Keys to Upward Mobility: Typewriter Adoption and Women's Economic Outcomes*

Myera Rashid†

April 5, 2026

Abstract

Workplace technological changes were instrumental in creating new tasks for women over the last century. This paper studies the adoption of the typewriter into US workplaces. Exploiting exogenous variation in typist demand across sectors, I document that the typewriter increased women's labor force participation, leading to lower rates of marriage and fertility. These developments stemmed from a transition of White women from households into office work and an indirect crowding-in effect drawing Black women into household services. Acting as a "meeting technology," the typewriter reshaped social interactions, enabling White women to marry above their socioeconomic backgrounds and achieve upward mobility.

*I thank my advisors Abi Adams, Leah Boustan, Walker Hanlon, and Joel Mokyr for their constant guidance and support. I am grateful to Ellora Derenoncourt for encouraging me to pursue this project and to Claudia Goldin for her invaluable advice. This project also benefited from the helpful feedback of Ran Abramitzky, Ken Alder, Lukas Althoff, Eric Auerbach, Lori Beaman, Federico Bugni, Marie-Louise Décamps, Andrea Di Giovan Paolo, Coly Elhai, José-Antonio Espín-Sánchez, James Feigenbaum, Joseph Ferrie, Martin Fiszbein, Carola Frydman, Richard Hornbeck, Elisa Jácome, Ezra Karger, Franco Malpassi, Giacomo Marcolin, Robert Margo, Alexandre Mas, Carlo Medici, Ludovica Mosillo, Claudia Olivetti, Daniele Paserman, Paul Rhode, Elyce Rotella, Martin Rotemberg, Christopher Udry, Mythili Vinnakota, Jennifer Withrow as well as participants and discussants at the NBER Development of the American Economy Summer Institute, Opportunity Insights Economic Mobility Conference, Paris School of Economics Economic History Seminar, Stanford Institute of Theoretical Economics Gender Conference, Harvard Graduate Workshop in Economic History, Princeton Pre-Doc Symposium, Yale Economic History Lunch, Stanford Graduate Economic History Workshop, Chicago Federal Reserve Microeconomics Workshop, Cliometrics Conference, Economic History Association Annual Conference, Northwestern 501 Seminar, Northwestern Economic History Lunch and Northwestern Applied Microeconomics Lunch. I acknowledge generous financial support from the Russell Sage Foundation, Economic History Association's Sokoloff Fellowship and Early Stage Dissertation Grant, Northwestern Center for Economic History, and the Robert Eisner Memorial Fellowship.

†Northwestern University, Department of Economics. E-mail: mrashid@u.northwestern.edu

1 Introduction

Women's labor force participation in the United States nearly doubled between 1870 and 1940 from 15 to 29 percent.[1] Concurrently, the kinds of occupations and industries accessible to women also expanded considerably, which included their greater integration into white-collar work. Existing work suggests that these developments were driven in part by factors such as increasing educational attainment, reductions in fertility, and the introduction of technologies related to the household (Goldin, 1990; Goldin and Katz, 2002; Greenwood et al., 2005). One potentially important factor that has not been carefully examined in the existing literature is the influence of new technologies introduced into the workplace.

Workplace technological changes can lead to automation of work that displaces labor or result in creation of new work that reinstates demand for workers (Acemoglu and Restrepo, 2018). Existing studies have examined the impact of displacing technologies, such as mechanized telephone exchanges or automatic milking machines, on female employment (Ager et al., 2023; Feigenbaum and Gross, 2024). However, the consequences of new task-creating technological changes, especially for women, and their role in explaining the rising demand for female labor are not well-understood.

This paper studies the effects of the invention and diffusion of the typewriter on women's long-term outcomes. The typewriter replaced handwritten secretarial tasks, primarily performed by men, with standardized typewriting that became dominated by women. Offices in the US adapted to the arrival of the commercial typewriter in the 1880s by shifting towards the available supply of educated women who provided cheaper labor: while women initially made up only 12 percent of the secretarial and typing occupation in 1880, by 1900 they accounted for 75 percent of all typists. By 1940, the typewriter had become a large shock to women's employment, with over 1.1 million women working as typists, accounting for nearly 9 percent of all employed women at the time and a quarter of women employed in white-collar occupations. In fact, the typewriter "created an occupation calling for more women than have been employed as a result of any other invention" (U.S. Department of Labor, Women's Bureau, 1926).

This paper shows that the introduction of the typewriter into US workplaces drew women into the labor force and new sectors of the economy, a shift that, in turn, led to unintended changes in their marriage and fertility patterns and intergenerational mobility. However, the effects of the technological change varied greatly by race. As White women left the household to work in clerical occupations, Black women substituted for them in the household by entering paid household service work. Joining

[1] Calculated using data from historical US population censuses. See Online Appendix Figure A.1.

the labor force also led to reductions in fertility and marriage rates for White women. For Black women entering domestic service work, their marriage patterns did not change but living away from their spouse and working in an occupation where kids could not accompany them to work, meant reductions in their fertility rates. The typewriter not only affected women's labor market outcomes but also served as a "meeting technology" for White women: it allowed them to enter office spaces where they could be connected with and marry men of higher income, translating into upward economic mobility through the channel of marriage.

I first discuss the factors that led to the entry of women into typing and secretarial work. I empirically demonstrate secondary schooling and early typing courses as key supply-side factors that helped women enter the typing occupation in response to the technological change. Using data from Goldin and Katz (2008), I show a positive association between adoption of early secondary schooling laws and the consequent supply of female typists across states. To study the role of early typing courses, I digitize and construct a new database of Women's Christian Associations (WCAs) in operation prior to 1880, which were established as religious boarding homes for young women but offered the first typing courses for women after the adoption of the typewriter. I find that counties with WCAs had a greater supply of female typists and secretaries in the decades after typewriter adoption. On the demand-side, the typewriter changed the secretarial role to requiring a new set of skills, enabling businesses to draw on the newly trained female labor supply. By making written communication standardized and faster to produce at scale, the typewriter also increased demand for record-keeping. These factors, coupled with women's lower wages, led to a shift in secretarial work being performed by women.

I begin my analysis by estimating the effect of typewriter adoption on women's labor force participation using a shift-share instrumental variable (SSIV) which relies on identifying variation in the aggregate demand for typists across industries generated by the technological change. My instrument, the 1880 to 1920 predicted change in typists, combines local industry employment shares prior to the adoption of the typewriter with national shifts in the demand for typists to identify exogenous variation in the local share of typists. This shift-share approach helps address biases from place-based confounders of women's outcomes because the instrument can satisfy the exclusion restriction as long as the national shifts are exogenous (Borusyak et al., 2022). I provide supporting evidence that the identifying variation in the instrument is driven by the national shifts rather than the potentially endogenous initial shares, and that these shifts are plausibly exogenous.

Using historical US complete count censuses and the shift-share approach, I show that a 1 percentage point (pp) increase in the predicted change in the number of typists between 1880 and 1920 led to a 0.75

pp increase in share of women in the labor force in 1920. Using a back-of-the-envelope calculation, this estimate implies that without the shock of the typewriter, women's labor force participation rate in 1920 would have been 3.65 pp lower, equivalent to nearly 1.16 million fewer women in the labor force out of a population of 31.7 million women of working age. I also show that this effect of the typewriter on women's labor force participation persists until 1940.

Next, I show that the changes in women's labor outcomes were not limited to White women, who were more likely to be hired as typists, but also had a crowding-in effect on Black women's labor participation. Specifically, I show that counties that had a 1 pp greater increase in the predicted change in typists had a 1.7 pp higher share of Black women in the labor force in 1920. I show that the main mechanism underlying this change is the reallocation of White women out of *unpaid* housework and into clerical employment, which increased the demand for Black women's labor in *paid* household services work.

The labor market effects induced by the introduction of the typewriter further led to a 0.4 pp reduction in the share of women who were married and a 0.6 pp decrease in the share of women who had children in 1920. These estimates imply that the share of married women and women with children would have been 2.04 pp and 2.89 pp higher in 1920, equivalent to 650,000 additional married women and 920,000 additional women with children in the absence of the typewriter. These changes in women's family outcomes reflect a combination of delayed marriage and childbearing, as well as some women forgoing these choices altogether.

I provide further evidence in support of my main results by utilizing variation in the supply of female typists. I employ the database of historical Women's Christian Associations (WCAs) and use a matched-control difference-in-differences framework to compare counties that had WCAs established before typewriter adoption to observationally similar counties that did not. The intuition underlying this approach is that women from counties that had a WCA before typewriter adoption would be more likely to be employed as typists and secretaries after the technology is introduced. I find results from this distinct empirical approach that are consistent with my main results and interpret them as additional supportive evidence for my core empirical strategy.

By allowing White women to enter offices, the typewriter also reshaped social interactions and influenced women's long-term economic mobility. Using data from Buckles et al. (2023), I am able to follow a sample of young White women from the 1920 to the 1940 Census and compare the economic standing of women's fathers to that of their future spouses.[2] Because a majority of women at the time

[2]This focus on young White women who lived with their fathers in 1920 is also well-justified because women who worked as typists in 1920 were primarily young, White women living with their parents.

dropped out of the labor force upon marriage, married women's historical intergenerational mobility is best measured using a comparison between their father's and husband's economic statuses (Goldin, 1983; Eriksson et al., 2026). I first descriptively illustrate that women who worked as typists in 1920 were married to higher-earning husbands in 1940 compared to women who worked in alternative non-typist occupations in the same county. To account for heterogeneity across family backgrounds, I also rely on a comparison across *sisters* to show that this result holds even when comparing typists to non-typists sisters. For women who grew up at the 25th percentile of their father's income distribution, working as a typist is associated with marrying men with an average income rank that was 18.4 percentiles above the average rank of husbands of non-typists. Importantly, this mobility advantage is not present in alternative white-collar occupations such as teaching, despite the fact that these occupations offered women similar wages.

Lastly, I use the instrument to document the effect of typewriter adoption on women's economic mobility. I show that conditional on father's socioeconomic status, women living in counties with a one percentage point greater increase in the predicted change in typists married husbands whose income rank was 1.27 percentiles higher. Among women with fathers at the 25th percentile, residing in a county with an above median value of the SSIV is associated with marrying men with an average income rank that was 4 percentiles higher. I show that these results are consistent with a hypothesis that being employed as typists and working in offices provided women a unique opportunity to work alongside and be connected to men of higher income as opposed to their alternative work options. I provide evidence in support of this mechanism by showing that in 1920 the future husbands of typists were more likely to work in white-collar occupations in the same county as their future wives when compared to the future husbands of women who worked in alternative occupations.

These findings point towards an important factor that is overlooked in the broad literature studying the historic increase in women's labor force participation in the US: the role of workplace technological changes. This paper provides a new, long-run perspective of a workplace technological change and its effects on women's outcomes. Papers studying factors affecting the historic increase in women's labor force participation have so far considered factors such as household technological advances (Greenwood et al., 2005), expansion of educational opportunities (Goldin, 1990), innovation in contraception and reductions in fertility (Goldin and Katz, 2002; Bailey, 2006; Myers, 2017), improvements in maternal health (Albanesi and Olivetti, 2016), reduction in the cost of children (Attanasio et al., 2008) and access to electricity (Vidart, 2024).

This paper also contributes to an extensive literature studying the consequences of technological change for workers, which has largely focused on the impact of automation. In comparison, there is relatively little empirical work documenting the consequences of predominantly new task-creating technologies (Autor, 2022).[3] Recent work studies the origins of new work and tasks, tracing it to technological change, and its effect on labor demand (Lin, 2011; Acemoglu and Restrepo, 2019; Autor et al., 2024). The results of this paper not only highlight the consequences of a task creating technological change for women's labor but also their marriage and fertility choices.

Papers at the intersection of technological change and women's outcomes have considered the role of technologies that automate work done by women (Ager et al., 2023; Feigenbaum and Gross, 2024), technologies related to household production (Greenwood et al., 2005), and general purpose technologies such as electrification (Vidart, 2024). Relative to pre-existing work, this paper introduces task-creating workplace technological changes as a novel determinant for women's long term labor and family outcomes.

More broadly, by linking a technological change to reductions in women's fertility, this paper also complements empirical work on the U.S. demographic transition and papers pointing to technological changes as drivers of fertility transitions (Galor and Weil, 1996; Greenwood et al., 2005, 2017; Bailey and Hershbein, 2018). Other technological changes linked to changes in fertility include electrification (Vidart, 2026), the contraceptive pill (Goldin and Katz, 2002; Bailey, 2006; Myers, 2017), and medical advances (Albanesi and Olivetti, 2016).

This paper makes a contribution to an extensive literature studying intergenerational mobility generally (see Mogstad and Torsvik (2023) and Abramitzky et al. (2025) for reviews) and specifically to a more recent literature studying women's historical intergenerational mobility in the US (Olivetti and Paserman, 2015; Bailey and Lin, 2022; Buckles et al., 2023; Jácome et al., 2025; Althoff et al., 2025; Eriksson et al., 2026), which has largely focused on documenting estimates of women's mobility and providing descriptive evidence of factors related to changes in women's mobility. Instead, my results highlight the potential of technological changes in impacting mobility patterns. Specifically, the typewriter served as a "meeting technology" for marriage outcomes, which allowed women to gain upward mobility.[4] The availability of such opportunities is especially meaningful at a time when most married women did not

[3] Papers studying the consequences of automation include Graetz and Michaels (2018); Acemoglu and Restrepo (2020); Bessen et al. (2023). In addition, this work also relates to empirical research on skill-biased technical change which often involves automating tasks performed by lower-skilled workers and an increased demand for higher-skilled workers (Acemoglu, 1998; Autor et al., 1998, 2003; Goldin and Katz, 2009; Gray, 2013; Boustan et al., 2022). Black and Spitz-Oener (2010) study the task content of occupations and the gender pay gap.

[4] Papers studying the role of other "meeting opportunities" for marriage include Goldman et al. (2024); Belot and Francesconi (2013); Kalmijn and Flap (2001) and Ciscato (2024). Relatedly, these results also highlight that workplaces can serve as environments that can lead to relationship formation and changing marriage patterns. Using workplace level data, Macdonald et al. (2024) study relationship formation in the workplace.

participate in the labor force and women's long-term economic success was determined largely by their husband's socioeconomic standing (Goldin, 1983).

Lastly, this research adds to the literature studying the introduction of women into occupations and the rise of white-collar work for women (Rotella, 1981b; Goldin, 1980, 1984, 1990, 2002; Costa, 2000; England and Boyer, 2009; Miller and Segal, 2019; Greenberg et al., 2024; Bald, 2025). This paper focuses on the creation of new white-collar work for women driven by a technological change. Compared to most examples of historical and modern white-collar work that primarily employ women, typing and secretarial work stands out as an occupation that rapidly transformed in terms of its gender composition and employed a large fraction of the female labor force across a variety of sectors.

2 Background

The first commercial typewriter was not only a major nineteenth-century innovation, but also spurred the creation of new work for women. In this section, I first outline the historical background relevant to the typewriter as a technological innovation and its adoption. Next, I empirically and historically document the factors that led to the feminization of typing and secretarial work and provide evidence for the role of this technological change in generating new work for women. Lastly, I present descriptive patterns from US census data relevant to the background of the typing and secretarial occupation in this time period.

2.1 Invention and Adoption of the Typewriter

There had been several attempts over the nineteenth century to create a "writing-machine" (Hoke, 1979). Inventors across both the US and Europe had been experimenting with many versions of such machines which were intended for use at home (Mokyr, 1992; Boorstin, 2010). However, none of these machines were commercially promising until Christopher Sholes, a Milwaukee based printer and editor, invented the "Type-Writer" in 1868 (Smith, 1922). Sholes, with the help of Carlos Glidden, improved this machine, and in 1873 convinced E. Remington & Sons to manufacture it. The first commercially successful typewriter, known as the "Sholes and Glidden Machine", was sold to the public in 1874 (see Online Appendix Figure A.9 for a picture of this early typewriter).

The early typewriter was marketed as a "literary machine" to writers and businesses were not thought of as its target consumers (Current, 1974; Hoke, 1979). In fact, "no one in business was striving to invent the typewriter. It was clearly exogenous to the business sector" (Hoke, 1979). This is evident in the slow adoption of the typewriter by businesses depicted in annual machine sales for the Remington typewriter.

Nearly a decade since its introduction, by 1882, Remington had only sold 1,200 typewriter machines, however, in 1887 this trend began to change when 14,000 machines were sold, mainly to businesses (Davies, 1974). This marked the "commercial acceptance" of the typewriter and by 1900, Remington was selling over 500,000 typewriters (Hoke, 1979).[5]

2.2 Women's Entry into Typing and Secretarial Work

As businesses began to rapidly adopt the typewriter, they also shifted to hiring a predominantly female workforce of typists and secretaries. While early secretarial and clerical work was mainly performed by men, after the invention of the typewriter, female typists and secretaries were hired at an unprecedented rate. Table 1 presents the number of men and women working in the "stenographers, typists, and secretaries" occupation in each decade from 1880 to 1940.[6] In 1880, women initially made up only 12 percent of the occupation, however, in 1900 women accounted for over 74% of all typists. By 1940, over 1.1 million women were employed in this occupation, accounting for nearly 93 percent of all typists and secretaries.

Table 1: Men and Women Working in the Typing and Secretarial Occupation, 1880-1940

Census Year	Total	Men	Women	Percent Women
1880	1,866	1,634	232	12.43
1900	106,857	27,066	79,791	74.67
1910	340,392	74,487	265,905	78.12
1920	668,414	83,975	584,439	87.44
1930	984,493	79,246	905,247	91.95
1940	1,206,880	87,282	1,119,598	92.77

NOTE: This table presents the number of men and women working in the stenographers, typists, and secretaries occupation as well as the percent of the occupation made up by women using complete count historical US Census data (Ruggles et al., 2021).

The typewriter was a predominantly new task-creating technological change because it replaced very few workers who performed secretarial work before its adoption and instead created new jobs for female labor in the office space across new sectors of the economy. These changes were limited to the secretarial occupation and such shifts did not take place in other comparable clerical or white-collar jobs at the time

[5]The increased demand for typewriter machines brought by businesses is also evident by the arrival of competing typewriter machines in the mid-1880s such as the Caligraph, the Crandall, the Hammond and the Hall (Boorstin, 2010). Over time as more competitors joined the market, machines also became more affordable. For example, the first typewriter by Remington had a list price of USD 125, but by the early twentieth century, the Royal Standard typewriter was listed for USD 65 (Oden, 1917).

[6]Both the recorded occupational information contained as strings in census data and historical evidence suggest that women who were hired as typists or stenographers also performed secretarial work. Occupation titles from the occupational strings commonly combine secretary with typist or stenographer. It should also be noted that handwritten stenography and secretarial work were occupations before the invention of the typewriter.

(see Online Appendix Figure A.4 for examples of alternative white-collar occupations for women at the time).

Both labor demand and supply-side forces shaped women's entry into this rapidly growing occupation and the office space. However, the typewriter remains "the key event, the catalyst which sparked this rapid social change" (Hoke, 1979). In fact, Rotella (1981a) emphasizes that “there was no other single technological change that transformed the office so much as did the typewriter.” I highlight below the key factors, which coupled with the invention of the typewriter, helped shift secretarial work from predominantly male to predominantly female.

2.2.1 Supply-Side Factors: The Role of Education and Early Typing Schools

I first document the role of education, specifically secondary school education, in shaping the supply of qualified women who could be hired as typists and secretaries. Because "typists had to be able to read, write, and execute minimal mathematical skill" (Hoke, 1979), I rely on the expansion of secondary schooling in the late nineteenth century (Goldin and Katz, 2008) to document a relationship between adoption of compulsory education laws and the supply of female typists. Using data from Goldin and Katz (2008) and variation in the decade of adoption of compulsory schooling, I show that states that had adopted compulsory education laws by 1900 saw a greater share of female typists in the early twentieth century (see Online Appendix A.3). In comparison, these schooling laws do not seem to be related to the supply of male typists, further emphasizing the importance of secondary school expansion for *women's* entry into this newly created white-collar occupation.

I next document the role of early typing schools in training female secretaries. Early typing training for women was provided by the Women's Christian Association (WCA). "It was only later, in response to business demand for typists, that business colleges, typewriter agencies and independent businesses began offering typing courses. It was in fact the YWCA, along with Remington's agents, that offered the first typing courses" (Hoke, 1979). The New York City's WCA was the first to offer a typing course for women in 1881. Using novel hand-collected data on WCAs, I show that counties that had established a WCA before 1880 had a greater mean share of female typists after the invention of the typewriter as compared to counties that did not establish a WCA (Online Appendix Figure E.2).

Together, these descriptive empirical analyses, along with the historical narrative, point to the crucial role played by secondary schooling expansion and early typing schools in training a supply of female secretaries and typists that businesses could employ after the invention of the typewriter. Other amenities provided by typing and secretarial work that could have helped women pick this occupation over alternatives included a cleaner work environment when compared to "brawn" jobs in manufacturing (Goldin, 2002) and the accompanying "social acceptability" of working in an office environment for middle-class women (Hoke, 1979).

2.2.2 Demand-Side Factors: Technological Change and Expansion of Secretarial Work

The typewriter presented clear efficiency gains in making written communication more legible, standardized, and faster to produce in comparison to handwritten memos that businesses had previously relied on.[7] With the adoption of the typewriter, along with carbon paper and vertical filing, businesses could easily create and keep copies of different forms of communication (Yates, 1991; Boorstin, 2010). This improved ease of producing, storing and sharing information attributable to the typewriter contributed to an increased demand for clerical work. The increase in demand for record keeping due to the typewriter was also complemented by an increasing complexity of firms in the late nineteenth century. Specifically, businesses began adopting "scientific management", a system which relied heavily on record keeping (Taylor, 1911; Rotella, 1979), and spurred further demand for clerical work.

The typewriter also altered the task-content of secretarial work and led to a shift in the skills required. As a result, the occupation became more standardized, with limited career advancement. This allowed businesses to meet the growing demand for secretarial and typing work with the available supply of lower-wage women who had obtained this new skill set. Together, increased demand for clerical work due to the adoption of the typewriter coupled with the available supply of qualified women led to the shift in secretarial work being performed by women.

2.3 The Resulting Typing Occupation and Female Typists

The resulting typing occupation, one which primarily employed women, was different from other predominantly female white-collar occupations at the time in three ways: (1) It was driven largely by an exogenous technological change, (2) typists were needed across many different sectors, and (3) women co-existed in the same environment as men. Out of the main set of alternative white-collar occupations for women at the time, which included teaching, bookkeeping, telephone operation, library work, and nursing, the typing occupation stands out in rapidly hiring a large share of female white-collar workers, surpassing even teaching, which was the main white-collar job that women worked in for decades before

[7] This advantage of the typewriter over the pen is also highlighted in early advertisements of the machine. See Appendix Figure A.10, Panel A for one of the first advertisements for the typewriter which specifies that the typewriter can "write from thirty to sixty words per minute, more than twice as fast as the pen – in plain type, just like print."

the typewriter was invented (see Online Appendix Figure A.4).

Among alternative white-collar occupations, telephone operation and bookkeeping also experienced technological changes.[8] However, the gender composition of the bookkeeping profession did not see a similar change and the number of women employed in both occupations was much smaller in magnitude when compared to the number of female typists in the economy (see Online Appendix Figure A.5).

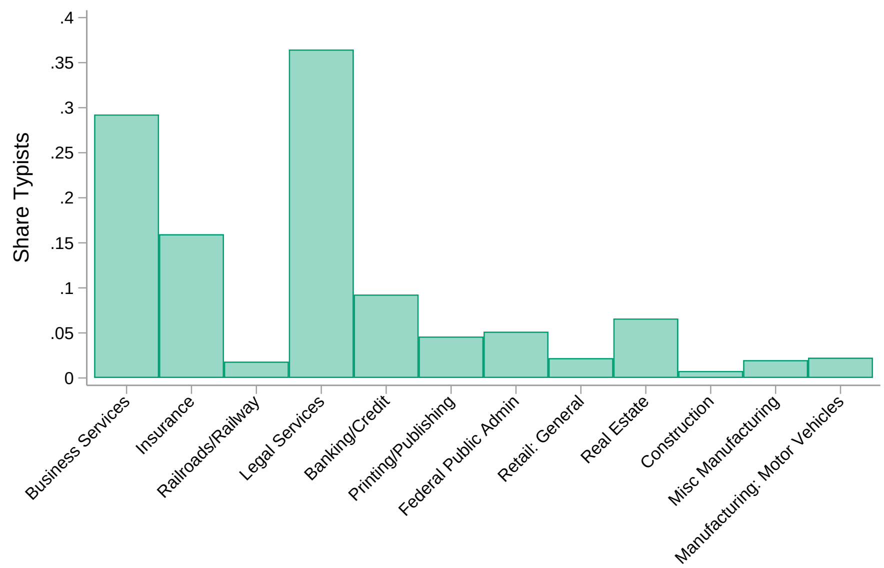
Compared to other major white-collar occupations, which were concentrated within single industries, typists were employed across many different sectors (e.g. teaching occupation is concentrated within the education sector). Figure 2 shows the twelve largest industries employing typists and secretaries in 1920 (each hiring at least 10,000 typists), ranked by the number of typists, with the y-axis reporting typists' share of each industry's workforce. By 1920, Business Services was the leading employer, hiring over 90,000 typists and secretaries, who comprised nearly 30 percent of the sector's employees. Other large employers of typists include the Insurance, Railroad Services, and Legal Services industries. I will utilize this variation in employment of typists across sectors for my core empirical strategy. For many of these industries, a majority of female workers in those industries were employed as typists (see Online Appendix Figure A.2). In fact, the entry of women into several sectors was predominantly driven by the entry of female typists (see Online Appendix Figure A.3 for two such examples from Legal Services and Banking industries).

The typing occupation, by allowing women to enter the office space, gave them the unique opportunity to work alongside and be connected to men in white-collar occupations, often of higher socioeconomic status. This was also referred to as an additional "amenity" of the occupation for women whereby "the educated middle-class woman who secured office employment often found that the business office was an excellent place in which to seek a well-bred husband" (Hoke, 1979). In comparison, alternative white-collar occupations, such as teaching, did not provide such an advantage for women at the time.

As the secretarial occupation and industries that employed typists transformed over time, so did the image of secretaries and typists. Compared to 1880, by 1920 typists were more likely to be women. Compared to the other women of working age, typists across the early twentieth century were more likely to be young, white, US-born, single, childless, living with parents, and living in urban areas. (see Online Appendix Tables A.1-A.2). Compared to other young women in alternative white-collar occupations, these differences are much smaller (see Online Appendix Tables A.3-A.4). Female typists in 1920 were drawn from across the income distribution, including the bottom and with the highest share coming from

[8] The main technological advancement relevant for creating work for women in telephone operation was the telephone switchboard, and the bookkeeping profession experienced the invention of the tabulation machine.

Figure 1: Employment of Typists Across Industries, 1920



NOTE: This figure plots on the x-axis, in descending order, the top 12 industries that employed the highest number of typists and secretaries in 1920. Each of these industries employed at least 10,000 typists. On the y-axis, it plots typists and secretaries as a share of the total industry employment. Three digit industry codes from Ruggles et al. (2021) are used for industry classification.

the middle of the distribution (see Online Appendix Figure A.7). Lastly, nearly all female typists had completed at least some high school education (see Online Appendix Figure A.8).

Having descriptively established how the typewriter led to the creation of new work for women and changed the nature of secretarial work, the main empirical analysis of this paper is dedicated to documenting and understanding the direct and indirect consequences of the typewriter as a predominantly task-creating technological change for women.

3 Data

In this section, I describe the two main sources of data used in the analysis of the paper: historical US census data and genealogical linked data following women across changes in marital status in historical censuses. Further details on the data and corresponding sample and variable construction are provided in Online Appendix B.

3.1 Historical US Census Data, 1860-1940

To conduct the main analysis of the paper, I employ digitized US population decennial censuses from 1860 to 1940 (Ruggles et al., 2021). The analysis focuses on individuals of working-age (aged 16-64). I use these data both aggregated to the county level for the first set of results (up until Section 7) and at the individual level when studying women's intergenerational mobility (Section 8). For parts of the data construction that require a panel of counties, to address changes in county boundaries over time, I use population-based weights from Ferrara et al. (2022) to harmonize county boundaries. Using these data, I construct three main outcome variables across counties: the share of women in the labor force, share of women who are married, and the share of women with children. I measure the share of women in the labor force using women's participation in paid occupations, a commonly used approach for constructing consistent measures of labor force participation from historical census data. This approach does not account for women's participation in unpaid family work (Chiswick and Robinson, 2021). I define individuals who worked as typists and secretaries as those who report their occupation as typing, secretarial work or stenography.

3.2 Linked Sample of White Women, 1920-1940

To study women's intergenerational mobility through marriage, I rely on a sample of White women linked from the 1920 to the 1940 Census using links from the Census Tree (Buckles et al., 2023). Specifically, I follow single young White women, aged 16-30, who can be observed in the labor force and living with their fathers in the 1920 Census, to their married selves in the 1940 Census when they can be observed living with their spouse. Because historical census data do not contain personal identifiers and women, who commonly changed their last names upon marriage, are especially difficult to link across the marriage decision, using genealogical data from FamilySearch Family Trees is one of the few ways to link such women across census decades.[9] The resulting main sample for the intergenerational mobility analysis consists of 903,150 White women.[10]

Linked samples can often be unrepresentative of the underlying population. When comparing the linked sample used in this paper to the 1920 population of White single women aged 16-30 across a variety of observable characteristics, I find that women from farming households are overrepresented and women from urban areas and daughters of immigrants are underrepresented in my sample (see Online Appendix Figure B.2). To account for these differences, I follow Pérez (2017), Zimran (2019), Bailey et al. (2020), and Abramitzky et al. (2021) and use inverse probability weights to reweight my sample to match the observable characteristics of the underlying population, including age, father's occupation

[9]These data are widely used in recent economics publications and working papers (for a list of papers see the Census Tree webpage). Other methods to link women across the marriage decision include using marriage certificates (Eriksson et al., 2026), vital records (Bailey et al., 2022), and administrative data sources (Althoff et al., 2025). For a review of historical record linking methods see Abramitzky et al. (2021).

[10]Though the Census Tree data provide additional links using machine learning methods for women who changed their marital status, I mainly rely on the provided genealogical links. These additional links account for 384,884 additional women. Results are robust to the inclusion of these additional links (see Online Appendix Table H.2).

score, farming household status, urban status, literacy, and nativity of women and their fathers.

Measuring the intergenerational mobility of women through marriage requires observing both the woman's father's income in 1920 and her husband's income in 1940. The 1940 Census records individual level income, which I use for the income of husbands in my sample. However, the 1920 Census did not record income, and so, to obtain a measure for father's socioeconomic status I rely on a constructed occupation based income-score measure based on father's characteristics from Abramitzky et al. (2021). These characteristics include place of birth, age, occupation and state of residence. I also show robustness of main results to using an alternative occupational score measure provided by Ruggles et al. (2021) (see Online Appendix Table H.2).

4 Empirical Strategy

Direct measures of the timing and intensity of typewriter adoption at the county level are not observed. I therefore proxy local exposure to the typewriter using a county's growth in typist and secretarial employment. However, endogenous place-based confounders imply that ordinary least squares (OLS) estimates of the relationship between changes in the number of typists and women's labor force participation could be biased. One obvious downward bias can arise from increased demand for female labor in the local economy in other industries crowding out the demand for female typists. On the other hand, these estimates can also be biased upwards if counties with the greatest change in typists also have more progressive norms for women.

To address these biases, as my core empirical strategy, I build a shift share instrumental variable (SSIV) that combines varying industrial composition of counties with shocks to industries' demand for typists after the adoption of the typewriter. This SSIV is constructed to capture the component of typewriter adoption that is orthogonal to local omitted variables, that could otherwise bias OLS estimates. The intuition behind this approach is well captured by the historical evolution of secretarial and typing employment in two neighboring counties in New York: Kings and Nassau. While both counties had similar population densities and a similar set of industries in 1880, Kings county had a higher share of its workforce employed in industries that, due to their production processes, later adopted the typewriter at higher rates. As a result in 1920, after mass adoption of the typewriter, Kings county had a higher share of secretaries and typists (see Online Appendix Figure C.1 for this example).

The shift-share instrumental variable generalizes this intuition and constructs two sources of variation. The first is the share of workers in a county, c that are employed in each industry, k, in 1880, which I denote as $s_{kc,1880}$.[11] The second is the national change in the number of typists and secretaries, typ_k, from 1880 to 1920 for each industry k. Scaling these changes by the 1880 industry employment, $emp_{k,1880}$, gives the shifts, $\Delta g_{k,1880-1920}$, defined as:

$$\Delta g_{k,1880-1920} = \frac{typ_{k,1920} - typ_{k,1880}}{emp_{k,1880}}. \tag{1}$$

Consistent with the historical record, I choose 1880 as the pre-period before mass adoption of the typewriter and 1920 as the end-point to allow for technology diffusion and the dissipation of adoption frictions that may vary by counties.[12] Using detailed, 3-digit industry codes results in a total of 145 shifts (see Online Appendix Figure C.2 for the distribution of shifts across industries). I show that these shifts are balanced across a range of 1880 industry characteristics (see Online Appendix Figure C.3).

Then, interacting local industry level employment shares before the introduction of the typewriter with the national growth in the typist occupation allows me to identify exogenous variation in the local share of typists. I formally define the SSIV, the predicted change in typists from 1880 to 1920, $\Delta\widehat{typ}_{c,1880-1920}$, as:

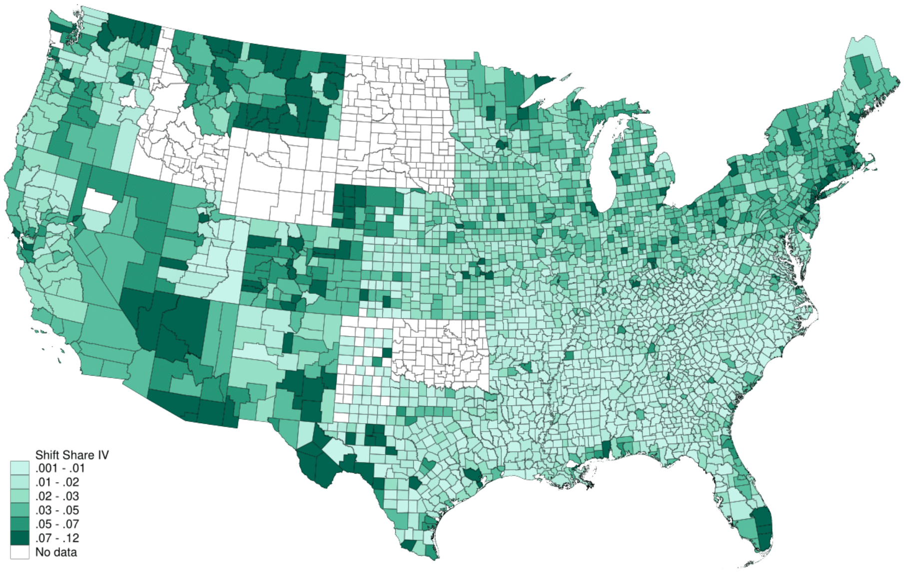
$$\Delta\widehat{typ}_{c,1880-1920} = \sum_{k=1}^{K} s_{kc,1880} \; \Delta g_{k,1880-1920}. \tag{2}$$

Figure 2 maps the variation in the resulting SSIV across counties. The instrument depicts substantial variation across counties. Sizable increases in the predicted change in typists are present in both urban and rural counties, including in less urban counties in the Western region. In the West, counties with larger predicted increases in typists include those with a strong presence of the railroad and railway sector, which was among the leading employers of typists and secretaries (see Figure 1 for top employers of typists in 1920). Finally, the spatial distribution of the SSIV closely mirrors the geographic variation in the actual change in typists from 1880 to 1920, supporting the relevance of the instrument (see Online Appendix Figure C.4 for a map of the geographic variation in the actual change in typists).

[11] By construction, these shares sum to one for each county, that is, $\sum_c \frac{emp_{kc}^{1880}}{emp_c^{1880}} = 1$, and consequently this shift-share design is free of what Borusyak et al. (2022) refer to as the "incomplete shares case".

[12] I do not use the 1910 Census as the endpoint for the main SSIV because women's participation in occupations is recorded differently in this Census as compared to other census decades (Goldin, 1990). Nevertheless, I show that main results are not sensitive to this choice and are robust to constructing the SSIV using shifts with 1910 as the endpoint instead of 1920 (see Online Appendix Table C.18).

Figure 2: Geographic Variation in the Predicted Change in Typists from 1880 to 1920



NOTE: This map plots, for each county, the value of the instrument: the predicted change in typists from 1880 to 1920. The instrument has been winsorized at the 1st and 99th percentiles. Colors and their respective values correspond to percentile bins of the resulting winsorized instrument. From the lightest to the darkest shade, bins of the SSIV represent the 0–25th, 25th–50th, 50th–75th, 75th–90th, and 90th–100th percentiles.

To focus on variation coming from industry-level shifts, rather than baseline differences in county characteristics, I control for predetermined 1880 county characteristics including whether a county is defined as urban, the share of county population in general clerical work, and the share of the county population made up of employed women. I also include census region fixed effects to account for differences across regions (e.g. North-South differences). The inclusion of these controls does not alter my main results, and I also show results without the inclusion of these controls in Table 3. In robustness tests, I also include the following county level characteristics as controls: share of the county population that is (i) aged 16-30, (ii) black, (iii) white, (iv) made up of immigrants, (v) employed in the manufacturing industry, and show that results are robust to choosing controls using double LASSO control selection (Belloni et al., 2014) (see Online Appendix Table C.3). Additionally, I show robustness of my main point estimates to relying on only limited within-state variation by using state fixed effects instead of census region fixed effects (see Online Appendix Table C.16).

Estimating Equation.— I estimate the relationship between typewriter adoption and women's outcomes in 1920 using the following empirical framework:

$$y_{c,1920} = \alpha + \beta \Delta typ_{c,1880-1920} + \mathbb{X}_{c,1880}\gamma + \varepsilon_c \tag{3}$$

$$\text{First Stage:} \quad \Delta typ_{c,1880-1920} = \mu + \lambda \Delta \widehat{typ}_{c,1880-1920} + \mathbb{X}_{c,1880}\Gamma + \epsilon_c. \tag{4}$$

In equation (3), β represents the OLS estimate of the effect of the change in county c's typists from 1880 to 1920, $\Delta typ_{c,1880-1920}$, on the county's share of women in the labor force in 1920, $y_{c,1920}$, conditional on baseline county characteristics and census region fixed effects represented by the control vector $\mathbb{X}_{c,1880}$.[13] Equation (4) estimates the first stage relationship between the instrument, the predicted change in typists from 1880 to 1920 $\Delta\widehat{typ}_{c,1880-1920}$, and the actual change in typists from 1880 to 1920 $\Delta typ_{c,1880-1920}$. Both the instrument and the endogenous variable are winsorized at the 1st and 99th percentiles to limit the influence of outliers, comprised mostly of smaller counties, which add noise to the first stage relationship. The use of winsorized variables improves the precision of the first-stage estimates, while my main results remain robust to this choice (see Online Appendix Table C.17). Women's labor force participation, $y_{c,1920}$, is measured in levels rather than as a change from 1880 to 1920. This choice simplifies interpretation and keeps the analysis anchored to a single reference year, which also aligns with the intergenerational mobility analysis that takes the 1920 Census as the base year for following women exposed to the technological change and working as typists. I also show that my point estimates are similar when using the change in women's labor participation from 1880 to 1920 as outcome, making this choice not consequential for the results (see Online Appendix Table C.1). My baseline sample consists of 2,457 counties and all county-level regressions are weighted by the relevant county population. I cluster standard errors at the county level and show robustness of standard errors to accounting for different forms of spatial correlation (Conley, 1999; Adao et al., 2019). The reduced form equation is as follows:

$$y_{c,1920} = \tilde{\alpha} + \tilde{\beta}\Delta\widehat{typ}_{c,1880-1920} + \mathbb{X}_{c,1880}\tilde{\gamma} + \tilde{\varepsilon}_c, \tag{5}$$

where $\tilde{\beta}$ captures the effect of a 1 percentage point (pp) greater increase in the predicted number of typists from 1880 to 1920 $\Delta\widehat{typ}_{c,1880-1920}$, on the share of women in the labor force in 1920 $y_{c,1920}$. For interpretation, in the text I focus on this reduced form coefficient. However, for all main results, I also report the estimated OLS (β), first stage (λ), and two-stage least squares or 2SLS ($\tilde{\beta}/\lambda$) coefficients.

Identifying Assumption and Validity Checks.— In order for this empirical specification to identify the causal impact of typewriter adoption, conditional on the specified baseline 1880 characteristics, my instrument for changes in the number of typists from 1880 to 1920 must be orthogonal to omitted

[13] Specifically, I construct the 1880 to 1920 change in typists $\Delta typ_{c,1880-1920}$ as the change in a county's number of typists from 1880 to 1920, $typ_{c,1920} - typ_{c,1880}$, relative to baseline county employment $emp_{c,1880}$. Then, $\Delta typ_{c,1880-1920} = \frac{typ_{c,1920} - typ_{c,1880}}{emp_{c,1880}}$. See Online Appendix Figure C.4 for a map of the geographic variation for this measure.

characteristics that are correlated with women's outcomes in 1920. This identifying assumption can be stated formally as:

$$\mathbb{E}[\Delta\widehat{typ}_{c,1880-1920} \times \tilde{\varepsilon}_c | \mathbb{X}_{c,1880}] = 0 \tag{6}$$

Although this assumption cannot be directly tested, relying on varying national shocks to industries' demand for typists assuages concerns that my instrument for increases in the number of typists is correlated with unobserved determinants of women's outcomes across counties. Consistent with the historical narrative, typewriter adoption was largely driven by industry production processes rather than by county-specific conditions, making it plausible that the resulting industry-level demand shocks are orthogonal to unobserved determinants of women's outcomes across counties.

A key advantage of my SSIV design is that identification does not require the exogeneity of baseline county shares $s_{kc,1880}$ which, though predetermined, may be endogenous to a county's women's labor force participation in 1920 through persistent unobserved county characteristics that jointly shape women's work and 1880 industrial composition in counties. In contrast, following Borusyak et al. (2022), my SSIV can satisfy the exclusion restriction even if the initial shares are endogenous insofar as the national shifts are exogenous to county conditions and unobserved determinants of women's outcomes.

I provide three key pieces of supporting evidence for this shifts-based identification. First, using a procedure developed by Adao et al. (2019), I show that the shares are not driving SSIV identification. I replace the shifts $\Delta g_{k,1880-1920}$ with randomly generated shifts $\Delta g^{rand}_{k,1880-1920}$ and find a negligible share of statistically significant results across 1,000 trials.[14] This provides evidence in favor of the shifts, rather than the potentially endogenous shares alone, driving the identifying variation underlying the SSIV.

Second, I provide a test of pretrends and show that, conditional on the specified baseline 1880 characteristics, the instrument is uncorrelated with women's labor force participation prior to 1880. Table 2 reports the coefficients on $\Delta\widehat{typ}_{c,1880-1920}$ from the reduced form model specified in equation (5) using women's labor force participation in censuses prior to 1880 as outcome. The coefficients are close to 0 in magnitude relative to dependent variable means and statistically insignificant across the decades 1860 to 1880.

[14]Specifically, I find 0.1% of the 2SLS coefficients are statistically significant (positive or negative) at the 1% level and 1.9% at the 5% level (see Online Appendix Figure C.5). I also repeat this exercise for the reduced form coefficients, and find that 1.7% of the coefficients are statistically significant at the 1% level (7.7% at the 5% level) and all estimates are close to 0 relative to the main reduced form estimate (see Online Appendix Figure C.6). In comparison, Bazzi et al. (2023), who also use a shifts-based SSIV, found that 5.4% of their IV coefficients were significant at the 1% level and 11.5% at the 5% level.

Table 2: Placebo Test of the Identification Strategy:
Reduced-Form Effect on Pre-Period Women's Labor Force Participation

	Share Women in Labor Force, 1860	Share Women in Labor Force, 1870	Share Women in Labor Force, 1880
$\widehat{\Delta typ}_{c,1880-1920}$	-0.0492	0.0546	0.0131
	(0.246)	(0.128)	(0.039)
Outcome Mean	0.145	0.151	0.169
Observations	2,036	2,229	2,447
Baseline 1880 Controls	Y	Y	Y
Census Region FE	Y	Y	Y

NOTE: This table reports the reduced-form effect of the instrument, the predicted change in typists from 1880 to 1920, on the share of women in the labor force prior to 1880. The unit of observation is a county. The dependent variable is the share of women in the labor force in a county in 1860 (column 1), 1870 (column 2) and 1880 (column 3). Baseline 1880 controls include an indicator for counties defined as urban, the share of county population in general clerical work, and the share of the county population made up of employed women. I define a county as urban if it has a population of 2,500 or larger in 1880. Robust standard errors clustered at the county level are reported in parentheses.

Lastly, to provide evidence that the identifying variation coming from the shifts is not driven by U.S. county-specific factors or other local confounders, I construct an alternative instrument using out-of-sample shifters based on changes to Canadian industries. This SSIV replaces the shifts $\Delta g_{k,1880-1920}$ in equation (2) with the 1891 to 1911 national changes in typists for Canadian industries $\Delta g^{Canada}_{k,1891-1911}$. Online Appendix Table D.1 shows that the main results are robust to using this alternative instrument. Further details of this alternative instrument are provided in Online Appendix D.

5 Results on Women's Labor Force Participation

The invention and diffusion of the typewriter created new employment opportunities for women. Did this technological change have persistent effects on women's outcomes? In this section, I first quantify its impact on women's labor force participation. In subsequent sections, I assess whether the resulting changes in women's work also translated into changes in family outcomes and their intergenerational mobility.

Table 3 first reports estimates of λ from equation (4) for the first-stage relationship between the predicted and actual change in typists from 1880 to 1920 in Panel A. Conditional on baseline county characteristics, a 1 percentage point greater increase in the predicted change in typists is associated with a 2.2 percentage point larger actual change in typists. The F-statistic on the first stage is 29.59 (column 3). This F-statistic changes to 14.5 when census region fixed effects are included with little change to the first-stage coefficient (column 4). The instrument is relevant across specifications where no controls are included (column 1) or when only census region fixed effects are included (column 2). While the

F-statistic from the first-stage is above conventional levels for all regressions, I report Anderson and Rubin (1949) confidence sets for weak-instrument-robust inference for all main results and show that estimates remain precise.

Table 3, Panels C and D report the reduced form and 2SLS coefficients, respectively. Conditional on baseline county characteristics and census region fixed effects, the reduced-form estimate of $\tilde{\beta}$ from equation (5) implies that a 1 percentage point increase in the predicted change in typists from 1880 to 1920 in a county led to a 0.75 percentage point increase in the share of women in the labor force in 1920 (column 4). The 2SLS estimates show that a 1 percentage point greater increase in the number typists in a county increased the share of women in the labor force by 0.37 percentage points. These main results are robust to removal of census region fixed effects (column 3), or baseline county characteristics (column 2), or both (column 1). Though the reduced-form and 2SLS estimates differ in magnitude, they imply similar overall changes to women's labor force participation in 1920 (see Section 7 for results from a back-of-the-envelope calculation to assess magnitudes). This table also presents the corresponding OLS estimates which are nearly 3 times smaller than my IV estimates and consistent with the downward bias discussed in Section 4. This gap between the OLS and IV estimates is also comparable to the gaps reported in Derenoncourt (2022) and Bazzi et al. (2023), who rely on similar shifts-based SSIVs. For brevity and interpretation, in the text, I focus on interpreting reduced form estimates but report first stage, OLS, and 2SLS coefficients for all main results.

Robustness of results.— Before providing further results on the effects of the typewriter on women's outcomes, I conduct additional checks to solidify a causal interpretation of my results. I report these checks in the Online Appendix.

1. *Using Changes in the Share of Women in the Labor Force from 1880 to 1920 as Outcome.* I show that SSIV results are very similar when using the change in a county's share of women in the labor force from 1880 to 1920 $\Delta y_{c,1880-1920}$ as outcome instead (see Online Appendix Table C.1). In the rest of the paper, for ease of interpretation, I use outcomes in levels instead.

2. *Alternative Standard Errors.* I show that main estimates from Table 3 (column 4) remain precise when accounting for spatial autocorrelation based on standard errors obtained using the Conley (1999) approach with cutoffs at 50km and 100km, and based on standard errors using the Adao et al. (2019) correction for SSIV estimators (see Online Appendix Table C.2).

3. *Varying Control Sets.* I use the Belloni et al. (2014) double LASSO procedure to select controls

Table 3: Effect of Typewriter on Women's Labor Force Participation in 1920

	Share Women in LF 1920	Share Women in LF 1920	Share Women in LF 1920	Share Women in LF 1920
Panel A: First Stage on $\Delta typ_{c,1880-1920}$				
$\widehat{\Delta typ}_{c,1880-1920}$	1.777	1.911	2.166	2.011
	(0.221)	(0.263)	(0.490)	(0.544)
F-statistic	64.82	52.65	29.59	14.49
Panel B: OLS				
$\Delta typ_{c,1880-1920}$	0.161	0.217	0.126	0.119
	(0.044)	(0.051)	(0.012)	(0.017)
Panel C: Reduced Form				
$\widehat{\Delta typ}_{c,1880-1920}$	1.526	1.725	0.856	0.748
	(0.140)	(0.120)	(0.136)	(0.137)
Panel D: 2SLS				
$\Delta typ_{c,1880-1920}$	0.859	0.903	0.395	0.372
	(0.159)	(0.137)	(0.082)	(0.092)
Anderson-Rubin 95% CI	[0.602, 1.260]	[0.684, 1.261]	[0.269, 0.651]	[0.237, 0.705]
Outcome Mean	0.262	0.262	0.262	0.262
Observations	2,457	2,457	2,457	2,457
Census Region FE	N	Y	N	Y
Baseline Controls	N	N	Y	Y

NOTE: Regressions in Panel A document the first stage relationship between the SSIV and the actual change in typists from 1880 to 1920. Panels B, C and D use the share of women in the labor force in 1920 as outcome. The unit of observation is a county. Column 1 does not include any controls, column 2 includes only census region fixed effects, column 3 includes only baseline 1880 county controls, and column 4 includes both baseline 1880 controls and census region fixed effects. Baseline 1880 controls include the share of county population that is employed in clerical work, employed women, and whether or not a county is defined as urban. I define a county as urban in 1880 if it has a population of at least 2,500. Robust standard errors clustered at the county level are reported in parentheses. I provide Anderson and Rubin (1949) confidence sets for 2SLS estimates (Panel D).

in addition to the baseline county characteristics included in the control vector $\mathbb{X}_{c,1880}$. This set of additional county controls include the share of county population that is comprised of individuals aged 16-30, Black individuals, White individuals, immigrants, and workers in the manufacturing industry. My SSIV results are robust to using the Belloni et al. (2014) post-double-selection LASSO estimator including these additional set of controls (see Online Appendix Table C.3).

4. *Role of Urbanization.* I provide a suite of checks to disentangle the effect of the technological change from the effects of urbanization, which can also be related to women's labor force participation. While my baseline specification already accounts for a county being urban in 1880 and my identifying variation comes from national shifts, I provide the following additional checks to show that my results are not driven by differences in urbanization at baseline:

   (a) In my baseline specification, I construct the indicator for whether a county is urban in 1880 using a county population cutoff of 2,500 residents.[15] I show that my main results are robust to

[15] Constructing indicator variables for urban localities based on population counts is common in the literature using historical census data (e.g. Abramitzky et al. (2023)).

using higher population cutoffs of 3,000 and 3,500 individuals instead (see Online Appendix Tables C.6 and C.7). I also construct an alternative definition of urban counties stemming from town populations using data from the Census Place Project (Berkes et al., 2023) and show that results are robust to using this alternative measure to classify a county as urban (see Online Appendix Table C.8).[16]

(b) I repeat the analysis limited to only urban counties based on different population cutoffs and show that estimates obtained from this within-urban county analysis are similar in magnitude (see Online Appendix Tables C.9-C.11).

(c) Lastly, I show that results are robust to accounting for population differences by including county population or population density in the control vector $\mathbb{X}_{c,1880}$ instead of an indicator for urban counties in 1880 (see Online Appendix Tables C.12 and C.13).

5. *Accounting for the Broader Growth in Clerical Occupations.* While it is difficult to truly disentangle the broader growth in non-typist clerical work due to unobserved factors such as adoption of scientific management from spillover effects of the technological change (outlined in Section 5.2 below), I construct an analogous shift-share variable for the predicted growth in clerical occupations that were not at risk of utilizing the typewriter from 1880 to 1920 $\widehat{\Delta Clerk}^{1880-1920}$ and include it in my empirical specification. I find that the broader growth in non-typist clerical work does not account for the observed changes in the share of women in the labor force and that the reduced-form estimate for this measure is 3.25 times smaller in magnitude when compared to my baseline estimate and is not significantly distinguishable from 0 (see Online Appendix Table C.14).

6. *Alternative Instrument Using Out-of-Sample Shifts.* My baseline SSIV uses shifts constructed from industries in the US. I construct an alternative instrument using out-of-sample shifters based on changes to Canadian industries from 1891 to 1911 $\Delta g^{Canada}_{k,1891-1911}$ instead. Online Appendix Table D.1 shows that my main results are robust to using this alternative instrument and that the underlying identifying variation of my SSIV coming from the shifts is not driven by U.S. county-specific factors or other local confounders.

7. *Using Only Within State Variation.* Online Appendix Table C.16 shows that my estimates are similar in magnitude when relying only on limited within state variation by including state fixed

[16]I do not use this alternative definition of an urban county in my baseline specification because not all of the individuals and households in the 1880 census can be geocoded to towns with the same accuracy (Berkes et al., 2023).

effects in the control vector $\mathbb{X}_{c,1880}$.

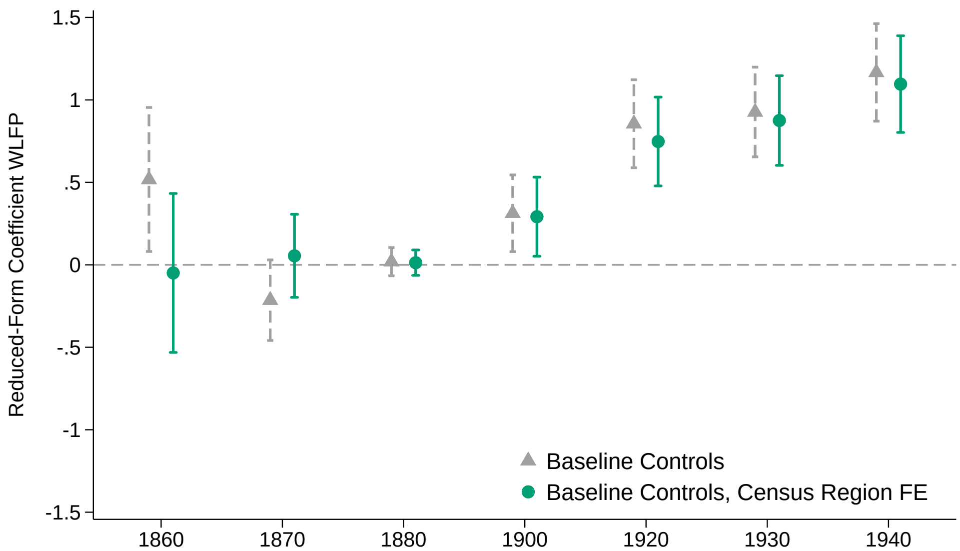
8. *Results Not Driven By Any One County or State.* I compute the reduced form and 2SLS estimates for the share of women in the labor force in 1920 leaving out one county at a time and show that estimates are not driven by any one specific county (see Online Appendix Figures C.10 and C.11). I also repeat this exercise leaving out one state at a time and find that the results are not sensitive to excluding any single state (see Online Appendix Figures C.8 and C.9).

9. *Robustness to Data Construction Choices.* Lastly, I show that my main reduced form and 2SLS results do not hinge upon data construction choices such as the choice of winsorizing the instrument at the 1st and 99th percentiles, using 1920 as the endpoint for constructing the shifts, or method of harmonizing county boundaries (see Online Appendix Tables C.17 and C.18).

Supporting Evidence Using an Alternative Empirical Approach.— I show that I obtain similar results when I use an alternative empirical approach which relies on variation in the supply of typists. Specifically, I digitize data on early Women's Christian Associations (WCAs) which were established as religious boarding homes but provided the first typing courses for women after the invention of the typewriter (Duncan, 1893). I use a matched-control difference-in-differences framework to compare outcomes of women in counties which had WCAs prior to 1880 with observationally similar counties which never established a WCA. I first show that counties which had WCAs prior to 1880 had a higher share of female typists (see Online Appendix Figure E.2). I next test for and find a lack of pre-trends and find results that are consistent with my main results (see Online Appendix Figure E.3). Specifically, I find that counties with WCAs prior to 1880 had a higher share of women in the labor force, a lower share of women who were married and a lower share of women with children in the decades after typewriter adoption. Because my results rely only on 43 treated counties which had WCAs before typewriter adoption, I interpret these findings using an alternative empirical approach as further supporting evidence for my core empirical strategy. See Online Appendix E for further details of this analysis.

Effect on Women's Labor Force Participation in Each Decade.— Figure 3 provides the reduced form estimate of $\tilde{\beta}$ from equation (5) separately for each census decade from 1860 to 1940. The effect of a 1 percentage point greater increase in the predicted change in typists on the share of women in the labor force is similar in magnitude and stable across decades after 1920, suggesting a persistent effect of the technological change on women's labor force participation. This is also largely consistent with the historical evidence that by 1920 typewriter diffusion was largely complete and frictions related to technological adoption had dissipated, and provides further support for focusing on women's outcomes in 1920. The sensitivity of estimates in 1860 and 1870 to census region fixed effects is consistent with these particular censuses having enumeration differences that varied systematically by census region, and further emphasizes the importance of including census-region fixed effects in the baseline specification.[17]

Figure 3: Reduced Form Effect of Typewriter on Women's Labor Force Participation in Each Decade



NOTE: This figure plots reduced form coefficients for the effect of the typewriter on women's labor force participation in each census decade from 1860 to 1940. The coefficients correspond to estimating reduced-form equation (5) using women's labor force participation separately from each decade. The unit of observation is a county. All regressions include baseline 1880 controls. Baseline 1880 controls include an indicator for counties defined as urban, the share of county population in general clerical work, and the share of the county population made up of employed women. I define a county as urban if it has a population of 2,500 or larger in 1880. Coefficients in green add census region fixed effects. The 1910 Census is omitted because women's labor force participation in this decade was measured differently from other decades (Goldin, 1990).

5.1 Heterogeneity By Race

I next ask whether typewriter adoption had varying effects on women's outcomes by race? Specifically, whether this technological change had any unintended consequences for Black women, who were not as likely as White women to be hired as typists and secretaries? Table 4 reports estimates separately for Black and White women's labor force participation in 1920. Compared to baseline estimates for all women (column 1), a one percentage point greater increase in the predicted change in typists led to an increase of 1.07 percentage points in a county's share of White women in the labor force in 1920 (column

[17] Specifically, the 1860 and 1870 censuses had under-enumeration in the South when compared to other census regions. The 1860 Census did not record Black women's work in the South and many Southern states in the 1870 Census suffered from under-enumeration due to post-war administrative disruptions.

2). On the other hand, the share of Black women increased by 1.7 percentage points in response to a 1 percentage point greater increase in the predicted change in typists in a county (column 3).

Table 4: Race and Gender Heterogeneity in Impact of Typewriter on Labor Force Participation in 1920

	All Women	White Women	Black Women	Men
Panel A: First Stage on $\Delta typ_{c,1880-1920}$				
$\widehat{\Delta typ}_{c,1880-1920}$	2.011	2.106	2.046	2.035
	(0.544)	(0.583)	(0.759)	(0.536)
F-statistic	14.49	13.73	10.94	15.11
Panel B: OLS				
$\Delta typ_{c,1880-1920}$	0.119	0.113	0.300	0.0428
	(0.017)	(0.019)	(0.071)	(0.017)
Panel C: Reduced Form				
$\widehat{\Delta typ}_{c,1880-1920}$	0.748	1.092	1.715	0.477
	(0.137)	(0.154)	(0.414)	(0.076)
Panel D: 2SLS				
$\Delta typ_{c,1880-1920}$	0.372	0.518	0.838	0.234
	(0.092)	(0.132)	(0.281)	(0.063)
Anderson-Rubin 95% CI	[0.237, 0.705]	[0.337, 1.041]	[0.458, 2.519]	[0.145, 0.465]
Outcome Mean	0.262	0.241	0.449	0.915
Observations	2,457	2,457	2,243	2,457
Baseline Controls + Census Region FE	Y	Y	Y	Y

NOTE: Column 1 presents baseline estimates from Table 3, column 4 for comparison. Column 2 uses the share of White women in the labor force in 1920 as outcome. Column 3 uses the share of Black women in the labor force. Column 4 uses the share of men. The unit of observation is a county. Respective population weights are used for estimates in each column. Robust standard errors clustered at the county level are reported in parentheses. I provide Anderson and Rubin (1949) 95% confidence sets for 2SLS estimates (Panel D). All columns include baseline 1880 controls and census region fixed effects. Baseline 1880 controls include the share of county population that is employed in clerical work, employed women, and whether or not a county is defined as urban. I define a county as urban in 1880 if it has a population of at least 2,500.

Because of Black migration from Southern to Northern states during the early twentieth century, changes in Black women's labor force participation could also in part reflect migration to industrial Northern cities rather than the effects of the typewriter. While census region fixed effects already account for differences in Black population in the North vs South, I further mitigate this concern by showing that the results for Black women's labor force participation are not being driven by Black population changes across counties and are robust to including changes in a county's Black population from 1880 to 1920 as an additional control (see Appendix Table C.15).

Table 4 also reports spillover effects on men's labor force participation in 1920 (see column 4). It shows that the share of men in the labor force also increased by 0.47 percentage points. I interpret the 1.6 times smaller effect on men's labor participation as a spillover effect of the technological change. In fact, this is expected as we anticipate "all workers to benefit from technological progress, at least to some degree" (Autor, 2022). I next analyze the mechanisms underlying these observed changes in Black and White women's outcomes.

5.2 Mechanisms

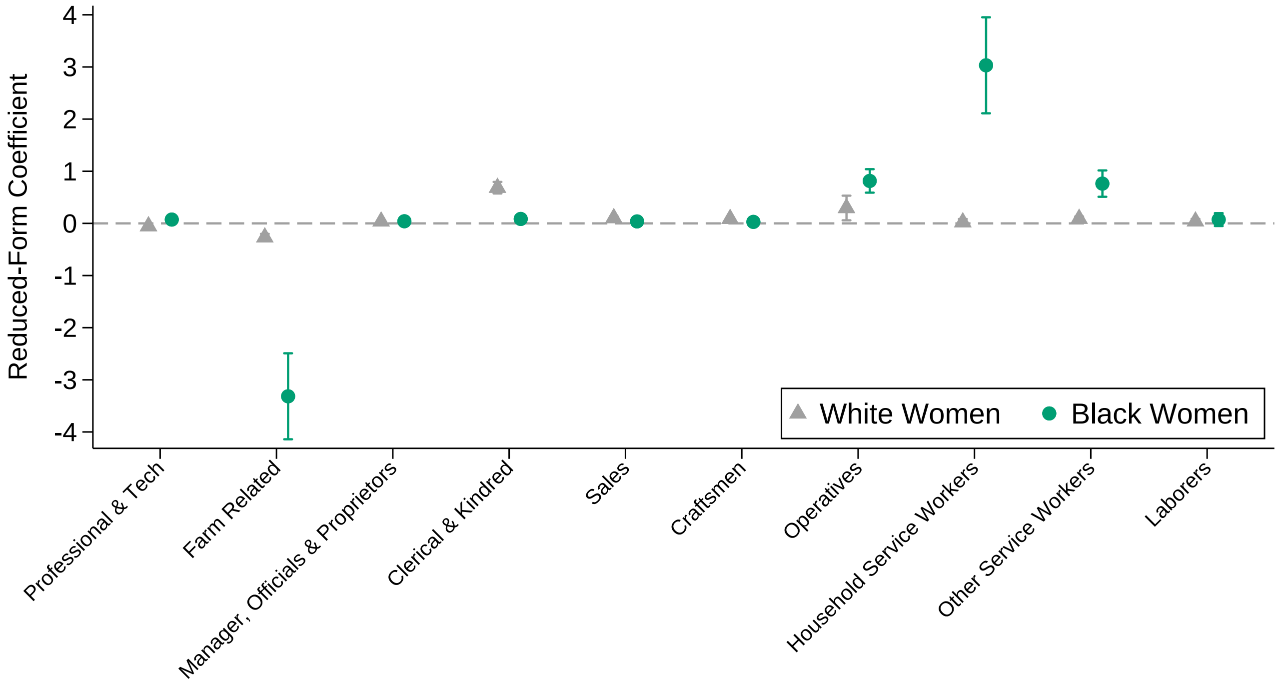
To understand the forces underlying the increases in Black and White women's labor participation, I turn to the types of occupations that Black and White women were employed in, in response to greater typewriter adoption. Figure 4 plots the reduced-form effect of a 1 pp greater increase in the predicted change in typists from 1880 to 1920 on the share of White women (gray coefficients) and Black women (green coefficients) employed in each broad occupation group. It first shows that a greater share of White women were employed in clerical occupations in counties with a greater predicted change in typists. Analyzing more granular occupations shows that underlying this increase are both direct effects of the technological change which lead to greater participation of White women in typing and secretarial work but also spillover effects of the technological change that increase employment of White women in closely related white-collar clerical occupations, such as bookkeepers, cashiers, and telephone operators (see Online Appendix Figure F.1). I interpret these as spillover effects of the typewriter rather than increases in demand of overall clerical work driven by unobserved factors because an analogous Bartik instrument constructed using national changes in non-typing clerical employment has no effect on women's labor force participation in 1920, indicating that the results are specific to typist demand rather than broader clerical expansion (see Online Appendix Table C.14 for results accounting for the broader growth in clerical occupations).[18]

Next, Figure 4 highlights that in response to typewriter adoption, a greater share of Black women were employed in services related work, especially in household services. This suggests the presence of an indirect crowding-in effect of the technological change, whereby as White women joined the labor force to enter clerical occupations, this led to an increase in demand for Black women in paid services work, especially household service work (see Online Appendix Table F.6 for effects on Black women's participation in more granular services occupations within these categories). Similar results are obtained when using industry groupings instead (see Online Appendix Table F.2). I also show that these results are not driven by differences in urbanization across counties at baseline and are robust to an analysis restricted only to urban counties (see Online Appendix Table F.4). Below, I build a case for this increased demand for Black women's labor in services work, particularly household services, arising primarily through White women's increased labor force participation.[19]

[18] There are also small spillover effects on White men's employment in clerical occupations including working as bookkeepers, office boys and secretaries (see Online Appendix Table F.3).

[19] Figure 4 also shows that a larger predicted change in typists is related to a reduction in the share of Black women employed in agricultural work, suggesting that a greater demand for their labor in alternative occupations, such as in household service work, could have allowed Black women to reduce their participation in agricultural work.

Figure 4: Reduced Form Effect of Typewriter on Black and White Women's Labor Force Participation in Occupation Groups



NOTE: This figure plots the reduced form coefficients for the effect of the typewriter on the share of Black and White women in each of the occupation groups in 1920. The occupation categories follow occupation classifications by Ruggles et al. (2021). The coefficients correspond to estimating equation (5) using shares of Black and White women within each occupation in a county as outcome. Respective population weights for Black and White women are used. All regressions include census region fixed effects and baseline 1880 controls. Baseline 1880 controls include the share of county population that is employed in clerical work, employed women, and whether or not a county is defined as urban. I define a county as urban in 1880 if it has a population of at least 2,500.

1. *Increased Participation of Black Women in Household Services Work.* One way in which increased participation of White women in the labor force arising from typewriter adoption could have led to greater demand for Black women in household service work is if the unpaid housework previously performed by White women needed to be delegated to paid help due to White women having less time for unpaid housework upon being employed in clerical work. This substitution mechanism applies both to young White women living with their parents and to White women living alone.

   First, as young White women entered clerical work, some either left their parents' households to take jobs elsewhere or spent less time at their parents' household due to their employment. Prior to labor force entry, these young women contributed a non-trivial amount of time to unpaid household production. Time-diary evidence from the 1920s and 1930s suggests that White women in high school living with their parents contributed on average about six hours of housework per week (Ramey, 2008). When these women began working and were less available to perform (or no longer present to perform) these tasks at home, households could respond by substituting toward paid domestic help, increasing demand for Black women in household service work. This is also consistent with a larger effect on Black women's employment as laundresses for households rather than as full time housekeepers for private households, suggesting that households were delegating some of the household production tasks to paid help (see Online Appendix Table F.6, Panel A).

Second, once White women living outside of their parents' homes entered clerical employment, they had fewer hours available for unpaid housework, which could further increase demand for Black women's labor in paid household services. Suggestive evidence for this also comes from early twentieth-century time diaries which suggest that unemployed married women without children spent about 44 hours per week on housework, whereas single women employed in white-collar occupations spent roughly 6–7 hours per week (Ramey, 2008).

2. *Increased Participation of Black Women in Other Related Services Work—.* I also find an increase in demand for Black women in similar service work outside of households which arose from single young White working women living in boarding and lodging homes while working as secretaries. I provide support for this channel by showing that Black women's employment as boarding and lodging house keepers, cooks, and cleaners outside private households also increased in response to a greater predicted change in typists (see Online Appendix Table F.6, Panel B).

Another complementary channel that could underlie the indirect increased demand for Black women's labor is an income channel whereby working White women, through their independent income, could now afford to hire help. However, an income effect mechanism is less consistent with prior work which does not find an association between income and time spent on home production by women in the twentieth century (Vanek, 1973; Ramey, 2008).

Together, these results suggest that Black women's increased participation in household service work in the early twentieth century was in part driven by an indirect crowding-in effect of the typewriter on Black women's labor. While historically it has been documented that Black women increasingly entered domestic service work in the early twentieth century (Jones, 2009), the mechanisms underlying this structural change are less well understood. This finding highlights a novel mechanism by which Black women entered domestic service work and underscores the role of technological changes in inducing indirect occupational shifts among groups of workers that are not directly impacted by the innovation.

6 Results on Women's Family Outcomes

Having established the impact of the typewriter on women's labor force participation in the early twentieth century, I now ask whether the labor market effects induced by the technological change also led to changes in women's marriage and fertility decisions? Table 5 shows that a one percentage point greater increase in the predicted change in typists is related to a 0.4 pp reduction in the share of women who are married and a 0.2 pp decrease in the share of women with children in 1920. I also subject these results to many of the same robustness checks as my results on women's labor force participation, and find that the estimates for women's family outcomes are also robust to the additional checks. I report the results of these additional checks in the Online Appendix.

Table 5 then reports estimates separately for White women (columns 3–4) and Black women (columns 5–6). Among White women, a greater predicted increase in typists is associated with reductions in marriage and fertility that are similar in magnitude to the pooled estimates for women overall. In contrast, the estimated effect on the share of Black women who are married in 1920 is statistically indistinguishable from zero, while the share of Black women with children declines by 1.8 pp.

Table 5: Effect of Typewriter on Women's Family Outcomes in 1920, by Race

	All Women		White Women		Black Women	
	Married	Children	Married	Children	Married	Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$						
$\widehat{\Delta typ}_{c,1880-1920}$	2.011	2.011	2.106	2.106	2.046	2.046
	(0.544)	(0.544)	(0.583)	(0.583)	(0.759)	(0.759)
F-statistic	14.49	14.49	13.73	13.73	10.94	10.94
Panel B: OLS						
$\Delta typ_{c,1880-1920}$	-0.0205	-0.0469	-0.0224	-0.0414	0.0230	-0.219
	(0.018)	(0.029)	(0.019)	(0.028)	(0.032)	(0.040)
Panel C: Reduced Form						
$\widehat{\Delta typ}_{c,1880-1920}$	-0.426	-0.595	-0.371	-0.454	-0.270	-1.858
	(0.111)	(0.138)	(0.112)	(0.142)	(0.201)	(0.198)
Panel D: 2SLS						
$\Delta typ_{c,1880-1920}$	-0.212	-0.296	-0.176	-0.215	-0.132	-0.908
	(0.079)	(0.103)	(0.071)	(0.087)	(0.111)	(0.355)
Anderson-Rubin 95% CI	[-0.493, -0.094]	[-0.670, -0.144]	[-0.426, -0.067]	[-0.517, -0.079]	[-0.638, 0.064]	[-3.377, -0.494]
Outcome Mean	0.647	0.533	0.648	0.538	0.641	0.489
Observations	2,457	2,457	2,457	2,457	2,243	2,243
Baseline Controls + Census Region FE	Y	Y	Y	Y	Y	Y

Note: Columns 1 and 2 present estimates for all women. Columns 3 and 4 present results for White women and columns 5-6 present results for Black women. Estimates are provided for two outcomes within each group: share of women who are married in 1920 and share of women who have children in 1920. The unit of observation is a county. Respective population weights are used for estimates in each column. Robust standard errors clustered at the county level are reported in parentheses. I provide Anderson and Rubin (1949) 95% confidence sets for 2SLS estimates (Panel D). All columns include 1880 baseline controls and census region fixed effects. Baseline 1880 controls include the share of county population that is employed in clerical work, employed women, and whether or not a county is defined as urban. I define a county as urban in 1880 if it has a population of at least 2,500.

These changes in women's marriage and fertility outcomes reflect both delayed family formation and, for some women, foregone marriage or childbearing. To distinguish between these margins, I compare the shares of women at each age (16-40) who are married and with children for White women living in counties with above- versus below-median changes in predicted typists. White women in above-median SSIV counties are less likely to be married and have children at nearly every age, with the gap in marriage narrowing at older ages, implying that a portion of women delay marriage rather than permanently forgo it (see Online Appendix Figure F.2 Panels A and B).

In contrast, gaps in the share of Black women who are married are small at all ages when comparing counties with above- versus below-median predicted changes in typists (see Online Appendix Figure F.2 Panels C and D). This is consistent with the overall insignificant estimate for the share of Black women who are married in 1920. However, the gaps in the share of Black women with children are large and persistent across the age distribution. Given that my fertility measure depends on co-residence with children, this pattern can be consistent with either a reduction in childbearing and/or Black mothers living apart from their children due to employment opportunities.

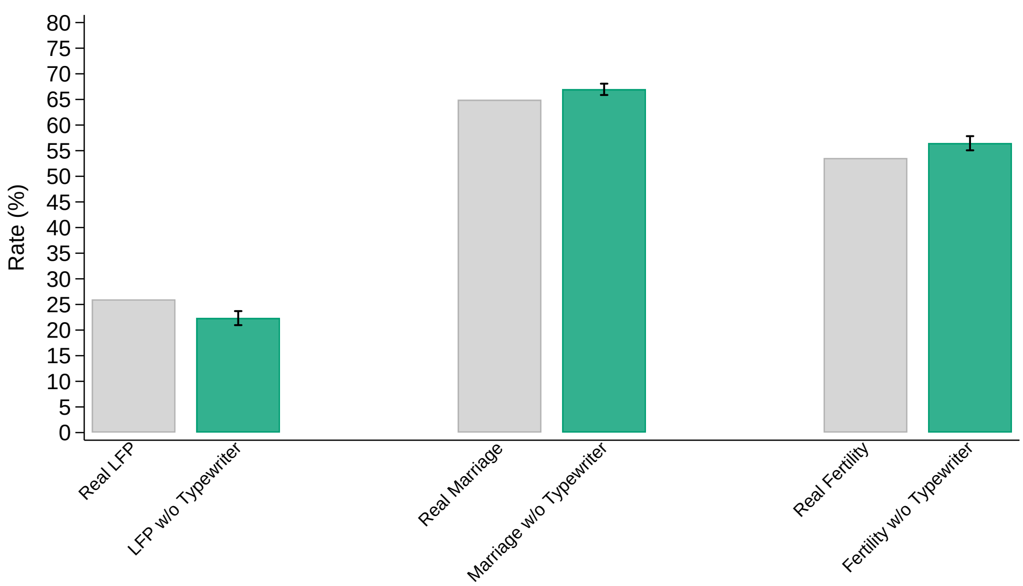
Two facts from my data help explain the decline in the share of Black women with (or co-residing with) children across all age groups. First, among married Black women, those in counties with larger predicted changes in typists are more likely to live apart from their husbands (see Online Appendix Table F.7), consistent with residential separation tied to their changing employment opportunities due to unintended consequences of the typewriter. Second, Black women employed in domestic service work are less likely to have or live with children even when compared to Black women employed in alternative occupations within the same county (see Online Appendix Figure F.3). This pattern is consistent with domestic service work being less compatible with childcare, an occupation which often required work in employers' homes. In comparison, agricultural work, which employed a large fraction of Black women at the time, was an occupation where children often accompanied their mothers to work (Thistle, 2006).

7 Assessing Magnitudes: Women's Outcomes in the Absence of the Typewriter

To understand the magnitude of the changes brought about by the typewriter, I use my estimates from the SSIV empirical framework to employ a back-of-the-envelope calculation and assess women's labor force participation, marriage, and fertility rates in 1920 in the absence of the typewriter.

Using the reduced-form estimates, Figure 5 plots women's labor force participation, marriage and fertility rates in the absence of the predicted change in typists brought about by the typewriter (in green) along with actual rates for comparison (gray). This back-of-the-envelope calculation suggests that the share of women in the labor force in 1920 would have been 3.65 pp lower in the absence of the typewriter. Using the underlying population of 31.7 million women of working age, this implies that the invention and diffusion of the typewriter accounted for roughly 1.16 million additional women in the labor force in 1920. This overall number masks both the direct effects of the technological change on the number of women employed as typists and secretaries, which reached 584,439 by 1920, and spillover effects which increased White women's employment in related clerical occupations and Black women's employment in household and related services work (see Section 5.2). Using the 2SLS estimates yields a similar back-of-the-envelope calculation: the share of women in the labor force would have been 3.35 p.p. lower (compared to 3.65 p.p. using the reduced form), corresponding to about 1.05 million fewer women in the labor force in 1920.

Figure 5: Women's Outcomes in 1920 in the Absence of the Typewriter



NOTE: This figure plots results from the back-of-the-envelope calculation described in Online Appendix G. It uses reduced form estimates corresponding to equation (5) and reported in Table 3, column 4 for women's labor force participation and Table 5, columns 1 and 2 for women's family outcomes.

Applying the same back-of-the-envelope approach to family outcomes, Figure 5 shows that absent the labor-market impacts of the typewriter, marriage and fertility rates in 1920 would have been higher as well. Specifically, the estimates imply a 2.04 pp higher share of women married and a 2.89 pp higher share of women with children. Using the underlying population of women, these magnitudes translate into approximately 650,000 fewer married women and 920,000 million fewer women with children in 1920 as a result of the adoption of the typewriter.

8 White Women's Intergenerational Mobility

By creating new work for women, the typewriter drew White women into clerical positions and offices, and these developments consequently helped reshape their choices about marriage and childbearing. For White women who were exposed to the typewriter early on and later got married, did this technological change also shape *who* they married? In this section, I study whether the changes brought about by the typewriter reshaped White women's social interactions and led them to marry husbands with higher income, and whether this, in turn, generated upward mobility for them.

To study women's intergenerational mobility, I follow young White women from the 1920 Census, when they can be observed living with their fathers, to the 1940 Census, when they are married and observed living with their husbands, using linked census data described in Section 3. I focus on intergenerational mobility for women specifically through the channel of marriage because women in the early twentieth century frequently dropped out of the labor force upon getting married (Goldin, 1983) and marriage was one of their only channels for upward mobility given their limited career opportunities. In fact, only 12% of the 903,150 White women in my linked sample are recorded as having an occupation in 1940 when they are married. While the estimates in this section are reweighted to be representative of the underlying population of young White women in 1920, they should nonetheless be interpreted within the context of the linked sample.

8.1 Descriptive Evidence

I begin by descriptively establishing whether women who worked as typists and secretaries in 1920 were married to higher-earning men by 1940, as compared to different comparison groups of women. To estimate the association between working as a typist in 1920 for a woman i, $\mathbb{1}\{Typist_{i,1920}\}$, and the logarithm of her future husband's income in 1940, $LogIncome^{husband}_{i,1940}$, I use the following specification:

$$LogIncome^{husband}_{i,1940} = \alpha + \beta\mathbb{1}\{Typist_{i,1920}\} + \gamma IncomeScore^{father}_{i,1920} + \mathbb{X}_{i,1920}\Gamma + \delta_c + \epsilon_i. \qquad (7)$$

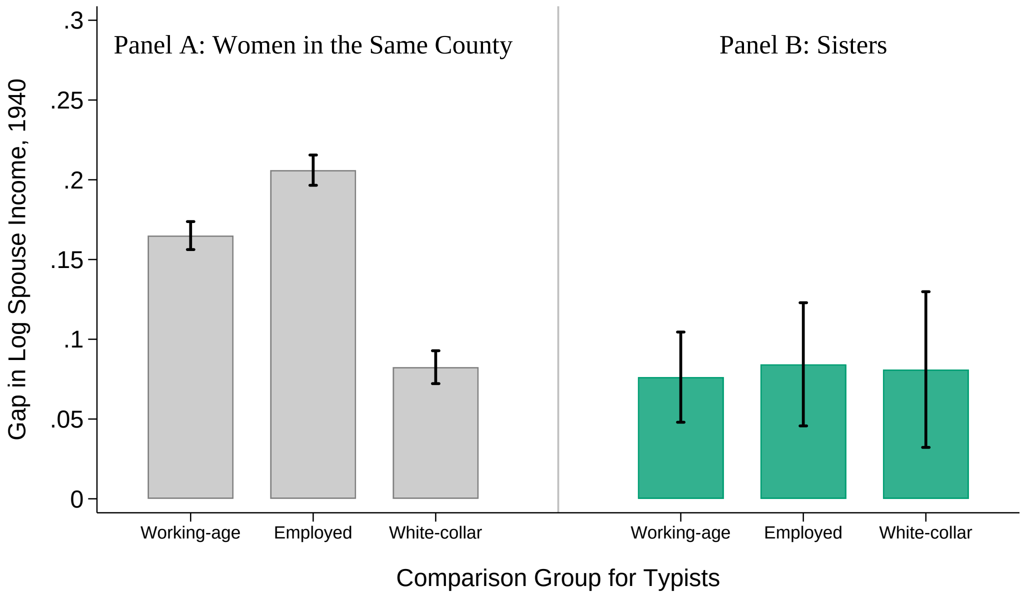
For each woman i, this specification controls for her father's income score in 1920, $IncomeScore^{father}_{i,1920}$, and control vector $\mathbb{X}_{i,1920}$ includes women's place of birth and age, as measured in the 1920 Census. I also include 1920 county fixed effects, δ_c, to only draw comparisons between women who lived and worked in the same county at baseline within my sample.

Figure 6 Panel A plots OLS estimates of β from equation (7) using three different comparison groups for young White women working as typists in 1920: (1) all other young White women, (2) only those women who were employed in alternative occupations in 1920, and (3) only those women who were employed in alternative white-collar occupations in 1920. Across all comparison groups of women, working as a typist in 1920 is associated with marrying a husband of higher income. Focusing on the third comparison group, working as a typist in 1920 is associated with marrying a man who had 8.6% higher income than husbands of comparable White women who were employed in alternative white-collar occupations in 1920 within the same county. The corresponding gaps rise to 17.9% and 22.9% when typists are compared with all other young women and with all employed women in 1920 in the sample, respectively.

While controlling for father's income score in 1920 $IncomeScore_{i,1920}^{father}$ helps account for observable differences in family income, unobservable differences across families of typists and non-typists in my sample may still bias the OLS estimates in Panel A. I therefore include father fixed effects, $\omega_{father(i)}$, in equation (7), which restricts the analysis to within-family comparisons across *sisters* who lived in the same household in 1920. Conditional on residing with the same father in 1920, their birth order and place of birth, women who worked as typists in 1920 married men with 8.4% higher income as compared to their sisters who were employed in alternative white-collar occupations in 1920. The estimated gap is similar when typists are compared to their sisters irrespective of employment status, and when they are compared only to sisters who were employed, irrespective of occupation. Because the estimates obtained from comparisons across sisters are smaller in magnitude than those obtained when comparing typists to all other women (Panel A), this pattern suggests that unobserved family characteristics may be correlated with selection into typing and subsequent marriage outcomes. It should be noted, however, that the estimates from the sister comparisons are not significantly different from the estimate obtained when comparing typists to all other women employed in white-collar occupations. This suggests that women employed in alternative white-collar occupations may provide a more appropriate comparison group for women working as typists.[20]

[20]The comparison group of women working in alternative white-collar occupations may contain some workers also using the typewriter, such as bookkeepers. However, such comparisons would bias my OLS estimates downwards. Consistent with this, I show that my estimates are larger when occupations at risk of using the typewriter are excluded from the comparison group of white-collar workers (see Online Appendix Table H.1).

Figure 6: Differences in Future Husbands' Income for Typists and Non-Typists



NOTE: This figure plots β coefficients corresponding to equation (7) using different samples of women. Panel A compares women working as typists in 1920 to other women who were residing in the same county as them in 1920. Panel B compares women working as typists only to their sisters who were living in the same household as them in 1920. All estimates in Panel A include 1920 county fixed effects, 1920 baseline controls, and father's income score. All estimates in Panel B include father fixed effects and 1920 baseline controls. Baseline controls from 1920 for Panel A include women's place of birth and age. Baseline controls from 1920 for Panel B include sisters place of birth and birth order. Only genealogical links are used from the underlying linked data of White women described in Section 2. All estimates are reweighted to be representative of the underlying population.

Having shown descriptively that working as a typist enabled women to marry higher-earning men, I next examine whether this translated into upward mobility for women employed as typists. Formally, I estimate the relationship between working as a typist in 1920 and intergenerational mobility using the following rank-rank specification:

$$\begin{aligned} RankHusband_i = \alpha &+ \beta_0 \mathbb{1}\{Typist_{i,1920}\} + \beta_1 RankFather_i \\ &+ \beta_2 \mathbb{1}\{Typist_{i,1920}\} \times RankFather_i + \epsilon_i, \end{aligned} \tag{8}$$

where, $\mathbb{1}\{Typist_{i,1920}\}$ equals one if woman i worked as a typist in 1920. Husbands and fathers are ranked in the national income distribution of their respective cohorts following Chetty et al. (2014, 2020), and *RankHusband* and *RankFather* denote husband's income rank in 1940 and father's income score rank in 1920, respectively. The constant term, α, then represents the absolute rank mobility, based on husband's income, for women not working as typists. β_0 measures the difference in this expected husband rank for women who worked as typists in 1920. β_1 captures relative mobility through marriage of women who were not employed as typists, that is the association between women's fathers' ranks and their husbands' ranks. Lastly, β_2 measures how this relative mobility differs for women who were employed as typists, or how the intergenerational mobility through marriage differs for women who worked and did not work as typists.

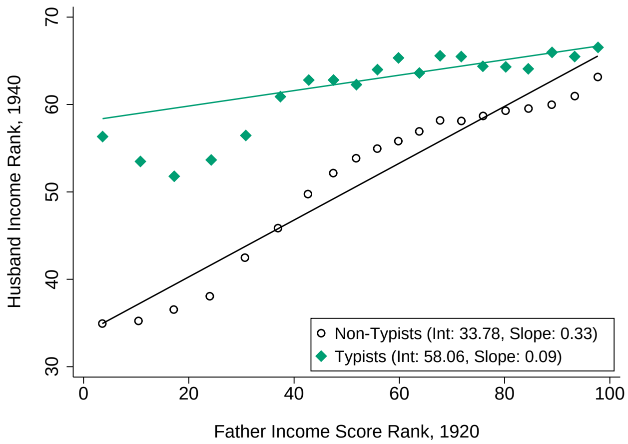
Figure 7, Panel A plots regression lines corresponding to equation (8) and a binned scatterplot showing husband's mean income rank by father's income ventile for women who worked and did not work as typists in 1920. The figure shows that the future husbands of typists out-earned those of non-typists at every ventile of father's income distribution, with the largest gaps appearing among women born to fathers at the bottom of the distribution. Among women whose fathers were at the 25^{th} percentile of the income distribution, those who worked as typists married men whose average income rank was 17.9 percentiles higher than that of the husbands of non-typists. I show that this gap is not driven by alternative explanations such as growing up with a working mother, differences in family size, and residing in an urban location at baseline (see Appendix Figure H.1).

Next, I compare the mobility advantage offered by the typing and secretarial occupation with that of teaching. Teaching was a similar white-collar occupation employing a large number of women, but it differed from the secretarial occupation in one crucial aspect: it did not allow women to work with and be connected to higher earning men. To study the intergenerational mobility of women working as teachers, I replace $\mathbb{1}\{Typist_{i,1920}\}$ in equation (8) with an indicator for being employed as a teacher in 1920 $\mathbb{1}\{Teacher_{i,1920}\}$. Figure 7, Panel B shows that teachers do not enjoy the same economic mobility advantages as typists. Among women whose fathers were at the 25th percentile of the income distribution, teachers married men whose average income rank was only 3.6 percentiles higher than that of non-teachers (compared with 17.9 percentiles for typists).

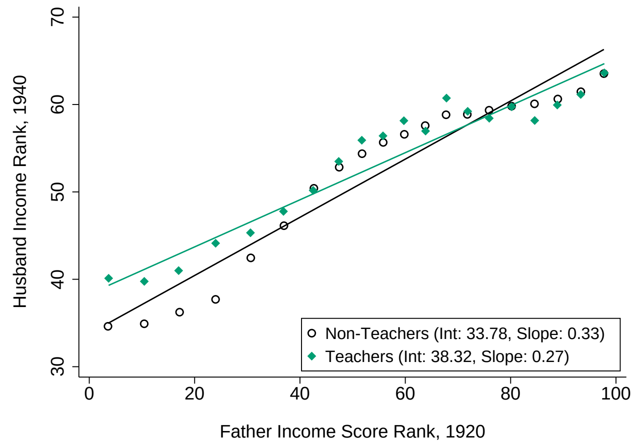
Lastly, I make direct comparisons between women working as typists and women working as teachers in 1920. Figure 7, Panel C, shows that typists experienced greater upward mobility than teachers at every ventile of father's income distribution. Among women whose fathers were at the 25th percentile of the income distribution, typists married men whose average income ranks were 14.3 percentiles higher than those of teachers' husbands. This comparison is particularly informative because typists and teachers earned similar incomes, with female typists in the 1940 Census having a median annual income of USD 918, compared with USD 900 for female teachers, suggesting that typists' ability to marry higher-earning men was not simply driven by higher independent earnings. Although the samples of women employed as nurses and telephone operators are smaller in my linked data, the results continue to show a mobility advantage for typists at every ventile of the father's income distribution relative to women employed in nursing and telephone operation (see Online Appendix Figure H.2).

Figure 7: Typewriter and the Intergenerational Mobility of Women

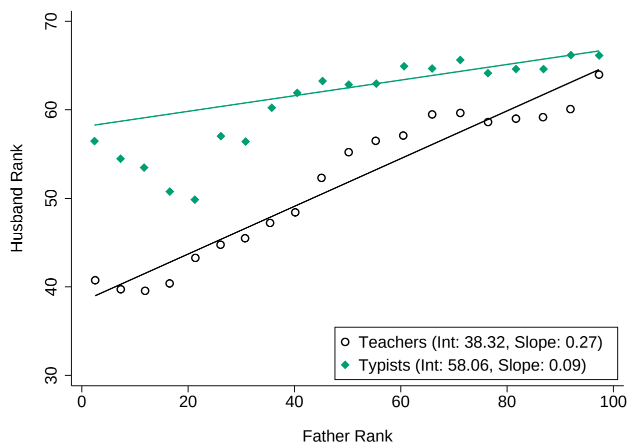
Panel A: Typists and Non-Typists in 1920



Panel B: Teachers and Non-Teachers in 1920



Panel C: Typists vs Teachers in 1920

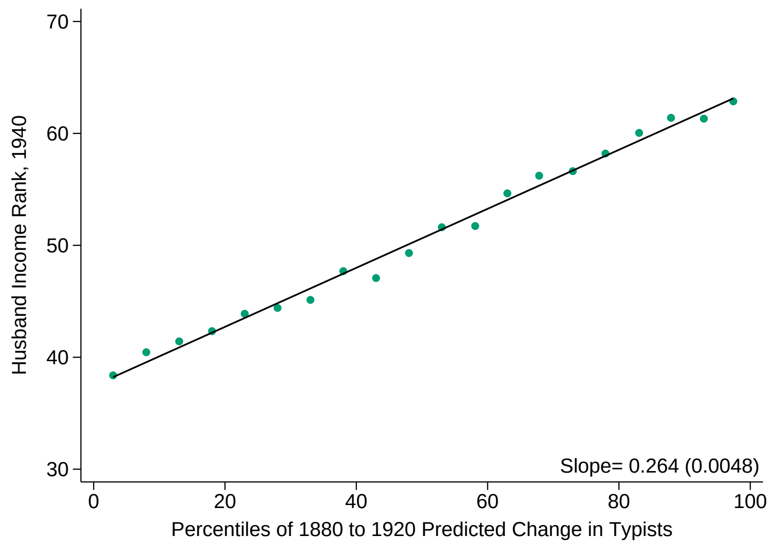


Note: Panel A plots mean income rank of husband by father's income rank, for typists and non-typists and reports slopes and intercepts corresponding to the regression specified in equation (8). Panel B uses an indicator for working as a teacher in 1920 instead in equation (8). Panel C restricts the sample only to typists and teachers so that non-typists from equation (8) are teachers. Husbands are assigned percentile ranks relative to all other husbands born in the same birth year. Fathers are ranked relative to all fathers with children born in the same birth year. Only genealogical links are used from the underlying linked data of White women described in Section 2. All estimates are reweighted to be representative of the underlying population.

8.2 Effect of Typewriter Adoption on Women's Economic Mobility

To estimate the effect of typewriter adoption on women's intergenerational mobility, I use my SSIV as defined in equation (2). To do so, I assign values of the instrument, which varies across counties, to each woman i in my data living in county c in 1920. In Figure 8, I first plot the relationship between percentiles of the 1880 to 1920 predicted change in typists $\Delta\widehat{typ}_{c(i),1880-1920}$ and future husband's income rank in 1940. The binned scatterplot shows a striking positive relationship between increasing exposure to the typewriter as captured by ventiles of the SSIV and the expected income rank of women's future husbands. Specifically, residing in a county with a one percentile greater increase in the 1880 to 1920 predicted change in typists is associated with a 0.2 percentile increase in future husband's income rank.

Figure 8: Relationship between Percentiles of SSIV and Husband's Income Rank



NOTE: This figure plots a binned scatterplot depicting the relationship between ventiles of the instrument, the 1880-1920 predicted change in typists, and husband's income rank in 1940. The regression does not include any controls. The reported slope and corresponding standard error is obtained from a simple regression between the SSIV and husbands income rank.

Next, to estimate the effect of being in a county with a one percentage point greater increase in the 1880 to 1920 predicted change in typists $\Delta\widehat{typ}_{c(i),1880-1920}$ for a woman i in county c on her future husband's income rank *RankHusband* in 1940, I use the following specification:

$$RankHusband_i = \alpha + \beta\Delta\widehat{typ}_{c(i),1880-1920} + \mathbb{X}_{c(i),1880}\gamma + \omega RankFather_i + \epsilon_i, \tag{9}$$

where, *RankFather* is woman i's father's income score rank in 1920, and control vector $\mathbb{X}_{c,1880}$ includes 1880 county characteristics and census region fixed effects, as in equation (5). Table 6 reports the estimates of the reduced form coefficient β. Conditional on baseline county characteristics, census region fixed effects, and father's income score rank, it implies that women living in counties with a 1 percentage point greater increase in the predicted change in typists married husbands whose income rank was 1.27 percentiles higher (column 2). Estimates of the 2SLS coefficient imply that residing in a county with a 1 percentage point greater increase in the actual change in typists from 1880 to 1920 is associated with women marrying men with 0.55 percentile higher income rank. These estimates are larger when I do not include a control for father's income score rank *RankFather* (column 1). Because 5.8% of husbands in my linked sample have missing income and these observations are not included in the analysis, I show that these estimates are robust to including these observations as zeros and adding a control for having missing husband's income (column 3). I also show that estimates from column 2 are robust to using all available links instead of only relying on high-quality genealogical links, not reweighting my linked sample to be representative of the population, and to using an alternative occupational income measure for fathers (see Online Appendix Table H.2).

Table 6: Effect of Typewriter Adoption on Women's Economic Mobility

	Husband's Income Rank, 1940	Husband's Income Rank, 1940	Husband's Income Rank, 1940
Panel A: First Stage on $\Delta typ_{c(i),1880-1920}$			
$\widehat{\Delta typ}_{c(i),1880-1920}$	2.465	2.293	2.293
	(0.817)	(0.809)	(0.809)
F-statistic	10.97	17.83	17.83
Panel B: OLS			
$\Delta typ_{c(i),1880-1920}$	8.372	5.200	5.123
	(1.260)	(0.871)	(0.836)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c(i),1880-1920}$	197.7	127.2	120.9
	(17.133)	(12.008)	(11.387)
Panel D: 2SLS			
$\Delta typ_{c(i),1880-1920}$	80.35	55.34	52.82
	(25.691)	(18.906)	(17.820)
Anderson-Rubin 95% CI	[49.321, 224.915]	[32.978, 175.572]	[31.652, 163.548]
Outcome Mean	52.89	52.74	49.93
Observations	770,224	586,533	623,266
Baseline Controls + Census Region FE	Y	Y	Y
Father Income Score Rank	N	Y	Y
Missing Husband Income	N	N	Y

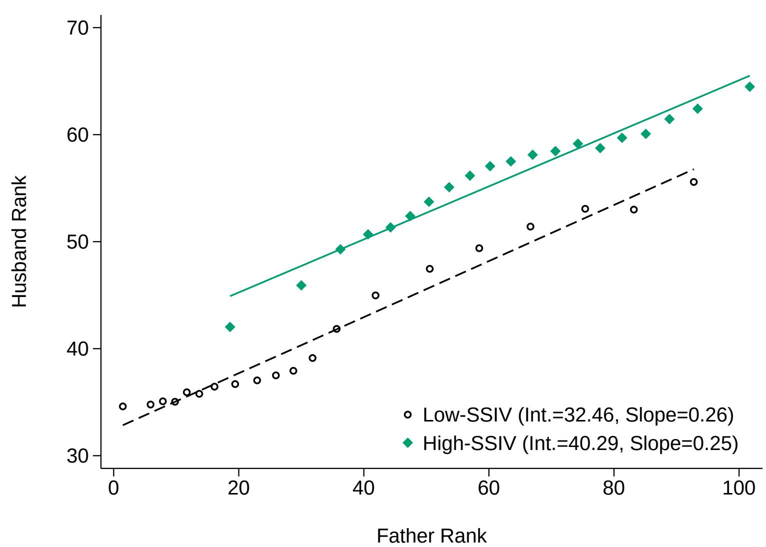
NOTE: This table reports reduced form results from equation (9) in Panel C and corresponding first stage, 2SLS and OLS estimates. Column 1 does not use father's income score rank as a control, column 2 uses father's income score rank as control and column 3 adds a control for husbands having missing income after assigning those with missing income as rank = 0. $\Delta typ_{c(i),1880-1920}$ is as defined in equation (2). The unit of observation is a woman. Robust standard errors clustered at the county level are reported in parentheses. I provide Anderson and Rubin (1949) confidence sets for 2SLS estimates in Panel D. Only genealogical links are used from the underlying data of linked women. All estimates are reweighted to be representative of the underlying population.

Lastly, to assess gaps in intergenerational mobility for women living in counties with higher versus lower predicted changes in typists, I compare women living in counties with above- versus below-median changes in the SSIV. Formally, I estimate the relationship between living in a high-SSIV county in 1920, $\mathbb{1}\{HighSSIV_{c(i),1920}\}$, defined as having an above-median value of the instrument, and women's intergenerational mobility using the following rank-rank specification:

$$RankHusband_i = \alpha + \beta_0 \mathbb{1}\{HighSSIV_{c(i),1920}\} + \beta_1 RankFather_i + \beta_2 \mathbb{1}\{HighSSIV_{c(i),1920}\} \times RankFather_i + \mathbb{X}_{c(i),1880}\gamma + \epsilon_i, \tag{10}$$

where all terms other than the indicator for residing in a high-SSIV county in 1920 $\mathbb{1}\{HighSSIV_{c(i),1920}\}$ and baseline SSIV controls $\mathbb{X}_{c(i),1880}$ are the same as in equation (8). Figure 9 plots regression lines corresponding to equation (10) for women who resided in high- versus low-SSIV counties in 1920. It shows that women living in high-SSIV counties in 1920 married husbands with higher income across father's income score distribution. Among women with fathers at the 25th percentile, residing in a high-SSIV county in 1920 is associated with marrying men with an average income rank that was 4 percentiles above the average rank of husbands of women in low-SSIV counties. I rule out several alternative explanations for this gap in intergenerational mobility, including differences in exposure to a working mother, family size, and residence in an urban location in 1920 (see Online Appendix Figure H.3).

Figure 9: Intergenerational Mobility of Women in Low versus High-SSIV counties



Note: This figure plots mean income rank of husband by father's income rank after residualizing each variable on the baseline controls and census region fixed effects within counties with high versus low SSIV values. Slopes and intercepts are obtained from a regression similar to equation (10) but which allow the slope and intercept to differ by low vs high-SSIV locations. Only genealogical links are used from the underlying linked data of women. All estimates are reweighted to be representative of the underlying population.

8.3 Key Mechanism: The Typewriter as a Meeting Technology

Combining the descriptive and causal evidence presented in this section, I show that by drawing White women into typing and secretarial work in offices, the typewriter enabled them to marry higher-income men, and that this same mobility advantage was not present in their alternative occupational options. I argue that these findings are consistent with the hypothesis that the typewriter acted as a "meeting technology" for women's marriage outcomes, allowing women employed in typing and secretarial work to meet and interact with men of higher socioeconomic status than they would have through alternative avenues. These interactions may have occurred directly within the workplace or indirectly through social settings to which women gained access via their occupational networks.

While I cannot directly test this hypothesis as individual workplaces are not recorded in census data, I provide suggestive evidence in support of this hypothesis by using similar linked data (Buckles et al., 2023) for the husbands of women in my sample in 1940 and follow them back to the 1920 Census. Using information from the 1920 Census on the occupations and counties that women's future husbands were working in, Table 4 documents three associations: compared to husbands of non-typists, husbands of typists are (1) 3.5 pp more likely to be living in the same county in 1920 as their future wives, (2) 12.7 pp more likely to be working in white-collar occupations in 1920, and (3) 9.7 pp more likely to be working in white-collar occupations in the same county in 1920 as their future wives. This suggests that compared to non-typists, women who worked as typists had greater opportunity to interact with and consequently marry higher-earning men.

Table 7: Associations Between Working as a Typist and Husband Characteristics in 1920

	(1) Residing in Same County as Future Husband, 1920	(2) Husband Working in White-Collar Occ, 1920	(3) Husband Working in White-Collar Occ in Same County, 1920
$\mathbb{1}(Typist^{1920})$	0.0353	0.127	0.0968
	(0.003)	(0.002)	(0.002)
Outcome Mean	0.449	0.126	0.0736
Observations	903,149	903,149	903,149

NOTE: This table reports OLS estimates from three separate regressions where an indicator for working as a typist in 1920 is regressed on (1) having resided in the same county in 1920 as future husband, (2) having a husband who worked in a white-collar occupation in 1920, and (3) having resided in the same county in 1920 as future husband who also worked in a white-collar occupation in 1920.

The evidence presented thus far is less consistent with an income-based explanation in which higher independent earnings allowed women working as typists and secretaries to marry up. Female typists earned incomes similar to those of women in alternative white-collar occupations, especially teachers. For example, in the 1940 Census, female typists had a median annual income of USD 918, compared with USD 900 for female teachers. Yet women who worked as typists married higher-income men than teachers (Figure 7) and than their own sisters employed in alternative white-collar occupations within the same county (Figure 6).

Evidence in support of this meeting mechanism operating through individual workplaces can be found in historical accounts and popular media from the period. For example, Waller (1986) writes that "marriage prospects [for female secretaries] were enhanced because so many men choose a wife amid the deft-fingered clerks in preference to the society misses." Newspapers and magazines from the late nineteenth and early twentieth centuries likewise featured stories of men marrying their typists, often emphasizing the role of close workplace proximity and the long hours spent together in fostering these relationships. For instance, in 1891, the Chicago Tribune ran a well-known story titled "Married His Typewriter."[21] Similar themes also appear in other forms of print media, including advertisements and postcards (see Online Appendix Figure A.10, Panel C).

9 Conclusion

The invention and diffusion of the typewriter is among one of the largest shocks to women's employment in the US. By creating a new task which drew more than a million women into the labor force, the adoption of the typewriter offers a unique opportunity to study what happens when a technological change creates new work instead of automating pre-existing work. Using variation in the demand for typists and secretaries across industries, I show that the adoption of the typewriter led to a persistent increase in women's labor force participation in the US economy.

The typewriter generated significant spillover effects on Black women's labor, a group not directly affected by the technological change itself. As White women entered clerical occupations, demand for Black women's labor increased in service work, especially in paid household services. In contrast, research on the automation of women's work finds little to no evidence of spillover effects on workers in other occupations (Feigenbaum and Gross, 2024). Because I focus solely on the typewriter, my results cannot speak to the conditions under which different technological changes can produce spillover effects across worker groups. I leave this question for future research.

My findings also shed light on how technological changes can create new social ties by bringing new groups of workers into shared workplaces. In the case of the typewriter, women's entry into office work altered marital sorting, allowing typists and secretaries to marry higher-earning men and achieve upward economic mobility. Although I focus on the typewriter as a meeting technology in the context of women's marriage outcomes, technological changes can also shape a broader set of social ties, particularly

[21] In the late nineteenth century, women working as typists were also commonly referred to as "typewriters."

when workplaces serve as an important locus of network formation. Future research could examine how workplace technological changes contribute to the creation of new social networks or the destruction of existing ones, as in the case of automation.

In a period of rapid technological change, these results provide a useful reference point for debates over how the adoption of technologies such as artificial intelligence (AI) may affect workers. Like the typewriter, AI may function not only as an automation technology, but also as an assistive technology that creates new tasks and new forms of work. My findings suggest that the effects of such technological changes on workers are not limited to displacement, but may also include the creation of new labor market opportunities, spillovers across worker groups, and broader consequences for family formation, social networks, and economic mobility. Both current technological developments and historical episodes of technological change offer promising settings for future research to study the broader consequences of different innovations.

References

Abramitzky, R., P. Ager, L. Boustan, E. Cohen, and C. W. Hansen (2023). The effect of immigration restrictions on local labor markets: Lessons from the 1920s border closure. *American Economic Journal: Applied Economics 15*(1), 164–191.

Abramitzky, R., L. Boustan, K. Eriksson, J. Feigenbaum, and S. Pérez (2021). Automated Linking of Historical Data. *Journal of Economic Literature 59*(3), 865–918.

Abramitzky, R., L. Boustan, E. Jácome, and S. Pérez (2021). Intergenerational Mobility Of Immigrants In The United States Over Two Centuries. *American Economic Review 111*(2), 580–608.

Abramitzky, R., L. P. Boustan, and T. Matiashvili (2025). Intergenerational Mobility Over Two Centuries. NBER Working Paper.

Acemoglu, D. (1998). Why Do New Technologies Complement Skills? Directed Technical Change And Wage Inequality. *The Quarterly Journal of Economics 113*(4), 1055–1089.

Acemoglu, D. and P. Restrepo (2018). The Race Between Man And Machine: Implications Of Technology For Growth, Factor Shares, And Employment. *American Economic Review 108*(6), 1488–1542.

Acemoglu, D. and P. Restrepo (2019). Automation And New Tasks: How Technology Displaces And Reinstates Labor. *Journal of Economic Perspectives 33*(2), 3–30.

Acemoglu, D. and P. Restrepo (2020). Robots And Jobs: Evidence From US Labor Markets. *Journal of Political Economy 128*(6), 2188–2244.

Adao, R., M. Kolesár, and E. Morales (2019). Shift-share designs: Theory and Inference. *The Quarterly Journal of Economics 134*(4), 1949–2010.

Ager, P., M. Goñi, and K. G. Salvanes (2023). Gender-biased Technological Change: Milking Machines And The Exodus Of Women From Farming. *NHH Dept. of Economics Discussion Paper* (16).

Albanesi, S. and C. Olivetti (2016). Gender Roles and Medical Progress. *Journal of Political Economy 124*(3), 650–695.

Althoff, L., H. Brookes-Gray, and H. Reichardt (2025). Mothers, Schools, and the Making of American Human Capital Mobility. *Working Paper*.

Anderson, T. W. and H. Rubin (1949). Estimation of the parameters of a single equation in a complete system of stochastic equations. *The Annals of mathematical statistics 20*(1), 46–63.

Attanasio, O., H. Low, and V. Sánchez-Marcos (2008). Explaining Changes in Female Labor Supply in a Life-Cycle Model. *American Economic Review 98*(4), 1517–1552.

Autor, D. (2022). The Labor Market Impacts of Technological Change: From Unbridled Enthusiasm to Qualified Optimism to Vast Uncertainty. *Brookings Institution: Global Forum on Democracy and Technology Project*.

Autor, D., C. Chin, A. Salomons, and B. Seegmiller (2024). New Frontiers: The Origins And Content Of New Work, 1940–2018. *The Quarterly Journal of Economics 139*(3), 1399–1465.

Autor, D., L. F. Katz, and A. B. Krueger (1998). Computing Inequality: Have Computers Changed the Labor Market? *The Quarterly Journal of Economics 113*(4), 1169–1213.

Autor, D., F. Levy, and R. J. Murnane (2003). The Skill Content Of Recent Technological Change: An Empirical Exploration. *The Quarterly Journal of Economics 118*(4), 1279–1333.

Bailey, M., P. Z. Lin, A. R. S. Mohammed, P. Mohnen, J. Murray, M. Zhang, and A. Prettyman (2022). LIFE-M: The Longitudinal Intergenerational Family Electronic Micro-database. Dataset released 2022-02-14.

Bailey, M. J. (2006). More Power to the Pill: The Impact of Contraceptive Freedom on Women's Life Cycle Labor Supply. *The Quarterly Journal of Economics 121*(1), 289–320.

Bailey, M. J., C. Cole, M. Henderson, and C. Massey (2020). How Well Do Automated Linking Methods Perform? Lessons From US Historical Data. *Journal of Economic Literature 58*(4), 997–1044.

Bailey, M. J. and B. J. Hershbein (2018). US Fertility Rates and Childbearing in American Economic History, 1800–2010. In L. P. Cain, P. V. Fishback, and P. W. Rhode (Eds.), *The Oxford Handbook of American Economic History*. Oxford: Oxford University Press.

Bailey, M. J. and P. Z. Lin (2022). Marital Matching And Women's Intergenerational Mobility In The Late 19th And Early 20th Century US. NBER Working Paper.

Bald, A. (2025). The Birth of an Occupation: Professional Nursing in the Era of Public Health. *Working Paper*.

Bazzi, S., A. Ferrara, M. Fiszbein, T. Pearson, and P. A. Testa (2023). The other great migration: Southern whites and the new right. *The Quarterly Journal of Economics 138*(3), 1577–1647.

Belloni, A., V. Chernozhukov, and C. Hansen (2014). Inference on Treatment Effects After Selection Among High-Dimensional Controls. *Review of Economic Studies 81*(2), 608–650.

Belot, M. and M. Francesconi (2013). Dating Preferences and Meeting Opportunities in Mate Choice Decisions. *Journal of Human Resources 48*(2), 474–508.

Berkes, E., E. Karger, and P. Nencka (2023). The Census Place Project: A Method for Geolocating Unstructured Place Names. *Explorations In Economic History 87*, 101477.

Bessen, J., M. Goos, A. Salomons, and W. Van den Berge (2023). Automatic Reaction - What Happens To Workers At Firms That Automate? *The Review of Economics And Statistics*.

Black, S. E. and A. Spitz-Oener (2010). Explaining Women's Success: Technological Change And The Skill Content Of Women's Work. *The Review of Economics And Statistics 92*(1), 187–194.

Boorstin, D. J. (2010). *The Americans: The Democratic Experience*, Volume 3. Vintage.

Borusyak, K., P. Hull, and X. Jaravel (2022). Quasi-experimental Shift-Share Research Designs. *The Review of Economic Studies 89*(1), 181–213.

Boustan, L. P., J. Choi, and D. Clingingsmith (2022). Computerized Machine Tools And The Transformation Of US Manufacturing. NBER Working Paper.

Buckles, K., A. Haws, J. Price, and H. E. Wilbert (2023). Breakthroughs in Historical Record Linking Using Genealogy Data: The Census Tree Project. NBER Working Paper.

Buckles, K., J. Price, Z. Ward, and H. E. Wilbert (2023). Family Trees and Falling Apples: Historical Intergenerational Mobility Estimates for Women and Men. NBER Working Paper.

Chetty, R., N. Hendren, M. R. Jones, and S. R. Porter (2020). Race And Economic Opportunity In The United States: An Intergenerational Perspective. *The Quarterly Journal of Economics 135*(2), 711–783.

Chetty, R., N. Hendren, P. Kline, and E. Saez (2014). Where Is The Land Of Opportunity? The Geography Of Intergenerational Mobility In The United States. *The Quarterly Journal of Economics 129*(4), 1553–1623.

Chiswick, B. R. and R. H. Robinson (2021, October). Women at work in the united states since 1860: An analysis of unreported family workers. *Explorations in Economic History 82*, 101406.

Ciscato, E. (2024). Assessing Racial and Educational Segmentation in Large Marriage Markets. *Review of Economic Studies*.

Conley, T. G. (1999). GMM Estimation with Cross Sectional Dependence. *Journal of econometrics 92*(1), 1–45.

Costa, D. L. (2000). From Mill Town To Board Room: The Rise Of Women's Paid Labor. *Journal of Economic Perspectives 14*(4), 101–122.

Current, R. N. (1974). *The Typewriter and the Men Who Made It*. University of Illinois Press.

Davies, M. (1974). Women's Place at the Typewriter: The Feminization of the Clerical Labor Force. *Radical America 8*.

Derenoncourt, E. (2022). Can You Move To Opportunity? Evidence From The Great Migration. *American Economic Review 112*(2), 369–408.

Duncan, F. C. (1893). A brief hand-book telling of the organization and methods of the international board of women's and young women's christian associations. Written under act of the Executive Committee.

England, K. and K. Boyer (2009). Women's Work: The Feminization And Shifting Meanings Of Clerical Work. *Journal of Social History 43*(2), 307–340.

Eriksson, K., G. Niemesh, M. Rashid, and J. Craig (2026). Marriage and the intergenerational mobility of women: Evidence from marriage certificates 1850-1910. *Working Paper*.

Feigenbaum, J. J. and D. P. Gross (2024). Answering the Call of Automation: How the Labor Market Adjusted to Mechanizing Telephone Operation. *The Quarterly Journal of Economics 139*(3), 1879–1939.

Ferrara, A., P. Testa, and L. Zhou (2022). New Area- And Population-based Geographic Crosswalks For U.S. Counties And Congressional Districts, 1790-2020. SSRN working paper.

Galor, O. and D. N. Weil (1996, June). The gender gap, fertility, and growth. *The American Economic Review 86*(3), 374–387.

Goldin, C. (1980). The Work And Wages Of Single Women, 1870 To 1920. *The Journal of Economic History 40*(1), 81–88.

Goldin, C. (1983). The Changing Economic Role Of Women: A Quantitative Approach. *The Journal of Interdisciplinary History 13*(4), 707–733.

Goldin, C. (1984). The Historical Evolution Of Female Earnings Functions And Occupations. *Explorations In Economic History 21*(1), 1–27.

Goldin, C. (1990). *Understanding the Gender Gap: An Economic History of American Women*. NBER.

Goldin, C. (2002). The Rising (And Then Declining) Significance Of Gender. NBER Working Paper.

Goldin, C. and L. F. Katz (2002). The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions. *Journal of Political Economy 110*(4), 730–770.

Goldin, C. and L. F. Katz (2008). Mass Secondary Schooling And The State: The Role Of State Compulsion In The High School Movement. In *Understanding Long-Run Economic Growth: Geography, Institutions, and the Knowledge Economy*, pp. 275–310. University of Chicago Press.

Goldin, C. and L. F. Katz (2009). *The Race Between Education And Technology*. Harvard University Press.

Goldman, B., J. Gracie, and S. Porter (2024). Who Marries Whom? The Role of Segregation by Race and Class. *Working Paper*.

Graetz, G. and G. Michaels (2018). Robots At Work. *Review of Economics And Statistics 100*(5), 753–768.

Gray, R. (2013). Taking Technology To Task: The Skill Content Of Technological Change In Early Twentieth Century United States. *Explorations In Economic History 50*(3), 351–367.

Greenberg, K., M. Wasserman, and E. A. Weber (2024). The Effects of Gender Integration on Men: Evidence from the US

Military. *NBER Working Paper*.

Greenwood, J., N. Guner, and G. Vandenbroucke (2017, December). Family economics writ large. *Journal of Economic Literature 55*(4), 1346–1434.

Greenwood, J., A. Seshadri, and M. Yorukoglu (2005). Engines of Liberation. *The Review of Economic Studies 72*(1), 109–133.

Hoke, D. (1979). The Woman and the Typewriter: A Case Study in Technological Innovation and Social Change. *Business And Economic History*, 76–88.

Jácome, E., I. Kuziemko, and S. Naidu (2025). Mobility For All: Representative Intergenerational Mobility Estimates Over The 20Th Century. *Journal of Political Economy 133*.

Jones, J. (2009). *Labor Of Love, Labor Of Sorrow: Black Women, Work, And The Family, From Slavery To The Present*. Basic Books.

Kalmijn, M. and H. Flap (2001). Assortative Meeting and Mating: Unintended Consequences of Organized Settings for Partner Choices. *Social Forces 79*(4), 1289–1312.

Lin, J. (2011). Technological Adaptation, Cities, And New Work. *Review of Economics And Statistics 93*(2), 554–574.

Macdonald, D., J. Montonen, and E. Nix (2024). Dating And Breaking Up With The Boss: Benefits, Costs, And Spillovers. *Working Paper*.

Miller, A. R. and C. Segal (2019). Do Female Officers Improve Law Enforcement Quality? Effects on Crime Reporting and Domestic Violence. *The Review of Economic Studies 86*(5), 2220–2247.

Mogstad, M. and G. Torsvik (2023). Family Background, Neighborhoods, and Intergenerational Mobility. *Handbook of The Economics of The Family 1*(1), 327–387.

Mokyr, J. (1992). *The Lever of Riches: Technological Creativity and Economic Progress*. Oxford University Press.

Myers, C. K. (2017). The Power Of Abortion Policy: Reexamining The Effects Of Young Women's Access To Reproductive Control. *Journal of Political Economy 125*(6), 2178–2224.

Oden, C. V. (1917). *Evolution of the Typewriter*. JE Hetsch.

Olivetti, C. and M. D. Paserman (2015). In The Name Of The Son (And The Daughter): Intergenerational Mobility In The United States, 1850–1940. *American Economic Review 105*(8), 2695–2724.

Pérez, S. (2017). The (South) American Dream: Mobility And Economic Outcomes Of First-and Second-generation Immigrants In Nineteenth-century Argentina. *The Journal of Economic History 77*(4), 971–1006.

Ramey, V. A. (2008). Time spent in home production in the 20th century: New estimates from old data. Technical report, National Bureau of Economic Research.

Rotella, E. J. (1979). Women's Labor Force Participation and the Growth of Clerical Employment in the United States, 1870–1930. *The Journal of Economic History 39*(1), 331–333.

Rotella, E. J. (1981a). *From Home To Office: U.S. Women At Work, 1870-1930*. UMI Research Press.

Rotella, E. J. (1981b). The Transformation Of The American Office: Changes In Employment And Technology. *The Journal of Economic History 41*(1), 51–57.

Ruggles, S., C. A. Fitch, R. Goeken, D. Hacker, M. A. Nelson, M. Schouweiler, and M. Sobek (2021). IPUMS Ancestry Full Count Data: Version 3.0 [dataset]. Minneapolis, MN: IPUMS, 2021.

Smith, C. C. (1922). *The Expert Typist*. Macmillan.

Taylor, F. W. (1911). The Principles Of Scientific Management. *Noton & Company*.

Thistle, S. (2006). *From Marriage to the Market: The Transformation of Women's Lives and Work*. University of California Press.

U.S. Department of Labor, Women's Bureau (1926). The Effects Of Applied Research Upon The Employment Opportunities Of American Women. Technical report, U. S. Department of Labor, Women's Bureau.

Vanek, J. (1973). *Keeping Busy: Time Spent in Housework, United States, 1920–1970*. Ph.d. dissertation, University of Michigan.

Vidart, D. (2024). Human Capital, Female Employment, and Electricity: Evidence from the early 20th-century United States. *Review of Economic Studies 91*(1), 560–594.

Vidart, D. (2026). Revisiting the link between electrification and fertility: Evidence from the early 20th-century united states. *Explorations in Economic History*, 101749.

Waller, R. A. (1986). Women And The Typewriter During The First Fifty Years, 1873-1923. *Studies In Popular Culture 9*(1), 39–50.

Yates, J. (1991). Investing In Information: Supply And Demand Forces In The Use Of Information In American Firms, 1850-1920. In *Inside the Business Enterprise: Historical Perspectives on the Use of Information*, pp. 117–160. University of Chicago Press.

Zimran, A. (2019). Sample-selection Bias And Height Trends In The Nineteenth-century United States. *The Journal of Economic History 79*(1), 99–138.

Online Appendix

Keys to Upward Mobility: Typewriter Adoption and Women's Economic Outcomes

Myera Rashid

April 5, 2026

Online Appendix Table of Contents

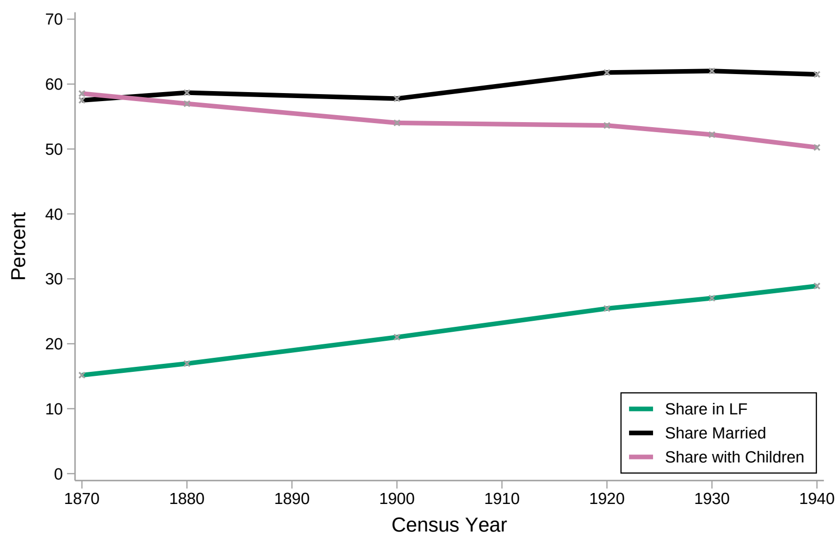
A Further Background Results

This section provides additional information related to women in the US economy from 1860-1940, typewriter adoption, and female typists. I first present additional descriptive patterns. Next, I provide further information related to the historical context. Lastly, I describe and present results related to the descriptive analysis documenting the relationship between secondary school education expansion and the supply of female typists.

A.1 Descriptive Patterns

A.1.1 Women's Outcomes, 1860-1940

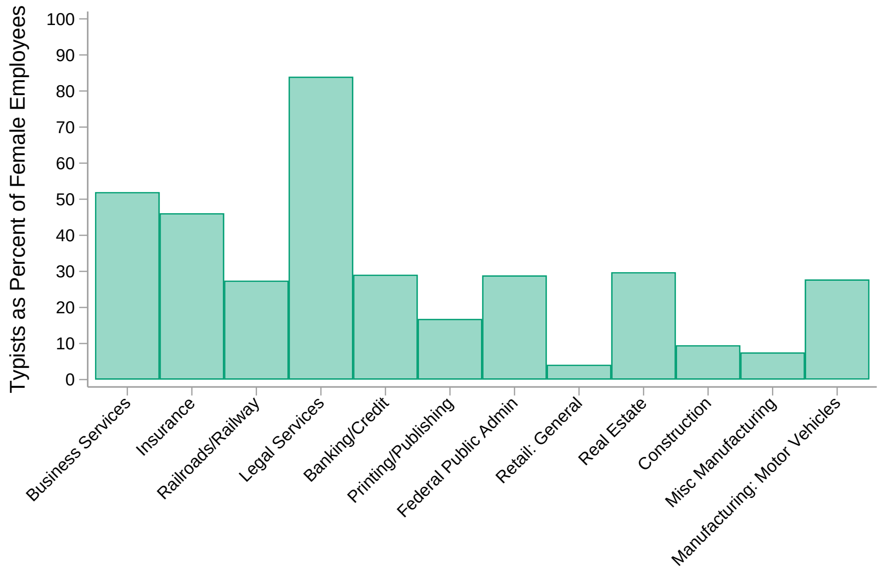
Appendix Figure A.1: Women's Labor Force Participation, Marriage and Fertility Rates, 1860-1940



NOTE: This figure plots the share of women who (i) are in the labor force (green), (ii) are married (black), and (iii) have children (pink), from 1870-1940. The denominator includes working age women (aged 16-64). Numbers for each decade are calculated from the US population decennial censuses. The *labforce* variable is used to calculate labor force participation, *sploc* for marriage, and *nchild* for children. Results are identical if *occ1950* or *empstat* are instead used to compute share of women who are employed. Importantly, for 1880, this figure computes labor force participation from v2019 of the census data. Recent versions of the data at the time of the analysis of this paper included an error that incorrectly inflates women's labor force participation. See Online Appendix B for details of author's correction of this. Data for 1890 is omitted as that complete count census does not exist. Data point for 1910 is also omitted as women's labor force participation is recorded differently than in other censuses (see Goldin (1990) for further details). Data for 1860 is not included because Black women's labor force participation in most states was not counted at the time and would generate overall women's labor force participation that would not be comparable to other decades.

A.1.2 Descriptive Patterns Related to Female Typists

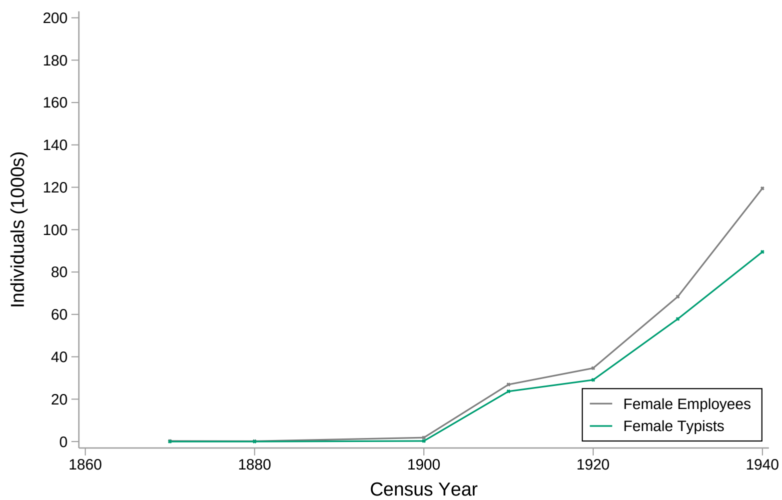
Appendix Figure A.2: Employment of Female Typists Across Industries, 1920



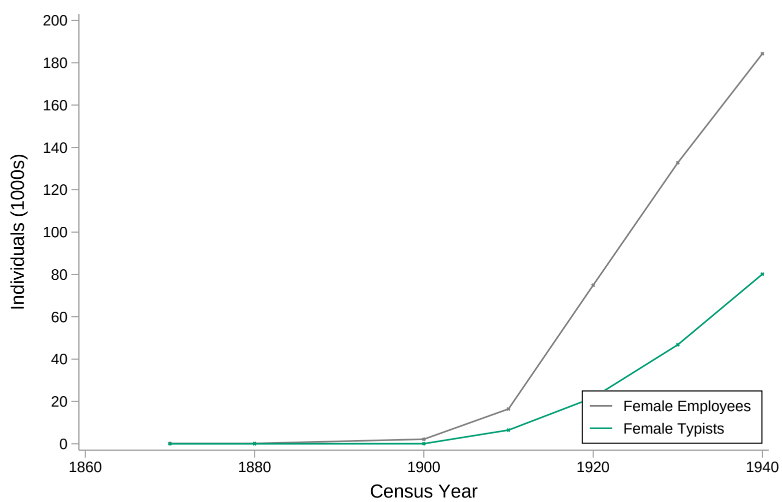
NOTE: This figure plots on the x-axis, in descending order, the top 12 industries that employ the highest number of female typists in 1920. Each of these industries employs at least 10,000 female typists. On the y-axis, it plots female typists as a share of the total industry employment. Three digit industry codes from the *ind1950* variable are used for industry classification.

Appendix Figure A.3: Examples of Industries Where Entry of Women Was Driven By Female Typists

(a) Panel A: Legal Services

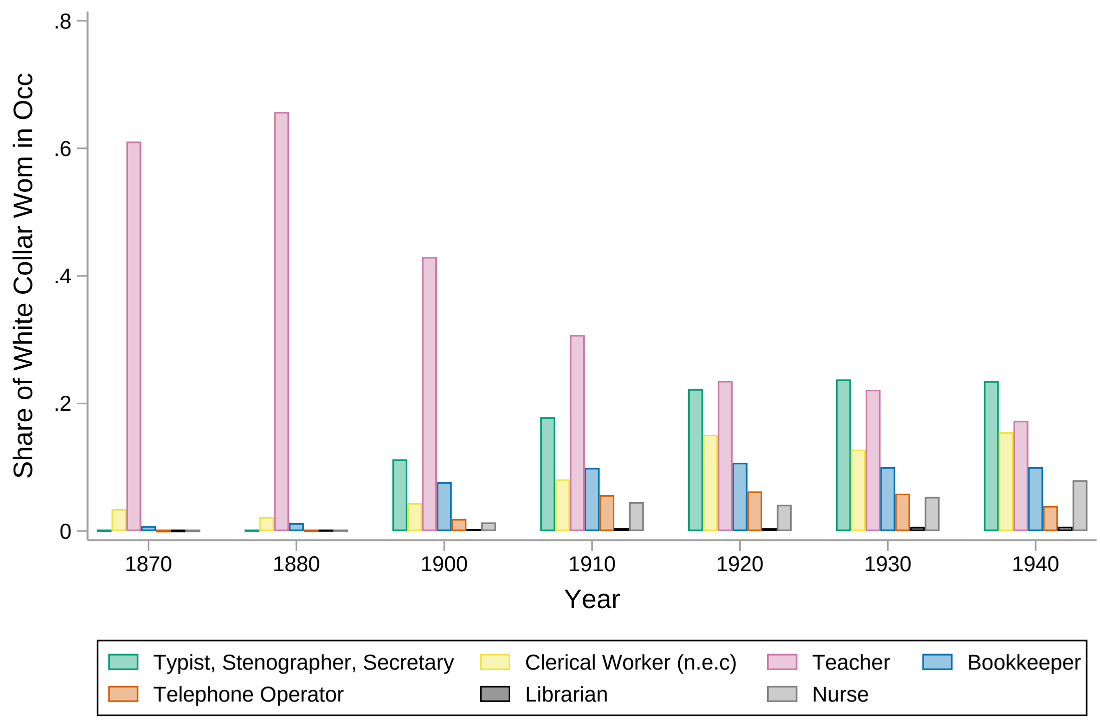


(b) Panel B: Banking and Credit Agencies



NOTE: This figure plots the total number of female employees and the number of female typists for each decade for the Legal Services (Panel A) and the Banking and Credit Agencies (Panel B) industries.

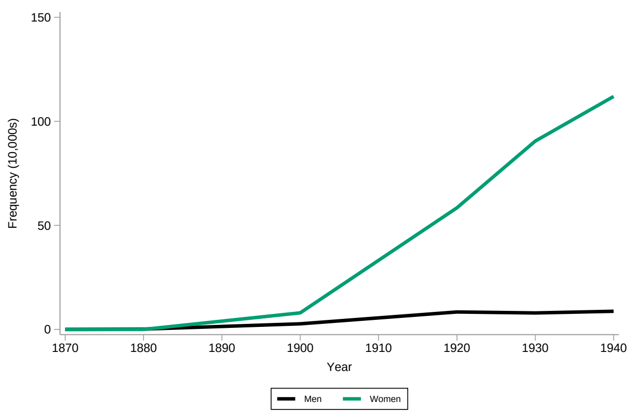
Appendix Figure A.4: Share of White-Collar Female Workers Employed Across Comparable Occupations



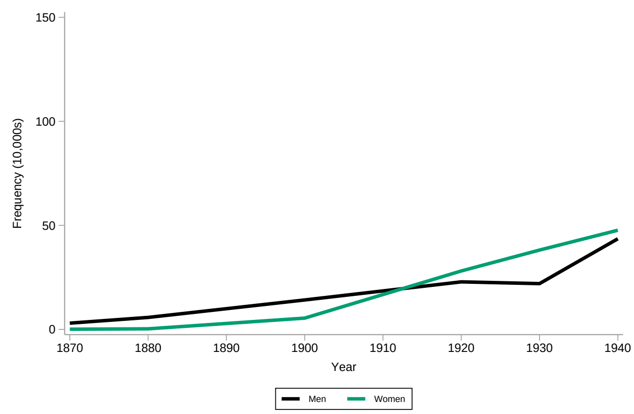
NOTE: This figure plots the number of women in seven comparable occupations as a share of the working-age women employed in white-collar work. Here white collar-work is defined as occ1950 codes 1-99 and 200-399.

Appendix Figure A.5: Evolution of Other Feminized White-Collar Occupations which Experienced Technological Changes

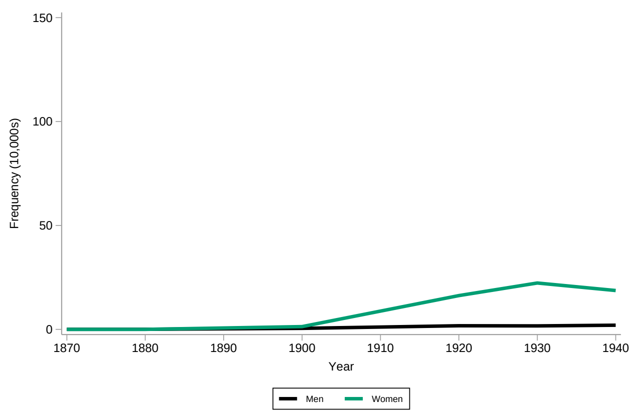
(a) Panel A: Typing, Stenography and Secretarial



(b) Panel B: Bookkeeping

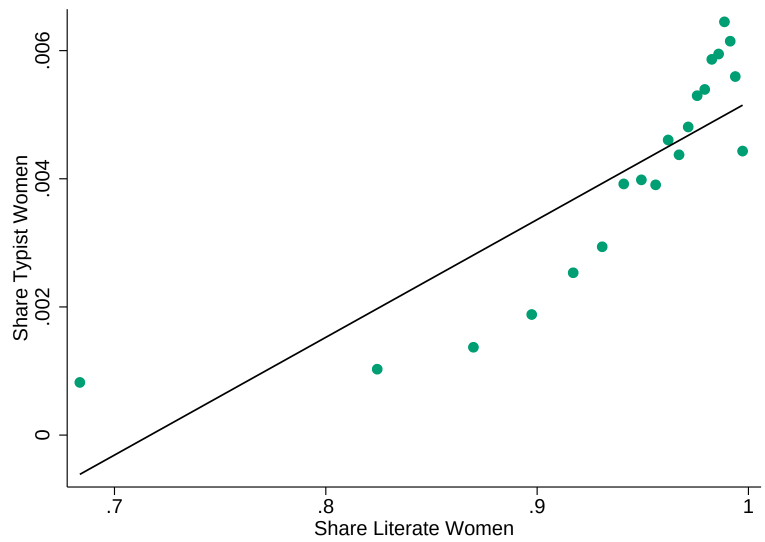


(c) Panel C: Telephone Operation



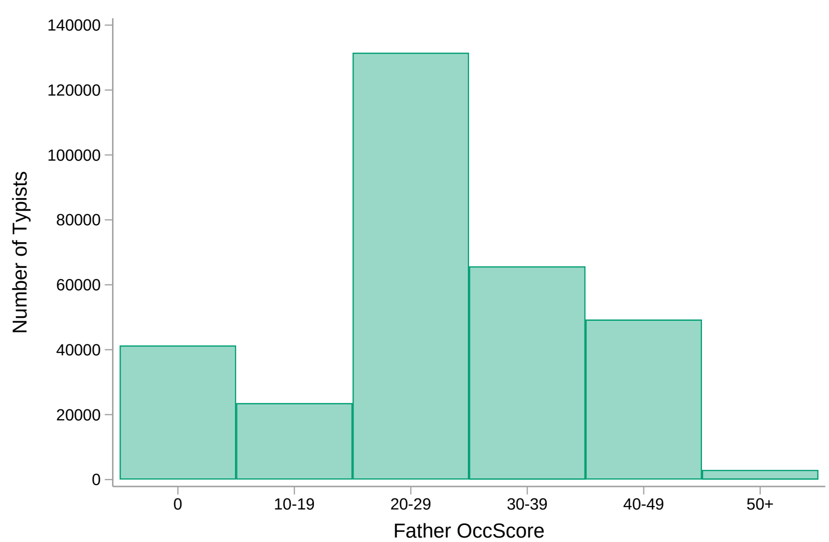
NOTE: This figure plots the number of male (black line) and female workers (green) from 1870 to 1940 for the following white-collar occupations: Typing, Stenography and Secretarial work (Panel A, *occ1950* = *350*); Bookkeeping (Panel B, *occ1950* = *310*); and Telephone Operation (Panel C, *occ1950* = *365*).

Appendix Figure A.6: Relationship between Share Literate and Share Typists for White Women Across Counties, 1900-1920



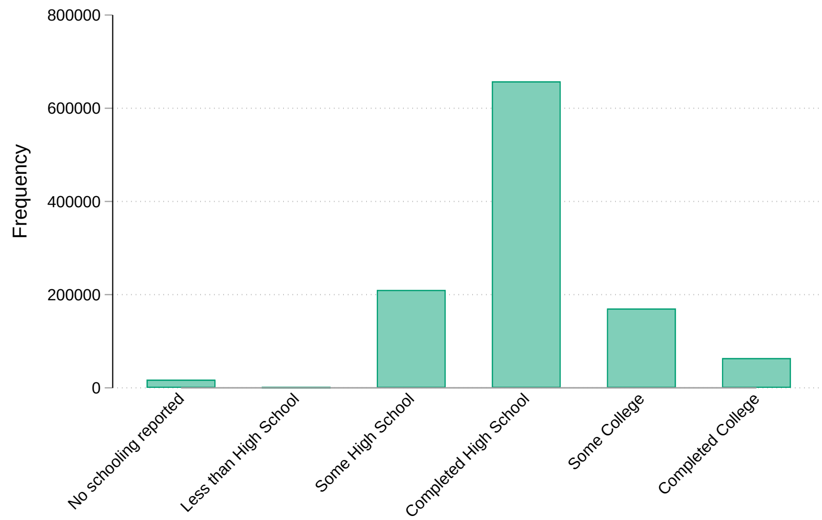
Note: This figure plots a binscatter depicting the relationship between share of White women who are literate in a county and share of White women who are employed as typists in the county. This figure pools together data for 1900, 1910 and 1920.

Appendix Figure A.7: Typists by Father Occupation Income Score, 1920



Note: This figure plots the number of typists across bins of father's occupational income score constructed using the *occscore* variable in 1920. The smallest bin represents women with fathers at the bottom of the occupational income distribution. The sample only includes female typists that are recorded as living with their fathers to be able to observe their fathers' occupations and consequently occupational income scores.

Appendix Figure A.8: Educational Attainment of Typists, 1940



NOTE:This figure plots the number of typists across educational attainment categories using the *educ* variable in the 1940 Census.

A.1.3 Differences in Characteristics of Typists and Non-Typists

I now describe the selection of women into the typing occupation by documenting differences in observable characteristics of typists and non-typist women across census decades from 1900-1940. I first use all non-typist women of working age (ages 16-64) as the comparison group for typists. Then, I use only non-typist young women (aged 16-30) who are employed in alternative white collar occupations as the comparison group for typists.

Appendix Table A.1: Differences in Characteristics of Typists and Non-Typist Women (1900–1920)

Variables	1900			1910			1920		
	Typist Means	Non-Typists Means	Difference	Typist Means	Non-Typists Means	Difference	Typist Means	Non-Typists Means	Difference
Age 16-30	0.867	0.485	0.382	0.867	0.474	0.393	0.843	0.437	0.406
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
White	0.998	0.887	0.111	0.996	0.890	0.106	0.996	0.896	0.100
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Black	0.002	0.111	-0.109	0.004	0.107	-0.103	0.004	0.101	-0.098
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Immigrant	0.073	0.183	-0.110	0.059	0.180	-0.122	0.059	0.170	-0.111
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Urban	0.888	0.434	0.454	0.902	0.505	0.397	0.910	0.556	0.354
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Living w/ Parent	0.461	0.183	0.278	0.519	0.179	0.340	0.531	0.168	0.363
	(0.002)	(0.000)	(0.002)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Married	0.019	0.579	-0.560	0.023	0.600	-0.577	0.052	0.630	-0.578
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Has Children	0.030	0.542	-0.512	0.026	0.536	-0.510	0.034	0.545	-0.511
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	79,791	21,868,341	21,948,132	265,905	26,949,473	27,215,378	584,439	31,196,325	31,780,764

NOTE: This table compares the mean characteristics of typists and non-typist women in 1900, 1910, and 1920. Differences are calculated as typist means minus non-typist means. Standard errors are reported in parentheses.

Appendix Table A.2: Differences in Characteristics of Typists and Non-Typist Women (1930–1940)

Variables	1930			1940		
	Typist Means	Non-Typists Means	Difference	Typist Means	Non-Typists Means	Difference
Age 16-30	0.784	0.416	0.369	0.647	0.401	0.246
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
White	0.995	0.896	0.099	0.993	0.900	0.093
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Black	0.005	0.101	-0.096	0.006	0.097	-0.090
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Immigrant	0.054	0.148	-0.094	0.037	0.104	-0.067
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Urban	0.913	0.604	0.308	0.862	0.596	0.266
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Living w/ Parent	0.468	0.161	0.307	0.391	0.163	0.228
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Married	0.138	0.631	-0.494	0.223	0.625	-0.402
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Has Children	0.057	0.532	-0.475	0.097	0.513	-0.416
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	905,247	37,490,253	38,395,500	1,119,598	42,551,374	43,670,972

NOTE: This table compares the mean characteristics of typists and non-typist women in 1930 and 1940. Differences are calculated as typist means minus non-typist means. Standard errors are reported in parentheses.

Appendix Table A.3: Differences in Characteristics of Typists and Non-Typist White-Collar Women, Aged 16–30 (1900–1920)

Variables	1900			1910			1920		
	Typists Means	Non-Typists Means	Difference	Typists Means	Non-Typists Means	Difference	Typists Means	Non-Typists Means	Difference
White	0.998	0.965	0.033	0.996	0.970	0.026	0.996	0.977	0.019
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Black	0.002	0.035	-0.032	0.004	0.030	-0.026	0.004	0.023	-0.019
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Immigrant	0.071	0.068	0.003	0.057	0.069	-0.012	0.058	0.056	0.001
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Urban	0.888	0.571	0.317	0.902	0.666	0.237	0.909	0.730	0.179
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Living w/ Parent	0.499	0.536	-0.037	0.563	0.531	0.032	0.589	0.532	0.057
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Married	0.012	0.041	-0.029	0.016	0.046	-0.030	0.042	0.066	-0.025
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Has Children	0.015	0.035	-0.021	0.012	0.032	-0.020	0.016	0.036	-0.019
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	69,178	409,934	479,112	230,459	819,176	1,049,635	492,938	1,364,755	1,857,693

NOTE: This table compares the mean characteristics of typists and non-typist women in 1900, 1910 and 1920. The sample is restricted to young women (aged 16-30) who were employed in white-collar occupations. Differences are calculated as typist means minus non-typist means. Standard errors are reported in parentheses.

Appendix Table A.4: Differences in Characteristics of Typists and Non-Typist White-Collar Women, Aged 16-30 (1930–1940)

Variables	1930			1940		
	Typists Means	Non-Typists Means	Difference	Typists Means	Non-Typists Means	Difference
White	0.995	0.974	0.021	0.992	0.968	0.024
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Black	0.004	0.025	-0.020	0.007	0.030	-0.023
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Immigrant	0.054	0.054	-0.000	0.029	0.031	-0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Urban	0.910	0.766	0.144	0.849	0.746	0.103
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Living w/ Parent	0.544	0.442	0.102	0.508	0.404	0.105
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Married	0.122	0.139	-0.018	0.185	0.211	-0.027
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Has Children	0.029	0.048	-0.019	0.041	0.071	-0.030
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	710,052	1,712,904	2,422,956	724,278	1,666,238	2,390,516

NOTE: This table compares the mean characteristics of typists and non-typist women in 1930 and 1940. The sample is restricted to young women (aged 16-30) who were employed in white-collar occupations. Differences are calculated as typist means minus non-typist means. Standard errors are reported in parentheses.

A.2 Historical Context

I present an image of the first typewriting machine, called the Sholes and Glidden Machine, below. This first typewriter, by Remington, had a list price of USD 125, which was considered a substantial investment at the time. However, over time as more competitors joined the market, by 1920 machines became more affordable. For example, in the early twentieth century, the Royal Standard typewriter was listed for USD 65 (Oden, 1917).

Appendix Figure A.9: Sholes and Glidden Machine

NOTE: This figure depicts the first typewriter manufactured by E. Remington and Sons, the Sholes and Glidden machine. Image taken from Smith (1922) (Fig 2, p.4). This image is a reproduced version of an original photograph by the Remington Company.

Typewriter advertisements help provide snapshots across time of the culture around typewriter. The earliest typewriters were not considered a technology to be used solely by women. In fact, the very first advertisement for the typewriter in 1875 by Remington depicts a man using the typewriter (see Online Appendix Figure A.10, Panel A below). Consistent with the descriptive patterns in the census data, by the early twentieth century, women are depicted in ads of the typewriter (see Online Appendix Figure A.10, Panel B below for an example of such an ad from 1905). By the 1930s and 1940s, typists and secretaries were often featured alongside executives and their bosses for typewriter ads. Such ads hint at the relationships formed between secretaries and office executives within workplaces (see Online Appendix Figure A.10, Panel C for an example of such an ad from 1939).

Appendix Figure A.10: Typewriter Advertisements

(a) Panel A: 1875

(b) Panel B: 1905

(c) Panel C: 1939

Note: This figure plots three different historical advertisements for the typewriter: (1) Panel A is the first ad of the typewriter from 1875, (2) Panel B from 1905, and (3) Panel C from 1939. Image for Panel A is obtained from Messenger, Robert (2021), Panel B from Ads By Dee, The Internet Antique Shop (NA), and Panel C from New World Cartographic (NA)

A.3 Secondary School Education and the Supply of Female Typists

To study the association between secondary schooling expansion and the supply of early female typists, I use data on state level compulsory education from Goldin and Katz (2008). I follow the instructions found in the associated data replication files to combine data from 1910-1939 with additional data from 1900-1909. Using the 1900-1909 file allows me to construct a variable at the state level that indicates which states had schooling laws by the end of 1900. I then combine the state level schooling data with state level census data from 1880-1920 which contains information on the share of male and female typists. Combining the two datasets results in a balanced panel of states that I can then use to document the relationship between secondary schooling and supply of female typists.

To study the association between adoption of mandatory schooling by states and the supply of female typists, I use the following two-way fixed effects (TWFE) specification:

$$y_{st} = \alpha + \beta \cdot \mathbb{1}(Treated)_s \cdot \mathbb{1}(\text{Post-1900})_t + \delta_s + \gamma_t + \varepsilon_{st} \tag{1}$$

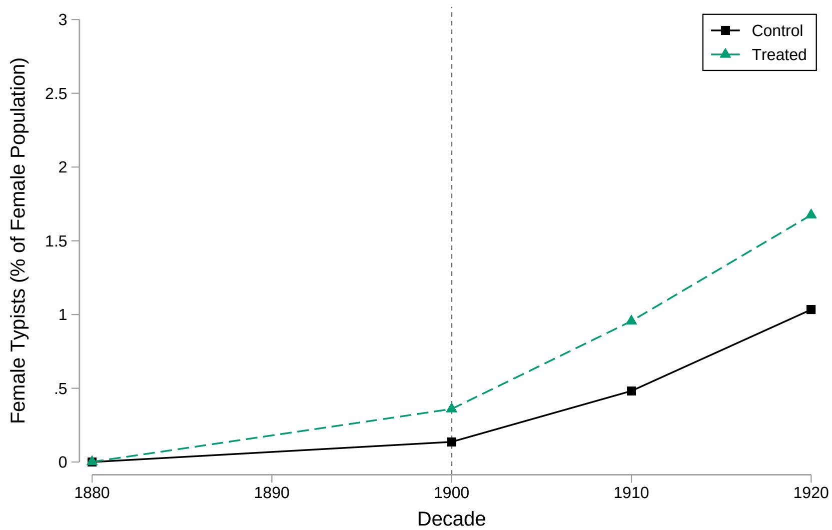
where, y_{st} represents the share of male or female typists in a state s and decade t. $\mathbb{1}(Treated)_s$ is equal to 1 if a state adopted mandatory schooling by the end of 1900, $\mathbb{1}(\text{Post-1900})_t$ is equal to 1 if the decade is 1900 or greater, and δ_s and γ_t represent state and decade fixed effects respectively. The OLS estimate of β then captures the relationship between early adoption of mandatory schooling and the outcomes. I report these estimates separately for the share of female typists and share of male typists in Online Appendix Table A.5 below. Online Appendix Figure A.11 below plots the corresponding means across treated and control states.

Appendix Table A.5: Relationship between Mandatory Schooling and Supply of Typists, TWFE

	(1) Female Typists (% of Female Population)	(2) Male Typists (% of Male Population)
Treated*Post1900	0.445	0.0313
	(0.112)	(0.023)
Outcome Mean	0.641	0.130
Observations	188	188
State Fixed Effects	Y	Y
Decade Fixed Effects	Y	Y

NOTE: This table reports results from a Two Way Fixed Effects (TWFE) specification that regresses an interaction term, *Treated*Post1900*, on two different outcome variables (represented by each column). States are defined as Treated if they had mandatory schooling laws in place by the end of 1900. All regressions include state and decade fixed effects. Outcome data comes from the 1880, 1900, 1910 and 1920 Censuses. Data on treatment comes from Goldin and Katz (2008).

Appendix Figure A.11: Mean Share of Women Employed as Typists by Control vs Treated States



Notes: This figure plots mean female typists as a percent of the female population for states that had mandatory schooling laws by the end of 1900 (treated, green line) and those that did not (control, black line) in each decade.

B Data Construction

B.1 Cross Sectional Data

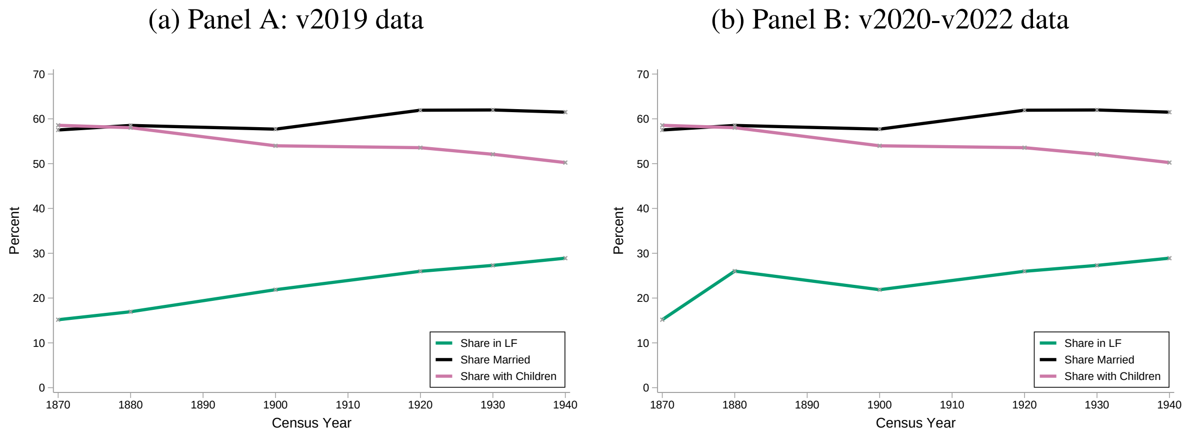
Throughout the analysis of the paper, I rely on historical US census data from 1860 to 1940 (Ruggles et al., 2021). I access these data using the NBER computing system. The analysis of this paper uses the most recent version of the data available at the time: v2022. Below I provide additional details of the variables that are used to construct outcome variables and the procedure used to address changes in county boundaries over time.

Outcome Variables Construction —. I construct women's labor force participation using the *labforce* variable. In historical censuses this variable is equivalent to the sample of women employed in occupations for pay. In 1920, I define a woman as married using the recorded marital status variable, *marst*. Because the 1870 Census did not record marital status, for time series that use this outcome, I rely instead on the *sploc* variable instead which specifies whether a spouse is present in the household. To determine whether a woman has at least one child, I use the *nchild* variable which counts the number of *own* children recorded as living with them. This will include biological children as well as step-children and adopted children.

1880 Census Women's Labor Participation Correction —. During the analysis of the paper, I came across an error in the coding of women's labor force participation in 1880 in the versions of the data after v2019, including the most up-to-date version of the data which I use in the analysis (v2022). I delineate this error and correction below.

Specifically, this error miscodes approximately 1 million women in the 1880 census from *occ1950* code 980 (Keeping House) to code 290 (Managers, officials, and proprietors (n.e.c.). This error then also affects the *labforce* and possibly the *ind1950* variables. This error was also confirmed by IPUMS but a corrected version was not released by the time of the analysis of this paper. Due to this error, women's labor force participation in 1880 appears to be artificially higher than it should be. Appendix Figure B.1 Panel A plots true women's labor force participation using the 1880 v2019 data and Panel B instead uses the v2022 data. Panel B shows that women's labor force participation in 1880 is much higher than it was in reality due to the error. Notice that other variables needed to construct the share of women who are married or with children are not affected (black and pink lines in the figure).

Appendix Figure B.1: 1880 Women's Labor Force Participation Error



Notes: This figure plots Appendix Figure 1 using v2019 (Panel A) of the census data and then v2020-v2022 (Panel B) of the census data, where v2019 is free of the miscoding error that incorrectly inflates women's lfp rates in 1880. This error is present in v2020-v2022 of the 1880 data. Women's labor force participation is plotted using the labforce variable. The picture is the same if instead the *occ1950* variable is used to construct the share of women in occupations for pay.

To correct for this error but to consistently use the most up-to-date version of the census data, I use occupation related, industry and labor force variables from the v2019 version of the 1880 census data. Specifically, only for the 1880 census, I merge in corrected variables from v2019 version of the data into the v2022 version of the data. Code to implement this is provided in the replication package.

County Boundary Harmonization—. For parts of the county-level data construction that require a panel of counties (e.g. constructing shifts from 1880 to 1920 for the SSIV), to address changes in county boundaries over time, I use population-based weights from Ferrara et al. (2022) to harmonize county boundaries. Specifically, I reweight relevant variables from the 1880 census using the $m2\_weight$ from the provided harmonization crosswalks. I provide accompanying code and data files in the replication package to harmonize county boundaries. Complementary methods for historical county boundary harmonization include Hornbeck (2010), Eckert et al. (2020), and Berkes et al. (2023).

B.2 Linked Data

I access linked data following men and women from the 1920 Census to the 1940 Census from the Census Tree website (https://www.censustree.org/). These links are based on the methods described in Buckles et al. (2023). Specifically, from these data the main analysis only uses genealogical links that come directly from the FamilySearch Family Tree and are labeled in the dataset as $family\_tree = 1$.

Using the *histid* variables from each of the census years, I merge in individuals' information from the

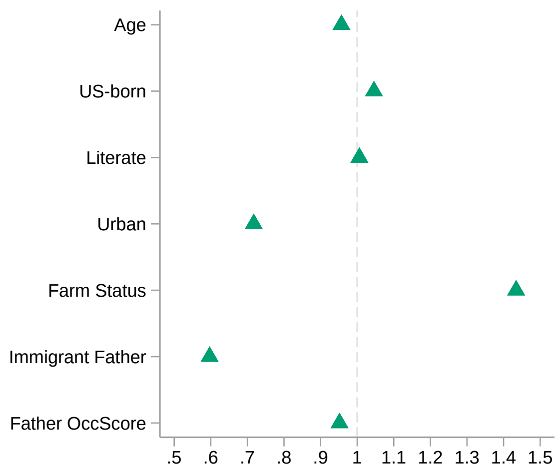
1920 and 1940 Censuses. Using information on race, sex, age, marital status, and father and spouse's locations in the household, I construct the sample for analysis which is restricted to White women who are single, aged 16-30, and observed as living with their father in 1920. They are further restricted to being married and living with their spouse in 1940. The main sample of linked women then consists of 903,150 White women.

Linked data can be unrepresentative of the underlying population, and the literature using such data commonly reweights estimates from linked data on observable characteristics to be representative of the underlying population of interest. Appendix Figure B.2, Panel A shows the representativeness of the linked sample of women across observable characteristics in 1920 including age, nativity, literacy, urban residence, residence in a farming household, having an immigrant father, and father's occupational income score, relative to the population of White single women aged 16-30 in the 1920 Census. Following Abramitzky et al. (2021); Bailey et al. (2020); Zimran (2019) and Pérez (2017), I construct inverse probability weights using observable characteristics from the 1920 Census which include age, father's occupation score, farming household status, urban status, literacy, and nativity of women and their fathers. All results shown in the paper are reweighted to be representative of the underlying population using these inverse probability weights.

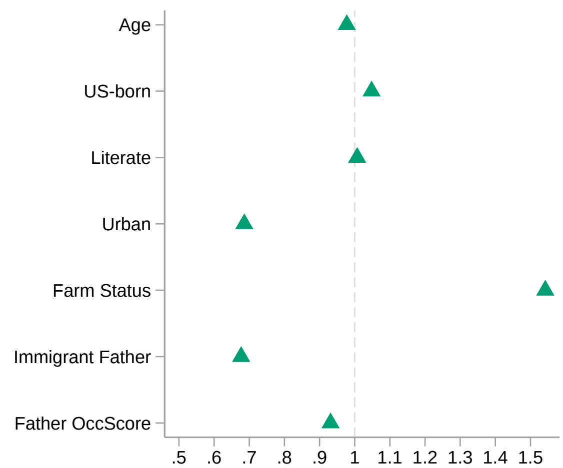
I also show representativeness of the linked sample used in the sisters analysis in Appendix Figure B.2, Panel B. Because both samples are similarly unrepresentative of the underlying population, I use the same weights for the sisters analysis.

Appendix Figure B.2: Representativeness of Linked Samples

(a) Panel A: Linked Sample of Women



(b) Panel B: Sample Used in Sisters Analysis



NOTE: This figure illustrates the representativeness of genealogical links from the FamilySearch Family Tree relative to the 1920 population of single White women aged 16-30. For each attribute, the x-axis represents a ratio indicating the mean of that attribute in the matched sample relative to the population mean. Dotted line for a ratio of 1 indicates perfect representativeness and values below (above) indicate under- (over-) representation of individuals with that attribute in the linked sample. Panel A shows representativeness for all women in the linked sample. Panel B limits the linked sample to only those women who are included in the sisters analysis in the paper.

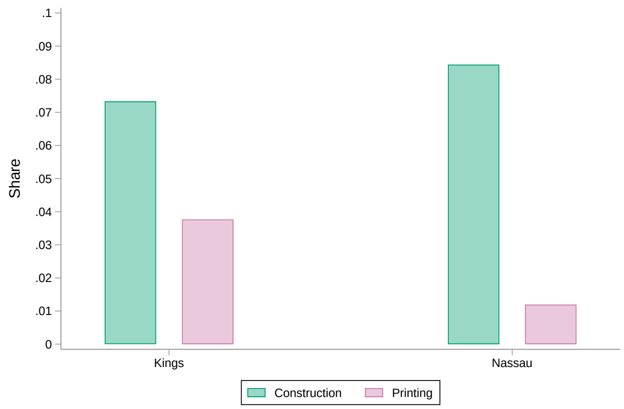
C SSIV Construction and Robustness Checks

C.1 Shift Share IV Variation

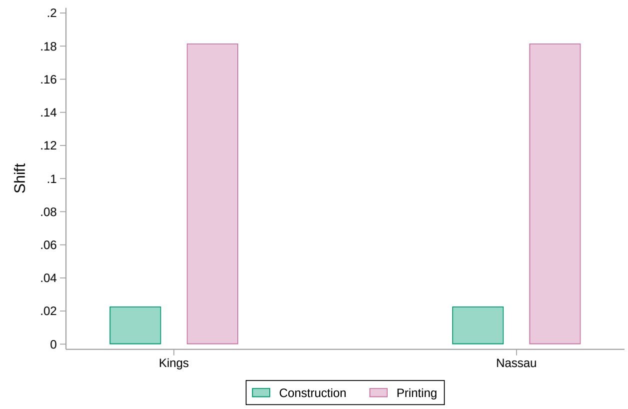
This section provides additional details and results related to my shift-share instrumental variable (SSIV) identification strategy. Appendix Figure C.1 provides intuition for the variation underlying the instrument. The figure relies on the example of two neighboring counties in New York state: Kings and Nassau. While both counties had similar population densities and a similar set of industries in 1880, the share of the workforce employed in the Printing and Publishing sector in Kings was higher than in Nassau (Panel A). At the same time, a higher share of the workforce in Nassau county was dedicated to construction than in Kings. After the invention of the typewriter, due to the nature of its production process, the Printing and Publishing industry adopted the typewriter at higher rates than did the Construction industry. This is reflected in the Printing and Publishing industry experiencing a greater *national* change in the number of typists hired between 1880 and 1920 as compared to Construction (Panel B). Consequently, by 1920, Kings county experienced a greater change in both the actual and predicted number of typists that it employed than did Nassau county (Panel C).

Appendix Figure C.1: Intuition Behind Shift Share Approach

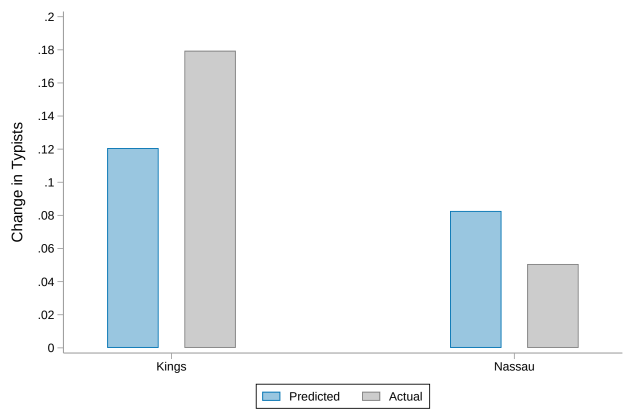
(a) Panel A: 1880 Shares ($s_{kc,1880}$)



(b) Panel B: Shifts ($g_{k,1880-1920}$)



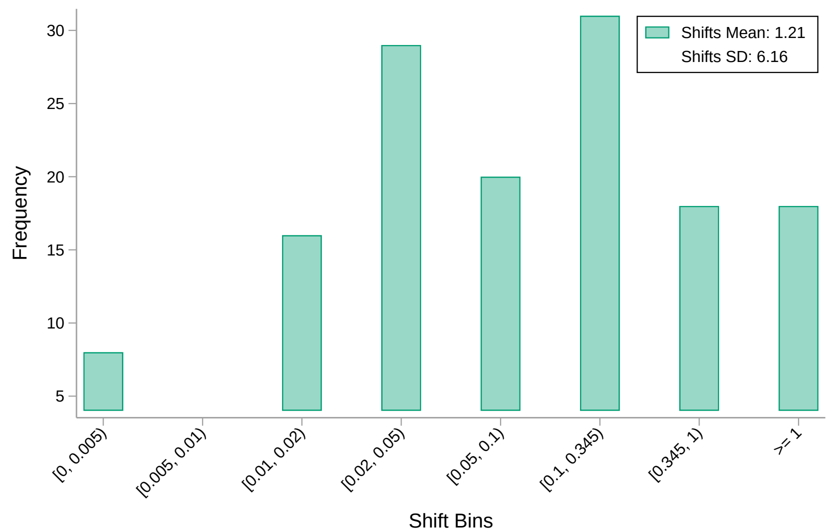
(c) Panel C: Predicted vs Actual Change in Typists



NOTE: This figure depicts the intuition behind the shift share approach. The example uses two neighboring counties in New York: Kings and Nassau, and two industries in those counties: Construction and Printing & Publishing. Panel A plots the share of workers employed in each industry in each county ($s_{kc,1880}$) . Panel B plots the 1880-1920 national change in typists for each industry ($g_{k,1880-1920}$). Panel C plots the resulting shift share IV, the predicted change in typists (blue bar) after aggregating over all industries for each of two counties. It also plots the endogenous variable, actual change in typists in the gray bar.

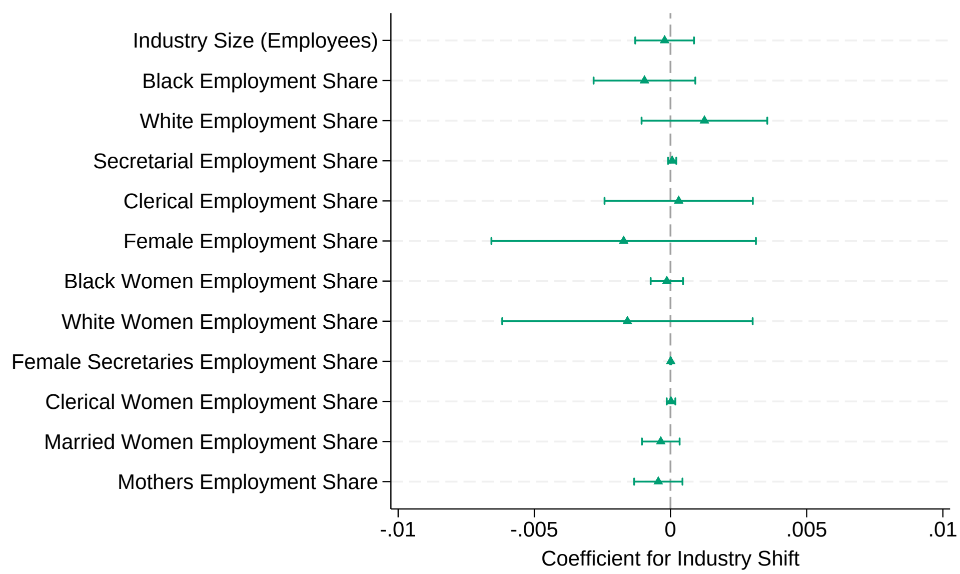
I next present descriptive figures showing the variation in the shifts underlying the instrument. Appendix Figure C.2. shows the distribution of the shifts. In Appendix Figure C.3., I check for balance of shifts with respect to 1880 industry (shift-level) characteristics and show that shifts are balanced across baseline general industry employment characteristics and characteristics specific to female industry employment.

Appendix Figure C.2: Distribution of Shifts



Note: This figure depicts the distribution of the industry level shifts and reports their mean and standard deviation.

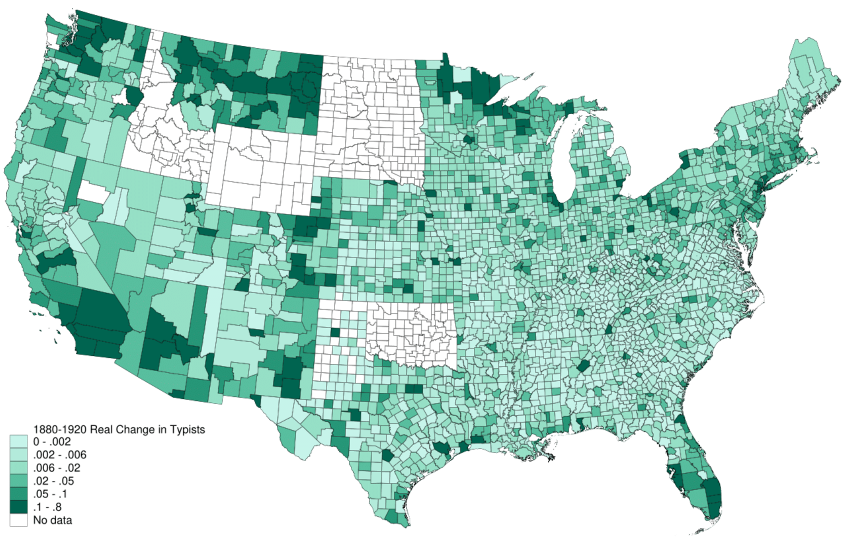
Appendix Figure C.3: Balance of Shifts on 1880 Industry Characteristics



Note: This figure plots the coefficients obtained from regressing each of the listed industry characteristics from 1880 on industry shifts.

Appendix Figure C.4 maps the variation in the actual 1880-1920 change in typists across counties. Comparing it to the geographic variation in the SSIV (Figure 2) allows us to see the geographic variation underlying the first stage relationship.

Appendix Figure C.4: Spatial Distribution of 1880-1920 Change in Typists Across Counties

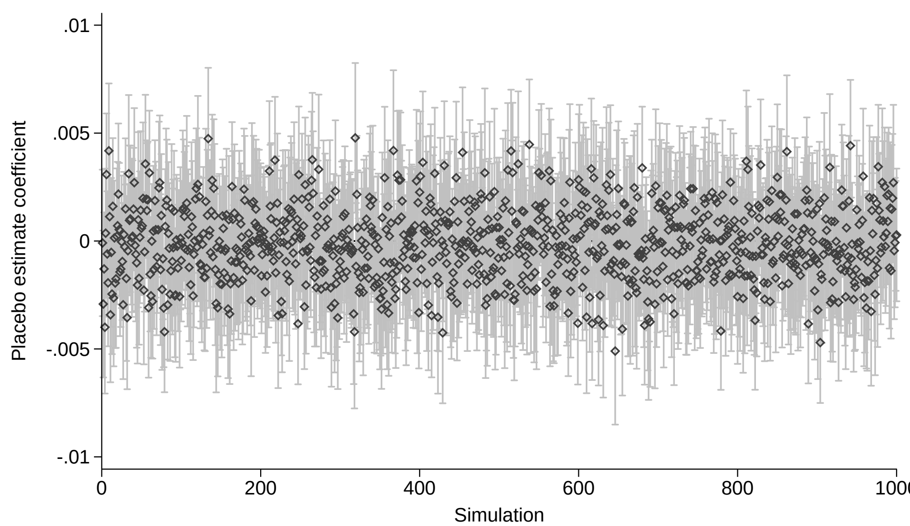


NOTE: This figure plots the values of the winsorized 1880-1920 actual change in typists across counties. Starting from the lightest shade, the first range represents 0-25th percentile of values, second range represents 25th-50th, third 50th-75th, fourth 75th-90th, and fifth represents all values above the 90th percentile.

C.2 Random Shifts Placebo Test

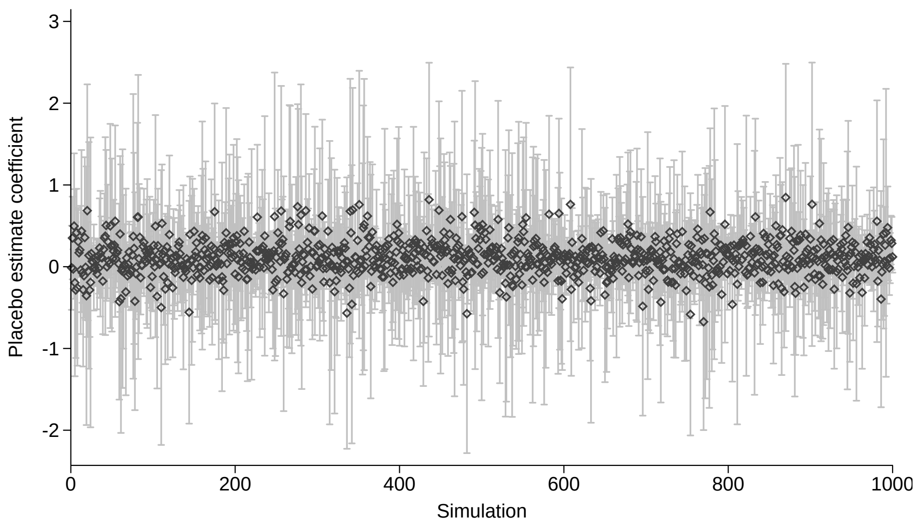
In this section, following a procedure developed by Adao et al. (2019), I show that the shares are not driving my SSIV identification. I replace the shifts $\Delta g_{k,1880-1920}$ with randomly generated shifts $\Delta g^{rand}_{k,1880-1920}$ and find a negligible share of statistically significant results across 1,000 trials. Specifically, I find 0.1% of the 2SLS coefficients are statistically significant (positive or negative) at the 1% level and 1.9% at the 5% level (see Online Appendix Figure C.5). I also repeat this exercise for the reduced form coefficients, and find that 1.7% of the coefficients are statistically significant at the 1% level (7.7% at the 5% level) and all estimates are close to 0 relative to the main reduced form estimate (see Online Appendix Figure C.6). In comparison, Bazzi et al. (2023), who also use a shifts-based SSIV, found that 5.4% of their IV coefficients were significant at the 1% level. At the 5% level, this number was 11.5%. This number is 16.1% in Derenoncourt (2022) and 55% in Adao et al. (2019). This exercise provides evidence in favor of the shifts, rather than the potentially endogenous shares alone, driving the identifying variation underlying the SSIV.

Appendix Figure C.5: 2SLS coefficients obtained from SSIV Using Random Placebo Shifts



NOTE: Instrumental variables regressions of the actual change in typists on share of women in the labor force in 1920. The actual change in typists is instrumented using a shift-share instrument based on the 1880 industry employment shares and a randomly generated shift. The random shift was generated based on a normal distribution with mean zero and variance five as in Adao et al. (2019). The figure shows the coefficients and 95% confidence intervals from instrumental variables regressions where the instrument was generated with 1,000 random shifts. Regressions include the baseline set of controls with census region fixed effects and assume robust standard errors.

Appendix Figure C.6: Reduced form coefficients obtained from SSIV Using Random Placebo Shifts



Note: Reduced-form regressions of the SSIV, the predicted change in typists, on share of women in the labor force in 1920. The shift-share instrument is based on the 1880 industry employment shares and a randomly generated shift. The random shift was generated based on a normal distribution with mean zero and variance five as in Adao et al. (2019). The figure shows the coefficients and 95% confidence intervals from reduced form regressions where the instrument was generated with 1,000 random shifts. Regressions include the baseline set of controls with census region fixed effects and assume robust standard errors.

C.3 Using Changes in Women's Labor Force Participation as Outcome

Appendix Table C.1: Results Robust to Using Change in WLFP

	1880-1920 Change in Share Women in LF	1880-1900 Change in Share Women in LF	1900-1920 Change in Share Women in LF
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	2.011	2.011	2.011
	(0.544)	(0.544)	(0.544)
F-stat	14.49	14.49	14.49
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.113	0.0549	0.0584
	(0.017)	(0.014)	(0.011)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.716	0.282	0.473
	(0.134)	(0.106)	(0.108)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.356	0.117	0.239
	(0.092)	(0.048)	(0.072)
Anderson-Rubin 95% CI	[0.221, 0.691]	[0.034, 0.263]	[0.128, 0.487]
Outcome Mean	0.0917	0.0518	0.0399
Observations	2,447	2,446	2,456
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

Note: This table uses as outcome the change in the share of women in the labor force in a county. The first column uses the 1880 to 1920 change in the share of women in the labor force. The second and third columns break this change into the 1880-1900 change and then the 1900-1920 change. All regressions include baseline county controls and census region fixed effects. Robust standard errors clustered at the county level in parentheses.

C.4 Alternative Approaches to Inference

Appendix Table C.2 shows that the statistical significance of my main estimates from Table 3 (column 4) is robust to alternative approaches to inference designed to account for downward-biased standard errors arising from spatially correlated unobservables. Specifically, I consider Conley (1999) spatial HAC estimator using bandwidths of 50 and 100 kilometers, as well as the Adao et al. (2019) correction for shift-share IV estimators, which permits correlation in unobservables across counties that may be geographically far apart but share similar initial industry composition underlying the instrument.

Appendix Table C.2: Alternative Approaches to Inference for Main Estimates

	Share Women in LF, 1920
Panel A: First Stage on $\Delta typ_{c,1880-1920}$	
$\widehat{\Delta typ}_{c,1880-1920}$	2.011
	(0.544)
Conley (1999) SE, 50km	0.543
Conley (1999) SE, 100km	0.543
Adao et al. (2019) SE	0.879
F-stat	14.492
Panel B: OLS	
$\Delta typ_{c,1880-1920}$	0.119
	(0.017)
Conley (1999) SE, 50km	0.017
Conley (1999) SE, 100km	0.017
Panel C: Reduced Form	
$\widehat{\Delta typ}_{c,1880-1920}$	0.748
	(0.137)
Conley (1999) SE, 50km	0.137
Conley (1999) SE, 100km	0.137
Adao et al. (2019) SE	0.219
Panel D: 2SLS	
$\Delta typ_{c,1880-1920}$	0.372
	(0.092)
Conley (1999) SE, 50km	0.092
Conley (1999) SE, 100km	0.092
Adao et al. (2019) SE	0.292
Anderson-Rubin 95% CI	[0.237, 0.705]
Outcome Mean	0.262
Observations	2,457
Baseline Controls + Census Region FE	Y

NOTE: This table re-estimates my main estimate from Table 3, column 4 with different approaches to inference besides the baseline robust standard errors clustered at the county level in parentheses. I provide Conley (1999) standard errors with distance cut-offs at 50 and 100 km and the adjusted standard errors for shift-share designs proposed by Adao et al. (2019).

C.5 Varying Control Sets

I use the Belloni et al. (2014) double LASSO procedure to select additional controls and show that my main results are robust to their post-double-selection LASSO estimator. In the set of additional controls, I include additional 1880 county level controls which can be constructed using census data, including share aged 16-30, share black, share white, share immigrants, and the share of workers in the manufacturing industry. Appendix Table C.2 below shows that my main IV results are robust to using the Belloni et al. (2013) post-double-selection LASSO estimator with these additional selected controls.

Appendix Table C.3: IV Estimates Using Belloni et al. (2014) post-double-selection LASSO estimator with all controls

	Share Women in LF	Share Women Married	Share Women with Children
$\Delta typ_{c,1880-1920}$	0.462 (0.098)	-0.282 (0.066)	-0.623 (0.118)

Note: This table re-estimates my main IV estimates for the share of women in the labor force, share married, and share who have children in 1920 using the Belloni et al. (2014) post-double-selection LASSO estimator with additional controls and reports the associated standard errors. The additional controls include share aged 16-30, share black, share white, share immigrants, and the share of workers in the manufacturing industry. All regressions include baseline county controls and census region fixed effects.

Because the Belloni et al. (2014) estimator and its corresponding command only applies to my IV coefficients, I use the Post-LASSO selected controls for women's labor force participation to show that my main estimates for the reduced form and 2SLS coefficients on Women's LFP in 1920 from Table 3, column 4 and my placebo test for the reduced form effect on pre-period women's LFP are robust to adding the selected county level controls which include the share young, share in the manufacturing industry and share immigrants.

Appendix Table C.4: Main Results Using Post-LASSO Selected Controls

	Share Women in LF, 1920	Share Women in LF, 1920
Panel A: First Stage on $\Delta typ_{c,1880-1920}$		
$\widehat{\Delta typ}_{c,1880-1920}$	2.011	1.993
	(0.544)	(0.653)
F-statistic	14.49	8.909
Panel B: OLS		
$\Delta typ_{c,1880-1920}$	0.119	0.116
	(0.017)	(0.014)
Panel C: Reduced Form		
$\widehat{\Delta typ}_{c,1880-1920}$	0.748	0.521
	(0.137)	(0.137)
Panel D: 2SLS		
$\Delta typ_{c,1880-1920}$	0.372	0.261
	(0.092)	(0.078)
Anderson-Rubin 95% CI	[0.237, 0.705]	[0.143, 0.594]
Outcome Mean	0.262	0.262
Observations	2,457	2,457
Baseline Controls + Census Region FE	Y	Y
Post-LASSO Selected Controls	N	Y

Note: This table re-estimates my main estimates for the share of women in the labor force in 1920 from Table 3 column 4 with the additional Post-LASSO selected controls including share young (aged 16-30), share in manufacturing industry and the share of immigrants in a county in 1880. All regressions include baseline county controls and census region fixed effects. Robust standard errors clustered at the county level in parentheses.

Appendix Table C.5: Reduced-Form Effect on Pre-Period Women's Labor Force Participation Adding Post-LASSO Selected Controls

	WLFP 1860	WLFP 1870	WLFP 1880
$\widehat{\Delta typ}_{c,1880-1920}$	-0.415	0.0732	0.0647
	(0.288)	(0.131)	(0.044)
Outcome Mean	0.145	0.151	0.169
Observations	2,036	2,229	2,447
Baseline 1880 Controls	Y	Y	Y
Census Region FE	Y	Y	Y
Post-LASSO Selected Controls	Y	Y	Y

Note: This table re-estimates Table 2 with the Post-LASSO selected controls including share young (aged 16-30), share in manufacturing industry and the share immigrants in a county in 1880.

C.6 Role of Urbanization

While my baseline specification already accounts for a county being urban in 1880, in this section, I provide a suite of additional checks to show that my main results for both women's labor force participation and their family outcomes are not confounded by differences in urbanization at baseline.

Alternative Population Thresholds for Defining an Urban County in 1880 —. In my main specification, I use a population threshold of 2,500 to define a county as urban in 1880. I first show that my results are robust to using alternative population thresholds of 3,000 and 3,500.

Appendix Table C.6: Controlling for Urban County in 1880 (Population $\geq$ 3,000)

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	2.028	2.028	2.028
	(0.536)	(0.536)	(0.536)
F-Stat	14.54	14.54	14.54
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.120	-0.0240	-0.0520
	(0.018)	(0.018)	(0.028)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.746	-0.415	-0.581
	(0.135)	(0.112)	(0.137)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.368	-0.204	-0.287
	(0.089)	(0.076)	(0.098)
Anderson-Rubin 95% CI	[0.236, 0.685]	[-0.463, -0.089]	[-0.632, -0.140]
Outcome Mean	0.262	0.647	0.533
Observations	2,457	2,457	2,457
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

NOTE: This table replaces the baseline control for a county being urban with an alternative control which classifies a county as urban in 1880 if it has a population of 3,000 or more.

Appendix Table C.7: Controlling for Urban County in 1880 (Population $\geq$ 3,500)

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	2.030	2.030	2.030
	(0.541)	(0.541)	(0.541)
F-Stat	14.48	14.48	14.48
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.120	-0.0229	-0.0507
	(0.017)	(0.018)	(0.028)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.744	-0.412	-0.578
	(0.136)	(0.112)	(0.137)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.367	-0.203	-0.285
	(0.089)	(0.076)	(0.098)
Anderson-Rubin 95% CI	[0.235, 0.685]	[-0.465, -0.087]	[-0.631, -0.139]
Outcome Mean	0.262	0.647	0.533
Observations	2,457	2,457	2,457
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

NOTE: This table replaces the baseline control for a county being urban with an alternative control which classifies a county as urban in 1880 if it has a population of 3,500 or more.

Aggregating from Town Populations using Census Place Project to Define Urban Counties —. I also construct an alternative definition of urban counties stemming from town populations using data from the Census Place Project (Berkes et al., 2023) and show that results are robust to using this alternative measure to classify a county as urban. I use these data to define a county as urban if it has at least one town with 2,500 or more people. I do not use this alternative definition of an urban county in my baseline specification because not all of the individuals and households in the 1880 census can be geocoded to towns with the same accuracy (Berkes et al., 2023).

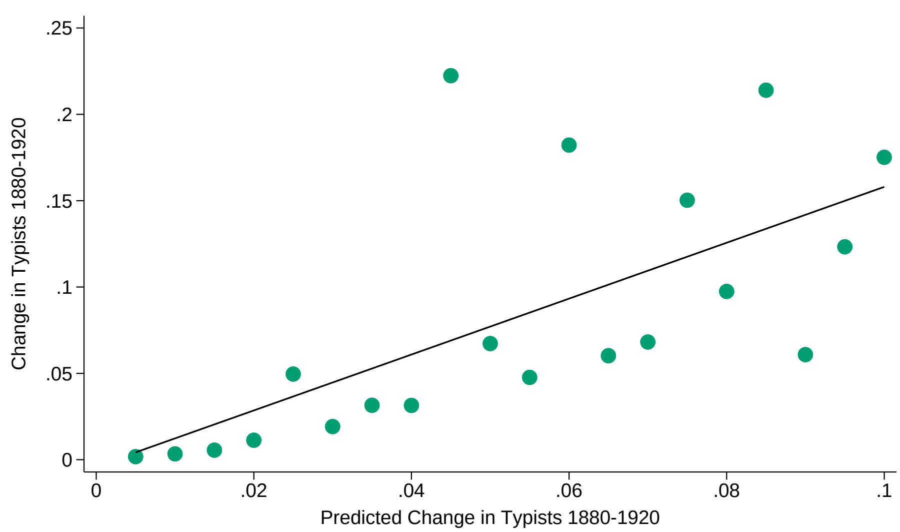
Appendix Table C.8: Main Results, Using CPP For Urban County Definition

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	2.045	2.045	2.045
	(0.624)	(0.624)	(0.624)
F-stat	15.32	15.32	15.32
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.117	-0.0182	-0.0428
	(0.018)	(0.017)	(0.026)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.660	-0.368	-0.438
	(0.140)	(0.116)	(0.137)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.323	-0.180	-0.214
	(0.085)	(0.075)	(0.085)
Anderson-Rubin 95% CI	[0.199, 0.673]	[-0.476, -0.065]	[-0.542, -0.082]
Outcome Mean	0.262	0.647	0.533
Observations	2,457	2,457	2,457
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

NOTE: This table replaces the baseline control for a county being urban with an alternative control which classifies a county as urban in 1880 if it has at least one town with 2,500 or more people. I obtain town population from the Census Place Project data (Berkes et al., 2023).

Restricting to a Within-Urban County Analysis —. I show that my main results are robust to limiting the analysis to only urban counties, using my main definition for an urban county. In Appendix Figure C.7 I first show that there is sufficient variation in the instrument when restricting to only urban counties.

Appendix Figure C.7: Binscatter of Relationship between Predicted and Actual Change in Typists, Restricting to Urban Counties (Population $\geq$ 2,500)



NOTE: This figure plots the mean change in typists (endogenous variable) for each bin of the 1880 to 1920 predicted change in typists (SSIV).

Appendix Table C.9: Restricting Analysis to Within Urban Counties (Population $\geq$ 2,500)

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	1.549	1.549	1.549
	(0.758)	(0.758)	(0.758)
F-Stat	15.90	15.90	15.90
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.119	-0.00755	-0.0330
	(0.020)	(0.019)	(0.031)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.834	-0.356	-0.577
	(0.179)	(0.154)	(0.208)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.538	-0.230	-0.373
	(0.230)	(0.152)	(0.225)
Anderson-Rubin 95% CI	[0.283, 10.042]	[-5.594, -0.032]	[-8.721, -0.095]
Outcome Mean	0.265	0.645	0.531
Observations	2,070	2,070	2,070
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

NOTE: This table restricts the analysis to urban counties which are classified as a county having a population of at least 2,500 in 1880.

I also show that the within-urban county analysis is robust to using alternative population thresholds of 3,000 and 3,500 for defining a county as urban in 1880.

Appendix Table C.10: Restricting Analysis to Within Urban Counties (Population $\geq$ 3,000)

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	1.960	1.960	1.960
	(0.702)	(0.702)	(0.702)
F-Stat	16.07	16.07	16.07
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.123	-0.00791	-0.0388
	(0.022)	(0.022)	(0.035)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.830	-0.358	-0.554
	(0.183)	(0.157)	(0.212)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.423	-0.183	-0.283
	(0.130)	(0.104)	(0.142)
Anderson-Rubin 95% CI	[0.248, 1.155]	[-0.701, -0.025]	[-0.993, -0.070]
Outcome Mean	0.266	0.644	0.530
Observations	1,955	1,955	1,955
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

NOTE: This table restricts the analysis to urban counties which are classified as a county having a population of at least 3,000 in 1880.

Appendix Table C.11: Restricting Analysis to Within Urban Counties (Population $\geq$ 3,500)

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	1.960	1.960	1.960
	(0.716)	(0.716)	(0.716)
F-Stat	15.56	15.56	15.56
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.122	-0.00597	-0.0353
	(0.022)	(0.022)	(0.034)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.820	-0.344	-0.530
	(0.185)	(0.157)	(0.213)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.419	-0.176	-0.270
	(0.131)	(0.103)	(0.140)
Anderson-Rubin 95% CI	[0.243, 1.190]	[-0.707, -0.018]	[-0.996, -0.058]
Outcome Mean	0.268	0.643	0.529
Observations	1,856	1,856	1,856
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

NOTE: This table restricts the analysis to urban counties which are classified as a county having a population of at least 3,500 in 1880.

Controlling for Baseline Population Differences —. Instead of adding a control for whether a county is urban or not at baseline as is common in the literature (e.g. Abramitzky et al. (2023)), I control directly for baseline county populations and show that results are robust to using this control instead.

Appendix Table C.12: Main Results, Controlling For Population in 1880

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	2.134	2.134	2.134
	(0.579)	(0.579)	(0.579)
F-stat	13.13	13.13	13.13
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.119	-0.0202	-0.0460
	(0.017)	(0.018)	(0.029)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.737	-0.351	-0.592
	(0.145)	(0.120)	(0.149)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.345	-0.165	-0.278
	(0.090)	(0.071)	(0.099)
Anderson-Rubin 95% CI	[0.211, 0.669]	[-0.405, -0.051]	[-0.629, -0.130]
Outcome Mean	0.262	0.647	0.533
Observations	2,457	2,457	2,457
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

NOTE: This table replaces the baseline control for a county being urban with an alternative control which is simply the population of each county in 1880.

Controlling for Baseline Population Density —. I show that results are also robust to adding a control for a county's population density in 1880 by using population counts from the census and county area measures obtained from Ferrara et al. (2022).

Appendix Table C.13: Main Results, Controlling For County Population Density in 1880

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	2.037	2.037	2.037
	(0.544)	(0.544)	(0.544)
F-stat	15.52	15.52	15.52
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.122	-0.0241	-0.0495
	(0.017)	(0.018)	(0.028)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.741	-0.407	-0.579
	(0.139)	(0.105)	(0.134)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.364	-0.200	-0.284
	(0.091)	(0.072)	(0.097)
Anderson-Rubin 95% CI	[0.230, 0.687]	[-0.451, -0.091]	[-0.631, -0.140]
Outcome Mean	0.262	0.647	0.533
Observations	2,457	2,457	2,457
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

NOTE: This table replaces the baseline control for a county being urban with an alternative control which is the population density of each county.

C.7 Accounting for the Broader Growth in Clerical Occupations

I construct an analogous shift-share variable for the predicted growth in clerical occupations that were not at risk of utilizing the typewriter from 1880 to 1920 $\widehat{\Delta Clerk}^{1880-1920}$ and include it in my empirical specification. The non-typing clerical occupations include all occupations classified as clerical and kindred except for bookkeepers, bank tellers and non-classified clerical occupations (occ1950 codes 305, 310, and 390). I find that the broader growth in non-typist clerical work does not account for the observed changes in the share of women in the labor force and that the reduced-form estimate for this measure is 3.25 times smaller in magnitude when compared to my baseline estimate and is not significantly distinguishable from 0

Appendix Table C.14: Main Result Using Predicted Growth in Clerical Occupations as Control

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	1.319	1.319	1.319
	(0.560)	(0.560)	(0.560)
F-stat	15.79	15.79	15.79
$\widehat{\Delta Clerk}^{1880-1920}$	0.896	0.896	0.896
	(0.544)	(0.544)	(0.544)
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.109	-0.0140	-0.0386
	(0.017)	(0.020)	(0.031)
$\widehat{\Delta Clerk}^{1880-1920}$	0.312	-0.201	-0.258
	(0.123)	(0.127)	(0.176)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.605	-0.407	-0.560
	(0.197)	(0.182)	(0.175)
$\widehat{\Delta Clerk}^{1880-1920}$	0.186	-0.0248	-0.0450
	(0.177)	(0.174)	(0.208)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.458	-0.309	-0.424
	(0.214)	(0.200)	(0.225)
Anderson-Rubin 95% CI	[0.167, 2.399]	[-2.113, -0.035]	[-2.620, -0.139]
$\widehat{\Delta Clerk}^{1880-1920}$	-0.225	0.252	0.335
	(0.435)	(0.428)	(0.516)
Outcome Mean	0.262	0.647	0.533
Observations	2457	2457	2457
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

NOTE: This table adds the predicted 1880 to 1920 change in non-typing related clerical occupations to the right hand side of each regression. This measure is constructed in the same manner as my shift share instrument and uses the shifts in non-typing clerical occupations instead. The non-typing clerical occupations include all occupations classified as clerical and kindred except for bookkeepers, bank tellers and non-classified clerical occupations (occ1950 codes 305, 310, and 390).

C.8 Black Population Changes

Because of Black migration from Southern to Northern states during the early twentieth century, changes in Black women's labor force participation could also in part reflect migration to industrial Northern cities rather than the effects of the typewriter. While census region fixed effects already account for differences in Black population in the North vs South, I further mitigate this concern by showing that the results for Black women's labor force participation are not being driven by Black population changes across counties and are robust to including changes in a county's Black population from 1880 to 1920 as an additional control.

Appendix Table C.15: Effect on Black Women's Labor Participation, Controlling for 1880-1920 Change in Black County Population

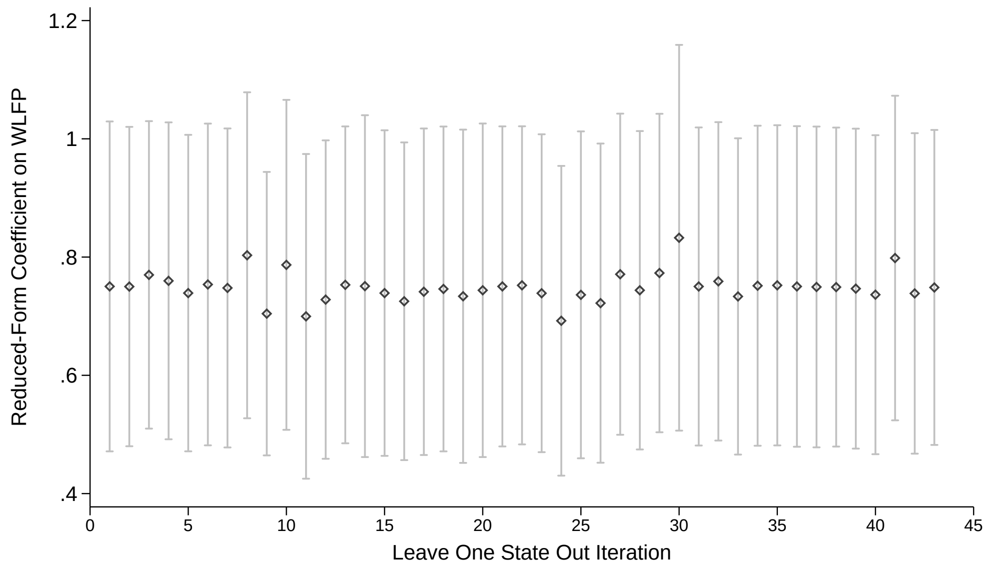
	Share Black Women in LF, 1920	Share Black Women in LF, 1920
Panel A: First Stage on $\Delta typ_{c,1880-1920}$		
$\widehat{\Delta typ}_{c,1880-1920}$	2.046	1.071
	(0.759)	(0.413)
F-Stat	10.94	16.77
Panel B: OLS		
$\Delta typ_{c,1880-1920}$	0.300	0.256
	(0.071)	(0.083)
Panel C: Reduced Form		
$\widehat{\Delta typ}_{c,1880-1920}$	1.715	1.403
	(0.414)	(0.391)
Panel D: 2SLS		
$\Delta typ_{c,1880-1920}$	0.838	1.310
	(0.281)	(0.577)
Anderson-Rubin 95% CI	[0.458, 2.519]	[0.541, 5.181]
Outcome Mean	0.449	0.449
Observations	2,243	2,243
Baseline Controls	Y	Y
Census Region FE	Y	Y
Control Change in Black Pop	N	Y

NOTE: This table adds the 1880 to 1920 change in a county's black population control in column 2. Column 1 presents my baseline estimates for comparison.

C.9 Alternative Samples

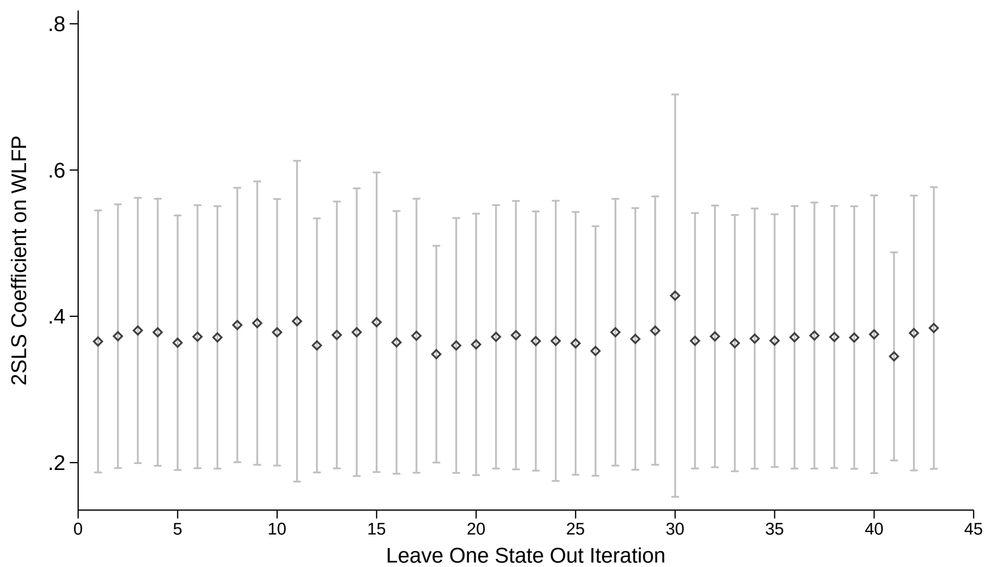
In this section, I show that my main estimates for the reduced form and 2SLS estimates for women's labor force participation are not driven by any one state or county.

Appendix Figure C.8: Reduced Form Estimates for Women's Labor Force Participation, Leave-One-Out Exercise Across States



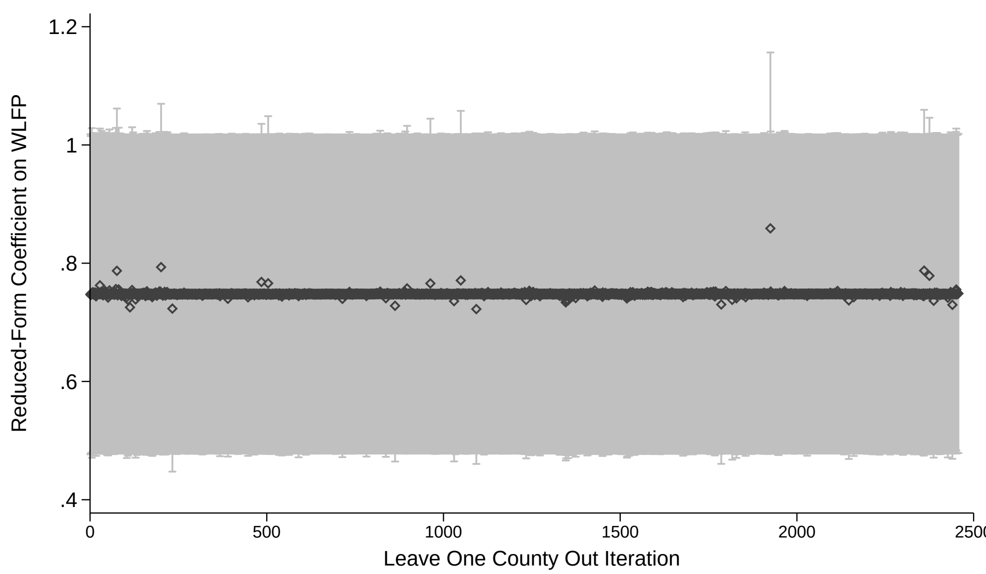
NOTE: This figure plots the estimates from running the reduced form regression on women's labor force participation while leaving one state out of the sample for each regression.

Appendix Figure C.9: 2SLS Estimates for Women's Labor Force Participation, Leave-One-Out Exercise Across States



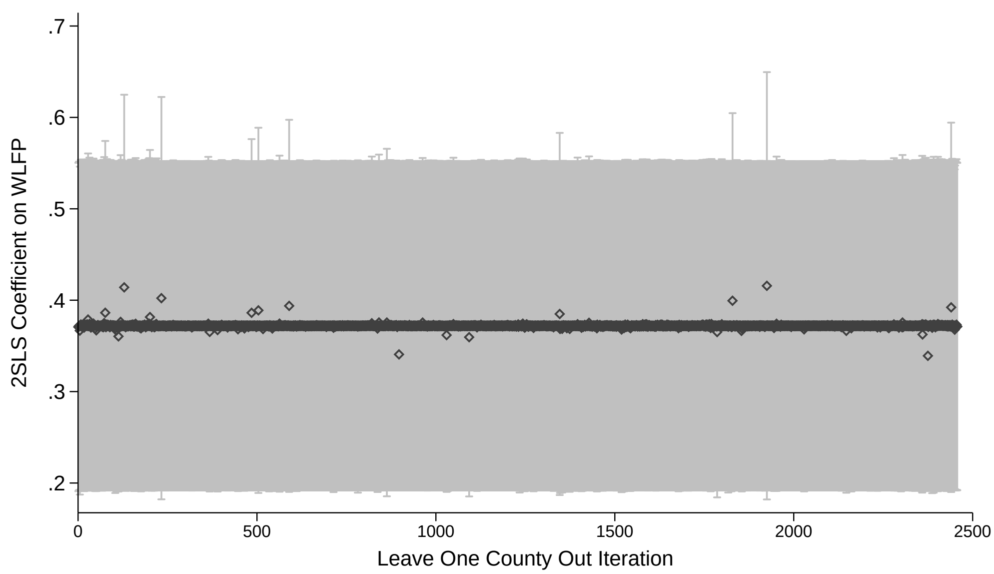
Note: This figure plots the estimates from running the IV regression on women's labor force participation while leaving one state out of the sample for each regression.

Appendix Figure C.10: Reduced Form Estimates for Women's Labor Force Participation, Leave-One-Out Exercise Across Counties



Note: This figure plots the estimates from running the reduced form regression on women's labor force participation while leaving one county out of the sample for each regression. In total these are estimates from 2,457 regressions corresponding to the number of counties in the sample for analysis

Appendix Figure C.11: 2SLS Estimates for Women's Labor Force Participation, Leave-One-Out Exercise Across Counties



NOTE: This figure plots the estimates from running the IV regression on women's labor force participation while leaving one county out of the sample for each regression. In total these are estimates from 2,457 regressions corresponding to the number of counties in the sample for analysis

C.10 Using Only Within State Variation

Appendix Table C.16 below includes state fixed effects and shows that my main results are robust to relying only on within state variation in the SSIV.

Appendix Table C.16: Main Results, Adding State Fixed Effects

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	2.170	2.170	2.170
	(0.561)	(0.561)	(0.561)
F-Stat	14.56	14.56	14.56
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.105	-0.0120	-0.0367
	(0.017)	(0.018)	(0.027)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.866	-0.559	-0.598
	(0.129)	(0.082)	(0.120)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.399	-0.258	-0.276
	(0.092)	(0.079)	(0.086)
Anderson-Rubin 95% CI	[0.267, 0.730]	[-0.550, -0.148]	[-0.576, -0.149]
Outcome Mean	0.262	0.647	0.533
Observations	2,457	2,457	2,457
Baseline Controls	Y	Y	Y
State FE	Y	Y	Y

NOTE: This table replaces census region fixed effects from my main specification with state fixed effects.

C.11 Robustness to SSIV Data Construction Choices

In constructing the shifts for my SSIV, I use counties from 1880 mapped to counties in 1920. Because county boundaries change over time, I reweight counties using population weights from Ferrara et al. (2022). In Appendix Table C.17 (column 3) I show that my main results are robust to not reweighting counties. I also winsorize my SSIV at the 1st and 99th percentiles to limit the influence of outliers, comprised mostly of smaller counties, which add noise to the first stage relationship. In Appendix Table C.17 (column 2) I show that the choice of using winsorized variables improves the precision of the first-stage and does not significantly impact the point estimates.

Appendix Table C.17: Main Result on Women's Labor Force Participation 1920, Sensitivity to SSIV Construction Choices

	(1) Baseline	(2) Non-Winsorized	(3) Non-Harmonized
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1920}$	2.011	3.077	1.603
	(0.544)	(1.374)	(0.203)
F-stat	14.49	6.723	40.62
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.119	0.0373	0.308
	(0.017)	(0.011)	(0.052)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1920}$	0.748	0.679	0.847
	(0.137)	(0.125)	(0.153)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.372	0.221	0.528
	(0.092)	(0.091)	(0.111)
Anderson-Rubin 95% CI	[0.237, 0.705]	[0.118, 1.523]	[0.331, 0.785]
Outcome Mean	0.262	0.262	0.261
Observations	2,457	2,457	2,536
Baseline Controls + Census Region FE	Y	Y	Y

NOTE: This table presents my baseline estimates (column 1), estimates without winsorizing the instrument and endogenous variable (column 2), and without reweighting counties to harmonize county boundary changes over time (column 3).

For my SSIV I use 1920 as the endpoint when constructing my shifts. Alternatively, one could use 1910 as the endpoint instead to limit the variation to the period before the outcomes are observed. However, in the paper I limit the use of the 1910 Census because women's participation in occupations is recorded differently in this Census as compared to other census decades. Specifically, in the 1910 Census, enumerators were instructed to record women's *unpaid* work that they did for their husbands' or family enterprises as their occupations. This overstatement of women's participation in the labor force in 1910 is most exaggerated in women working as farm laborers, often representing women helping with work on family farms (see Goldin (1990) for a discussion of this). This is why Appendix Figure A.1.

and similar time series of women's labor force participation, including Goldin (1990), often exclude data from 1910. Nevertheless, because we wouldn't expect there to be a drastic over-count of women working as secretaries in 1910, I construct an alternative instrument using the change in typists from 1880 to 1910 and show that my main results are robust to this alternative choice.

Appendix Table C.18: Main Results Using Predicted 1880-1910 Change in Typists as Instrument

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}_{c,1880-1910}$	1.826	1.826	1.826
	(0.340)	(0.340)	(0.340)
F-stat	21.55	21.55	21.55
Panel B: OLS			
$\Delta typ_{c,1880-1910}$	0.362	-0.0641	-0.115
	(0.045)	(0.049)	(0.077)
Panel C: Reduced Form			
$\widehat{\Delta typ}_{c,1880-1910}$	1.686	-0.898	-1.631
	(0.354)	(0.262)	(0.322)
Panel D: 2SLS			
$\Delta typ_{c,1880-1910}$	0.923	-0.492	-0.893
	(0.204)	(0.159)	(0.243)
Anderson-Rubin 95% CI	[0.567, 1.440]	[-0.890, -0.211]	[-1.562, -0.501]
Outcome Mean	0.262	0.647	0.533
Observations	2,458	2,458	2,458
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

NOTE: This table uses 1910 as the endpoint for construction of the shifts in my SSIV (instead of 1920).

D Alternative SSIV Using Shifts from Canadian Censuses

In this section I describe the alternative instrument constructed using shifts from Canadian census data. I obtain samples of the Canadian 1891 and 1911 censuses from Ruggles et al. (2025). Specifically 1891 is a 9% sample and 1911 is a 5% sample. I use variables on occupation, industry and person weights to construct the alternative shifts. The occupation and industry variables (*occ95us* and *ind95us*) are already mapped to industries and occupations in the US historical censuses.

I first define the alternative shifts as the national change in the number of typists typ_k^{Canada} from 1891 to 1911 for each industry k in Canada. Scaling these changes by the 1891 industry employment $emp_{k,1891}^{Canada}$ gives the shifts, $\Delta g_{k,1891-1911}^{Canada}$, defined as :

$$\Delta g_{k,1891-1911}^{Canada} = \frac{typ_{k,1911}^{Canada} - typ_{k,1891}^{Canada}}{emp_{k,1891}^{Canada}}. \tag{2}$$

I then map Canadian industries to US industries using the consistent *ind95us* variable and interact these shifts with 1880 employment shares from the US $emp_{k,1880}$ to obtain the alternative shift share IV $\Delta \widehat{typ}_{c,1891-1911}^{Canada}$:

$$\Delta \widehat{typ}_{c,1891-1911}^{Canada} = \sum_{k=1}^{K} s_{kc,1880} \ \Delta g_{k,1891-1911}^{Canada}. \tag{3}$$

I then use this alternative instrument in my empirical framework. Online Appendix Table D.1 below shows that my main estimates are robust to using this alternative instrument and provides evidence that the identifying variation coming from the shifts is not driven by U.S. county-specific factors or other local confounders

Appendix Table D.1: Main Results with $\widehat{\Delta typ}^{Canada}_{c,1891-1911}$ as SSIV

	Share Women in LF	Share Women Married	Share Women with Children
Panel A: First Stage on $\Delta typ_{c,1880-1920}$			
$\widehat{\Delta typ}^{Canada}_{c,1891-1911}$	4.764	4.764	4.764
	(1.967)	(1.967)	(1.967)
F-Stat	12.58	12.58	12.58
Panel B: OLS			
$\Delta typ_{c,1880-1920}$	0.119	-0.0205	-0.0469
	(0.017)	(0.018)	(0.029)
Panel C: Reduced Form			
$\widehat{\Delta typ}^{Canada}_{c,1891-1911}$	1.610	-0.864	-1.259
	(0.416)	(0.418)	(0.391)
Panel D: 2SLS			
$\Delta typ_{c,1880-1920}$	0.338	-0.181	-0.264
	(0.139)	(0.121)	(0.153)
Anderson-Rubin 95% CI	[0.160, 1.530]	[-1.118, -0.009]	[-1.651, -0.077]
Outcome Mean	0.262	0.647	0.533
Observations	2,457	2,457	2,457
Baseline Controls	Y	Y	Y
Census Region FE	Y	Y	Y

Note: This table presents my main estimates using the $\widehat{\Delta typ}^{Canada}_{c,1891-1911}$ as the SSIV instead of my main SSIV. This alternative SSIV uses out of sample shifts from the 1891 and 1911 Canadian censuses. See Online Appendix D for details of this alternative SSIV. All regressions use baseline 1880 controls from US counties and census region fixed effects. Baseline 1880 controls include an indicator for counties defined as urban, the share of county population in general clerical work, and the share of the county population made up of employed women. I define a county as urban if it has a population of 2,500 or larger in 1880. The unit of observation is a county. Robust standard errors clustered at the county level are reported in parentheses. I provide Anderson-Rubin 95% confidence sets for 2SLS estimates (Panel D).

E Supporting Evidence Using an Alternative Empirical Approach

To complement my main empirical specification which relies on identifying variation coming from aggregate shifts in demand for typists across industries, I develop an additional supporting empirical strategy which relies on variation in the supply of female typists across counties. Specifically, I use a matched control difference-in-differences approach to compare women's outcomes in counties that had a Women's Christian Association (WCA) present prior to 1880 to observationally similar counties that did not have WCAs before 1880. WCAs before 1880 were established as religious boarding homes for young women and were not established with the purpose of influencing young women's employment (Duncan, 1893).[1] After the invention of the typewriter, the same WCAs which had already been established began offering the first typing courses for women and consequently trained a supply of female typists. Thus, the intuition behind this approach is that counties which had a WCA in operation prior to the adoption of the typewriter were more likely to train early female typists and have a greater supply of female typists (see Online Appendix Figure E.1 for a map of counties that had at least one WCA established prior to 1880). Indeed counties which had WCAs had a greater share of female of typists in the decades after 1880 (see Online Appendix Figure E.2 below). I only rely on a comparison between counties which had WCAs before 1880 to counties which never had WCAs in my sample period to mitigate concerns that typewriting courses will also respond to greater demand for typists in the decades after the typewriter. While WCAs were not founded for the purpose of influencing young women's labor at the time, it is plausible that counties that had WCA openings on average looked different from counties that did not. I therefore employ a matched control difference-in-differences design to carefully compare women's outcomes in counties that had WCAs to observationally similar counties that did not have WCAs before 1880.

Formally, I identify control counties that are observationally similar to counties with WCAs according to their 1870 ($t = -1$) characteristics. I first perfectly match counties based on their census region. Then, within each census region, I match on a wider set of pre-period covariates on the basis of an estimated propensity score. To do so, I estimate a logit regression, where the dependent variable is a dummy for whether a county had a WCA and with controls including county population bins, share white, share women, share of women participating in the labor force, share of women married, share of women

[1] Duncan (1893) is a WCA handbook contained in the Sophia Smith Collection of Women's History. This handbook details the founding of WCAs as "The simple story of the first step is, that in 1858, at an undenominated ladies' prayer meeting New York City the question arose, What must we do? Quickly the answer came to the waiting hearts there: See the motherless girls all about you, homeless, tempted, ignorant. Do for them what you can. It was felt to be a trust; and at once there formed a Women's Christian Association, the first in America. They began in 1860 by opening a boarding home for girls."

with children, and share of female secretaries. Using this estimated propensity score, I identify each treated county's five nearest neighbor matches which are in the same census region and appear similar on observables in 1870. I report balance statistics for counties with WCAs and their matched controls in Online Appendix Table E.1 which shows balance across characteristics that are targeted in the matching, as well as across relevant covariates that were not targeted in the matching procedure.

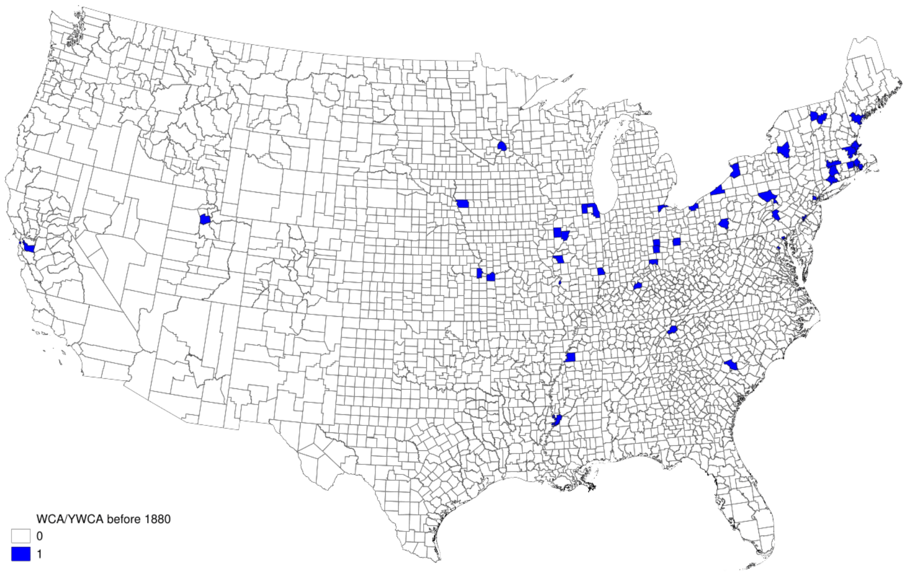
With the matched control and treatment observations, I estimate the following specification:

$$Y_{ct} = \sum_{\substack{j=-2, \\ j\neq -1}}^{3} (\delta_j \cdot \mathbb{1}\{WCA_c^{Pre-1880}\} \cdot \mathbb{1}\{1880 + j = t\}) + \alpha_{m(c)} + \gamma_t + \omega_c + \epsilon_{ct} \quad (4)$$

where Y_{ct} is an outcome variable for county c in census decade t, $\mathbb{1}(WCA)_c^{Pre-1880}$ is an indicator equal to 1 if county c had a WCA before 1880, and $\mathbb{1}\{1880 + j = t\})$ are event time dummies where 1880 denotes the year of typewriter adoption. I include match-by-census region fixed effects, $\alpha_{m(c)}$, which allow for comparisons of treated counties to observationally matched control counties within census-regions. γ_t represent census decade fixed effects and ω_c represent county fixed effects. Standard errors are clustered at the county level.

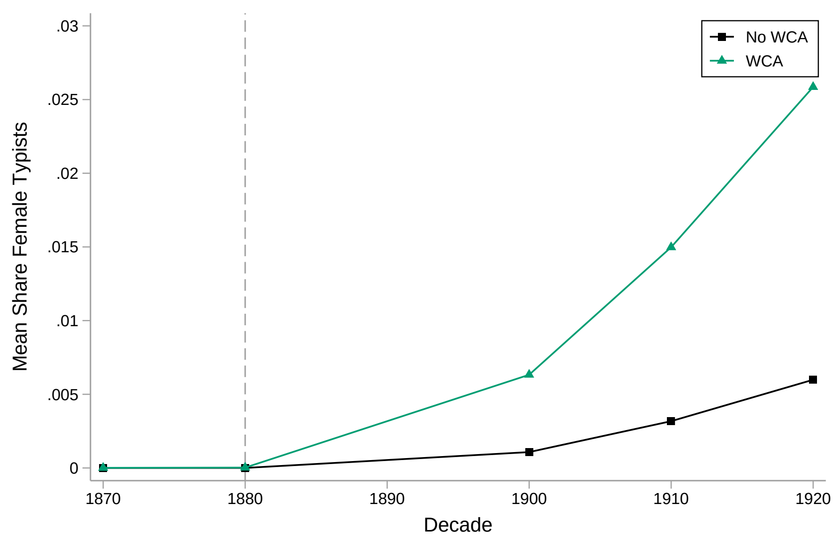
I first test the parallel-trends assumption by examining the event-study leads and find that the pre-1880 coefficients are small and statistically indistinguishable from zero (see Online Appendix Figure E.3). Next, I show that the share of women employed as typists and secretaries is higher in treated counties after the adoption of the typewriter (see Online Appendix Figure E.3 Panel A). I also find that results on women's labor force participation, marriage and fertility from this separate empirical strategy are consistent in sign and interpretation with those obtained from my primary specification (see Online Appendix Figure E.3 Panels B-D for event-study plots, see Online Appendix Table E.2 for difference-in-differences estimates). However, because there are only 43 treated counties which had established WCAs before 1880 in my sample, the estimates from this secondary analysis are not as precise, which is why I interpret these findings as additional supportive and descriptive evidence that corroborates my main results.

Appendix Figure E.1: Counties with WCA Chapters prior to 1880



NOTE: This figure plots in blue counties that had at least one WCA or YWCA chapter present before 1880 in my sample.

Appendix Figure E.2: Mean Share Female Typists and WCA presence



NOTE: This figure plots mean female typists as a share of the female population for counties that had Women's Christian Association (WCA) chapters (including YWCAs) before 1880 (green line) and those that did not (black line) in each decade.

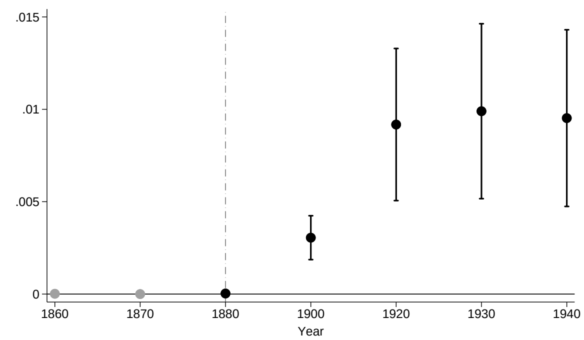
Appendix Table E.1: Balance Table

	Treated	Control	Difference
Targeted in Matching			
Pop >= 5,000	0.977	0.949	0.028
	(0.023)	(0.015)	(0.028)
Share Women	0.499	0.491	0.007
	(0.004)	(0.003)	(0.005)
Share Women in Labor Force	0.182	0.161	0.021
	(0.013)	(0.005)	(0.014)
Share Women Married	0.560	0.565	-0.005
	(0.008)	(0.004)	(0.009)
Share Women with Children	0.555	0.565	-0.010
	(0.007)	(0.003)	(0.007)
Share Female Secretaries	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Share White	0.930	0.931	-0.001
	(0.024)	(0.010)	(0.025)
Not Targeted in Matching			
Share White Women	0.926	0.930	-0.004
	(0.025)	(0.010)	(0.027)
Share Black Women	0.074	0.067	0.006
	(0.025)	(0.010)	(0.027)
Share Black	0.070	0.066	0.003
	(0.024)	(0.009)	(0.025)
Share Literate	0.862	0.868	-0.006
	(0.020)	(0.009)	(0.022)
Share Women Aged 16-30	0.518	0.506	0.012
	(0.006)	(0.003)	(0.007)
Share Aged 16-30	0.503	0.496	0.007
	(0.005)	(0.002)	(0.006)
N	43	215	258

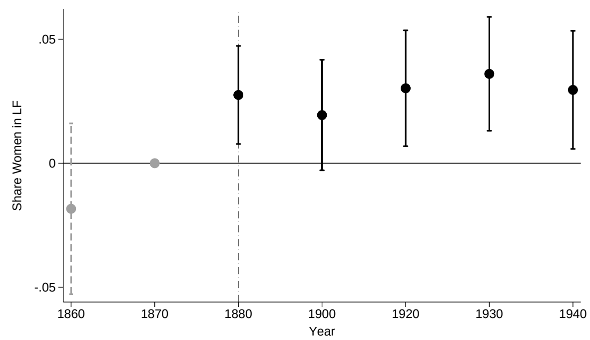
NOTE: This table presents means of characteristics for the sample of treated and matched control counties in 1870, at $t = -1$, and the difference between those means. Standard errors are presented in parentheses.

Appendix Figure E.3: Results from Matched Control Event Study

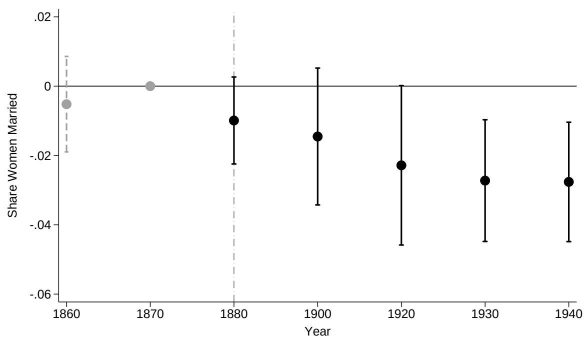
(a) Panel A: Share Female Typists



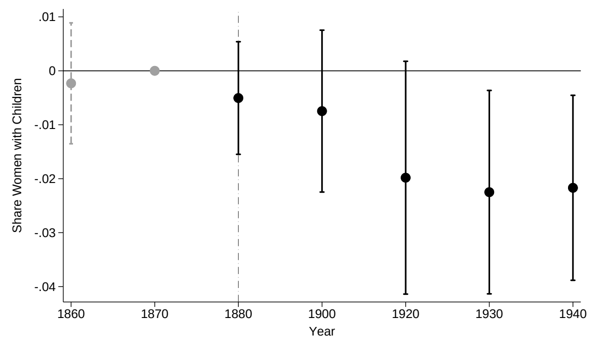
(b) Panel B: Share in LF



(c) Panel C: Share Married



(d) Panel D: Share with Children



NOTE: This figure plots results of the matched-control event study specification in equation (4) for four different outcomes: (1) the share of women who are typists in a county (Panel A), (2) the share of women in the labor force (Panel B), (3) the share of women who are married (Panel C), and (4) the share of women who have children (Panel D). All regressions include decade fixed effects, county fixed effects and match-by-census region fixed effects. Standard errors are clustered at the county level.

Appendix Table E.2: Difference-in-Differences Estimates Using Matched-Control Approach

	Share Female Typists	Share Women in LF	Share Women Married	Share Women with Children
$\mathbb{1}(WCA)_c^{Pre-1880} \cdot \mathbb{1}(Post1880)_t$	0.00633	0.0377	-0.0178	-0.0141
	(0.001)	(0.009)	(0.009)	(0.009)
Outcome Mean	0.00942	0.221	0.583	0.531
Observations	1,806	1,806	1,806	1,806
Year Fixed Effects	Y	Y	Y	Y
Match-by-Census Region Fixed Effects	Y	Y	Y	Y
County Fixed Effects	Y	Y	Y	Y

NOTE: This table presents the difference in differences estimates corresponding to equation (4) and the event study plots in Appendix Figure E.3. Each column uses a different ouctome: (1) the share of women who are typists in a county, (2) the share of women in the labor force, (3) the share of women who are married, and (4) the share of women who have children (Panel D). All regressions include decade fixed effects, county fixed effects and match-by-census region fixed effects. Standard errors are clustered at the county level and presented in parentheses.

F Further Results Related to Mechanisms

F.1 Further Results on Labor Force Participation Mechanisms

Appendix Table F.1: Reduced Form Effect on Black and White Women's Participation Across Occupation Groups (Point Estimates Underlying Figure 4)

	Black Women			White Women		
	IV	Ymean	N	IV	Ymean	N
Professional & Technical	0.074	0.010	2,243	-0.053	0.030	2,457
	(0.018)			(0.021)		
Farm Related	-3.316	0.071	2,243	-0.267	0.027	2,457
	(0.420)			(0.033)		
Manager, Officials & Proprietors	0.041	0.003	2,243	0.038	0.005	2,457
	(0.010)			(0.005)		
Clerical & Kindred	0.086	0.004	2,243	0.684	0.021	2,457
	(0.027)			(0.057)		
Sales	0.038	0.002	2,243	0.102	0.011	2,457
	(0.017)			(0.016)		
Craftsmen	0.029	0.002	2,243	0.087	0.002	2,457
	(0.005)			(0.009)		
Operatives	0.814	0.017	2,243	0.295	0.022	2,457
	(0.115)			(0.120)		
Household Service Workers	3.032	0.177	2,243	0.023	0.026	2,457
	(0.469)			(0.031)		
Other Service Workers	0.763	0.045	2,243	0.090	0.010	2,457
	(0.129)			(0.023)		
Laborers	0.073	0.012	2,243	0.039	0.005	2,457
	(0.063)			(0.024)		

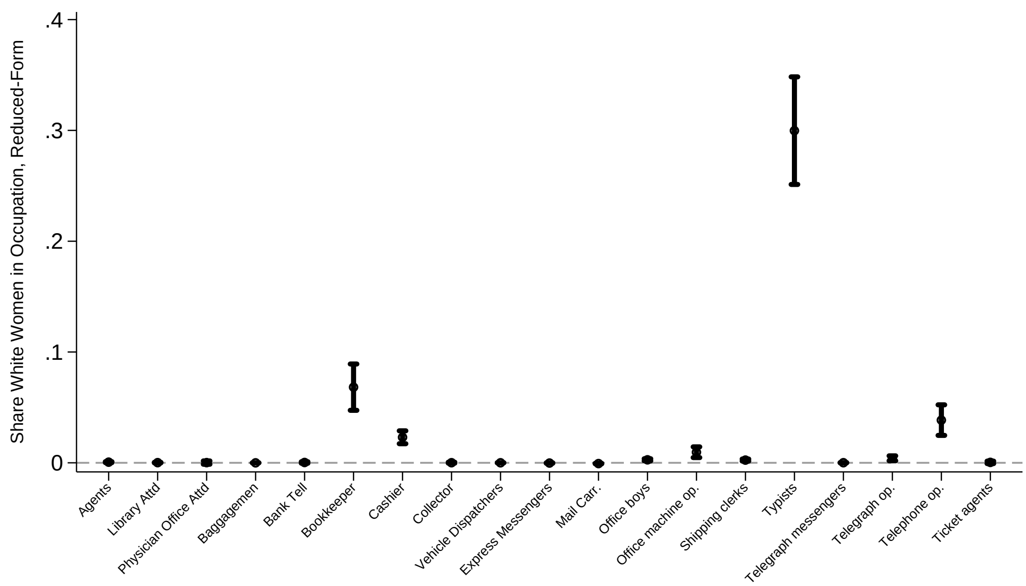
Note: This table presents the reduced form coefficients for the effect of the typewriter on the share of Black and White women in each of the occupation groups in 1920. The occupation categories follow occupation classifications by Ruggles et al. (2021). The coefficients correspond to estimating equation (5) in the main text using shares of Black and White women within each occupation in a county as outcome. Respective population weights for Black and White women are used. All regressions include census region fixed effects and baseline 1880 controls. Baseline 1880 controls include the share of county population that is employed in clerical work, employed women, and whether or not a county is defined as urban. I define a county as urban in 1880 if it has a population of at least 2,500. Robust standard errors clustered at the county level are presented in parentheses.

Appendix Table F.2: Reduced Form Effect on Black and White Women's Participation Across Industry Groups (Industry Analogue to Figure 4)

	Black Women			White Women		
	IV	Ymean	N	IV	Ymean	N
Agriculture	-3.319	0.086	2,243	-0.283	0.031	2,457
	(0.422)			(0.034)		
Mining	0.000	0.001	2,243	-0.001	0.000	2,457
	(0.004)			(0.002)		
Construction	0.091	0.008	2,243	0.022	0.003	2,457
	(0.052)			(0.004)		
Manufacturing	0.490	0.013	2,243	0.489	0.022	2,457
	(0.140)			(0.164)		
Transportation & Utilities	0.057	0.002	2,243	0.120	0.006	2,457
	(0.022)			(0.017)		
Wholesale & Retail Trade	0.345	0.009	2,243	0.363	0.019	2,457
	(0.053)			(0.049)		
Finance, Insurance & Real Estate	0.038	0.001	2,243	0.083	0.003	2,457
	(0.012)			(0.015)		
Business Services	0.024	0.001	2,243	0.125	0.002	2,457
	(0.005)			(0.020)		
Personal Services	3.703	0.203	2,243	0.143	0.038	2,457
	(0.517)			(0.050)		
Entertainment Services	0.029	0.001	2,243	0.013	0.000	2,457
	(0.006)			(0.005)		
Professional Services	0.174	0.016	2,243	-0.040	0.032	2,457
	(0.030)			(0.023)		
Public Admin	0.025	0.001	2,243	0.009	0.003	2,457
	(0.011)			(0.009)		

NOTE: This table presents the reduced form coefficients for the effect of the typewriter on the share of Black and White women in each of the industry groups in 1920. The industry categories follow industry classifications by Ruggles et al. (2021). The coefficients correspond to estimating equation (5) in the main text using shares of Black and White women within each industry in a county as outcome. Respective population weights for Black and White women are used. All regressions include census region fixed effects and baseline 1880 controls. Baseline 1880 controls include the share of county population that is employed in clerical work, employed women, and whether or not a county is defined as urban. I define a county as urban in 1880 if it has a population of at least 2,500. Robust standard errors clustered at the county level are presented in parentheses.

Appendix Figure F.1: Reduced-Form Effect on White Women's Entry into Clerical Occupations



Note: This figure plots the reduced form coefficients for the effect of the typewriter on the share of White women in each clerical occupation in 1920. The clerical occupation categories follow occupation classifications by Ruggles et al. (2021). The coefficients correspond to estimating equation (5) in the main text using shares of White women within each occupation in a county as outcome. Population weights for White women are used. All regressions include census region fixed effects and baseline 1880 controls. Baseline 1880 controls include the share of county population that is employed in clerical work, employed women, and whether or not a county is defined as urban. I define a county as urban in 1880 if it has a population of at least 2,500. Standard errors are clustered at the county level.

Appendix Table F.3: Reduced-Form Effect on White Men and Women's Participation in Clerical Occupations, 1920

	White Men	White Women
Agents	0.006	0.001
	(0.001)	(0.000)
Library Attd.	0.000	0.000
	(0.000)	(0.000)
Physician Office Attd.	0.000	0.000
	(0.000)	(0.001)
Baggagemen	0.000	-0.000
	(0.001)	(0.000)
Bank Teller	0.005	0.000
	(0.001)	(0.000)
Bookkeeper	0.055	0.068
	(0.009)	(0.011)
Cashier	0.008	0.023
	(0.001)	(0.003)
Collector	0.013	0.000
	(0.002)	(0.000)
Vehicle Dispatchers	0.000	0.000
	(0.001)	(0.000)
Express Messengers	0.001	-0.000
	(0.002)	(0.000)
Mail Carrier	-0.016	-0.001
	(0.002)	(0.000)
Office boys	0.019	0.003
	(0.004)	(0.000)
Office machine op.	0.001	0.010
	(0.000)	(0.002)
Shipping clerks	0.063	0.002
	(0.005)	(0.000)
Typists	0.035	0.300
	(0.004)	(0.025)
Telegraph messengers	0.001	0.000
	(0.000)	(0.000)
Telegraph op.	-0.006	0.004
	(0.002)	(0.001)
Telephone op.	0.001	0.039
	(0.001)	(0.007)
Ticket agents	-0.013	0.000
	(0.001)	(0.001)

Appendix Table F.4: Effect of Typewriter on Employment in Occupations, Within Urban Counties

	Black Women			White Women		
	IV	Ymean	N	IV	Ymean	N
Professional & Technical	0.071	0.011	1,957	-0.067	0.030	2,070
	(0.023)			(0.031)		
Farm Related	-3.545	0.074	1,957	-0.306	0.028	2,070
	(0.543)			(0.044)		
Manager, Officials & Proprietors	0.037	0.003	1,957	0.035	0.005	2,070
	(0.013)			(0.007)		
Clerical & Kindred	0.092	0.004	1,957	0.679	0.022	2,070
	(0.034)			(0.069)		
Sales	0.036	0.002	1,957	0.115	0.011	2,070
	(0.023)			(0.027)		
Craftsmen	0.029	0.001	1,957	0.103	0.002	2,070
	(0.006)			(0.012)		
Operatives	0.846	0.017	1,957	0.483	0.024	2,070
	(0.150)			(0.122)		
Household Service Workers	2.992	0.180	1,957	0.023	0.026	2,070
	(0.566)			(0.053)		
Other Service Workers	0.775	0.043	1,957	0.087	0.010	2,070
	(0.161)			(0.042)		
Laborers	0.095	0.012	1,957	0.078	0.005	2,070
	(0.079)			(0.025)		

NOTE: This table restricts the analysis underlying Appendix Figure F.1 to only counties defined as urban. I define a county as urban if it has a population of at least 2,500.

Appendix Table F.5: Effect of Typewriter on Employment in Occupations, Within Urban Counties Using CPP Definition

	Black Women			White Women		
	IV	Ymean	N	IV	Ymean	N
Professional & Technical	0.046	0.010	934	-0.059	0.030	951
	(0.025)			(0.033)		
Farm Related	-3.193	0.079	934	-0.223	0.025	951
	(0.554)			(0.035)		
Manager, Officials & Proprietors	0.030	0.004	934	0.031	0.005	951
	(0.015)			(0.008)		
Clerical & Kindred	0.098	0.004	934	0.595	0.030	951
	(0.037)			(0.077)		
Sales	0.032	0.003	934	0.058	0.014	951
	(0.026)			(0.024)		
Craftsmen	0.030	0.001	934	0.093	0.003	951
	(0.007)			(0.013)		
Operatives	0.802	0.023	934	0.277	0.034	951
	(0.165)			(0.143)		
Household Service Workers	2.651	0.197	934	0.023	0.025	951
	(0.594)			(0.059)		
Other Service Workers	0.667	0.044	934	0.014	0.011	951
	(0.179)			(0.037)		
Laborers	0.066	0.013	934	0.063	0.006	951
	(0.079)			(0.033)		

NOTE: This table restricts the analysis underlying Appendix Figure F.1 to only counties defined as urban using data from the Census Place Project (Berkes et al., 2023). I define a county as urban if more than 2,500 people in that county live in urban towns.

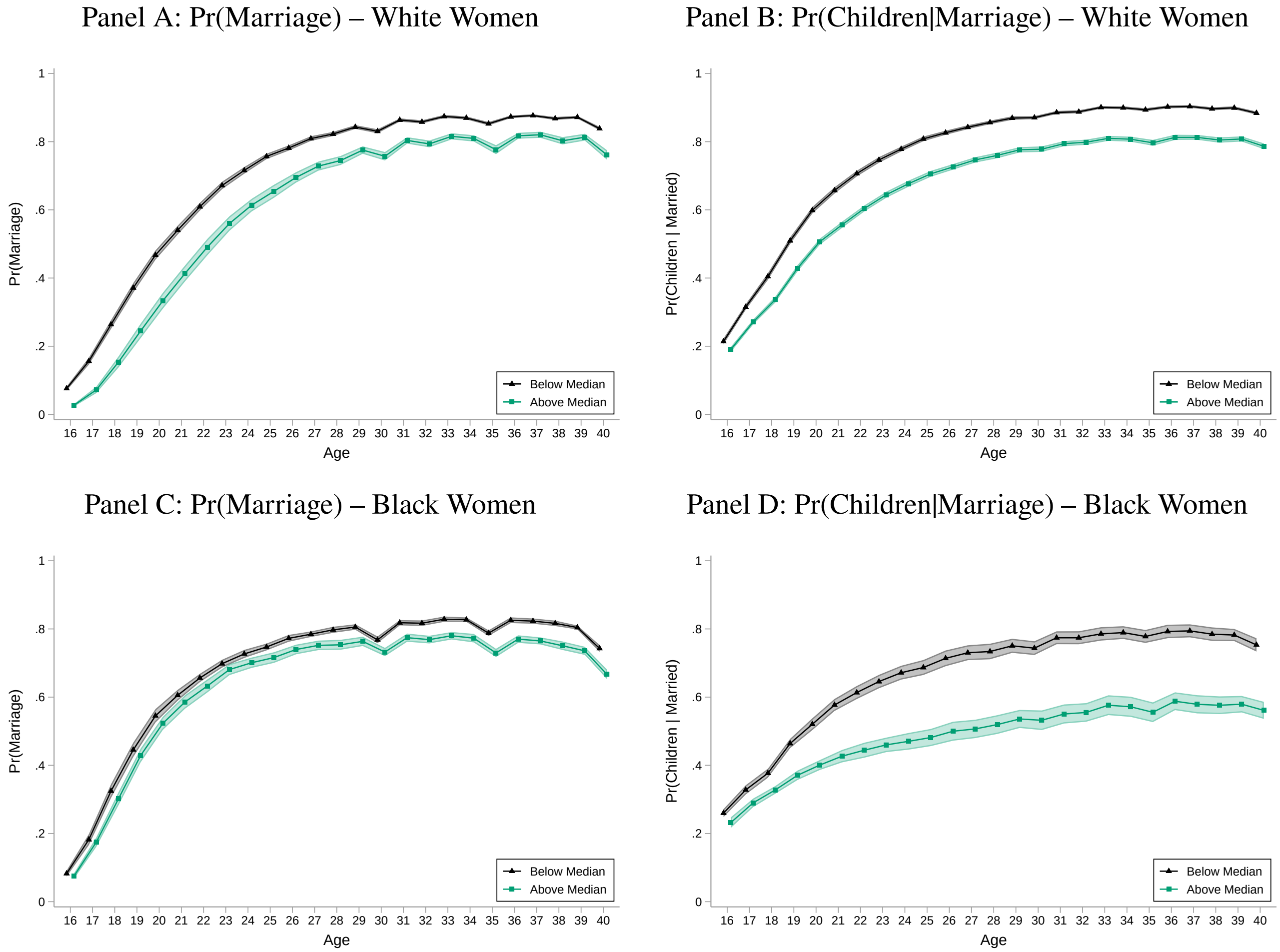
Appendix Table F.6: Effect of Typewriter on Black Women's Employment Across Household and Non-Household Service Occupations

Occupation	$\widehat{\Delta typ}_{c,1880-1920}$
Panel A: Household Services Occupations	
All Household Services Work	3.003
	(0.469)
Housekeepers	0.0426
	(0.047)
Household Laundresses	1.551
	(0.281)
Non-classified household worker	1.409
	(0.237)
Panel B: Related Non-Household Services Occupations	
Boarding and lodging house keepers	0.0359
	(0.013)
Charwomen and cleaners	0.0259
	(0.009)
Cooks, except private household	0.108
	(0.026)
Housekeepers and stewards, except private household	0.00237
	(0.006)

NOTE: This table presents the reduced form effect on Black women's participation in occupations within the household services category (Panel A) and related occupations within the non-household services category (Panel B). Population weights for Black women are used. All regressions include baseline 1880 controls and census region fixed effects. Robust standard errors clustered at the county level are presented in parentheses.

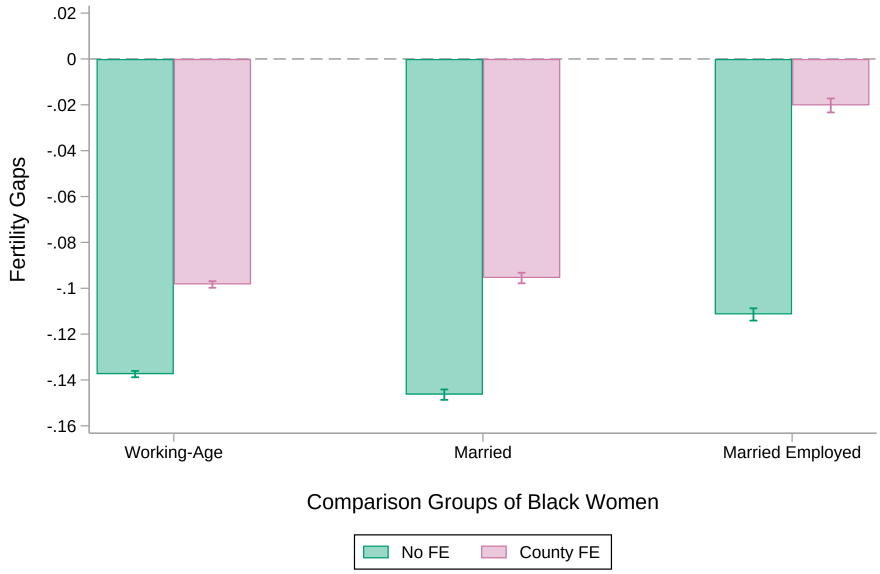
F.2 Further Results on Mechanisms Related to Family Outcomes

Appendix Figure F.2: Probability of Marriage & Children by Age



NOTE: This figure reports the probability of being married and having children, conditional on being married, for White and Black women at various ages who are residing in counties with above vs below median predicted change in typists in 1920. Panel A reports the probability of being married for White women in each age group and Panel B reports the probability of having children conditional on being married. Panels C and D report these probabilities for Black women. Appendix Section C.3 provides details of the specification used to obtain coefficients for these plots.

Appendix Figure F.3: Fertility Gaps between Black Women Employed in Domestic Services and Other Black Women



NOTE: This figure plots gaps in the likelihood of having children for married Black women employed in domestic services and other Black women who are also of working age, married, and married and employed in other occupations. Bars in pink add county fixed effects.

Appendix Table F.7: Reduced-Form Effect on Married Black Women Living Away From Spouse, Compared to all Black Married Women

	Married, Spouse Absent
$\widehat{\Delta typ}_{c,1880-1920}$	1.000
	(0.131)
Outcome Mean	0.0885
Observations	2,205
Baseline Controls + Census Region FE	Y

NOTE: This table presents the reduced form effect of the SSIV on the share of married Black women who are married but are not living with their spouses. Appropriate population weights for Black women are used. All regressions include baseline 1880 controls and census region fixed effects. Robust standard errors clustered at the county level are presented in parentheses.

G Back-of-the-Envelope Calculation to Assess Magnitudes

This section describes the back-of-the-envelope calculation used in Section 7 to quantify the contribution of typewriter adoption to women's labor force participation, marriage, and fertility in 1920. I illustrate the back-of-the-envelope calculation procedure using women's labor force participation as the outcome, defined as the share of women in the labor force in a county c:

$$y_{c,1920} \equiv \frac{WomInLF_{c,1920}}{WomPop_{c,1920}}. \tag{5}$$

I begin with my county-level reduced-form specification (equation 5 in the main text):

$$y_{c,1920} = \tilde{\alpha} + \tilde{\beta}\Delta\widehat{typ}_{c,1880-1920} + \mathbb{X}_{c,1880}\tilde{\gamma} + \tilde{\varepsilon}_c. \tag{6}$$

Using the reduced form estimates of $\tilde{\beta}$, the implied women's labor force participation in the absence of typewriter adoption $y^{\text{no TW}}_{c,1920}$ will then be:

$$y^{\text{no TW}}_{c,1920} = y_{c,1920} - \tilde{\beta}\Delta\widehat{typ}_{c,1880-1920}. \tag{7}$$

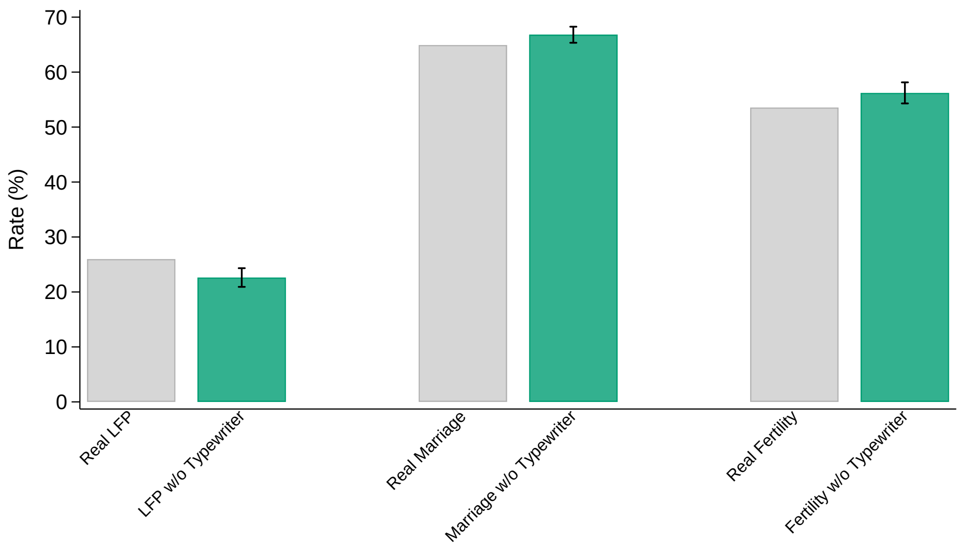
Using women's labor force participation as the outcome and aggregating across counties using 1920 female population weights yields the implied 1920 labor force participation rate in the absence of typewriter adoption as:

$$\text{Women's LFP in 1920 without Typewriter} = \frac{\sum_c \left(WomInLF_{c,1920} - WomPop_{c,1920}\tilde{\beta}\Delta\widehat{typ}_{c,1880-1920}\right)}{\sum_c WomPop_{c,1920}}. \tag{8}$$

I compute marriage and fertility rates in 1920 in the absence of the typewriter using a similar expression and the corresponding reduced-form coefficients. When using 2SLS estimates for the back-of-the-envelope calculation, I use the actual (instead of predicted) change in typists and the relevant 2SLS coefficients. I present the results from the back-of-the-envelope calculation using 2SLS estimates below in Appendix Figure G.1.

This exercise should be interpreted as a partial-equilibrium calculation. In particular, it assumes that removing the typewriter channel subtracts the direct contribution of typewriter adoption captured by $\tilde{\beta}\Delta\widehat{typ}_{c,1880-1920}$, without inducing offsetting adjustments through other general-equilibrium responses.

Appendix Figure G.1: Results from Back-of-the-Envelope Calculation Using 2SLS estimates

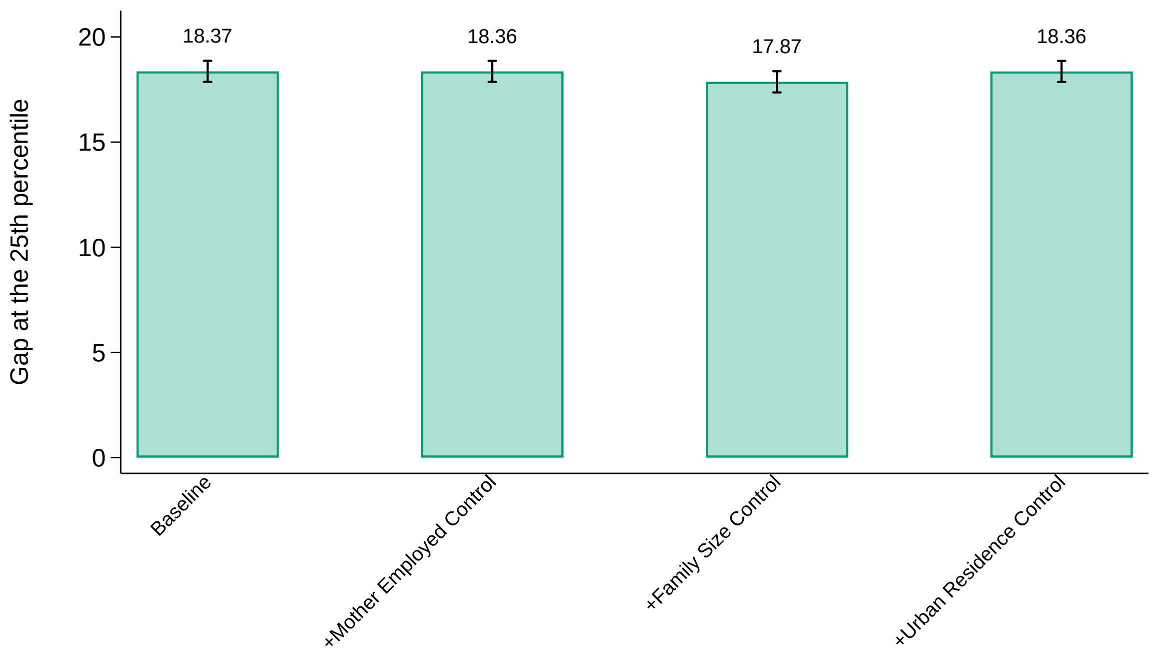


NOTE: This figure plots results from the back-of-the-envelope calculation described in Online Appendix G. It uses 2SLS estimates reported in Table 3, column 4 for women's labor force participation and Table 5, columns 1 and 2 for women's family outcomes.

H Additional Results on Intergenerational Mobility

H.1 Additional Descriptive Results

Appendix Figure H.1: Intergenerational Gap Between Typists and Non-Typists at the Twenty-Fifth Percentile, Adding Controls



Note: This figure plots gaps between typists and non-typists for women growing up at the 25th percentile of father's income score distribution, controlling for different baseline characteristics of women in 1920. The reported baseline gap corresponds to equation (8) of the main text and Figure 7, Panel A. I test the sensitivity of this baseline gap to three additional controls: (1) an indicator for having a working mother in 1920, (2) number of family members in the household in 1920, and (3) an indicator for living in an urban location in 1920. I define urban counties as those with a population of at least 2,500 in 1920. Only genealogical links are used from the underlying linked data of White women described in Section 2. All estimates are reweighted to be representative of the underlying population.

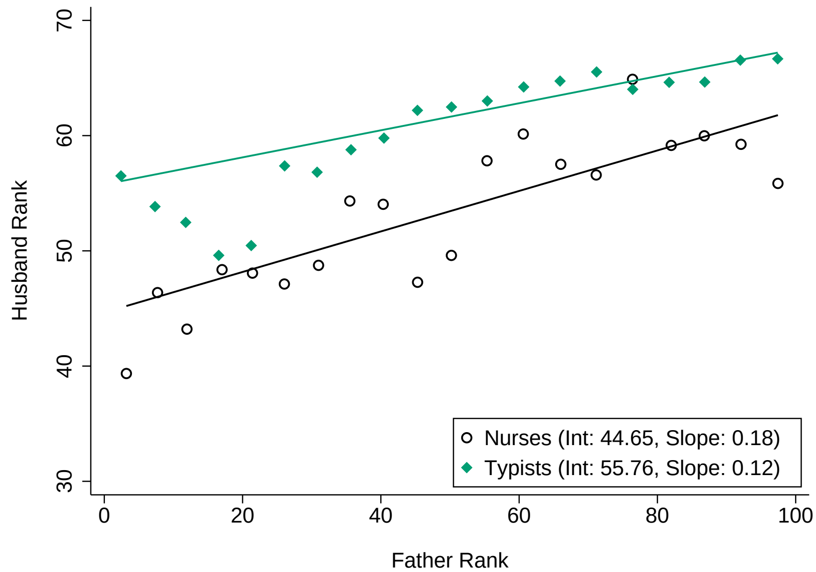
Appendix Table H.1: Gaps in Future Husband Incomes of Typists and Non-Typist White Collar Workers

	(1)	(2)
	Log Husband Income, 1940	Log Husband Income, 1940
$\mathbb{1}(Typist^{1920})$	0.0879	0.0915
	(0.006)	(0.007)
Outcome Mean	7.410	7.391
Observations	91,850	65,366
Controls	Y	Y
County FE	Y	Y

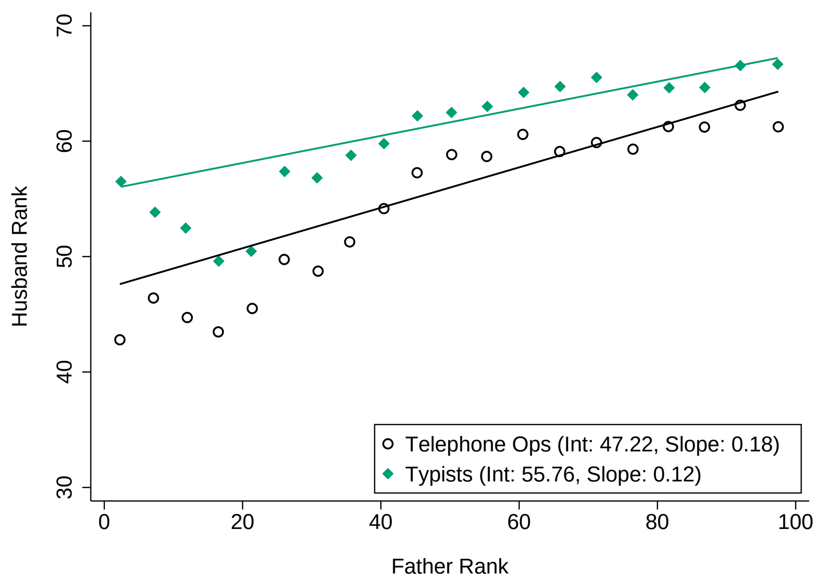
NOTE: This table presents gaps in future husbands incomes for women working as typists and women working in non-typist white collar occupations in 1920. Column 1 includes all white-collar occupations. Column 2 drops women working as bank tellers, bookkeepers and in non-classified clerical occupations in 1920 to avoid drawing comparisons to occupations using the typewriter.

Appendix Figure H.2: Mobility Advantage of Typists Relative to Alternative Occupations

Panel A: Typists vs Nurses in 1920



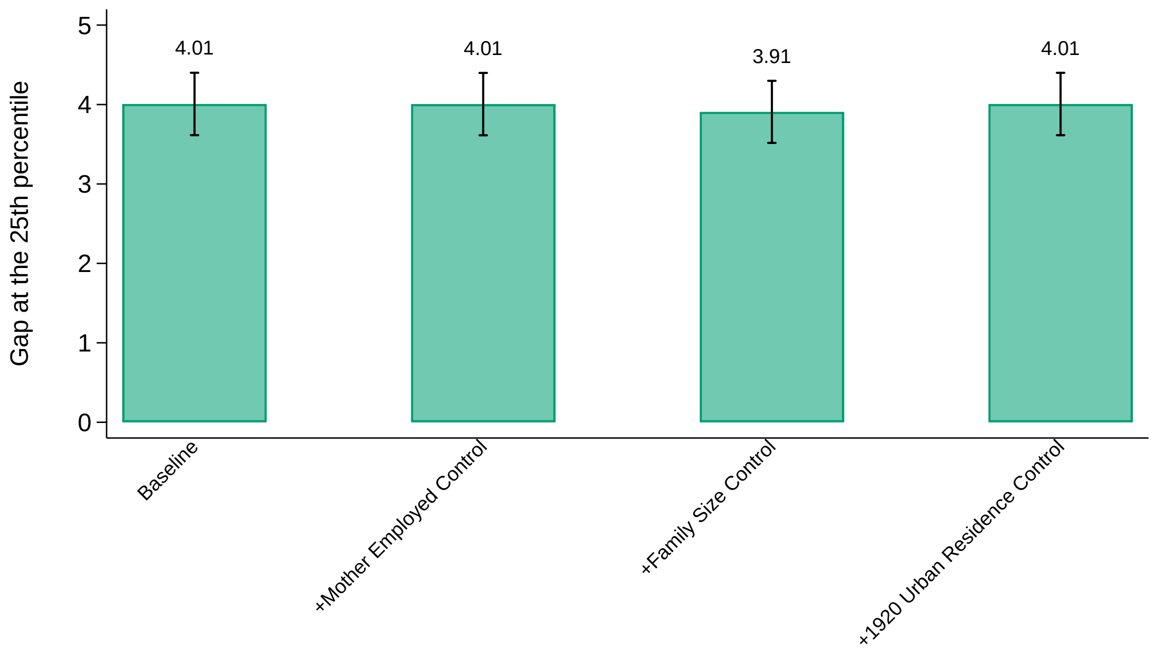
Panel B: Typists vs Telephone Operators in 1920



NOTE: Panel A plots mean income rank of husband by father's income rank, for typists and nurses and reports slopes and intercepts corresponding to the regression specified in equation (8). Panel B instead compares typists to telephone operators. Husbands are assigned percentile ranks relative to all other husbands born in the same birth year. Fathers are ranked relative to all fathers with children born in the same birth year. Only genealogical links are used from the underlying linked data of White women described in Section 2. All estimates are reweighted to be representative of the underlying population.

H.2 Robustness of Causal Result

Appendix Figure H.3: Intergenerational Gap Between Women in Low and High-SSIV counties at the Twenty-Fifth Percentile, Adding Controls



NOTE: This figure plots gaps in expected husband's income between women living in high versus low-SSIV counties for women growing up at the 25th percentile of father's income score distribution, controlling for different baseline characteristics of women in 1920. The reported baseline gap corresponds to equation (10) of the main text and Figure 9. I test the sensitivity of this baseline gap to three additional controls: (1) an indicator for having a working mother in 1920, (2) number of family members in the household in 1920, and (3) an indicator for living in an urban location in 1920. I define urban counties as those with a population of at least 2,500 in 1920.

Appendix Table H.2: Robustness of Table 6, Effect of Typewriter Adoption on Women's Economic Mobility

	Husband's Income Rank, 1940	Husband's Income Rank, 1940	Husband's Income Rank, 1940	Husband's Income Rank, 1940
Panel A: First Stage on $\Delta typ_{c(i),1880-1920}$				
$\widehat{\Delta typ}_{c(i),1880-1920}$	2.293	2.358	2.123	2.390
	(0.809)	(0.888)	(0.603)	(0.815)
F-statistic	17.83	17.95	19.17	17.97
Panel B: OLS				
$\Delta typ_{c(i),1880-1920}$	5.200	4.907	5.657	6.877
	(0.871)	(0.799)	(1.079)	(1.076)
Panel C: Reduced Form				
$\widehat{\Delta typ}_{c(i),1880-1920}$	127.2	123.4	131.9	169.3
	(12.008)	(11.920)	(10.453)	(14.929)
Panel D: 2SLS				
$\Delta typ_{c(i),1880-1920}$	55.34	52.27	62.01	70.93
	(18.906)	(19.168)	(17.062)	(23.390)
Anderson-Rubin 95% CI	[32.978, 175.572]	[30.266, 198.805]	[40.157, 137.122]	[42.983, 210.136]
Outcome Mean	52.74	53.34	49.43	52.89
Observations	586,533	835,982	586,533	770,224
Baseline Controls + Census Region FE	Y	Y	Y	Y
Father Income Score Rank	Y	Y	Y	Y
Reweighted	Y	Y	N	Y
Links Used	Family Tree Links Only	All Links	Family Tree Links Only	Family Tree Links Only
Father Income Measure Used	Income Score	Income Score	Income Score	IPUMS OccScore

NOTE: This table reports reduced form results from equation (9) in Panel C and corresponding first stage, 2SLS and OLS estimates. Column 1 presents baseline results from Table 6, column 2. Column 2 here uses additional Census Tree links (not just genealogical links). Column 3 does not reweight estimates to be representative of the underlying population of young White women in 1920. Column 4 uses Ruggles et al. (2021) occscore variable to construct fathers income ranks. $\Delta typ_{c(i),1880-1920}$ is as defined in equation (2). The unit of observation is a woman. Robust standard errors clustered at the county level are reported in parentheses. I provide Anderson and Rubin (1949) confidence sets for 2SLS estimates in Panel D.

Appendix References

Abramitzky, R., P. Ager, L. Boustan, E. Cohen, and C. W. Hansen (2023). The effect of immigration restrictions on local labor markets: Lessons from the 1920s border closure. *American Economic Journal: Applied Economics 15*(1), 164–191.

Abramitzky, R., L. Boustan, K. Eriksson, J. Feigenbaum, and S. Pérez (2021). Automated Linking of Historical Data. *Journal of Economic Literature 59*(3), 865–918.

Adao, R., M. Kolesár, and E. Morales (2019). Shift-share designs: Theory and Inference. *The Quarterly Journal of Economics 134*(4), 1949–2010.

Ads By Dee, The Internet Antique Shop (N/A). 1905 Remington Typewriter With Woman Typing. https://www.tias.com/1905-remington-typewriter-with-woman-typing-715322.html. Accessed: March 14, 2025.

Anderson, T. W. and H. Rubin (1949). Estimation of the parameters of a single equation in a complete system of stochastic equations. *The Annals of mathematical statistics 20*(1), 46–63.

Bailey, M. J., C. Cole, M. Henderson, and C. Massey (2020). How Well Do Automated Linking Methods Perform? Lessons From US Historical Data. *Journal of Economic Literature 58*(4), 997–1044.

Bazzi, S., A. Ferrara, M. Fiszbein, T. Pearson, and P. A. Testa (2023). The other great migration: Southern whites and the new right. *The Quarterly Journal of Economics 138*(3), 1577–1647.

Belloni, A., V. Chernozhukov, and C. Hansen (2014). Inference on Treatment Effects After Selection Among High-Dimensional Controls. *Review of Economic Studies 81*(2), 608–650.

Berkes, E., E. Karger, and P. Nencka (2023). The Census Place Project: A Method for Geolocating Unstructured Place Names. *Explorations In Economic History 87*, 101477.

Buckles, K., A. Haws, J. Price, and H. E. Wilbert (2023). Breakthroughs in Historical Record Linking Using Genealogy Data: The Census Tree Project. NBER Working Paper.

Conley, T. G. (1999). GMM Estimation with Cross Sectional Dependence. *Journal of econometrics 92*(1), 1–45.

Derenoncourt, E. (2022). Can You Move To Opportunity? Evidence From The Great Migration. *American Economic Review 112*(2), 369–408.

Duncan, F. C. (1893). A brief hand-book telling of the organization and methods of the international board of women's and young women's christian associations. Written under act of the Executive Committee.

Eckert, F., A. Gvirtz, J. Liang, and M. Peters (2020). A Method to Construct Geographical Crosswalks with an Application to As Counties Since 1790. NBER Working Paper.

Ferrara, A., P. Testa, and L. Zhou (2022). New Area- And Population-based Geographic Crosswalks For U.S. Counties And Congressional Districts, 1790-2020. SSRN working paper.

Goldin, C. (1990). *Understanding the Gender Gap: An Economic History of American Women*. NBER.

Goldin, C. and L. F. Katz (2008). Mass Secondary Schooling And The State: The Role Of State Compulsion In The High School Movement. In *Understanding Long-Run Economic Growth: Geography, Institutions, and the Knowledge Economy*, pp. 275–310. University of Chicago Press.

Hornbeck, R. (2010). Barbed Wire: Property Rights and Agricultural Development. *The Quarterly Journal of Economics 125*(2), 767–810.

Messenger, Robert (2021, December). The Wonderful World Of Typewriters, OzTypewriter. https://oztypewriter.blogspot.com/2021/12/1875-letter-written-on-sholes-glidden.html. Accessed: March 14, 2025.

New World Cartographic (N/A). L.C. Smith Typewriter Ad, 1939. https://nwcartographic.com/products/l-c-smith-typewriter-ad-1939. Accessed: March 14, 2025.

Oden, C. V. (1917). *Evolution of the Typewriter*. JE Hetsch.

Pérez, S. (2017). The (South) American Dream: Mobility And Economic Outcomes Of First-and Second-generation Immigrants In Nineteenth-century Argentina. *The Journal of Economic History 77*(4), 971–1006.

Ruggles, S., L. Cleveland, R. Lovaton, S. Sarkar, M. Sobek, D. Burk, D. Ehrlich, Q. Heimann, J. Lee, and N. Merrill (2025). Integrated Public Use Microdata Series, International: Version 7.6 [Dataset]. https://doi.org/10.18128/D020.V7.6.

Ruggles, S., C. A. Fitch, R. Goeken, D. Hacker, M. A. Nelson, M. Schouweiler, and M. Sobek (2021). IPUMS Ancestry Full Count Data: Version 3.0 [dataset]. Minneapolis, MN: IPUMS, 2021.

Smith, C. C. (1922). *The Expert Typist*. Macmillan.

Zimran, A. (2019). Sample-selection Bias And Height Trends In The Nineteenth-century United States. *The Journal of Economic History 79*(1), 99–138.