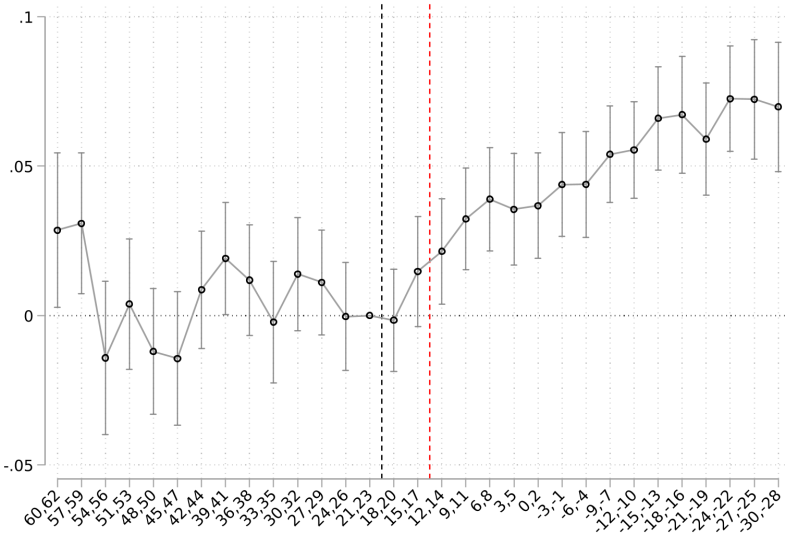
Figure: Women Enrollment, Baseline model



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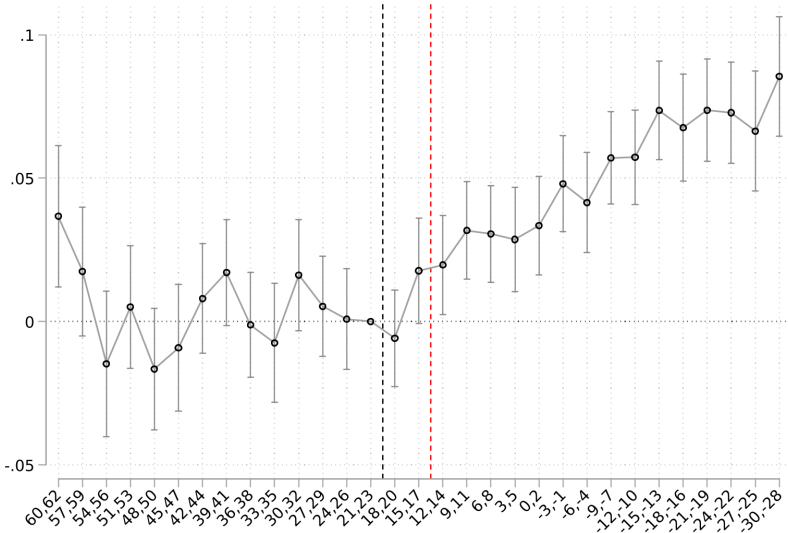
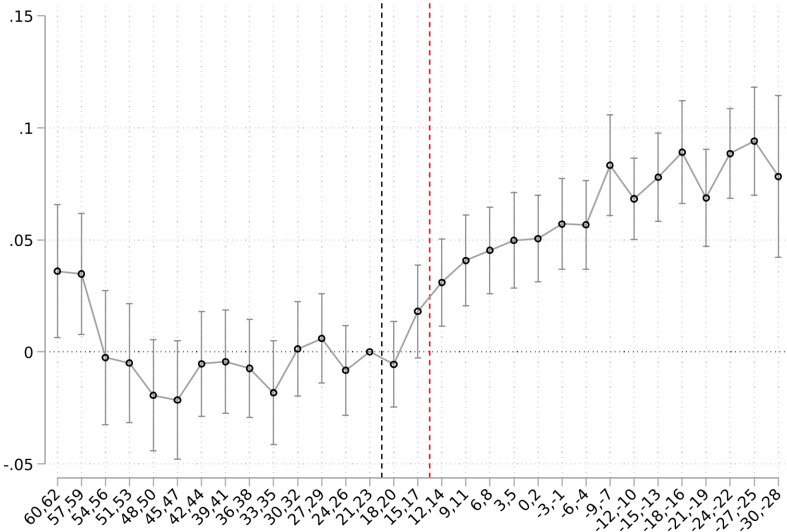


Figure: Women Enrollment, exclude interacted FEs



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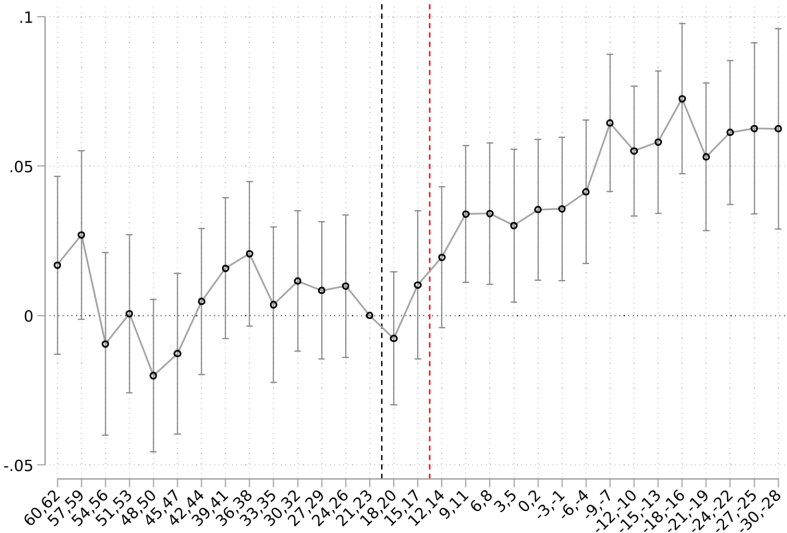

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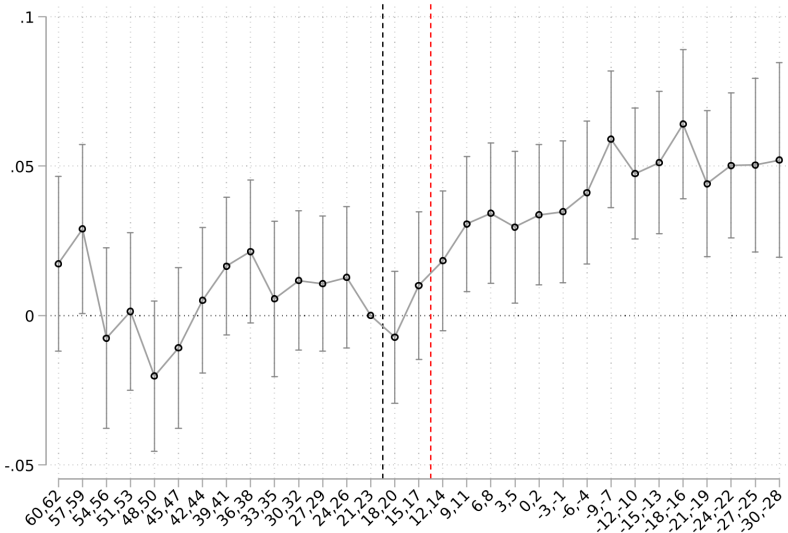

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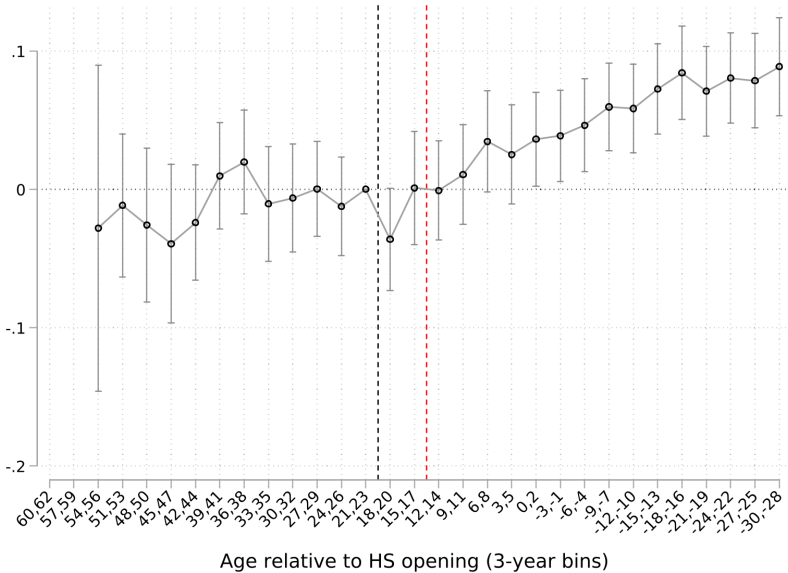

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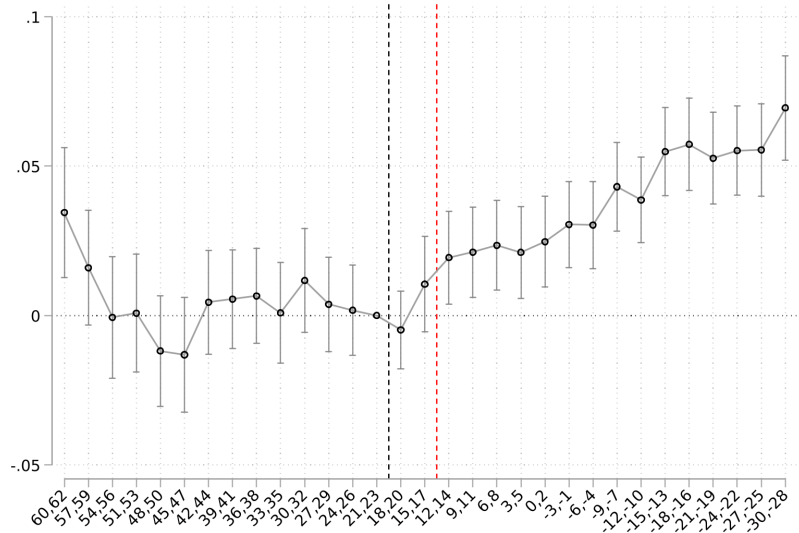

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