Learning by Mail: The Impact of Correspondence Schools in Early 20th Century America*

Daniela Vidart†

University of Connecticut and NBER

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Abstract

This paper examines correspondence education as an alternative pathway to human capital acquisition in early 20th-century America. Using digitized records from the International Correspondence Schools (ICS), the largest such institution, linked to census data, I show that correspondence education expanded educational opportunity by reaching individuals conventional schools could not serve, and providing occupation-specific technical training those schools lacked. Enrollment increased men's probability of working in a professional or technical occupation by 6–10pp within 2–10 years, with gains concentrated in occupations for which students trained. By 1910, ICS accounted for 1.3–2.1% of the male professional and technical workforce.

Keywords: Correspondence education, Human capital, Occupational mobility, High school expansion

JEL codes: J24, N32, E24, I21

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†daniela.vidart@uconn.edu.

"Always figured somebody'd come along with the brains to not leave education to a lot of bookworms and impractical theorists but make a big thing out of it."

— Sinclair Lewis, *Babbitt* (1922), chapter VI

In the first half of the 20th century, the United States made major strides toward universal, publicly funded secondary education. This transformation, known as the "high school movement," sparked both an educational and economic revolution by expanding access to schooling at a time when the demand for skilled labor was rising rapidly (Goldin and Katz, 1998, 1999; Doxey et al., 2025). In 1900, only 6 percent of American youths earned a high school diploma; by 1930, that figure had risen to 30 percent. Yet access to secondary and further education remained highly uneven across geographic and socioeconomic lines during this time. Conventional schooling required physical proximity to a school and full-time attendance, and followed a fixed progression by grade and age. The American curriculum was also predominantly academic, with few options for occupation-specific technical training (Goldin and Katz, 2008). For individuals past school age, living far from a school, or employed full-time, the formal schooling system offered little.

In this paper, I study an alternative educational pathway that spread across the United States alongside the high school movement: correspondence education. Unlike conventional schools, correspondence courses allowed students to study remotely and at their own pace, work while studying, and acquire practical occupation-specific training. I show that correspondence education filled an important gap in the American education system, opening a path to skilled occupations for individuals conventional schools could not serve. By 1940, this alternative pathway had reached one in thirteen adult men in the United States.

I begin by digitizing a 1908 student register of the International Correspondence Schools (ICS), the largest and most successful correspondence education institution in the world at the time. Founded in 1891, ICS offered practical occupation-specific instruction through self-paced courses delivered by mail, with installment plans that allowed students to spread tuition payments over time. The register provides detailed records for the universe of individuals who enrolled in ICS and made significant progress between 1891 and 1907, including each student's name, location, enrollment year(s), and course progress. The U.S. portion of the register covers roughly 97,000 students, of whom about 92,000 were male and form the focus of this study.[1] I combine the personal information in the register with record linkage methods

[1]Enrollment was also overwhelmingly white, so while ICS expanded access along several important margins, its reach remained highly unequal across sex and race. Nevertheless, I also examine the smaller sample of female ICS students and show that correspondence education encouraged women to participate in the labor force.

developed by the Census Tree Project (Price et al., 2021; Buckles et al., 2023) to identify these individuals in the 1900 and 1910 census waves.

Using this linked dataset, I first show that correspondence education expanded educational opportunity along two key margins. First, its flexible structure relaxed the age, employment, and location constraints of formal schooling. More than 30% of ICS students enrolled at age 30 or older, well beyond conventional school ages, and over 60% of students were employed before enrollment. Correspondence education also reached places without high schools: more than two-thirds of towns represented in the ICS register, accounting for roughly 41% of male ICS students, had no high school in 1900. Second, correspondence education filled a gap in the skills taught by conventional schools. More than 80% of the courses offered by ICS, and 84% of male enrollments, were in technical subjects such as mechanical drawing, electrical work, architecture, and machinery. Enrollment in these courses was high even among students with relatively high levels of formal schooling, consistent with correspondence education filling a curricular gap in the American education system.

I next estimate the effects of correspondence education on occupational mobility using an event-study design centered on men's first ICS enrollment. This design compares the occupational outcomes of employed ICS enrollees with similar demographic characteristics observed in the same county and census year but at different horizons relative to their first ICS enrollment.[2] I find that correspondence education increased the probability of working in a professional or technical occupation by 6–10 percentage points within two to ten years of enrollment. These gains are concentrated in technical occupations and are robust across alternative samples and to implementing a complementary difference-in-differences design using never-enrolled men as an untreated comparison group.[3] A back-of-the-envelope calculation extrapolating these estimates implies that ICS moved approximately 13,000–21,000 men into professional and technical occupations by 1910, equivalent to 1.3–2.1% of the male professional and technical workforce in that year.

I then use the detailed information on course content in the ICS register to show that the occupational gains of ICS reflect the specific skills students acquired through their courses of study. I group ICS courses into 21 families of related subjects and link each family to the occupations that used the skills taught in its courses. This mapping allows me to compare

[2]Consistent with the assumption that individuals observed at different enrollment horizons are comparable and would have followed similar occupational trajectories absent enrollment, I find no evidence of differential pre-enrollment trends.

[3]For this analysis, I compare changes in occupational outcomes between 1900 and 1910 among ICS students who enrolled between the two censuses and never-enrolled men matched on county, race, age, occupation, and industry in 1900. I find that ICS enrollees experienced a 1–4 percentage-point greater increase in the probability of working in a professional or technical occupation relative to untreated men.

the gains in occupations targeted by a student's own course with the gains in occupations targeted by other courses. I find that enrollment raises the probability of working in an occupation targeted by a student's own course by an average of 6.5 percentage points in the post-enrollment period, compared with 0.43 percentage points for occupations targeted by other course families—a 15-fold difference. This effect persists when I exclude men already working in one of their target occupations before enrolling, when I exclude men who worked in industries associated with those occupations prior to enrollment, when identification comes from occupational change within the same individual, and when I compare ICS students with never-enrolled men who began in the same occupation and industry. I also find that the estimated occupational gains increased with the intensity of ICS training within course families, measured using the number of subjects in a course and course price. These patterns point to the acquisition of occupation-specific skills as the key mechanism driving the occupational gains of ICS, rather than general ability, motivation, broad shifts in labor demand, or career progression.

Finally, I return to the patterns of educational access documented above to examine who gained most from correspondence education. First, I find positive and sizeable occupational gains among enrollees of all ages, indicating that the flexibility that allowed ICS to reach individuals beyond conventional school ages also provided a path to occupational advancement for them. The gains are substantially larger, however, among those enrolling earlier in their careers, when there may have been greater scope for occupational mobility and longer horizons over which to use the skills acquired. Second, although ICS attracted students of all schooling levels, the occupational gains are larger among men who did not complete high school, consistent with correspondence education being particularly valuable to individuals with less formal education. Third, I examine how these gains varied with the local environment. The gains are similar across towns with and without secondary-level technical education, but substantially larger in counties with a higher share of employment in manufacturing. This pattern suggests that the returns to correspondence education depended in part on the availability of jobs in which students could put their training to use.

Related literature

This paper contributes to several strands of literature. First, it contributes to the literature on the role of education in shaping occupational and social mobility in the early 20th-century United States. Prior work has focused primarily on formal classroom-based schooling, examining the effects of primary education (such as the Rosenwald program, which expanded access for Black students in the rural South; Aaronson and Mazumder, 2011); high school

education (particularly the expansion driven by the high school movement and its implications for mobility, productivity, innovation, and racial and gender gaps; Goldin and Katz, 1999, 2000, 2008; Doxey et al., 2025); and higher education (through the growth of junior and four-year colleges and their effects on the college premium; Bleemer and Quincy, 2025a,b). This paper contributes to this literature in three ways. First, it documents the widespread use of correspondence education, an understudied alternative to classroom-based schooling, and quantifies its impact on occupational mobility. Second, it shows that correspondence education expanded educational access by reaching individuals whom conventional schools were poorly equipped to serve because of their age, employment, or location. Finally, it shows that ICS provided practical, occupation-specific training that conventional schools largely lacked. In supplying this training, ICS partially filled a gap left by the decline of the earlier academy movement, as discussed by Goldin and Katz (2008). This role was particularly important in the United States, which lacked a separate vocational and technical school system comparable to those that developed in continental Europe.

Second, this paper contributes to the literature on vocational education and occupation-specific human capital. One strand of this literature studies formal vocational schooling and the tradeoff between general and occupation-specific education (Malamud and Pop-Eleches, 2010; Hanushek et al., 2017). A related literature examines how workers acquire occupation-specific skills through work experience, learning on the job, and employer-provided training (Becker, 1962; Acemoglu and Pischke, 1998, 1999; Kambourov and Manovskii, 2009; Gathmann and Schönberg, 2010). This paper shows that correspondence education sat in between these two channels, as it provided structured occupation-specific instruction outside conventional schooling and employer-provided training, while allowing workers to remain employed. I also show that the occupational gains of correspondence education were concentrated overwhelmingly in occupations targeted by a student's own course and were larger for more intensive courses within course families. These results show that structured training undertaken alongside employment can build occupation-specific human capital and facilitate occupational mobility.

Finally, this paper relates to the literature on remote and flexible education options and their effects on student learning and labor-market outcomes (Figlio et al., 2013; Deming et al., 2012, 2015; Bettinger et al., 2017; Hoxby, 2017; Goodman et al., 2019; Barrow et al., 2024; Kofoed et al., 2024; Barahona et al., 2025). Much of this literature has focused on the past two decades and examined the rise of online education. This paper instead studies correspondence schooling, a remote learning technology available more than a century earlier but sharing many of the same features: instruction was delivered at a distance, could be

completed asynchronously and at the student's own pace, and offered substantially greater flexibility than conventional classroom-based schooling. The historical setting also provides a useful contrast to the modern experience. A central concern in the recent literature is that flexible remote options may draw students away from higher-return in-person alternatives. The evidence here points to an important complementary role for remote education. Correspondence schooling reached individuals for whom conventional schooling was inaccessible because of employment, location, or age. By relaxing these constraints, it expanded the set of individuals able to acquire additional human capital alongside the growth of the formal school system.

The rest of the paper is organized as follows. Section 1 provides a brief history of correspondence education and documents the rise of ICS in the United States in the early 20th century. Section 2 describes the newly digitized ICS register and census linkage. Section 3 examines the characteristics of ICS enrollees and courses and documents how correspondence education expanded educational opportunity. Section 4 presents empirical evidence on the impact of correspondence education on occupational mobility. Section 5 studies the mechanisms behind these occupational gains, focusing on course-specific skill acquisition and heterogeneity in the returns to correspondence education. Section 6 concludes.

1 Historical context: Correspondence education and the rise of ICS

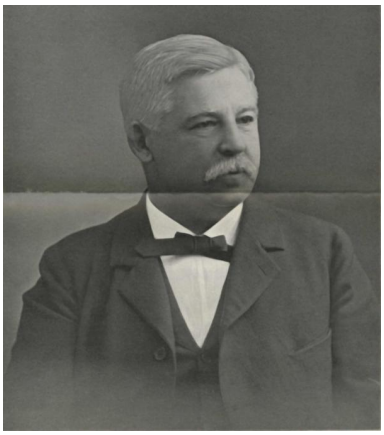
Correspondence education in the United States began in 1873 with the founding of The Society to Encourage Studies at Home in Boston by Anna Eliot Ticknor. Aimed at women constrained by domestic responsibilities, the society offered individually planned courses and regular communication with instructors for education and personal enrichment, enrolling more than 7,000 students over its 24 years in operation (Bergmann, 2001). Correspondence education expanded in the following decades (Watkins, 1991). The Correspondence University, which was affiliated with several colleges and universities, was established in Ithaca, New York, with the goal of offering college-level education to those unable to attend in person. This model soon spread, notably to the University of Chicago, which created an extension division offering correspondence-based instruction (Noffsinger, 1926).

The most widespread and successful form of correspondence education in the late 19th and early 20th century, however, was occupational training. This model originated with Thomas J. Foster (pictured in Figure 1.1a), a newspaper publisher in eastern Pennsylvania who, concerned about the high number of mining accidents in the region, began publishing safety

advice for miners in the Mining Herald (later renamed the Colliery Engineer) in the late 1880s. When the Pennsylvania legislature soon after started requiring mining foremen to pass a safety examination, demand for a more structured and comprehensive form of mining education grew rapidly. In response, Foster established The Colliery Engineer School of Mines in 1891 to deliver mining instruction through correspondence (The University of Scranton Digital Collections, 2025). By mid-1892, the school had enrolled more than 1,000 miners. As inquiries from individuals looking for education in other fields followed, the curriculum expanded, and in 1894, the school was incorporated as the International Textbook Company, with its educational division renamed the International Correspondence Schools of Scranton, Pennsylvania (ICS) (Noffsinger, 1926).

Figure 1.1: Pictures of Thomas J. Foster (founder of ICS) and ICS Printery

(a) Picture of Thomas J. Foster



(b) ICS Printery in 1915



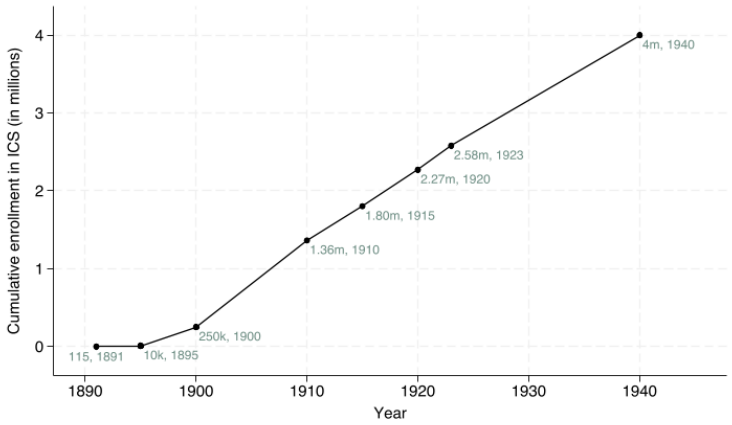
Sources: Weinberg Memorial Library, University of Scranton, International Correspondence Schools of Scranton, Pennsylvania, 1897–1996.

ICS experienced rapid growth in the years that followed, reaching a cumulative enrollment of 1,363,700 students worldwide by 1910 and offering more than 370 distinct courses. Figure 1.1b and Figure 1.2 illustrate the scale and expansion of ICS's operations, showing the size of its printery in Scranton in 1915, and the sharp rise in enrollment from 1891 to 1940, respectively. By 1940, total enrollment had reached 4 million students, of which approximately 3.5 million were American men (roughly one in thirteen men aged 18 and over in the U.S. at the time), and ICS's reputation led the War Department to contract with the school to develop training manuals for military use (Watkinson, 1996).[4]

This rapid expansion was facilitated by three broader developments creating particularly

[4]Several smaller schools also offered occupational training by correspondence, namely in subjects such as bookkeeping, drafting, and shorthand. ICS was nevertheless the largest and offered a substantially broader curriculum (Harris, 1903; Gibbons, 1914).

Figure 1.2: Cumulative ICS enrollment over time



Sources: Noffsinger (1926) (1891–1923), and Watkinson (1996) (1940).

favorable conditions for correspondence education. First, the spread of free public primary education in the 19th century, often called the "first transformation of American education" and led by Horace Mann, equipped most Americans with basic literacy and numeracy skills, making correspondence-based learning feasible on a broad scale (Cremin, 1980; Kaestle, 2001). Second, rapid industrialization generated growing demand for technical skills at a time when the formal educational system in the United States provided few dedicated avenues for acquiring them. In particular, the United States did not develop a separate vocational and trade-school tier comparable to those of continental Europe, instead relying on a general and academically oriented secondary-school system (Kliebard, 1999; Goldin and Katz, 2008).[5] Moreover, the high school movement, and tertiary education institutions such as junior colleges, expanded unevenly, leaving many communities without access to secondary and post-secondary education until decades later (Goldin and Katz, 1999; Bleemer and Quincy, 2025b). Third, the expansion of the U.S. Postal Service, through the growth of the Railway Mail Service after the Civil War and the introduction of Rural Free Delivery in 1896, made it possible to distribute instructional materials widely and reliably across the country (Gallagher, 2020).

These developments created a large potential market for correspondence education. ICS capitalized on this opportunity through three distinctive features of its model. First, ICS invested heavily in reaching prospective students, becoming one of the largest magazine advertisers

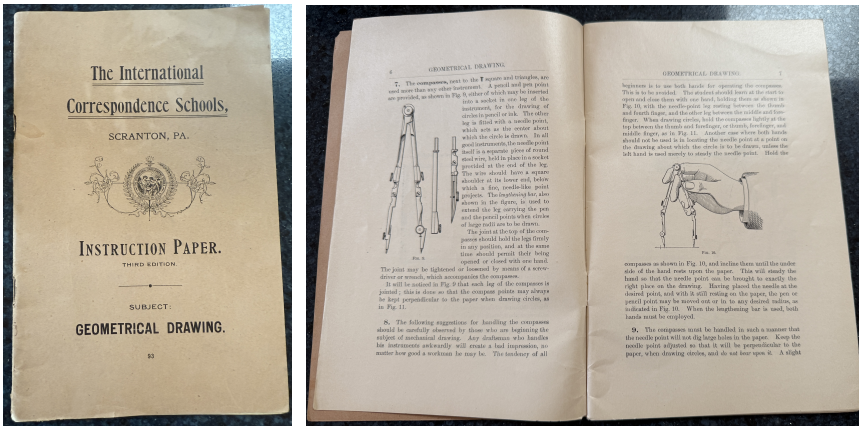
[5] As noted by Goldin and Katz (2008), the academies that preceded public high schools often offered practical and vocational instruction in subjects such as bookkeeping, surveying, mechanical drawing, and navigation. These institutions declined, however, as publicly funded high schools expanded. Some public high schools incorporated trade and vocational subjects, but generally emphasized academic and commercial instruction rather than training for specific industrial trades.

in the country during the first decade of the 20th century (World and Record, 1902).[6] Second, ICS reduced financial barriers by offering installment payment plans. Although courses were relatively expensive (e.g., the Architecture course cost approximately $120 in 1906, or about $3,400 in 2019 dollars), students were able to pay in smaller monthly installments (The University of Scranton Digital Collections, 2025).

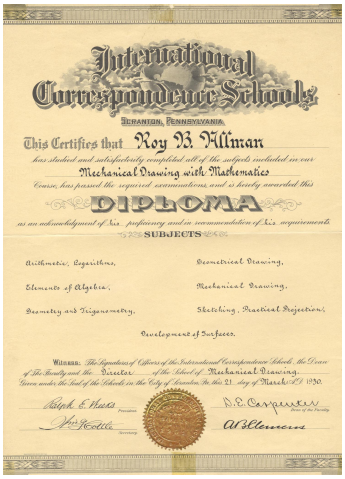
Third, and most importantly, ICS designed a flexible educational model combining self-directed instruction with a curriculum oriented toward practical occupational skills. Courses were self-paced and could be pursued while employed, with instruction delivered through booklets written in plain English and explicitly designed to be used without a classroom or teacher. Figure 1.3a illustrates the detailed, step-by-step character of the material, showing instructions from a geometrical drawing booklet on how to use a compass to draw a circle, including illustrations of proper hand positioning.

Figure 1.3: ICS course materials: instruction papers and diploma

(a) Sample pages from ICS Geometrical Drawing Instruction Paper in 1898



(b) ICS Diploma



Notes: Panel (a) presents two pages from an ICS instruction paper on geometrical drawing from 1898. Panel (b) presents a diploma awarded on completion of a course in mechanical drawing with mathematics, along with the subjects completed. Sources: International Correspondence Schools of Scranton, Pennsylvania, (panel a); Scioto County Public Library Local History Digital Collection, 1930 (panel b).

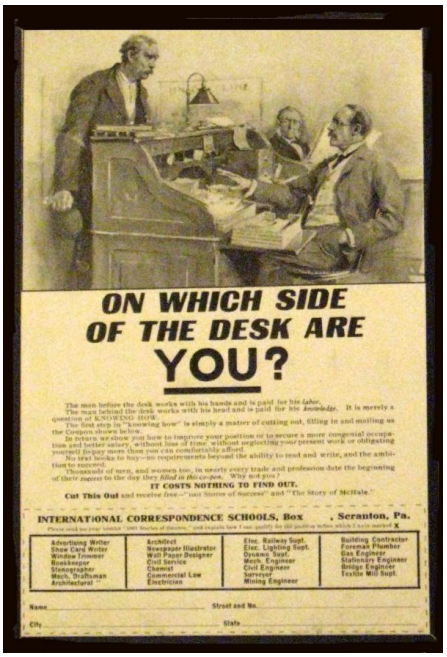
After enrolling in a course with ICS, students proceeded through a sequence of these booklets covering different topics. Each booklet ended with an exam that students completed and mailed to Scranton, where it was graded and returned with corrections. Figure A.1 presents surviving exam questions from ICS booklets I could access. Students who completed the prescribed course of study received a diploma. For example, Figure 1.3b presents a diploma

[6] Word of mouth also mattered, however. Appendix C shows, for instance, that a man was more likely to enroll in ICS if a neighbor had enrolled previously.

awarded to Roy B. Allman for a course in Mechanical Drawing with Mathematics, and lists the individual subjects he completed as part of the course.

This mode of instruction was closely tied to ICS's educational mission, which aimed to provide "practical men with a technical education, and technical men with a practical education" (Watkinson, 1996). This approach stood in contrast to prevailing educational philosophies of the era, which emphasized enlightenment, moral cultivation, and self-development over immediate application or economic advancement. ICS articulated this practical approach in its 1908 register: "Our courses are all prepared from a utilitarian standpoint; that is, it is always kept in view that the reason for the student taking one of our courses is that he desires to put the knowledge obtained into immediate practical use. We are not aiming to train the mind, but to give the student such information regarding the principles, theory, and practice as he can use in connection with the position he is aiming to fill." (International Textbook Company, 1908).

Figure 1.4: Advertisement for ICS in 1905



Source: Weinberg Memorial Library, University of Scranton, International Correspondence Schools of Scranton, Pennsylvania, 1897–1996.

This emphasis on practical skill acquisition and occupational advancement positioned ICS as a pathway into technical and professional occupations without the need for apprenticeships or access to formal schooling (Watkinson, 1996). In Figure 1.4, I present a 1905 advertisement for ICS that highlights this occupational upskilling mission. It reads:

"The man before the desk works with his hands and is paid for his *labor*. The man behind the

desk works with his head and is paid for his *knowledge*. It is merely a question of KNOWING HOW. The first step in "knowing how" is simply a matter of cutting out, filling in and mailing us the Coupon shown below. In return we show you how to improve your position or to secure a more congenial occupation and better salary, without loss of time, without neglecting your present work, or obligating yourself to pay more than you can comfortably afford. No textbooks to buy—no requirements beyond the ability to read and write, and the ambition to succeed..."

2 Data

2.1 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. The register contains a list of students who had made sufficient progress in their ICS coursework by August 1907 to meet the school's threshold for inclusion. In particular, to be included, students had to have completed at least one technical subject (or ten drawing plates), or approximately one-third of a non-technical course. The purpose of this register, which was distributed to key education figures, was to document the scale of ICS and its legitimacy as an educational institution by presenting a large number of names, each with a verifiable address.

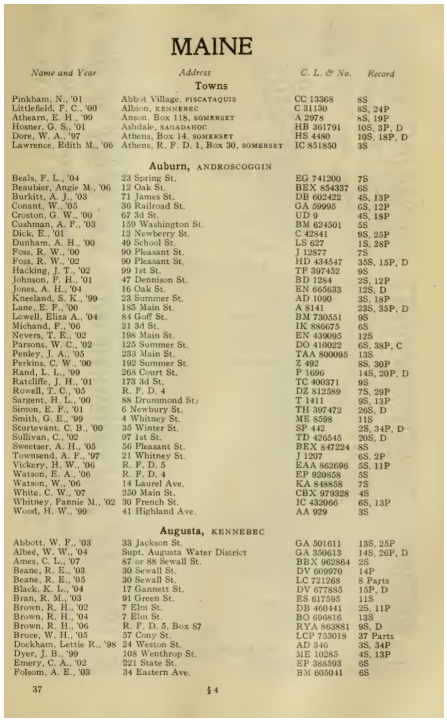
In Figure 2.1a, I present a sample page from the ICS register showing students in several towns in Maine to illustrate how the information is organized. Each entry reports the student's name, year of enrollment, address, course taken, and progress, including the number of subjects or drawing plates completed and whether the student earned a diploma or certificate.[7] For instance, the first entry for the town of Auburn, located in Androscoggin county, records student F. L. Beals, who enrolled in 1904 in the EG course (identified at the beginning of the register as telephone engineering), resided at 23 Spring Street, and had completed seven subjects. The register also distinguishes male and female students, since women are listed using their full first names or with the titles "Miss" or "Mrs". The sample page contains five women identifiable in this way. Students can also appear more than once if they enrolled in multiple courses, though only 1.8 percent of men and 0.3 percent of women did so. In what follows, I use one observation per student, corresponding to the first course in which they enrolled, to avoid giving greater weight to students who took multiple courses and to

[7] According to the register, diplomas were issued when long courses were completed, whereas certificates follow the completion of single subjects or short courses.

define enrollment consistently at the student's initial exposure to ICS. Additional details on the information contained in the ICS register are provided in Appendix B.1.

Figure 2.1: ICS register and geographic distribution of male and female correspondence school students

(a) Sample page from the ICS register

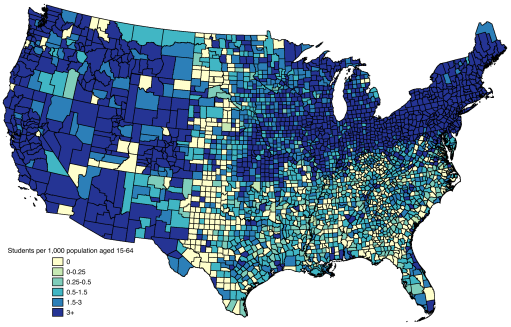


MAINE

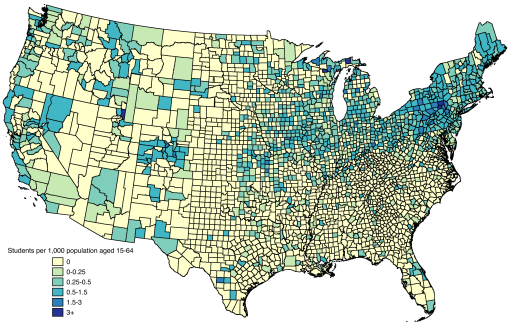
Name and Year	Address	C. L. & No.	Record
Towns			
Pinkham, N., '01	Abbot Village, PISCATAQUIS	CC 13368	8S
Littlefield, F. C., '00	Albion, KENNEBEC	C 31130	8S, 24P
Athearn, E. H., '99	Anson, Box 118, SOMERSET	A 2978	8S, 19P
Hosner, G. S., '01	Ashdale, SAGADAHOC	HB 361791	10S, 3P, D
Dore, W. A., '97	Athens, 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
Comant, 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	3S, 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
Lewell, 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 929858	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 432966	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
Albee, 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 609070	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 862881	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 Winthrop St.	ME 10235	4S, 13P
Emery, C. A., '02	221 State St.	EP 388593	6S
Folsom, A. E., '03	34 Eastern Ave.	BM 605041	6S

37 § 4

(b) Men



(c) Women



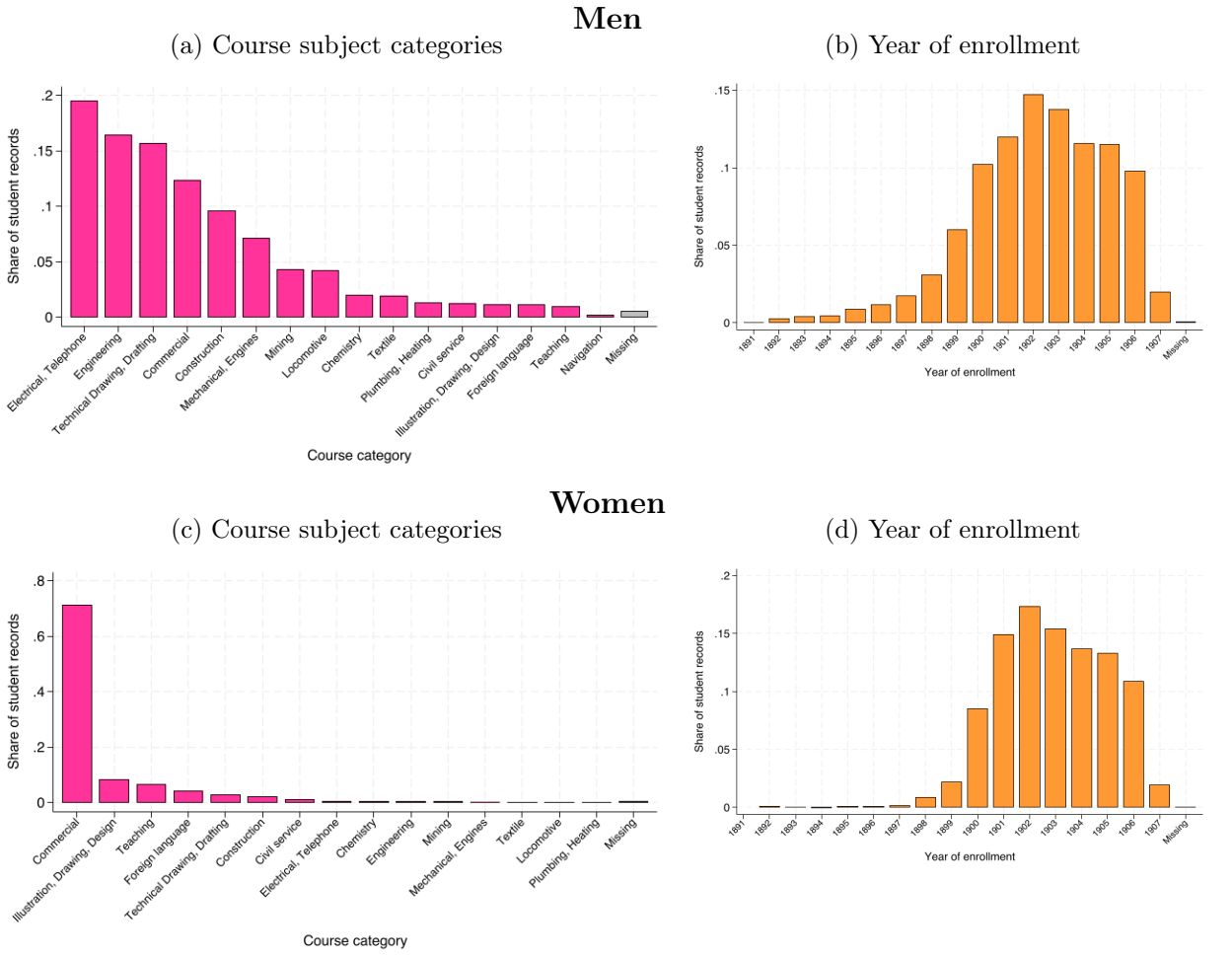
Notes: Panel (a) presents a sample page from the 1908 "Register of International Correspondence Schools." Panels (b) and (c) plot the number of male and female students in the register per 1,000 individuals in the corresponding 1910 working-age (15–64) population in each county.

The U.S. portion of the register includes 96,959 unique individuals residing across all states in the contiguous United States and Alaska. Of these, the overwhelming majority are men: 91,906 students, or 95% of the sample, compared with 5,053 women.[8] Figures 2.1b and 2.1c illustrate the geographic reach of ICS separately for men and women, plotting the number of students per 1,000 individuals in the corresponding working-age population in each county in 1910. Male students were distributed widely across the country, with particularly high concentrations in the Northeast, Midwest, and West and lower rates across much of the South and Great Plains, consistent with the location of ICS in northeastern Pennsylvania and its emphasis on technical and industrial training rather than agriculture. Despite their much smaller numbers, female students exhibit a broadly similar geographic distribution.

[8]The male students represent 0.302% of the working-age male population (ages 15–64) in 1910, a substantial share, particularly given the low levels of educational attainment at the time, with only 13.5% of adults aged 25 and older having completed high school (National Center for Education Statistics, 2021).

Figure 2.2 further characterizes male and female students by course subject and year of enrollment. Figures 2.2a and 2.2c show stark differences in course choice across gender lines. Men enrolled overwhelmingly in technical fields associated with manufacturing, industrial activity, and construction, with engineering, shop practice, drafting, and the steam and electrical trades together accounting for 83% of male enrollments. Women, by contrast, enrolled predominantly in commercial courses, with bookkeeping, stenography, and related clerical training accounting for 71% of female enrollments.

Figure 2.2: Share of male and female correspondence school students by course subject category and year of enrollment



Notes: These figures plot the distribution of correspondence school students by the subject of their first course (which follows ICS's own course categorization) and their year of first enrollment, separately for male and female students. The sample is all students in the "Register of International Correspondence Schools" published in 1908.

Figures 2.2b and 2.2d show the distribution of register students by year of first enrollment. For both men and women, the number of students represented increased across enrollment cohorts through the 1890s and early 1900s, although the increase among women occurred

somewhat later. The decline among the most recent cohorts likely reflects, at least in part, the register's progress requirement: students who enrolled closer to the August 1907 cutoff had less time to complete enough coursework to qualify for inclusion.

2.2 Census data and matching

I identify correspondence school students in the full-count census data from 1900 and 1910 through a two-step process.[9]

First, I use name and location information from the ICS register to probabilistically match students to records in either the 1900 or 1910 census. This yields 68,756 matched individuals: 65,182 out of 91,906 men in the register (70.9%) and 3,574 of 5,053 women in the register (70.7%).[10] Second, I trace these individuals to the other census wave (1900 or 1910) using the record linkages developed by the Census Tree Project (Price et al., 2021; Buckles et al., 2023).[11] This method leverages familial relationships recorded on the genealogy platform FamilySearch.org to link individuals across census years. By incorporating private information such as maiden names and household composition, it overcomes many of the limitations of traditional linkage approaches, including name changes and missing data. The Census Tree data is further supplemented with links from other census-linking projects and machine-learning-based matches. Additional details on these two steps of the matching process are provided in Appendix B.2.

Columns (1) and (2) of Table 2.1 report summary statistics for the matched male and female ICS samples in 1900 and 1910. Columns (3) and (4) report the corresponding statistics for the full working-age male and female populations for comparison. Relative to their respective population benchmarks, both male and female ICS students were more likely to be white, more concentrated in the Northeast, and less concentrated in the South. Over time, ICS students also became increasingly urban and, particularly among men, more concentrated in manufacturing and services relative to the broader population. Female ICS students were also more likely to be gainfully employed in 1910 than women in the broader population. These patterns are consistent with correspondence education being closely tied to industrial

[9] I do not use data from 1890 since census records from this wave were largely lost to fire.

[10] Table B.1 shows that matched and unmatched students are very similar in enrollment year, course progress, diploma or certificate acquisition, and multiple enrollments, for both men and women. There are modest geographic differences, with matched students somewhat more represented in the Northeast and less represented in the Midwest, South, and West. This is consistent with documented regional differences in the quality of historical census records (Hacker, 2013; Hwang and Squires, 2024).

[11] For analyses that require information on completed schooling, I additionally trace individuals forward to the 1940 census, the first census to report educational attainment. Because linkage to 1940 requires surviving to that year and being found by the linking algorithm, these men are a selected subset and the estimates should be read with caution.

and technical employment and occupational skill acquisition.

Table 2.1: Summary statistics of correspondence students and the full working-age population in 1900 and 1910, by sex

	ICS sample		Full working-age pop.	
	1900	**1910**	**1900**	**1910**
Panel A. Men				
Avg. age	26.2	35.2	33.7	33.9
Share white	0.98	0.97	0.89	0.90
Lives in Northeast	0.47	0.46	0.29	0.29
Lives in Midwest	0.36	0.33	0.36	0.33
Lives in South	0.099	0.098	0.29	0.29
Lives in West	0.078	0.109	0.064	0.091
Share urban	0.57	0.73	0.41	0.48
Share with a gainful occupation	0.64	0.90	0.84	0.89
Share in professional or technical occupations	0.062	0.104	0.033	0.033
Share in all other occupations	0.938	0.896	0.967	0.967
Share in agriculture	0.19	0.11	0.45	0.35
Share in manufacturing	0.39	0.45	0.24	0.32
Share in services	0.42	0.44	0.31	0.33
Observations	50,470	58,607	23,939,768	30,442,776
Panel B. Women				
Avg. age	25.6	34.5	33.1	33.3
Share white	0.99	0.97	0.89	0.89
Lives in Northeast	0.52	0.53	0.30	0.30
Lives in Midwest	0.35	0.32	0.35	0.33
Lives in South	0.072	0.077	0.30	0.30
Lives in West	0.061	0.077	0.049	0.070
Share urban	0.47	0.65	0.43	0.51
Share with a gainful occupation	0.19	0.41	0.21	0.27
Share in professional or technical occupations	0.296	0.230	0.087	0.092
Share in all other occupations	0.704	0.770	0.913	0.908
Share in agriculture	0.04	0.03	0.18	0.21
Share in manufacturing	0.13	0.22	0.13	0.18
Share in services	0.83	0.75	0.69	0.61
Observations	2,845	3,311	22,800,996	28,071,264

Notes: This table presents average values for selected variables for male and female students from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 2.2, alongside the full working-age (15–64) population of the same sex. Occupation and industry shares are computed among people the census records in a gainful occupation.

These results also highlight the unequal reach of ICS across demographic groups. Women accounted for only 5% of students in the register, as documented above, while Black men constituted only 2–3% of male students and Black women 1–3% of the already small female

student population. Thus, while correspondence education provided an alternative route to occupational training beyond existing educational institutions, its reach was concentrated primarily among white men.

Given the overwhelming predominance of men in both the ICS register and the early 20th-century labor force, and the resulting limited statistical power for studying women's occupational outcomes, I restrict the main analysis to men. I examine the smaller sample of female ICS students in Appendix K, where I provide evidence on their characteristics, and show that correspondence education encouraged women to participate in the labor force.

3 Correspondence education and the expansion of educational access

Correspondence education expanded educational opportunity by reaching individuals for whom conventional schooling was difficult or unavailable because of their age, employment, or location and by providing occupation-specific technical training that formal schools largely lacked. This section documents these dimensions of access.

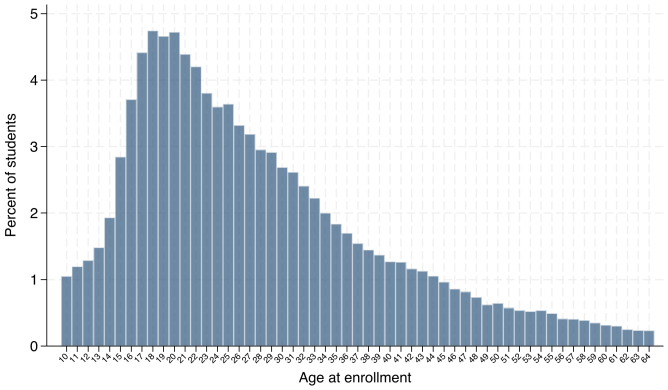
3.1 Correspondence students were of all ages

First, correspondence education expanded educational access by relaxing the age constraints of formal schooling. Formal schooling was, and remains, organized around progression through grades during childhood, adolescence, and early adulthood, and generally required students to withdraw from full-time work. Correspondence education imposed neither restriction: courses were self-paced, could be pursued while employed, and remained accessible well beyond the conventional school years.

Figure 3.1 shows the distribution of age at enrollment among male ICS students matched to census records. Although enrollment is concentrated among men in their late teens and twenties, students entered ICS across a remarkably wide age range, with a substantial share (over 30%) enrolling at age 30 and beyond. For these older students, correspondence study provided an opportunity to acquire additional education long after they would ordinarily have left the formal school system. This was particularly important in a period when opportunities for adults to return to formal education remained limited and expanded substantially only much later with the growth of community colleges and the GI Bill after World War II.

The formal educational attainment of older ICS students further illustrates this point. Table 3.1 reports the highest grade attained by 1940 by age at enrollment and shows that,

Figure 3.1: Distribution of age at enrollment



Notes: This figure shows the distribution of age at enrollment for men in the ICS sample matched to census records. Age at enrollment is computed as the difference between the year of first enrollment listed in the ICS register and the individual's birth year as reported in the census.

although schooling levels were limited among ICS students at all ages, they were particularly low among older students. Among students who enrolled at age 35 or older, for example, 80.8% had not completed high school. These men had reached adulthood before the high school movement had spread widely across the country and well before the subsequent expansion of junior and community colleges (Goldin and Katz, 1999; Bleemer and Quincy, 2025b). For them, ICS provided a way to resume their education and acquire additional skills after the conventional path through formal schooling had largely closed.[12]

Table 3.1: Educational attainment (by 1940) by age at enrollment

Age at enrollment	Grade 5 or less	Grades 6–8	Grades 9–11	Grade 12	Some college	College graduate+
10-15	8.2	45.0	17.5	14.8	6.6	7.9
16-19	5.4	37.8	19.6	21.4	7.7	8.0
20-24	7.0	41.5	15.8	19.9	8.7	7.2
25-29	9.9	48.1	13.1	15.0	7.5	6.4
30-34	13.3	51.5	11.2	12.9	5.5	5.5
35-64	19.1	52.5	9.2	9.7	4.1	5.4

Notes: This table reports the share of men of different ages at first ICS enrollment whose highest grade attained fell in each category. Shares sum to 100 within each row. Age at enrollment refers to the student's first enrollment, and each student contributes one observation. The sample encompasses male students from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 2.2, and whose schooling is recovered from the 1940 census.

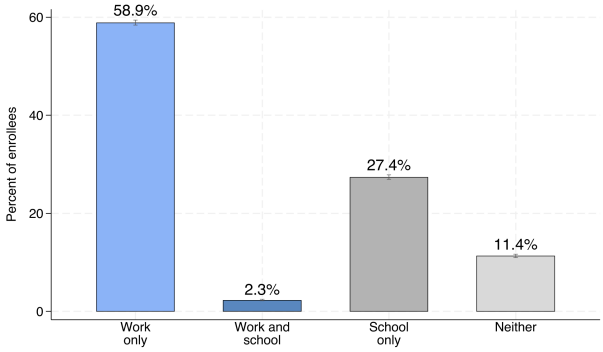
[12]Interestingly, younger and older students pursued similar types of courses and appear to have progressed through them at similar rates. Figure D.1 shows that roughly 85% of male students at all ages enrolled in technical courses, with the remainder pursuing commercial or, less commonly, academic subjects. Furthermore, both the number of subjects completed at the time of the register, and the probability of receiving a diploma or certificate, are also relatively flat across age at enrollment.

3.2 Correspondence education could be combined with work

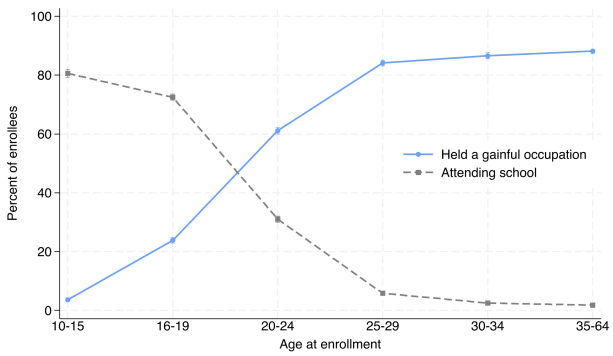
A second way in which correspondence education expanded educational access was by allowing students to work while studying. Figure 3.2 plots the share of ICS enrollees who held a gainful occupation at the census preceding enrollment, as well as the share who were still attending school, both overall and by age at enrollment.

Figure 3.2: Work and school status at the census preceding ICS enrollment

(a) All enrollees



(b) By age at first enrollment



Notes: These figures plot the share of men in the ICS register who held a gainful occupation and/or attended school, at the census wave preceding their first enrollment both in total and by age at first enrollment. Because the 1890 census was destroyed, a pre-enrollment observation exists only for the 75.6 percent of men who enrolled in 1901 or later, and the information follows from the 1900 census.

Overall, 61.3% of male ICS enrollees held a gainful occupation in the census prior to enrollment. This share naturally varied with age, in part because men who enrolled at younger ages were also younger when observed in the preceding census. Among men who enrolled in ICS at age 25 or older, however, 86.5% held a gainful occupation in the preceding census, while only 3.2% were attending school. For these students, correspondence education provided a way to further their education while remaining employed.

3.3 Correspondence education reached places without schools

A third way in which correspondence education expanded educational access was by allowing students to study regardless of where they lived. Unlike formal schooling, which required access to a physical school, correspondence courses could reach students anywhere. Of the 13,803 distinct towns with at least one student in the ICS register, 9,864, or more than two-thirds, did not have a high school in 1900 according to the data compiled by Doxey et al. (2025). Overall, 40.8% of male ICS students lived in one of these towns.[13]

[13]Figure D.2 maps the location of towns with a high school in 1900 in the Doxey et al. (2025) data.

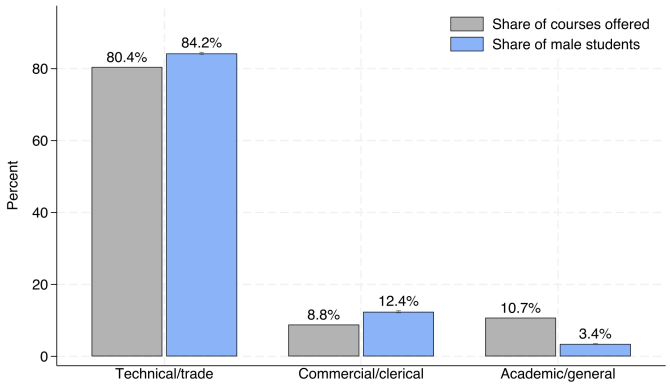
To document this pattern more systematically, in Appendix D.1.1 I compare correspondence-school enrollment trends in towns with and without a high school in 1900. The results show that after 1900, ICS enrollment growth slowed more in towns with a high school than in towns without one. This pattern is consistent with correspondence education playing a particularly important role where access to formal secondary schooling was limited.

3.4 Correspondence education offered technical training

Besides expanding access to individuals who were difficult to reach through formal schooling, correspondence education also filled a gap in the type of education available by offering technical training directly oriented toward particular trades and occupations.

The ICS course catalog and students' enrollment choices illustrate the predominance of technical training among both the supply and demand sides within ICS. Figure 3.3 shows the composition of courses offered by ICS and the share of male enrollments in each course track. Of the 373 distinct courses offered by ICS, 80.4% were technical or trade courses (such as mechanical drawing, electrical work, architecture, and engines), compared with 8.8% commercial courses (such as bookkeeping, business, stenography, and advertising), and 10.7% academic courses (such as English grammar and foreign languages). Demand similarly favored technical training, with 84% of men's first course enrollments being for technical courses.

Figure 3.3: ICS course catalog and enrollments



Notes: This figure compares the share of distinct courses ICS offered in each track with the share of male enrollments in that track. Of the 531 courses appearing in the register, 373 can be identified and classified by track (the 158 unclassified courses account for only 0.4 percent of enrollments).

The demand for technical training was also not confined to students with little formal schooling. Table D.1 reports course track by educational attainment recorded in the 1940 census, and shows that the share of students enrolling in technical courses is essentially flat across the schooling ladder. The high prevalence of technical enrollment even among students with

relatively high levels of formal schooling is consistent with correspondence education filling a curricular gap in the American education system.

To further examine the relationship between formal schooling and ICS, in Appendix D.1.2 I use the chapter on manual and industrial training in the "Report of the Commissioner of Education for the Year 1899–1900" (U.S. Bureau of Education, 1901) to classify towns with a high school in 1900 according to whether they also offered technical education at this time. I classify a town as having a technical option if its public schools taught manual training in the high-school grades or if it had a secondary-level manual, industrial, or trade school open to men. Only 116 towns offered such an option in 1900, illustrating how rare occupation-specific technical training was within the formal schooling system, even in places with a secondary school. Consistent with ICS filling this curricular gap, I find that after 1900, ICS enrollment growth slowed substantially more in towns with a technical option than in towns with an academic high school only, with the relative slowdown concentrated specifically in technical ICS courses.

4 Effects of correspondence education on occupational mobility

4.1 Strategy and identification

I study the effects of correspondence education on occupational mobility using an event-study framework centered on the year of men's first ICS enrollment, normalized to event time $\tau = 0$.[14] Specifically, I use data from the 1900 and 1910 census waves and assign each individual i, observed in census year t, an event time $\tau_{i,t} = t - \text{Year of First Enrollment}_i$. Thus, negative values of τ correspond to census observations before enrollment and positive values to observations after enrollment, with $\tau \in \{-T^-, -T^- + 1, \ldots, -1, 0, 1, \ldots, T^+\}$ spanning a window of T^- years before and T^+ years after enrollment.

Using these event times, I estimate the following specification:

$$Y_{i,t} = \sum_{\substack{\tau=-T^- \\ \tau \notin \{-1,0,1\}}}^{T^+} \beta_\tau \mathbb{1}\{\tau_{i,t} = \tau\} + \alpha_{c,t} + \theta X_{i,t} + \varepsilon_{i,t}, \tag{4.1}$$

[14] Although course completion might appear to provide a more natural reference point, the register does not report completion dates. Moreover, because correspondence courses were self-paced, completion times varied across students. Most courses were completed within six months to two years (International Correspondence Schools, 1943), however, making the year of enrollment a useful benchmark for the event study.

where $Y_{i,t}$ is an occupational outcome for individual i in census year t. I set $T^- = 6$ and $T^+ = 10$ and use $\tau = -2$ as the reference period. I exclude observations within one year of enrollment, $\tau \in \{-1, 0, 1\}$, because the register records only the calendar year in which a student enrolled in a course, rather than the month or exact date, and students sometimes began studying individual subjects with ICS before formally enrolling in a course. As a result, census observations close to enrollment cannot be cleanly classified as occurring before or after treatment.[15] The coefficients β_τ measure differences in occupational outcomes at each event time relative to the base period, $\tau = -2$. The specification includes county-by-census-year fixed effects ($\alpha_{c,t}$), which absorb differences in local labor-market conditions across counties and census years.[16] The vector $X_{i,t}$ includes controls for age, race, and ICS course subject (which follows ICS's own course categorization). Standard errors are clustered at the county level to account for regional heterogeneity in labor-market conditions and potential spatial correlation in the effects of correspondence education.[17]

This specification compares the occupational outcomes of ICS enrollees with similar demographic characteristics observed in the same county and census year but at different horizons relative to their first ICS enrollment. Identification relies on the assumption that, conditional on these controls and fixed effects, individuals observed at different enrollment horizons are comparable and would have followed similar occupational trajectories absent enrollment. The pre-enrollment coefficients provide a check on this assumption.

Two additional features of the design are important for interpreting the estimates. First, because the outcomes measure occupational advancement, the estimation sample is restricted to men who report a gainful occupation. In Section 4.4.1, I examine robustness to this restriction. Second, the estimation sample consists entirely of men who eventually enrolled in ICS, so variation comes from *when* an enrollee is observed relative to his enrollment date. This avoids comparing ICS students with individuals who never enrolled, and who may differ substantially from ICS students in unobservable ways, including ability and motivation. The cost, however, is that observations of students at different stages of treatment

[15] For example, some students in the register appear as enrolled in longer courses, but have already acquired certificates for the completion of single subjects. In Section 4.4.1, I show that the results are very similar when I include observations and event times within one year of enrollment in the analysis.

[16] Because county boundaries have changed over time in the US, I use the 1900 county definitions and link them to other years using the crosswalk developed by Eckert et al. (2020).

[17] I do not include individual fixed effects in this analysis because, with outcomes observed only in the 1900 and 1910 censuses, within-individual changes cannot identify the full annual event-time profile. The enrollee-only sample also lacks untreated observations in 1910, limiting the use of modern staggered-adoption estimators that construct counterfactual outcomes from untreated or not-yet-treated individuals (Sun and Abraham, 2021; Callaway and Sant'Anna, 2021; Borusyak et al., 2024). In Section 4.4.2, I explore an alternative specification that collapses event time into pre- and post-enrollment periods and introduces never-enrolled men as an untreated comparison group, allowing for individual fixed effects.

provide the comparison underlying the event-time coefficients. If the benefits of correspondence education continue accumulating after enrollment, these comparisons may attenuate estimated differences across event times (Goodman-Bacon, 2021). In Section 4.4.2, I examine robustness to introducing never-enrolled men as an untreated comparison group and using a difference-in-differences strategy.

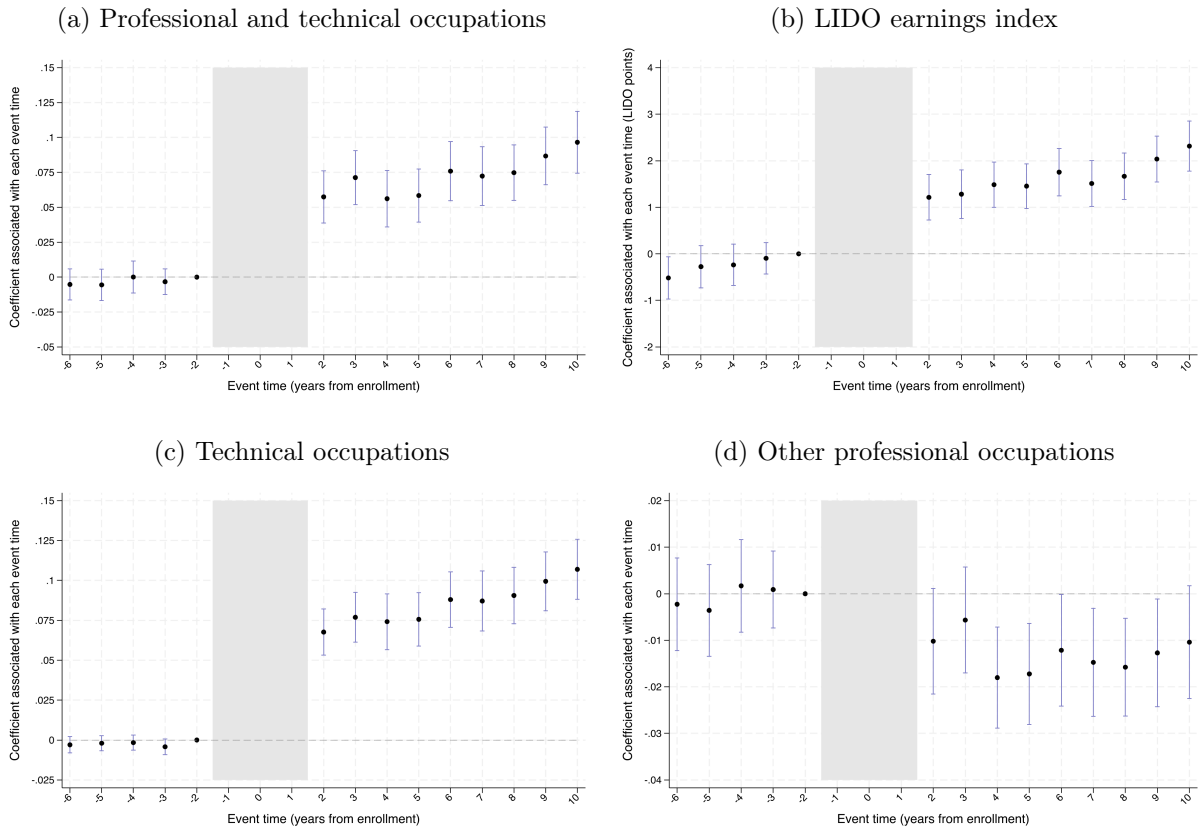
I consider four occupational outcomes constructed using the occupation codes in the census. The first and primary outcome is an indicator for employment in a professional or technical occupation. I then decompose this category into two groups: technical professional occupations closely related to the skills taught by ICS, including draftsmen, engineers, architects, chemists, designers, surveyors, and technicians; and all other professional occupations, including teachers, lawyers, physicians, and clergymen. Finally, I examine effects on the Lasso-adjusted Industry, Demographic, and Occupation (LIDO) earnings measure constructed by Saavedra and Twinam (2020). LIDO predicts earnings using occupation, industry, location, and demographic characteristics and therefore provides a continuous measure of occupational earnings that can capture changes not reflected in movement across broad occupational categories. Appendix E provides further details on these occupational outcomes.

4.2 Main results: Effects of correspondence education on occupational mobility

I present the event-study results in Figure 4.1. Figure 4.1a shows that correspondence education increased the probability of working in a professional or technical occupation by approximately 6 to 10 percentage points in the 2 to 10 years following enrollment. Similarly, Figure 4.1b shows that the LIDO earnings score increased by approximately 1–2.5 points over the same horizon, corresponding to a rise of roughly \$100–\$230 in predicted annual earnings in 1950 dollars. Together, these results indicate that correspondence education promoted upward occupational mobility in the early 20th century. Moreover, neither outcome exhibits evidence of differential trends prior to enrollment, supporting the identifying assumption that individuals observed at different enrollment horizons would have followed similar occupational trajectories absent enrollment.

Figures 4.1c and 4.1d decompose professional and technical occupations into technical occupations closely related to the skills taught by ICS and other professional occupations. The results reveal a striking difference across the two groups. The positive effect of correspondence education is concentrated entirely in technical professional occupations, while the estimated effect on other professional occupations is small and negative. Thus, correspondence students did not simply become more likely to enter professional employment generally. Instead, oc-

Figure 4.1: Effect of correspondence education on occupational outcomes



Notes: These figures plot the event-study estimates of the effects of correspondence education on occupational outcomes, corresponding to β_τ for $\tau \in \{-6, \ldots, -2, 2, \ldots, 10\}$ in Equation (4.1). Each coefficient captures the difference in the outcome at event time τ relative to the omitted period, $\tau = -2$. Outcomes are: (1) an indicator for employment in a professional or technical occupation; (2) the LIDO earnings score; (3) an indicator for employment in a technical occupation within the professional and technical category; and (4) an indicator for employment in all other professional occupations. The three event times immediately surrounding enrollment, $\tau \in \{-1, 0, +1\}$, are shaded and excluded from the estimation because treatment status within these periods is ambiguous. 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 2.2, and who had a gainful occupation. The figures report 95% confidence intervals constructed from standard errors clustered at the county level.

cupational gains were concentrated in the types of jobs correspondence courses were designed to prepare students for, suggesting that the effects operated through the specific skills taught by ICS. I return to this mechanism in Section 5.1, where I link individual courses to the specific occupations that required the skills they taught.

4.3 Aggregate magnitude: A back-of-the-envelope calculation

I next use the estimated effect on professional and technical employment to obtain a back-of-the-envelope estimate of the aggregate effect of ICS on occupational mobility.

Per the ICS register, 17.8% of students on ICS's rolls by 1907 met the progress threshold required for inclusion. Of those included, 92% were located in the U.S., and 95% of these were men. Given that cumulative ICS enrollment had reached 1.36 million worldwide by 1910, assuming similar shares implies roughly 212,000 U.S. male enrollees comparable to those in the estimation sample. Applying the estimated 6–10 percentage-point effect implies that ICS moved approximately 13,000–21,000 men into professional and technical occupations by 1910 who would not otherwise have entered them. These numbers correspond to 1.3–2.1% of the total number of professional and technical male workers in the U.S. in 1910, and are comparable in size to the entire population of a medium-sized city such as Raleigh, North Carolina, at the time.

4.4 Robustness of main results

I now assess the robustness of the main event-study results along two dimensions: the sample over which the estimates are computed and the empirical strategy used to obtain them.

4.4.1 Robustness to the sample used for estimation

I perform seven exercises to examine the robustness of the main event-study results to the sample used for estimation: (1) excluding men who enrolled in more than one course, so that every individual in the sample has a single enrollment date and no subsequent enrollment; (2) including observations within one year of enrollment, $\tau \in \{-1, 0, 1\}$; (3) including men without a gainful occupation; (4) excluding men residing in Pennsylvania, where ICS was headquartered; (5) excluding men residing in the South, which experienced markedly different patterns of schooling and migration over this period; (6) restricting the sample to men who lived in the same county in 1900 and 1910, to limit the role of migration; and (7) re-estimating the specification using only the 1900 census wave, which contains both pre- and post-enrollment observations (while the 1910 wave contains only post-enrollment observations).[18]

I present the results in Figure G.1, showing that the results remain qualitatively and quantitatively similar to baseline in all cases. For brevity, I focus on the main outcome, employment in professional and technical occupations.

[18]The limitation with this last exercise is that longer post-enrollment horizons necessarily correspond to very early ICS enrollment cohorts (1895 or before), when the school was still small, and therefore contain relatively few observations.

4.4.2 Robustness to the event-study specification

I next examine the robustness of the main results to the event-study specification by introducing never-enrolled men as an untreated comparison group. To do this, I first restrict ICS students to men who enrolled between 1901 and 1907, for whom the 1900 census provides a pre-enrollment observation and the 1910 census a post-enrollment observation. I then construct a comparison group from the 1900 census, sampling up to five never-enrolled men per ICS enrollee within cells defined by county, race, five-year age group, occupation, and industry (both at the 2-digit level), and trace these men to 1910 using the same Census Tree linkage procedure applied to ICS students. The never-enrolled men provide the counterfactual change in occupational outcomes against which the change among enrollees is measured. This design also addresses a structural feature of the event study: within each census year, comparisons across event times are comparisons across enrollment cohorts. Introducing never-enrolled men provides a contemporaneous untreated comparison group, though at the cost of relying on comparisons between enrollees and non-enrollees.

I estimate three specifications. First, I collapse the event study into a pre/post difference-in-differences specification with county-by-year, race, age-by-year, and baseline occupation and industry fixed effects. Second, I estimate this specification with individual and year fixed effects, comparing changes within each man across the two census waves. Third, I estimate the event-study analog of the first specification, assigning each comparison man the enrollment year of the student he is matched to, interacting event time with an indicator for appearing in the register, and using the same set of controls and fixed effects. This shows the difference between the two groups at each event time, including before enrollment, while allowing the estimated gains to differ across men with different lengths of exposure to ICS by 1910.[19]

The results of the first two exercises are reported in Figure 4.2a. The first column shows that correspondence education increased the probability of working in a professional or technical occupation by 2.77 percentage points after enrollment relative to the change for untreated men over the same period. Adding individual fixed effects similarly yields an estimated effect of 2.81 percentage points. Thus, specifications that introduce never-enrolled men as a comparison group continue to indicate that correspondence education promoted upward

[19] As in the main event study, this third specification cannot include individual fixed effects: with two census waves, which leave only each man's single change between 1900 and 1910, we cannot recover a full profile across event times. More generally, because all treated men move from untreated in 1900 to treated in 1910, these analyses have a standard two-period difference-in-differences structure. Modern staggered-adoption estimators are therefore not needed to eliminate comparisons between newly treated and already-treated individuals, since such comparisons do not occur in this setting (Sun and Abraham, 2021; Callaway and Sant'Anna, 2021; Borusyak et al., 2024).

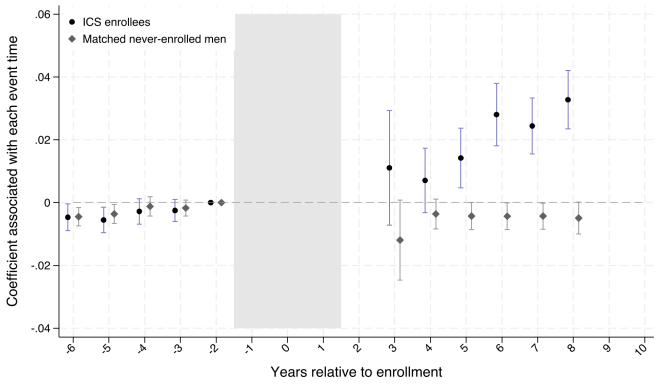
occupational mobility, although the estimated effects are smaller than in the main specification, which estimated effects of 6–10 percentage points. This difference may reflect shorter average post-enrollment exposure in the matched sample, as well as remaining differences in occupational trajectories between ICS enrollees and never-enrolled men, who provide an imperfect counterfactual despite being matched on observable characteristics.

Figure 4.2: Effects of correspondence education on occupational outcomes, using DiD design with never-enrolled men

(a) Pooled DiD estimates

	(1)	(2)
ICS Enrollee × Post	0.028***	0.028***
	(0.002)	(0.002)
Observations	132,176	132,286
County × year FE	Yes	
Race and age FE	Yes	
Baseline occ. and ind. FE	Yes	
Individual FE		Yes
Year FE	Yes	Yes

(b) Event-time profiles of enrollees and matched men



Notes: These estimates compare men in the ICS register with never-enrolled men (namely, men not appearing in the ICS register) across the 1900 and 1910 censuses. The outcome is an indicator for employment in a professional or technical occupation. Panel (a) reports the coefficient on the interaction of appearance in the register with the 1910 census: column (1) absorbs county-by-year, race, age-by-year and baseline 1900 occupation and industry (both 2-digit level) fixed effects, and column (2) absorbs individual and year fixed effects. Panel (b) plots event-time coefficients, with $\tau = -2$ as the base period, estimated separately for ICS enrollees and for comparison men with county, race, age, and baseline occupation and industry fixed effects; each comparison man is assigned the enrollment year of the student he is matched to. The sample consists of men from the "Register of International Correspondence Schools" who first enrolled between 1901 and 1907, together with never-enrolled men drawn from the 1900 census and sampled within cells defined by county, race, five-year age group, and 1900 occupation and industry (both 2-digit level). Men must be observed in both 1900 and 1910, and have a gainful occupation in both waves. Observations at $\tau \in \{-1, 0, +1\}$ are excluded for both groups, as in Equation (4.1). Standard errors are clustered at the county level; ***p<0.01, **p<0.05, *p<0.1.

Figure 4.2b then plots the event-time profiles of enrollees and of their matched comparison men. Before enrollment the two groups move together. After enrollment, enrollees pull away while comparison men remain flat: the gap rises from 1–2 percentage points three to four years after enrollment to 3.7 percentage points at eight years. This reproduces the increasing profile in Figure 4.1.

5 Mechanisms: How did correspondence education promote occupational mobility?

I next examine the mechanisms underlying the occupational gains from correspondence education.

5.1 Course content and target occupations

I first return to the concentration of gains in technical occupations documented in Figure 4.1 and ask whether students entered occupations that used the skills taught in their own courses. To do this, I group ICS courses into 21 families of related subjects and identify the occupations targeted by each family. Appendix F reports the mapping from individual courses to course families and target occupations and explains how these classifications are constructed. The target occupation sets are mutually exclusive across course families.

To increase power, I collapse event time into pre- and post-enrollment periods, and estimate a simplified version of the event study separately for each combination of course family and occupation group. Specifically, for each course family f and occupation group associated with family g, I estimate

$$Y_{i,t}^{g} = \gamma_{fg}\, \mathbb{1}\{\tau_{i,t} \geq 0\} + \alpha_{c,t} + \theta X_{i,t} + \varepsilon_{i,t} \tag{5.1}$$

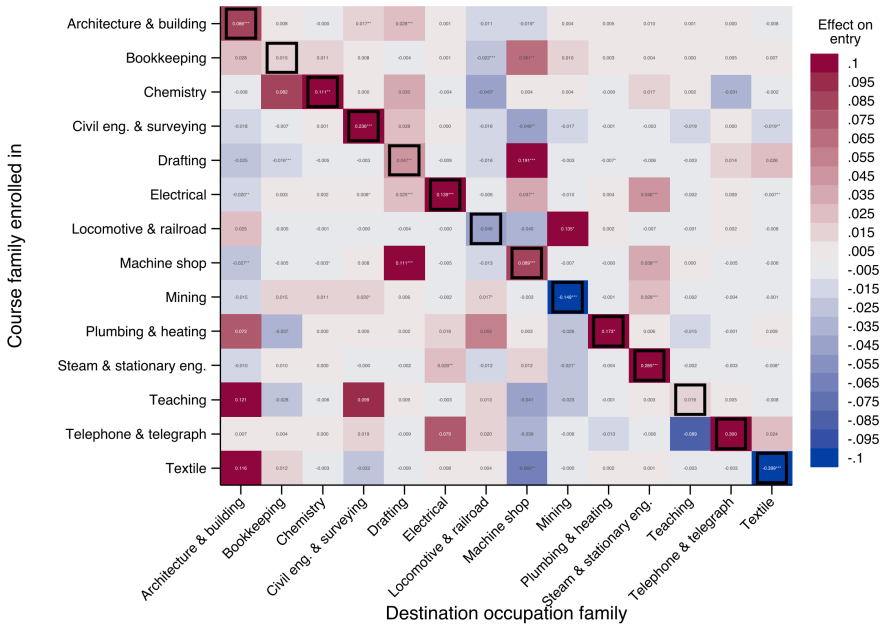
on the sample of men whose first course belonged to course family f. The outcome $Y_{i,t}^{g}$ equals one if individual i works in an occupation associated with course family g in census year t, and zero if he holds any other gainful occupation. Similar to Equation (4.1), $\alpha_{c,t}$ are county-by-census-year fixed effects, $X_{i,t}$ includes age and race controls, and standard errors are clustered by county. The coefficient γ_{fg} measures the difference in the probability of working in occupation group g after versus before enrollment among men enrolled in a family-f course.

Figure 5.1 presents a heatmap of the resulting coefficients, with course family on the vertical axis and occupation group on the horizontal axis. The cells on the diagonal capture changes in the probability of working in occupations targeted by the course a student actually took, while the remaining cells capture changes in occupations targeted by other course families. The contrast is stark. Enrollment increases the probability of working in one's own course-targeted occupations by an average of 6.5 percentage points, compared with only 0.43 percentage points across the off-diagonal course-occupation combinations.[20] Thus, the effect

[20] Mining and textiles are the main exceptions: men enrolled in mining or textile courses become significantly

on occupations targeted by a student's own course is roughly 15 times as large as the average effect on occupations targeted by other courses. This concentration of occupational gains in the specific occupations for which students trained is difficult to explain by general ability, motivation, or broad labor-demand shocks.

Figure 5.1: Course family and target occupation



Notes: This figure plots the estimated coefficients $\hat{\gamma}_{fg}$ from Equation (5.1) for each combination of course family f and occupation group g. Rows correspond to the course family of a student's first ICS course, and columns to the occupations targeted by each course family. 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 2.2, and who had a gainful occupation. The analysis is estimated for the course families that have a target occupation set and at least 800 person-year observations in the estimation sample. Standard errors are clustered at the county level.

There are two main concerns with this analysis. First, some men may have enrolled for additional training in occupations they already held. Second, others may already have been on a career path leading to their target occupation. For example, a machinist's helper might later become a machinist even without ICS training. To address these concerns, I pool students across course families and define a single outcome indicating whether each man works in an occupation targeted by his first ICS course. I estimate

$$Y_{i,t}^{Own} = \delta \, \mathbb{1}\{\tau_{i,t} \geq 0\} + \alpha_{c,t} + \theta X_{i,t} + \varepsilon_{i,t}, \tag{5.2}$$

where $Y_{i,t}^{Own}$ equals one if, in census year t, individual i works in an occupation associated

less likely to work in related occupations.

with the course family of his first ICS enrollment, and zero if he holds any other gainful occupation. The remaining controls and fixed effects are defined as in Equation (5.1), with the addition of ICS course subject (which can be included here because the specification pools course families).

I consider five alternative samples. First, I use the full sample. Second, I exclude men observed working in an occupation targeted by their ICS course before enrolling, so that the estimate reflects entry rather than incumbency. Third, I restrict to men observed in both censuses and add individual fixed effects, so that the effect is identified from occupational change within the same man. Fourth, I exclude men who, prior to enrollment, are observed working in an industry associated with their course family's target occupations or in any ICS-targeted occupation.[21] Fifth, I combine this last restriction with individual fixed effects.

Table 5.1 reports the results. Across all five specifications, enrollment increases the probability of working in an occupation targeted by a student's own course by 12–23 percentage points. The gains persist among men who were neither already in a target occupation nor working in an associated industry before enrollment. They also persist when identification comes from occupational change within the same individual.

Table 5.1: Effect of correspondence education on employment in course-targeted occupations

	(1)	(2)	(3)	(4)	(5)
Post-enrollment	0.128***	0.234***	0.116***	0.212***	0.141***
	(0.008)	(0.008)	(0.012)	(0.009)	(0.016)
Sample	All enrollees	Not already in own target occ	Observed in both censuses	Not in industries of target occ and all target occs	(4) + observed in both censuses
County × census year FE	Yes	Yes	Yes	Yes	Yes
Demographic FE	Yes	Yes	—	Yes	—
Individual FE	No	No	Yes	No	Yes
Observations	72,906	69,909	34,864	46,713	10,854

Notes: This table presents the results from Equation (5.2). 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 2.2, and who had a gainful occupation. Column (1) imposes no sample restriction. Column (2) excludes men who worked in an occupation targeted by their ICS course before enrolling. Column (3) restricts to men observed in both censuses and includes individual fixed effects. Column (4) excludes men who, prior to enrollment, worked in any ICS-targeted occupation or in an industry associated with their course family's target occupations. Column (5) combines the restrictions in column (4) with individual fixed effects. Demographic fixed effects include age, race, and ICS course subject. Standard errors clustered at the county level are reported in parentheses. ***p<0.01, **p<0.05, *p<0.1.

I perform two additional exercises. First, I repeat the analysis using the difference-in-

[21] For each course family, associated industries are defined as any `ind1950` codes observed among men working in that family's target occupations in 1900 or 1910.

differences design with the never-enrolled comparison group described in Section 4.4.2 to examine whether ICS students were more likely than comparable never-enrolled men to enter occupations targeted by their own courses. Figure H.1a shows that enrollment increases the probability of working in occupations targeted by students' own courses by 11.3 percentage points relative to never-enrolled men, while the estimated effect on occupations targeted by other course families is 0.68 percentage points and is not statistically distinguishable from zero. The pattern of gains across course families, shown in Figure H.1b, is also similar to the main results. Further details are provided in Appendix H.

Second, in Appendix I, I examine whether occupational gains varied with the intensity of training within course families. Using the number of subjects in a course and course price as alternative proxies for training intensity, I find that longer and more expensive courses were associated with larger occupational gains.

Taken together, these results suggest that the occupational gains of correspondence education reflect the acquisition of occupation-specific skills.

5.2 Who gained most? Access constraints and local conditions

I next examine how the occupational effects of correspondence education varied with students' characteristics and with the schooling and labor-market environment in which they lived.

5.2.1 Age and education

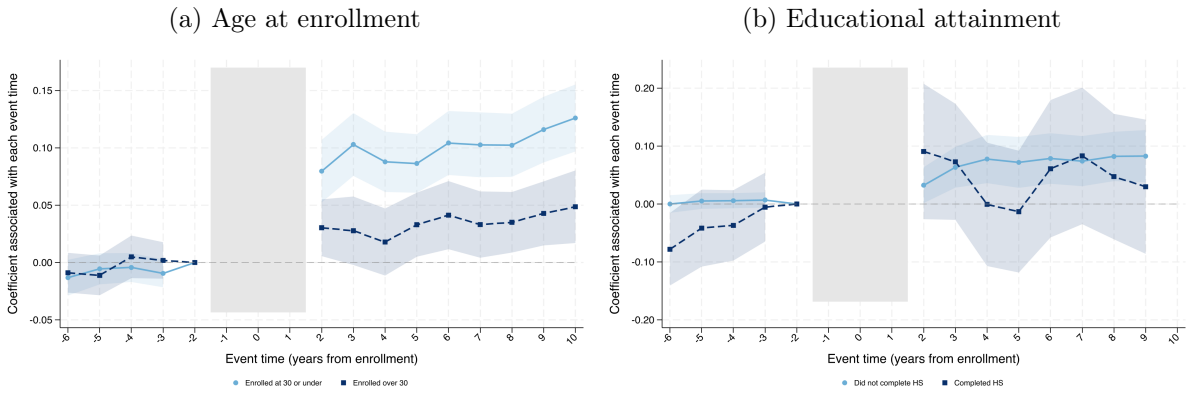
In Section 3, I showed that ICS reached men beyond conventional school ages and those with limited formal schooling. To examine how occupational gains varied along these dimensions, I repeat the event-study analysis in Equation (4.1), splitting the sample by age at enrollment and educational attainment. For the latter analysis, I restrict the sample to men who enrolled at age 21 or older, who were more likely to have completed their formal schooling before ICS enrollment.

Figure 5.2a first compares students who enrolled before age 30 with those who enrolled at age 30 or older, and shows positive occupational gains for both. The gains are substantially larger, however, for younger enrollees. The probability of professional or technical employment increased by approximately 8–13 percentage points in the post-enrollment period among men who enrolled before age 30, compared with 2–5 percentage points among those who enrolled at age 30 or older. Thus, although the flexible structure of correspondence education allowed ICS to reach individuals well beyond conventional school ages, the occupational returns

were larger for workers earlier in their careers, when there may have been greater scope for occupational mobility and longer horizons over which to use the skills acquired.

Figure 5.2b reports the results by educational attainment using the sample of men whose schooling can be recovered from the 1940 census. Although the estimates are relatively noisy, the clearest occupational gains are among men who did not complete high school. For these men, correspondence education raised the probability of professional or technical employment by 3.2–8.3 percentage points over the post-enrollment period. In contrast, the estimates for men who completed high school are not statistically distinguishable from zero. This pattern is consistent with ICS generating larger gains for men with more limited access to formal education.

Figure 5.2: Effect of correspondence education on professional and technical occupations by age and educational level



Notes: These figures plot the event-study estimates of the impact of correspondence education on the probability of working in a professional or technical occupation, corresponding to β_τ for $\tau \in \{-6, \ldots, -2, 2, \ldots, 10\}$ in Equation (4.1), estimated separately for each subgroup. Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -2$, on an indicator variable for this occupational category. Panel (a) splits men by age at first enrollment. Panel (b) splits men by whether they completed high school, and restricts to men who first enrolled at 21 or older. The three event times immediately surrounding enrollment, $\tau \in \{-1, 0, +1\}$, are shaded and excluded from the estimation because treatment status within these periods is ambiguous. 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 2.2, who had a gainful occupation, and, for panel (b) whose schooling is recovered from the 1940 census. The figures report 95% confidence intervals constructed from standard errors clustered at the county level.

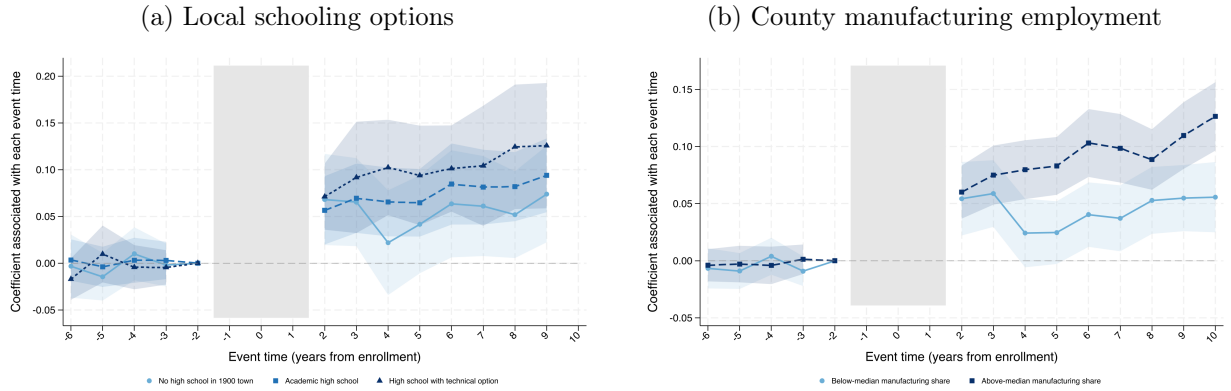
5.2.2 Local schooling and economic context

Finally, I examine whether the occupational effects of correspondence education varied with the local environment in which students lived. I consider two dimensions: the schooling options available locally and the extent to which local labor markets offered opportunities to

use technical skills.[22]

First, I repeat the event-study analysis in Equation (4.1), splitting the sample across towns according to the schooling options available in 1900, using the classification in Appendix D.1.2: towns without a high school, towns with an academic high school only, and towns with a technical option. Panel (a) of Figure 5.3 shows positive occupational gains of similar magnitude across all three groups, and a joint test does not reject equality of the post-enrollment effects. Thus, although ICS enrollment growth slowed more after 1900 in towns with a technical option at this time, the occupational gains among those who enrolled do not display the same pattern.

Figure 5.3: Effect of correspondence education by local schooling and economic context



Notes: This figure plots the event-study estimates of the impact of correspondence education on the probability of working in a professional or technical occupation, corresponding to β_τ for $\tau \in \{-6, \ldots, -2, 2, \ldots, 10\}$ in Equation (4.1). Panel (a) estimates the effects separately for men living in 1900 in towns with no high school, with an academic high school only, and with a technical option, classified as described in Appendix D.1.2. Panel (b) estimates the effects separately for men living in counties with above- and below-median shares of employment in manufacturing in 1900. Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -2$, on an indicator for working in a professional or technical occupation. The three event times immediately surrounding enrollment, $\tau \in \{-1, 0, +1\}$, are shaded and excluded from the estimation because treatment status within these periods is ambiguous. 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 2.2, and who had a gainful occupation. Men whose 1900 town cannot be matched to the high-school data are excluded from panel (a). The figure reports 95% confidence intervals constructed from standard errors clustered at the county level.

I next split the sample between counties with above- and below-median shares of employment in manufacturing in 1900. Panel (b) shows that the occupational effects are positive

[22]Both measures are assigned according to where the census records the man living. For men who first enrolled in 1901 or later, this is their 1900 county and town and therefore precedes enrollment. For men who enrolled between 1891 and 1900, no pre-enrollment observation exists because the 1890 census was destroyed, so the county is measured contemporaneously in each census year and the town is taken from the 1900 census, after enrollment. These earlier cohorts are retained because they identify the longer event-time horizons, so the resulting heterogeneity analysis should be interpreted as suggestive.

in both groups, but larger in counties with above-median manufacturing employment. The probability of professional or technical employment increased by approximately 6–13 percentage points in the post-enrollment period among men in these counties, compared with 2–6 percentage points among those in below-median counties.[23]

Taken together, these results suggest that the occupational gains of ICS vary little with local schooling options, but are larger where there were more opportunities to use the technical skills provided.

6 Conclusions

This paper documents correspondence education as a large but understudied pathway to human capital acquisition in early 20th-century America. Using newly digitized records from the International Correspondence Schools linked to census data, I show that correspondence education expanded educational opportunity along two margins: by reaching individuals poorly served by conventional schooling because of age, employment, or location, and by supplying occupation-specific technical training that formal schools largely lacked. Enrollment increased the probability of working in a professional or technical occupation by 6–10 percentage points within two to ten years. A back-of-the-envelope calculation implies that ICS moved approximately 13,000–21,000 men into professional and technical occupations by 1910, equivalent to 1.3–2.1% of the total male professional and technical workforce in that year. Occupational gains were concentrated in the occupations targeted by students' own courses, pointing to the acquisition of occupation-specific skills as a key mechanism.

This paper contributes to our understanding of how nontraditional educational models, often overlooked in historical work, can shape labor-market outcomes and interact with formal schooling systems. In particular, the analysis shows that alternative educational models can complement formal schooling by relaxing the constraints on who can participate, and by supplying forms of human capital that existing institutions lack. These insights are also relevant for contemporary discussions of remote learning. Flexible and remote options may be especially valuable when they expand access for students poorly served by traditional settings rather than simply substituting for existing forms of education.

[23] The larger gains in more industrial counties are not driven by migration. In Appendix J, I show that ICS students were only slightly more likely than matched never-enrolled men to move across counties, although those who moved tended to move to more industrial counties. The event-study estimates are essentially unchanged when county movers are excluded (Figure G.1, panel (f)), and the difference-in-differences estimates are similarly robust when restricting both enrolled and never-enrolled men to those who remained in their 1900 county (Table J.2).

The paper leaves several questions for future research. First, the remarkable rise of ICS remains an open question. This paper highlights several contributing factors, including ICS's occupational focus, flexible structure, nationwide accessibility, advertising, and the uneven availability of formal schooling. Understanding their relative importance would shed light on the conditions under which alternative educational models can scale. Second, while the analysis focuses on worker-level outcomes, correspondence education may also have shaped employer behavior through changes in the supply of skilled labor. These responses may have influenced technological adoption, firm structure, and hiring practices. Studying these firm-level responses would provide a broader account of the aggregate consequences of correspondence education.

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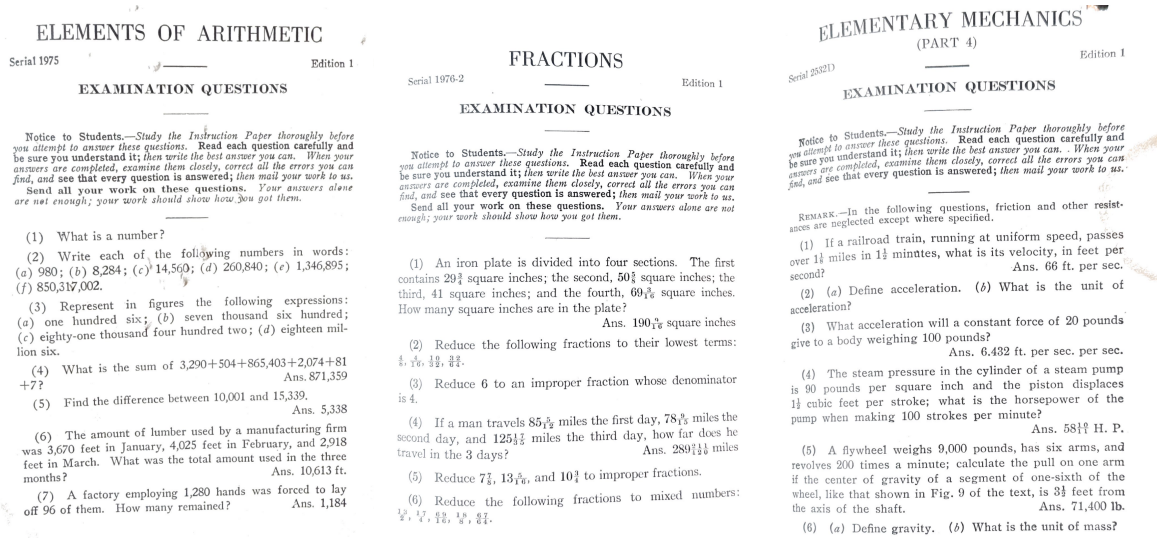
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A Historical background

Figure A.1: Sample exam questions from ICS courses on arithmetic, fractions, and elementary mechanics



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

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. $190\frac{5}{16}$ square inches

(2) Reduce the following fractions to their lowest terms: $\frac{4}{8}$, $\frac{4}{16}$, $\frac{30}{32}$, $\frac{32}{64}$.

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

(4) If a man travels $85\frac{5}{32}$ miles the first day, $78\frac{3}{16}$ miles the second day, and $125\frac{17}{32}$ miles the third day, how far does he travel in the 3 days? Ans. $289\frac{11}{16}$ miles

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

(6) Reduce the following fractions to mixed numbers: $\frac{13}{2}$, $\frac{17}{4}$, $\frac{69}{16}$, $\frac{19}{8}$, $\frac{67}{64}$.

ELEMENTARY MECHANICS

(PART 4)

Serial 2532(1) — 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 mile 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?

Notes: These figures show examination questions from ICS course booklets on arithmetic, fractions, and elementary mechanics. Sources: ICS course booklets from 1975, 1976, and 1937, respectively.

B Data

B.1 Register of correspondence school participants

I digitize the 1908 edition of the "Register of International Correspondence Schools," using Amazon Textract OCR application, supplemented with manual verification.

This register lists students who had made sufficient progress on their ICS coursework by August 1907. Specifically, for technical courses, students were required to have completed at least one technical subject, or ten drawing plates for courses involving drawing. For non-technical courses, they were required to have completed approximately one-third of the course. The register excludes students who made insufficient progress, enrolled only in single subjects, or requested not to be listed. In total, the register contains 107,239 student listings worldwide. ICS reported that 601,800 students had enrolled by this date, excluding single-subject enrollees and those who opted out of the register, implying that 17.82% had made sufficient progress to be included.

In the register, and as Figure 2.1a shows, for towns with more than ten students, such as Auburn and Augusta in Maine, 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.

B.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.

B.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.

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.[24] 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.[25]

The algorithm assigns a matching score based on the similarity of selected variables. Agreement on the last name adds 15 points, on the middle initial 3, and on town 5, while disagreement subtracts 5, 1, and 1 respectively, so scores range up to 23. I accept a link only if it is the highest-scoring candidate for that student, and its score is at least 17, which in practice requires agreement on the last name together with agreement on at least one of the two remaining variables. Matching is one-to-one on both sides, so no census record is assigned to more than one student, and students for whom the two passes return conflicting assignments are discarded. For students still unmatched after these two passes, I apply the same procedure using the 1900 census.

As a measure of match quality, I compare the birth years implied by men's reported ages

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

[25] 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.

in the two censuses: for 91.7% of the 49,589 men matched to both, the implied birth years agree to within two years.[26]

B.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. Furthermore, for some additional analyses, I extend the panel to follow individuals through 1940 as this was the first census that recorded educational attainment.

[26]Since age is frequently misreported in this period, this figure understates the share of correct links.

B.2.3 Match balance

Table B.1: Comparison between register students matched and not matched to the census

	Matched	Not matched	Normalized difference
Panel A. Men			
Year of first enrollment	1902.16	1902.41	-0.090
Course completion			
Subjects recorded, first course	7.190	7.318	-0.019
Earned a diploma	0.103	0.106	-0.009
Earned a certificate	0.019	0.016	+0.023
More than one enrollment	0.019	0.015	+0.030
Region (share)			
Northeast	0.465	0.370	+0.195
Midwest	0.336	0.369	-0.069
South	0.097	0.112	-0.050
West	0.102	0.149	-0.143
Panel B. Women			
Year of first enrollment	1902.86	1902.97	-0.050
Course completion			
Subjects recorded, first course	3.835	3.980	-0.051
Earned a diploma	0.069	0.066	+0.015
Earned a certificate	0.001	0.004	-0.058
More than one enrollment	0.003	0.003	-0.010
Region (share)			
Northeast	0.523	0.406	+0.236
Midwest	0.327	0.379	-0.110
South	0.076	0.099	-0.082
West	0.075	0.116	-0.141

Notes: This table compares students in the "Register of International Correspondence Schools" who could be matched to a census record against those who could not, on the variables the register records. A student is counted as matched if he or she appears in the 1900 or 1910 census, using the procedure described in Section 2.2. The final column reports the difference in means divided by the pooled standard deviation (normalized difference).

C Neighbor exposure and the diffusion of correspondence education

This appendix provides suggestive evidence that information about correspondence education diffused locally through existing students.

To show this, I first estimate whether having a male neighbor on the same street who had enrolled in correspondence school by 1900 increased a man's likelihood of enrolling after 1900,

controlling for neighborhood (enumeration district) fixed effects.[27] I then restrict the sample to men with at least one such neighbor and examine whether the likelihood of enrollment varies with proximity, comparing men who lived very close to an existing correspondence student with those who lived farther away on the same street. This provides additional evidence on the local diffusion of correspondence education through word of mouth, under the assumption that individuals were more likely to learn about correspondence schools from neighbors who lived nearby.

Formally, for each man i observed in 1900, I define $I_{i,c\leq 1900}$ as an indicator equal to one if at least one other man living in a different household on the same street had enrolled in ICS by 1900. For men with $I_{i,c\leq 1900} = 1$, I construct an additional variable $N_{i,c\leq 1900}$ measuring distance to the nearest such neighbor based on the order of enumeration along the street. For example, if the nearest treated neighbor lived next door, then $N_{i,c\leq 1900} = 1$; if he lived two doors away, then $N_{i,c\leq 1900} = 2$; and so on.

I then estimate the following two specifications:

$$C_{i,c>1900} = \xi I_{i,c\leq 1900} + \alpha_{ed} + \theta X_i + \varepsilon_i, \tag{C.1}$$

and, for individuals with at least one treated neighbor on their street ($I_{i,c\leq 1900} = 1$):

$$C_{i,c>1900} = \xi_1 \mathbb{1}\{N_{i,c\leq 1900} \in B_1\} + \alpha_{ed} + \theta X_i + \varepsilon_i. \tag{C.2}$$

$C_{i,c>1900}$ is an indicator for whether man i enrolled in correspondence school after 1900. In Equation (C.1), the coefficient ξ captures the difference in subsequent enrollment between men with and without a neighbor on the same street who had enrolled by 1900. In Equation (C.2), I allow the relationship to vary with proximity by grouping $N_{i,c\leq 1900}$ into two distance bins, where $B_1 = \{1, 2, 3\}$ and $B_2 = \{4+\}$. The coefficient ξ_1 captures the difference in subsequent enrollment between men whose nearest treated neighbor lived within one to three houses and those whose nearest treated neighbor lived four or more houses away. Both specifications include neighborhood (enumeration district) fixed effects (α_{ed}) and controls X_i for age, race, and literacy. Standard errors are clustered at the enumeration district level. Men who had themselves enrolled by 1900 are excluded from the analysis.

I present the results in Table C.1. Having a male neighbor on the same street who had enrolled by 1900 increases the probability of subsequently enrolling in correspondence school. Moreover, this relationship is concentrated among close neighbors: men living within one to

[27] Although precisely defining neighborhoods in census data is challenging, enumeration districts are commonly used for this purpose, as they were designed so that an enumerator could cover all households within the district in roughly two weeks in urban areas and four weeks in rural areas, making them a reasonable proxy for relatively small neighborhood units.

three houses of an existing correspondence student were more likely to enroll subsequently than those whose nearest treated neighbor lived four or more houses away. This pattern is consistent with word of mouth complementing ICS's extensive advertising efforts in spreading information about correspondence education and attracting new students.

Table C.1: Correspondence school enrollment and neighbor exposure

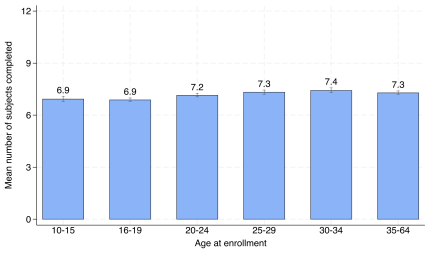
	Correspondence school enrollment after 1900	
Has treated neighbor	0.00013*	
	(0.00007)	
Nearest treated neighbor is 1–3 doors away		0.00067***
		(0.00017)
Sample	All	With treated neighbor
Observations	29,143,488	2,307,192
Neighborhood FE	Yes	Yes
Demographic controls	Yes	Yes
Cluster	Neighborhood	Neighborhood

Notes: This table presents the results from Equations (C.1) and (C.2). The analysis uses men observed in the 1900 census who had not themselves enrolled in ICS by 1900. Column (1) estimates the relationship between enrollment after 1900 and living on a street where at least one man in another household had enrolled in ICS by 1900. Column (2) restricts the sample to men with at least one such neighbor and compares those whose nearest one lived within one to three doors with those whose nearest lived four or more doors away, the omitted category. Correspondence school enrollment is identified using the "Register of International Correspondence Schools" and the matching procedure described in Section 2.2. Standard errors clustered at the enumeration district level are reported in parentheses. ***p<0.01, **p<0.05, *p<0.1.

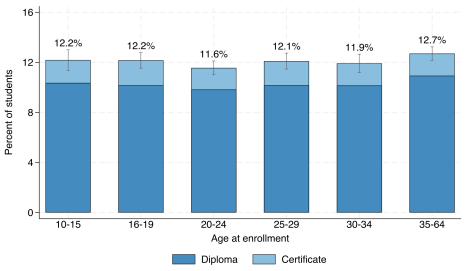
D Additional descriptive results

Figure D.1: Course progress, completion, and course track by age at enrollment

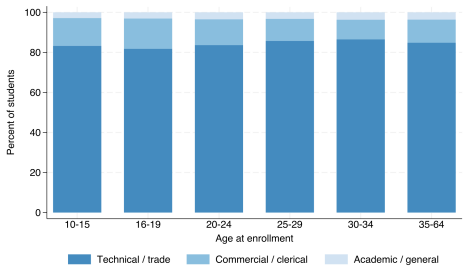
(a) Subjects per student



(b) Credential receipt

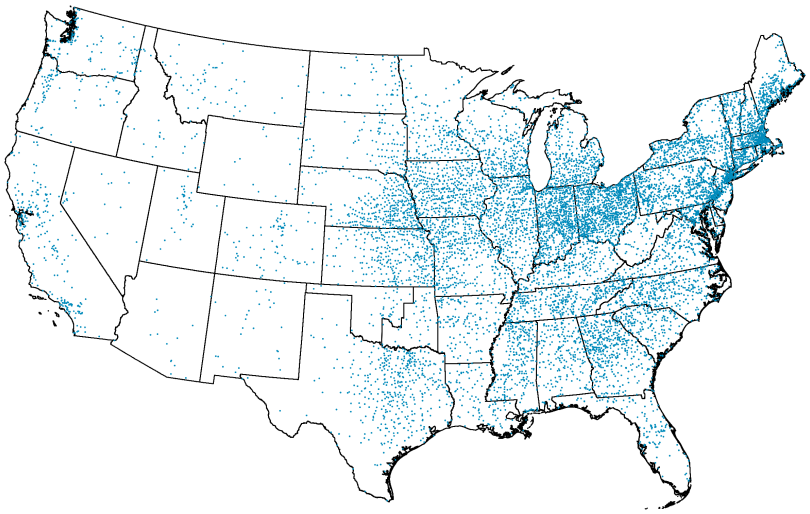


(c) Course track



Notes: These figures show the mean number of subjects a student enrolled in, the percentage earning a diploma or a certificate, and the share of students in each course track. All three panels use one observation per student, taken from the first course in which they enrolled, and are plotted by age at first enrollment. All panels cover men in the "Register of International Correspondence Schools.'

Figure D.2: 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 D.1: Course track by schooling attainment

Highest grade attained	Technical/ trade	Commercial/ clerical	Academic/ general
Grade 5 or less	85.4	11.8	2.8
Grades 6–8	84.1	12.5	3.4
Grades 9–11	81.3	15.5	3.2
Grade 12	82.6	13.8	3.6
Some college	83.6	13.5	3.0
College graduate+	83.2	12.3	4.5

Notes: This table reports the share of men enrolling in different course tracks by the highest grade they attained. Shares sum to 100 within each row. Course track refers to the student's first enrollment, and each student contributes one observation. The sample encompasses male students from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 2.2, and whose schooling is recovered from the 1940 census.

D.1 High school presence, technical education, and ICS enrollment

In this appendix, I examine whether the growth of correspondence school enrollment differed between towns with and without a high school in 1900 and, among towns with a high school, by whether the town also offered technical education.

D.1.1 High school presence and ICS enrollment

First, using the enrollment years and town locations recorded in the ICS register, I construct annual town-level counts of ICS students from 1891 to 1907. I then examine whether the difference in enrollment growth between towns with and without a high school in 1900 changed after 1900. Information on high-school locations comes from Doxey et al. (2025). I estimate the following specification:

$$\Delta \ln E_{v,t} = \psi_{HS,post} \left(HS_{v,1900} \times Post1900_t \right) + \alpha_v + \alpha_{c,t} + \varepsilon_{v,t}, \tag{D.1}$$

where $\Delta \ln E_{v,t} = \ln E_{v,t} - \ln E_{v,t-1}$ is the log change in correspondence school enrollment in town v, located in county c, from year $t-1$ to t; $HS_{v,1900}$ is an indicator for whether town v had a high school by 1900; and $Post1900_t$ is an indicator for years after 1900. The coefficient $\psi_{HS,post}$ captures how the difference in enrollment growth between towns with and without a high school changed after 1900. The specification includes town fixed effects (α_v), which absorb time-invariant differences across towns, and county-by-year fixed effects ($\alpha_{c,t}$), which absorb shocks and trends common to towns within the same county in a given year. Standard errors are clustered at the county level.

Table D.2 presents the results, and shows that the difference in annual enrollment growth between towns with and without a high school fell by approximately 0.14 log points after 1900, relative to the period before 1900.

Table D.2: Correspondence school enrollment and high school availability

	Log change in yearly correspondence school enrollment (1892–1907)
High school present in 1900 × Post 1900	-0.143***
	(0.045)
Observations	7,311
Town FE	Yes
County × Year of Enrollment FE	Yes
Cluster	County

Notes: This table presents the results from Equation (D.1). The analysis uses town-level correspondence school enrollment counts from 1891–1907 constructed from the "Register of International Correspondence Schools," matched to high-school presence in 1900 from Doxey et al. (2025). The estimation sample includes only town-year observations with positive enrollment in both the current and preceding year, as required to compute log changes. Standard errors clustered at the county level are reported in parentheses. ***p<0.01, **p<0.05, *p<0.1.

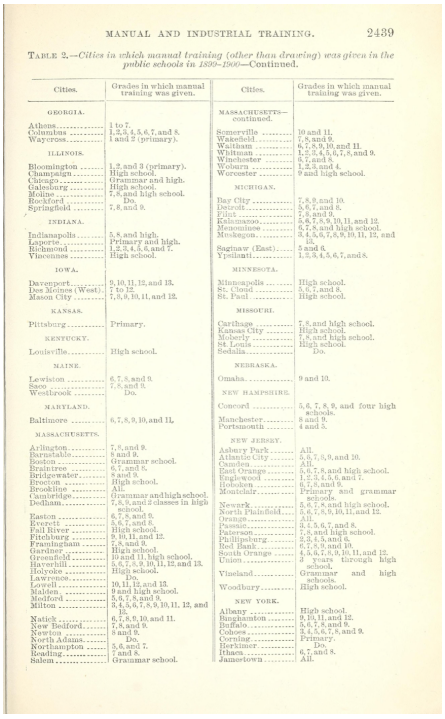
D.1.2 Technical education and ICS enrollment

I next extend the previous exercise to examine whether the post-1900 change in ICS enrollment growth depended on whether each town offered technical education.

To classify towns, I use the chapter on manual and industrial training in the "Report of the Commissioner of Education for the Year 1899–1900" (U.S. Bureau of Education, 1901).[28] The chapter provides two lists. The first names cities with populations of 8,000 or more whose public schools offered manual training in 1899–1900, together with the grades in which it was given. The second is a census of manual and industrial training schools in the country, whether public or private, which reports each school's location, the level of its academic instruction (elementary, secondary, or collegiate), and its pupils by sex. Figure D.3 shows example pages from both.

Figure D.3: Sample pages from the chapter on manual and industrial training, *Report of the Commissioner of Education for the Year 1899–1900*

(a) Cities with manual training in the public schools

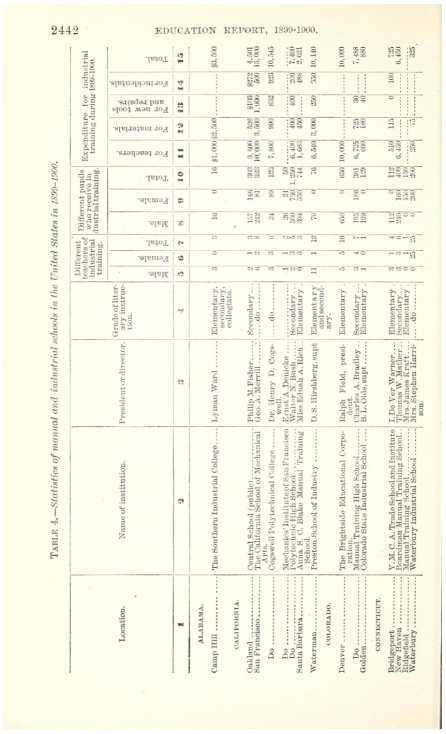


MANUAL AND INDUSTRIAL TRAINING. 2439

TABLE 2.—*Cities in which manual training (other than drawing) was given in the public schools in 1899–1900*—Continued.

Cities.	Grades in which manual training was given.
GEORGIA.	
Athens	1 to 7.
Columbus	1, 2, 3, 4, 5, 6, 7, and 8.
Waycross	1 and 2 (primary).
ILLINOIS.	
Bloomington	1, 2, and 3 (primary).
Champaign	High school.
Chicago	Grammar and high.
Galesburg	High school.
Moline	7, 8, and high school.
Rockford	Do.
Springfield	7, 8, and 9.
INDIANA.	
Indianapolis	5, 8, and high.
Laporte	Primary and high.
Richmond	1, 2, 3, 4, 5, 6, and 7.
Vincennes	High school.
IOWA.	
Davenport	9, 10, 11, 12, and 13.
Des Moines (West)	7 to 12.
Mason City	7, 8, 9, 10, 11, and 12.
KANSAS.	
Pittsburg	Primary.
KENTUCKY.	
Louisville	High school.
MAINE.	
Lewiston	6, 7, 8, and 9.
Saco	7, 8, and 9.
Westbrook	Do.
MARYLAND.	
Baltimore	6, 7, 8, 9, 10, and 11.
MASSACHUSETTS.	
Arlington	7, 8, and 9.
Barnstable	8 and 9.
Boston	Grammar school.
Braintree	6, 7, and 8.
Bridgewater	8 and 9.
Brockton	High school.
Brookline	All.
Cambridge	Grammar and high school.
Dedham	7, 8, 9, and 2 classes in high school.
Easton	6, 7, 8, and 9.
Everett	5, 6, 7, and 8.
Fall River	High school.
Fitchburg	9, 10, 11, and 12.
Framingham	7, 8, and 9.
Gardner	High school.
Greenfield	10 and 11, high school.
Haverhill	5, 6, 7, 8, 9, 10, 11, 12, and 13.
Holyoke	High school.
Lawrence	Do.
Lowell	10, 11, 12, and 13.
Malden	9 and high school.
Medford	5, 6, 7, 8, and 9.
Milton	5, 6, 7, 8, 9, 10, 11, 12, and high school.
Natick	6, 7, 8, 9, 10, and 11.
New Bedford	7, 8, and 9.
Newton	8 and 9.
North Adams	Do.
Northampton	5, 6, and 7.
Reading	7 and 8.
Salem	Grammar school.
MASSACHUSETTS—continued.	
Somerville	10 and 11.
Wakefield	7, 8, and 9.
Waltham	6, 7, 8, 9, 10, and 11.
Whitman	1, 2, 3, 4, 5, 6, 7, 8, and 9.
Winchester	6, 7, and 8.
Woburn	1, 2, 3, and 4.
Worcester	9 and high school.
MICHIGAN.	
Bay City	7, 8, 9, and 10.
Detroit	5, 6, 7, and 8.
Flint	7, 8, and 9.
Kalamazoo	5, 6, 7, 8, 9, 10, 11, and 12.
Menominee	6, 7, 8, and high school.
Muskegon	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and Do.
Saginaw (East)	5 and 6.
Ypsilanti	1, 2, 3, 4, 5, 6, 7, and 8.
MINNESOTA.	
Minneapolis	High school.
St. Cloud	5, 6, 7, and 8.
St. Paul	High school.
MISSOURI.	
Carthage	7, 8, and high school.
Kansas City	High school.
Moberly	7, 8, and high school.
St. Louis	High school.
Sedalia	Do.
NEBRASKA.	
Omaha	9 and 10.
NEW HAMPSHIRE.	
Concord	5, 6, 7, 8, 9, and four high schools.
Manchester	8 and 9.
Portsmouth	4 and 5.
NEW JERSEY.	
Asbury Park	All.
Atlantic City	5, 6, 7, 8, 9, and 10.
Camden	All.
East Orange	5, 6, 7, 8, and high school.
Englewood	1, 2, 3, 4, 5, 6, and 7.
Hoboken	6, 7, 8, and 9.
Montclair	Primary and grammar schools.
Newark	5, 6, 7, 8, and high school.
North Plainfield	5, 6, 7, 8, 9, 10, 11, and 12.
Orange	All.
Passaic	3, 4, 5, 6, 7, and 8.
Paterson	7, 8, and high school.
Phillipsburg	5, 6, 7, 8, and 9.
Red Bank	6, 7, 8, 9, and 10.
South Orange	4, 5, 6, 7, 8, 9, 10, 11, and 12.
Union	3 years through high school.
Vineland	Grammar and high schools.
Woodbury	High school.
NEW YORK.	
Albany	High school.
Binghamton	9, 10, 11, and 12.
Buffalo	5, 6, 7, 8, and 9.
Cohoes	3, 4, 5, 6, 7, 8, and 9.
Corning	Primary.
Herkimer	Do.
Ithaca	6, 7, and 8.
Jamestown	All.

(b) Census of manual and industrial training schools



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TABLE 4.—*Statistics of manual and industrial schools in the United States in 1899–1900.*

Location.	Name of institution.	President or director.	Grade of literary instruction.	Different pupils under industrial training: Male.	Different pupils under industrial training: Female.	Different pupils under industrial training: Total.	Different pupils in literary instruction: Male.	Different pupils in literary instruction: Female.	Different pupils in literary instruction: Total.	Expenditures for industrial training during 1899-1900: For teachers.	For materials.	For new tools and repairs.	For incidentals.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ALABAMA.														
Camp Hill	The Southern Industrial College	Lyman Ward	Elementary, secondary, and collegiate.											50,000
CALIFORNIA.														
Oakland	Central School (public)	Phillip M. Fisher	Secondary	300	300	600	3,000	3,000	6,000				8272	4,501
San Francisco	The California School of Mechanical Arts.	Geo. A. Merrill	do	225	225	450	10,000	5,500	15,500	3,000	1,000	500	500	10,940
Do	Ogden's Polytechnical College	Dr. Henry D. Cogs	do	125	125	250	7,000	900	7,900	682	325	35	125	10,345
Do	Mechanics' Institute and San Francisco Art Association.	Ernest A. Dauchez	Secondary	20	20	40	750	750	1,500					
Santa Barbara	Anna M. C. Blake Manual Training School.	Miss Ethna A. Rich	Elementary	30	30	60	374	370	744	1,465	456	200	488	2,611
Waterman	Preston School of Industry	D. S. Hirshberg, supt	Elementary and secondary.	11	1	12	76	6	82	6,466	1,000	250	350	10,140
COLORADO.														
Denver	The Brightside Educational Corporation.	Ralph Field, pres	Elementary	5	5	10	650	0	650	10,000				10,000
Do	Manual Training High School	Charles A. Bradley	Secondary	1	1	2	195	198	393	6,225	725	30		7,888
Golden	Colorado School of Mines	M. L. Gallagher	do	4	4	8	125	75	200	6,225	725	30		6,980
CONNECTICUT.														
Bridgeport	Y. M. C. A. Trade School and Institute	I. De Yor Warner	Elementary											
New Haven	Boardman Manual Training School	Thomas W. Mather	Secondary	3	3	6	150	150	300	6,450	510	115	100	7,175
Norwich	Free Academy	Miss Sarah Hyde	do	1	1	2	150	150	300	6,450	510	115	100	7,175
Waterbury	Waterbury Industrial School	Mrs. Stephen Harrison	do	0	0	0	25	25	50	256	15			325

Notes: Panel (a) shows a page from the list of cities with 8,000 or more inhabitants whose public schools offered manual training in 1899–1900, together with the grades in which it was given. Panel (b) shows the first page of the census of manual and industrial training schools, which reports each school's location, the grade of its literary instruction, and its pupils by sex.

[28] Doxey et al. (2025) build their high-school panel from the same annual report, using its census of high schools rather than the chapter on manual and industrial training.

I classify a town as having a technical option if its public schools offered manual training in the high-school grades, or if it had a manual, industrial, or trade school of secondary grade open to men; 116 towns qualify, all of which had a high school in 1900. All other towns with a high school are classified as having an academic high school only.[29] Because the list of cities with manual training in their public schools covers only cities with at least 8,000 inhabitants, I also restrict the comparison to cities of that size, using population from the 1900 census.

Column 1 of Table D.3 re-estimates Equation (D.1), replacing $HS_{v,1900}$ with separate indicators for towns with an academic high school only and for towns with a technical option, each interacted with the post-1900 indicator. The decline in ICS enrollment growth after 1900 is substantially larger in towns with a technical option. Relative to towns without a high school, annual enrollment growth fell by 0.32 log points in those towns, compared with 0.11 log points in towns with an academic high school only.

Table D.3: Correspondence school enrollment and local technical education

	Log change in yearly correspondence school enrollment (1892–1907)				
	All courses	**Technical**	**Commercial and academic**	**Large cities, all**	**Large cities, technical**
Academic HS × Post 1900	-0.110**	-0.057	0.034	–	–
	(0.049)	(0.059)	(0.172)		
Technical option × Post 1900	-0.320***	-0.455***	-0.030	-0.142***	-0.208***
	(0.078)	(0.080)	(0.333)	(0.048)	(0.058)
Observations	7,311	5,024	1,024	3,191	2,859
Town FE	Yes	Yes	Yes	Yes	Yes
County × Year FE	Yes	Yes	Yes	No	No
State × Year FE	No	No	No	Yes	Yes
Cluster	County	County	County	County	County

Notes: This table presents the results from Equation (D.1) with $HS_{v,1900}$ replaced by indicators for a town having an academic high school only and for a town having a technical option, each interacted with the post-1900 indicator. Towns without a high school are the omitted group, and the level terms are absorbed by the town fixed effects. Columns (2) and (3) split enrollment by course family. Columns (4) and (5) restrict the sample to cities with at least 8,000 inhabitants in the 1900 census and exclude towns without a high school, so towns with an academic high school only are the omitted group. Because most counties contain only one such city, these columns replace county-by-year fixed effects with state-by-year fixed effects. The estimation sample includes only town-year observations with positive enrollment in both the current and preceding year. Standard errors clustered at the county level are reported in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Columns 2 and 3 examine whether this pattern differs by the type of ICS course in which students enrolled. Column 2 shows that the decline is concentrated in enrollment in technical ICS courses, while column 3 shows little differential change in enrollment in commercial and academic courses. Finally, columns 4 and 5 restrict the sample to cities with at least 8,000

[29] Manual training reaching grade 10 is classified as reaching the high-school grades, since grade 9 was still a grammar-school grade in the nine-grade systems used in Massachusetts, Connecticut, Maine, and New Hampshire. Among manual and industrial training schools, those of elementary grade only, those without male pupils, and custodial institutions such as orphanages and reformatories are excluded; trade schools with no literary course are included.

inhabitants and exclude towns without a high school. The coefficients therefore compare large cities with a technical option with large cities with an academic high school only. The results continue to show a larger post-1900 decline in ICS enrollment growth in cities with a technical option.

E Occupational outcomes

All occupational outcomes are constructed using occupation codes from the 1950 occupational basis (`OCC1950`), so that occupations are comparable across the 1900 and 1910 waves.[30]

- **Professional and technical occupations**: An indicator for an `OCC1950` code below 100, the first major group of the 1950 classification. It equals one for men in that group and zero for all other men reporting an occupation, namely those in either of the ten remaining occupational groups: farmers, managers, clerical, sales, craftsmen, operatives, domestic and service workers, and farm and other laborers.

  I then split this category into two:

  - **Technical occupations**: An indicator taking a value of one for professional and technical occupations whose description contains any of: engineer, draftsman, designer, surveyor, chemist, architect, technician, radio operator, or forester; and zero for all other men reporting an occupation.
  - **Other professional occupations**: An indicator taking a value of one for the remaining professional and technical occupations, of which the largest are teachers, physicians and surgeons, lawyers and judges, pharmacists, clergymen, and accountants and auditors; and zero for all other men reporting an occupation

- **LIDO**: The LIDO earnings measure of Saavedra and Twinam (2020) is merged onto each census record by census division, state, sex, age, race, occupation (`OCC1950`), and industry (`IND1950`). Because it is defined on those cells jointly, LIDO varies within occupation with industry, location, and demographics, unlike occupational income scores that assign a single value to each occupation. LIDO scores are available only for men aged 20 to 70 who report a gainful occupation.

[30] Codes of 979 and above denote non-occupational responses—at school, retired, keeping house, inmate, and so on—and are set to missing. The outcomes below, and therefore the estimation sample, are restricted to men reporting a gainful occupation.

F Course families and target occupations

I construct the mapping from individual ICS courses to the occupations for which they provided training in two steps.

First, I assign each of the courses in the register to one of 21 course families according to the trade named in the course title. When a title refers both to a medium and to a particular trade, I classify the course according to the trade. For example, "Mechanical Drawing" is assigned to drafting, "Sheet-Metal Pattern Drafting" to sheet-metal work, and "Architectural Drawing" to architecture.[31]

Second, I map each course family to the set of *occ1950* occupations whose census titles name the trade that family trained for, constrained to be mutually exclusive across families.[32]

Table F.1: Course families, constituent courses, and target occupations

Course family	ICS courses assigned to the family	Target occupations (*occ1950* code)
Electrical	Electric Lighting and Railways; Electrical Engineering; Electric Power and Lighting; Electric Lighting; Electrical; Complete Electrical Engineering; Electric Railways; Interior Wiring; Electric Car Running; Advanced Electric Lighting; Wiring and Bellwork; Electrical Engineering, Part 1; Advanced Electric Railways; Electrical Engineering, Part 2	Electrical engineers (44); Electricians (515); Electricians, apprentice (603); Power station operators (672)
Bookkeeping & accounting	Bookkeeping and Business Forms; Complete Commercial; Complete Commercial Law; Banking and Banking Law; Corporation Organization, Cost Accounting, and Bank Bookkeeping; Bookkeepers'; Law for Corporation Managers, Business Men, Clerks, Stenographers, Bookkeepers, and Secretaries; Civil Service-Bookkeeper, Departmental Service	Accountants and auditors (0); Bank tellers (305); Bookkeepers (310); Cashiers (320)

[31] This classification is finer than the broader subject headings used by ICS itself. For example, all three of these example courses appear under the broader heading "Technical Drawing, Drafting."

[32] Foreign language courses name no trade, and so have no occupations attached.

Table F.1, continued

Course family	ICS courses assigned to the family	Target occupations (*occ1950* code)
Architecture & building trades	Complete Architectural; Architectural Drawing; Building Contractors'; Architectural Drawing and Designing; Structural Engineering; Architectural Rendering	Architects (3); Brickmasons, stonemasons, and tile setters (504); Carpenters (510); Paperhangers (565); Plasterers (573); Structural metal workers (585)
Steam & stationary engineering	Stationary Engineers; Engine Running; Complete Steam Engineering; Steam-Electric; Dynamo Running; Engine and Dynamo Running; Advanced Engine Running; Stationary Firemen's Course	Stationary engineers (583); Stationary firemen (680)
Mechanical drawing & drafting	Mechanical Drawing; Draftsmen's Course; Mechanical Drawing With Mathematics; Mechanical Drawing Without Mathematics; Structural Drafting; Drawing for Monument Workers; School Teachers' Drawing	Draftsmen (35)
Mechanical & machine shop	Mechanical; Shop Practice, Machine-Shop Division; Mechanical Engineering; Shop Practice, Foundry-Work Division; Shop Practice, Blacksmithing and Forging Division; Shop Practice, Patternmaking Division; Complete Shop Practice; Gas Engines; Farm Machinery; Shop Practice, Toolmaking Division; Refrigeration; Mine Mechanical; Boilermakers' Course; Gas-Engines, Automobile Division; Complete Gas-Engines; Gas-Engines, Stationary Division	Mechanical engineers (46); Blacksmiths (501); Machinists (544); Millwrights (560); Molders, metal (561); Pattern and model makers, except paper (570); Tool makers, and die makers and setters (592); Machinists and toolmakers, apprentice (604)
Civil engineering & surveying	Surveying and Mapping; Civil Engineering; Railroad Engineering; Bridge Engineering; Municipal Engineering; Hydraulic Engineering	Civil engineers (43); Surveyors (92); Chainmen, rodmen, and axmen, surveying (630)

Table F.1, continued

Course family	ICS courses assigned to the family	Target occupations (*occ1950* code)
Locomotive & railroad operating	Locomotive Running, Complete; Complete Air Brake; Complete Trainmen and Carmen's; Locomotive Engineering; Locomotive Running, Division 3; Mechanical Locomotive; Roundhouse, Division 1; Air Brake, Division 1; Locomotive Running, Division 1; Complete Locomotive; Roundhouse; Trainmen and Carmen's, Division 1; Roundhouse, Division 2; Roundhouse, Division 3; Locomotive Running, Division 2; Locomotive Running, Division 4; Air Brake, Division 3; Air Brake, Division 4	Conductors, railroad (203); Locomotive engineers (541); Locomotive firemen (542); Railroad and car shop mechanics and repairmen (553); Brakemen, railroad (624); Switchmen, railroad (681)
Mining	Short Coal Mining; Metal Mining; Complete Coal Mining; Metal Prospectors'; Full Mining; Complete Metallurgy; Milling; Smelting; Hydrometallurgy; Assaying	Mining engineers (48); Blasters and powdermen (622); Furnacemen, smeltermen and pourers (641); Mine operatives and laborers (650)
Advertising & window display	Complete Advertising; Complete Lettering and Sign Painting; Advanced Show-Card Writing; Window Trimming and Mercantile Decoration; Window Trimming and Show-Card Writing; Show-Card Writing and Advertising; Window Trimming, Show-Card Writing, and Advertising; Plain Show-Card Writing; Window Trimming and Advertising	Advertising agents and salesmen (400); Decorators and window dressers (514)
Stenography & typing	Complete Stenographic; Stenography and Typewriting; Grammar and Letter Writing; Civil Service-Stenographer and Typewriter, Departmental Service	Stenographers, typists, and secretaries (350)

Table F.1, continued

Course family	ICS courses assigned to the family	Target occupations (*occ1950* code)
Chemistry	General Chemistry; Chemistry and Chemical Technology; Chemistry and Manufacture of Iron and Steel; Organic and Inorganic Chemistry; Chemistry; Chemistry and Manufacture of Cement; Chemistry and Packing-House Industries; Chemistry and Manufacture of Paper; Chemistry, Petroleum, and Manufacture of Products; Chemistry and Manufacture of Gas; Chemistry and Manufacture of Soap; Chemistry and Manufacture of Alkalies and Hydrochloric Acid; Chemistry and Manufacture of Leather; Chemistry and Manufacture of Sugar; Chemistry and Manufacture of Sulphuric Acid; Chemistry and Manufacture of Cottonseed Oil and Products	Chemists (7); Chemical engineers (42); Testing technicians (95)
Textile	Cotton Carding and Spinning; Complete Cotton; Complete Textile Designing; Woolen and Worsted Designing; Complete Woolen; Woolen Carding and Spinning; Cotton Designing; Theory of Textile Designing; Cotton Warp Preparation and Plain Weaving; Fancy Cotton Weaving; Woolen Warp Preparation and Weaving; Cotton Carding, Spinning, and Plain Weaving; Woolen Carding, Spinning, and Weaving; Cotton Spinning and Warp Preparation; Worsted Warp Preparation and Weaving; Silk Designing; Yarn Reeling, Warping, and Winding; Fancy Woolen Weaving	Loom fixers (543); Dyers (634); Spinners, textile (675); Weavers, textile (684)
Illustration & design	Ornamental Design; General Illustrating; Drawing, Sketching, and Perspective; General Design; Newspaper Illustrating; Bookcover Design; Wallpaper Design; Perspective Drawing; Carpet Design	Artists and art teachers (4); Designers (33)

Table F.1, continued

Course family	ICS courses assigned to the family	Target occupations (*occ1950* code)
Foreign language	French Language; Spanish Language; German Language; English-French Language; English-Spanish Language	*None assigned*
Civil service & postal	Civil Service; Civil Service-Railway Mail Clerk, Railway Mail Weigher, Railway Mail Porter, in Departmental Service; Civil Service-Clerk, Carrier, in Post-Office Service; Civil Service-Clerk, Departmental Service; Civil Service-Clerk, Day Inspector, Sampler, Junior Clerk, in Custom-House Service; Civil Service-Clerk, Gauger, Storekeeper, Storekeeper Gauger, in Internal- Revenue Service; Civil Service-Tagger, Departmental Service; Assistant Weigher, Messenger, Night Inspector, in Custom-House Service; Civil Service-Rural Free Delivery Carrier, Post-Office Service	Inspectors, public administration (210); Officials and administrators, public administration (250); Postmasters (270); Express messengers and railway mail clerks (325); Mail carriers (335)
Teaching	English Branches; Teachers'; Methods of Teaching; Mathematics and Physics; Special Teachers' Course	Teachers, n.e.c. (93)
Plumbing & heating	Sanitary Plumbing, Heating, and Ventilation; Heating and Ventilation; Sanitary Plumbing and Gas-Fitting; Sanitary Plumbing; Complete Plumbing and Heating; Short Plumbing; Plumbers and Steam Fitters'; Complete Heating; Complete Plumbing; Steam Fitters'; Gas-Fitting; Plumbing Inspectors	Plumbers and pipe fitters (574); Plumbers and pipe fitters, apprentice (610)
Telephone & telegraph	Telephone Engineering; Telegraph Engineering	Telegraph operators (365); Linemen and servicemen, telegraph, telephone, and power (540)
Marine & navigation	Marine Engineers'; Ocean Navigation; Lake Navigation; Coast Navigation	Officers, pilots, pursers and engineers, ship (240)

Table F.1, continued

Course family	ICS courses assigned to the family	Target occupations (*occ1950* code)
Sheet-metal work	Sheet-Metal Pattern Drafting	Tinsmiths, coppersmiths, and sheet metal workers (591)

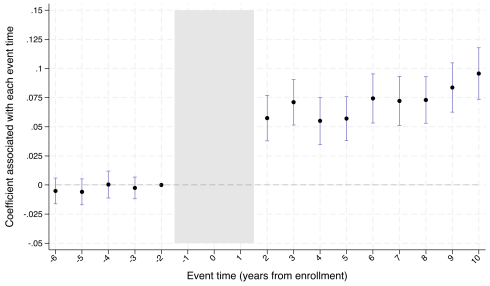
Notes: This table lists the 21 course families defined in the enrollment-register crosswalk, the courses assigned to each, and the occupations each family trained for. Families are ordered by register enrollments. Target occupations are the *occ1950* categories whose census titles name the trade the family trained for, constructed to be mutually exclusive across families.

G Robustness of the effects of correspondence education on occupational mobility

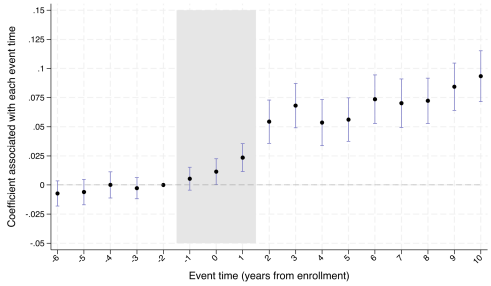
G.1 Robustness to alternative samples

Figure G.1: Effect of correspondence education on professional and technical occupations, alternative samples

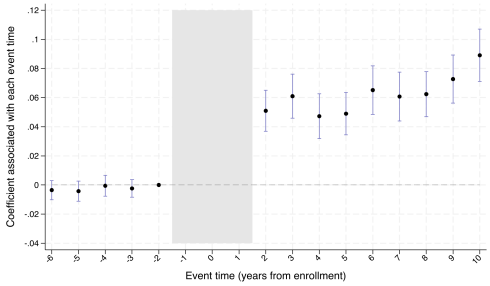
(a) Excluding men with > 1 enrollment



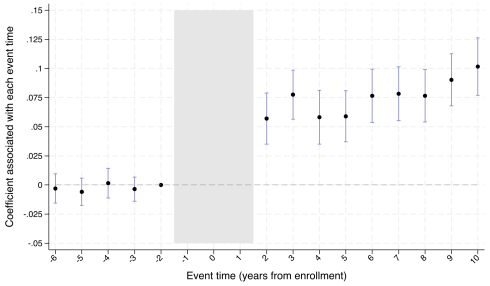
(b) Including obs. with $\tau \in \{-1, 0, 1\}$



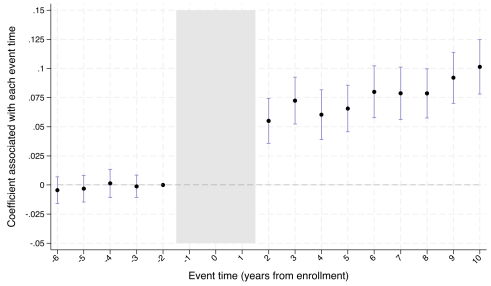
(c) Including non-employed men



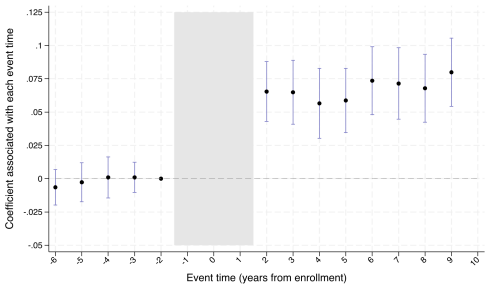
(d) Excluding Pennsylvania



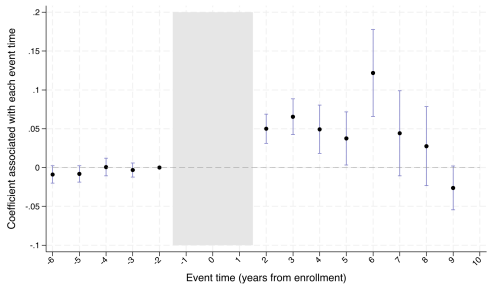
(e) Excluding the South



(f) Excluding men who moved



(g) 1900 census wave only



Notes: These figures plot the event-study estimates of the effects of correspondence education on employment in a professional or technical occupation, corresponding to β_τ in Equation (4.1), re-estimated on alternative samples. Each coefficient captures the difference in the outcome at event time τ relative to the omitted period, $\tau = -2$. Samples are: (1) excluding men recorded in the register with more than one enrollment year; (2) including observations (and event times) within one year of enrollment; (3) including non-employed men (for whom the outcome variable, working in a professional or technical occupation, is coded zero); (4) excluding men living in Pennsylvania, where ICS was headquartered; (5) excluding men living in the South (defined as encompassing Alabama, Arkansas, Delaware, the District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia); (6) excluding men who lived in a different county in 1910 than in 1900, which restricts the sample to men observed in both censuses; and (7) using only the 1900 census wave. The three event times immediately surrounding enrollment, $\tau \in \{-1, 0, +1\}$, are shaded and excluded from the estimation in all panels except Panel (b), because treatment status within these periods is ambiguous. 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 2.2 and, in all panels except Panel (c), who had a gainful occupation. The figures report 95% confidence intervals constructed from standard errors clustered at the county level.

H Course-targeted occupations, relative to never-enrolled men

I repeat the course-to-occupation analysis using the never-enrolled comparison approach described in Section 4.4.2. For each ICS student, I select a man who does not appear in the register and who, in 1900, lived in the same county, belonged to the same race and age group, and worked in the same occupation and industry (2-digit level). I assign each comparison man the course family of his matched ICS student, so that both men are evaluated against the same set of target occupations. Each comparison man is matched to exactly one student, and so is assigned exactly one course family.

I estimate

$$Y_{i,t}^{Own} = \delta\left(\text{ICS}_i \times \text{Post}_t\right) + \gamma\,\text{ICS}_i + \alpha_{f,t} + \alpha_{c,t} + \phi_{o_i} + \psi_{k_i} + \varepsilon_{i,t}, \tag{H.1}$$

where $Y_{i,t}^{Own}$ equals one if, in census year t, individual i works in an occupation targeted by his assigned course family f, and zero if he holds any other gainful occupation; ICS_i indicates that i appears in the register; and Post_t indicates the 1910 census. The specification includes course-family-by-census-year fixed effects ($\alpha_{f,t}$), which absorb differences across families in the prevalence of their target occupations and in how that prevalence changed over the decade; county-by-census-year fixed effects ($\alpha_{c,t}$); and fixed effects for 1900 occupation (ϕ_{o_i}) and 1900 industry (ψ_{k_i}). The coefficient of interest, δ, measures the difference between ICS students and comparison men in the change from 1900 to 1910 in the probability of working in their assigned course family's target occupations. Standard errors are clustered at the county level. The sample consists of ICS students who enrolled between 1901 and 1907 and their matched comparison men, observed in both the 1900 and 1910 censuses. As in Equation (4.1), observations at $\tau \in \{-1, 0, +1\}$ are excluded.

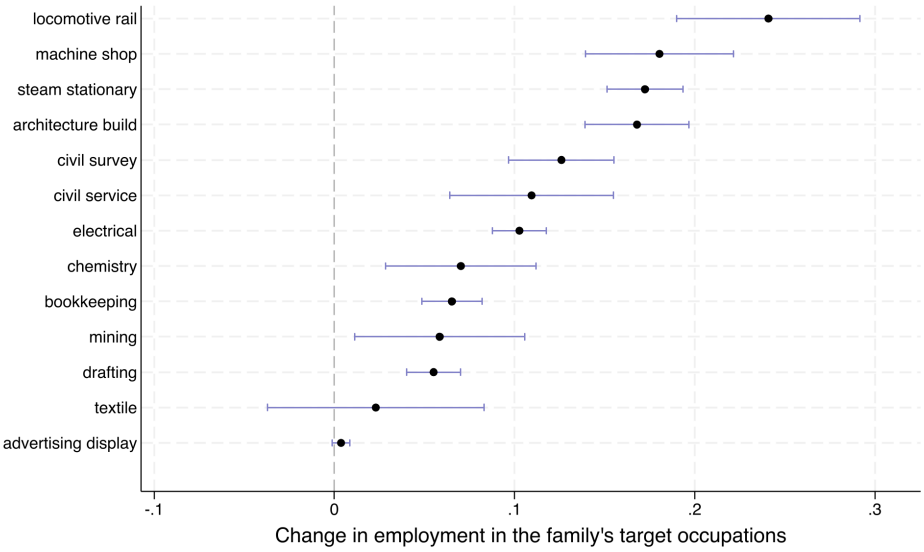
I first estimate Equation (H.1) using employment in occupations targeted by a man's assigned course family as the outcome. As a placebo, I repeat the estimation using $Y_{i,t}^{Other}$, an indicator for employment in an occupation targeted by any other course family. I then estimate the own-course specification separately by course family.

Figure H.1: Effect of correspondence education on employment in course-targeted occupations, relative to never-enrolled men

(a) Pooled estimate and placebo

	Own-course targets	Other families' targets
ICS Enrollee × Post	0.113***	0.007
	(0.004)	(0.005)
Observations	49,662	49,662
Family × year FE	Yes	Yes
County × year FE	Yes	Yes
Baseline occ. and ind. FE	Yes	Yes

(b) By course family



Notes: These panels present the results from Equation (H.1), comparing men in the ICS register with never-enrolled men (namely, men not appearing in the ICS register) across the 1900 and 1910 censuses. The outcome is an indicator for employment in an occupation targeted by the course family assigned to each man. Panel (a) reports the coefficient on the interaction of appearance in the register with the 1910 census: column (1) uses the target occupations of the assigned course family, and column (2), as a placebo, the occupations targeted by all other course families. Both columns absorb course-family-by-year, county-by-year, and baseline 1900 occupation and industry (both 2-digit level) fixed effects. Panel (b) reports the column (1) estimate separately by course family, and is estimated for the course families with at least 300 matched students. The sample consists of men from the "Register of International Correspondence Schools" who first enrolled between 1901 and 1907, together with never-enrolled men drawn from the 1900 census and sampled within cells defined by county, race, five-year age group, and 1900 occupation and industry (both 2-digit level), and assigned the course family of the student to whom they are matched. Men must be observed in both 1900 and 1910, and have a gainful occupation in both waves. Observations at $\tau \in \{-1, 0, +1\}$ are excluded for both groups, as in Equation (4.1). Standard errors are clustered at the county level; ***p<0.01, **p<0.05, *p<0.1.

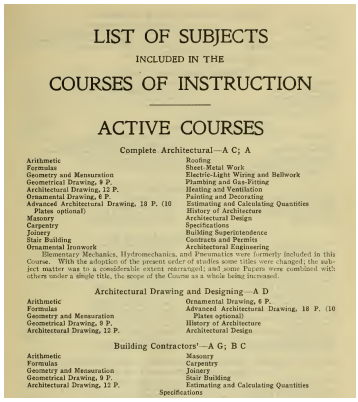
I Intensity of training and the effects of correspondence education

In this appendix, I examine whether more intensive training within a course family generated larger occupational gains.

I measure training intensity in two ways. First, I use the number of subjects required for each course, as reported in the ICS register. Second, because the length and depth of individual subjects may vary, I use course price as an additional proxy for intensity. To construct this measure, I digitize a 1931 ICS field booklet titled "Price List and Rules for Field Men," which reports tuition prices for individual ICS courses.[33]

Figure I.1: Sample data pages and measures of course intensity

(a) List of subjects in ICS register



LIST OF SUBJECTS

INCLUDED IN THE

COURSES OF INSTRUCTION

ACTIVE COURSES

Complete Architectural—A C; A

Arithmetic
Formulas
Geometry and Mensuration
Geometrical Drawing, 9 P.
Architectural Drawing, 12 P.
Ornamental Drawing, 6 P.
Advanced Architectural Drawing, 18 P. (10 Plates optional)
Masonry
Carpentry
Joinery
Stair Building
Ornamental Ironwork
Roofing
Sheet-Metal Work
Electric-Light Wiring and Bellwork
Plumbing and Gas-Fitting
Heating and Ventilation
Painting and Decorating
Estimating and Calculating Quantities
History of Architecture
Architectural Design
Specifications
Building Superintendence
Contracts and Permits
Architectural Engineering

Elementary Mechanics, Hydromechanics, and Pneumatics were formerly included in this Course. With the adoption of the present order of studies some titles were changed; the subject matter was to a considerable extent rearranged; and some Papers were combined with others under a single title, the scope of the Course as a whole being increased.

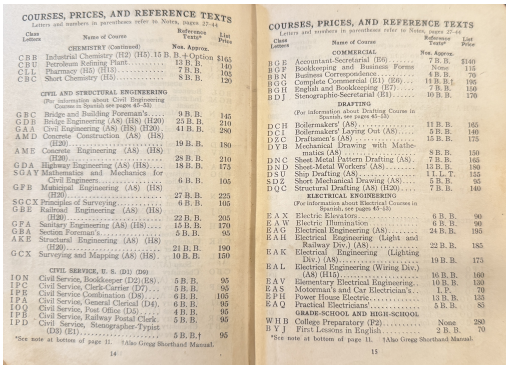
Architectural Drawing and Designing—A D

Arithmetic
Formulas
Geometry and Mensuration
Geometrical Drawing, 9 P.
Architectural Drawing, 12 P.
Ornamental Drawing, 6 P.
Advanced Architectural Drawing, 18 P. (10 Plates optional)
History of Architecture
Architectural Design

Building Contractors'—A G; B C

Arithmetic
Formulas
Geometry and Mensuration
Geometrical Drawing, 9 P.
Architectural Drawing, 12 P.
Masonry
Carpentry
Joinery
Stair Building
Estimating and Calculating Quantities
Specifications

(b) Prices in ICS field booklet



COURSES, PRICES, AND REFERENCE TEXTS

Letters and numbers in parentheses refer to Notes, pages 27-44

Class Letters	Name of Course	Reference Texts*	List Price
	CHEMISTRY (Continued)	Nos. Approx.	
C B B	Industrial Chemistry (H2) (H5)	15 B. B.+Option	$165
C B U	Petroleum Refining Plant	13 B. B.	140
C L L	Pharmacy (H3) (H15)	7 B. B.	105
C B C	Short Chemistry (H5)	8 B. B.	120
	CIVIL AND STRUCTURAL ENGINEERING (For information about Civil Engineering Courses in Spanish see pages 45-53)		
G B C	Bridge and Building Foreman's	9 B. B.	145
G D B	Bridge Engineering (AS) (H8) (H20)	23 B. B.	210
G A A	Civil Engineering (AS) (H8) (H20)	41 B. B.	280
A M D	Concrete Construction (AS) (H8) (H20)	19 B. B.	180
A M E	Concrete Engineering (AS) (H8) (H20)	28 B. B.	210
G D A	Highway Engineering (AS) (H8)	18 B. B.	175
S G A Y	Mathematics and Mechanics for Civil Engineers	6 B. B.	105
G F B	Municipal Engineering (AS) (H8) (H20)	27 B. B.	225
S G C X	Principles of Surveying	6 B. B.	105
G B E	Railroad Engineering (AS) (H8) (H20)	22 B. B.	205
G F A	Sanitary Engineering (AS) (H8)	15 B. B.	170
G B A	Section Foreman's	5 B. B.	95
A K E	Structural Engineering (AS) (H8) (H20)	21 B. B.	190
G C X	Surveying and Mapping (AS) (H8)	10 B. B.	150
	CIVIL SERVICE, U. S. (D1) (D9)		
I O N	Civil Service, Bookkeeper (D2) (D3)	5 B. B.	95
I P C	Civil Service, Clerk-Carrier (D7)	5 B. B.	95
I P E	Civil Service Combination (D9)	6 B. B.	105
I P A	Civil Service, General Clerical (D4)	6 B. B.	95
I P Q	Civil Service, Post Office (D5)	4 B. B.	95
I P B	Civil Service, Railway Postal Clerk	5 B. B.	95
I P D	Civil Service, Stenographer-Typist (D3) (E1)	5 B. B.†	95

*See note at bottom of page 11. †Also Gregg Shorthand Manual.

14

COURSES, PRICES, AND REFERENCE TEXTS

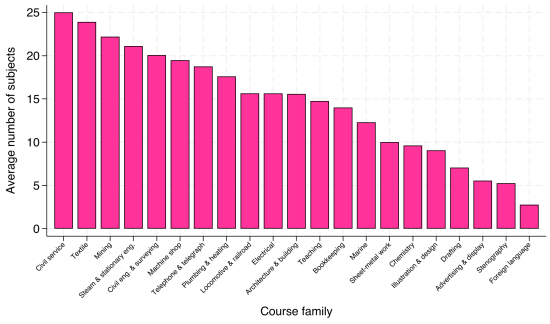
Letters and numbers in parentheses refer to Notes, pages 27-44

Class Letters	Name of Course	Reference Texts*	List Price
	COMMERCIAL	Nos. Approx.	
B G E	Accountant-Secretarial (D6)	7 B. B.	$140
B G P	Bookkeeping and Business Forms	7 Books	115
B B N	Business Correspondence	4 B. B.	70
B G G	Complete Commercial (E1) (D6)	11 B. B.†	195
B G H	English and Bookkeeping (E7)	7 B. B.	105
B D J	Stenographic-Secretarial (E1)	10 B. B.	170
	DRAFTING (For information about Drafting Courses in Spanish, see pages 45-53)		
D C H	Boilermakers' (AS)	11 B. B.	165
D C I	Boilermakers' Laying Out (AS)	5 B. B.	140
D 2 C	Draftsmen's (AS)	15 B. B.	175
D Y B	Mechanical Drawing with Mathematics (AS)	8 B. B.	150
D N C	Sheet Metal Pattern Drafting (AS)	7 B. B.	165
D N D	Sheet-Metal Workers' (AS)	13 B. B.	180
D S U	Ship Drafting (AS)	1 L. L. T.	135
S D Z	Sheet Mechanical Drawing (AS)	5 B. B.	95
D Q C	Structural Drafting (AS) (H20)	7 B. B.	140
	ELECTRICAL ENGINEERING (For information about Electrical Courses in Spanish, see pages 45-53)		
E A X	Electric Elevators	6 B. B.	90
E A W	Electric Illumination	6 B. B.	90
E A G	Electrical Engineering (AS)	24 B. B.	195
E A H	Electrical Engineering (Light and Railway Div.) (AS)	22 B. B.	185
E A K	Electrical Engineering (Lighting Div.) (AS)	19 B. B.	175
E A L	Electrical Engineering (Wiring Div.) (AS) (H15)	16 B. B.	160
E A V	Elementary Electrical Engineering	10 B. B.	120
E A S	Motorman's and Car Electrician's	1 B.	70
E P H	Power House Electric	13 B. B.	135
E A Q	Practical Electricians'	5 B. B.	83
	GRADE-SCHOOL AND HIGH-SCHOOL		
W H B	College Preparatory (P2)	None	280
B Y J	First Lessons in English	2 B. B.	70

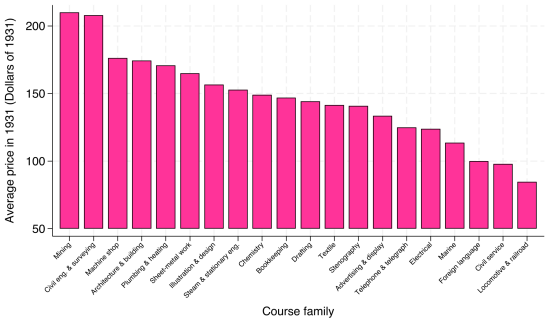
*See note at bottom of page 11. †Also Gregg Shorthand Manual.

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(c) Number of subjects by course family



(d) Course prices by course family



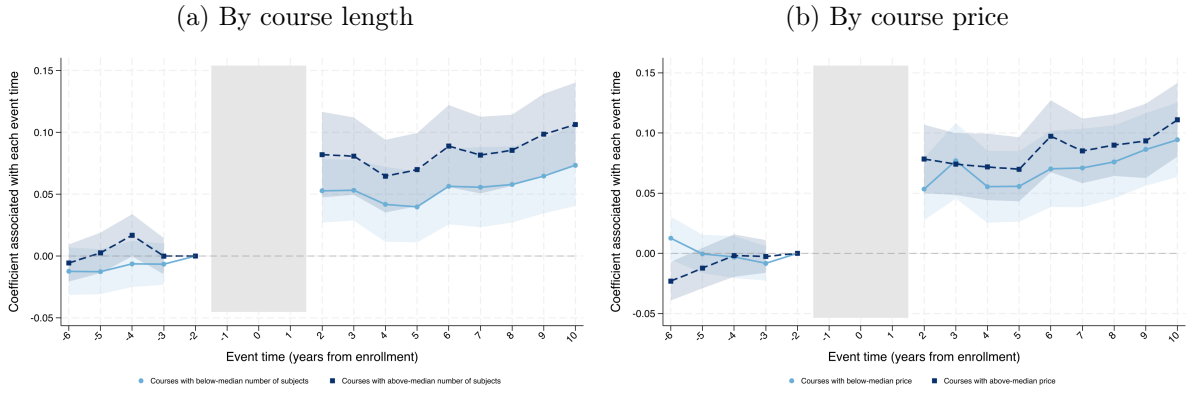
Notes: Panel (a) presents an example page from the ICS register showing the subjects required for each course. Panel (c) reports the average number of subjects per course by course family. Panel (b) presents sample pages with price information from the "Price List and Rules for Field Men" booklet published in 1931. Panel (d) reports average course prices by course family for courses in the booklet that can be matched to entries in the 1908 "Register of International Correspondence Schools."

[33] Although the price list dates from 1931, whereas the student register is from 1908, it is the earliest price list available, as many ICS materials were discarded in a landfill in the late 1990s. Because of this time gap, not all courses taken by students in the 1908 register appear in the 1931 list. The price analysis is therefore restricted to the subset of courses for which price data are available.

Figure I.1a shows how the register reports the subjects required for each course, and Figure I.1c reports average course length by course family. Figure I.1b presents sample pages from the price booklet, and Figure I.1d reports average course prices by course family.

I repeat the event-study analysis in Equation (4.1), splitting the sample according to whether course intensity is above or below the enrollment weighted median, measured alternatively by the number of subjects required or by course price. I include course-family fixed effects so that comparisons are made across courses geared toward similar occupations. For example, this compares the longer and more expensive Complete Cotton course with the shorter and cheaper Complete Wool course, both within the textiles course family, rather than comparing courses across unrelated fields such as textiles and construction.

Figure I.2: Effect of correspondence education on professional and technical occupations by course length and price



Notes: These figures plot the event-study estimates of the impact of correspondence education on the probability of working in a professional or technical occupation, corresponding to β_τ for $\tau \in \{-6, \ldots, -2, 2, \ldots, 10\}$ in Equation (4.1), estimated separately for each subgroup. Each coefficient captures the effect of being τ years from enrollment, relative to the base period $\tau = -2$, on an indicator variable for this occupational category. Panel (a) splits courses at the median number of subjects and panel (b) at the median price. The three event times immediately surrounding enrollment, $\tau \in \{-1, 0, +1\}$, are shaded and excluded from the estimation because treatment status within these periods is ambiguous. 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 2.2, who had a gainful occupation, and who either took a course with a listed number of subjects in the ICS register for panel (a), or took a course found in the "Price List and Rules for Field Men" booklet published in 1931 for panel (b). The figures report 95% confidence intervals constructed from standard errors clustered at the county level.

Figure I.2 shows that the occupational effects of correspondence education are positive for all subgroups, but larger at every event horizon among students enrolled in longer and higher-priced courses. The differences are more pronounced when intensity is measured by course length, however, which may partly reflect measurement error in the price data given that prices are taken from a later booklet and may not perfectly capture the relative prices faced by

students in 1908. Overall, these patterns are consistent with more intensive correspondence training generating larger occupational gains.

J Correspondence education and migration

This appendix examines whether correspondence education affected where men lived, and whether migration contributed to its occupational effects. I use the matched sample of ICS students and never-enrolled men constructed in Section 4.4.2.

The sample consists of men who first enrolled in ICS between 1901 and 1907 and comparison matched never-enrolled men drawn from the same county, race, age band, and two-digit occupation and industry cell in 1900, all observed with a gainful occupation in both censuses. For each man, I recover his county of residence in 1910 and classify him as a mover if it differs from his 1900 county.

Table J.1 shows that ICS students were only 1.4 percentage points more likely than their matched counterparts to live in a different county in 1910. Among movers, however, ICS students moved to counties that had a higher share of manufacturing employment in 1900. Never-enrolled movers, by contrast, moved on average to slightly less industrial counties, yielding a 3.1 percentage-point difference between the two groups. Correspondence education therefore had little relationship with whether men moved, but was associated with where movers went.

Table J.1: Correspondence education and migration, 1900–1910

	ICS students	**Matched controls**	**Difference**
Moved to a different county	0.324	0.301	0.014***
			(0.005)
Change in county manufacturing share, movers	0.033	-0.012	0.031***
			(0.002)
Observations	18,932	62,036	

Notes: This table compares men in the ICS register with never-enrolled men (namely, men not appearing in the ICS register) across the 1900 and 1910 censuses, using the matched sample of Figure 4.2a: men who first enrolled in 1901–1907 and never-enrolled men drawn from the same county, race, age band, and two-digit occupation and industry cell in 1900, all observed with a gainful occupation in both censuses. The first row reports the share of each group living in a different county in 1910 than in 1900. The second row reports, for men who changed county, the difference between the 1900 manufacturing employment share of the destination and the origin county. The difference column reports the coefficient on appearance in the register from a regression absorbing 1900 county, race, age, and baseline 1900 occupation and industry (both 2-digit level) fixed effects. Standard errors clustered at the county level are reported in parentheses. ***p<0.01, **p<0.05, *p<0.1.

I next use the pooled difference-in-differences analysis of Section 4.4.2 among stayers to

examine whether migration accounts for the occupational effects of correspondence education. Table J.2 repeats the two specifications in Figure 4.2a among stayers and shows that the estimated effect of ICS on professional and technical employment is very similar to that in the full matched sample.

The occupational gains from correspondence education therefore do not depend on migration, although ICS students who did move tended to move toward more industrial counties.

Table J.2: Pooled difference-in-differences estimates, men who did not change county

	(1)	(2)
ICS Enrollee × Post	0.026***	0.027***
	(0.003)	(0.003)
Observations	111,974	112,300
County × year FE	Yes	
Race and age FE	Yes	
Baseline occ. and ind. FE	Yes	
Individual FE		Yes
Year FE	Yes	Yes

Notes: These estimates compare men in the ICS register with never-enrolled men (namely, men not appearing in the ICS register) across the 1900 and 1910 censuses, restricting both groups to men who lived in the same county in 1910 as in 1900. The outcome is an indicator for employment in a professional or technical occupation. The table reports the coefficient on the interaction of appearance in the register with the 1910 census: column (1) absorbs county-by-year, race, age-by-year and baseline 1900 occupation and industry (both 2-digit level) fixed effects, and column (2) absorbs individual and year fixed effects. Standard errors clustered at the county level are reported in parentheses. ***p<0.01, **p<0.05, *p<0.1.

K Women and correspondence education

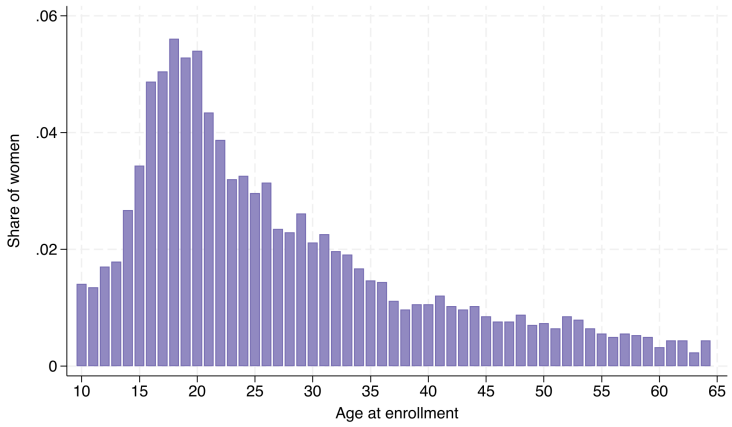
This appendix first examines the characteristics of women who enrolled in ICS, showing that although few women enrolled, correspondence education expanded educational access for women along many of the same margins as it did for men. I then examine the effects of correspondence education on women's labor force participation.

K.1 Correspondence education and the expansion of educational access among women

K.1.1 Age

Figure K.1 plots the distribution of age at enrollment for women. As with men, enrollment was concentrated at younger ages for women, but substantial numbers of women also enrolled later in life: 46.8% of female students enrolled at age 25 or older.

Figure K.1: Distribution of age at enrollment for women



Notes: This figure shows the distribution of age at enrollment for women in the ICS sample matched to census records. Age at enrollment is computed as the difference between the year of first enrollment listed in the ICS register and the individual's birth year as reported in the census.

Table K.1 then reports educational attainment by age at enrollment for women. Compared with the analogous results for men in Table 3.1, female enrollees were more highly educated at every age. Nevertheless, the same age gradient is apparent among women: those enrolling at older ages had substantially less formal schooling than younger enrollees. Correspondence education therefore provided older women, like older men, an avenue to continue their education after the conventional school years.

Table K.1: Educational attainment (by 1940) by age at enrollment for women

Age at enrollment	Grade 5 or less	Grades 6–8	Grades 9–11	Grade 12	Some college	College graduate+
10-15	1.2	38.6	23.5	19.3	9.6	7.8
16-19	2.3	28.6	22.8	28.6	13.2	4.5
20-24	6.0	33.9	16.1	30.4	7.6	6.0
25-29	7.0	34.5	17.5	22.8	11.1	7.0
30-34	10.2	44.1	14.4	16.1	9.3	5.9
35-64	16.0	46.2	10.4	14.2	6.6	6.6

Notes: This table reports the share of women of different ages at first ICS enrollment whose highest grade attained fell in each category. Shares sum to 100 within each row. Age at enrollment refers to the student's first enrollment, and each student contributes one observation. The sample encompasses female students from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 2.2, and whose schooling is recovered from the 1940 census.

As documented earlier, women's course choices differed sharply from men's. Figure K.2 shows that commercial subjects, including bookkeeping, stenography, and related clerical preparation, accounted for approximately 70% of female enrollment at all ages. Enroll-

ment in technical subjects nevertheless increased modestly among women enrolling at older ages.

Figure K.2: Subject matter by age at enrollment for women



Notes: This figure shows the share of female ICS students enrolled in each course track by age at first enrollment. The figure uses one observation per student, corresponding to the first course in which she enrolled.

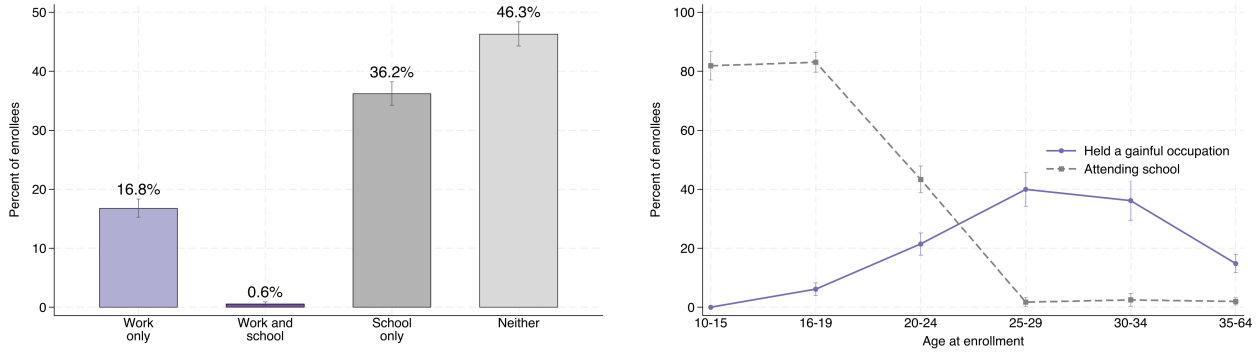
K.1.2 Work status

Figure K.3 plots the share of female ICS enrollees who held a gainful occupation at the census preceding enrollment, as well as the share who were still attending school, both overall and by age at enrollment.

Figure K.3: Work and school status at the census preceding ICS enrollment for women

(a) All enrollees

(b) By age at first enrollment



Notes: These figures plot the share of women in the ICS register who held a gainful occupation and/or attended school, at the census wave preceding their first enrollment both in total and by age at first enrollment. Because the 1890 census was destroyed, a pre-enrollment observation exists only for women who enrolled in 1901 or later, and the information follows from the 1900 census.

Overall, 17.4% of female enrollees held a gainful occupation in the census preceding enrollment, substantially below the corresponding share among men. Women's employment also

varied sharply with age, following an inverted-U pattern that peaked around age 24 and declined thereafter. This pattern is consistent with the strong life-cycle relationship between women's employment and marriage during this period, when many women worked at younger ages but left the labor force after marriage (Goldin, 2023).

K.1.3 Geography

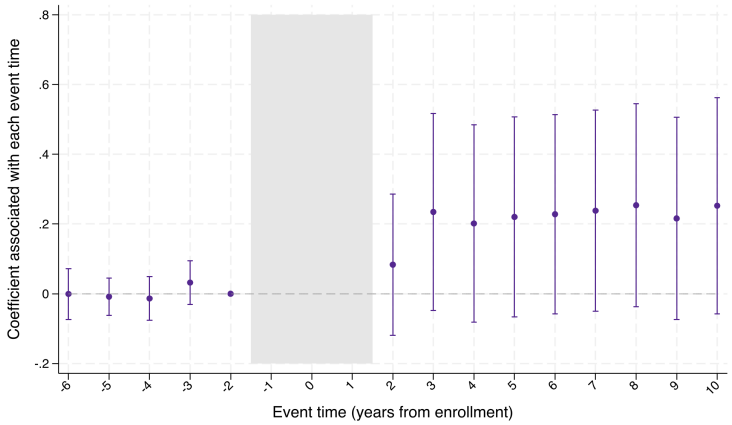
Correspondence education also allowed women to study in places without access to formal schooling. Of the 2,646 distinct towns with at least one female student in the ICS register, 1,408 had no high school in 1900. Overall, 41% of female ICS students lived in one of these towns, remarkably similar to the 40.8% share among male students. Thus, despite the much smaller number of female enrollees, the geographic margin of expanded access was similar for women and men.

K.2 Effects of correspondence education on female LFP

I next examine the effects of correspondence education on women's employment. This is a more relevant outcome for women than the occupational outcomes studied for men in the body of the paper, since those outcomes are defined only for individuals recorded by the census as holding a gainful occupation and only 17.4% of female ICS students held a gainful occupation prior to enrollment.

I therefore estimate an event-study specification analogous to Equation (4.1), replacing the occupational outcomes with an indicator for whether the individual reports a gainful occupation in the census. Figure K.4 presents the results. The estimates indicate that enrollment in ICS increased women's probability of holding a gainful occupation by approximately 10–20 percentage points. The estimates are imprecise, however, reflecting the substantially smaller sample of female ICS students.

Figure K.4: Effect of correspondence education on female labor force participation



Notes: This figure plots the event-study estimates of the effects of correspondence education on female labor force participation, corresponding to β_τ for $\tau \in \{-6, \ldots, -2, 2, \ldots, 10\}$ in Equation (4.1). Each coefficient captures the difference in the outcome at event time τ relative to the omitted period, $\tau = -2$. The three event times immediately surrounding enrollment, $\tau \in \{-1, 0, +1\}$, are shaded and excluded from the estimation because treatment status within these periods is ambiguous. The analysis includes women from the "Register of International Correspondence Schools" matched to census records in 1900 and/or 1910 using the procedure described in Section 2.2. The figures report 95% confidence intervals constructed from standard errors clustered at the county level.