## How the Dawn of Public Higher Education (1900-1940) Shaped Access and Work

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October 30, 2025

# Higher education in the US experienced its first major transformation in the early 1900s

- Many more students enrolled
- Public universities began to dominate in terms of enrollment

#### Questions

- How did the founding of public colleges change access to college?
- How did the founding of public colleges change the labor force of local economies?

#### Preview of identification approach

- Identifying variation: quasi-random founding date of a university
- Some people are lucky as they are born just late enough to access a new university
- Some people are unlucky as they are born too early to access a new university

#### Literature

- History of US higher education (1900-1940): Goldin (1998), Goldin and Katz (1998), Goldin (2001)
- → My contribution: Quantify the causal effect of university expansion on education access
- Effects of university building in non-US countries: Duflo (2001), Nimier-David (2023)
  - → My contribution: US university foundings and variation in public vs private control
- How proximity to college affects attainment and earnings: Card (1993), Acton et al. (2025)
  - → My contribution: Examine extensive margin of college access via new university foundings

#### BA Completion: 1900 vs 1936 Birth Cohorts

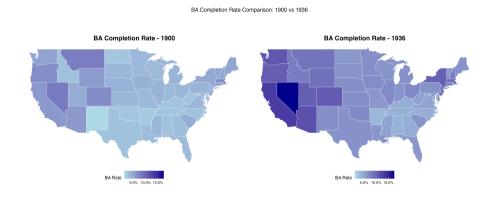


Figure: BA Completion: 1900 vs 1936 Birth Cohorts

#### College Founding Years by Region

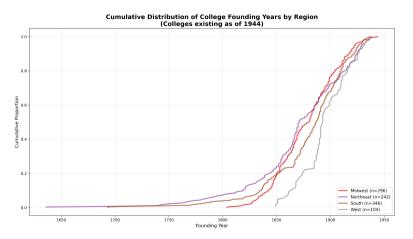


Figure: Regional Distribution of College Founding Years

#### College Founding Years by Control

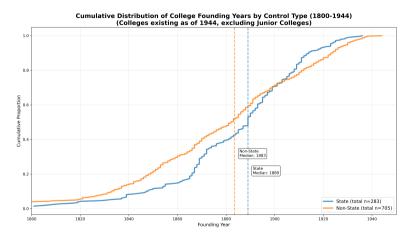


Figure: Regional Distribution of College Founding Years (1800+)

## Estimating the effect of a university founding on college attainment

Cross sectional regression, identifying variation is at the cohort-by-county level.

$$y_{\textit{ick}} = \alpha_{\textit{c}} + \lambda_{\textit{k}} + \beta \text{New college}_{\textit{ck}} \times \lambda_{\textit{k}} + \xi \textit{\textbf{X}}_{\textit{ick}} + \epsilon_{\textit{ick}}$$
 (1)

- c: county, k: age cohort, i: person
- New college<sub>ck</sub> =  $\mathbb{1}$ {There is a college founded in c that is available to k}

#### The identification assumption

- Compare the gap in attainment between older cohorts and younger cohorts in counties that have a new college versus those that do not
- **Identifying assumption**: Conditional on controls, counties that gained a college and those that didn't would have experienced parallel trends in attainment across cohorts, absent the new college.

#### Isolating treated and control counties

- Restrict attention to "conventional" colleges: exclude junior colleges, normal schools, teachers colleges, and colleges with capacity ≤ 100.
- Treated counties gain exactly one college over this period
- Three natural control groups:
  - Counties that never get a college (never-treated)
  - Counties that get a college later in the period (not yet treated)
  - Counties that received a college before 1900 and do not receive a college during this period (already treated)

County spatial stability over 1900-1940 County crosswalk construction

#### Quantifying the treated and control counties

Table: County Classification for College Analysis (1900-1940)

County Group	Count	Role in Analysis
Had college before 1900	320	_
Did not gain college 1900-1940	239	<b>Potential Control</b>
Gained college(s) 1900-1940	81	_
No college before 1900	2788	_
Gained exactly 1 college 1900-1940	72	Treated
Gained 2+ colleges 1900-1940	4	_
Never gained college by 1940	2712	Potential Control

Notes: Analysis excludes junior colleges, normal schools, teachers colleges, and colleges with capacity  $\leq$  100. Treated group consists of counties that had no college before 1900 and gained exactly one college 1900-1940. Potential control groups consist of (1) counties that had a college before 1900 but did not gain additional colleges 1900-1940, and (2) counties that never had a college by 1940.

#### Identifying treated individuals in the census

We only observe education in 1940, after individuals either received or did not receive a college education

- 1. Identify individuals who are at least 25 in the 1940 census
- 2. Link back to the latest census for which they are below the age of 18
- 3. Assign the individual that county of residence for the purposes of treatment assignment

#### Comparing linked versus unlinked individuals in the census

Table: Comparison of 1940 Characteristics: Linked vs Unlinked Individuals

	Linked	Unlinked	Difference
	Mean	Mean	
Female (%)	22.7	63.9	-41.2
Age	36.3	47.7	-11.4
College (%)	9.9	6.9	3.0
Married (%)	74.7	83.5	-8.7
White (%)	77.2	67.9	9.2
N	391,789	641,859	
% of Total	37.9%	62.1%	

Note: This table compares mean characteristics in 1940 for individuals age between 25 and 70 who were successfully linked to pre-age 18 observations versus those who were not linked.

#### Testing parallel trends: Event study specification

To test for pre-trends and trace out dynamic effects, estimate:

$$y_{ick} = \alpha_c + \lambda_k + \sum_{j \neq -1} \beta_j \mathbb{1}\{\text{Cohort } k \text{ born } j \text{ years relative to college founding in } c\} + \xi \mathbf{X}_{ick} + \epsilon_{ick}$$
(2)

- j < 0: Cohorts born before college founding (test for pre-trends)
- $j \ge 0$ : Cohorts born after college founding (treatment effects)
- Omit j = -1 as reference category
- Null hypothesis:  $\beta_j = 0$  for all j < 0 (no pre-trends)

#### County spatial stability over 1900-1940

Table: County Boundary Stability Between 1900 and 1940

	Reference Period		
Overlap Threshold	1940 Counties	1900 Counties	
Total Counties	3108	2848	
99% or more overlap	2852 (91.8%)	2538 (89.1%)	
95% or more overlap	2941 (94.6%)	2616 (91.9%)	
90% or more overlap	2976 (95.8%)	2647 (92.9%)	
80% or more overlap	3005 (96.7%)	2681 (94.1%)	

Notes: The 1940 Counties column shows the percentage of 1940 counties that overlap with a single 1900 county at the specified threshold. The 1900 Counties column shows the percentage of 1900 counties that overlap with a single 1940 county.

#### Creating a county crosswalk

We need consistent county boundaries to accurately assign college locations across census years.

#### Approach:

- 1. Use 1900 as the reference year (counties typically split into smaller units over time, rather than merging)
- 2. Spatially intersect 1910, 1920, 1930, and 1940 boundaries with 1900 boundaries
- 3. Match counties where the intersection exceeds 70% overlap
- 4. Retain only counties that appear consistently across all census years

Back to Isolating treated and control counties

## My reference on how the spatial join is performed

Consider A and B from 1900 (the base year) and 1940 (the target year) respectively. Then get the area of  $A \cap B$ . We then compare this to the area of the target to calculate

$$\frac{A \cap B}{B} \tag{3}$$

and we map B to A if this is above some threshold. I am using 70% as of right now but this could be modified. In practice, almost 90% of the counties have close to 100% overlap.