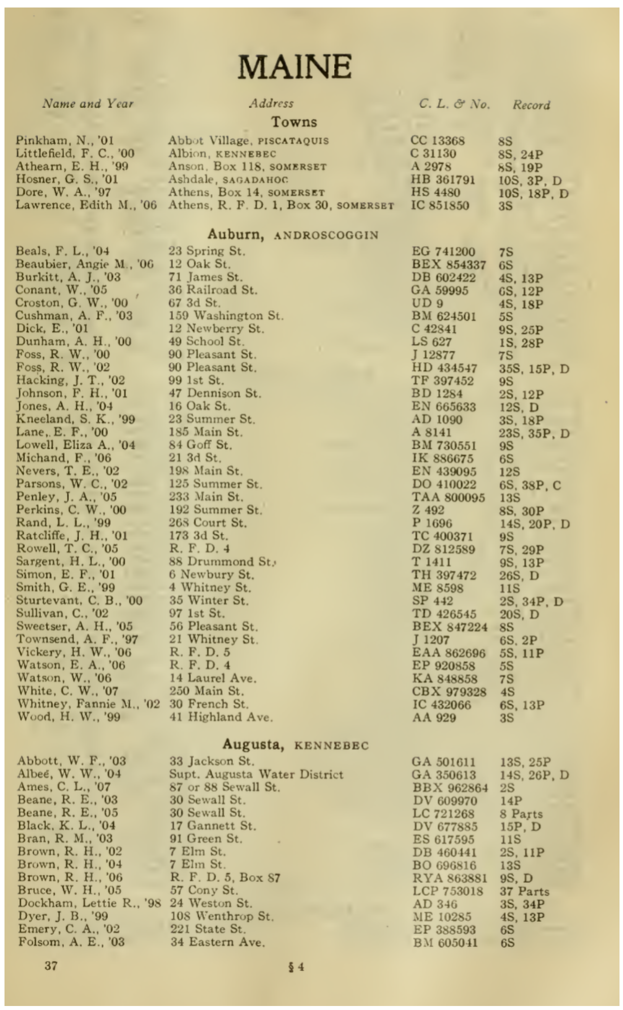
A Data

A.1 Register of correspondence school participants

I build a dataset of correspondence school students by digitizing the 1908 edition of the "Register of International Correspondence Schools," published by the International Textbook Company in Scranton, Pennsylvania, using Amazon Textract OCR application, supplemented with manual verification. This register lists students who, by August 1907, had completed at least one subject (or ten drawing plates) in a technical course, or one-third of a non-technical course. It excludes individuals who made insufficient progress, enrolled only in single subjects, or explicitly requested not to be listed. In total, the ICS register includes 107,239 students from around the world. According to the preface, 601,800 students had enrolled by that date (excluding single-subject enrollees and those who opted out), implying that 17.82% had made sufficient progress to be included.

Figure A.1: Sample page from "Register of International Correspondence Schools"



MAINE

Name and Year	*Address*	*C. L. & No.*	*Record*
	Towns		
Pinkham, N., '01	Abbot Village, PISCATAQUIS	CC 13368	8S
Littlefield, F. C., '00	Albion, KENNEBEC	C 31130	8S, 24P
Athearn, E. H., '99	Anson, Box 118, SOMERSET	A 2978	8S, 19P
Hosner, G. S., '01	Ashdale, SAGADAHOC	HB 361791	10S, 3P, D
Dore, W. A., '97	Athens, Box 14, SOMERSET	HS 4480	10S, 18P, D
Lawrence, Edith M., '06	Athens, R. F. D. 1, Box 30, SOMERSET	IC 851850	3S
	Auburn, ANDROSCOGGIN		
Beals, F. L., '04	23 Spring St.	EG 741200	7S
Beaubier, Angie M., '06	12 Oak St.	BEX 854337	6S
Burkitt, A. J., '03	71 James St.	DB 602422	4S, 13P
Conant, W., '05	36 Railroad St.	GA 59995	6S, 12P
Croston, G. W., '00	67 3d St.	UD 9	4S, 18P
Cushman, A. F., '03	159 Washington St.	BM 624501	5S
Dick, E., '01	12 Newberry St.	C 42841	9S, 25P
Dunham, A. H., '00	49 School St.	LS 627	1S, 28P
Foss, R. W., '00	90 Pleasant St.	J 12877	7S
Foss, R. W., '02	90 Pleasant St.	HD 434547	35S, 15P, D
Hacking, J. T., '02	99 1st St.	TF 397452	9S
Johnson, F. H., '01	47 Dennison St.	BD 1284	2S, 12P
Jones, A. H., '04	16 Oak St.	EN 665633	12S, D
Kneeland, S. K., '99	23 Summer St.	AD 1090	3S, 18P
Lane, E. F., '00	185 Main St.	A 8141	23S, 35P, D
Lowell, Eliza A., '04	84 Goff St.	BM 730551	9S
Michand, F., '06	21 3d St.	IK 886675	6S
Nevers, T. E., '02	198 Main St.	EN 439095	12S
Parsons, W. C., '02	125 Summer St.	DO 410022	6S, 38P, C
Penley, J. A., '05	233 Main St.	TAA 800095	13S
Perkins, C. W., '00	192 Summer St.	Z 492	8S, 30P
Rand, L. L., '99	268 Court St.	P 1696	14S, 20P, D
Ratcliffe, J. H., '01	173 3d St.	TC 400371	9S
Rowell, T. C., '05	R. F. D. 4	DZ 812589	7S, 29P
Sargent, H. L., '00	88 Drummond St.	T 1411	9S, 13P
Simon, E. F., '01	6 Newbury St.	TH 397472	26S, D
Smith, G. E., '99	4 Whitney St.	ME 8598	11S
Sturtevant, C. B., '00	35 Winter St.	SP 442	2S, 34P, D
Sullivan, C., '02	97 1st St.	TD 426545	20S, D
Sweetser, A. H., '05	56 Pleasant St.	BEX 847224	8S
Townsend, A. F., '97	21 Whitney St.	J 1207	6S, 2P
Vickery, H. W., '06	R. F. D. 5	EAA 862696	5S, 11P
Watson, E. A., '06	R. F. D. 4	EP 920858	5S
Watson, W., '06	14 Laurel Ave.	KA 848858	7S
White, C. W., '07	250 Main St.	CBX 979328	4S
Whitney, Fannie M., '02	30 French St.	IC 432066	6S, 13P
Wood, H. W., '99	41 Highland Ave.	AA 929	3S
	Augusta, KENNEBEC		
Abbott, W. F., '03	33 Jackson St.	GA 501611	13S, 25P
Albeé, W. W., '04	Supt. Augusta Water District	GA 350613	14S, 26P, D
Ames, C. L., '07	87 or 88 Sewall St.	BBX 962864	2S
Beane, R. E., '03	30 Sewall St.	DV 609970	14P
Beane, R. E., '05	30 Sewall St.	LC 721268	8 Parts
Black, K. L., '04	17 Gannett St.	DV 677885	15P, D
Bran, R. M., '03	91 Green St.	ES 617595	11S
Brown, R. H., '02	7 Elm St.	DB 460441	2S, 11P
Brown, R. H., '04	7 Elm St.	BO 696816	13S
Brown, R. H., '06	R. F. D. 5, Box 87	RYA 863881	9S, D
Bruce, W. H., '05	57 Cony St.	LCP 753018	37 Parts
Dockham, Lettie R., '98	24 Weston St.	AD 346	3S, 34P
Dyer, J. B., '99	108 Wenthrop St.	ME 10285	4S, 13P
Emery, C. A., '02	221 State St.	EP 388593	6S
Folsom, A. E., '03	34 Eastern Ave.	BM 605041	6S

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In Figure A.1, I present a sample page from the ICS register to show how student information is organized. This page includes students' names, enrollment years, and additional details for several towns in Maine. For instance, the first entry for Auburn records student F. L. Beals, enrolled in 1904, residing at 23 Spring Street, registered in the EG course (telephone engineering), and having completed seven subjects.

As this page shows, for towns with more than ten students, such as Auburn and Augusta, the register specifies the town name and county above the student listings. In contrast, for smaller towns with fewer than ten students, the register uses the label "Towns," and provides the town and county information alongside each student's address. Examples of this latter format appear at the top of the sample page for towns like Abbot Village, Albion, Anson, Ashdale, and Athens.

It is also worth noting that the register distinguishes between men and women by including either the full names of female students or the titles "Miss" or "Mrs." For example, on this page, all listed students are men except for five women: Edith M. Lawrence, Angie M. Beaubier, Eliza A. Lowell, Fannie M. Whitney, and Lettie R. Dockham. Additionally, students may appear multiple times in the register if enrolled in different courses. An example of this from this page is R. E. Beane from Augusta, who enrolled in the DV course (show-card writing) in 1903 and in the LC course (French language) in 1905.

A.2 Census data and matching

I identify correspondence school students in the full-count census data from 1900 and 1910 through a two-step process.

A.2.1 First step: Locating correspondence school students in the census

First, I use the personal information recorded in the ICS register to locate students in the 1910 or 1900 census using probabilistic matching methods. I begin by attempting to match students to the 1910 census based on their name and location, using the dtalink probabilistic data linking protocol in Stata. This algorithm assigns a matching score based on the similarity of selected variables and retains the highest-scoring match for each record. To reduce the dimensionality of the problem and ensure computational feasibility, the method allows for blocking variables, which restrict comparisons to records sharing key attributes.

In the first pass, I block on the NYSIIS phonetic code of the last name (to account for nicknames and spelling variations), first initial, last two letters of the last name, sex, state, and county. Matching variables include last name, middle initial, and town.[22] To account for possible migration across counties or errors in county reporting, I perform a second pass in which I drop county from the set of blocking variables and instead include it as a matching variable.[23] For students still unmatched after these two passes, I apply the same procedure using the 1900 census.

This procedure yields 45,030 matched individuals, representing 46.4% of those listed in the register.

A.2.2 Second step: Following correspondence school students over time

In the second step, I trace these individuals across census waves using the record linkages developed by the Census Tree Project (Price et al., 2021; Buckles et al., 2023). This method leverages familial relationships recorded on the genealogy platform FamilySearch.org to link individuals across census years. As users build their family trees, they attach source documents, such as census records, to individual profiles, thereby creating longitudinal links. These user-contributed connections rely on private information, including maiden names and household composition, allowing for more accurate matches across census years. FamilySearch hosts information and family trees for over 1.2 billion deceased individuals and is supported by a community of more than 12.6 million registered users.

While a large share of Census Tree links originate from FamilySearch user submissions, additional matches are generated using supervised machine learning algorithms trained on those links, as well as through the incorporation of matches from the Census Linking Project and the IPUMS Multigenerational Longitudinal Panel. The final data set contains 67.8% of the potential matches between the 1900 and 1910 full-count US censuses (42.7 million matches). Please see Price et al. (2021), Buckles et al. (2023), and Censustree.org for further details about this data.

I use the record-linking information to build an unbalanced panel of correspondence school students observed between 1900 and 1910.[24] I restrict the the analysis to men, which yields a sample of 58,716 observations from 43,240 individuals.

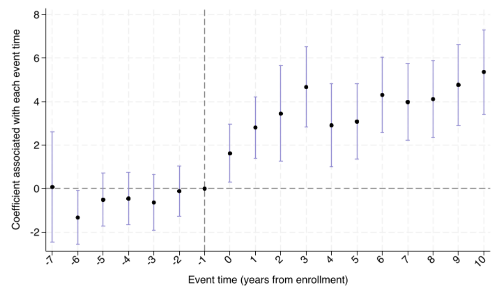
[22] Although the census includes address information, this is missing for many students in the ICS register and therefore cannot be used at scale.

[23] I continue to block on state to limit the size of the matching problem and to improve match quality. Thus, interstate movers are excluded from this data.

[24] For some additional analyses, I extend the panel to follow individuals through 1940.

B Additional results of the effects of correspondence education on occupational mobility

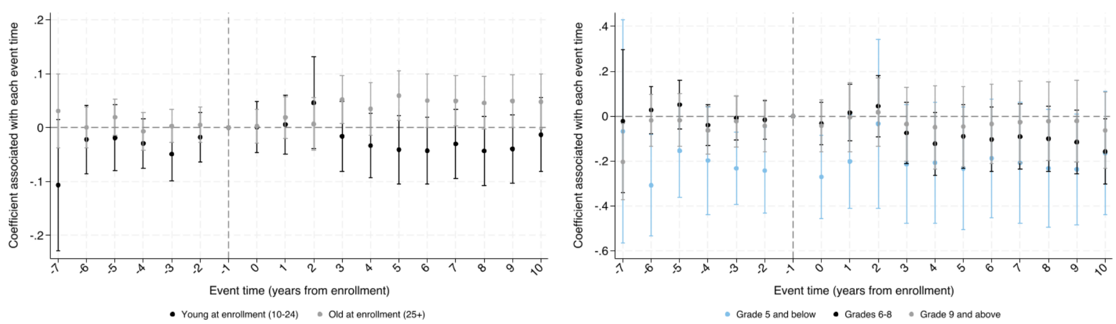
Figure B.1: Effect of correspondence education on the Duncan Socioeconomic Index (SEI)



Notes: These figures plot the event-study estimates of the impact of correspondence education on the SEI, corresponding to β_τ for $\tau \in \{-7, -6, \ldots, -1, 0, 1, \ldots, 10\}$ in Equation (3.1). Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -1$ on this index. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2. 95% confidence intervals built from standard errors clustered at the county level are plotted.

Figure B.2: Effect of correspondence education on other white-collar occupations by individual characteristics

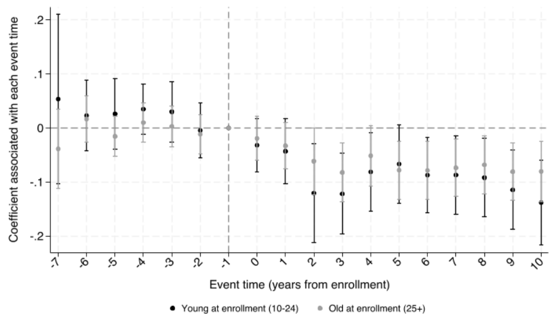
(a) Age at enrollment (b) Educational attainment



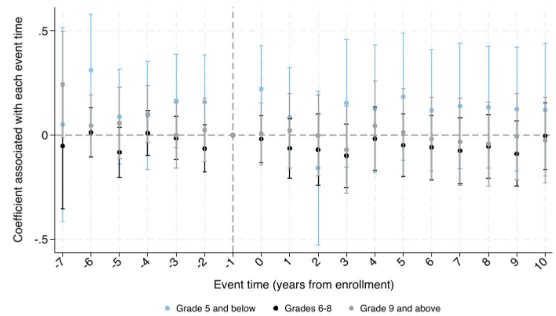
Notes: These figures plot the event-study estimates of the impact of correspondence education on the probability of working in other white-collar occupations, corresponding to β_τ for $\tau \in \{-7, -6, \ldots, -1, 0, 1, \ldots, 10\}$ in Equation (3.1), estimated separately for each subgroup. Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -1$, on an indicator variable for this occupational category. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2. 95% confidence intervals built from standard errors clustered at the county level are plotted.

Figure B.3: Effect of correspondence education on blue-collar occupations by individual characteristics

(a) Age at enrollment



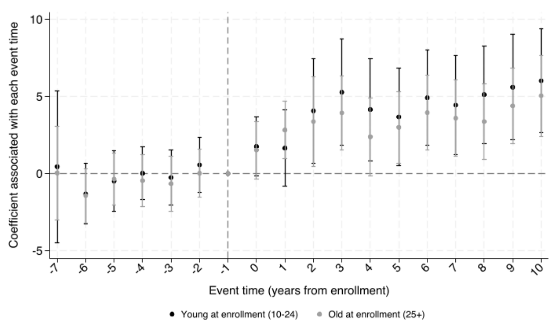
(b) Educational attainment



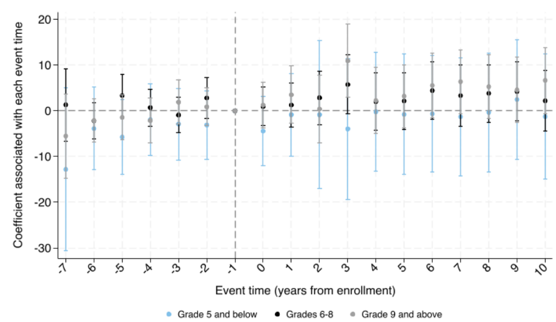
Notes: These figures plot the event-study estimates of the impact of correspondence education on the probability of working in a blue-collar occupation, corresponding to β_τ for $\tau \in \{-7, -6, \ldots, -1, 0, 1, \ldots, 10\}$ in Equation (3.1), estimated separately for each subgroup. Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -1$, on an indicator variable for this occupational category. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2. 95% confidence intervals built from standard errors clustered at the county level are plotted.

Figure B.4: Effect of correspondence education on the Duncan Socioeconomic Index (SEI) by individual characteristics

(a) Age at enrollment



(b) Educational attainment



Notes: These figures plot the event-study estimates of the impact of correspondence education on the SEI, corresponding to β_τ for $\tau \in \{-7, -6, \ldots, -1, 0, 1, \ldots, 10\}$ in Equation (3.1), estimated separately for each subgroup. Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -1$, on this index. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2. 95% confidence intervals built from standard errors clustered at the county level are plotted.

Figure B.5: Sample exam questions from ICS courses on arithmetic, fractions, and elementary mechanics

(a) Arithmetic

ELEMENTS OF ARITHMETIC

Serial 1975 Edition 1

EXAMINATION QUESTIONS

Notice to Students.—*Study the Instruction Paper thoroughly before you attempt to answer these questions.* **Read each question carefully and be sure you understand it;** *then write the best answer you can. When your answers are completed, examine them closely, correct all the errors you can find, and* **see that every question is answered;** *then mail your work to us.*

Send all your work on these questions. *Your answers alone are not enough; your work should show how you got them.*

(1) What is a number?

(2) Write each of the following numbers in words: (*a*) 980; (*b*) 8,284; (*c*) 14,560; (*d*) 260,840; (*e*) 1,346,895; (*f*) 850,317,002.

(3) Represent in figures the following expressions: (*a*) one hundred six; (*b*) seven thousand six hundred; (*c*) eighty-one thousand four hundred two; (*d*) eighteen million six.

(4) What is the sum of 3,290+504+865,403+2,074+81+7? Ans. 871,359

(5) Find the difference between 10,001 and 15,339. Ans. 5,338

(6) The amount of lumber used by a manufacturing firm was 3,670 feet in January, 4,025 feet in February, and 2,918 feet in March. What was the total amount used in the three months? Ans. 10,613 ft.

(7) A factory employing 1,280 hands was forced to lay off 96 of them. How many remained? Ans. 1,184

(b) Fractions

FRACTIONS

Serial 1976-2 Edition 1

EXAMINATION QUESTIONS

Notice to Students.—*Study the Instruction Paper thoroughly before you attempt to answer these questions.* **Read each question carefully and be sure you understand it;** *then write the best answer you can. When your answers are completed, examine them closely, correct all the errors you can find, and* **see that every question is answered;** *then mail your work to us.*

Send all your work on these questions. *Your answers alone are not enough; your work should show how you got them.*

(1) An iron plate is divided into four sections. The first contains $29\frac{3}{4}$ square inches; the second, $50\frac{5}{8}$ square inches; the third, 41 square inches; and the fourth, $69\frac{3}{16}$ square inches. How many square inches are in the plate? Ans. $190\frac{9}{16}$ square inches

(2) Reduce the following fractions to their lowest terms: $\frac{4}{8}$, $\frac{4}{16}$, $\frac{10}{32}$, $\frac{32}{64}$.

(3) Reduce 6 to an improper fraction whose denominator is 4.

(4) If a man travels $85\frac{5}{12}$ miles the first day, $78\frac{9}{15}$ miles the second day, and $125\frac{17}{35}$ miles the third day, how far does he travel in the 3 days? Ans. $289\frac{211}{420}$ miles

(5) Reduce $7\frac{7}{8}$, $13\frac{5}{16}$, and $10\frac{3}{4}$ to improper fractions.

(6) Reduce the following fractions to mixed numbers: $\frac{13}{2}$, $\frac{17}{4}$, $\frac{69}{16}$, $\frac{18}{8}$, $\frac{67}{64}$.

(c) Elementary mechanics

ELEMENTARY MECHANICS (PART 4)

Serial 2532D Edition 1

EXAMINATION QUESTIONS

Notice to Students.—*Study the Instruction Paper thoroughly before you attempt to answer these questions.* **Read each question carefully and be sure you understand it;** *then write the best answer you can. When your answers are completed, examine them closely, correct all the errors you can find, and* **see that every question is answered;** *then mail your work to us.*

REMARK.—In the following questions, friction and other resistances are neglected except where specified.

(1) If a railroad train, running at uniform speed, passes over $1\frac{1}{8}$ miles in $1\frac{1}{2}$ minutes, what is its velocity, in feet per second? Ans. 66 ft. per sec.

(2) (*a*) Define acceleration. (*b*) What is the unit of acceleration?

(3) What acceleration will a constant force of 20 pounds give to a body weighing 100 pounds? Ans. 6.432 ft. per sec. per sec.

(4) The steam pressure in the cylinder of a steam pump is 90 pounds per square inch and the piston displaces $1\frac{1}{2}$ cubic feet per stroke; what is the horsepower of the pump when making 100 strokes per minute? Ans. $58\frac{10}{11}$ H. P.

(5) A flywheel weighs 9,000 pounds, has six arms, and revolves 200 times a minute; calculate the pull on one arm if the center of gravity of a segment of one-sixth of the wheel, like that shown in Fig. 9 of the text, is $3\frac{1}{2}$ feet from the axis of the shaft. Ans. 71,400 lb.

(6) (*a*) Define gravity. (*b*) What is the unit of mass?

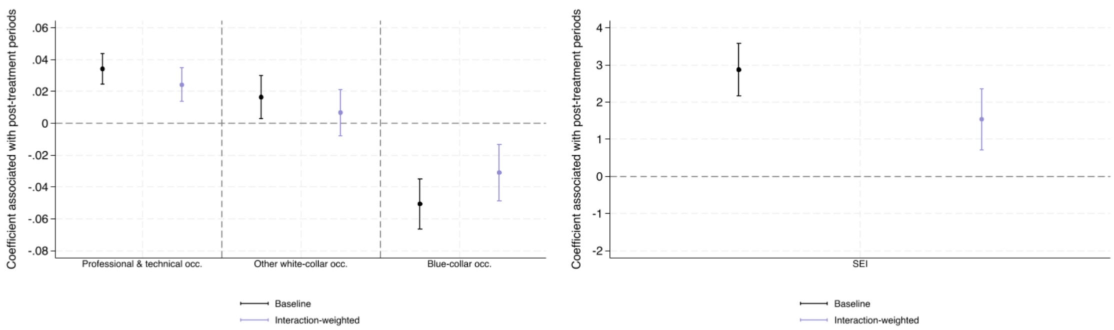
Source: ICS course booklets on arithmetic, fractions, and elementary mechanics from 1975, 1976, and 1937, respectively.

C Robustness of the effects of correspondence education on occupational mobility

C.1 Robustness to pre/post design and interaction-weighted estimation

Figure C.1: Effect of correspondence education on occupational outcomes and Duncan Socioeconomic Index (SEI), using pre/post design and interaction-weighted estimation

(a) Occupational outcomes (b) SEI

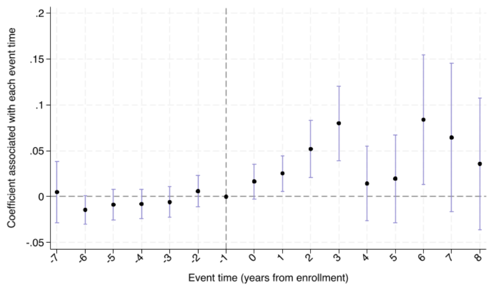


Notes: These figures plot the estimates of the impact of correspondence education on occupational outcomes and the SEI, using a pre/post event structure. The baseline specification follows Equation (3.1), but collapses event time τ into two groups: pre-enrollment ($\tau < 0$) and post-enrollment ($\tau \geq 0$). The interaction-weighted (IW) estimates implement the method of Sun and Abraham (2021) within this framework to account for treatment effect heterogeneity across cohorts, defined by year of enrollment. The 1907 enrollees (the last treated cohort) serve as the control group in this case, and are included only in their pre-treatment 1900 observations to ensure they are not yet treated when used as controls. The plotted coefficients capture the effect of post-enrollment, relative to the pre-enrollment period, on indicator variables for: (1) professional and technical occupations; (2) other white-collar occupations; (3) blue-collar occupations; and (4) the SEI, respectively. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2. 95% confidence intervals built from standard errors clustered at the county level are plotted. Results by individual characteristics available upon request.

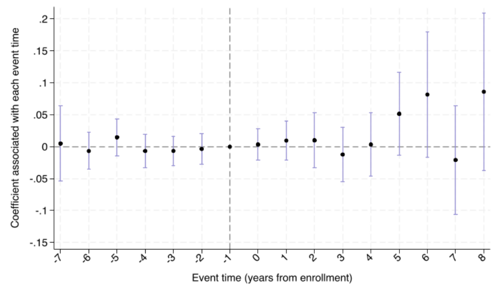
C.2 Robustness to using data from 1900 only

Figure C.2: Effect of correspondence education on occupational outcomes and Duncan Socioeconomic Index (SEI), using data from 1900 only

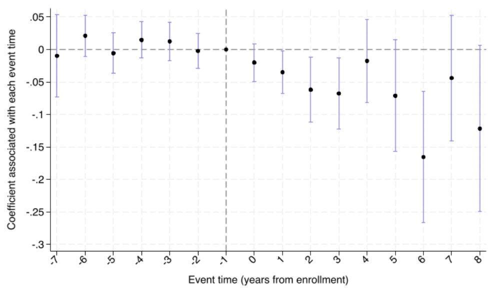
(a) Professional and technical occupations



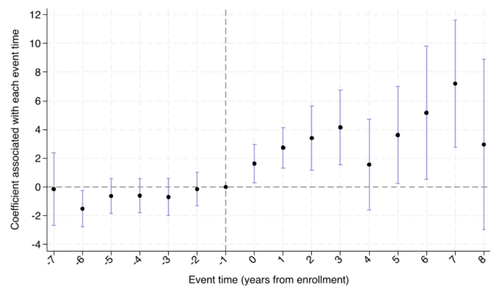
(b) Other white-collar occupations



(c) Blue-collar occupations



(d) SEI

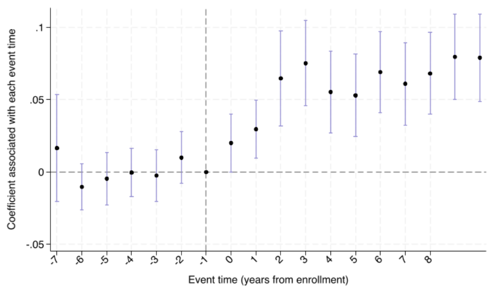


Notes: These figures plot the event-study estimates of the impact of correspondence education on occupational outcomes and the SEI, corresponding to β_τ for $\tau \in \{-7, -6, \ldots, -1, 0, 1, \ldots, 8\}$ in Equation (3.1).[25] Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -1$, on indicator variables for: (1) professional and technical occupations; (2) other white-collar occupations; (3) blue-collar occupations; and (4) the SEI, respectively. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 using the procedure described in Section 3.2. 95% confidence intervals built from standard errors clustered at the county level are plotted. Results by individual characteristics available upon request.

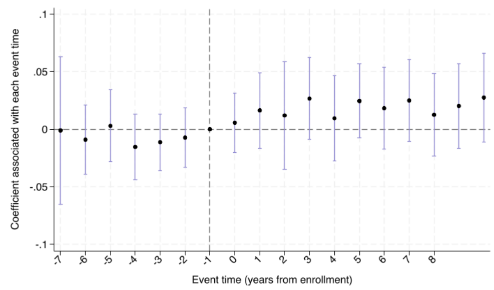
C.3 Robustness to excluding individuals in the South

Figure C.3: Effect of correspondence education on occupational outcomes and Duncan Socioeconomic Index (SEI), excluding individuals living in the South

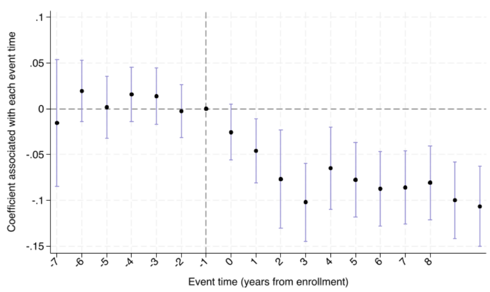
(a) Professional and technical occupations



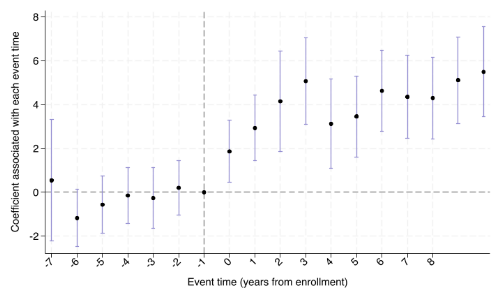
(b) Other white-collar occupations



(c) Blue-collar occupations



(d) SEI



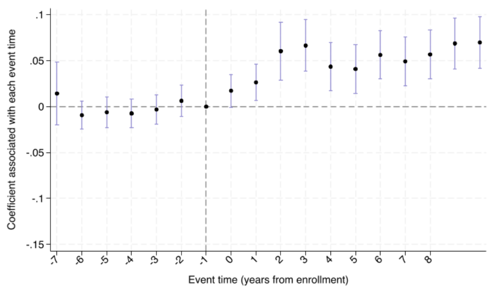
Notes: These figures plot the event-study estimates of the impact of correspondence education on occupational outcomes and the SEI, corresponding to β_τ for $\tau \in \{-7, -6, \ldots, -1, 0, 1, \ldots, 10\}$ in Equation (3.1). Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -1$, on indicator variables for: (1) professional and technical occupations; (2) other white-collar occupations; (3) blue-collar occupations; and (4) the SEI, respectively. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2, and who did not live in Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, or West Virginia. 95% confidence intervals built from standard errors clustered at the county level are plotted. Results by individual characteristics available upon request.

[25]Given that the analysis is restricted to 1900, I restrict the highest possible event time, τ, to be 8 corresponding to enrollment in 1892.

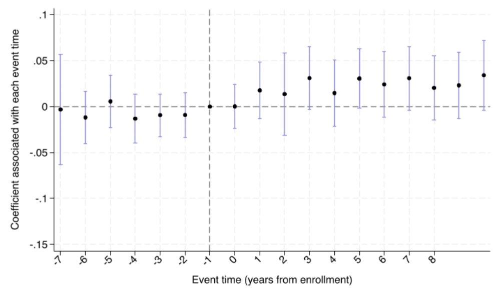
C.4 Robustness to excluding individuals who enrolled in two or more correspondence courses

Figure C.4: Effect of correspondence education on occupational outcomes and Duncan Socioeconomic Index (SEI), excluding individuals who enrolled in two or more correspondence courses

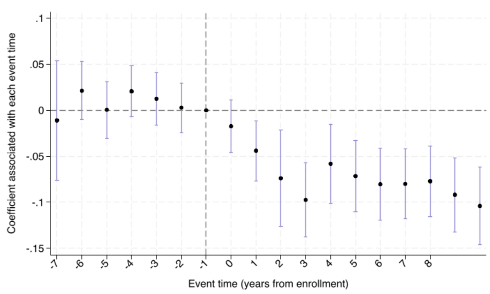
(a) Professional and technical occupations



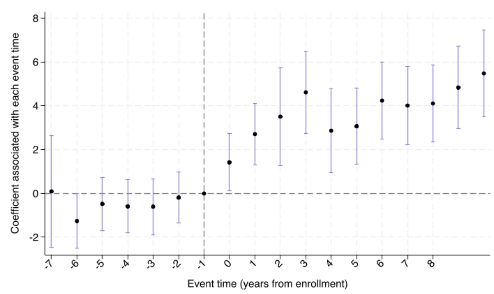
(b) Other white-collar occupations



(c) Blue-collar occupations



(d) SEI



Notes: These figures plot the event-study estimates of the impact of correspondence education on occupational outcomes and the SEI, corresponding to β_τ for $\tau \in \{-7, -6, \ldots, -1, 0, 1, \ldots, 10\}$ in Equation (3.1). Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -1$, on indicator variables for: (1) professional and technical occupations; (2) other white-collar occupations; (3) blue-collar occupations; and (4) the SEI, respectively. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2, and who had only enrolled in one correspondence course by 1907. 95% confidence intervals built from standard errors clustered at the county level are plotted. Results by individual characteristics available upon request.

D Model proofs

D.1 Proof of Proposition 1

Case 1: Only correspondence school available, $S = \{s_c\}$

First, note that both unskilled and skilled individuals must be present in equilibrium, implying that some individuals choose to remain unskilled while others enroll in correspondence school. If either group were absent (that is, if all individuals chose to remain unskilled or all chose to become skilled), then the wage for this missing type would tend to infinity under the CES production function in Equation (4.1). This would create arbitrage opportunities, inducing individuals to switch occupations, thereby violating equilibrium.[26]

We now determine which individuals choose to remain unskilled and which enroll in correspondence school by comparing their respective value functions. At the lowest learning ability level $a = 0$, individuals strictly prefer to remain unskilled because $P_c(0) = 0$. Specifically, the value of remaining unskilled is $V_u(0) = w_u$, while the value of enrolling in correspondence school is $V_c(0) = P_c(0)w_s + (1 - P_c(0))w_u - \gamma_c = w_u - \gamma_c$. Since $\gamma_c > 0$, we have $V_u(0) > V_c(0)$.

As learning ability a increases, the value of correspondence school $V_c(a)$ strictly increases because $P_c(a)$ is strictly increasing, while both $V_u(a)$ and the cost of correspondence school remain constant.

Therefore, there exists a unique cutoff $a_{c,1} \in (0, \bar{a})$ such that:

- for individuals with $a < a_{c,1}$, $V_u(a) > V_c(a)$, so they remain unskilled,
- for individuals with $a \geq a_{c,1}$, $V_c(a) \geq V_u(a)$, so they choose to enroll in correspondence school.

Case 2: Only high school available, $S = \{s_h\}$

As before, both unskilled and skilled individuals must be present in equilibrium, implying that some individuals choose to remain unskilled while others enroll in high school.

[26] Specifically, the first-order conditions of the CES production function imply:

$$w_u = \left[\zeta L_u^{\frac{\sigma-1}{\sigma}} + (1-\zeta) L_s^{\frac{\sigma-1}{\sigma}}\right]^{\frac{1}{\sigma-1}} \cdot \zeta L_u^{-\frac{1}{\sigma}},$$

$$w_s = \left[\zeta L_u^{\frac{\sigma-1}{\sigma}} + (1-\zeta) L_s^{\frac{\sigma-1}{\sigma}}\right]^{\frac{1}{\sigma-1}} \cdot (1-\zeta) L_s^{-\frac{1}{\sigma}}.$$

Since $\sigma > 1$, each of these wages tends to infinity as $L_u \to 0$ or $L_s \to 0$, respectively.

We determine which individuals choose to remain unskilled and which enroll in high school by comparing their respective value functions. At the lowest learning ability level $a = 0$, individuals strictly prefer to remain unskilled because $P_h(0) = 0$. Specifically, the value of remaining unskilled is $V_u(0) = w_u$, while the value of enrolling in high school is $V_h(0) = P_h(0)w_s + (1 - P_h(0))w_u - \gamma_h = w_u - \gamma_h$. Since $\gamma_h > 0$, we have $V_u(0) > V_h(0)$.

As learning ability a increases, the value of high school $V_h(a)$ strictly increases because $P_h(a)$ is strictly increasing, while both $V_u(a)$ and the cost of high school remain constant.

Therefore, there exists a unique cutoff $a_{h,2} \in (0, \bar{a})$ such that:

- for individuals with $a < a_{h,2}$, $V_u(a) > V_h(a)$, so they remain unskilled,
- for individuals with $a \geq a_{h,2}$, $V_h(a) \geq V_u(a)$, so they choose to enroll in high school.

Case 3: Both options available, $S = \{s_c, s_h\}$

As before, both unskilled and skilled individuals must be present in equilibrium. Since we assume that both the correspondence school and high school options are used in equilibrium,[27] it follows that all three types, unskilled, correspondence-schooled, and high school-schooled individuals, must be present in equilibrium.

We determine which individuals choose to remain unskilled and which enroll in correspondence school or high school by comparing their respective value functions. At the lowest learning ability level $a = 0$, individuals strictly prefer to remain unskilled because $P_c(0) = P_h(0) = 0$ so $V_u(0) = w_u > w_u - \gamma_c = V_c(0) > w_u - \gamma_h = V_h(0)$.

As learning ability a increases, the values of correspondence school $V_c(a)$ and high school $V_h(a)$ strictly increase, since the probabilities $P_c(a)$ and $P_h(a)$ are strictly increasing. In contrast, the value of remaining unskilled $V_u(a)$ and the costs of both schooling options remain constant.

However, $V_c(a)$ crosses $V_u(a)$ at a lower learning ability level than $V_h(a)$ does. If instead $V_h(a)$ were to cross $V_u(a)$ first, individuals would bypass correspondence school entirely, since $P_h(a)$ increases more steeply with learning ability than $P_c(a)$, making high school strictly more attractive across the relevant range.[28] Eventually, for some $a < \bar{a}$, $V_h(a)$ overtakes $V_c(a)$ (and thus $V_u(a)$) as otherwise, no individual would choose high school in equilibrium.[29]

[27] This assumption is consistent with the historical record showing that even well into the 20th century, after high school became widely accessible, many individuals continued to enroll in correspondence schools.

[28] For this to occur, $P_c(a)$ would have to increase too slowly with learning ability, or the cost of correspondence schools γ_c would need to be exceedingly high.

[29] For this to occur, $P_h(a)$ would need to increase too slowly relative to $P_c(a)$.

Therefore, there exist two unique cutoffs $a_{c,3}, a_{h,3} \in (0, \bar{a})$ with $a_{c,3} < a_{h,3}$ such that:

- for individuals with $a < a_{c,3}$, $V_u(a) > V_c(a), V_h(a)$, so they remain unskilled;
- for individuals with $a_{c,3} \leq a < a_{h,3}$, $V_c(a) > V_u(a), V_h(a)$, so they enroll in correspondence school;
- for individuals with $a \geq a_{h,3}$, $V_h(a) > V_u(a), V_c(a)$, so they enroll in high school.

D.2 Proof of Proposition 2

We begin by stating the equations that characterize the cutoff learning ability levels in each case. These follow from equating the values of the different options available in each case at the cutoff, where the individuals are indifferent between the two.

- **Case 1: Only correspondence school available, $S = \{s_c\}$.** The cutoff $a_{c,1}$ satisfies $P_c(a_{c,1})(w_{s,1} - w_{u,1}) = \gamma_c$.
- **Case 2: Only high school available, $S = \{s_h\}$.** The cutoff $a_{h,2}$ satisfies $P_h(a_{h,2})(w_{s,2} - w_{u,2}) = \gamma_h$.
- **Case 3: Both options available, $S = \{s_c, s_h\}$.** The cutoffs $a_{c,3}$ and $a_{h,3}$ satisfy $P_c(a_{c,3})(w_{s,3} - w_{u,3}) = \gamma_c$, and $(P_h(a_{h,3}) - P_c(a_{h,3}))(w_{s,3} - w_{u,3}) = \gamma_h - \gamma_c$.

We now proceed to compare these cutoff values across the different cases.

1. Comparing cutoffs in cases 1 and 3: showing that $a_{c,1} < a_{c,3} < a_{h,3}$

We begin by comparing the cutoffs in cases 1 (only correspondence school) and 3 (both options available). From the cutoff conditions in each case, we have:

$$P_c(a_{c,1})(w_{s,1} - w_{u,1}) = \gamma_c = P_c(a_{c,3})(w_{s,3} - w_{u,3}).$$

To show that $a_{c,1} < a_{c,3} < a_{h,3}$, we proceed by contradiction.

Option 1: Suppose $a_{h,3} > a_{c,1} > a_{c,3}$.

Since $P_c(a)$ is strictly increasing, it follows that $P_c(a_{c,1}) > P_c(a_{c,3})$. Given the equality above, this implies $w_{s,1} - w_{u,1} < w_{s,3} - w_{u,3}$. In our CES framework where wages are determined by the relative supplies of skilled and unskilled labor, a smaller skill premium in case 1 implies that $L_{s,1} > L_{s,3}$. We now compare these two quantities using the equilibrium definitions:

$$L_{s,1} = \int_{a_{c,1}}^{\bar{a}} f(a) P_c(a) da$$

$$L_{s,3} = \int_{a_{c,3}}^{a_{h,3}} f(a)P_c(a)da + \int_{a_{h,3}}^{\bar{a}} f(a)P_h(a)da$$

Splitting these integrals, we can write:

$$L_{s,1} = \int_{a_{c,1}}^{a_{h,3}} f(a)P_c(a)da + \int_{a_{h,3}}^{\bar{a}} f(a)P_c(a)da$$

$$L_{s,3} = \int_{a_{c,3}}^{a_{c,1}} f(a)P_c(a)da + \int_{a_{c,1}}^{a_{h,3}} f(a)P_c(a)da + \int_{a_{h,3}}^{\bar{a}} f(a)P_h(a)da$$

Subtracting, we obtain:

$$L_{s,1} - L_{s,3} = \int_{a_{h,3}}^{\bar{a}} f(a)[P_c(a) - P_h(a)]\, da - \int_{a_{c,3}}^{a_{c,1}} f(a)P_c(a)\, da.$$

Since $P_h(a) > P_c(a)$ for all $a > 0$, the first term is negative, and the second term is strictly positive. Thus, the entire expression is negative, $L_{s,1} - L_{s,3} < 0$, which contradicts the earlier implication that $L_{s,1} > L_{s,3}$. Therefore, the assumed ordering $a_{h,3} > a_{c,1} > a_{c,3}$ cannot hold.

Option 2: Suppose $a_{c,1} > a_{h,3} > a_{c,3}$.
Again, $P_c(a_{c,1}) > P_c(a_{c,3}) \Rightarrow w_{s,1} - w_{u,1} < w_{s,3} - w_{u,3} \Rightarrow L_{s,1} > L_{s,3}$. As before:

$$L_{s,1} = \int_{a_{c,1}}^{\bar{a}} f(a)P_c(a)\, da,$$

$$L_{s,3} = \int_{a_{c,3}}^{a_{h,3}} f(a)P_c(a)\, da + \int_{a_{h,3}}^{\bar{a}} f(a)P_h(a)\, da.$$

Since $a_{h,3} < a_{c,1}$, the integration domain for $L_{s,1}$ is a strict subset of that for $L_{s,3}$, and $P_h(a) > P_c(a)$, so $L_{s,3} > L_{s,1}$, which contradicts the earlier implication that $L_{s,1} > L_{s,3}$. Thus, this assumed ordering also cannot hold.

Combining the contradiction arguments above with the result from Proposition 1 that $a_{c,3} < a_{h,3}$, we conclude that the only possible ordering is $a_{c,1} < a_{c,3} < a_{h,3}$.

2. Comparing cutoffs in cases 2 and 3: showing that $a_{h,2} < a_{h,3}$

We now compare the cutoffs in cases 2 (only high school) and 3 (both options available). Putting together the cutoff conditions in cases 2 and 3, we get:

$$P_h(a_{h,3})(w_{s,3} - w_{u,3}) - P_c(a_{h,3})(w_{s,3} - w_{u,3}) = \gamma_h - \gamma_c = P_h(a_{h,2})(w_{s,2} - w_{u,2}) - P_c(a_{c,3})(w_{s,3} - w_{u,3}.)$$

To show that $a_{h,2} < a_{h,3}$, we proceed by contradiction.

Suppose $a_{h,2} > a_{h,3}$.

Since $P_c(a)$ is strictly increasing and $a_{h,3} > a_{c,3}$, this means that $P_c(a_{h,3})(w_{s,3} - w_{u,3}) > P_c(a_{c,3})(w_{s,3} - w_{u,3})$, and thus that:

$$P_h(a_{h,3})(w_{s,3} - w_{u,3}) > P_h(a_{h,2})(w_{s,2} - w_{u,2}).$$

Since $P_h(a)$ is also strictly increasing, it follows that $P_h(a_{h,3}) < P_h(a_{h,2})$, so for this to hold, $w_{s,2} - w_{u,2} < w_{s,3} - w_{u,3}$, so $L_{s,2} > L_{s,3}$. We now compare these two quantities using the equilibrium definitions:

$$L_{s,2} = \int_{a_{h,2}}^{\bar{a}} f(a)P_h(a)da$$

$$L_{s,3} = \int_{a_{c,3}}^{a_{h,3}} f(a)P_c(a)da + \int_{a_{h,3}}^{\bar{a}} f(a)P_h(a)da.$$

Since $a_{h,2} > a_{h,3}$, the integration domain for $L_{s,2}$ is a strict subset of that for $L_{s,3}$, and $P_h(a) > P_c(a)$, so $L_{s,3} > L_{s,2}$, which contradicts the earlier implication that $L_{s,2} > L_{s,3}$. Thus, this assumed ordering cannot hold, and we have $a_{h,2} < a_{h,3}$.

D.3 Proof of Proposition 3

1. Effectiveness of correspondence education

The upskilling rate of correspondence education, denoted by R_c, is defined as the share of individuals who become skilled after choosing correspondence education. In cases 1 and 3, this is given by:

$$R_c = \begin{cases} \frac{\int_{a_{c,1}}^{\bar{a}} f(a)P_c(a)\,da}{\int_{a_{c,1}}^{\bar{a}} f(a)\,da} & \text{if } S = \{s_c\} \text{ (case 1, only corr. school)} \\ \frac{\int_{a_{c,3}}^{a_{h,3}} f(a)P_c(a)\,da}{\int_{a_{c,3}}^{a_{h,3}} f(a)\,da} & \text{if } S = \{s_c, s_h\} \text{ (case 3, both options)} \end{cases}$$

The relevant cutoff conditions are:

- For case 1: $P_c(a_{c,1})(w_{s,1} - w_{u,1}) = \gamma_c$,
- For case 3: $P_c(a_{c,3})(w_{s,3} - w_{u,3}) = \gamma_c$, and $(P_h(a_{h,3}) - P_c(a_{h,3}))(w_{s,3} - w_{u,3}) = \gamma_h - \gamma_c$.

Effect of increasing $P_c(a)$ at high learning ability levels

We consider the effect of increasing $P_c(a)$ for individuals with learning ability levels close to the upper bound $\bar{a}$, i.e., for $a \in [\bar{a} - \epsilon, \bar{a})$ with small $\epsilon > 0$, on the upskilling rate R_c in cases 1 and 3.

In case 1, individuals with learning ability levels close to $\bar{a}$ are enrolled in correspondence education, as their learning ability exceeds the cutoff $a_{c,1}$. Increasing $P_c(a)$ in this upper tail raises the probability that these individuals become skilled. This, in turn, increases the overall share of skilled workers in the economy, which reduces the skilled wage premium $w_{s,1} - w_{u,1}$ in equilibrium.

To maintain the cutoff condition $P_c(a_{c,1})(w_{s,1} - w_{u,1}) = \gamma_c$, and since $P_c(a)$ remains unchanged at lower learning ability levels, the decline in the skilled premium must be offset by an increase in $a_{c,1}$. That is, the marginal individual must now have a higher learning ability level to justify the same investment in correspondence education. As a result, the pool of individuals enrolling in correspondence school becomes more positively selected on ability. This selection effect, together with the increase in $P_c(a)$ at the top, raises the average success rate among enrollees—i.e., the upskilling rate R_c increases.

In case 3, a similar logic applies. High-ability individuals close to $\bar{a}$ enroll in high school, as their learning ability exceeds the high school cutoff $a_{h,3}$. An increase in $P_h(a)$ in this region raises the overall share of skilled workers, which reduces the skilled wage premium $w_{s,3} - w_{u,3}$. This, in turn, lowers the returns to skill acquisition for marginal individuals, whether choosing between correspondence school and remaining unskilled, or between correspondence school and high school.

To maintain the cutoff condition $P_c(a_{c,3})(w_{s,3} - w_{u,3}) = \gamma_c$, and given that $P_c(a)$ remains unchanged at lower learning ability levels, the correspondence school cutoff $a_{c,3}$ must rise. Likewise, to satisfy the cutoff condition $(P_h(a_{h,3}) - P_c(a_{h,3}))(w_{s,3} - w_{u,3}) = \gamma_h - \gamma_c$, and given that $P_c(a)$ and $P_h(a)$ are unchanged at lower learning ability levels, the high school cutoff $a_{h,3}$ must also rise. These joint adjustments imply stronger positive selection into correspondence education, thereby increasing the average upskilling rate R_c.

Effect of increasing γ_c

We now consider the effect of increasing the cost of correspondence education, γ_c, in case 1.

To maintain the cutoff condition $P_c(a_{c,1})(w_{s,1} - w_{u,1}) = \gamma_c$, the increase in γ_c must be offset by an increase in $a_{c,1}$. That is, the marginal individual must now have a higher learning ability level to justify a higher cost for correspondence education. As a result, the pool of individuals enrolling in correspondence school becomes more positively selected on ability, thereby increasing the average upskilling rate R_c.[30]

2. Interaction with high school

Measure of individuals enrolling in correspondence school in cases 1 and 3

The measure of individuals who enroll in correspondence education in cases 1 and 3 is given by:

- Case 1: $\int_{a_{c,1}}^{\bar{a}} f(a)\, da = 1 - F(a_{c,1})$
- Case 3: $\int_{a_{c,3}}^{a_{h,3}} f(a)\, da = F(a_{h,3}) - F(a_{c,3})$

Since $a_{c,1} < a_{c,3}$, as shown in Proposition 2, it follows that the measure of individuals enrolling in correspondence education is strictly larger in case 1 than in case 3.

Reallocation of lower-ability individuals from high school to correspondence school in cases 2 and 3

The share of individuals enrolling in either high school or correspondence school in cases 2 and 3 is given by:

- High school share in case 2: $\int_{a_{h,2}}^{\bar{a}} f(a)\, da = 1 - F(a_{h,2})$
- High school share in case 3: $\int_{a_{h,3}}^{\bar{a}} f(a)\, da = 1 - F(a_{h,3})$
- Correspondence school share in case 3: $\int_{a_{c,3}}^{a_{h,3}} f(a)\, da = F(a_{h,3}) - F(a_{c,3})$

Since $a_{h,2} < a_{h,3}$ and $a_{c,3} < a_{h,3}$, as shown in Proposition 2, some individuals who would have enrolled in high school in case 2 instead choose correspondence education in case 3. Moreover, because $a_{h,3} < \bar{a}$, we can write $a_{h,3} = \bar{a} - \epsilon$ for some $\epsilon > 0$. Hence, those who switch from high school to correspondence school have learning ability levels strictly below $\bar{a}$; that is, $a < \bar{a} - \epsilon$.

Upskilling rate of high school in cases 2 and 3

The upskilling rate of high school, denoted by R_h, is defined as the share of individuals who

[30] Notice that for case 3, the increase in γ_c also induces more individuals to enroll in high school as it has become relatively cheaper than correspondence school. This reduces the high school cutoff $a_{h,3}$, and makes the effect on R_c, ambiguous as the ability distribution of correspondence students is higher at the lower end but lower at the upper end.

become skilled after choosing to enroll in high school. In cases 2 and 3, this is given by:

$$R_h = \begin{cases} \frac{\int_{a_{h,2}}^{\bar{a}} f(a) P_h(a)\, da}{\int_{a_{h,2}}^{\bar{a}} f(a)\, da} & \text{if } S = \{s_h\} \text{ (case 2: only high school)} \\ \frac{\int_{a_{h,3}}^{\bar{a}} f(a) P_h(a)\, da}{\int_{a_{h,3}}^{\bar{a}} f(a)\, da} & \text{if } S = \{s_c, s_h\} \text{ (case 3: both options)} \end{cases}$$

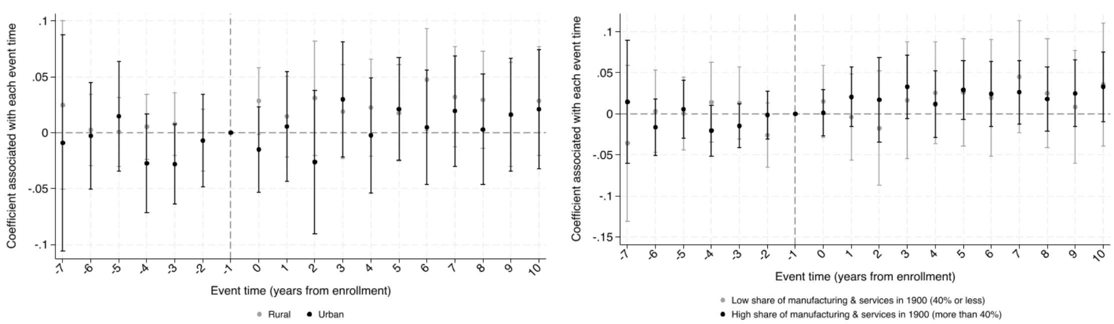
Since $a_{h,2} < a_{h,3}$, as shown in Proposition 2, the pool of individuals selecting into high school in case 3 is more positively selected on learning ability. Given that $P_h(a)$ is strictly increasing in a, the upskilling rate R_h is therefore higher in case 3 than in case 2.

E Additional empirical results supporting the testable implications of the theory

E.1 Effectiveness of correspondence education for occupational upskilling

Figure E.1: Effect of correspondence education on other white-collar occupations by urban status and industrial composition

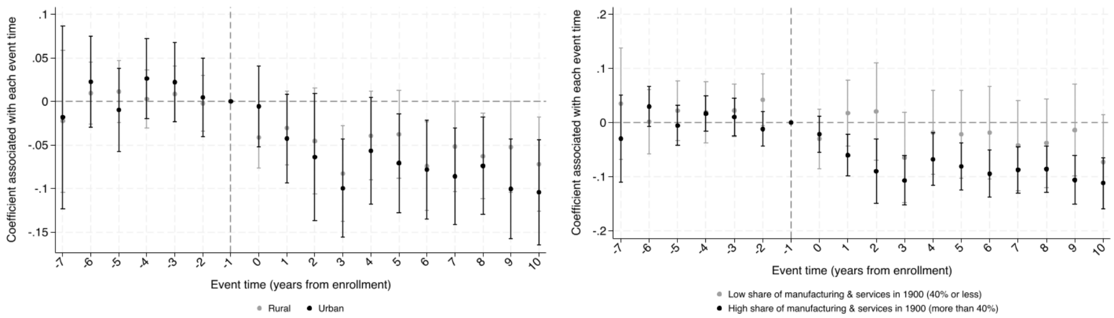
(a) Urban or rural status　　(b) Prevalence of manufacturing and services



Notes: These figures plot the event-study estimates of the impact of correspondence education on the probability of working in other white-collar occupations, corresponding to β_τ for $\tau \in \{-7, -6, \ldots, -1, 0, 1, \ldots, 10\}$ in Equation (3.1), estimated separately for each subgroup. Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -1$, on an indicator variable for this occupational category. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2. 95% confidence intervals built from standard errors clustered at the county level are plotted.

Figure E.2: Effect of correspondence education on blue-collar occupations by urban status and industrial composition

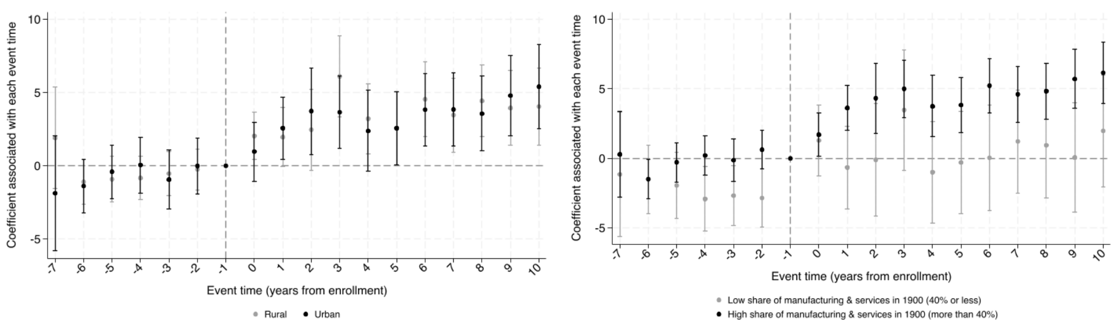
(a) Urban or rural status (b) Prevalence of manufacturing and services



Notes: These figures plot the event-study estimates of the impact of correspondence education on the probability of working in blue-collar occupations, corresponding to β_τ for $\tau \in \{-7, -6, \ldots, -1, 0, 1, \ldots, 10\}$ in Equation (3.1), estimated separately for each subgroup. Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -1$, on an indicator variable for this occupational category. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2. 95% confidence intervals built from standard errors clustered at the county level are plotted.

Figure E.3: Effect of correspondence education on the Duncan Socioeconomic Index (SEI) by urban status and industrial composition

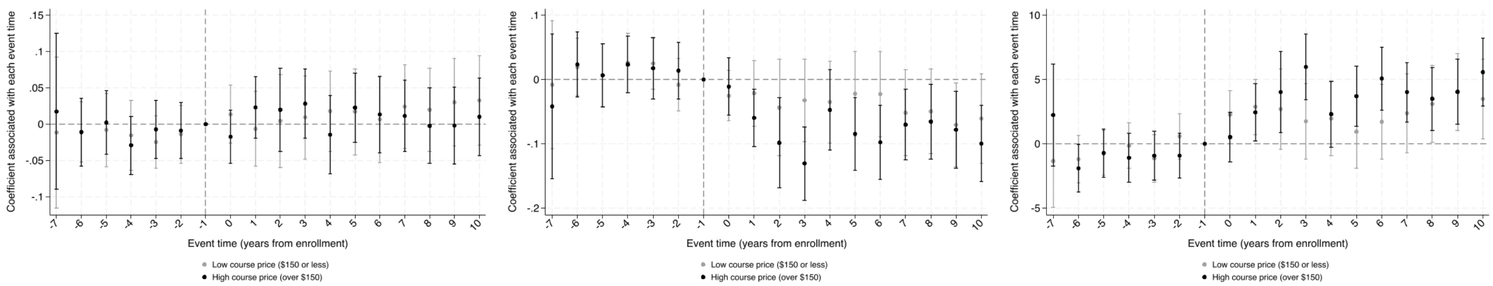
(a) Urban or rural status (b) Prevalence of manufacturing and services



Notes: These figures plot the event-study estimates of the impact of correspondence education on the SEI, corresponding to β_τ for $\tau \in \{-7, -6, \ldots, -1, 0, 1, \ldots, 10\}$ in Equation (3.1), estimated separately for each subgroup. Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -1$, on this index. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2. 95% confidence intervals built from standard errors clustered at the county level are plotted.

Figure E.4: Effect of correspondence education on occupational outcomes and Duncan Socioeconomic Index (SEI) by course price

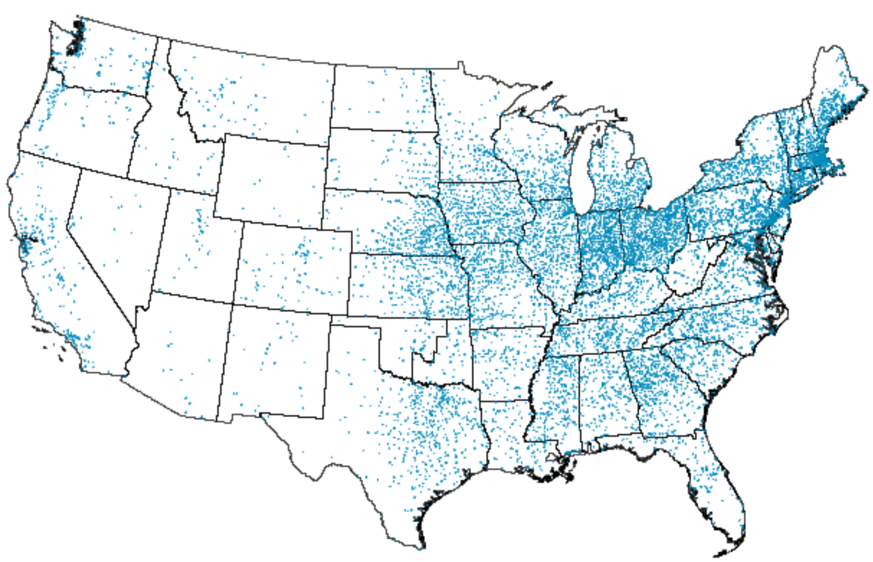
(a) Other white-collar occupations (b) Blue-collar occupations (c) SEI



Notes: These figures plot the event-study estimates of the impact of correspondence education on occupational outcomes and the SEI, corresponding to β_τ for $\tau \in \{-7, -6, \ldots, -1, 0, 1, \ldots, 10\}$ in Equation (3.1), estimated separately for each subgroup. Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -1$, on indicator variables for: (1) other white-collar occupations; (2) blue-collar occupations; and (3) the SEI, respectively. The analysis includes men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2 who took a course found in the "Price List and Rules for Field Men" booklet published in 1931. 95% confidence intervals built from standard errors clustered at the county level are plotted.

E.2 Interaction between correspondence and high school education

Figure E.5: Cities with a high school by 1900



Notes: This map indicates all US cities that had a public or private high school in operation by 1900, based on the dataset compiled by Doxey et al. (2025).

Table E.1: Summary statistics for neighbor exposure measures of full male population 1900 and 1910

	1900	**1910**
Has treated neighbor	0.047	0.032
Nearest treated neighbor is 1 doors away	0.001	0.001
Nearest treated neighbor is 2 doors away	0.001	0.001
Nearest treated neighbor is 3 doors away	0.001	0.001
Nearest treated neighbor is 4 doors away	0.001	0.001
Nearest treated neighbor is 5 doors away	0.001	0.001
Nearest treated neighbor is 6 doors away	0.001	0.001
Nearest treated neighbor is 7 doors away	0.001	0.001
Nearest treated neighbor is 8 doors away	0.001	0.001
Nearest treated neighbor is 9 doors away	0.001	0.001
Nearest treated neighbor is 10 or more doors away	0.04	0.03
Observations in full sample with all men	38,757,848	47,609,664
Observations in sample with treated neighbor	1,817,197	1,531,536

Notes: This table presents the average values for the measures of exposure to male neighbors living on the same street who enrolled in correspondence school by 1900, for men in the 1900 and 1910 census waves. Correspondence school enrollment is identified using men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2.

Table E.2: High school effectiveness and neighbor exposure (for the Duncan Socioeconomic Index, SEI)

	SEI	
Has treated neighbor	0.51***	
	(0.18)	
Nearest treated neighbor is 1–3 doors away		0.42.
		(0.44)
Nearest treated neighbor is 4–6 doors away		0.33.
		(0.45)
Nearest treated neighbor is 7–9 doors away		0.78*
		(0.47)
Sample	All HS	HS w/ treated neigh.
Observations	1,508,129	42,658
Neighborhood FE	Yes	Yes
Demographic controls	Yes	Yes
Cluster	Nbhd	Nbhd

This table presents the results from Equation (5.4). The analysis includes men aged 16 to 35 in the 1910 census, and identifies correspondence school enrollment using men from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 3.2. Standard errors clustered at the enumeration district level in parentheses. ***p<0.01, **p<0.05, *p<0.1.