Long-Run Intergenerational Health Benefits of Women Empowerment: Evidence from Suffrage Movements in the US[1]

Hamid Noghanibehambari[2]

Farzaneh Noghani[3]

Abstract

An ongoing body of research documents that women empowerment is associated with improved outcomes for children. However, little is known about the long-run effects on health outcomes. This paper adds to this literature and studies the association between maternal exposure to suffrage reforms and children's old-age longevity. We utilize changes in suffrage laws across US states and over time as a source of incentivizing maternal investment in children's health and education. Using the universe of death records in the US over the years 1979-2019 and implementing a difference-in-difference econometric framework, we find that cohorts exposed to suffrage throughout their childhood compared with unexposed cohorts live 0.5 years longer. Furthermore, we show that these effects are not driven by preexisting trends in longevity, endogenous migration, selective fertility, and changes in the demographic composition of the sample. Additional analysis reveals that improvements in education and income are candidate mechanisms.

Keywords: Health, Mortality, Suffrage, Parental Investment, Historical Data

JEL Codes: J12, J13, J14, J16

---

[1] The author claims no conflict of interest to report. Funding details: None. The authors would like to thank Jason Fletcher, Kaj Gittings, and participants of Health Economic Group at the University of Wisconsin-Madison for their useful comments and suggestions.

[2] Center for Demography of Health and Aging, University of Wisconsin-Madison, 1180 Observatory Drive, Madison, WI 53706

Email: noghanibeham@wisc.edu, Phone: +1-806-620-1812, ORCID ID: https://orcid.org/0000-0001-7868-2900

[3] Department of Management, College of Business, University of Houston-Clear Lake 2700 Bay Area Blvd, Box 13 Houston, TX 77058

Email: noghani@uhcl.com

1. Introduction

Interest continues to grow in the positive effects of women empowerment on children's outcomes (Bandiera et al., 2020; Duflo, 2012; Homan, 2017; Kose et al., 2021; Nobles et al., 2010). Much of this work has been dedicated to examining the idea that women are generally more pro-social and prefer higher levels of investment in their children (Alesina & Giuliano, 2011; Araújo et al., 2017; Ashok et al., 2015; Simmons & Emanuele, 2007). On the other end, a growing body of research evaluates the association between early life and childhood conditions with later-life outcomes. Specifically, studies have shown a link between childhood parental investment and old-age longevity and mortality outcomes (Almond et al., 2018; Almond & Currie, 2011; Currie, 2009; Gagnon & Bohnert, 2012; Hayward & Gorman, 2004a; Ko & Yeung, 2019; Lazuka, 2019; Lee & Ryff, 2019; Montez & Hayward, 2011; Steptoe & Zaninotto, 2020; van den Berg et al., 2011a).

However, despite this voluminous empirical work, research has not yet addressed the link between women empowerment and long-term outcomes of children, such as their old-age health. Shedding light on this link could have important implications for the unintended and unexplored effects of women empowerment. The externalities of women empowerment are detected in factors related to human capital and health capital, including the availability of clean water (Chattopadhyay & Duflo, 2004), infant mortality (Homan, 2017), public school expenditures (Carruthers & Wanamaker, 2015), and maternal mortality (Bhalotra et al., 2017). Since the inequalities often stem from structural laws and regulations, the logical first step in empowering women and reducing gender inequalities is to aim at these laws and systematically alter them. To inspire this first step, we must begin by portraying the outcomes of such law changes. Therefore, our overlooking the influence of the suffrage laws, as a mechanism of women empowerment, on the long-term outcomes of children is an oversight in need of correction.

Therefore, this paper aims to address this gap in the literature by investigating the association between maternal exposure to suffrage laws and children's old-age mortality in the US. The central thesis of this paper is that the positive implications of empowering women through granting them the right to vote go beyond their own generation. When women are empowered, they are more motivated and enabled to provide their children with better health and educational environments. This improved health and education of children, in turn, improves their longevity. We provide empirical evidence for our central assertion by searching for longevity effects utilizing the universe of death records in the US between 1979-2019 for cohorts born between 1880-1940 and who died at ages 39-100. We complement this analysis by looking at mortality outcomes using the National Longitudinal Mortality Study (NLMS) data. We employ a difference-in-difference methodology and find that compared with those who were not exposed to suffrage, those who were exposed to suffrage during childhood benefit from 0.5 additional life years. The results are robust across different specifications, e.g., in models that include state-of-birth-by-cohort linear trend or a series of interactions between state-of-birth-by-gender and state-of-birth-by-race dummies. Furthermore, the NLMS analysis suggests that a one-unit change in the share of exposure is associated with an approximately 5 percentage-points decrease in the probability of death, about an 18 percent reduction from the mean. Finally, we provide evidence for the potential role of improved education and income as the mechanism linking exposure to suffrage to old-age mortality by establishing a significant positive relationship between exposure to suffrage and years of schooling, probability of having any college education, and total family income.

This paper makes two important contributions to the literature. First, to the best of our knowledge, this is the first study to explore the effects of the suffrage movements on children's old-age mortality. Second, it adds to the research on intergenerational aspects of women empowerment, an understudied and overlooked aspect of this literature. In addition, this study adds to the long-run health effects of the childhood environment by providing suggestive evidence of the effectiveness of parental investment on their children's old-age mortality outcomes.

The rest of the paper is organized as follows. Section 2 offers a background review of the suffrage movement and the relevant literature. Section 3 introduces data sources and discusses the sample selection strategy. Section 4 discusses the econometric method. Section 5 reviews the results of the paper. Section 6 investigates potential channels of impact. Finally, we conclude the paper in section 7.

2. Background

2.1. Background on Suffrage Movement in the US

Historical roots of the suffrage movement in the US go back to the first wave of women's voluntary organizations. These voluntary organizations originated in the nineteenth century as a consequence of the rise in industrialization (Flexner & Fitzpatrick, 1996). With men working more and more outside of the home and women becoming the sole person in charge of home responsibilities, women took their responsibilities at home one step forward and expanded the meaning of "home" to "community" (Dorr, 1910). They established several women-led voluntary organizations to advocate "municipal housekeeping," i.e., that they are promoters of welfare, health, and hygiene of not only their own house but also the whole community (Dorr, 1910). These voluntary organizations later provided both the ideological foundation and infrastructural means for the women's suffrage movement. The movement officially started with the first women's rights convention (also known as the Seneca Falls Convention) in New York in July 1848 (Skocpol, 1995).

Several voluntary organizations dedicated to the right to vote emerged after the women's rights convention, including the National Woman Suffrage Association, the American Woman Suffrage Association, and the National League of Colored Women. Although the movement saw some early victories in Wyoming and Utah (in 1869 and 1870, respectively), it wasn't until they coordinated their efforts by merging the most important suffrage associations in the 1890s and underlined their municipal housekeeping philosophy that they saw more widespread state-level victories (King et al., 2005). As shown in Figure 1, the movement realized success in several states in the early 1900s. The final catalyst for the movement came with the US entrance into World War I in 1917, as women played an essential role by volunteering as nurses and filling the jobs of men who were deployed to the war (Flexner & Fitzpatrick, 1996). Realizing this essential role, the 19th Amendment, giving women in the US the right to vote, was proposed to Congress in 1918 by President Wilson and it was ratified in 1920. In this paper, we use the variation in the timing of state-level suffrage law passages, as depicted in Figure 1, to explore the relationship between exposure to maternal suffrage laws during one's childhood and old-age mortality outcomes.

2.2. Literature Review

Women empowerment refers to "the expansion of people's ability to make strategic life choices in a context where this ability was previously denied to them" (Kabeer, 1999). This empowerment can take many forms, such as participation in household decision making, women's ability to visit important places in their community, women's status (commonly measured as educational level and employment), rights in marriage, control by partner, financial autonomy (Upadhyay et al., 2014), and political empowerment (e.g., the right to vote and parliament representation (Kabeer, 1999)). There is strong evidence establishing beneficial outcomes of women empowerment from the household to the societal level. Drawing on the argument that women are more invested in enhancing public good, are more pro-social, prioritize child health, and favor higher investment in their children (Doepke et al., 2012; Duflo, 2012), scholars have shown significant effects of women empowerment on maternal and child health outcomes (see Pratley (2016) for a review). The documented positive influences of women empowerment include reductions in infant mortality and child mortality (Eswaran, 2002; Hossain, 2015), reductions in fertility rates (Eswaran, 2002; Upadhyay et al., 2014), increases in educational investments in children (Doepke & Tertilt, 2009), increases in occupational mobility of children (Asiedu et al., 2021), better nutritional status of children (measured as height-for-age, weight-for-age, and weight-for-height (Imai et al., 2014)), higher childhood vaccination rates (Wado et al., 2014), longer birth intervals (Upadhyay & Hindin, 2005), and lower rates of unintended pregnancy (see Upadhyay et al. (2014) for a review of reproductive outcomes of women empowerment). For example, Hossain (2015) shows that women's educational level and participation in household decision-making were significantly related to lower levels of infant mortality in Bangladesh.

Political empowerment and the enfranchisement of women have also been linked to several public health outcomes, such as infant and child mortality (Bhalotra & Clots-Figueras, 2014; Homan, 2017; Quamruzzaman & Lange, 2016; Swiss et al., 2012), public school expenditures (Carruthers & Wanamaker, 2015), measles and DPT immunization (Swiss et al., 2012), usage of prenatal care (Bhalotra et al., 2017), and lifespan of female offspring (Nobles et al., 2010).

For instance, Miller (2008) shows that the passage of suffrage laws in the US had a significant relationship with an increase in public health spending, which resulted in a reduction in child mortality due to hygiene-related infectious diseases. The author argues that, immediately after the passage of state-level suffrage laws and the 19th Amendment, local and national legislators voted in favor of public health appropriations that were lobbied and campaigned by women. This sudden change was an a-prior reaction to the fear that women won't vote for them later on if they don't pass women-favored legislations. These public health legislations, and the accompanying increase in public health spending, brought about a significant increase in door-to-door hygiene campaigns. These improvements resulted in a large reduction in child mortality rates (an estimated drop of roughly 20,000 counts annually) caused by hygiene-related infectious diseases.

A growing body of research evaluates the early-life parental investment and childhood conditions on later-life outcomes, including cognitive development (Abufhele et al., 2017; Thomas et al., 2022), education (Case et al., 2005; de Haan & Leuven, 2020; Smith, 2009), labor market outcomes (Flores & Kalwij, 2014; Goodman-Bacon, 2021b; Schiman et al., 2019), disability (Arthi, 2018; Muchomba & Chatterji, 2020; Schiman et al., 2019), hospitalization (S. Miller & Wherry, 2019; Scholte et al., 2015), diabetes (Sotomayor, 2013), respiratory function (Bartley et al., 2012), psychological stress (Daly & Delaney, 2013; Darin-Mattsson et al., 2018), old-age mental health (Adhvaryu et al., 2019; Singhal, 2019), and mortality outcomes (Hayward & Gorman, 2004; Ko & Yeung, 2019; K. R. Smith et al., 2014; Steptoe & Zaninotto, 2020; Van Den Berg et al., 2009, 2011; Van Den Berg et al., 2006). For instance, Smith et al. (2014) employ Utah Population Database (UPDB) to explore the effects (and the mediatory channels) of early-life parental death on old-age mortality. They control for a wide array of early-life economic and social conditions as well as contemporary covariates, including socioeconomic status and marital status. They find modest but significant effects on mortality risks in ages above 65. They argue that contemporaneous economic conditions do not offset the early-life effects.

Suppose maternal exposure to suffrage generates incentive for increasing investment in infants and children and improvements in early life conditions. In that case, one expects to observe positive gains in old-age health outcomes. The link between early-life parental investment and old-age mortality could operate through several channels. First, mothers may contribute to the initial health endowments of their children by improving the prenatal development environment. In so doing, they may increase material inputs such as better nutrition, increase the utilization of health inputs such as prenatal care, and change their health behavior such as avoiding drinking and smoking. These channels are linked to improved birth outcomes (Abrevaya, 2006; Douglas Almond et al., 2011; Cil, 2017; Hoynes et al., 2015; Sonchak, 2015). Several studies document the association between birth outcomes and later-life education and earnings (Almond et al., 2005; Behrman & Rosenzweig, 2004; Black et al., 2007; Maruyama & Heinesen, 2020; Royer, 2009). In postnatal ages, mothers may invest in their offspring's human capital by allocating more time and resources toward their education. For instance, Kose et al. (2021) show that children whose mothers were exposed to suffrage reforms have higher educational attainments during adulthood. Carruthers and Wanamaker (2015) document that up to one-third of the rise in public school spending over the years 1920-1940 can be explained by the 19^{th} Amendment, which enforced suffrage reform to states that had not yet established one. The increases in public education quality could boost overall educational attainments in the short run and improve long-run health outcomes. There is also a growing literature that examines the role of education in health outcomes and specifically old-age mortality (Braakmann, 2011; Buckles et al., 2016; Cutler et al., 2015; Cutler & Lleras-Muney, 2006; Fletcher, 2015; Fletcher & Noghanibehambari, 2021; Galama et al., 2018; Lacroix et al., 2019; Lleras-Muney, 2005; Lleras-Muney et al., 2020). For instance, Halpern-Manners et al. (2020) explore the effects of education on old-age longevity. They implement a twin-fixed effect strategy to control for unobserved innate abilities and shared exposures during childhood and find that an additional year of schooling is associated with 0.3 additional life years. Fletcher & Noghanibehambari (2021) argue that the accessibility and availability of colleges generate incentives for individuals to attend college. They examine the impact of new college openings in the county of residence during adolescence on old-age longevity. They show that new college openings increase education and longevity. Their treatment-on-treated calculations suggest that having earned any college education raises age at death by 1-1.6 years.

3. Data Sources

The primary data source is state-identified restricted-access multiple-cause of death data extracted from National Center for Health Statistics (2020) (henceforth NCHS data). The NCHS data reports the universe of death records that occur in the US. Since 1979, death records contain the state-of-birth of an individual, a necessary variable to infer childhood state-level policy exposure. The data also contains limited individual characteristics, including race, gender, and age at death. We merge the NCHS data with the database of state-level timing of suffrage laws extracted from Kose et al. (2021). We restrict the sample to post-1880 cohorts to remove those above-100 years old individuals in the control group as their outcomes arguably follow a different path than the treated later-born cohorts. The sample is also restricted to those aged at least 40 so as to remove the potential confounding influence of health trends in later cohorts. In addition, we remove individuals born in Wyoming and Utah as the implemented suffrage laws occur years before the first cohorts appear in the data.[4]

[4] Wyoming implemented the law in 1869 and Utah in 1870. Moreover, as we build the matrix of covariates based on decennial census and since the census did not cover Hawaii and Alaska (up to 1940), we remove individuals in these states, too.

The geographic distribution of state-level women's suffrage implementation is depicted in Figure 1. Summary statistics of the final sample are reported in Table 1. The final sample includes more than 61 million observations and covers the death years of 1979-2019 for cohorts born between 1880-1940 and who died at ages 39-100. The average childhood exposure to suffrage across individuals is 75 percent. The average age at death is 78.7 years. Figure 2 delves into this number by showing the geographic distribution of age at death in the final sample, based on the state-of-birth. Individuals born in Midwest and West have higher longevity, and those born in southern states generally have lower age at death. Moreover, Figure 3 shows the density distribution of age at death in the NCHS data over the sample period.

To complement the analysis of longevity, we also use an alternative data source to explore the effects on mortality. We use version-11 of the public-use National Longitudinal Mortality Study extracted from the US Census Bureau (henceforth NLMS). The NLMS is a nationally representative random sample of the non-institutionalized population. Version-11 of NLMS is conducted in 1983 and is linked to the Annual Social and Economic Supplement of the Current Population Survey as well as to death records from National Center for Health Statistics. The advantage of NLMS over the NCHS data is that for a certain (random) sample of cohorts we observe those who survived until 1983 (from the initial interview in 1973) and those who died, in addition to all demographic and location information necessary for the analysis. This fact allows us to look at the probability of death as opposed to longevity in NCHS data.

The decennial census data is extracted from Ruggles et al. (2020). For endogeneity analysis, we use birth registration laws from Fagernäs (2014), state-level prohibition reforms from Law & Marks (2020), and the share of dry counties from Sechrist (2012). Finally, the database on poll tax and suffrage reforms is extracted from Fagernäs (2014).

4. Empirical Method

The econometric method exploits the differences in the differential adoption of suffrage law across states and over time. We operationalize this comparison in a two-way fixed effect difference-in-difference model as follows:

$$y_{ics} = \alpha_0 + \alpha_1 ShareExp_{cs} + +\alpha_2 X_i + \alpha_3 Z_{cs} + \xi_{cr} + \zeta_s + \varepsilon_{ics} \quad (1)$$

Where y is the outcome (longevity in NCHS and mortality in NLMS analysis) of individual i who belongs to birth cohort c and is born in state s. In X, we include as individual controls gender and race dummies. In Z, we include birth-state-by-birth-year covariates, including female literacy rate, female labor force participation rate, average socioeconomic index, the average number of children, and share of employees in different occupation groups. These covariates are extracted from the full-count decennial census data (1880-1940) and interpolated for non-decennial years. To control for convergence in health outcomes of different cohorts across census regions, we include region-of-birth-by-birth-year fixed effects represented by ξ.[5] The parameter ζ represents state-of-birth fixed effects. The variable of interest, $ShareExp$, measures the share of time during a person's childhood up to age 17 that their mother was exposed to the implementation of suffrage laws. Thus, for those who turned 18 at the time of suffrage, the variable takes a value of zero. Also, for those born before the suffrage reform, it equals one. For a person who turned nine at the suffrage reform year, it equals 0.5. Finally, ε is a disturbance term. To account for serial correlation in the error term across the place of birth, we cluster standard errors at the birth-state level.

[5] While in the main results we include region-of-birth-by-birth-cohort fixed effects, in Appendix D we show that the results are robust to excluding this double-interaction of fixed effects.

5. Results

5.1. Endogeneity Concerns

The idea behind the empirical methodology is that the changes in suffrage laws are uncorrelated with other determinants of longevity. In other words, the underlying assumption is that in the absence of the reforms, the outcome of treated and control cohorts would have followed the same path and were influenced by the same factors. However, several reasons pose doubts about this assumption which we discuss below.

First, suffrage reforms could be accompanied by other state-level law changes that marginally affect later-life health outcomes. For instance, several studies show that state-level alcohol consumption ban during prohibition movements was associated with improvements in later-life education and health (Evans et al., 2016; Jacks et al., 2021; Law & Marks, 2020). Other studies point to the effectiveness of state entrance into the birth registration areas to enforce child labor laws and consequent improvements in educational outcomes (Fagernäs, 2014). In order to explore whether the suffrage reforms followed or were proceeded with other potential law changes, we implement a series of event-study analyses in which the event is the suffrage law reform, and event-time is the distance (in year groups) from the year of law change.[6] These results are depicted in four panels of Figure 4. There is no discernible pattern that suffrage laws were enacted following other laws or followed other changes specifically prohibition reforms, share of dry counties, enactment of birth registration law, and the introduction of poll taxes. All point estimates are indistinguishable from zero.

Another concern is that certain subpopulations may value suffrage laws in a way to move to states which enacted the law earlier. Similarly, people may interpret suffrage laws as the

[6] Similar to equation 1, we include region-by-year and state fixed effects in all these regressions. The standard errors are clustered at the state level.

predictors of the upcoming changes and incipient social and economic movements. For instance, blacks may observe suffrage as a step toward a more socially equal society and move to states that pass the law. Since blacks have lower longevity for reasons that cannot be simply absorbed by race dummies, the estimated effects of equation 1 are biased. To explore this endogeneity issue, we implement event-study analyses to evaluate the decennial evolution of demographic features as a response to suffrage reforms. Specifically, we regress the decennial census (1880-1940) share of state-level people in each race/ethnicity on a dummy indicating the passage of suffrage. The results are reported in four panels of Figure 5. As the small and insignificant event coefficients suggest, there is no significant change in the share of whites, blacks, and Hispanics during pre-post suffrage years.

The third concern is related to changes in the share of females, family structure, and endogenous fertility. For instance, if states with earlier adoption of suffrage attract single mothers, the coefficients of equation 1 may underestimate the true effects as single parenthood could also be associated with lower health endowment and lower later-life longevity.[7] However, Figure 6 provides no evidence that suffrage reforms were accompanied by changes in the share of females, married women, the percentage of households with a child less than five years old, and the total number of children in the family.

Fourth, the reforms may follow structural social and economic changes that can also be observed in economic variables. For instance, children born in early-adopter states may also experience improvements in economic conditions and reveal improvements in longevity as a result of the latter rather than the former. To explore this, we look at the decennial census changes in the

[7] The argument rests on the assumption that single mothers, on average, have fewer available material resources. See, for instance, Duriancik & Goff (2019), Taanila et al. (2002), and Waldfogel et al. (2010).

average socioeconomic index, the average occupational prestigious score, the share of white-collar employees, and the percentage of farmers. The results of event-studies, reported in four panels of Figure 7, reveal no pattern of any pre-post changes in these outcomes due to the suffrage law change.

The fifth concern is regarding the survival of infants and children to NCHS data. Suppose suffrage imposes a condition on survival that differs by gender/race/ethnicity. In that case, the regression estimations are contaminated since there are differences in longevity by gender, race, and ethnicity that cannot be captured by including these as control variables. To explore this source of bias, we implement some balancing-test type event-study analysis in which the event-time is the year a person turns 17 relative to the year of suffrage.[8] The results are reported in four panels of Figure 8. All the pre-post coefficients' point estimates are indistinguishable from zero, statistically and economically.

To complement this section and show that the effects are indeed driven by exposure during a specific age range, i.e., childhood, we implement several placebo tests to explore the association between exposure to suffrage laws at ages that individuals likely moved out of their original household. The results are reported across different columns of Table 2 for different age group comparisons. For instance, column 1 compares the outcomes of those individuals who experienced suffrage when they were 19-20 years old to those who were 21-23. If the association between childhood exposure to suffrage and longevity were driven by overall improvement in health outcomes in early-adopter states versus later-adopter states, we would observe strong associations

[8] The logic behind age 17 cut-off is that children leave their home after this age and that, if we believe education is a likely channel as we discuss in section 2.2, this is the usual cut-off age for completing K-12 education. However, in Appendix B, we show the robustness of the results to alternative age restrictions.

in this table. However, the estimated effects are quite small in magnitude and statistically insignificant.

5.2. Event-Study Results

We start our analysis by showing the event-study results of childhood exposure to suffrage reform and longevity.[9] The results are illustrated in Figure 9. The negative event-time coefficients are close to zero and statistically insignificant, which rule out the concern over preexisting trends in the outcome. The coefficients start to rise for those who turn 15-16 years old at the time of suffrage (event-time=[1,2]) and continue to increase for other partially exposed cohorts. The coefficients become relatively (at least relative to the rising trend for partially exposed cohorts) stable for fully exposed cohorts. Moreover, all post-exposure coefficients are statistically significant at 5 percent level.

5.3. Main Results

The main results of the paper are reported in Table 3 across subsamples in consecutive panels. The first column within each panel shows the effects conditional on fixed effects, and the second panel adds individual and state-level controls. The full specification of the full sample suggests that compared with those who turned 18 at the time of suffrage (share of exposure=0), being exposed to suffrage during all years of childhood (share of exposure=1) is associated with 0.5 additional life years (column 2). Alternatively, we can use the standard deviation in the exposure share as the benchmark change in the explanatory variable (from Table 1). On average and conditional on fixed effects and covariates, a one-standard-deviation change in exposure share

[9] Specifically, we implement regressions of the following forms using ordinary-least-square: $y_{ics} = \alpha_0 + \sum_{i=\underline{T}}^{\overline{T'}} \beta_i (I((BY_{ics} + 17 - Suff_{cs}) = i)) + \alpha_2 X_i + \alpha_3 Z_{cs} + \xi_{cr} + \zeta_s + \varepsilon_{ics}$, where all covariates and fixed effects are as in equation 1. The event times (denoted by i) are grouped in two-year chunks. For illustrative purposes, the event times are grouped for less than $\underline{T}$ (<-9) and more than $\overline{T'}$ (>24) into two single dummies. The parameter $I(.)$ represent unit function that takes one if its argument is true and zero otherwise.

(0.35 units change) is associated with 0.19 years higher longevity. This effect is slightly larger among males than females (comparing columns 4 and 6). However, the effects are significantly larger among blacks compared to whites. Among blacks, the difference in the longevity of fully-exposed versus unexposed cohorts is about 1.3 years, equivalent to roughly 1.7 percent rise from the mean. This racial difference in the effects of suffrage is also documented in the previous literature. For instance, Kose et al. (2021) show that children fully exposed to suffrage reveal improvements in educational attainments and that these benefits appear to be significantly larger among black children than white children. They also find modestly larger effects among males than females, consistent with our reduced-form findings on longevity.

5.4. Robustness across Specifications

In Table 4, we explore the sensitivity of the main results to alternative model specifications. In column 1, we replicate the full specification results of column 2 of Table 3 as our benchmark comparison. In column 2, we add to column 1 a series of interactions between state-of-birth-by-gender and state-of-birth-by-race dummies to allow for the state effects to vary for each subpopulation. The coefficient remains virtually constant.

In column 3, we absorb all state-level observable and unobservable characteristics that evolve linearly across cohorts. Adding a state-of-birth-by-birth-year linear trend drops the magnitude of the effect by roughly 22 percent, while the marginal effect is still significant at 5 percent level.

In the main analysis, we avoid controlling for state-of-death as the choice of state later in life can also be determined by early life events and is an endogenous control. In column 4, we show that controlling for death-state fixed effects does not alter the magnitude or statistical significance of the coefficient. In addition, to account for seasonality in mortality, column 5 adds month of death fixed effects. The effect is almost identical to that of column 1.

To check the sensitivity of the functional form to the linear outcome, we replace the outcome with the log of age at death. The result is reported in column 6. It suggests that fully exposed cohorts (relative to non-exposed cohorts) have a 0.7 percent higher age at death. This is almost identical to the percentage change from the mean reported in row 5 of column 2 of Table 3.

Finally, while we cluster standard errors at the birth-state level in column 1, we show that the estimated standard error is considerably smaller if we use the Huber-White robust method (column 7). Moreover, the standard errors are smaller if we cluster them at the region-cohort and birth-state level (two-way clustering, column 8). Thus, the birth-state level is a relatively more conservative level of clustering of standard errors.

5.5. Heterogeneity across Subsamples

In accompanying the suffrage laws, states also enacted literacy tests. Therefore, one would a priori expect to observe larger effects in places with higher female literacy rates. Moreover, several studies suggest that women empowerment in society can also be attained by increasing the share of women in the labor force (Togeby, 2016). In this view, female labor force participation can operate as a dynamic complementarity factor to boost the effects of suffrage laws. Therefore, we would expect to observe larger effects in places with higher initial female labor force participation. To examine these potential heterogeneities, we replicate the main results across states below/above the median of female literacy, female socioeconomic index, and female labor force participation rate in the year of the suffrage law change.[10] These results are reported in Table 5. As expected, the effects are stronger for states with higher female literacy and higher initial female labor force participation.

Another argument is that the effects might be concentrated in one specific region. In columns 7-10 of Table 5, we replicate the main results across census regions. The effects are not uniform across regions, but we don't observe that a specific region drives them. For instance, the coefficient of Midwest-born people suggests 1.2 years increase in longevity while this effect is 0.4 years for Southern-born individuals.

5.6. Using an Alternative Outcome

In this subsection, we show that the effects do not appear solely for longevity outcomes. We document that comparing cross-cohorts and across states leads us to observe lower mortality of suffrage-exposed individuals. In so doing, we replicate the main results for the NLMS sample and replace the outcome with a dummy variable indicating whether or not a person was dead by the year of the interview in 1983. We start our analysis by showing that the NLMS sample does not reveal a demographic change resulting from suffrage law change by showing the balancing-test type event-study analysis in Appendix A. Then, we implement a similar event-study as in Figure 9, using all fixed effects and covariates discussed in equation 1. The results are illustrated in Figure 10. Pre-treatment coefficients are statistically and economically indistinguishable from zero revealing no preexisting trend in mortality of unexposed cohorts. The effects start to rise (in magnitude) for partially exposed cohorts and become quite stable for fully exposed cohorts.

[10] We use the year of suffrage as the initial year so as to avoid the potential endogenous responses of people to suffrage law changes.

In Table 6, we show the regression results for two models: ordinary-least-square and logit regressions. Both models suggest considerable reductions in mortality of exposed individuals. The OLS results suggest that a one-unit change in the share of exposure (comparing fully-exposed to unexposed cohorts) is associated with a roughly 5 percentage-points decrease in the probability of death, equivalent to an 18 percent drop from the mean of mortality in the sample. The logit model suggests that for a one-unit increase in the share of exposure, the odds of death decreases by 18.5 percent.

5.7. Robustness to Alternative Difference-in-Difference Estimations

Our empirical methodology is primarily an OLS-produced difference-in-difference (DD) strategy. The recent development in the econometrics of DD analysis, specifically for staggered adoption in policy analysis, suggests that the DD coefficient is a combination of 2-by-2 DD comparisons between post/pre and treatment/control groups (Goodman-Bacon, 2021a). For instance, the OLS compares early suffrage adopter states to those states yet to adopt the law as well as later adopter states to those who adopted the law earlier. In this case, the already treated observations are in a different trajectory as suffrage has changed their longevity trends and are not an appropriate control group for newly treated groups. To explore this heterogeneity in different comparison sets, we implement bacon-decomposition and discuss the results in Appendix E (Goodman-Bacon, 2021a). We observe that comparing later treated versus already treated cohorts reveals a negative overall coefficient while the other comparisons and the overall DD coefficient are positive. Therefore, we would expect that the OLS contaminations only under-bias the overall effects, and the true effects could be even larger. As an alternative analysis, we replicate the event-study analysis of de Chaisemartin & D'Haultfœuille (2020), which attempts to modify the OLS estimates by removing contaminations of later-treated versus earlier-treated comparisons. These results are depicted in Figure 11. The absence of a pre-trend and the rise in coefficients for treated cohorts reveal a pattern similar to those of Figure 9. However, the marginal effects of treated cohorts and specifically fully-exposed cohorts are only modestly larger than those of the OLS-produced event-study. Overall, we find our initial findings relatively robust after excluding the contaminant comparison sets.

5.8. Additional Analysis

In Appendix C, we replicate the event-study for different causes of death. The longevity benefits appear to be stronger for diseases related to Malignant Neoplasm, Cardiovascular diseases, Chronic Lower Respiratory diseases, Influenza, Pneumonia, and Nephritis. We also replicate the event-study for subsamples based on race and gender.

6. Potential Mechanisms

So far, the results suggest improvements in old-age health due to exposure to empowering women during childhood. However, these results are reduced-form impacts and are not informative regarding the potential mechanisms. As we discussed in section 2.2, the literature documents suffrage-induced increases in school spending and rises in public education among exposed children. In addition, a strand of the literature argues, though inconclusively, that improvements in education and labor market outcomes are associated with increases in longevity and reductions in mortality (Cutler et al., 2016; Fletcher, 2015; Huebener, 2019; Lleras-Muney, 2005; Meghir et al., 2018).

We reevaluate the association between suffrage and education for cohorts similar to those in our study sample. In so doing, we focus on the 1980 census for two reasons. First, it contains all the necessary information required for our empirical strategy, in addition to education and income. Also, it is the last year that the census asks about years of schooling.[11] Second, our sample

[11] In census-1990-onwars, we only observe education in categories.

starts from 1979. If treated cohorts are more likely to survive in future years as the main results suggests, looking at post 1980 censuses may overestimate the effects as we are observing healthier and probably better educated individuals.

We impose similar cohort and state choices as discussed in section 3 and implement regressions similar to the full specification of equation 1 while replacing the education-income profile as the outcomes. The results are reported in Table 7 for different outcomes across different columns. A one-unit increase in the share of exposure ($ShareExp$=1 versus $ShareExp$=0) is associated with an increase of 0.24 years of schooling, 3.3 percentage points increase in the probability of having any college education, 5.9 percent higher total family income, and roughly 17 percent reduction in total welfare receipt. These effects are statistically significant, economically considerable, and consistent with previous findings (Carruthers & Wanamaker, 2015; Kose et al., 2021). However, education seems to be a modest and partial channel if we compare the magnitudes with the findings of education-longevity studies. For instance, Halpern-Manners et al. (2020) Show that an additional year of schooling increases longevity by about 0.34 years. Using this figure and combing the effects of column 1 of Table 7 and column 2 of Table 3, we can deduce that increases in years of schooling can explain only 15 percent of rises in longevity. Therefore, other health investments during childhood (that do not appear in education and income) could also play a role in linking suffrage exposure and longevity.

7. Conclusion

While the developed countries started a path toward a more gender-equal society, issues of the gender gap still possess a wide range of outcomes (Doepke et al., 2012). Moreover, in many developing countries, the inequalities stem from the structural design of legal systems and cultural platforms (e.g., Godefroy (2019)). While the research has offered potential benefits of women empowerment and its spillover effects, fewer studies have looked at the long-run externalities. This paper added to this literature by documenting the long-run longevity improvements among children whose mothers were exposed to suffrage law changes in the United States during the late 19^{th} century and early 20^{th} century.

We extensively discussed the potential endogeneity concerns and ruled out issues regarding migration, endogenous fertility, and demographic compositional changes. A series of placebo tests combined with event-study analyses ruled out the concern that the observed effects ride on the preexisting trend and cross-cohort differentials in longevity. The main results suggested that cohorts fully exposed to suffrage during childhood compared with unexposed cohorts live roughly 0.5 years longer. These effects were stronger among blacks but somewhat similar between males and females. The gains also appeared to be larger in states with higher initial female literacy rates and higher initial female labor force participation. Additional analyses suggested that increases in education and income could have, though partially, operated as underlying mechanisms. These findings added to the ongoing literature on the long-run and intergenerational health benefits of women empowerment.

References

Abrevaya, J. (2006). Estimating the effect of smoking on birth outcomes using a matched panel data approach. *Journal of Applied Econometrics*, *21*(4), 489–519. https://doi.org/10.1002/jae.851

Abufhele, A., Behrman, J., & Bravo, D. (2017). Parental preferences and allocations of investments in children's learning and health within families. *Social Science and Medicine*, *194*, 76–86. https://doi.org/10.1016/j.socscimed.2017.09.051

Adhvaryu, A., Fenske, J., & Nyshadham, A. (2019). Early life circumstance and adult mental health. *Journal of Political Economy*, *127*(4), 1516–1549. https://doi.org/10.1086/701606/SUPPL_FILE/2014095DATA.ZIP

Alesina, A., & Giuliano, P. (2011). Preferences for Redistribution. *Handbook of Social Economics*, *1*, 93–131. https://doi.org/10.1016/B978-0-444-53187-2.00004-8

Almond, D, Chay, K. Y., & Lee, D. S. (2005). The Costs of Low Birth Weight. *The Quarterly Journal of Economics*, *120*(3), 1031–1083. https://doi.org/10.1093/qje/120.3.1031

Almond, Douglas, & Currie, J. (2011). Killing me softly: The fetal origins hypothesis. *Journal of Economic Perspectives*, *25*(3), 153–172. https://doi.org/10.1257/jep.25.3.153

Almond, Douglas, Currie, J., & Duque, V. (2018). Childhood circumstances and adult outcomes: Act II. *Journal of Economic Literature*, *56*(4), 1360–1446.

Almond, Douglas, Hoynes, H. W., & Schanzenbach, D. W. (2011). Inside the war on poverty: The impact of food stamps on birth outcomes. *Review of Economics and Statistics*, *93*(2), 387–403. https://doi.org/10.1162/REST_a_00089

Araújo, E. B., Araújo, N. A. M., Moreira, A. A., Herrmann, H. J., & Andrade, J. S. (2017). Gender differences in scientific collaborations: Women are more egalitarian than men. *PLOS ONE*, *12*(5), e0176791. https://doi.org/10.1371/JOURNAL.PONE.0176791

Arthi, V. (2018). "The dust was long in settling": Human capital and the lasting impact of the American Dust Bowl. *Journal of Economic History*, *78*(1), 196–230. https://doi.org/10.1017/S0022050718000074

Ashok, V., Kuziemko, I., & Washington, E. (2015). *Support for Redistribution in an Age of Rising Inequality: New Stylized Facts and Some Tentative Explanations*. https://doi.org/10.3386/W21529

Asiedu, E., Azomahou, T. T., Getachew, Y., & Yitbarek, E. (2021). Share the love: Parental bias, women empowerment and intergenerational mobility. *Journal of Economic Behavior & Organization*, *191*, 846–867. https://doi.org/10.1016/J.JEBO.2021.09.039

Bandiera, O., Buehren, N., Burgess, R., Goldstein, M., Gulesci, S., Rasul, I., & Sulaiman, M. (2020). Women's Empowerment in Action: Evidence from a Randomized Control Trial in Africa. *American Economic Journal: Applied Economics*, *12*(1), 210–259. https://doi.org/10.1257/APP.20170416

Bartley, M., Kelly, Y., & Sacker, A. (2012). Early Life Financial Adversity and Respiratory Function in Midlife: A Prospective Birth Cohort Study. *American Journal of Epidemiology*, *175*(1), 33–42. https://doi.org/10.1093/AJE/KWR284

Behrman, J. R., & Rosenzweig, M. R. (2004). Returns to birthweight. In *Review of Economics and Statistics* (Vol. 86, Issue 2, pp. 586–601). https://doi.org/10.1162/003465304323031139

Bhalotra, S., & Clots-Figueras, I. (2014). Health and the Political Agency of Women. *American*

Economic Journal: Economic Policy, *6*(2), 164–197. https://doi.org/10.1257/POL.6.2.164

Bhalotra, S., Karlsson, M., & Nilsson, T. (2017). Infant health and longevity: Evidence from a historical intervention in Sweden. *Journal of the European Economic Association*, *15*(5), 1101–1157.

Black, S. E., Devereux, P. J., & Salvanes, K. G. (2007). From the cradle to the labor market? The effect of birth weight on adult outcomes. *The Quarterly Journal of Economics*, *122*(1), 409–439. https://doi.org/10.1162/qjec.122.1.409

Braakmann, N. (2011). The causal relationship between education, health and health related behaviour: Evidence from a natural experiment in England. *Journal of Health Economics*, *30*(4), 753–763. https://doi.org/10.1016/J.JHEALECO.2011.05.015

Buckles, K., Hagemann, A., Malamud, O., Morrill, M., & Wozniak, A. (2016). The effect of college education on mortality. *Journal of Health Economics*, *50*, 99–114. https://doi.org/10.1016/J.JHEALECO.2016.08.002

Carruthers, C. K., & Wanamaker, M. H. (2015). Municipal Housekeeping. *Journal of Human Resources*, *50*(4), 837–872. https://doi.org/10.3368/JHR.50.4.837

Case, A., Fertig, A., & Paxson, C. (2005). The lasting impact of childhood health and circumstance. *Journal of Health Economics*, *24*(2), 365–389.

Chattopadhyay, R., & Duflo, E. (2004). Women as Policy Makers: Evidence from a Randomized Policy Experiment in India. *Econometrica*, *72*(5), 1409–1443. https://doi.org/10.1111/J.1468-0262.2004.00539.X

Cil, G. (2017). Effects of posted point-of-sale warnings on alcohol consumption during pregnancy and on birth outcomes. *Journal of Health Economics*, *53*, 131–155. https://doi.org/10.1016/j.jhealeco.2017.03.004

Currie, J. (2009). Healthy, wealthy, and wise: Socioeconomic status, poor health in childhood, and human capital development. *Journal of Economic Literature*, *47*(1), 87–122. https://doi.org/10.1257/jel.47.1.87

Cutler, D. M., Huang, W., & Lleras-Muney, A. (2015). When does education matter? The protective effect of education for cohorts graduating in bad times. *Social Science & Medicine*, *127*, 63–73. https://doi.org/10.1016/J.SOCSCIMED.2014.07.056

Cutler, D. M., Huang, W., & Lleras-Muney, A. (2016). *Economic conditions and mortality: evidence from 200 years of data*.

Cutler, D. M., & Lleras-Muney, A. (2006). Education and Health: Evaluating Theories and Evidence. *National Bureau of Economic Research*, 37. https://doi.org/10.3386/W12352

Daly, M., & Delaney, L. (2013). The scarring effect of unemployment throughout adulthood on psychological distress at age 50: Estimates controlling for early adulthood distress and childhood psychological factors. *Social Science & Medicine*, *80*, 19–23. https://doi.org/10.1016/J.SOCSCIMED.2012.12.008

Darin-Mattsson, A., Andel, R., Celeste, R. K., & Kåreholt, I. (2018). Linking financial hardship throughout the life-course with psychological distress in old age: Sensitive period, accumulation of risks, and chain of risks hypotheses. *Social Science & Medicine*, *201*, 111–119. https://doi.org/10.1016/J.SOCSCIMED.2018.02.012

de Chaisemartin, C., & D'Haultfœuille, X. (2020). Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects. *American Economic Review*, *110*(9), 2964–2996.

https://doi.org/10.1257/AER.20181169

de Haan, M., & Leuven, E. (2020). Head start and the distribution of long-term education and labor market outcomes. *Journal of Labor Economics*, *38*(3), 727–765. https://doi.org/10.1086/706090/SUPPL_FILE/17306DATA.ZIP

Doepke, M., & Tertilt, M. (2009). Women's Liberation: What's in It for Men? *. *Quarterly Journal of Economics*, *124*(4), 1541–1591. https://doi.org/10.1162/qjec.2009.124.4.1541

Doepke, M., Tertilt, M., & Voena, A. (2012). The Economics and Politics of Women's Rights. *Annual Reviews*, *4*, 339–372. https://doi.org/10.1146/ANNUREV-ECONOMICS-061109-080201

Dorr, R. (1910). *What eight million women want,*. Small Maynard & company.

Duflo, E. (2012). Women Empowerment and Economic Development. *Journal of Economic Literature*, *50*(4), 1051–1079. https://doi.org/10.1257/JEL.50.4.1051

Duriancik, D. M., & Goff, C. R. (2019). Children of single-parent households are at a higher risk of obesity: A systematic review. *Journal of Child Health Care*, *23*(3), 358–369. https://doi.org/10.1177/1367493519852463

Eswaran, M. (2002). The empowerment of women, fertility, and child mortality: Towards a theoretical analysis. *Journal of Population Economics 2002 15:3*, *15*(3), 433–454. https://doi.org/10.1007/S001480100070

Evans, M. F., Helland, E., Klick, J., & Patel, A. (2016). The developmental effect of state alcohol prohibitions at the turn of the twentieth century. *Economic Inquiry*, *54*(2), 762–777. https://doi.org/10.1111/ecin.12303

Fagernäs, S. (2014). Papers, please! The effect of birth registration on child labor and education in early 20th century USA. *Explorations in Economic History*, *52*(1), 63–92. https://doi.org/10.1016/J.EEH.2013.09.002

Fletcher, J. M. (2015). New evidence of the effects of education on health in the US: Compulsory schooling laws revisited. *Social Science & Medicine*, *127*, 101–107. https://doi.org/10.1016/J.SOCSCIMED.2014.09.052

Fletcher, J., & Noghanibehambari, H. (2021). *The Effects of Education on Mortality: Evidence Using College Expansions*. https://doi.org/10.3386/W29423

Flexner, E., & Fitzpatrick, E. F. (Ellen F. (1996). *Century of struggle : the woman's rights movement in the United States.* 398.

Flores, M., & Kalwij, A. (2014). The associations between early life circumstances and later life health and employment in Europe. *Empirical Economics*, *47*(4), 1251–1282.

Gagnon, A., & Bohnert, N. (2012). Early life socioeconomic conditions in rural areas and old-age mortality in twentieth-century Quebec. *Social Science & Medicine*, *75*(8), 1497–1504. https://doi.org/10.1016/J.SOCSCIMED.2012.06.007

Galama, T. J., Lleras-Muney, A., & van Kippersluis, H. (2018). *The Effect of Education on Health and Mortality: A Review of Experimental and Quasi-Experimental Evidence.* https://doi.org/10.3386/W24225

Godefroy, R. (2019). How Women's Rights Affect Fertility: Evidence From Nigeria. *The Economic Journal*, *129*(619), 1247–1280. https://doi.org/10.1111/ECOJ.12610

Goodman-Bacon, A. (2021a). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*. https://doi.org/10.1016/J.JECONOM.2021.03.014

Goodman-Bacon, A. (2021b). The Long-Run Effects of Childhood Insurance Coverage: Medicaid Implementation, Adult Health, and Labor Market Outcomes. *American Economic Review*, *111*(8), 2550–2593. https://doi.org/10.1257/AER.20171671

Halpern-Manners, A., Helgertz, J., Warren, J. R., & Roberts, E. (2020). The Effects of Education on Mortality: Evidence From Linked US Census and Administrative Mortality Data. *Demography*, *57*(4), 1513–1541. https://doi.org/10.1007/S13524-020-00892-6

Hayward, M. D., & Gorman, B. K. (2004a). The long arm of childhood: The influence of early-life social conditions on men's mortality. *Demography 2004 41:1*, *41*(1), 87–107. https://doi.org/10.1353/DEM.2004.0005

Hayward, M. D., & Gorman, B. K. (2004b). The long arm of childhood: The influence of early-life social conditions on men's mortality. *Demography 2004 41:1*, *41*(1), 87–107. https://doi.org/10.1353/DEM.2004.0005

Homan, P. (2017). Political gender inequality and infant mortality in the United States, 1990–2012. *Social Science & Medicine*, *182*, 127–135. https://doi.org/10.1016/J.SOCSCIMED.2017.04.024

Hossain, B. (2015). Women empowerment and infant mortality in Bangladesh. *Applied Economics*, *47*(51), 5534–5547. https://doi.org/10.1080/00036846.2015.1051657

Hoynes, H., Miller, D., & Simon, D. (2015). Income, the earned income tax credit, and infant health. *American Economic Journal: Economic Policy*, *7*(1), 172–211. https://doi.org/10.1257/pol.20120179

Huebener, M. (2019). Life expectancy and parental education. *Social Science & Medicine*, *232*, 351–365. https://doi.org/10.1016/J.SOCSCIMED.2019.04.034

Imai, K. S., Annim, S. K., Kulkarni, V. S., & Gaiha, R. (2014). Women's Empowerment and Prevalence of Stunted and Underweight Children in Rural India. *World Development*, *62*, 88–105. https://doi.org/10.1016/J.WORLDDEV.2014.05.001

Jacks, D. S., Pendakur, K., & Shigeoka, H. (2021). Infant Mortality and the Repeal of Federal Prohibition. *The Economic Journal*, *131*(639), 2955–2983. https://doi.org/10.1093/EJ/UEAB011

Kabeer, N. (1999). Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment. *Development and Change*, *30*(3), 435–464. https://doi.org/10.1111/1467-7660.00125

King, B. G., Cornwall, M., & Dahlin, E. C. (2005). Winning Woman Suffrage One Step at a Time: Social Movements and the Logic of the Legislative Process. *Social Forces*, *83*(3), 1211–1234. https://doi.org/10.1353/SOF.2005.0037

Ko, P. C., & Yeung, W. J. J. (2019). Childhood conditions and productive aging in China. *Social Science & Medicine*, *229*, 60–69. https://doi.org/10.1016/J.SOCSCIMED.2018.09.051

Kose, E., Kuka, E., & Shenhav, N. (2021). Women's Suffrage and Children's Education. *American Economic Journal: Economic Policy*, *13*(3), 374–405. https://doi.org/10.1257/POL.20180677

Lacroix, G., Laliberté-Auger, F., Michaud, P.-C., & Parent, D. (2019). The effect of college education on health and mortality: Evidence from Canada. *Health Economics*. https://doi.org/10.1002/HEC.3975

Law, M. T., & Marks, M. S. (2020). Did early twentieth-century alcohol prohibition affect mortality? *Economic Inquiry*, *58*(2), 680–697. https://doi.org/10.1111/ecin.12868

Lazuka, V. (2019). Early-Life Assets in Oldest-Old Age: Evidence From Primary Care Reform in Early Twentieth Century Sweden. *Demography*, *56*(2), 679–706. https://doi.org/10.1007/s13524-018-0758-4

Lee, C., & Ryff, C. D. (2019). Pathways linking combinations of early-life adversities to adult mortality: Tales that vary by gender. *Social Science & Medicine*, *240*, 112566. https://doi.org/10.1016/J.SOCSCIMED.2019.112566

Lleras-Muney, A. (2005). The Relationship Between Education and Adult Mortality in the United States. *The Review of Economic Studies*, *72*(1), 189–221. https://doi.org/10.1111/0034-6527.00329

Lleras-Muney, A., Price, J., & Yue, D. (2020). *The Association Between Educational Attainment and Longevity using Individual Level Data from the 1940 Census*. https://doi.org/10.3386/W27514

Maruyama, S., & Heinesen, E. (2020). Another look at returns to birthweight. *Journal of Health Economics*, *70*, 102269. https://doi.org/10.1016/j.jhealeco.2019.102269

Meghir, C., Palme, M., & Simeonova, E. (2018). Education and mortality: Evidence from a social experiment. *American Economic Journal: Applied Economics*, *10*(2), 234–256. https://doi.org/10.1257/app.20150365

Miller, G. (2008). Women's Suffrage, Political Responsiveness, and Child Survival in American History. *The Quarterly Journal of Economics*, *123*(3), 1287–1327. https://doi.org/10.1162/QJEC.2008.123.3.1287

Miller, S., & Wherry, L. R. (2019). The Long-Term Effects of Early Life Medicaid Coverage. *Journal of Human Resources*, *54*(3), 785–824. https://doi.org/10.3368/jhr.54.3.0816.8173r1

Montez, J. K., & Hayward, M. D. (2011). Early Life Conditions and Later Life Mortality. *International Handbook of Adult Mortality*, 187–206. https://doi.org/10.1007/978-90-481-9996-9_9

Muchomba, F. M., & Chatterji, S. (2020). Disability among children of immigrants from India and China: Is there excess disability among girls? *Population Studies*, *74*(2), 263–281. https://doi.org/10.1080/00324728.2020.1762911

NCHS. (2020). Multiple Cause-of-Death Data Files. In *National Center for Health Statistics*.

Nobles, J., Brown, R., & Catalano, R. (2010). National independence, women's political participation, and life expectancy in Norway. *Social Science & Medicine*, *70*(9), 1350–1357. https://doi.org/10.1016/J.SOCSCIMED.2009.12.012

Pratley, P. (2016). Associations between quantitative measures of women's empowerment and access to care and health status for mothers and their children: A systematic review of evidence from the developing world. *Social Science & Medicine*, *169*, 119–131. https://doi.org/10.1016/J.SOCSCIMED.2016.08.001

Quamruzzaman, A., & Lange, M. (2016). Female political representation and child health: Evidence from a multilevel analysis. *Social Science & Medicine*, *171*, 48–57. https://doi.org/10.1016/J.SOCSCIMED.2016.10.025

Royer, H. (2009). Separated at girth: US twin estimates of the effects of birth weight. *American Economic Journal: Applied Economics*, *1*(1), 49–85. https://doi.org/10.1257/app.1.1.49

Ruggles, S., Flood, S., Goeken, R., Grover, J., & Meyer, E. (2020). IPUMS USA: Version 10.0

[dataset]. *Minneapolis, MN: IPUMS*. https://doi.org/10.18128/D010.V10.0

Schiman, J. C., Kaestner, R., & Sasso, A. T. Lo. (2019). Infant mortality and adult wellbeing: Evidence from wartime Britain. *Labour Economics*, *60*, 12–29. https://doi.org/10.1016/J.LABECO.2019.05.001

Scholte, R. S., Berg, G. J. Van Den, & Lindeboom, M. (2015). Long-run effects of gestation during the Dutch Hunger Winter famine on labor market and hospitalization outcomes. *Journal of Health Economics*, *39*, 17–30.

Sechrist, R. P. (2012). Prohibition Movement in the United States, 1801--1920. *Ann Arbor, MI: Inter-University Consortium for Political and Social Research.(ICPSR08343-v2. Http://Doi. Org/10.3886/ICPSR08343. V2.)*.

Simmons, W. O., & Emanuele, R. (2007). Male-female giving differentials: Are women more altruistic? *Journal of Economic Studies*, *34*(6), 534–550. https://doi.org/10.1108/01443580710830989/FULL/PDF

Singhal, S. (2019). Early life shocks and mental health: The long-term effect of war in Vietnam. *Journal of Development Economics*, *141*, 102244. https://doi.org/10.1016/J.JDEVECO.2018.06.002

Skocpol, T. (1995). *Protecting soldiers and mothers: the political origins of social policy in ...* Belknap Press of Harvard University Press. http://books.google.com/books?hl=en&lr=&id=BWZ0g8A7NBwC&pgis=1

Smith, J. P. (2009). The impact of childhood health on adult labor market outcomes. *Review of Economics and Statistics*, *91*(3), 478–489. https://doi.org/10.1162/rest.91.3.478

Smith, K. R., Hanson, H. A., Norton, M. C., Hollingshaus, M. S., & Mineau, G. P. (2014). Survival of offspring who experience early parental death: Early life conditions and later-life mortality. *Social Science & Medicine*, *119*, 180–190. https://doi.org/10.1016/J.SOCSCIMED.2013.11.054

Sonchak, L. (2015). Medicaid reimbursement, prenatal care and infant health. *Journal of Health Economics*, *44*, 10–24. https://doi.org/10.1016/j.jhealeco.2015.08.008

Sotomayor, O. (2013). Fetal and infant origins of diabetes and ill health: Evidence from Puerto Rico's 1928 and 1932 hurricanes. *Economics & Human Biology*, *11*(3), 281–293. https://doi.org/10.1016/J.EHB.2012.02.009

Steptoe, A., & Zaninotto, P. (2020). Lower socioeconomic status and the acceleration of aging: An outcome-wide analysis. *Proceedings of the National Academy of Sciences of the United States of America*, *117*(26), 14911–14917. https://doi.org/10.1073/PNAS.1915741117

Swiss, L., Fallon, K. M., & Burgos, G. (2012). Does Critical Mass Matter? Women's Political Representation and Child Health in Developing Countries. *Social Forces*, *91*(2), 531–558. https://doi.org/10.1093/SF/SOS169

Taanila, A., Laitinen, E., Moilanen, I., & Järvelin, M. R. (2002). Effects of Family Interaction on the Child's Behavior In Single-Parent or Reconstructed Families. *Family Process*, *41*(4), 693–708. https://doi.org/10.1111/J.1545-5300.2002.00693.X

Thomas, P. A., Williams-Farrelly, M. M., Sauerteig, M. R., & Ferraro, K. F. (2022). Childhood Stressors, Relationship Quality, and Cognitive Health in Later Life. *The Journals of Gerontology: Series B*. https://doi.org/10.1093/GERONB/GBAC007

Togeby, L. (2016). Political Implications of Increasing Numbers of Women in the Labor Force:

Comparative Political Studies, *27*(2), 211–240. https://doi.org/10.1177/0010414094027002003

Upadhyay, U. D., Gipson, J. D., Withers, M., Lewis, S., Ciaraldi, E. J., Fraser, A., Huchko, M. J., & Prata, N. (2014). Women's empowerment and fertility: A review of the literature. *Social Science & Medicine*, *115*, 111–120. https://doi.org/10.1016/J.SOCSCIMED.2014.06.014

Upadhyay, U. D., & Hindin, M. J. (2005). Do higher status and more autonomous women have longer birth intervals?: Results from Cebu, Philippines. *Social Science & Medicine*, *60*(11), 2641–2655. https://doi.org/10.1016/J.SOCSCIMED.2004.11.032

van den Berg, G. J., Doblhammer-Reiter, G., Christensen, K., den Berg, G. J., Doblhammer-Reiter, G., & Christensen, K. (2011a). Being born under adverse economic conditions leads to a higher cardiovascular mortality rate later in life: Evidence based on individuals born at different stages of the business cycle. *Demography*, *48*(2), 507–530. https://doi.org/10.1007/s13524-011-0021-8

van den Berg, G. J., Doblhammer-Reiter, G., Christensen, K., den Berg, G. J., Doblhammer-Reiter, G., & Christensen, K. (2011b). Being born under adverse economic conditions leads to a higher cardiovascular mortality rate later in life: Evidence based on individuals born at different stages of the business cycle. *Demography*, *48*(2), 507–530. https://doi.org/10.1007/s13524-011-0021-8

van den Berg, G. J., Doblhammer, G., & Christensen, K. (2009). Exogenous determinants of early-life conditions, and mortality later in life. *Social Science & Medicine*, *68*(9), 1591–1598. https://doi.org/10.1016/J.SOCSCIMED.2009.02.007

Van Den Berg, G. J., Lindeboom, M., & Portrait, F. (2006). Economic Conditions Early in Life and Individual Mortality. *American Economic Review*, *96*(1), 290–302. https://doi.org/10.1257/000282806776157740

Wado, Y. D., Afework, M. F., & Hindin, M. J. (2014). Childhood vaccination in rural southwestern Ethiopia: the nexus with demographic factors and women′s autonomy. *The Pan African Medical Journal*, *ARTVOL*(ARTISSUE). https://doi.org/10.11604/PAMJ.SUPP.2014.17.1.3135

Waldfogel, J., Craigie, T. A., & Brooks-Gunn, J. (2010). Fragile Families and Child Wellbeing. *The Future of Children / Center for the Future of Children, the David and Lucile Packard Foundation*, *20*(2), 87. https://doi.org/10.1353/foc.2010.0002

Tables

Table 1 - Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Death Age	78.69771	10.85135	39	122
Female	0.52539	0.49935	0	1
White	0.89316	0.30891	0	1
Black	0.10227	0.303	0	1
Share Exposed	0.75355	0.35295	0	1
Birth State-Year Characteristics:				
Number Of Children Less than 5 years old	0.44492	0.11484	0.21049	0.83944
Share Of White-Collar Workers	0.0366	0.00956	0.01987	0.08233
Share Of Farmers	0.22496	0.15292	0.01096	0.89634
Share of Other Occupations	0.73623	0.14537	0.08454	0.9455
Share Of Literate Female	0.66225	0.17523	0	0.8337
Female Labor Force Participation	0.22817	0.08702	0	0.51277
Average Socioeconomic Index	25.19972	4.67166	13.5855	34.28532
Observations	61,326,487			

Table 2 - Placebo Tests: Exposure to Suffrage Laws among Potentially Unaffected Cohorts

	Outcome: Age at Death (Years)			
	Suffrage Age 19-20 VS 21-23	Suffrage Age 24-26 VS 27-29	Suffrage Age 30-32 VS 33-35	Suffrage Age 35-36 VS 37-40
	(1)	(2)	(3)	(4)
Share of Exposure	-0.01159	-0.01251	-0.0048	0.02229
	(0.01914)	(0.01292)	(0.03225)	(0.09203)
Observations	2494734	1469923	417821	89343
R-Squared	0.09702	0.13194	0.18291	0.20715
Mean DV	88.078	91.172	95.046	98.624
%Change	-0.013	-0.014	-0.005	0.023
Birth State FE	✓	✓	✓	✓
Region-of-Birth-by-Birth-Year FE	✓	✓	✓	✓
Controls	✓	✓	✓	✓

Notes. Standard errors, clustered at the birth-state level, are reported in parentheses. Controls include a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations.

*** p<0.01, ** p<0.05, * p<0.1

Table 3 - Main Results: The Association between Childhood Exposure to Suffrage Laws and Old-Age Longevity

	Outcome: Age at Death (Years), Samples:									
	Full Sample		Females		Males		Blacks		Whites	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Share of Exposure	0.36177**	0.53425**	0.42272**	0.49916**	0.29861	0.58292**	1.18398***	1.25349***	0.43114***	0.47968***
	(0.16457)	(0.19955)	(0.16714)	(0.19455)	(0.21776)	(0.22727)	(0.29825)	(0.38203)	(0.15801)	(0.16573)
Observations	61370021	61326487	32243182	32214226	29126839	29112261	6276382	6273961	54813377	54773898
R-Squared	0.31023	0.33134	0.3246	0.32666	0.27541	0.2775	0.35184	0.3682	0.30073	0.32021
Mean DV	78.698	78.690	80.843	80.835	76.323	76.317	75.610	75.604	79.060	79.053
%Change	0.460	0.679	0.523	0.618	0.391	0.764	1.566	1.658	0.545	0.607
Birth State FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Region-of-Birth-by-Birth-Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls		✓		✓		✓		✓		✓

Notes. Standard errors, clustered at the birth-state level, are reported in parentheses. Controls include a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations.

*** p<0.01, ** p<0.05, * p<0.1

Table 4 - Robustness Checks across Specifications

	Outcome: Age at Death							
	Column 2 Table 3	Adding Birth-State by Race/Gender FE	Adding Birth-State by Birth-Year Linear Trend	Adding Death State FE	Adding Month of Death FE	Outcome in Log	Huber-White Robust SE	Two-Way Clustering SE at Birth-State and Region-by-Birth-Year Level
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share of Exposure	0.53425**	0.52595**	0.41847**	0.52834***	0.53411**	0.00742***	0.53425***	0.53425***
	(0.19955)	(0.20098)	(0.17128)	(0.19002)	(0.19958)	(0.00269)	(0.05979)	(0.02251)
Observations	61326487	61326487	61326487	61319907	61326487	61326487	61326487	61326487
R-Squared	0.33134	0.33178	0.33137	0.33354	0.33147	0.32285	0.33134	0.33134
Birth State FE	✓	✓	✓	✓	✓	✓	✓	✓
Region-of-Birth-by-Birth-Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes. Standard errors, clustered at the birth-state level, are reported in parentheses. Controls include a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations.
*** p<0.01, ** p<0.05, * p<0.1

Table 5 - Heterogeneity of the Main Results across Subsamples

	Outcome: Age at Death (Years), Samples:									
	Female Literacy		Female Socioeconomic Index		Female Labor Force Participation		Census Region			
	Below Median	Above Median	Below Median	Above Median	Below Median	Above Median	Northeast	Midwest	South	West
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Share of Exposure	0.36177**	0.53425**	0.42272**	0.49916**	0.29861	0.58292**	1.18398***	1.25349***	0.43114***	0.47968***
	(0.16457)	(0.19955)	(0.16714)	(0.19455)	(0.21776)	(0.22727)	(0.29825)	(0.38203)	(0.15801)	(0.16573)
Observations	61370021	61326487	32243182	32214226	29126839	29112261	6276382	6273961	54813377	54773898
R-Squared	0.31023	0.33134	0.3246	0.32666	0.27541	0.2775	0.35184	0.3682	0.30073	0.32021
Mean DV	78.698	78.690	80.843	80.835	76.323	76.317	75.610	75.604	79.060	79.053
%Change	0.460	0.679	0.523	0.618	0.391	0.764	1.566	1.658	0.545	0.607
Birth State FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Region-of-Birth-by-Birth-Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls		✓		✓		✓		✓		✓

Notes. Standard errors, clustered at the birth-state level, are reported in parentheses. Controls include a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations.
*** p<0.01, ** p<0.05, * p<0.1

Table 6 - The Association between Exposure to Suffrage Laws and Old Age Mortality Using National Longitudinal Mortality Study

	Outcome: Individual is Dead (Dummy)	
	LPM	Logit
	(1)	(3)
Share of Exposure	-0.05028***	-0.20408***
	(0.0163)	(0.059)
Observations	381141	381141
R-Squared	0.2864	0.25152
Mean DV	0.274	0.274
Birth State FE	✓	✓
Region-of-Birth-by-Birth-Year FE	✓	✓
Controls	✓	✓

Notes. Standard errors, clustered at the birth-state level, are reported in parentheses. Controls include a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations.
*** p<0.01, ** p<0.05, * p<0.1

Table 7 - Exploring Mechanisms of Impact: The Association between Exposure to Suffrage Laws and Education-Income Outcomes Using Census 1980

	Outcome:				
	Years of Schooling	Education Less than High School	Education: College and More	Log Total Family Income	Log Total Welfare Income
	(1)	(2)	(3)	(4)	(5)
Share of Exposure	0.23794**	-0.01625	0.03328***	0.05948*	-0.17108**
	(0.11405)	(0.01251)	(0.00966)	(0.03469)	(0.06744)
Observations	3541076	3541076	3541076	3454789	3541076
R-Squared	0.14189	0.07208	0.04287	0.18785	0.04233
Mean DV	11.269	0.037	0.251	10.862	0.398
%Change	2.111	-43.927	13.259	0.548	-42.986
Birth State FE	✓	✓	✓	✓	✓
Region-of-Birth-by-Birth-Year FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓

Notes. Standard errors, clustered at the birth-state level, are reported in parentheses. Controls include a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations.
*** p<0.01, ** p<0.05, * p<0.1

Figures

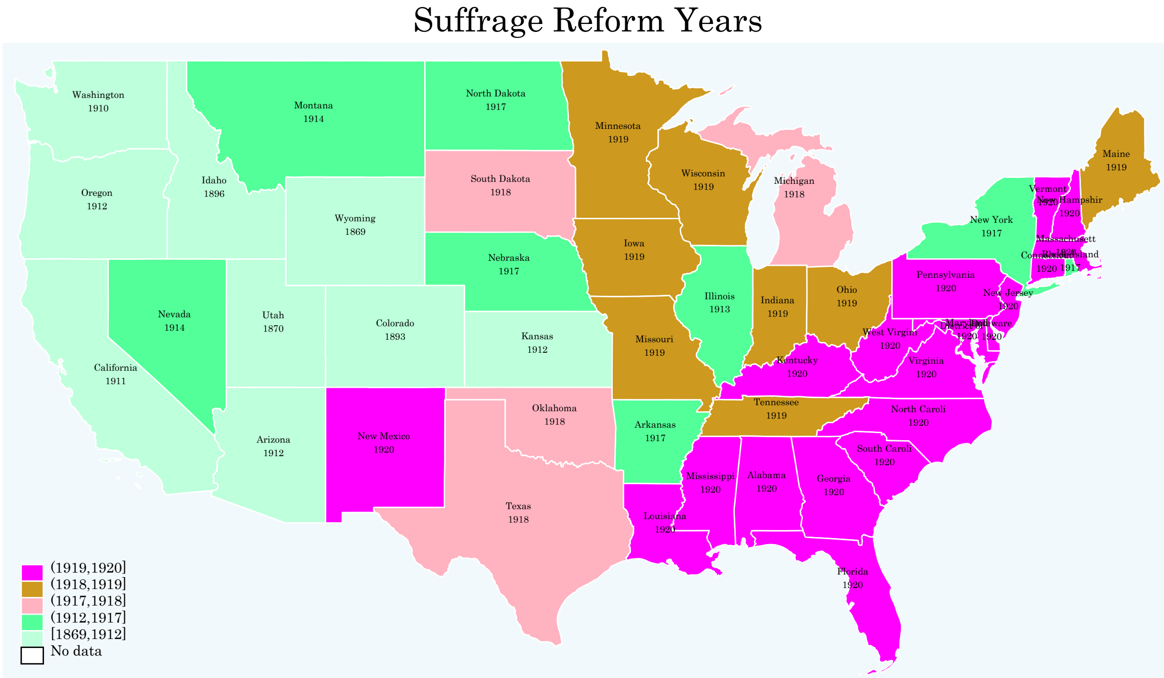


Figure 1 - Suffrage Reform Years across States

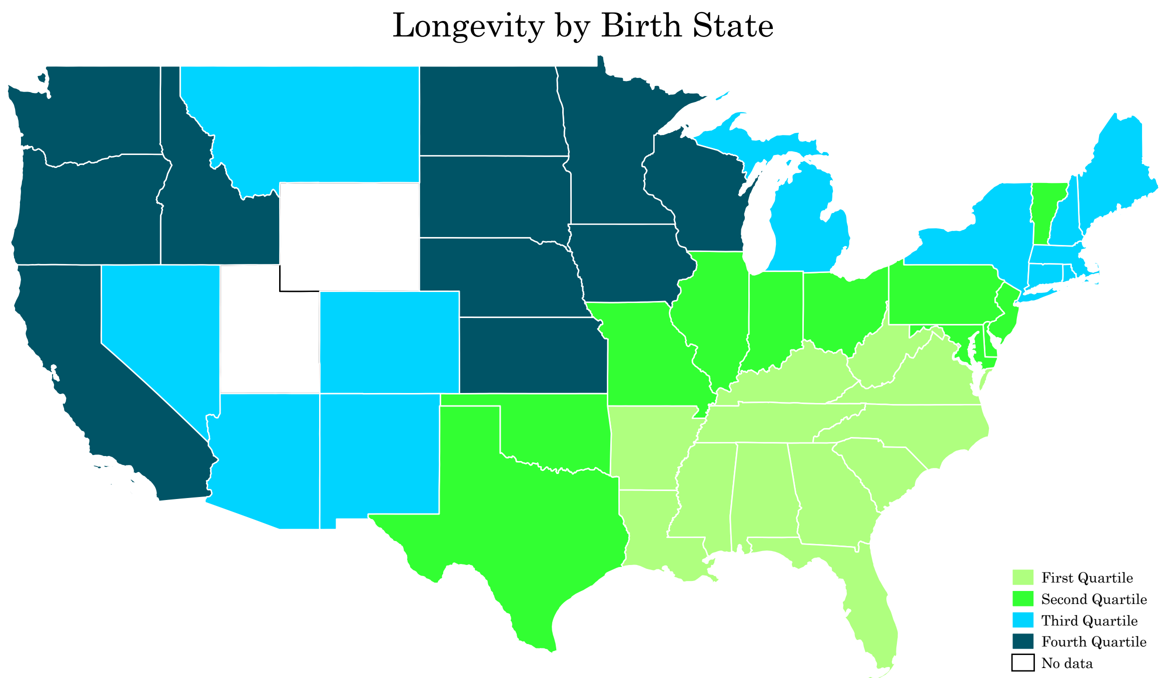


Figure 2 - Geographic Distribution of Old Age Longevity by State-of-Birth

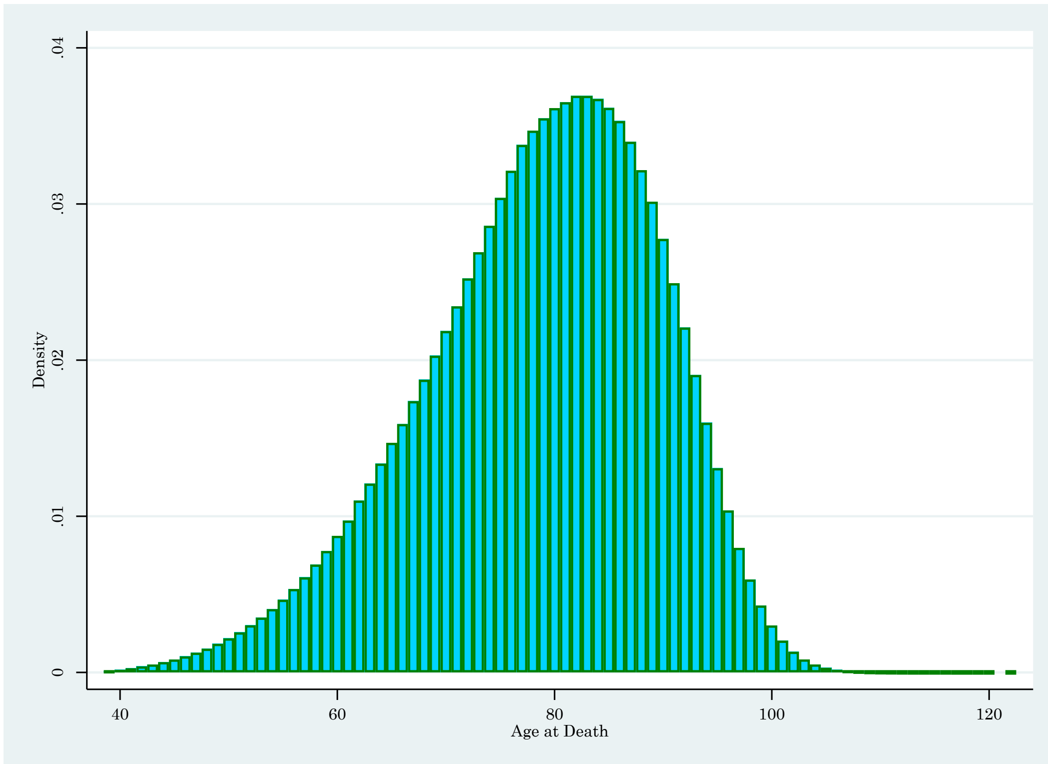


Figure 3 - Density Distribution of Old-Age Longevity over the Years 1979-2019 and for Birth Cohorts of 1880-1940

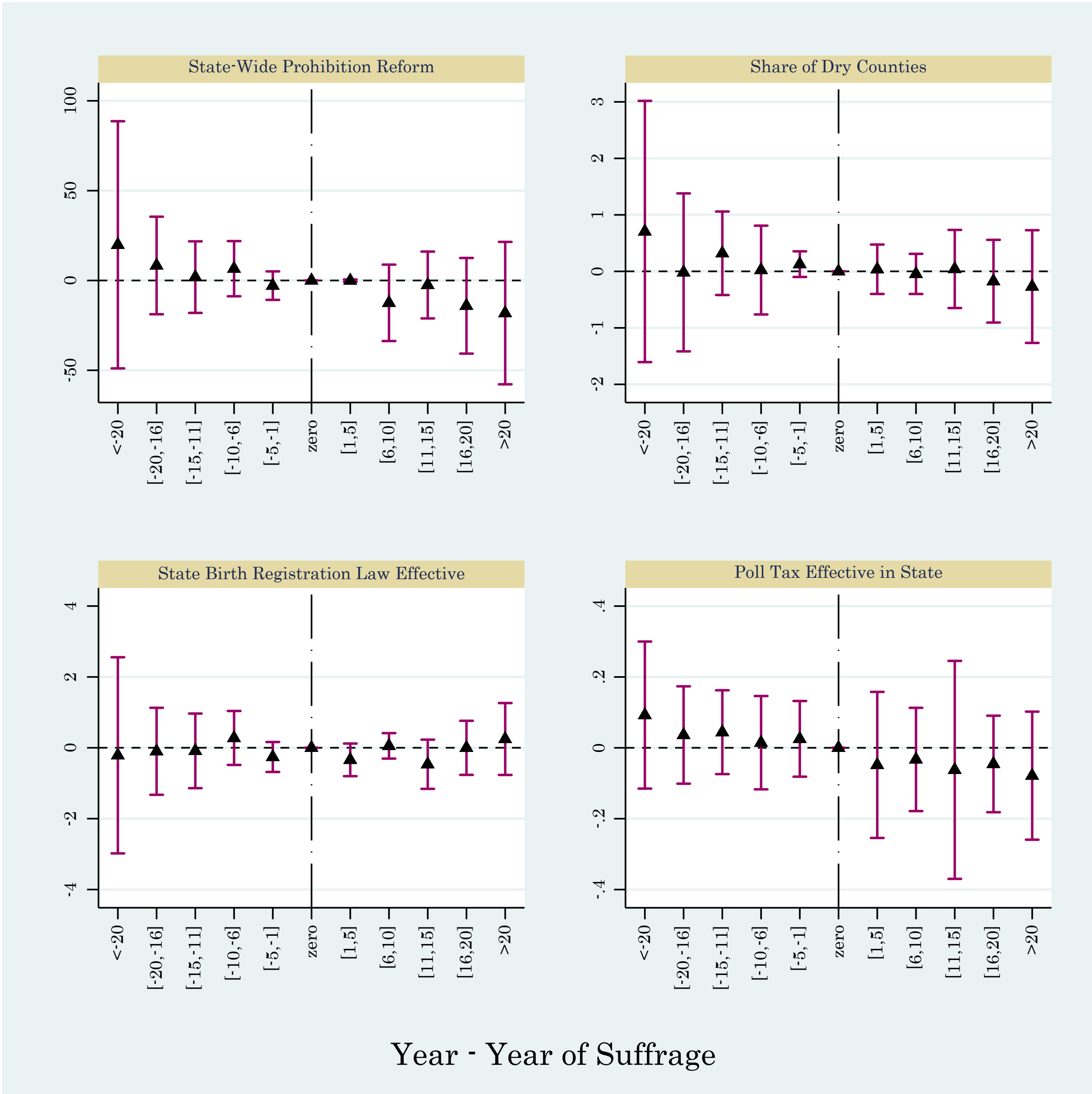


Figure 4 - Event-Study to Explore the Endogenous Changes in State-Level Characteristics before and after the Suffrage Reforms

Notes. Point estimates and 90 percent confidence intervals are illustrated. Outcomes are shown in each panel's title. The event-time is the distance between each census year (in which the outcome is observed) and the year of suffrage reform. All regressions include state fixed effects, year fixed effects, and region-by-year fixed effects. Standard errors are clustered at the state level. The data covers the decennial years 1880-1940.

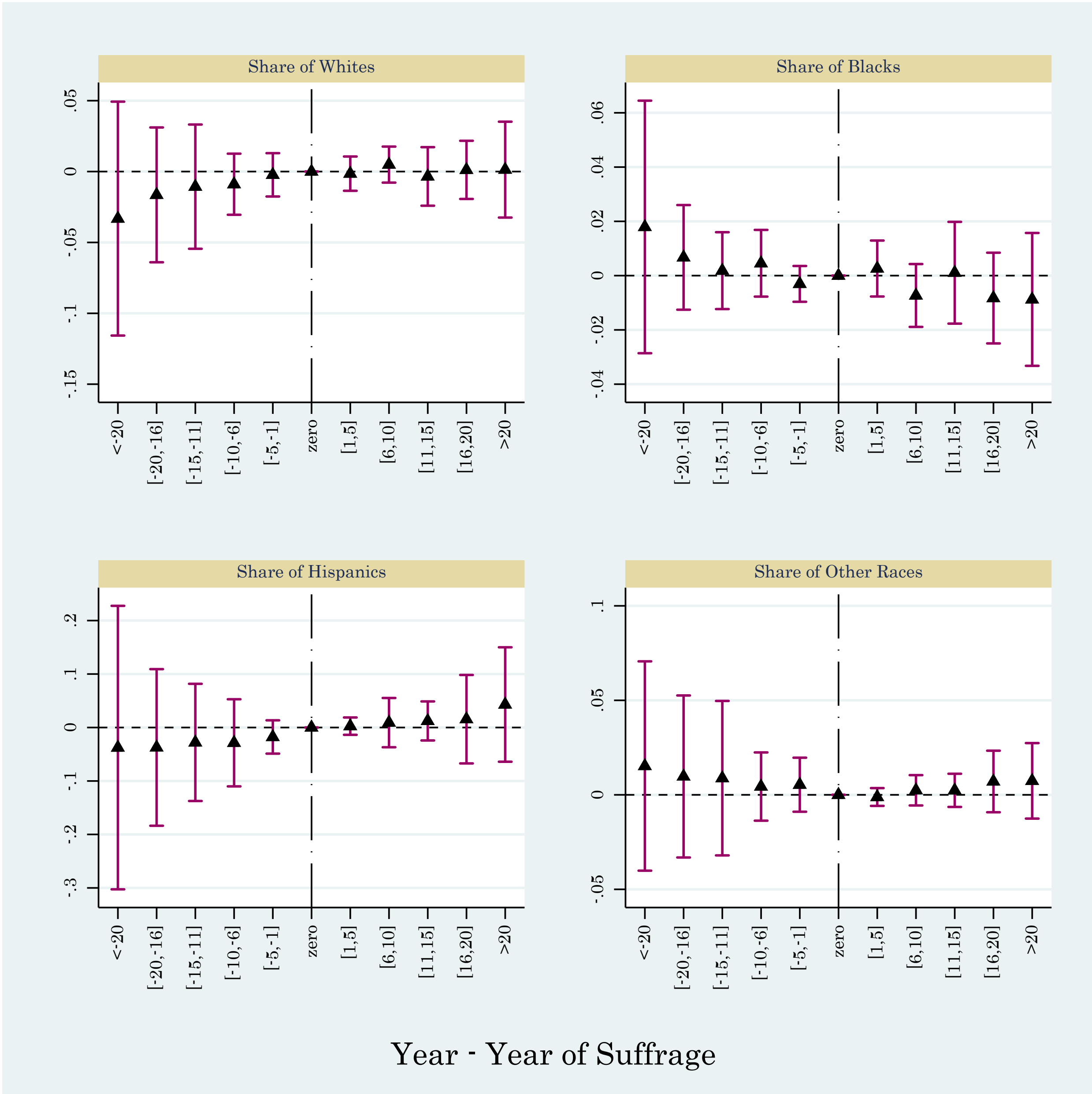


Figure 5 - Event-Study to Explore the Endogenous Changes in State-Level Characteristics before and after the Suffrage Reforms

Notes. Point estimates and 90 percent confidence intervals are illustrated. Outcomes are shown in each panel's title. The event-time is the distance between each census year (in which the outcome is observed) and the year of suffrage reform. All regressions include state fixed effects, year fixed effects, and region-by-year fixed effects. Standard errors are clustered at the state level. The data covers the decennial years 1880-1940.

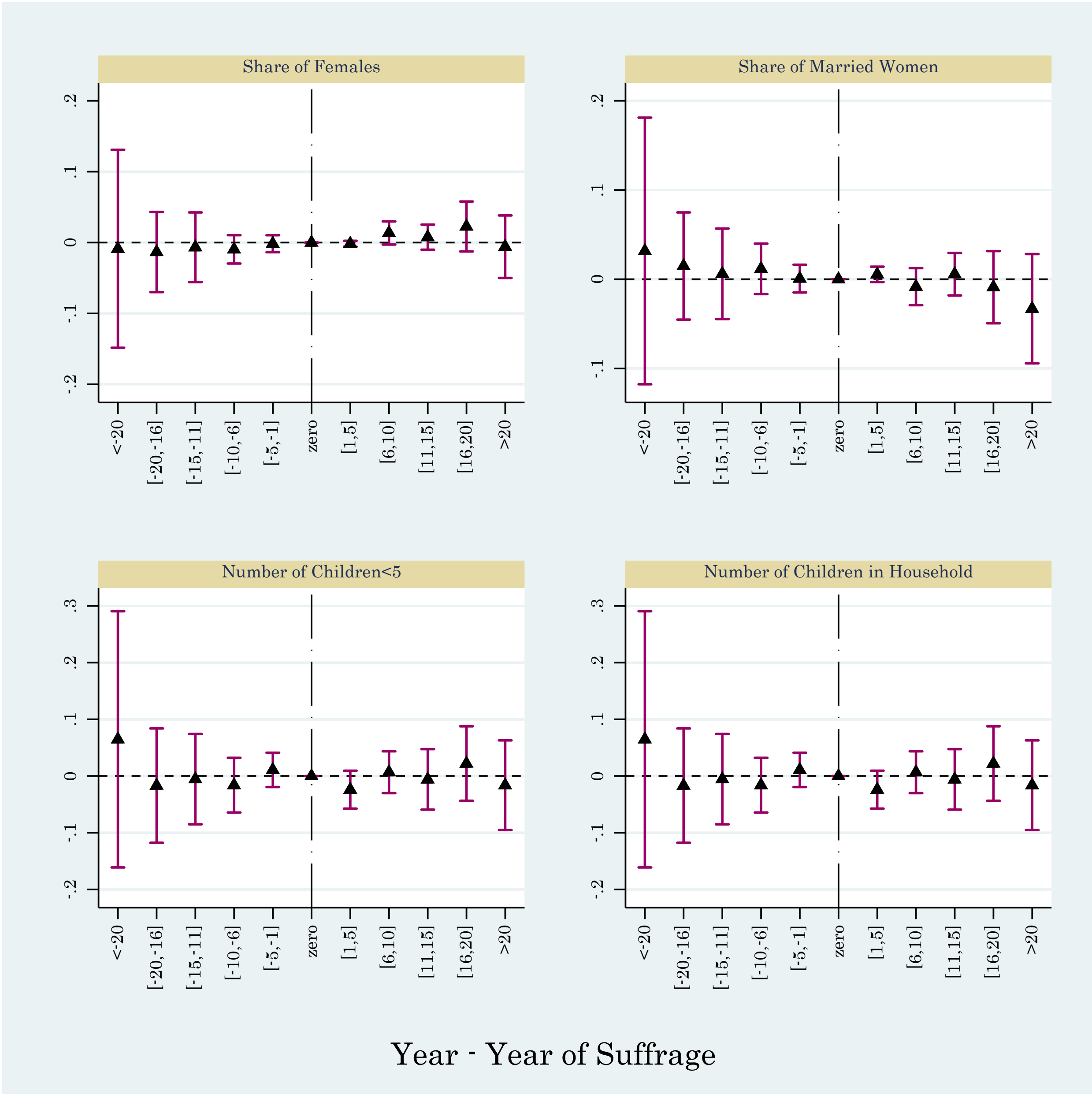


Figure 6 - Event-Study to Explore the Endogenous Changes in State-Level Characteristics before and after the Suffrage Reforms

Notes. Point estimates and 90 percent confidence intervals are illustrated. Outcomes are shown in each panel's title. The event-time is the distance between each census year (in which the outcome is observed) and the year of suffrage reform. All regressions include state fixed effects, year fixed effects, and region-by-year fixed effects. Standard errors are clustered at the state level. The data covers the decennial years 1880-1940.

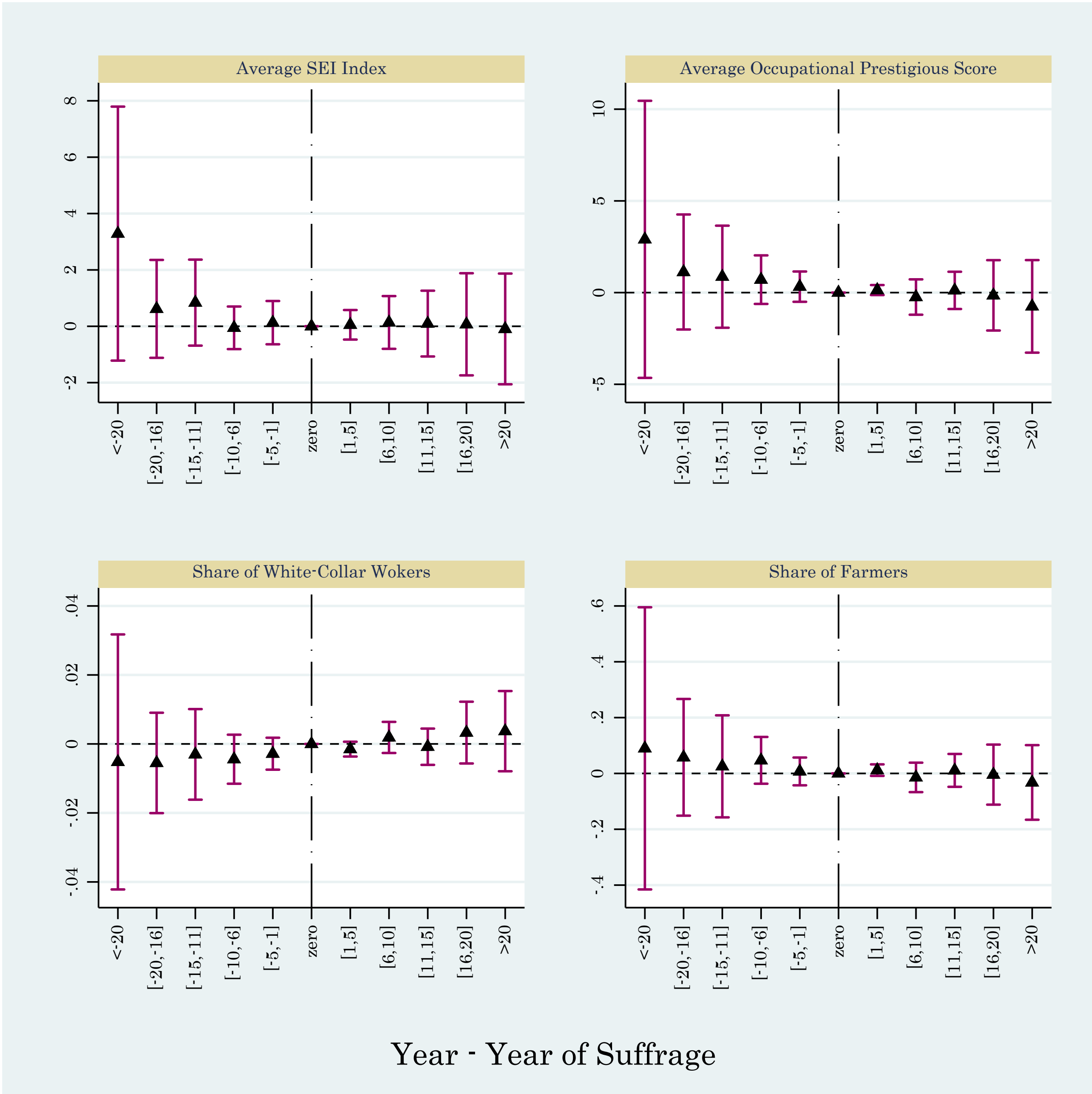


Figure 7 - Event-Study to Explore the Endogenous Changes in State-Level Characteristics before and after the Suffrage Reforms

Notes. Point estimates and 90 percent confidence intervals are illustrated. Outcomes are shown in each panel's title. The event-time is the distance between each census year (in which the outcome is observed) and the year of suffrage reform. All regressions include state fixed effects, year fixed effects, and region-by-year fixed effects. Standard errors are clustered at the state level. The data covers the decennial years 1880-1940.

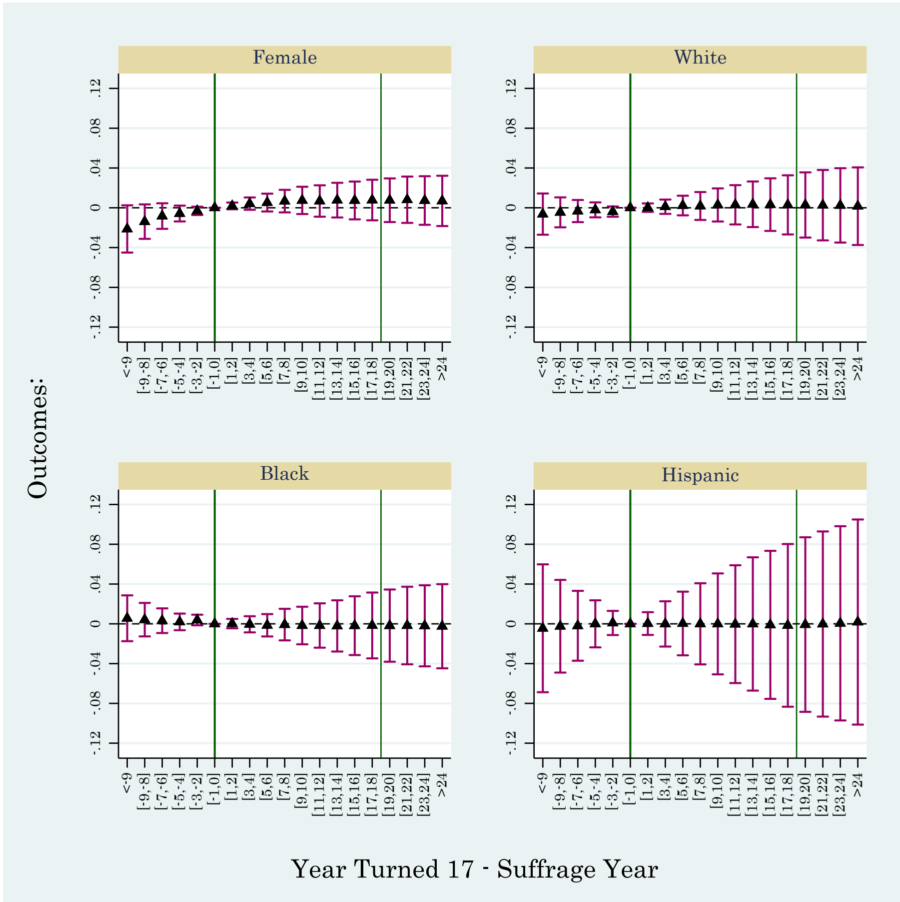


Figure 8 - Event-Study to Explore the Association between Childhood Exposure to Suffrage Laws and Observable Characteristics in NCHS Mortality Data

Notes. Point estimates and 90 percent confidence intervals are illustrated. The regression includes birth-state fixed effects, birth-year fixed effects, and birth-region-by-birth-year fixed effects. The data covers the years 1979-2019 for cohorts born in years 1880-1940.

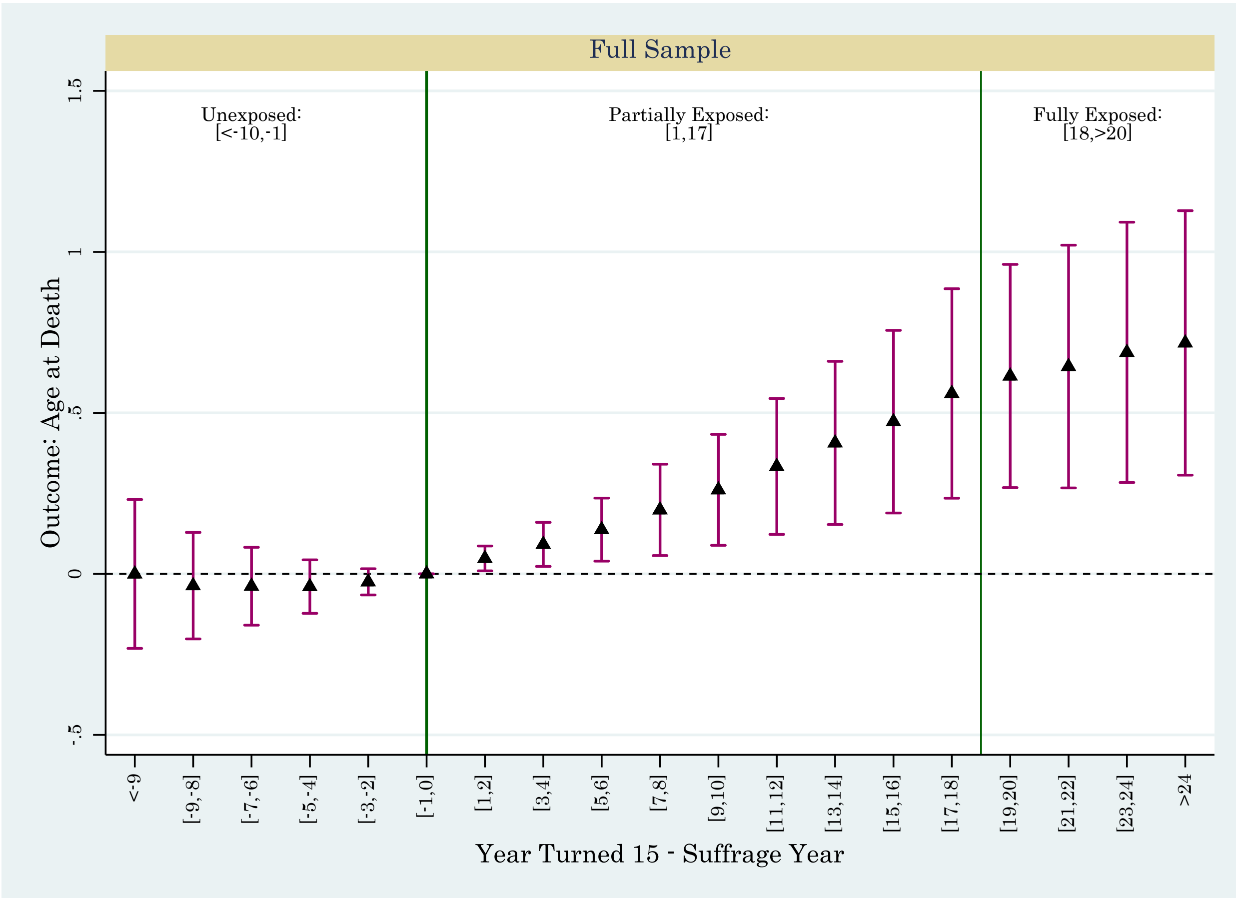


Figure 9 - Event-Study to Explore the Association between Childhood Exposure to Suffrage Laws and Old-Age Longevity Using NCHS Mortality Data

Notes. Point estimates and 90 percent confidence intervals are illustrated. The regression includes birth-state fixed effects, birth-year fixed effects, and birth-region-by-birth-year fixed effects. The regression also includes a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations. Standard errors are clustered at the state level. The data covers the years 1979-2019 for cohorts born in years 1880-1940.

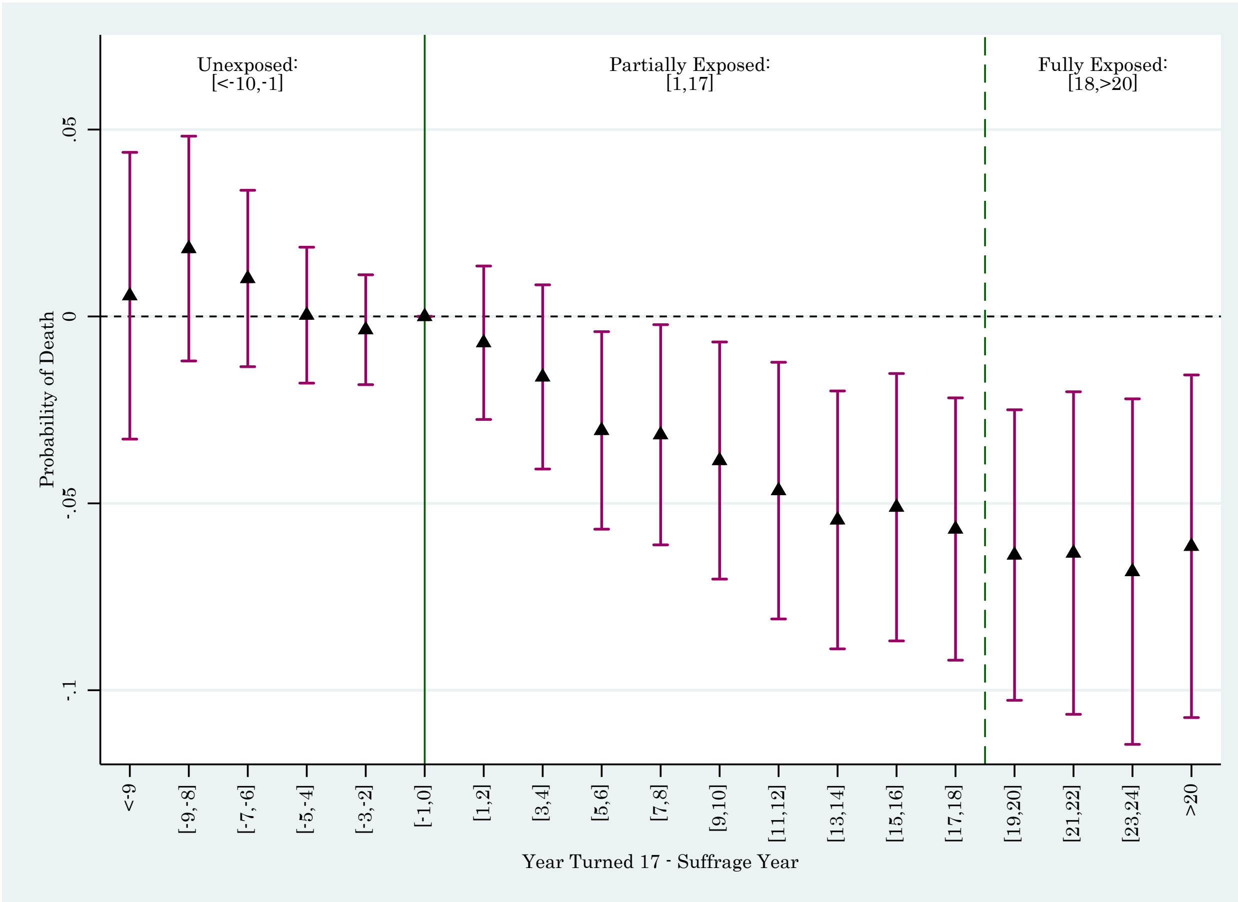


Figure 10 - Event-Study to Explore the Association between Childhood Exposure to Suffrage Laws and Old-Age Mortality Using National Longitudinal Mortality Study

Notes. Point estimates and 90 percent confidence intervals are illustrated. The regression includes birth-state fixed effects, birth-year fixed effects, and birth-region-by-birth-year fixed effects. The regression also includes a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations. Standard errors are clustered at the state level. The data covers cohorts born in years 1880-1940.

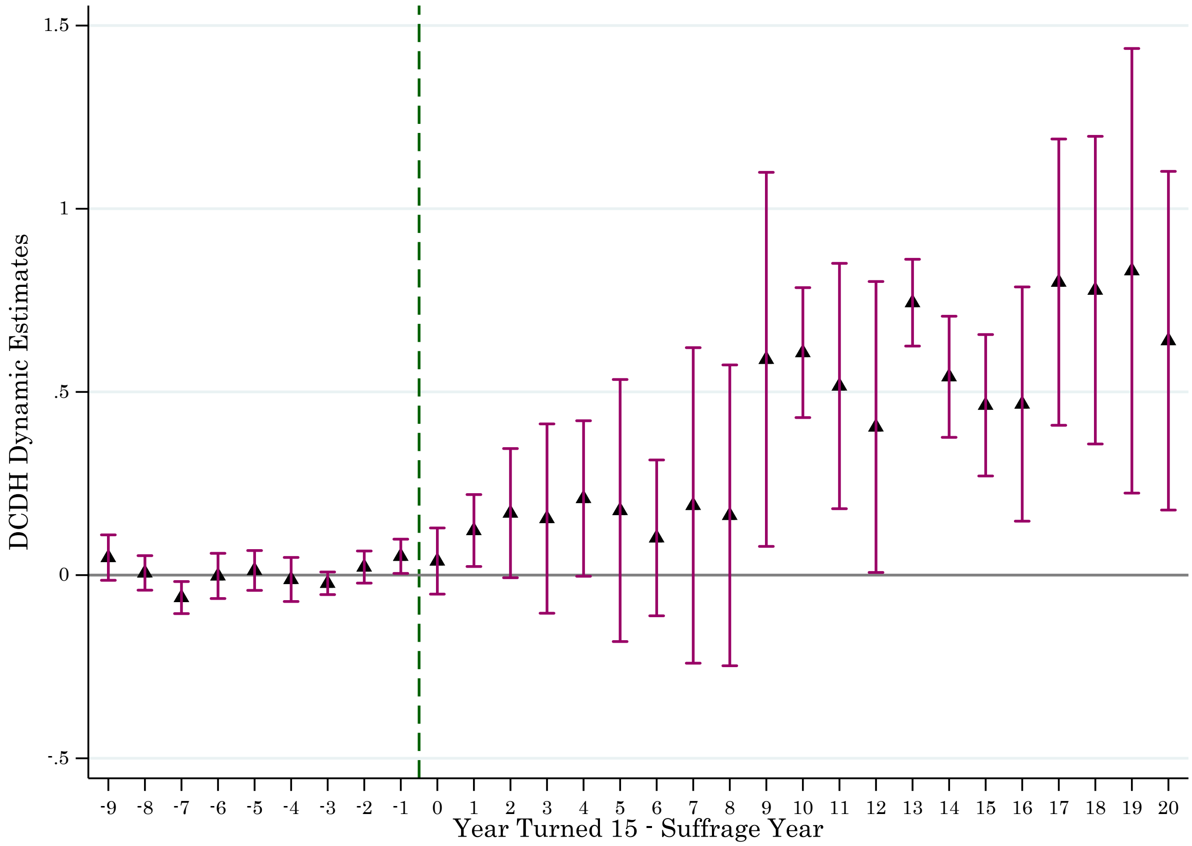


Figure 11 - Event-Study to Explore the Association between Childhood Exposure to Suffrage Laws and Old-Age Longevity in NCHS Data Using DCDH Approach

Notes. Point estimates and 90 percent confidence intervals are illustrated. The regression includes birth-state fixed effects, birth-year fixed effects, and birth-region-by-birth-year fixed effects. The regression also includes a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations. Standard errors are clustered at the state level. The data covers the years 1979-2019 for cohorts born in years 1880-1940.

Appendix A

In the main text, we implement the balancing tests through a series of event studies. In Appendix Table A-1, we show the balancing test through regressions similar to equation 1, where the outcome is individual observable characteristics. We also replicate this practice with the NLMS sample in Appendix Table A-2. Moreover, we replicate the event-study similar to the balancing test of Figure 8 for the NLMS sample and report the results in Appendix Figure A-1. Overall, these results do not provide a strong and statistically significant association between samples' demographic compositional change due to suffrage laws.

Appendix Table A-1 - Balancing Test: The Association between Childhood Exposure to Suffrage Laws and Observable Characteristics in NCHS Data

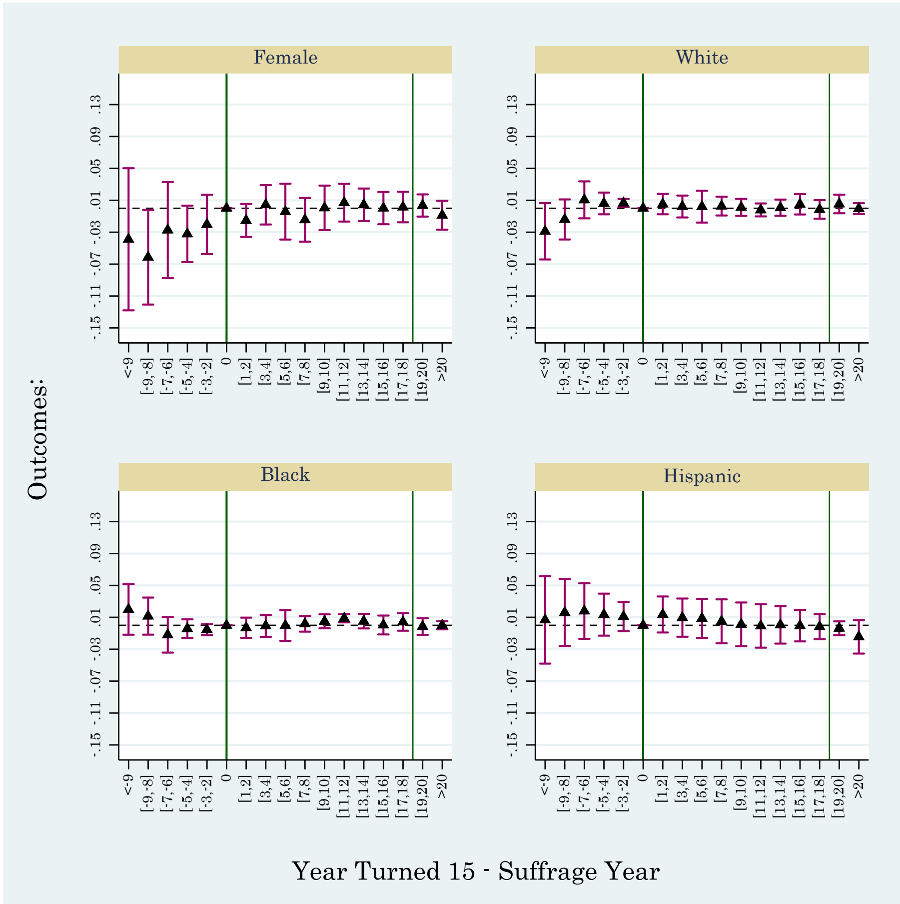
	Outcome:			
	Female	White	Black	Hispanic
	(1)	(2)	(3)	(4)
Share of Exposure	-0.00746	0.00515	0.00368	-0.00561
	(0.00465)	(0.00595)	(0.00441)	(0.01225)
Observations	61370021	61370021	61370021	61370021
R-Squared	0.01779	0.19308	0.20406	0.18369
Mean DV	0.525	0.893	0.102	0.289
%Change	-1.421	0.577	3.608	-1.941
95% Confidence Intervals	[-0.015 0.000]	[-0.005 0.015]	[-0.004 0.011]	[-0.026 0.015]
Birth State FE	✓	✓	✓	✓
Region-of-Birth-by-Birth-Year FE	✓	✓	✓	✓
Controls	✓	✓	✓	✓

Notes. Standard errors, clustered at the birth-state level, are reported in parentheses. Controls include a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations.
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A-2 - Balancing Test: The Association between Childhood Exposure to Suffrage Laws and Observable Characteristics in NLMS Data

	Outcome:			
	Female	White	Black	Hispanic
	(1)	(2)	(3)	(4)
Share of Exposure	0.01176	0.0092	-0.00678	0.00476
	(0.02028)	(0.00924)	(0.00621)	(0.01759)
Observations	381375	381375	381375	381375
R-Squared	0.00456	0.1503	0.17204	0.14549
Mean DV	0.539	0.903	0.088	0.060
%Change	2.181	1.019	-7.704	7.939
95% Confidence Intervals	[-0.022 0.046]	[-0.006 0.025]	[-0.017 0.004]	[-0.025 0.034]
Birth State FE	✓	✓	✓	✓
Region-of-Birth-by-Birth-Year FE	✓	✓	✓	✓
Controls	✓	✓	✓	✓

Notes. Standard errors, clustered at the birth-state level, are reported in parentheses. Controls include a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations.
*** p<0.01, ** p<0.05, * p<0.1



Appendix Figure A-1 - Event-Study to Explore the Association between Childhood Exposure to Suffrage Laws and Observable Characteristics in NLMS Data

Notes. Point estimates and 90 percent confidence intervals are illustrated. The regression includes birth-state fixed effects, birth-year fixed effects, and birth-region-by-birth-year fixed effects. The data covers cohorts born in years 1880-1940.

Appendix B

In the main results, we considered childhood exposure up to age 17, assuming that children leave households at this age and have completed K-12 education by this age. Appendix Table B-1 shows that the results are robust to alternative cut-off ages. However, the effects become only modestly smaller if we assume exposure up at ages 10, 12, and 15.

Appendix Table B-1 - Robustness of the Results to Different Thresholds of Childhood Exposure

	Outcome: Age at Death, Exposure Up to:		
	Age 10	Age 12	Age 15
	(1)	(2)	(3)
Share of Exposure	0.35479***	0.41153**	0.48623**
	(0.13079)	(0.15472)	(0.18153)
Observations	61326487	61326487	61326487
R-Squared	0.33134	0.33134	0.33134
Mean DV	78.690	78.690	78.690
%Change	0.451	0.523	0.618
Birth State FE	✓	✓	✓
Region-of-Birth-by-Birth-Year FE	✓	✓	✓
Controls	✓	✓	✓

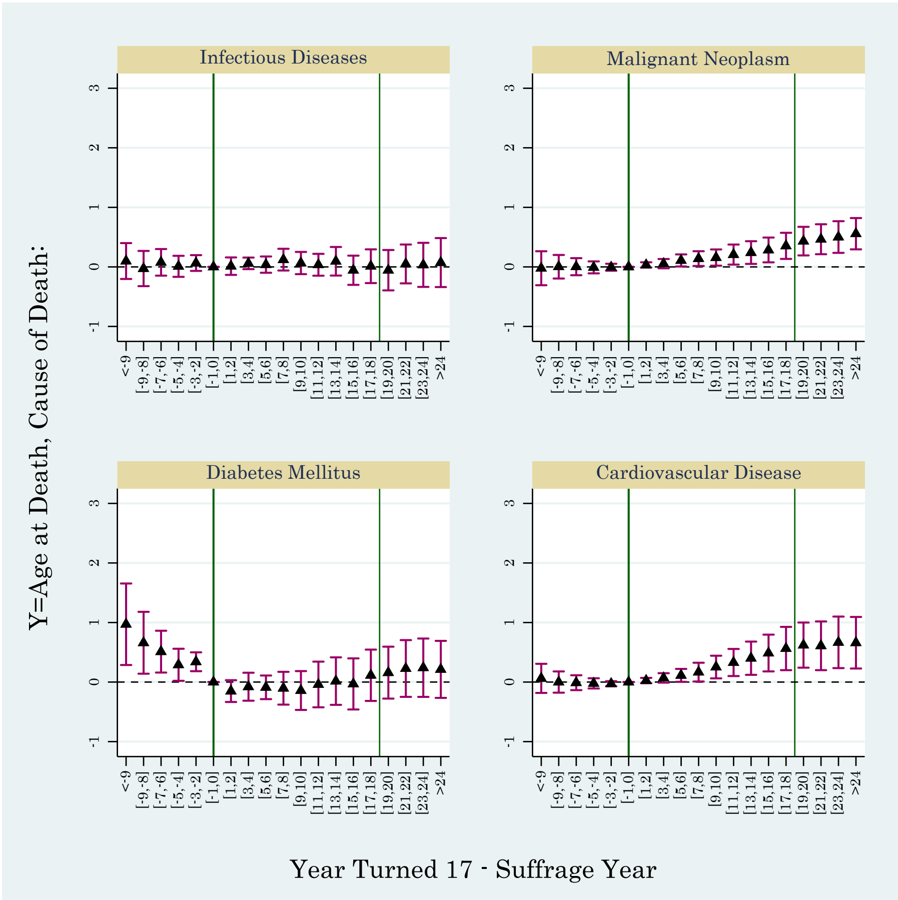
Notes. Standard errors, clustered at the birth-state level, are reported in parentheses. Controls include a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix C

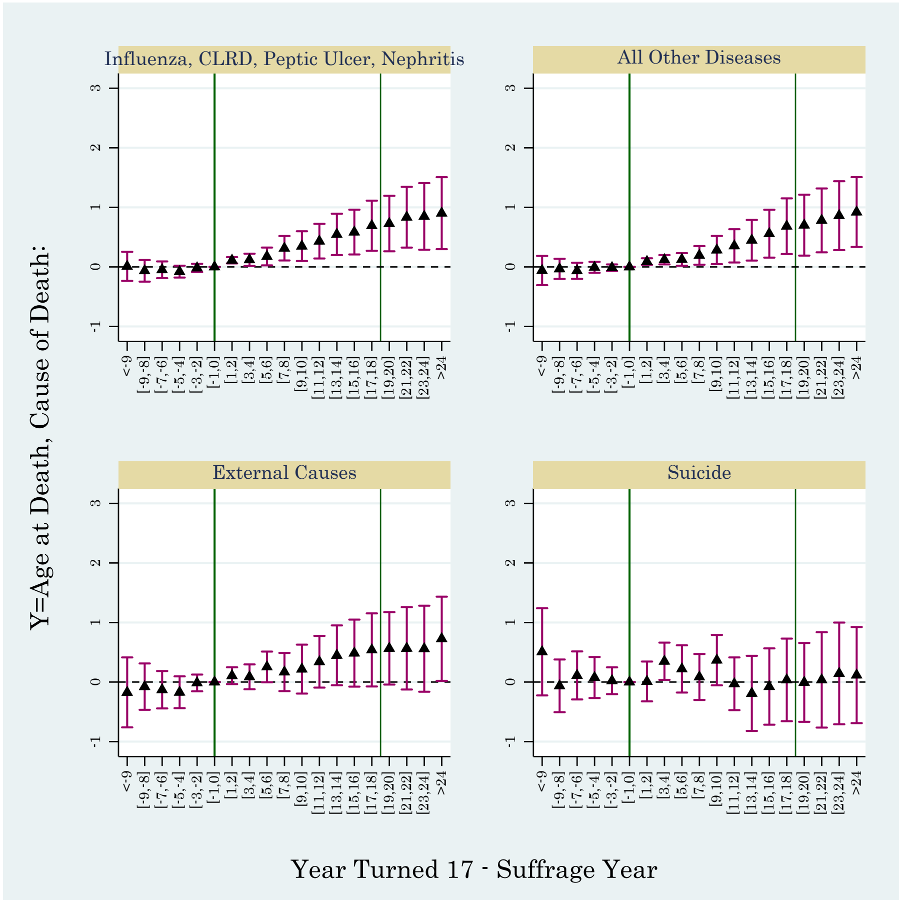
One potential heterogeneity is due to differences in longevity of those who die of certain causes of death. To explore this, we replicate the event-study analysis for subsamples of individuals who die from specific causes. These results are reported across eight panels of Appendix Figure C-1 and Appendix Figure C-2. The gains in old-age longevity appear to be stronger in deaths due to Malignant Neoplasm, Cardiovascular diseases, Chronic Lower Respiratory diseases, Influenza, Pneumonia, and Nephritis.

We continue the heterogeneity analysis of event studies by reporting the event-study results across subsamples by race in Appendix Figure C-3 and gender in Appendix Figure C-4. For instance, comparing the bottom and top panels of Appendix Figure C-3, one can observe the relatively larger rises in post-suffrage coefficients.



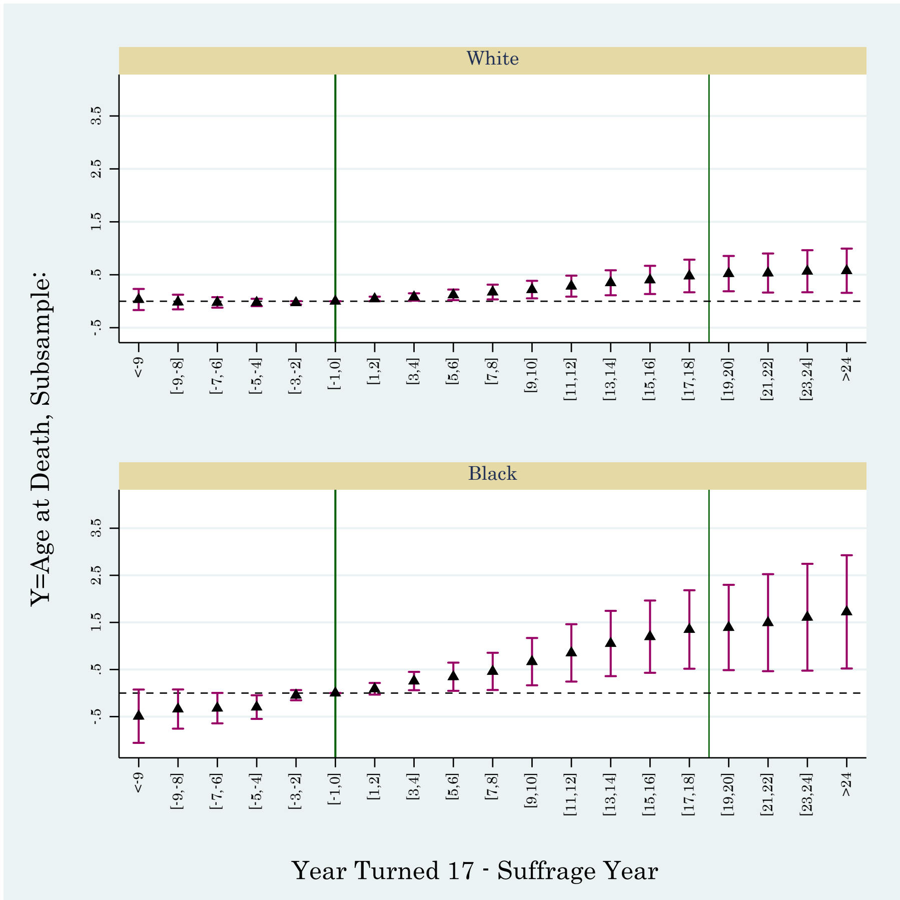
Appendix Figure C-1 - Event-Study to Explore the Association between Childhood Exposure to Suffrage Laws and Old-Age Longevity Using NCHS Mortality Data for Different Cause of Deaths

Notes. Point estimates and 90 percent confidence intervals are illustrated. The regression includes birth-state fixed effects, birth-year fixed effects, and birth-region-by-birth-year fixed effects. The regression also includes a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations. Standard errors are clustered at the state level. The data covers the years 1979-2019 for cohorts born in years 1880-1940.



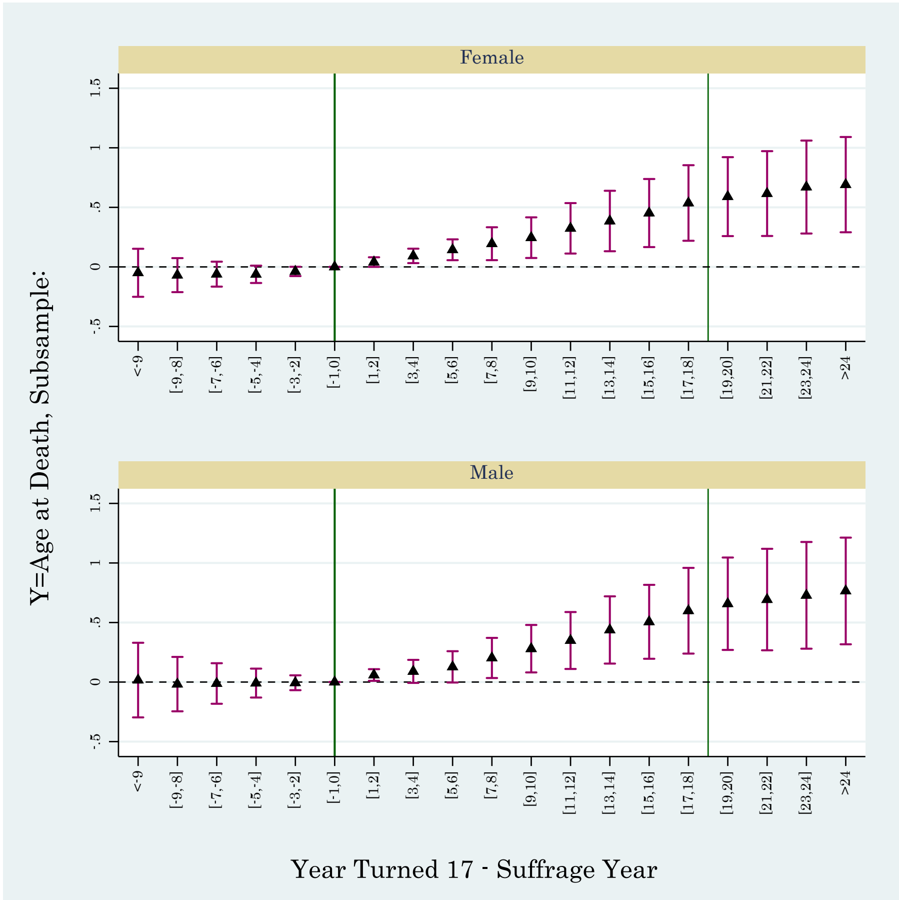
Appendix Figure C-2 - Event-Study to Explore the Association between Childhood Exposure to Suffrage Laws and Old-Age Longevity Using NCHS Mortality Data for Different Cause of Deaths

Notes. Point estimates and 90 percent confidence intervals are illustrated. The regression includes birth-state fixed effects, birth-year fixed effects, and birth-region-by-birth-year fixed effects. The regression also includes a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations. Standard errors are clustered at the state level. The data covers the years 1979-2019 for cohorts born in years 1880-1940.



Appendix Figure C-3 - Event-Study to Explore the Heterogeneity of the Association between Childhood Exposure to Suffrage Laws and Old-Age Longevity Using NCHS Mortality Data for Whites and Blacks

Notes. Point estimates and 90 percent confidence intervals are illustrated. The regression includes birth-state fixed effects, birth-year fixed effects, and birth-region-by-birth-year fixed effects. The regression also includes a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations. Standard errors are clustered at the state level. The data covers the years 1979-2019 for cohorts born in years 1880-1940.

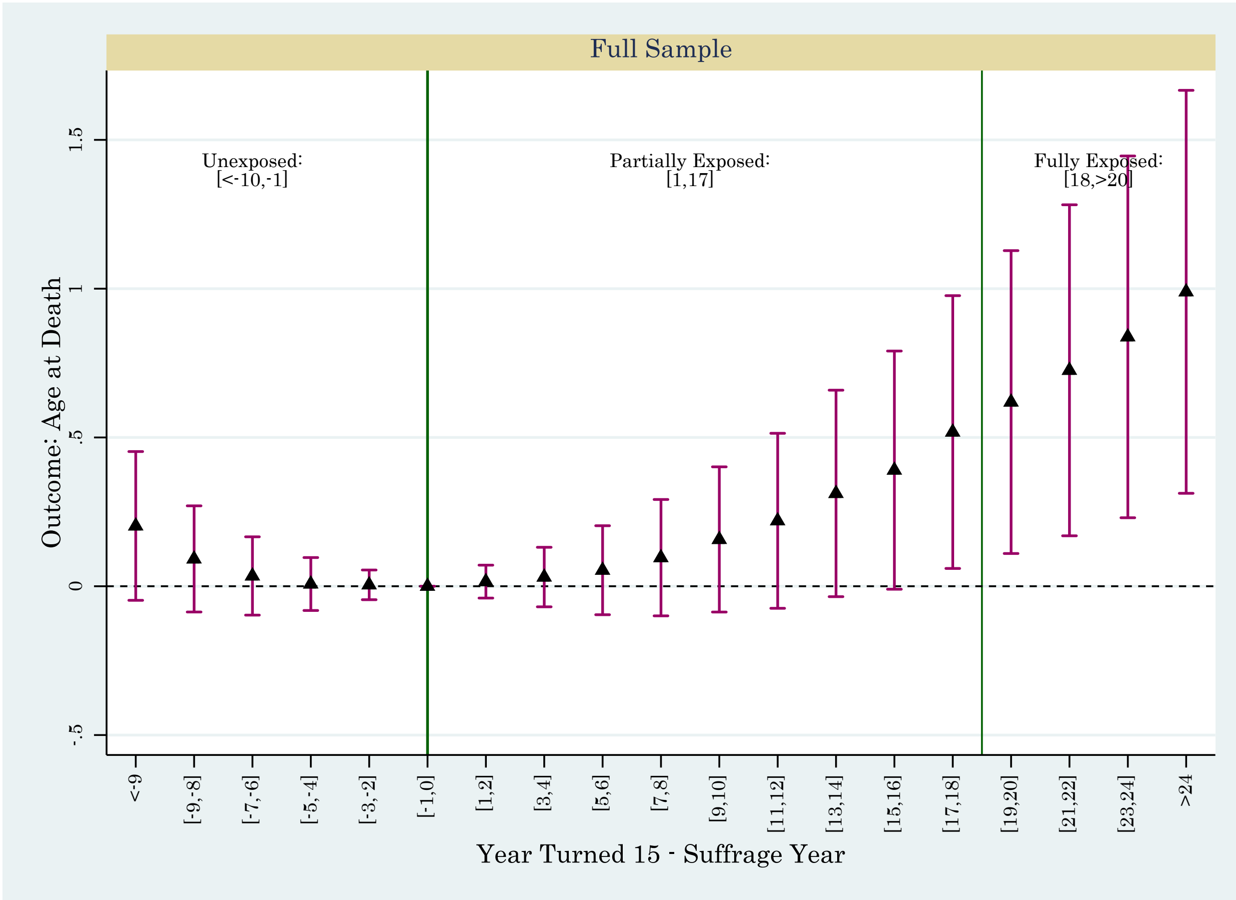


Appendix Figure C-4 - Event-Study to Explore the Heterogeneity of the Association between Childhood Exposure to Suffrage Laws and Old-Age Longevity Using NCHS Mortality Data among Males and Females

Notes. Point estimates and 90 percent confidence intervals are illustrated. The regression includes birth-state fixed effects, birth-year fixed effects, and birth-region-by-birth-year fixed effects. The regression also includes a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations. Standard errors are clustered at the state level. The data covers the years 1979-2019 for cohorts born in years 1880-1940.

Appendix D

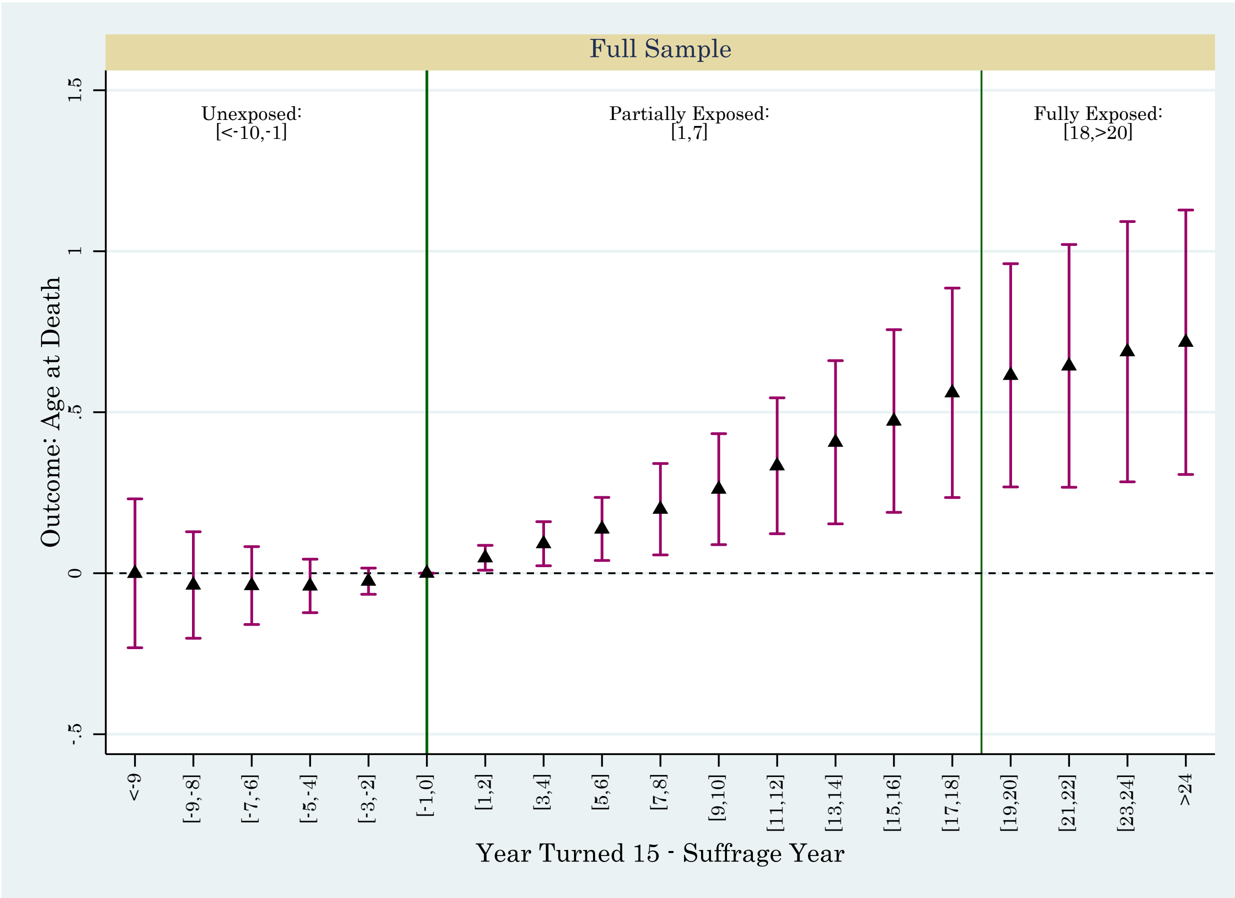
In this appendix, we show additional robustness checks. First, we show that the event-study estimate is relatively robust to excluding the set of region-cohort dummies. These results are reported in Appendix Figure D-1. It seems that including region-cohort dummies help control for preexisting trends in longevity, although in the current event study, all the pre-trend coefficients are statistically insignificant. We also add a state-of-birth-by-birth-cohort linear trend and replicate the event-study in Appendix Figure D-2. All pre-trend coefficients are economically and statistically zero. The effects start to rise for partially exposed cohorts and become relatively stable for fully exposed cohorts, a similar pattern and similar coefficients as observed in Figure 9.



Appendix Figure D-1 - Event-Study to Explore the Association between Childhood Exposure to Suffrage Laws and Old-Age Longevity Using NCHS Mortality Data, Excluding Region-Cohort Fixed Effects

Notes. Point estimates and 90 percent confidence intervals are illustrated. The regression includes birth-state fixed effects and birth-year fixed effects. The regression also includes a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations.

Standard errors are clustered at the state level. The data covers the years 1979-2019 for cohorts born in years 1880-1940.



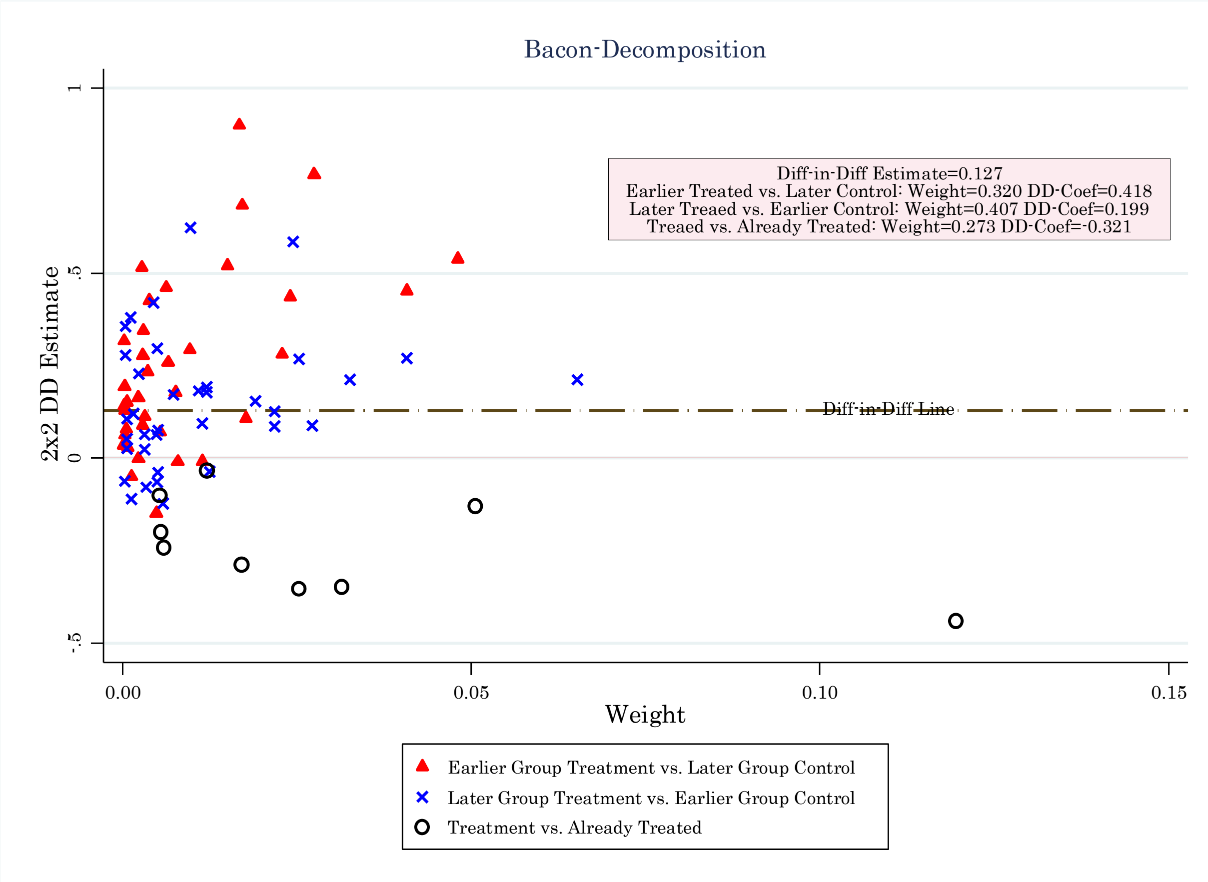
Appendix Figure D-2 - Event-Study to Explore the Association between Childhood Exposure to Suffrage Laws and Old-Age Longevity Using NCHS Mortality Data, Including Birth-State by Birth Year Trend

Notes. Point estimates and 90 percent confidence intervals are illustrated. The regression includes birth-state fixed effects, birth-year -by-birth-region fixed effects, and birth-state by birth year linear trend. The regression also includes a dummy for gender, a dummy for race, and average birth-state-by-birth-year covariates including female literacy rate, female labor force participation rate, average socioeconomic index, average number of children under 5 years old, and share of workers in different occupations.

Standard errors are clustered at the state level. The data covers the years 1979-2019 for cohorts born in years 1880-1940.

Appendix E

Appendix Figure E-1 shows the bacon-decomposition of the 2-by-2 difference-in-difference comparisons. We should note that in this figure, the sample is collapsed at the birth-year and state-of-birth level, and comparisons lack any controls (a restriction imposed by the bacon decomposition command). The overall DD coefficient is 0.13 additional life years. The overall DD coefficient in earlier treated versus later control (treatment= early adopters; control=later adopters) is 0.4 with a weight (in calculating overall DD) of 0.3. The DD effect of later treatment and earlier control (treatment= later adopters; control=earlier adopters) is 0.2 with a weight of 0.4. the effects are so far consistent with a positive impact across comparison groups. The only contamination appears in the comparison set of treated versus already treated. It provides an overall effect of -0.3 with a weight of 0.27. We believe that this is contamination in OLS-produced DD effects throughout the paper since the already treated states (early suffrage adopters) are in a distorted and different trajectory, and it does not offer a well-behaved control group that satisfies the exogeneity criteria. Therefore, we believe that the true effects could be even larger than those reported in the text.



Appendix Figure E-1 – Bacon Decomposition of the Association between Childhood Exposure to Suffrage Laws and Old-Age Longevity Using NCHS Mortality Data