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The Labor Market Impact of K-11 vs. K-12

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Abstract

In 1945, Louisiana extended secondary education from 11 years to 12. Since many students followed diploma-based stopping rules, consecutive birth cohorts exogenously received different amounts of schooling. We use this natural experiment to evaluate the long-run labor market impact of having an 11-year versus a 12-year program. Using a difference-in-differences analysis, we find that cohorts exposed to the additional year earn about 13% more in annual real labor income, with gains concentrated among White individuals. The policy does not alter the likelihood of high school graduation, though White students become four points more likely to complete some college.

Keywords: secondary education, human capital, labor market signaling, policy evaluation, returns to education

JEL Codes: H7, I26, I28, J24

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1 Introduction

The 12-grade structure of U.S. public education is so deeply entrenched that its origins and rationale are rarely scrutinized. Yet the decision to end formal secondary schooling after grade 12 is a policy choice. Proposals to eliminate or restructure the final year of high school have surfaced repeatedly, often justified by budgetary pressures or concerns about the productivity of students in their final year of school.[1] Despite the stakes, policymakers rarely have access to causal evidence on what, if anything, having 12 grades contributes to students' long-term outcomes.

A 1945 reform in Louisiana, which extended secondary education from 11 to 12 years, represents a natural experiment to estimate the contribution of the twelfth grade to students' long-run labor market outcomes. Using a difference-in-differences approach, we compare the outcomes of Louisianans born before and after the policy change with those in other states that had already implemented the 12-year system. We find that individuals exposed to the 12-year program earned approximately $3,000 more annually—a 13% increase over the sample mean. This effect is particularly pronounced among White individuals, revealing heterogeneity in the policy's impact in line with prevailing demographic variation in labor market opportunities. Beyond earnings, we also examine the reform's effect on educational attainment. While the policy did not significantly change the likelihood of graduating from high school, we find suggestive evidence that White students exposed to the 12-year program were more likely to pursue some college education.

Education plays a key role in shaping economic outcomes, both through the development of human capital (Oreopoulos and Petronijevic 2013; Psacharopoulos and Patrinos 2018; Hanushek and Woessmann 2020) and as a signal to employers (Spence 1973; Lang and Kropp 1986; Weiss 1995; Arcidiacono et al. 2010; Kreisman et al. 2023). Many studies estimate the causal impact of schooling on earnings by instrumenting for endogeneity in years of schooling (Angrist and Krueger 1991; Card 1999; Oreopoulos 2006; Brunello et al. 2009). While these studies focus on marginal years of education, our setting allows for a clean causal estimate of the effect of structurally adding a year of school without changing the terminal degree for a broader population than that identified by a local average treatment effect. By leveraging an exogenous shift in the amount of education underlying attainment of the same diploma, we avoid confounders such as selection bias, credential changes or other types of distinctions. Our approach to identification is conceptually similar to how Arteaga (2018) examines a change in the length of the college curriculum and the earnings impact after the amount of coursework needed to graduate was reduced—a change in the opposite direction

[1] In 2010, a Utah state senator argued for eliminating 12th grade entirely, noting: "You're spending a whole lot of money for a whole bunch of kids who aren't getting anything out of that grade." See `https://abcnews.go.com/WN/utah-mulls-eliminating-12th-grade/story?id=9853553`. In 1983, a North Carolina legislative committee studied whether to eliminate 12th grade, citing concerns that some students were not benefiting from it and that the state was spending over $55 million annually on a year many used to "slide" through with minimal coursework (North Carolina. General Assembly. Legislative Research Commission 1983)

from the policy in Louisiana. In that case, wages for students with the diploma requiring less education were about 13-16% lower for business and economics majors, though the scope of the policy change in that study was limited specifically to students from those majors at one university in Colombia. Gong and Pan (2023) exploit a discontinuity leading some college graduates in Singapore to receive an additional year of undergraduate education, estimating that it produces a 12% increase in earnings. However, by design, they estimate together the value of the additional year with that from earning honors, as only honors students could qualify for the program. Khoo and Ost (2018) show that an honors designation has value in the labor market in and of itself.

In our case, we examine a policy that altered the structure of high school uniformly across a state without altering the diploma itself. Unlike reforms that target specific schools or programs, Louisiana's shift affected all students and operated at the scale of the full local labor market. The focus on high school is especially salient in this historical context, when completing high school marked the end of formal education for most individuals and directly preceded labor market entry. The policy change is similar to a 2003 German reform that eliminated the 13th year of schooling. Previous literature has examined the effect of that reduction in years of schooling on test scores (Büttner and Thomsen 2015), grade point averages (Huebener and Marcus 2017), and university enrollment (Marcus and Zambre 2019). Besides being a change in the opposite direction, the German setting also differs from that in Louisiana because the curriculum remained unchanged: students covered the same material in less time, making that a question more of educational effectiveness than of quantity. Krashinsky (2014) also analyzes a one-year reduction in high school requirements in Ontario, Canada, though the outcome of interest is performance in university courses and is therefore limited in scope to the subpopulation of individuals who select into college. For neither case has the literature examined post-schooling labor market outcomes reflecting potential changes in human capital, as we do in this paper.

A different amount of educational content underlying a high school diploma could affect labor market outcomes for several reasons. Under the classical model of education as an investment in human capital (Becker 1964), the additional year of schooling should have increased wages for degree completers in the class of 1950 by the marginal return to education. Estimates of the average marginal return, based on Mincer models (Mincer 1974), generally range from 10% to 20% (Card 1999). These models assume that individuals continue schooling until the internal rate of return equals the rate of discount. However, social pressures or institutional breakpoints, such as the division between middle and high school, could lead students to complete high school regardless of whether it requires 11 or 12 years.

An alternative model of education's value is based on the signaling effect of the diploma and how earnings rise sharply after completing milestones like high school or college (Hungerford and Solon 1987; Belman and

Heywood 1991; Jaeger and Page 1996; Park 1999; Aryal et al. 2022).[2] To explain our results, such a model would require a substantial change in the composition of those who completed high school. We do not find a decrease in high school completion rates. Additionally, the literature on employer learning argues that firms, in the absence of information about a worker, may initially rely on external signals such as a degree. However, as the worker's productivity is learned over time, wages increasingly adjust to reflect that revealed information (Lange 2007; Khoo and Ost 2018; Aryal et al. 2022; Hansen et al. 2024). Due to data availability, we only start observing the birth cohorts in our sample once they reach their late 20s. At that point, most short-run signaling effects are likely to have faded. This makes it more plausible that the observed earnings gains reflect persistent differences in skills or productivity developed during the additional year of schooling, rather than temporary labor market signals.

Evidence from Kroch and Sjoblom (1994) indicates that the content of human capital matters more for earnings than the level of credential obtained, and studies of individuals with high school credentials do tend to find that something about the amount of education received matters more than obtaining the certification. Findings in both Cameron and Heckman (1993) and Jepsen et al. (2016) are that traditional high school graduates earn more than observationally similar individuals who obtain a high-school equivalent (GED), though Tyler et al. (2000) find a positive signaling effect in the labor market from obtaining a GED for White high school dropouts. By contrast, Clark and Martorell (2014) compare students who barely pass or fail a high school exit exam and find no earnings effect from actually obtaining a degree.

Following this introduction, Section 2 details the background and institutional setting for the transition to a 12-year program in Louisiana. Section 3 provides evidence that the transition did in fact shift the number of years of completed education for affected Louisianans and compares earnings outcomes across birth cohorts within the state. Section 4 discusses the main empirical approach, data source, and estimation sample. Section 5 presents the empirical results along with an exploration of heterogeneity by race and gender and a set of placebo tests. Section 6 concludes with an approximation of the net welfare gain from the policy change.

2 The transition to a 12-year program in Louisiana

In a circular indexed in the records of the Louisiana Department of Education as "Article, unfair", State Superintendent John E. Coxe railed against the Louisiana Report in the November 1942 issue of *School Management*. He chastised the editor for spreading "half-truths," by pointing out that a large percentage of school-age children were not enrolled in school without also noting that Louisiana was doing better in

[2] Also called "sheepskin effects."

that regard than twelve other states. Full of umbrage, he sent a copy of his letter to the editor, to all parish superintendents and school board presidents in Louisiana—on New Year's Eve (State of Louisiana Department of Education 1942).

What Coxe neglected to mention was that the Louisiana Report merely summarized the recommendations of the state's own Educational Survey Commission, authorized by Act 36 of the 1940 State Legislature to study "the conditions and needs of the public schools of Louisiana" (Louisiana Educational Survey Commission 1942). One of the commission's central conclusions was that the public education system needed an additional year: "All but six of the forty-eight states in the Union have found it necessary, in order to give an adequate elementary and secondary education, to provide twelve years of schooling. Louisiana is one of the six." This recommendation was supported by a survey on whether to add an eighth grade to elementary school, followed by four years of high school. Eighty-nine percent of citizens, 81% of teachers, 76% of principals, 81% of school boards... and 0% of school superintendents agreed (Louisiana Educational Survey Commission 1942). See Figure 1.

Figure 1: 1942 Survey Responses on Adding an Eighth Grade in Louisiana, by Committee Type.

Number Parishes Reporting	Type of Committee	Number Persons Voting	Per Cent in Favor	Per Cent Against
40	Citizens	363	89%	11%
32	Teachers	279	81%	19%
24	Principals	220	76%	24%
55	Superintendents	55	0	100%
9	School Boards	81	81%	19%
	State Department Committee			X

Notes: Survey results from the question: "Should an eighth grade be added as rapidly as possible to the elementary grades and four year high school?" Reproduced from (Louisiana Educational Survey Commission 1942)

Although the report does not list the other five states still on the 11-year system at the time, by 1929, all but 10 states had fully adopted a 12-year program. A survey from the Bureau of Education of the U.S. Department of Interior, reproduced as Figure 2 lists these states and the number of pupils in the public school system enrolled in an 11 or 12-year program during the 1926-1927 school year (Jessen 1929). At that time, Louisiana and South Carolina were the only states without a 12-year program.[3] All other states that did not initially have 12 grades had transitioned by then, following the recommendation of the "Committee of Ten", a group of educators assembled by the National Education Association in 1892 to promulgate best

[3]South Carolina legislated a 12th year around 1948 (Hopson 1947), Virginia sometime after 1944 (Johnson 1950), and Texas in 1941 (Watlington 2012). North Carolina first let schools start to opt in in 1942 before making it a statewide requirement in 1955 (Legislative Research Commission 1983). Georgia already had 12 grades in cities like Atlanta, and completed the statewide transition in 1951 and 1952 (Georgia Department of Education 1950).

curricular practices (National Education Association of the United States. Committee of Ten on Secondary School Studies and United States. Bureau of Education 1893).

Figure 2: Pupil Enrollment in 11-Year and 12-Year School Systems in Selected States, 1929

TABLE 4.—*Distribution by States of pupils enrolled in 11-year and 12-year school systems*

State	Pupil enrollment in 11-year systems	Pupil enrollment in 12-year systems	State	Pupil enrollment in 11-year systems	Pupil enrollment in 12-year systems
Georgia	652,907	40,000	South Carolina	471,701	None.
Louisiana	400,402	None.	Texas	1,210,127	7,945
Maryland	118,064	141,541	Utah	32,143	106,614
Missouri	13,367	412,534	Virginia	512,520	36,797
New Hampshire	3,426	74,248			
North Carolina	782,602	41,549	Total	4,197,259	861,228

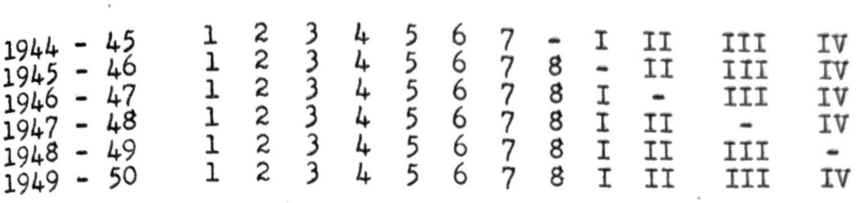
Notes: Reproduction of Table 4 from Jessen (1929) reporting pupil enrollment in 11-year and 12-year school systems for the remaining 10 states with an 11-year program.

The Louisiana State Board of Education resolved to implement a 12-year school program by the start of the 1944-1945 school year (State of Louisiana Department of Education 1944).[4] A Committee on the Twelve Year Program formed to determine how to implement the transition proposed a phased transition over five years, which the Board adopted. Under this plan, children completing seventh grade in spring 1944 advanced directly to high school (ninth grade) that fall. In contrast, students finishing seventh grade in 1945 entered the newly created eighth grade. This staggered implementation created a gap: the 1945 cohort began eighth grade while the previous year's cohort advanced to sophomore year. The last students under the 11-year system graduated in 1948, leaving one empty senior class before the first 12-year cohort graduated in 1950. Figure 3, taken from a circular distributed by the Louisiana Department of Education in 1944, depicts the transition by showing which grades were to have students enrolled in which years (State of Louisiana Department of Education 1944).[5]

[4]Parochial schools, at least within the Archdiocese of New Orleans, appear to have adopted the program as well (Times-Picayune 1944).

[5]Several contemporary news articles mention that Orleans Parish and Caddo Parish began to implement the program in the 1944-1945 school year (Times-Picayune 1949). Records of the Louisiana Department of Education list 3,284 total White eighth graders enrolled in 1944 (versus 23,050 seventh graders), including 1,269 in Caddo and 1,800 in Orleans (State of Louisiana Department of Education 1945a). This early treatment would bias any estimated ITT downwards.

Figure 3: Five-Year Implementation Plan for the Twelve-Grade System in Louisiana, 1944–1950.



Notes: Plan showing the phased addition of an eighth grade beginning in 1945. Source: State of Louisiana Department of Education (1944).

The transition to a 12-year program might appear to create a gap in new labor market entrants, with no graduates in 1949. Consequently, any measured effect of exposure to the 12-year program could also reflect the impact of entering the labor market after a constrained supply of entry-level workers. However, an argument by the committee investigating the 12-year program suggests this gap may not have occurred. Under the 11-year system, the average high school graduate was 17 years old, while many jobs required a minimum age of 18: "Industry and commerce have generally set the age for employment at 18 years. This means that a large percentage of the graduates under our 11-year system must spend one year in idleness" (Morning Advocate 1940).

For birth cohorts completing elementary school around the 1945 cutoff, the overall curriculum that they experienced through seventh grade remained largely unchanged. According to a bulletin from the State Department of Education, "Ultimately the change to the 12-grade program will be felt in the curriculum from the first to the twelfth grade, but no curricular changes will be made below the seventh grade until the reorganization of the program of studies of the seventh and eighth grades has been inaugurated and in operation for at least one year" (State of Louisiana Department of Education 1945a). Many would have been taught by the same set of teachers as well, since the gap in grades during the implementation period allowed schools to reallocate their current teachers and not need to cover an additional grade until the 1949-1950 school year. Aside from the reallocation of several high school subjects including General Business, Vocations, and Louisiana Civics to the new eighth grade, with freshman social studies adding a global component to replace civics, the primary curricular change was exposure to an additional year of English, science, and health classes as well as electives such as music, art, home living, agriculture, or industrial arts (State of Louisiana Department of Education 1945a).[6]

Another contemporaneous change in education policy was the Louisiana Compulsory School Attendance Law, Act 239 of the Regular Session of the Legislature of 1944, which made school compulsory for children

[6]The required math sequence shifted down, with freshman math moving to the eighth grade. Although students may have taken more than the minimum required amount of math in high school, the number of units required to graduate was reduced by one for those who took eighth-grade math.

Table 1: Public School Enrollment and Attendance in Louisiana from 1945 to 1950

Year	Race	Number of Educables	Number Enrolled	Average Attendance	Enrollment %	Attendance %
1945-46	White	387,829	264,770	227,681	68.3	86.0
	Black	229,877	165,227	138,883	71.9	84.1
	Total	617,706	429,997	366,564	69.6	85.2
1946-47	White	381,008	271,972	233,749	71.4	85.9
	Black	233,034	166,072	139,283	71.3	83.9
	Total	614,042	438,044	373,032	71.3	85.2
1947-48	White	396,634	273,380	235,851	68.9	86.3
	Black	247,537	169,031	140,940	68.3	83.4
	Total	644,171	442,411	376,791	68.7	85.2
1948-49	White	417,239	280,828	246,521	67.3	87.8
	Black	263,546	174,054	148,039	66.0	85.1
	Total	680,785	454,882	394,560	66.8	86.7
1949-50	White	426,556	299,766	263,390	70.3	87.9
	Black	269,593	183,597	157,350	68.1	85.7
	Total	696,149	483,363	420,740	69.4	87.0

Notes: Number of educable children (ages 6 to 18), enrolled students, average daily attendance, enrollment percentage, and attendance percentage are reported separately for White and Black students, as well as in total, for each school year from 1945–46 to 1949–50. Figures are compiled from annual and biennial reports of the Louisiana Department of Education and reproduced from Robertson (1952).

from age seven to fifteen (State of Louisiana Department of Education 1945b). Although compulsory education had existed in New Orleans since 1910 for children aged eight to fifteen, in cities with populations over 25,000 since 1914, and statewide for children aged seven to fourteen since 1916 (Robertson 1952), this act aimed to enforce attendance more rigorously (Allison 1954). However, the policy did not affect school attrition rates for birth cohorts near the transition to the 12-year program, as most had already aged out by the time the state implemented the visiting teacher program. Table 1 shows no systematic increase in school attendance during this period. The table presents school enrollment rates for "educables" (children aged six to eighteen, as defined in the 1898 Louisiana Constitution (Robertson 1952) by year and race.[7] From 1945 to 1950, the enrollment rate was around 70%, with the average daily attendance rate conditional on enrollment at about 85%.

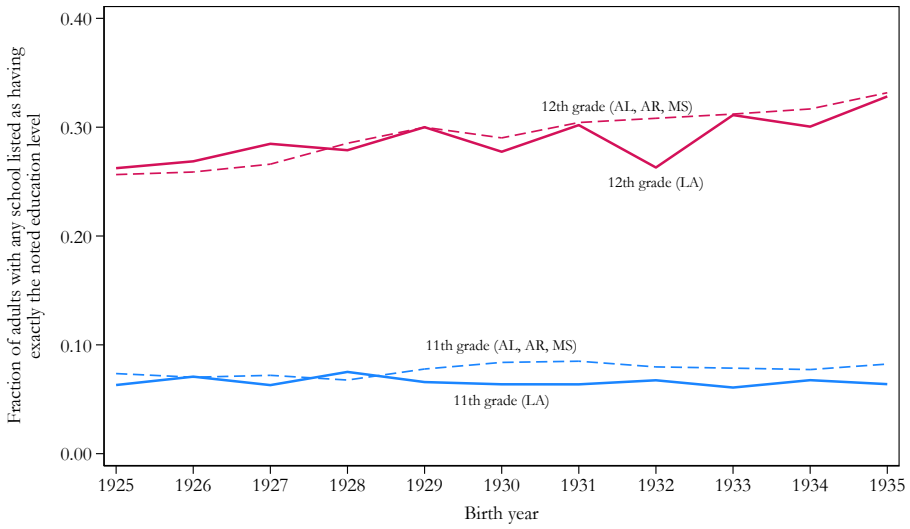
3 Evidence of a shift in years of education after the policy change

The most direct way to evaluate whether the policy changed the number of years of education attained by high school graduates is to analyze full-count Census data for Louisianans who completed high school, comparing whether their highest grade completed is recorded as eleventh or twelfth grade. However, it

[7]Schools were segregated prior to the U.S. Supreme Court decision in Brown v. Board of Education (1954). Examining issues of race—a major and controversial topic in the history of public education in Louisiana—is outside the scope of this paper.

seems that many respondents who completed high school before the policy change are recorded as having finished twelfth grade, despite the absence of a twelfth grade during their schooling. This likely arises because respondents indicated they completed high school, leading enumerators to default to twelfth grade as the recorded level of attainment. Figure 4 illustrates this issue by showing, for each birth cohort, the proportions of individuals born in Louisiana and nearby states with 12-year programs (Alabama, Arkansas, and Mississippi) who completed at least the first grade and whose highest grade completed is reported as either eleventh or twelfth grade. The trends are visually similar regardless of the educational program, and for Louisiana, more respondents are listed as having completed twelfth grade than eleventh, even in the years prior to the 12-year program. This may partly reflect naming conventions of the time: before the policy change, the fourth year of high school might not have been called "eleventh grade" but instead referred to as the "fourth" or "senior" year (see Figure 3). Additionally, some considered the first year of high school to be the eighth grade, as noted in the enrollment report on page 156 of State of Louisiana Department of Education (1929).

Figure 4: Share of Individuals with Exactly 11 or 12 Years of Education in Louisiana and Nearby States, by Birth Cohort.

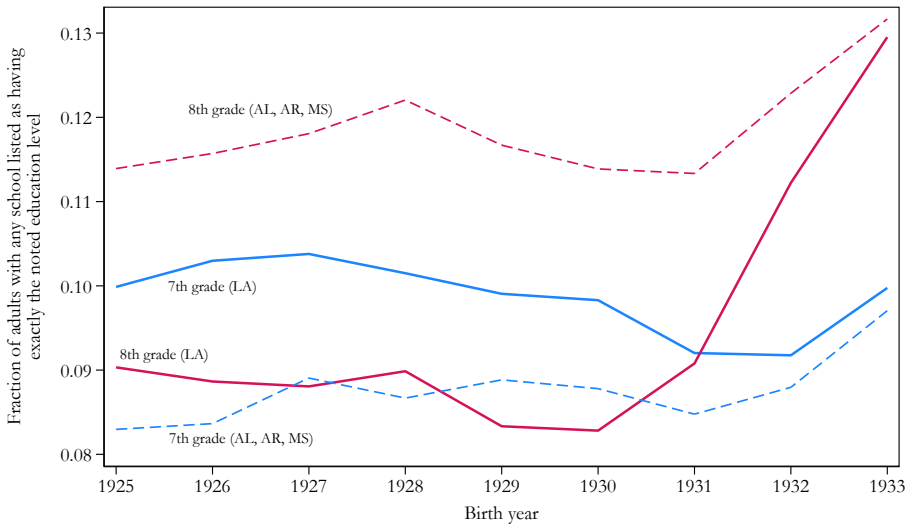


Notes: Fraction of individuals who completed first grade and have exactly 11 or 12 years of education, by birth cohort. Estimates use a 5% sample from the 1960 Census of individuals born and living in Louisiana, Alabama, Arkansas, or Mississippi. Source: Ruggles et al. (2024).

To illustrate the shift, we examine middle school completion. Middle school represented a natural stopping point for students ending their education, and grades were typically referred to by number. When seventh grade marked the end of middle school, we expect a concentration of individuals recorded with exactly a seventh-grade education relative to adjacent grades. Once eighth grade became the end of middle school,

this concentration would shift to eighth grade. Figure 5 confirms this pattern. Among native Louisianans who completed at least the first grade, those born before 1931 are more likely to be recorded in the census as having completed exactly seventh grade. Starting with the 1931 cohort, this proportion declines, while the proportion with exactly eighth-grade education rises.[8] By contrast, no similar pattern emerges among individuals born in neighboring states during this period. In these states, respondents are consistently more likely to be recorded with exactly an eighth-grade education across all cohorts, with no shift around 1931. By 1933, Louisiana's proportions have converged to the level of its neighbors.

Figure 5: Share of Individuals with Exactly 7 or 8 Years of Education in Louisiana and Nearby States, by Birth Cohort.



Notes: Fraction of individuals who completed first grade and have exactly seven or eight years of education, by birth cohort. Estimates use the complete count from the 1950 Census of individuals born and living in Louisiana, Alabama, Arkansas, or Mississippi. Source: Ruggles et al. (2024).

The change in years of education among high school graduates can be observed by examining the total number of graduates per academic year in Louisiana public high schools, as shown in Table 2 for 1945 to 1950. The number of high school graduates was 15,337 in 1947, 14,287 in 1948, and 12,860 in 1950. However, there were only 4,219 graduates in 1949. This drop reflects the transition from the 11-year to the 12-year system. The last students under the 11-year system graduated in 1948, leaving one empty senior class before the first 12-year cohort graduated in 1950. The fact that the number for 1949 is not zero reflects the complexities of education systems. There will always be some students who skip grades, are held back a year, take time out from school, or otherwise do not graduate on schedule for various reasons. Additionally, as noted earlier,

[8] This is still an imperfect measure, as some individuals are recorded with eighth-grade education even when no eighth-grade existed. Possible explanations include enumerator error (e.g., interpreting "completed middle school" as eighth grade), misremembering (e.g., in the 1940 census, the proportion with exactly seventh grade is higher for the 1925 cohort), and migration to or from other states.

several news articles from the time report that at least some schools in Orleans Parish introduced the eighth grade in the fall of 1944, contributing to the variability in graduation numbers.

Table 2: High School Enrollment and Graduation Figures in Louisiana from 1945 to 1950

	White			**Black**			**Total**		
Year	High Schools	High School Students	Graduates	High Schools	High School Students	Graduates	High Schools	High School Students	Graduates
1945-46	370	51,542	11,441	81	12,116	2,431	451	63,658	13,872
1946-47	368	51,725	12,632	84	12,898	2,705	452	64,623	15,337
1947-48	367	49,836	11,652	87	14,412	2,635	454	64,248	14,287
1948-49	363	51,166	3,532	87	16,035	687	450	67,201	4,219
1949-50	362	61,146	10,245	98	21,053	2,615	460	82,199	12,860

Notes: Number of high schools, enrolled high school students, and high school graduates are reported separately for White and Black students, as well as in total, for each school year from 1945–46 to 1949–50. Figures are compiled from annual and biennial reports of the Louisiana Department of Education and reproduced from Robertson (1952).

3.1 Evidence of a level shift in earnings after the policy change

Before discussing the causal estimates, we show that Louisiana birth cohorts affected by the policy experienced a level shift in earnings. To do so, we use repeated cross-sectional samples from the Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS) from 1962 to 1989, sourced from Flood et al. (2023). Although data from the 1950s would be ideal, ASEC data begins in 1962. By this time, the cohorts of interest are around 30 years old and reach their late 50s or early 60s by 1989. Our analysis focuses on individuals born between 1928 and 1933 who lived in Louisiana, were not in the military, and had no missing information on educational attainment.[9] Since ASEC is fielded in March, we follow Krueger and Pischke (1992) and calculate birth year as the survey year minus the respondent's age at the survey date, minus one.

We estimate the following equation using ordinary least squares (OLS):

$$Y_{it} = \beta_0 + \beta_1 After_i + \gamma \mathbf{X}_i + \epsilon_{it} \tag{1}$$

where Y_{it} represents the real annual income (in 1999 USD) of individual i in year t, and $After_i$ is an indicator equal to one if the individual was born in 1931 or later. The 1931 cutoff is based on the assumption that

[9]Cohorts born before 1928 may be systematically different as they were eligible to enlist in World War II. The World War II Army Enlistment Records of the National Archives and Records Administration for enlistments by residents of Louisiana between 1941 and 1945 contain the following counts by birth year: 1925 - 3,013; 1926 - 2,492; 1927 - 2,153; 1928 - 221; 1929 - 7. See https://www.archives.gov/publications/prologue/2006/spring/aad-ww2.html.

most children in this cohort were the first to enroll in the new eighth grade in 1945. The vector $\mathbf{X}_i$ includes controls for age, race, and gender.

Table 3: Relationship Between Exposure to the 12-Year Program and Labor Income in Louisiana

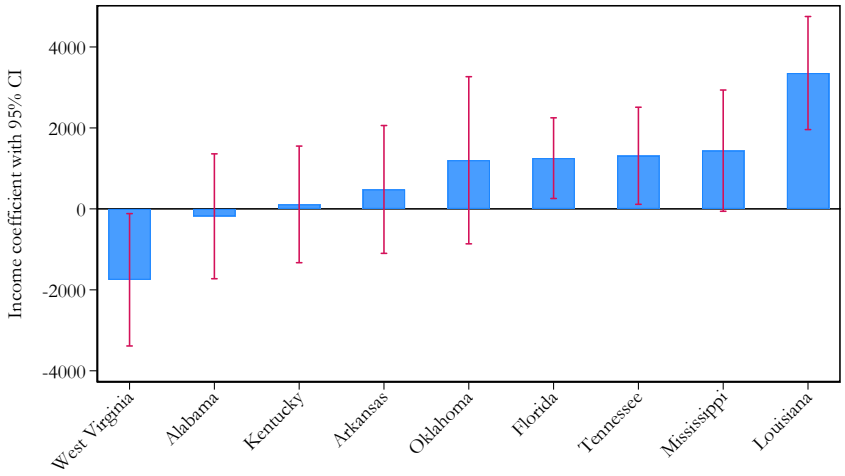
	(1)	(2)	(3)	(4)
	All	$>$ 6th Grade	$\leq$ 6th Grade	No College
After	3809.2***	4123.8***	-437.1	3080.2***
	(721.2)	(775.8)	(1211.4)	(623.4)
Mean Income	\$17,611	\$18,734	\$8,881	\$14,412
Observations	3,200	2,835	365	2,447
R^2	0.268	0.284	0.286	0.335

Notes: Table reports estimates from regressions of annual labor income (in 1999 dollars) on an indicator variable denoted After, equal to 1 for individuals born in 1931 or later. All models control for age, age squared, female, and White, and use ASEC weights. The sample includes individuals born between 1928 and 1933 and residing in Louisiana. Column 1 includes all individuals; Column 2 restricts to those with more than a sixth-grade education; Column 3 to those with sixth grade or less; and Column 4 to those with at most a high school education. Robust standard errors in parentheses. ***: p<0.01, **: p<0.05, *: p<0.10

Table 3 presents the results from estimating Equation 1across four samples: all individuals in Louisiana (Column 1), those with at least a seventh-grade education (Column 2), those with at most a sixth-grade education (Column 3), and those with at most a high school education (Column 4). The coefficient on the indicator for being born after 1930 and thus exposed to the 12-year program is \$3,809 for all respondents and is precisely estimated. Among individuals with more than a sixth-grade education, the estimate increases to \$4,124. By contrast, for those with at most a sixth-grade education, who were unaffected by the additional year of schooling, the policy shows no impact on earnings. Restricting the sample to individuals who never attended college, the earnings increase remains substantial, at approximately \$3,000.

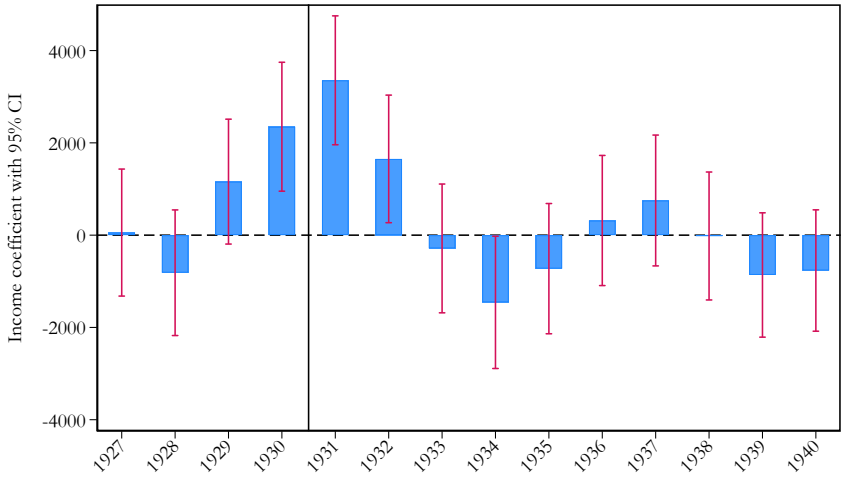
The coefficients indicating a positive relationship between earnings and cohorts born after 1930 represent about 20% of the average earnings in the respective samples. This magnitude aligns well with estimates of returns to education reported by Heckman et al. (2006), including the internal rate of return for White males in 1940 (0.24, Table 8a), the treatment effect on the treated in a generalized Roy model (0.24, Table 10), and the average treatment effect of one year of college (0.21, Table 11).

Figure 6: Placebo Effects of the 12-Year Program on Affected Cohorts in Southern States



Notes: Coefficients from regressions of annual labor income (in 1999 dollars) on an indicator variable, After, equal to 1 for individuals born in 1931 or later. All models control for age, age squared, female, and White, and use ASEC weights. The sample includes individuals born between 1928 and 1933 and residing in each state shown. States already had a 12-year program by 1928. Bars are sorted by magnitude, with whiskers showing 95% confidence intervals.

Figure 7: Placebo Effects of the 12-Year Program in Louisiana Using Alternate "Treatment" Years



Notes: Coefficients from placebo regressions of annual labor income (in 1999 dollars) on an indicator for exposure to the 12-year program in Louisiana, using alternate years as the transition year. The true treatment year is 1931. All models control for age, age squared, female, and White, and use ASEC weights. Each regression uses a five-year birth cohort window centered on the transition year shown on the x-axis. Bars represent point estimates, and whiskers denote 95% confidence intervals.

We show that the level shift in earnings observed for Louisiana cohorts exposed to the 12-year program is unique to this group. There is no comparable shift for contemporaneous cohorts in other Southern states or for other cohorts in Louisiana. Figure 6 presents coefficients from estimating Equation 1 for samples restricted to each of the nine Southern states without a 12-year program as of 1928. The bars, ordered by

coefficient magnitude, include 95% confidence intervals. Louisiana's coefficient is more than twice that of the next largest state, Mississippi, and the confidence intervals for all states except Louisiana include zero or values near zero.

Figure 7 examines Louisiana cohorts, plotting coefficients from Equation 1 with *After* defined as being born in the year noted on the x-axis or later. This analysis compares birth cohorts within a five-year window around each year. The largest coefficients correspond to years near 1931, where the samples include cohorts exposed and unexposed to the policy. Coefficients for years where treatment status does not vary across cohorts are small, with 95% confidence intervals including zero.

4 Empirical approach

To identify the causal effect of extending schooling in Louisiana from 11 to 12 years, we exploit the fact that assignment to the 12-year program (treatment) is determined by the year in which an individual completes the seventh grade, as discussed in Section 2. We use birth year as a proxy for this assignment, reflecting the common practice of starting first grade at age seven. Individuals born in 1931 in Louisiana likely completed seventh grade in the spring of 1945. These individuals would have entered the newly established eighth grade that fall, instead of advancing directly to high school.

In practice, birth year is an imperfect proxy for treatment due to variations in school starting age and grade progression, such as skipping or repeating grades. Consequently, individuals born around 1931 might have taken more or fewer than 12 years to graduate high school, leading to imperfect compliance with the treatment assignment rule.[10] To the extent that imperfect alignment between our proxy for treatment exposure and actual treatment status reflects classical measurement error, our estimated coefficients would likely be attenuated toward zero. Using birth year as a proxy for treatment, we estimate an intention-to-treat effect (ITT) that incorporates both the policy's impact and any anticipatory educational decisions by students.

We identify the ITT using a difference-in-differences framework, comparing changes in Louisiana birth cohorts to those in other U.S. states that had implemented a 12-year education program by 1928 (see Figure 2 for the list of excluded states). We estimate the following equation:

$$Y_{ist} = \beta_0 + \delta After_t \times LA_s + \mathbf{X}_i\gamma + \eta_t + \eta_s + \epsilon_{ist} \tag{2}$$

where Y_{ist} is an outcome variable for individual i in state s in year t. LA is an indicator variable for being

[10] Additional imprecision arises from the fact that birth year is not reported in the CPS data. We approximate it based on age at survey date.

in the state of Louisiana, and $After$ is an indicator variable equal to one if an individual was born in 1931 or later. The parameter of interest is δ, which recovers the ITT of being assigned to a curriculum with an additional year of education in Louisiana. Matrix $\mathbf{X}$ includes controls for gender, race, and a quadratic term for age, η_t and η_s represents birth year and state fixed-effects, and ϵ_{ist} represents unobserved idiosyncratic heterogeneity, assumed to have zero mean.

The estimation sample includes pooled ASEC surveys from 1962 to 1989, comprising all individual observations from Louisiana and other states that had adopted a 12-year program by 1928, serving as the control group.[11,12] Table 4 presents unweighted summary statistics by treatment and birth cohort groups. Education levels are generally lower in Louisiana, where about 60% of individuals in the sample complete high school, compared to 70% in other states. Baseline income levels are approximately $5,000 lower in Louisiana, and the state has a higher proportion of non-white residents. Despite these differences, few disparities in cohort-level changes exist between Louisiana and the control states, except for annual real labor income.

Table 4: Sample Means for Individuals Born 1928–1933 in Louisiana and Other States

	Louisiana		Other States	
	1928-1930	**1931-1933**	**1928-1930**	**1931-1933**
N	1668	1614	87862	81500
Birth Year	1929.03	1932.05	1929.00	1931.98
	(0.812)	(0.799)	(0.8181)	(0.8145)
Female	0.5288	0.5446	0.5243	0.5227
Non-white	0.2440	0.2330	0.0933	0.1026
Employed	0.6205	0.6722	0.6738	0.6937
Real Income	16294.43	18967.24	21428.55	22190.29
	(20448.80)	(21909.91)	(25277.48)	(25307.88)
6th Grade +	0.9197	0.9356	0.9658	0.9677
HS Graduate	0.5737	0.5979	0.6884	0.7136
Any College	0.2302	0.2627	0.2836	0.3013
Survey Year	1974.50	1974.42	1976.44	1976.62
	(8.174)	(8.116)	(8.001)	(7.970)

Notes: Table reports unweighted sample means for individuals born between 1928 and 1933 in Louisiana and in other U.S. states that had adopted a 12-year education program by 1928 (see Figure 2 for the list of excluded states). Means are shown separately by location (Louisiana vs. other states) and cohort group (1928–1930 vs. 1931–1933). Real income is expressed in 1999 dollars. Standard deviations are shown in parentheses for continuous variables. Source: pooled CPS ASEC data from 1962 to 1989 (Flood et al. 2023).

[11] The main results remain robust when restricting the control group to southern states that adopted a 12-year program.
[12] We omit Alaska and Hawaii, which were not yet states at the time.

Because the ASEC only reports the state of residence and not birthplace, this increases the noise in our ITT estimation approach. Not everyone educated in Louisiana necessarily resides there in adulthood, and not every adult living in Louisiana was necessarily educated there. Based on the 5% public use sample from the 1960 Census (Ruggles et al. 2024), we estimate that 75.4% of adults ages 21 and over who were living in Louisiana were born there, and 70.0% of adults born in Louisiana still resided there. More important for identification, there are no differences in migration rates for the birth cohorts surrounding the policy change of interest. The difference in proportions of adults born in Louisiana still residing there in 1960 for the 1928-1930 cohorts versus the 1931-1933 cohorts is 0.0056 ($p = 0.4967$), and the differences in proportions of adults living in Louisiana who were born there is 0.0053 ($p = 0.5062$).

Evidence regarding identifying assumptions

To assess the validity of the difference-in-differences approach, we use standard tools to test the parallel trends assumption. We first present descriptive summary statistics for birth cohorts near the treatment year, comparing Louisiana to other U.S. states, using complete count data from the 1940 U.S. Census (Ruggles et al. 2024). Table 5 summarizes a wide range of observable characteristics, including gender, race, birthplace, family size, school enrollment, urban/rural status, parental age, education, nativity, and home ownership. While Louisiana differs from other states in levels—for example, households are larger, less likely to be White, more likely to live on farms, and parents are more often born in-state—there are no systematic differences in the changes for the 1928–1930 and 1931–1933 cohorts. Most differences across these groups are economically small, typically one percentage point or less.[13] Overall, the "before" and "after" cohorts in Louisiana and the control states appear fairly similar in observable characteristics.

Figure 8 plots the mean annual real labor income by birth cohort for Louisiana and the control states. The time paths are parallel from 1928 to 1930, leading up to the treatment year, providing compelling evidence in favor of the parallel trends assumption. In 1931, Louisiana experienced an upward level shift, after which the trend continued in parallel with the control states in 1932. The raw income difference narrows from approximately \$4,700 in 1930 to \$2,700 in 1931. This suggests a naive treatment effect of about \$2,000, representing a 12 percent increase over Louisiana's 1930 mean income, attributed to an additional year of schooling.

We conduct an event study to evaluate whether the treatment and control groups share similar dynamic trends in the pre-treatment period. Figure 9 plots annual real labor income by birth cohort, with coefficients measured relative to the 1930 cohort. Before 1930, income trends for individuals in Louisiana and the control states are similar, supporting the parallel trends assumption. A discrete upward-level shift begins

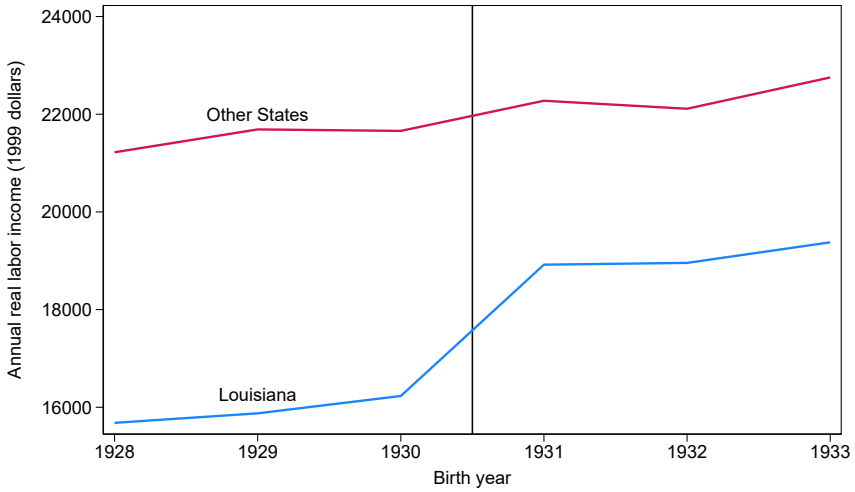
[13] Statistical tests often reject the null hypothesis of no difference due to the large sample size.

Table 5: Comparison of Children's Household Characteristics in Louisiana and Other States (1940 Census)

	1928-1930		1931-1933		
	Louisiana	Other States	Louisiana	Other States	DiD
N	144,067	5,388,929	137,439	4,996,014	
Male	0.506 (0.500)	0.507 (0.500)	0.504 (0.500)	0.507 (0.500)	0.002
White	0.635 (0.481)	0.921 (0.270)	0.621 (0.485)	0.917 (0.276)	-0.010
Age (1940)	11.015 (0.829)	11.019 (0.825)	8.005 (0.809)	8.018 (0.813)	0.009
Born in state	0.930 (0.255)	0.886 (0.317)	0.942 (0.234)	0.903 (0.297)	-0.005
Family size	6.318 (2.522)	5.789 (2.317)	6.330 (2.478)	5.774 (2.282)	-0.003
Enrolled in school	0.925 (0.263)	0.944 (0.230)	0.898 (0.302)	0.933 (0.250)	-0.016
Mother's age (1940)	37.604 (7.501)	38.643 (7.106)	34.731 (7.422)	35.610 (7.041)	-0.240
Father's age (1940)	42.510 (8.721)	43.038 (8.039)	39.643 (8.764)	40.046 (8.081)	-0.271
Mother born in state	0.780 (0.414)	0.551 (0.497)	0.800 (0.400)	0.586 (0.493)	-0.015
Father born in state	0.693 (0.461)	0.483 (0.500)	0.720 (0.449)	0.521 (0.500)	-0.011
Mother no HS edu	0.682 (0.466)	0.595 (0.491)	0.679 (0.467)	0.562 (0.496)	0.030
Father no HS edu	0.659 (0.474)	0.607 (0.488)	0.671 (0.470)	0.591 (0.492)	-0.004
Mother any college	0.130 (0.336)	0.128 (0.334)	0.116 (0.320)	0.120 (0.325)	-0.022
Father any college	0.213 (0.410)	0.198 (0.399)	0.189 (0.392)	0.184 (0.387)	-0.009
Urban residence	0.340 (0.474)	0.531 (0.499)	0.323 (0.468)	0.518 (0.500)	-0.004
Lives on farm	0.431 (0.495)	0.250 (0.433)	0.441 (0.496)	0.254 (0.435)	0.006
Family owns home	0.375 (0.484)	0.426 (0.494)	0.350 (0.477)	0.392 (0.488)	-0.009

Notes: Table reports sample means for children born between 1928 and 1933 living in Louisiana or in states with 12-year programs by 1928 (see Figure 2 for the list of excluded states). Means are shown separately by location (Louisiana vs. other states) and cohort group (1928–1930 vs. 1931–1933). The DiD column reports the difference-in-differences of means (post – pre) for each characteristic. Most differences are economically small (one percentage point or less), and age differences reflect the mechanical three-year gap between cohort groups. Rows report variable means, with sample standard deviations in parentheses. Source: 1940 U.S. Census complete count data (Ruggles et al. 2024).

Figure 8: Mean Annual Real Labor Income by Birth Cohort in Louisiana and Control States



Notes: Mean annual labor income (in 1999 dollars) by birth cohort for individuals in Louisiana and in control states. Control states include all U.S. states except Alaska, Hawaii, and those listed in Figure 2.

with the adoption of the 12-year program for the 1931 cohort. The 95 percent confidence intervals, based on state-clustered standard errors, are likely too narrow due to having only one treated group (Louisiana). To address this, our main results report the standard errors estimated using the method of Ferman and Pinto (2019), designed for settings with few treated groups.[14,15]

5 Results

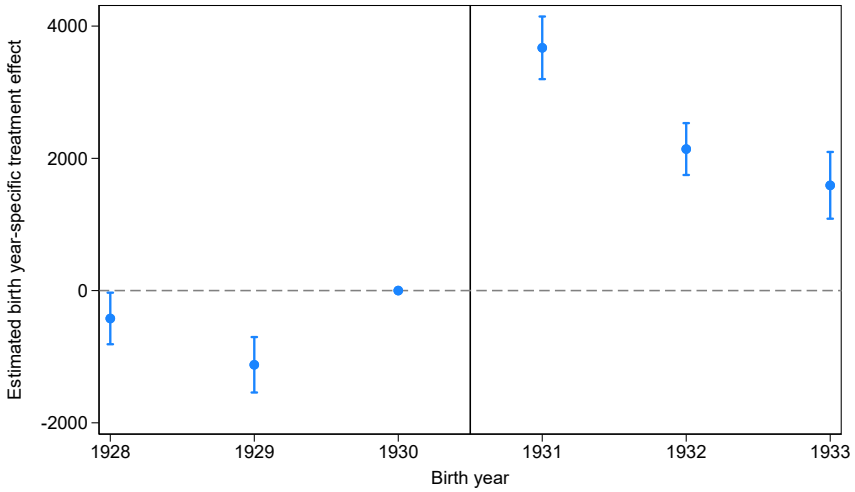
After showing similar baseline levels in observable characteristics between the treatment and control groups, as well as minimal differences in intergroup dynamics during the pre-period, in this section, we present the main estimation results on the impact of exposure to the 12-year program. Table 6 displays estimates of δ from Equation 2, where real annual labor income serves as the outcome of interest, across eight specifications. The first four columns include all individuals, regardless of employment status, while the last four are restricted to those reporting employment at the time of the survey. Within each subset, results are presented for the full sample (Columns 1 and 5), individuals with more than a sixth-grade education (Columns 2 and 6), individuals with at most a sixth-grade education (Columns 3 and 7), and those with at most a high school degree (Columns 4 and 8).

Overall, exposure to the additional year of education in Louisiana has a positive and precisely estimated

[14] Although wild bootstrap is another method for addressing settings with few groups, it becomes unreliable when there is only one treated unit (MacKinnon and Webb 2018).

[15] Because Orleans Parish may have implemented the 12-year program a year earlier, Appendix A reproduces the means and event study plots excluding respondents from the New Orleans metro area. Although this reduces precision due to the smaller sample size, the estimated magnitudes remain similar.

Figure 9: Event Study Estimates for Annual Real Labor Income by Birth Cohort



Notes: This figure plots estimated birth year–specific treatment effects from a difference-in-differences specification. The outcome is annual real labor income (1999 dollars). The regression controls for gender, race, age, and age squared, and applies ASEC person weights. Louisiana cohorts born in 1931 and later are the treated group, while contemporaneous cohorts in other states serve as the control. Control states include all U.S. states except Alaska, Hawaii, and those listed in Figure 2. Estimates are reported relative to the 1930 birth cohort, with the vertical line marking the 1931 reform cutoff. Whiskers represent 95% confidence intervals with standard errors clustered at the state level.

effect of approximately $2,926 per year. This represents about 13% of the average earnings for all individuals (Column 1) and 9.6% of the average earnings for those who are employed (Column 5). As expected for a program affecting education beyond the sixth grade, the positive effect persists among individuals with more than a sixth-grade education (Columns 2 and 6). In contrast, we find no effect for individuals with at most a sixth-grade education (Columns 3 and 7).

One possible explanation for the observed effect is that the policy increased overall educational attainment in the population rather than simply adding a year of education for those already earning a high school degree. For instance, the policy may have induced more students to attend college. Conversely, requiring an additional year to graduate high school could have discouraged some individuals from remaining in school. If the additional requirement dissuaded students from continuing, the estimates for the high school sample would likely be biased downward. We investigate whether the policy affected high school or college completion rates in Section 5.2. To focus on individuals most likely to have attained the same level of education, adjusted for the additional year, we restrict the sample to those who never attended college and re-estimate Equation 2. These estimates, shown in Columns 4 and 8 of Table 6, suggest an ITT effect of approximately $2,800–$2,900 per year—16.4% of the average earnings for all individuals with at most a high school degree and 10.8% of the average earnings for employed individuals with at most a high school degree. These estimates fall within the range reported in the literature, where returns to an additional year of schooling are typically estimated at 10–20%, depending on the sample and econometric approach (Card

1999).

Table 6: Impact of Exposure to the 12-year Program on Annual Labor Income in Louisiana

	(1) All	(2) > 6th	(3) ≤ 6th	(4) No College	(5) All	(6) > 6th	(7) ≤ 6th	(8) No College
After × LA	2926.2***	2980.8***	1475.4	2873.1***	2980.0**	2778.3**	3141.7	2810.0**
	(981.6)	(1018.8)	(3458.2)	(969.1)	(1172.6)	(1170.4)	5332.0)	(1116.8)
Employed					✓	✓	✓	✓
Mean	$21,835	$22,404	$10,963	$17,549	$30,752	$31,232	$18,828	$25,852
N	168,466	159,467	8,999	120,438	115,150	110,476	4,674	77,790

Notes: Table reports estimates from regressions of annual labor income (in 1999 dollars) on an After indicator equal to 1 for 1931 birth cohorts and later, a LA indicator equal to 1 for the state of Louisiana, and their interaction. The sample includes individuals born between 1928 and 1933. Columns 1 and 5 include all individuals; Columns 2 and 6 restrict to those with more than a sixth-grade education; Columns 3 and 7 to those with sixth grade or less; and Columns 4 and 8 to those with at most a high school education. The "Employed" sample is conditional on reporting having a job. All models control for gender, a non-white indicator, age and age squared, and birth year and state fixed effects and use ASEC weights. Standard errors are calculated using the method of Ferman and Pinto (2019) and are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In addition to confirming the absence of effects among individuals who never attended the seventh grade and were therefore not directly exposed to the policy, we conduct two placebo analyses. First, we counterfactually assign the treatment across the 38 states in the control group and find no effect (p-value $<$ 0.1) for 36 of them.[16] Second, we test alternative treatment years. For each year listed in the columns of Table 7, we construct an ASEC sample similar to the one used for the main results in Equation 2, using a five-year window of birth cohorts around each placebo treatment year, ranging from 1916 (Column 1) to 1951 (Column 8). In all cases, the estimated coefficients are much smaller than those for the actual treatment year of 1931, with two departures: a negative coefficient of –$1,718 in 1926 (Column 3, $p = 0.0580$), and a positive, statistically significant coefficient in 1930 (Column 4).

The positive 1930 estimate is consistent with substantial grade repetition in southern states (Collins and Margo 2006; Cascio and Lewis 2024). Students born before 1931, particularly those who progressed more slowly through school, may have been exposed to the reform despite being classified as untreated in our baseline design. This implies that some pre-1931 Louisiana cohorts could have partially benefited from the additional year of schooling, introducing imprecision in treatment assignment. In such cases, the contrast between pre- and post-1931 Louisiana cohorts becomes less sharp, and our difference-in-differences estimates are biased toward zero. While this complicates interpretation, the placebo results outside of the 1930 case do not reveal a consistent pattern of positive effects among earlier cohorts, which supports our view that 1931 marks the relevant threshold. When iterating over every placebo treatment year from 1911 to 1961

[16]Results from these placebo exercises are omitted for brevity but are available upon request.

(excluding 1928–1932, which overlap with the true treatment), only three out of 51 estimates yield a p-value less than 0.05.

Table 7: Placebo Regressions Using Alternative Treatment Years for the 12-Year Program in Louisiana

	1961	1921	1926	1930	1936	1941	1946	1951
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
After × LA	300	1,653	-1,718*	2,093**	611	754	577	-292
	(788.7)	(957.1)	(1,012.7)	(898.0)	(881.1)	(753.8)	(976.8)	(641.8)
Mean	$9,978.0	$17,225.7	$20,189.1	$21,589.5	$22,403.6	$21,754.4	$18,771.1	$16,249.8
N	184,150	171,381	177,621	171,936	165,658	189,183	230,257	245,651

Notes: Table reports estimates from regressions of annual labor income (in 1999 dollars) on an After indicator equal to 1 for individuals born in the year indicated at the top of each column or later, a LA indicator equal to 1 for the state of Louisiana, and their interaction. Each column uses a sample of individuals born within a five-year window centered around the year listed in the column header (three years before to two years after). The dependent variable is annual wage and labor income. All models control for gender, a non-white indicator, age, age squared, birth year, state fixed effects, and use ASEC weights. Standard errors are calculated using the method of Ferman and Pinto (2019) and are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.1 Heterogeneity by race and gender

Given the limited educational opportunities available to non-Whites and the constrained labor force participation of women in 1930s–1940s Louisiana, we examine whether the estimated income effect of the transition to the 12-year program varies by gender and race. Table 8 reports the results from re-estimating Equation 2 on five subsamples: males, females, Whites, non-Whites, and White males.

The estimated effect is larger for males ($3,190, Column 1), though their higher average labor income means this increase represents 9% of their average earnings. For females (Column 2), the point estimate is smaller at $2,000, but given the average labor income, it represents a 21% increase. For non-Whites (Column 4), we find no significant effects. In contrast, Whites (Column 3) experience a substantial effect of $3,053, corresponding to 13.5% of their average earnings. The largest effect is observed for White males (Column 5), with an estimated increase of $3,602 in annual labor income due to exposure to the 12-year program. These findings indicate that the treatment effects seen in the main results in Section 5 are concentrated among White individuals, particularly those who are both. This subset represents the group most likely to be impacted by educational policy and to experience higher returns to human capital in the labor market. These results suggest potential implications for widening income inequality, particularly across racial groups, as White individuals appear to benefit more from the reform. While the smaller sample size for non-White individuals may limit our ability to detect effects with precision, the absence of measurable gains for these groups is itself an intriguing result. Future work should try to understand whether this pattern reflects limited statistical power or meaningful differences in how the reform affected non-White students, especially

given the historical context of educational inequality in the state.[17]

Table 8: Heterogeneous Impact of Exposure to the 12-year Program on Annual Labor Income in Louisiana by Race and Gender

	(1)	(2)	(3)	(4)	(5)
	Male	Female	White	Non-White	White Male
After × LA	3190.9*	2009.5**	3053.3**	925.5	3602.5*
	(1605.3)	(847.1)	(1104.9)	(3367.0)	(1819.0)
Mean	$35,185	$9,500	$22,542	$16,101	$36,528
N	80,214	88,252	151,495	16,971	72,903

Notes: Table reports estimates from regressions of annual labor income (in 1999 dollars) on an After indicator equal to 1 for 1931 birth cohorts and later, a LA indicator equal to 1 for the state of Louisiana, and their interaction. The sample includes individuals born between 1928 and 1933. Columns 1 and 2 restrict to males and females, respectively; Columns 3 and 4 to White and Non-White individuals, respectively; and Column 5 to White males. All models control for age, age squared, birth year and state fixed effects, and use ASEC weights. Standard errors are calculated using the method of Ferman and Pinto (2019) and are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.2 Educational attainment

We next examine whether the change in the number of years required to obtain a high school degree in Louisiana affected educational attainment. Although one of the original arguments for adopting a 12-year program was to better prepare students for college, contemporary evidence from Louisiana suggested that local students who did attend college were not significantly less prepared than graduates from 12-year systems. The Louisiana Educational Survey noted: "The Southern Association has for years kept track of the percent of college failures from graduates of the two types of systems, and while the percentage is greater year in and year out for children who graduate from eleven-year school systems, the difference is not striking" (Louisiana Educational Survey Commission 1942). However, the report also highlighted that Louisiana high school seniors had test scores equivalent to the national average for sophomores. Thus, the primary goal of adopting the 12-year program was not to improve college performance but to raise the level of secondary education.

Given that Louisiana's education system was legally segregated until the 1950s and informally segregated beyond that, we analyze educational outcomes separately by race. Figure 10 plots high school completion and the completion of at least one year of college for White and Non-White individuals by birth year, surrounding the 1931 policy change. The y-axes are set to the same scale to facilitate level comparisons

[17] Collins and Margo (2006) and Cascio and Lewis (2024) document that grade retention was more common among Black students, implying that a relatively larger share of the non-White 1930 birth cohort may have been exposed to the treatment. Using 1930 as the cutoff instead of 1931, we obtain a slightly higher estimated effect of $1,316, though it remains statistically insignificant.

across racial groups. Among White Louisianans, the share completing high school is slightly lower than the national average, with a persistent five-point gap throughout the sample window (Figure 10a). In contrast, Figure 10b shows that education levels are substantially lower for Non-White individuals—both overall, by about 30 percentage points, and relative to the rest of the country, where there is a 10-point gap.[18] As with White individuals, we observe no discernible level shift or change in trend for Non-White individuals following the adoption of the 12-year program.

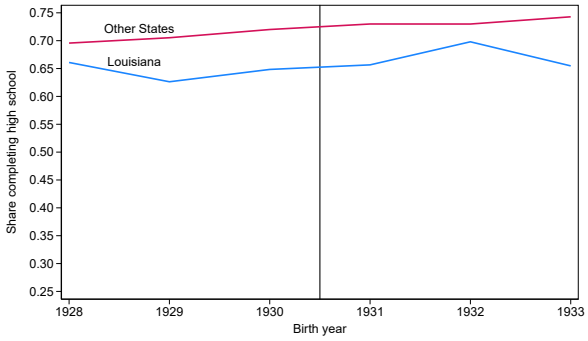
When examining tertiary educational attainment, measured as the proportion of individuals completing at least one year of college, we observe an initial gap of about five percentage points between Louisiana and the rest of the country. For White individuals, Louisiana shows a slight upward shift beginning with the 1931 cohort (Figure 10c). In contrast, there is no discernible pattern for Non-White individuals (Figure 10d), although the precision of the estimated means is much lower due to these values representing only about 2.5% of the population. The apparent increase in college completion starting with the 1930 birth cohort may reflect an underlying catch-up trend independent of the policy, the imperfect nature of birth year as a proxy (since some individuals from 1930 may have been exposed to the 12-year program), or a combination of both.[19]

Estimating Equation 2 with each of the two educational attainment indicators—high school completion and completion of at least one year of college (both measured as 0/1 variables)—as the outcome of interest yields similar conclusions to the means plots. Table 9 reports the difference-in-differences estimates of the ITT for high school completion (Columns 1 to 3) and for completion of at least one year of college (Columns 4 to 6), both overall and by race. There does not appear to be any effect of the transition to the 12-year program on high school completion in Louisiana. For the subsample of White individuals, we estimate about a four-point increase in the probability of completing at least one year of college, although this estimate is fairly imprecise (Column 5, $p = 0.0650$). Overall, while the program may have altered the contents of the education curriculum, there is limited evidence that it significantly altered educational attainment, with a small potential positive effect for White individuals.

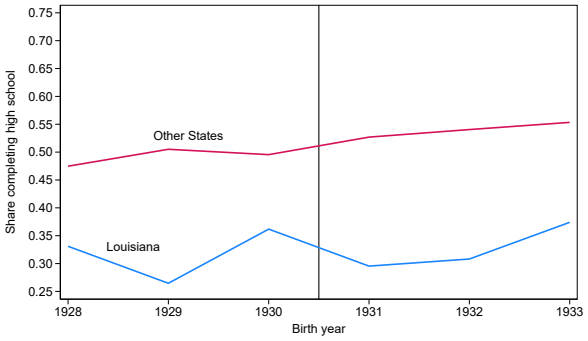
[18] In Louisiana, 98% of Non-White individuals in this sample are Black, compared to 85% nationwide. If the analysis is restricted to Black individuals only, the gap narrows by about three percentage points but at the cost of further reducing the already limited Non-White sample size in ASEC.

[19] Figure A3 in Appendix A reproduces Figure 10, excluding respondents from the New Orleans metro area as a proxy for potential early exposure to the 12-year program. This adjustment reduces the observed increase in college completion for the White 1930 birth cohort.

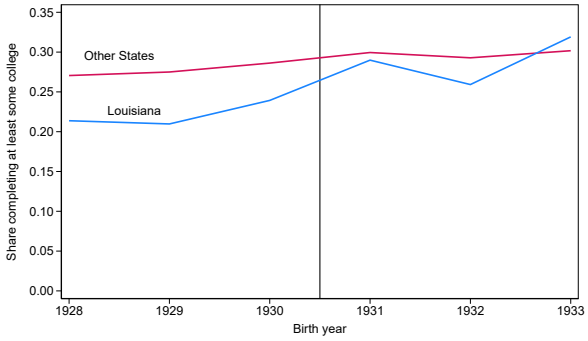
Figure 10: High School and Some College Completion Rates by Race and Birth Cohort in Louisiana and Control States



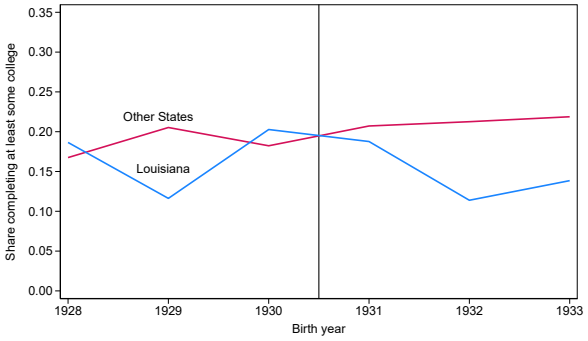
(a) High school completion (White)



(b) High school completion (Non-White)



(c) Completion of some college (White)



(d) Completion of some college (Non-White)

Notes: Mean proportion of White (left panels) and Non-White (right panels) individuals completing high school (top panels) or at least one year of college (bottom panels), by birth year surrounding the 1931 policy change. Control states include all U.S. states except Alaska, Hawaii, and those listed in Figure 2.

Table 9: Impact of Exposure to the 12-year Program on the Likelihood of Completing High School and Completing at Least One Year of College

	(1)	(2)	(3)	(4)	(5)	(6)
	HS Grad	HS Grad	HS Grad	Any Col.	Any Col.	Any Col.
After × LA	-0.0105	-0.0030	-0.0570	0.0174	0.0421*	-0.0691
	(0.0217)	(0.0213)	(0.1287)	(0.0210)	(0.0226)	(0.0930)
Population	All	White	Non-White	All	White	Non-White
Mean	0.695	0.719	0.507	0.277	0.287	0.197
N	167,814	150,863	16,951	167,814	150,863	16,951

Notes: Table reports estimates from regressions on binary outcome variables: completing high school (Columns 1–3) and completing at least one year of college (Columns 4–6). Each model includes an After indicator equal to 1 for 1931 birth cohorts and later, a LA indicator equal to 1 for the state of Louisiana, and their interaction. The sample includes individuals born between 1928 and 1933. All models control for gender and birth year and state fixed effects and use ASEC weights. Standard errors are calculated using the method of Ferman and Pinto (2019) and are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

This analysis indicates that the change in the number of years required to obtain a high school degree did not, at least for the cohorts adjacent to the transition, significantly alter the composition of high school graduates. This suggests that many students are "always takers"—individuals who complete high school once they start, rather than making year-by-year decisions about whether to continue. Even if the choice to complete high school is not driven by a comparison of the discount rate and the internal rate of return, the labor market's valuation of the additional skills imparted in the twelfth year of education aligns with our main findings of higher earnings for these graduates.

6 Conclusion

The statewide shift in Louisiana's public education system, which increased the required years of schooling from eleven to twelve to obtain a high school diploma, offers a unique opportunity to study the labor market consequences of having a twelfth grade. Based on the timing of when students completed seventh grade, some high school graduates received one additional year of education compared to their peers. We leverage this discontinuity across birth cohorts using a difference-in-differences methodology that compares adjacent cohorts within Louisiana and in neighboring states to estimate the long-term effects of requiring 12 years of formal schooling to complete secondary education.

We find that exposure to the new twelve-year program led to a $3,000 increase in annual earnings, representing 13% above the average income of the affected cohorts. The effect was particularly concentrated

among White individuals, with limited impacts on Non-White individuals. While the change did not significantly affect high school graduation rates, there is weak statistical evidence that it increased the likelihood of college attendance among White students. Overall, the main impact of the twelfth-grade reform was to improve labor market outcomes rather than expand educational attainment.

College attendance was, and remains, a minority experience for most students. After discussing the idea that converting to a 12-year system might marginally better prepare students for college, the authors of the Louisiana Education Survey emphasized: "Elementary and secondary education is all the systematic education that most of our children will get... It should be as complete and satisfactory an education as it is possible to give before children go out into their communities as adult human beings..." (Louisiana Educational Survey Commission 1942). One dimension of being an adult human being mentioned specifically in the subsequent sentence is as "economic producers," a theory that additional time in school would produce additional skills, consistent with our findings.

To approximate the net cost or benefit of the policy change, we can suppose that output and labor markets are competitive such that workers are paid their marginal product. In that case, the estimated wage gains can serve as a proxy for the economic benefits, with a rate of return on the order of 13%. The per-pupil cost of implementing the additional year of education for White students in the 1949–1950 school year was $1,672 in 1999 dollars as reported by Robertson (1952).[20] Comparing this to the $3,000 estimated annual wage benefit, the policy demonstrates a highly favorable cost-benefit ratio, even when excluding broader societal returns or opportunity costs.

In conclusion, this study provides robust evidence that Louisiana's adoption of a twelve-grade high school structure led to meaningful labor market gains, particularly for specific demographic groups with relatively high rates of labor force access and participation. While the policy had limited effects on educational attainment, which is consistent with many students following a diploma-based heuristic stopping rule for educational attainment, the significant earnings increase underscores the importance of requiring twelve grades as part of a more complete secondary education. The minimal effects for Non-White students potentially reflect a combination of differential resource allocation within Louisiana's segregated school system and the limited economic opportunities available to Non-White individuals regardless of educational attainment in that era. This raises a question for future research: how might institutional barriers prevent certain groups from realizing the same gains from educational reform despite exposure to the same nominal policy?

[20] Robertson (1952) reports a per-pupil cost of $239 in 1949-1950 dollars. We converted this to 1999 dollars using the Consumer Price Index.

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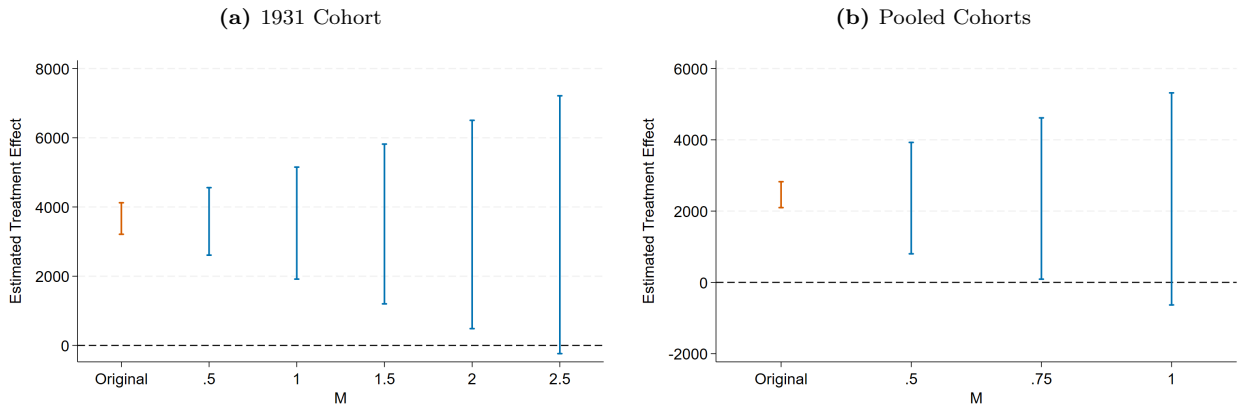
A Appendix: Sensitivity Analysis for Main Results

A.1 "Honest" difference-in-differences analysis

Figures A1 presents the results of a sensitivity analysis based on Rambachan and Roth (2023). The framework supposes that the assumption of parallel trends is violated by a factor of M times the largest violation observed in the pre-period, reported on the x-axis, and the plotted bars represent a 95% confidence interval for the treatment effect, allowing for violations of up to that magnitude. For the 1931 cohort (panel a), the violation can be up to 2.5 times the largest observed before the confidence interval includes 0. For all cohorts pooled together (panel b), this can be about as large as the largest pre-period violation before the confidence interval expands to include zero.

Figure A1: Sensitivity Analysis for the Effect on Labor Income for 1931 Cohort



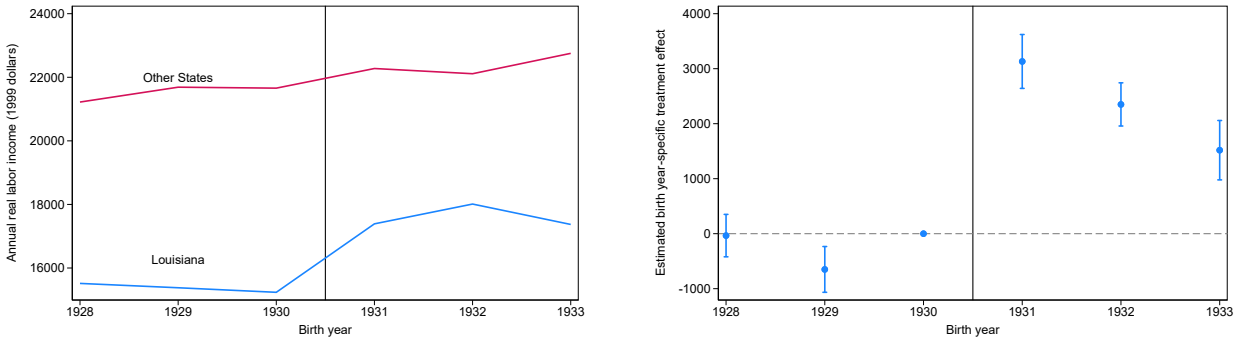
Notes: Panel (a) reports sensitivity analysis results for the 1931 cohort, while Panel (b) reports results pooling the 1931–1933 cohorts. Sensitivity analysis follows the approach of Rambachan and Roth (2023). The method bounds the maximum post-treatment violation of parallel trends between consecutive periods by M times the maximum pre-treatment violation, with M values reported on the x-axis. The framework supposes that the parallel trends assumption may be violated by up to M times the largest violation observed in the pre-period. Orange caps represent 95% confidence intervals under baseline identifying assumptions, while blue caps illustrate 95% confidence intervals that allow for potential violations of parallel trends. Estimates are derived from the event study regression with annual real labor income (in 1999 dollars) as the outcome. All regressions control for gender, race, age, and age squared, and apply ASEC person weights. Louisiana cohorts born in 1931 and later are treated, while contemporaneous cohorts in control states serve as the comparison group. Control states include all U.S. states except Alaska, Hawaii, and those listed in Figure 2.

A.2 Omission of ASEC respondents from New Orleans

As Orleans Parish appears to have introduced the eighth grade one academic year ahead of the rest of the state, some members of the 1930 birth cohort there are particularly likely to have been exposed to the treatment of the 12-year program. With the tradeoff of a reduction in sample size of about 15%, in Figures A2 and A3 we reproduce the main difference-in-differences figures excluding respondents from New Orleans. Mean income trends in Louisiana continue to parallel those for the rest of the country before exhibiting a level increase starting with the 1931 birth cohort (Figure A2a, and the event study plot corroborates this

level shift (Figure A2b). For educational attainment, as in the main results there is no observable change in high school completion rates for Louisiana on its own or relative to the rest of the country, either for White or for Non-White individuals. For completion of at least one year of college, there is a slight increase in 1931 for White individuals, and no pattern at all for Non-White individuals (Figure A3).

Figure A2: Mean Annual Real Labor Income and Event Study Estimates Excluding New Orleans Metro Area

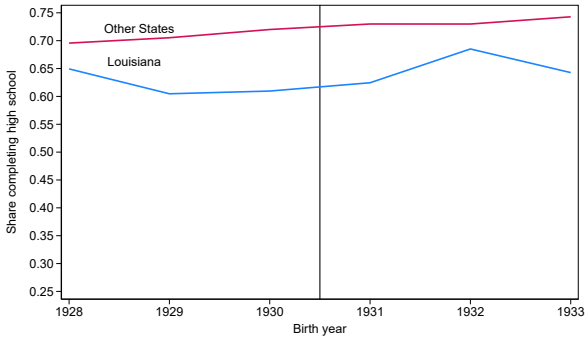


(a) Mean Annual Real Labor Income

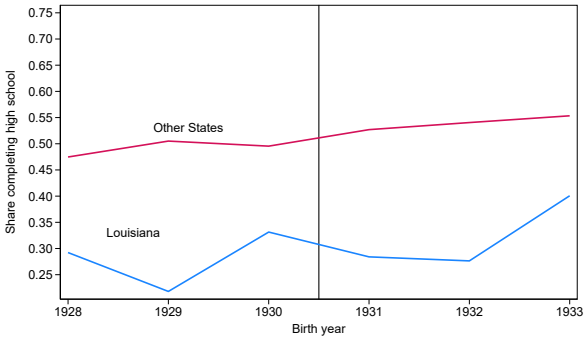
(b) Event Study

Notes: Panel (a) replicates Figure 8 excluding Louisiana respondents residing in the New Orleans metro area. It plots mean annual labor income (in 1999 dollars) by birth cohort for individuals in Louisiana and in control states. Panel (b) replicates the event study estimates from Figure 9, also excluding Louisiana respondents residing in the New Orleans metro area. The figure reports estimated birth year–specific treatment effects from a difference-in-differences specification, with annual real labor income (1999 dollars) as the outcome. Regressions control for gender, race, age, and age squared, and apply ASEC person weights. Louisiana cohorts born in 1931 and later are the treated group, while contemporaneous cohorts in other states serve as the control. Estimates are reported relative to the 1930 birth cohort, with the vertical line marking the 1931 reform cutoff. Whiskers denote 95% confidence intervals with standard errors clustered at the state level. In both panels, control states include all U.S. states except Alaska, Hawaii, and those listed in Figure 2.

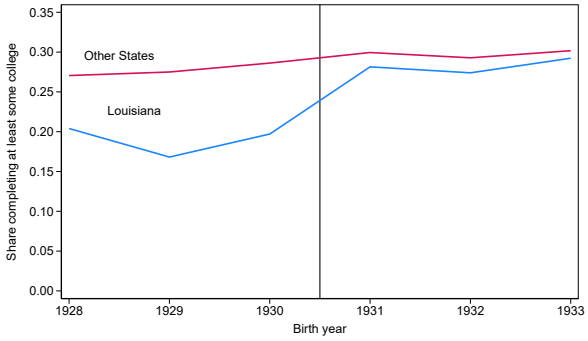
Figure A3: High School and Some College Completion Rates by Race and Birth Cohort, Excluding New Orleans Metro Area



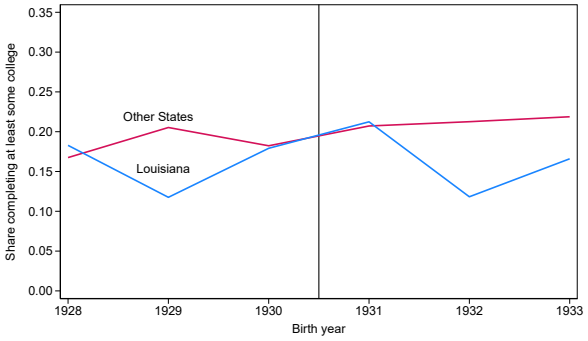
(a) High school completion (White)



(b) High school completion (Non-White)



(c) Complete some college (White)



(d) Complete some college (Non-White)

Notes: Mean proportion of White (left panels) and Non-White (right panels) individuals completing high school (top panels) or at least one year of college (bottom panels), by birth year. Estimates omit Louisiana respondents residing in the New Orleans metro area. Control states include all U.S. states except Alaska, Hawaii, and those listed in Figure 2.