The 1918 U.S. Influenza Pandemic as a Natural Experiment, Revisited

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Abstract

Douglas Almond's use of the 1918 U.S. influenza pandemic as a natural experiment led to the seminal works on the subject of in utero health's impact on later life outcomes. The identification strength of his work, though, is driven by the inherent natural experiment supposition of random assignment. By using data from the 1920 and 1930 U.S. Censuses, this study investigates this keystone assumption and shows that the families of the "treatment" cohort were significantly less literate and economically prosperous than the families of the "control" group. Additionally, when proxies for childhood environment are added to Almond's analyses, his findings are appreciably reduced in magnitude and significance. This research implies that failing to control for the first order effect of parent's education and wealth on a child's long-run outcomes, eliminates Douglas Almond's ability to use the 1918 U.S. influenza pandemic to make direct inferences regarding fetal health's impact on long-term wellbeing.

I Introduction

Douglas Almond's 2006 paper in the *Journal of Political Economy* and 2005 research in the *American Economic Review Papers and Proceedings* (with Bhashkar Mazumder), are two of the most influential works on the impact of maternal health on the long-term outcomes of the in utero child. Both of these papers achieve their results by relying on the power of using the 1918 U.S. flu pandemic as a natural experiment. The strategy used in these studies is to analyze the long run outcomes of the 1919 birth cohort, whose mothers had the highest probability of being infected at some point during pregnancy, versus cohorts born before and after 1919. Almond's results indicate that, in adulthood, the exposure group has less education, poorer economic performance, and worse health than the surrounding cohort groups. These results are seen as the strongest proof of the fetal-origins hypothesis and are cited ubiquitously throughout the early life health and human capital literature. Moreover, by asserting that the health of expecting mothers impacts the next generation's earnings and output potential, Almond's work suggests a new method of aid and welfare policy specifically directed at pregnant women. These important findings though, as do all that rely on natural experiments, sit on a knife's edge. If the in utero exposure to the 1918 U.S. flu outbreak was not random, particularly with respect to characteristics correlated with later life health, education, and economic outcomes, maternal health can no longer be identified as the cause.

Using data from the 1920 and 1930 U.S. Censuses, this paper investigates the claim that the 1918 U.S. influenza pandemic is a valid natural experiment for the effects of maternal health on the long-term outcomes of children. The results indicate that parents that produced a child in 1919 were significantly less literate, of lower economic status, and had jobs that produced less income. In addition, the 1919 birth cohort was a member of significantly larger families with older parents. Finally, when controlling for proxies of parental characteristics, many of Almonds 2006 results are greatly attenuated in size and significance. Thus, while inferior in utero health may play a part in the significantly poorer later life outcomes of the

1919 birth cohort, first order family factors systematic to being part of the 1919 birth cohort make Almond's interpretation of the effect of maternal health inconclusive.

This paper is organized as follows. Section II.1 will present a brief history of the 1918 U.S. influenza pandemic and the case for its use as a natural experiment. Section II.2 will discuss the fetal-origins hypothesis, the prior evidence of its existence, and how using the 1918 U.S. pandemic as a natural experiment could allow for major progress in its verification. Section II.3 will provide the results of the seminal papers written by Douglas Almond about maternal health's effect on later life outcomes. Section III will highlight a major event that took place during the pertinent period and explain how its occurrence creates potentially damaging selection problems for social scientists that wish to use the 1918 influenza pandemic as a natural experiment for in utero health. Sections IV through VI present the methodology and results of three approaches to identifying the validity of these concerns using data from the 1930 U.S. Census, the 1920 U.S. Census and a combination of both datasets, respectively. Section VII offers a rough estimation of the impact this paper's findings have on Almond's results. Lastly, Section VIII provides conclusions.

II Using the 1918 U.S. Influenza Pandemic to Evaluate the Fetal-Origins Hypothesis

II.1 History of the 1918 U.S. Influenza Pandemic

The justification for using the 1918 U.S. influenza pandemic as a natural experiment revolves around a few keys aspects of its history. The first, and possibly most crucial element is the onset of the disease; the pandemic began unexpectedly in October 1918.[1] This creates the necessary criteria that subjects are unable to change behavior prior to the exposure period in a

[1] Most historians now note that the first wave of influenza appeared in March 1918 in an army base in Kansas. This wave though received minimal media coverage at the time and was not reported as influenza until years later, and thus has little potential to impact behavior (Almond 2006).

way that would affect the researcher's sample or group assignment. Further, the disease struck violently, yet quickly, and was almost completely inert by the end of January 1919.[2] In fact, the disease's impact was so condensed that approximately 85% of all the U.S. influenza deaths occurred between October 1918 and January 1918 (Almond 2006). The swift onset and departure of the disease is another beneficial aspect of the 1918 U.S. influenza pandemic as it allows the researcher to assume that there is very little room for meaningful behavior adjustment during the exposure period. Additionally, the pandemic struck an incredibly large portion of the population, 28%, which affords researchers the ability to treat the entire population alive in that period as an "intent-to-treat" exposure group (Jordan 1927 as cited in Almond 2006). Finally, the disease is portrayed as having no prejudices. Avoiding the disease was nearly impossible as it was transmitted and obtained through the common air everyone shares. As the old children's rhyme popular at the time explained, "I opened up the window and in-flu-Enza" (Crawford 2005). Thus, there were extremely variant exposure intensities throughout the country, but most importantly, the variance seems to have had no discernable pattern with regard to an area's wealth, climate, or topographical characteristics (Brainerd and Siegler 2003).

The general picture of life in 1918 given by social scientists is that it was in no way different than previous or subsequent years, except for the sudden, short-lived, and widespread outbreak of influenza. This version of U.S. history creates the opportunity for a near-textbook natural experiment using the 1918 cohort as the treatment group and surrounding cohorts as controls. More specifically, this portrayal of the 1918 pandemic, along with some additional key features of this particular influenza strain, lends itself perfectly to the investigation of a greatly theorized, hotly-debated, yet relatively unverified topic; the impact of a pregnant mother's health on the later-life outcomes of the child in utero.

[2]There was a final mild flare up of the disease in the spring of 1919, but it was quite benign and went relatively unnoticed and is thus not considered a threat to the validity of the natural experiment (1918.pandemic.gov).

II.2 Connecting the Fetal Origins Hypothesis to the 1918 U.S. Influenza Pandemic

For many decades it has been an accepted fact that what happens during several crucial periods of human development have long lasting effects (Rasmussen 2001). What has been in dispute over this time, though, is how early these periods begin and how far their impacts span. At the tail end of the 1980's David J. P. Barker introduced what would later be popularly referred to as the fetal-origins hypothesis. He suggested that poor health as early as the fetal period had dire consequences for mid to late life chronic diseases (Barker 1994). This theory, and others like it, including fetal programming and the "thrifty phenotype", gained a great deal of traction via results gleaned from non-experimental work. These studies, though, lacked acceptable controls for observable (SES, income, education) and/or more difficult to observe (parental investment in the child's health and human capital) characteristics of the families, leading to results that do not properly identify the effect of in utero health (Rasmussen 2001).[3] To avoid the selection concerns apparent in non-experimental work, fetal health researchers turned to the natural experiment, and in particular, to the study of the effect of in utero famine on later life outcomes.

The first example is the study of the Finnish famine of 1866-1868. Researchers found no long-term effects on those subjects that were in utero during the famine. The length of this famine, though, does not lend itself to a strong natural experiment. Since the treatment period is over two years long there is plenty of time for subjects to self-select into or out of the treatment group through family planning, creating a non-random experimental group. Further, due to the severity of the famine, a larger portion of the weakest children perished in utero, creating the type of bias within the treatment group that would skew estimates toward a non-result (Kannisto, Christensen, and Vaupel 1997). Similarly, Stanner et. al.'s study of the long run impact of being in utero during the Nazi created famine in

[3]Animal experiments have also provided confirmatory results, but issues of small sample size and lack of proper external validity temper their insights.

Leningrad did not provide support for the fetal-origins hypothesis (1997). However, as before, the potential bias caused by selective attrition in the treatment group, cast doubt over the soundness of the findings. A third historical event that has been used extensively as a natural experiment to study early life health is the 1944 - 1945 Dutch famine imposed by Germany during WWII. Most studies of this event have found results that concur with the Barker hypothesis, including findings of increased incidences of obesity, heart disease, and adult psychological disorders, but not all research has been confirmatory (Ravelli et al 1999, Roseboom et al 2000, and Neugebaur et al. 1999, concur respectively, and Roseboom et al. 1999 dissents). One major issue with these studies though, is that while the timing of the official famine event was presumably unanticipated, food supply restriction had been occurring since the beginning of the war. The fact that, due to food shortage and the stress of war, the Netherlands was already facing an adverse environment before the 1944 famine means parents that have a preference for raising higher quality, healthy children are more likely to wait to have children until after the war. This behavioral change would effect random selection into exposure and mitigate some of the weight of findings that use this natural experiment. Thus, while much thought and effort had been given to the study of the fetal-origins hypotheses, opinion about its validity was still greatly divided. By innovatively using the 1918 U.S. influenza pandemic as a natural experiment to study the long-term effects of in utero health, Douglas Almond's work was the first major step towards bridging that gap.

Above and beyond the historical aspects mentioned in the previous section, the 1918 U.S. influenza pandemic contained unique attributes that lent themselves perfectly to the evaluation of the fetal-origins hypothesis. First of all, unlike previous influenza pandemics, this one had particularly high incidence amongst people between the ages of 25 and 35 (Almond 2006). More specifically, Almond cites multiple sources which indicate that pregnant women and women of childbearing age were especially susceptible to infection. Additionally, unlike some of the previously mentioned studies, mortality, though severe in terms of typical influenza exposure, was quite low. Finally, the fact that the event took place over 80 years ago allows those in utero at the time to be viewed in mid to late life, when the fetal-origins hypothesis posits that they should be experiencing the detrimental effects of exposure. The value of the research topic coupled with the, as reported, seemingly ideal methodological construct, created the platform to propel the importance of Almond's work. The next section will provide a summary of his findings.

II.3 Review of Douglas Almond's 2005 and 2006 Results

The reverence given to Douglas Almond's 2005 and 2006 work on early childhood health, though founded in his clever natural experiment, is driven by the bold and diverse nature of his findings. While his 2005 paper with Bhashkar Mazmuder and parts of his 2006 work speak directly to the fetal-origins hypothesis, that is later life chronic health conditions, the 2006 study also makes striking statements about later life outcomes such as economic status and education attainment.

In 2005, Almond and Mazmuder published work using 10 waves of panel data, over the period 1984 to 1996, from the Survey of Income and Program Participation to identify the long-term health impact of being in utero during the 1918 pandemic. Due to the intent-to-treat/control structure the methodology affords, the identification strategy is rather simple; compare the later life health of the cohort born in 1919, those that were in utero during the peak of the pandemic, to the later life health conditions of the unexposed surrounding cohorts.[4] The coefficient estimates reported in the 2005 paper for the 1919 birth year dummy variable are shown in Table 1.

As is immediately clear, being in utero during the pandemic has severe and significant effects on one's later life health conditions. Not only does the 1919 birth cohort report poorer general health, they also have a higher incidence of several chronic health problems, including diabetes and stroke.

[4] The main specification is a regression of the health outcome on a set of survey year dummies, age at survey squared interacted with survey year, and a dummy variable for being born in 1919. The authors, though, indicate that the results are robust to several other models.

Additionally, Almond and Mazmuder run a regression that breaks the 1919 cohort dummy into 4 variables, one for each quarter, and that includes general quarter of birth indicator variables. The point estimates reported in the 2005 paper for the four 1919 birth quarter dummy variables are shown in Table 2 and are offered by the authors as proof of the purity of the natural experiment. They suggest that since the results are consistently significantly adverse for subjects born in the first two quarter of 1919, and thus conceived before the onset of the pandemic, selective fertility decisions are not driving results. Further, any attrition bias that may occur from an increase in miscarriages during the pandemic would presumably censor the weakest subjects in the treatment group and simply cause the results to be a lower bound estimate of the complete effect of in utero health. In light of these findings the authors declare that by using a sound natural experiment one can uncover clear and unambiguous evidence of the fetal-origins hypothesis. Douglas Almond took his analysis one step further in his 2006 work, when he added more than health outcomes to the domain of this research. The large and detailed data that can be obtained for the adult years of the pertinent cohorts in the U.S. Census Integrated Public Use Microdata Series (IPUMS) afforded Douglas Almond the ability to push his analysis to the areas of long run economic and educational outcomes.

His 2006 research used the 1% sample of the 1960, a combined 3% sample of the 1970, and a 5% sample of the 1980 U.S. Censuses from IPUMS. With this data he was able to analyze outcomes such as educational attainment, SES, and disability. As before, he treated those born in 1919 as the intent-to-treat group and the surrounding birth cohorts, in this case 1912 to 1918 and 1920 to 1922, as the controls. As shown below, his specification measures the effect of being born in 1919, $I_i(YOB = 1919)$, on a later life outcome, y_i, while controlling for the yearly trend, YOB_i, and a quadratic of the yearly trend, YOB_i^2:

$$y_i = \beta_0 + \beta_1 \cdot YOB_i + \beta_2 \cdot YOB_i^2 + \beta_3 \cdot I_i(YOB = 1919) + \epsilon_i \qquad (1)$$

Almond's results, once again, are striking. Table 3 presents his estimates of the coefficient on the 1919 year of birth dummy for regressions run on males.[5] Every one of the outcomes of interest, be it economic, educational, or health related, is significantly adversely affected by being born in 1919. These results are even more impressive when one remembers these are findings based on a group in which only approximately a third of the mothers were infected (Jordan 1927 cited in Almond 2006). As in the previous paper, Almond further tests the quarter-by-quarter timing of his findings as evidence that the results are not driven by family planning. Figure 1 contains the coefficient estimates from a regression on high school completion that includes a dummy for each quarter of birth between 1916 and 1920 and controls for seasonal effects and the yearly trend (estimated over the years 1912-1923). As the figure suggests, being born in the first two quarters of 1919 significantly lowers one's probability of obtaining a high school degree.

The combined power of both sets of results make these two works the seminal proof of the connection between maternal health and the long-term future of one's child. In fact, graphs such as Figure 2, from Almond's 2006 paper, have become common starting points for policy makers and scientists who would like to stress the importance of fetal programming. As mentioned in the introduction though, results from natural experiments rest precariously on the assumption of randomness. Thus, it is critical to investigate the theoretical foundation on which this natural experiment is built, because while there is no denying the stark clarity of Figure 2, the interpretation of the diagram becomes quite different if exposure status is non-random in a manner correlated with poor later life outcomes.

Figure 3 plots the average socioeconomic status in 1930, as measured by Otis Duncan's socioeconomic index (SEI), of the fathers of people born between 1912 and 1922 by year of birth from the 1930 U.S. Census.[6] This figure, as Duncan Thomas established, strongly suggests that the 1919 birth cohort, the cohort of interest in Almond's work, had fathers of substantially lower socioeconomic quality. This stylized fact does not fit the general

[5]In his paper, Almond provides tables for women and non-whites with similar results.

[6]Figure 3 is a replication of a graph created by and first shown to the researcher by Prof. Duncan Thomas (2010).

history given by Douglas Almond and greatly hinders the assumption of randomness necessary for his natural experiment. In the next section this paper will highlight a major event in U.S. history that was taking place during the pertinent period and describe how the impact of this event may help to clarify the cause of the non-random selection that Figure 3 suggests.

III The Great War and its Implications

The major threat to Almond's natural experiment framework is the fact that overlapping the 1918 U.S. influenza pandemic was an event that significantly impacted fertility during the entire "treatment" period; World War I. Not only is a war of its magnitude always of great demographic significance when evaluating a particular time period, but, in addition, the timing of the United States involvement in WWI is directly correlated with the creation and spread of the 1918 influenza bug.

The United States declared war on Germany in April 1917, was regularly sending troops in the summer of 1918, and had accepted Germany's surrender by November 1918. Thus, during the key conception periods of Almond's studies, the second and third quarter of 1918, a large and select group of child bearing age men were either stationed in an army barracks or overseas. In other words, the "treatment" cohort is made up of children whose fathers are predominately less likely to have served in WWI. For this selection issue to be a problem, that is create upward and thus misleading bias of the importance of fetal heath, it would have to be the case that WWI veterans were, on average and significantly, men of higher parental quality. While in many wars this would not seem like a reasonable fear, there are some legitimate reasons for concern in this case.

First of all this was the first war in which a U.S. citizen was not allowed to hire a proxy to serve in his place. This ruled out the possibility of the upper class simply buying their way out of service. In fact, due to the draft categories in use in 1917, men with means were more likely to be conscripted. While almost all draft eligible men were put in Class I, one of the main deferments was based on the income dependency of one's family.

A man who's family had little financial support apart from himself, such that they would have "insufficient" income if he were drafted, were placed in a lower priority group (Jean Nudd 2004). Further, as with all drafts, men of particularly low health were either less likely to be drafted or completely removed from the conscription process. These draft classifications suggest a major issue for the assumption of random selection, as the more financially stable and healthy men were more likely to be at war. Thus, it is possible that the 1919 birth cohort is made up of a significantly larger portion of poorer and less healthy families.

Additionally, since the military selection criteria is related to age, fathers in the "treatment" period were likely to be significantly older then the surrounding cohorts. This presents a problem for Almond's strategy as educational cohort trends suggest that younger men were significantly more likely to be literate and educated in this time period, meaning the men with the opportunity to be fathers during the "treatment" period are those with less human capital.

Another avenue through which the war may impact the parental distribution is through systematic reactions to the experience of living in wartime. Gary Becker has posited a well-known theory of income-based fertility patterns based on child quantity versus child quality (1960). In essence he suggests that, like many other durable goods, high-income individuals choose fewer, higher quality children, while low-income individuals choose more, lower quality progeny. This theory offers some intriguing hypotheses when applied to fertility during wartime. Since, during wartime, families experience more stress, less certainty, and the threat of rationing, parents interested in producing high quality children may wait until the adverse conditions subside. A reasonable hypothesis that follows from this theory is that, during wartime, families with higher income, or at least, families concerned with having higher quality children, may postpone family enlargement until the war is over. In summary, the non-random selection of the draft and the hypothesized non-arbitrary family planning of those experiencing a war, create legitimate concerns over the assumption of random experimental assignment.

These hypotheses suggest that the income, health, and education of the parents of the 1919 birth cohort were significantly lower than surrounding birth cohorts. This type of sorting would present a major problem for identifying the impact of maternal health on the child's later life wealth, health, and education conditions, as numerous studies have connected parental wealth, health, and schooling with these very same outcomes (Davis-Kean 2005, Duflo 2000, Thomas and Strauss 1998, Brooks-Gunn and Duncan 1997, Corcoran et al. 1992, Hill and Duncan 1987). Additionally, if families interested in raising quality children were more likely to select out of the 1919 birth cohort, as is suggested by the Becker hypothesis, this would obviously cause being in the "treatment" group to misidentify the impact of fetal health on the outcomes of interest.

While Figure 3 suggests that the concerns presented in this section are real, the goal of the remainder of this paper is to rigorously compare the family characteristics of those born in 1919 with the surrounding birth cohorts. Namely, this paper will test the hypotheses that assert that the parents of children born in 1919 were significantly worse in the areas of income and education, that they were older, and that they desired a larger quantity, rather than a higher quality of children, than the parents of children from surrounding cohorts.[7] The next three sections will present three approaches to analyzing the validity of these suppositions.

IV First Approach, 1930 U.S. Census Data

IV.1 Methodology

To examine the hypotheses, it was imperative to find data that contained the parental characteristics of the early 1900's birth cohorts. As Almond, this research takes advantage of the comprehensive and demographically rich U.S. Census data. The IPUMS 1% sample of the 1930 U.S. Census data is particularly useful as it contains information on the parents of U.S. born

[7]Unfortunately, this paper is unable to directly test the hypothesis that the 1919 birth cohort had significantly less healthy parents as no variable that measured or could proxy for parental health existed in the data.

children over the entire time period of Almond's 2006 analysis, 1912 - 1922. Although the range of parental characteristics is not exhaustive in relation to this study's hypotheses, the 1930 census contains ample demographic statistics to provide informative analysis.[8]

One area in which the 1930 census is particularly thorough is in information about the economic status of the parents, which includes outcomes such as whether the father is in the labor force, the father's Duncan's SEI score, the father's occupational income score, and the father's occupational earnings score.[9] An additional proxy for wealth is whether the family owns a radio, as radio ownership is a clear sign of disposable income. A less rich data category is education. Unfortunately, the only relevant educational characteristic, other than what is inherent in the Duncan's SEI score, is the parent's literacy. More promisingly, family size can be used to address the quantity versus quality hypothesis. In this case, the number of the father's or mother's children in the household will be used as a signal of a family's preference. Another nice element of the 1930 census data is that it can be used to directly test the inference that children born in 1919 were less likely to be the child of a WWI veteran. Finally, the age of the parents at the time of the child's birth will be used to test if the 1919 birth cohort had significantly older parents than those in surrounding cohorts. This data, with all its richness, is not without its drawbacks.

The 1930 U.S. Census was collected on April 1, 1930 and, rather than asking for the birth date information of the respondents, they simply asked for their age as of March 31, 1930. Due to this data collection decision, this approach is limited to placing people into birth cohort bins between April 1st and March 31st rather than January 1st and December 31st. This hinders the analysis, in that, the birth cohort of interest, 1919, loses a major

[8] All data is as of March 31, 1930.

[9] Otis Duncan's SEI is a measure of occupational status based upon the income level and educational attainment associated with each occupation in 1950. Occupational income score assigns each occupation a value representing the median total income (in hundreds of 1950 dollars) of all persons with that particular occupation in 1950. Occupational earnings score is created in two steps. First a z-score indicating the number of standard deviations by which each occupational category differed from the mean earnings of all occupations is created. Then these scores are translated into a percentile rank.

quarter of exposure, those conceived in the 2nd quarter of 1918, and replaces them with an unexposed group, those conceived in the 2nd quarter of 1919. Theoretically, this would simply cause the results to be a lower bound, but due to the lack of more precise birth date data, this problem cannot be solved directly. In the rest of Section IV, unless otherwise noted, reference to any birth year indicates the person was born between April 1st of that year and March 31st of the subsequent year.

As this study purposefully follows Almond's own model, the 1919 birth cohort will be isolated to test if it is significantly different than the surrounding cohorts, 1912 to 1922, while controlling for the time trend.[10] The only difference in the two models is that where his outcomes, y_i, were individual i's outcomes in later years, the dependent variables in these specifications are the individual's parent's characteristics in 1930:

$$y_i = \beta_0 + \beta_1 \cdot YOB_i + \beta_2 \cdot YOB_i^2 + \beta_3 \cdot I_i(YOB = 1919) + \epsilon_i \qquad (2)$$

Since the specification choice was made to mirror Almond's work this study's main findings use a model that includes a quadratic in the time trend. It should be noted, though, that at no time in Almond's 2006 study does he provide the basis for his decision to include a quadratic in the time trend, and further, no obvious historical or theoretical intuition for its inclusion is apparent. Thus, all the results presented in this section are accompanied in the Appendix by identical analysis that excludes this variable, Tables A1 - A3. The change does not substantially impact any of the results or interpretations.

IV.2 Results

Table 4 presents the coefficient estimates of β_3 from the analysis of the IPUMS 1% sample of the 1930 U.S. Census. The education coefficients, while not significant, each have the predicted sign. Further, the indicators of economic success are almost all significantly negative, at least at the

[10] The actual period used in the analysis was April 1st, 1911 to March 31st, 1923, in order to capture all the respondents born between 1912 and 1922.

10% level. This suggests that there was some treatment group assignment bias with respect to an individual's wealth. In regards to one of the other hypotheses, it is clear that the 1919 birth cohort is a member of significantly larger families, suggesting that Becker's theory of quality versus quantity may be biasing Almond's findings. Additionally, a further marker of parental composition, age of parent at birth, suggests that the parents of the 1919 birth cohort were significantly older at the time of the child's birth. Aside from the negative distributional change this suggests with respect to the education of the parents of the 1919 birth cohort, this fact can also adversely impact a child's long-term educational, economic, and health outcomes in a few additional ways.

First and foremost, children of older mothers have more health problems/risks than those of younger mothers, including birth defects, low birth weight, Down syndrome, and autism (Park and Falco 2010). In fact, it has even been shown that the age of the father is positively correlated with autism incidence in their children. Beyond the severe initial health risks they pose, older parents also need care from their children at a younger age which is associated with significantly higher levels of stress (Deimling and Bass 1986; Noelker and Townsend 1987; Stoller and Pugliesi 1989). Further, this additional need for care earlier in the child's life may stunt their educational and income trajectories, as the time, effort, and money spent on caring for the aging parent can limit the child's ability to take advantage of all opportunities and fully realize their potential.

Finally, the results using two additional parental characteristics are worth noting. First, as expected, the 1919 birth cohort is significantly less likely to be the child of a World War I veteran. Furthermore, a child born in the U.S. in 1919 was significantly less likely to have Caucasian parents. The latter of these composition differences is a clear signal of being born into a less ideal environment as, in 1930 America, being white provided not just circumstantially better educated and more economically viable parents but, due to rampant racism, also better long term opportunities for one's own achievement. Moreover, as mentioned, the draft classifications would suggest that children of non-WWI veterans are more likely to be born into financially unstable households. To more firmly establish both of these claims, this study examined the correlation between being a white father or being a WWI veteran father and the father's literacy, economic standing, and number of children while controlling for the father's age, father's age squared, and state of birth fixed effects. For each variable, being white or being a WWI veteran was significantly positively related to having more desirable traits.[11]

The 1930 U.S. Census indicates that the parents of the 1919 birth cohort were not random. Further, the attributes on which they selected into the "treatment" group are all negatively related to the child's future educational, economic, and health outcomes. While these results suggest that identification issues exist for Almond's findings, to feel entirely confident, it is important to make sure that the underlying census data is not biased and that the findings are unique to the 1919 birth cohort.

IV.3 Tests of Robustness

There are two main areas of sampling concern with respect to using the 1930 U.S. Census data. First, it is a reasonable conjecture that fathers of the 1919 birth cohort were less likely to be in WWI. Further, to be included in the regressions related to a father's characteristics, one's father must be alive in 1930. If it were the case that smarter and more economically viable soldiers were less likely to be killed at war, then the sample of pre-war birth cohort fathers may be biased because the weakest fathers are missing. If this issue is a valid concern, it should be the case that the children born before the war are significantly more likely to be missing data on their fathers. Evidence of this problem is not found.[12] Thus, while the intuition presents a problem, the data does not identify this bias.

A second area of concern is that the 1930 U.S. Census does not contain data for one's parents if the person was living independently from their parents. This is particularly problematic if those children that move out and live by themselves earlier are the children from lower quality households. To

[11]The results of this analysis can be found in the Appendix, Table A4.
[12]Analysis provided upon request.

determine the severity of this problem this study examined if early birth cohorts, the older children in 1930, had significantly less parental information. In the end, only the earliest birth cohort in the trend, 1912, exhibited this problem. Another way this issue could come into play is if the women from the most low quality households are being married off significantly younger than others. After a close examination of the data, it does appear that women in the pertinent period, 1912 to 1922, are significantly more likely to be missing parental than men. To test the robustness of the results to each of these potential composition concerns, the regressions from Table 4 were separately run using one specification that only included the period 1913 to 1922 and another which only used data on male children.

Table 5 presents the estimates when using the smaller time period. The results are very consistent with the base case in Table 4. Similarly, in Table 6, where only male children are included, only 2 of the 10 original significant findings have lost statistical significance. In addition, the point estimates from most of the remaining statistically significant regressions, owning a radio, father's occupation score, family size, and race, have all increased.

An additional potential critique of the findings in Table 4 is that, due to the large sample size being used, they may be non-unique to the 1919 birth cohort. If similar estimates, in sign and significance, are found for other birth cohorts the interpretation and importance of the results of Table 4 would be greatly hindered. Thus, to add strength to the results, placebo tests were run in which the dummy variable for the 1919 birth cohort was replaced by either an indicator variable for the 1917 birth cohort or the 1920 birth cohort.[13,14] Using either specification, estimates are non-significant or opposing from those in Table 4 in the literacy, socioeconomic status, family size, and parental age estimates. Only 2 of the 32 placebo regressions provide significant results in the same direction as Table 4, lending support to the

[13]To be a true placebo test the 1917 birth cohort was used rather than the 1918 birth cohort because the approximation of the 1918 birth cohort in the 1930 U.S. Census data contains an important quarter of the exposure group, those born in the first quarter of 1919.

[14]The results of this analysis can be found in the Appendix, Tables A5 and A6, respectively.

uniqueness of the 1919 birth cohort estimates.

In summary, even after testing for robustness, the overall message remains consistent; the children born in 1919 had family situations that were significantly more undesirable than children from the surrounding cohorts. Additionally, these results were significant despite losing a key segment of the pertinent birth cohort due to the limitations of the 1930 U.S. Census data. Including the children of the 1919 birth cohort that were unable to be properly assigned, those conceived in the 2nd quarter of 1918, should only strengthen the results. To address this inadequacy, as well as, to take a closer look at the timing of the treatment assignment bias, a second approach which uses the 1920 U.S. Census data was employed.

V Second Approach, 1920 U.S. Census Data

V.1 Methodology

Using the 1920 U.S. Census data provides some straightforward gains. First and most importantly, the 1920 census was taken on January 1st, 1920, thus one's age accurately predicts the respondent's year of birth and each birth cohort can be accurately identified. Further, in this census they recorded the age in months of all children 5 years old and younger, which means that for the birth cohorts from 1915 to 1919 the researcher knows the child's conception date down to the month. By exploiting these advantages, the study can examine the parental attributes of the true 1919 birth cohort, as well as, speak directly to the fact that children conceived in the 2nd and 3rd quarters of 1918 drive Almond's findings. Additionally, due to the fact that the cohorts of interest are 10 years younger in 1920, there is no concern that lower quality older children will have moved out, and as such, left the sample.[15] Along with these beneficial elements of the 1920 census data, though, are some obvious shortcomings.

The major problem with using data obtained on January 1st, 1920 is

[15]As before, the father's data is not missing significantly more for the pre-war cohorts.

that the comparison group loses almost the entire post pandemic cohort.[16] Although all indications from the 1930 U.S. Census analysis suggest that this is not the case, losing the post pandemic cohort leaves the significant differences found in the 1919 birth group open to the interpretation that they are simply the result of the start of a new trend. An additional restriction for this data, as mentioned above, is that the 1920 U.S. Census only has the more detailed age data back to 1915. Thus, analysis that wishes to use month or quarter of birth information is even more constrained. Finally, in the 1920 U.S. Census they do not ask about military status or radio ownership, so both of these outcomes are no longer testable.

The primary specification will be the same as equation (2) except the indicator for being born in 1919 will actually refer to being born between January 1st 1919 and December 31st 1919 and the trend will be from 1912 to 1919. A second model is used to establish the timing of the 1919 differences. Related in spirit to a similar regression in Almond 2005 it splits the 1919 birth year indicator into four separate quarter-of-1919 birth dummy variables. In addition, this model includes dummy variables for quarter of birth to control for the types of seasonal effects on the education and income composition of families that choose to have children during these quarters (Buckles and Hungerman 2008). As before, all the regressions were additionally run excluding the year of birth quadratic term. The alternative estimates were consistent with the main results and can be found in the Appendix, Tables B1 and B2.

V.2 Results

Table 7 presents the coefficient estimates of the 1919 birth cohort dummy from regressions over the 1912 to 1919 time period. The majority of the results are identical in interpretation to the estimates using the 1930 U.S. Census data. One conclusion for which there is a change is that being born in 1919 now has no significant relationship with the probability of one's father being in the labor force. This non-result, though, may stem

[16] Only the 4th quarter 1919 birth cohort could be considered relatively unexposed.

from the fact that so few fathers are not in the labor force in 1920, only 1.2%. If the 1919 birth cohort fathers were just as likely to be employed in 1920 as the fathers of the previous cohorts, it is hypothesized that they were employed in significantly lower income jobs. The results confirm this expectation. For both occupation score variables as well as the Duncan SEI outcome, fathers of children born in 1919 are doing significantly worse in 1920, after controlling for the time trend, than the fathers of the previous cohorts. Additionally, unlike in the previous section, both of the study's education proxies are now significant. Further, as before, the 1919 birth cohort is part of significantly larger families, has significantly older parents, and is significantly less likely to have white parents. Once again, the findings suggest that "treatment" group assignment is non-random in a way that is correlated with potential for poor later life outcomes.[17] What must still be addressed are Almond's findings that the 1st and 2nd quarter 1919 births have the poorest long-term outcomes. Table 8 presents results that explain these results through selection bias.

Table 8 displays the coefficient estimates for each of the quarter dummy variables of the 1919 birth cohort when using data from the 1915 to 1919 time period. The results mirror those in Table 7 and also offer a counter to Almond's claim that there should be no concern over non-random selection into giving birth during the 1st two quarters of 1919. In stark contrast, both of these quarters portend significant sorting behavior based on education, income, family size, parent's age, and race. Further, since the direction of all the coefficients indicate poorer conditions and they are usually the largest of the point estimates, it is unsurprising that Almond finds the worst outcomes for these cohorts.

Finally, as a counterpoint to Almond's Figure 1, Figure 4 presents the point estimates from each quarter of birth dummy over the 1916 to 3rd quarter 1919 time period from a regression of father's literacy rate, which

[17]As before, a placebo test was used to determine the uniqueness of the results. The estimates from regressions which replaced the 1919 birth cohort dummy with an indicator variable for the 1918 birth cohort are found in the Appendix, Table B3. In support of this study's hypotheses, none of the results were similar in sign and significance to those in Table 7.

controls for a birth year trend and seasonal effects (estimated over the 1915 to 1919 birth cohorts). As is clear, being born in the first 3 quarters of 1919 has an adverse relationship with father's literacy, severely hindering the inference Almond makes when presenting Figure 1. As in Section IV, the sum of the results indicates an acute problem for Almond's ability to determine the impact of fetal health on long-term health, wealth, and educational outcomes. As mentioned earlier though, this dataset, due to its lack of post-pandemic cohorts, may not hold water for all skeptics, so an attempt was made to repeat the analysis using a dataset which pulls together the benefits of both the 1920 and 1930 U.S. Censuses.

VI Third Approach, Combining Datasets

VI.1 Methodology

The previous section shows the power one gains in this analysis by correctly specifying the 1919 birth cohort. In particular, the quarter that the 1930 census analysis loses, the 1st quarter of 1919, is especially important to the results. It seems reasonable that if the 1919 birth cohort could be accurately determine in the 1930 census data, the results in section IV would make an even stronger statement. The final approach used in this study adds the 1920 U.S. Census's ability to correctly identify the 1919 birth cohort to the more complete 1930 U.S. Census data.

The first hurdle when combing these two datasets is that, as mentioned previously, they were conducted during different parts of the year and do not contain complete birth date information. This makes defining a consistent "birth year" variable more difficult. In order to do this, the part of the 1920 census data that also provides quarter of birth data is used, so that, as is the case in the 1930 U.S. Census, birth year can be defined as of March 31st. The combined dataset uses 1930 census information for the periods April 1st, 1911 to March 31st, 1915 and April 1st, 1920 to March 31st, 1923 and 1920 census information for the period April 1st, 1915 to December 31st, 1919. Constructed in this way, the dataset can accurately identify all the members of the 1919 birth cohort and contains the post-pandemic cohorts of interest. The drawback is that, by combining the censuses, one loses the entire January 1st, 1920 to March 31st, 1920 birth cohort.

While losing this data is far from ideal, analysis of the children born from 1915 to 1919 indicate that families who have their child in the first quarter of the year, controlling for those born in the 1st quarter of 1919, are significantly more literate, economically viable, and more likely to be white.[18] Following this logic, losing the 1st quarter 1920 birth cohort simply causes the analysis to underestimate the low quality of the parents of the 1919 birth cohort. The only variable for which there is concern that excluding the 1st quarter of 1920 birth cohort would overestimate the results is with age at birth, as the parents of first quarter children are significantly older during the 1915 to 1919 period, even when controlling for the first quarter 1919 birth cohort.

Choice of specification, when using the combined dataset, is also a bit more complicated. First of all, due to the fact that these responses are taken from separate censuses, given 10 years apart, there are certainly temporal and life cycle shifts in education and economic standing that need to be controlled. Further, beyond a simple intercept shift, there also may have been a change in the slope of outcomes. In this analysis, though, the slope change seems less likely as it would have to be assumed that, in the 10 years since 1920, the change in outcomes between parents, assumed to be on average one year different from each other, has significantly shifted trends.

The initial choice of specification was a model consistent with the previous analysis, which simply added a dummy variable for the 1930 census.[19] This model is slightly flawed though, as it does not account for the fact that, unlike in the previous analysis, birth year no longer linearly predicts the age of the child at the time of survey. For example in this combined data a child born in 1914 is 16 at the time of survey, 1930, while a child born in

[18]Father's inclusion in the labor force, as well as, the family size variables were not significantly different than zero.

[19]Estimates from this model are completely consistent with the primary model used in this section except for in the regressions on family size. Analysis provided upon request.

1915 is 5 at the time of survey, 1920. To control for this, following Almond 2005, an alternate specification choice is used that includes the 1930 survey year dummy, as well as, a quadratic in age of survey interacted with the 1930 census dummy term. Also, similar to Almond 2005, multiple other specifications were estimated with consistent results.[20] As in the previous sections, estimates from the main model, which exclude the year of birth quadratic, are completely consistent with the primary results and are found in the Appendix, Tables C1 - C3.

VI.2 Results

The coefficient estimates of the 1919 birth year dummy variable using the combined dataset are presented in Table 9. Consistent with all the previous findings, the 1919 birth cohort has fathers who are significantly less occupationally prosperous, have significantly lower socioeconomic status, and come from larger families with older parents.[21] Additionally, as was the case using the 1920 census, the estimates from the combined data indicate that the parents of the 1919 birth cohort are significantly less literate. Taken together, these findings continue to confirm the suspicion that Almond's natural experiment is non-random in a way which clouds identification of the impact of fetal health on long-term outcomes.

VI.3 Tests of Robustness

The same attrition concerns espoused in Section IV are present in the combined dataset. As before, the concern over losing pre-war cohort data from relatively lower quality fathers who passed away in the war, is not empirically founded, as there is no significant relationship between missing one's father's information and being born before WWI. On the other hand, as in Section IV, there does appear to be a relationship between missing parental data and being from the 1912 birth cohort or being an older girl.

[20]Estimates of three alternate models can be found in the Appendix, Tables C4 - C6.

[21]As mentioned previously, the age of the parents' estimates may be biased due to the missing 1st quarter 1920 birth cohort.

As in Section IV, robustness tests were conducted by repeating the analysis from Table 9 using one specification that only included the period 1913 to 1922 and another that only used data on males. The results for these two analyses can be found in Tables 10 and 11, respectively. The inference made on the estimates from these alternative models remains completely consistent with the primary findings.

Finally, as in the previous sections, placebo tests were conducted to examine the uniqueness of the findings with respect to the 1919 birth cohort. Tables C7 and C8, in the Appendix, provide the results of regressions which replace the 1919 birth cohort indicator variable with dummy variables for the 1918 birth cohort and the 1920 birth cohort, respectively.[22] In congruence with the previous placebo tests, Tables C7 and C8 support this study's hypotheses, as none of the estimates are similar in sign and significance to the main findings found in Table 9.

VII Discussion

The previous three sections make a strong case that the parents of the 1919 birth cohort were significantly different than the parents of surrounding cohorts in areas that damage the identification strategy used in Almond's U.S. influenza papers. The next appropriate step to take, after identifying this bias, is to estimate to what extent controlling for parental characteristics reduces the magnitude and significance of Almond's findings. Unfortunately, testing this directly is not possible as neither data source used in Almond's U.S. influenza papers (U.S. Census and SIPP) has data on parental or family background characteristics. In order to provide a lower bound approximation of the importance of factoring in parental characteristics when examining the persistent effect of fetal health using the 1918 U.S. influenza pandemic, an additional analysis was conducted.

The strategy was to replicate Douglas Almond's 2006 work, which uses

[22]Due to the appending process and the 1930 U.S. Census data, the 1920 birth cohort dummy used in these regressions represents people born between April 1, 1920 and March 31, 1921.

the 1960, 1970, and 1980 IPUMS samples, and compare his findings to the same model which additionally includes as close a control for parental characteristics as is available in the data.[23] The most useful data to proxy parental characteristics is information about the respondent's childhood environment. The only variables that fit this description in the data are the respondent's state of birth and race. While these variables are clearly insufficient to hold constant all the differences in parental characteristics identified in the previous sections, incorporating them into the regressions can serve as a partial control for the differential childhood environment factors faced by the 1919 birth cohort.[24]

This correction analysis was conducted by first replicating Almond's 2006 findings using his original specification (shown in Equation 1) and then comparing the magnitude and significance of the point estimates on the 1919 birth cohort dummy variable to the same model that additionally includes

[23]The data used for the replication and additional analysis was the same IPUMS U.S. Census microdata used in Almond's work, except, while he did not use any age or birthplace data with a census quality flag above 3, this study does not use any variable's value which had a quality flag above 3. In addition, this study's analysis removed any individual not born in the U.S. These changes in the data had little impact on the magnitude or significance of his original findings. In the 54 regressions replicating Almond's work, the significance level interpretation (significant at or below 5%, vs. other) only changed 6 times. Further, of these 6 changes, two resulted in lower p-values, three only changed from significant at or below the 5% level to having p-values between .06 and .09, and only one changed from significant at the 5% level to insignificant.

[24]Along with the methodology already mentioned, in his 2006 paper, Douglas Almond uses an alternative strategy in order to look at outcome differences by state of birth. In this analysis he uses maternal mortality rates by state and year prior to birth to proxy for infection intensity. This methodology though, does not control for the identification biases discussed in this paper, as high maternal mortality rates in one year are likely to be correlated with poor parental characteristics and a weaker health environment for the next birth cohort. High maternal mortality rates, particularly when the rate is trending up, can serve as a signal of a poor quality health environment. In states where maternal mortality rates where relatively high or steadily increasing in the previous year, the families that still choose to conceive a child are likely to have weaker preferences for health and the child is likely being born into an increasingly low quality health environment. Using Almond's state of birth model the subsequent inferior long-term outcomes of the child would simply be viewed as the result of poorer in utero health, and the findings would seemingly verify Almond's hypotheses. As is apparent from this example though, the fetal health variation Almond is using in this analysis is significantly correlated with parental and environmental characteristics and, similar to his simpler methodology, a failure to control for these factors will lead to biased results.

indicators for the respondent's state of birth, race, and an interaction of the two.[25] By using this alternative model the comparison group that the members of the 1919 birth cohort is being evaluated against will be stripped of the differential parental characteristics that are constant within a state, racial group, and its interaction over this time period.

Tables 12 and 13 present the results of this analysis for men and women, respectively. As an overview, of the 37 estimates of the 1919 birth cohort effect that had the sign that corresponded to Almond's hypothesis and were significant at or below the 5% level in the 2006 paper, approximately 40%, 14, are no longer significant at that level.[26] Further, on average, those 37 point estimates lost 40% of their magnitude.

The results that hold up the most to these artificial controls for parental characteristics are the education regressions. None of the 12 male or female regressions of interest, which look at high school graduation or total years of education, lose their significance. Even with no changes of statistical significance though, the magnitudes of the point estimates are greatly reduced. The high school graduation point estimates are reduced by an average of one-third (34% for men and 32% for women) and the years of education magnitudes are reduced by 42% (40% for men and 44% for women). These findings suggest that at least at an upper bound, Almond's estimates, while greatly reduced, still remain significant for educational outcomes. The estimates using the financial outcomes are less favorable.

Of the 18 regressions of interest that deal with in utero health's impact on long term financial outcomes (total income, wage income, neighbors' income, poverty, and Duncan's SEI) *half* of the results are no longer significant

[25]The race variable used is an indicator variable taking the value one if the subject is white and zero otherwise. All regressions follow Equation 1, except in the few instances that Almond specifically uses a different model. The "years of disability in 1970" regressions were not replicated as the public data only had it coded as a categorical rather than ordinal variable.

[26]This 37 drops two regressions that fit the criteria given in the text; the 1970 regression for men on "years of disability" as it was not replicated for reasons mentioned in footnote 25, as well as, the 1970 regression for women on "disability prevents work", as simply using higher quality data, even before fixed effects were introduced, made the coefficient non-significant.

at the 5% level. As expected the magnitudes are also greatly reduced; the point estimates of interest are reduced by approximately 44% for men and 51% for women (56% for the 9 made non-significant and 37% for the 9 that remained significant at the 5% level). Taken all together, these results suggest that, even at an upper bound, Almond's findings with regard to in utero health's impact on later life economic well-being is greatly diminished once parental characteristics are controlled. Similarly, the effects on disability and entitlement payments are also not supportive of Almond's original findings.

To analyze fetal health's impact on adult health Douglas Almond's 2006 research uses measures of disability and entitlement payments as its indicators. For males, he finds some consistent and significant support for the hypothesis that the 1919 birth cohort is more likely to have a disability that prevents or limits work and more likely to be receiving entitlement payments (6 of his 8 estimates are significant at the 5% level), but when the same regressions are run adding proxies for parental characteristics, the evidence is greatly attenuated. Four of the 6 previously significant results are no longer significant at the 5% level, and the point estimates are reduced by an average of 25% after partially controlling for childhood environment. Further, when analyzing women, Almond's results were mostly non-supportive; only 2 of 8 were originally significant at the 5% level and had the hypothesized sign and, moreover, 1 of the regressions was significant and had the opposite sign. Additionally, when the regressions were re-estimated, one of these two supportive findings lost significance once the controls were added, and the other's significance was unable to be replicated with either the original or alternative specification as mentioned in footnote 26. In summary, of the 16 estimates of the impact of in utero health on disability and entitlement payments, only 2 remained significant at the 5% level with Almond's hypothesized sign once proxies for parental characterizes were added.

While the two analysis described in this section is imperfect, it makes a point consistent with the previous sections; the sample selection issue expressed in this study has a significant attenuating effect on the magnitude and power of results that use the 1918 U.S. influenza pandemic as a natural experiment for in utero health and do not control for parental characteristics.

VIII Conclusion

Testing the fetal-origins hypothesis using methods other than a natural experiment is rife with empirical and logistical issues. Controlling for all the unobserved parental characteristics correlated with both a parent's health and a child's later life outcomes, as well as, obtaining data which includes the health of pregnant mothers, family characteristics, and follows the child to adulthood is seemingly impossible. Further, experimenting with maternal health has ethical constraints, as well as, financial burdens inherent in tracking the sample children for several decades. Given this reality, a number of researchers, as documented in Section II, have tried to use the natural experiment framework with limited precision and varying results. Douglas Almond's clever use of the 1918 U.S. influenza pandemic and its landmark findings appeared to be the long awaited breakthrough in the study of fetal health's persistence. What was taken for granted though, was the appropriateness of the natural experiment framework to the U.S. experience of the influenza pandemic. This paper set out to explore the underlying assumptions necessary to support Almond's influential findings.

The more complete historical circumstances, presented in Section III, led to reasonable hypotheses that challenged the concept of randomness necessary to the use of the 1918 U.S. influenza pandemic as a natural experiment. The approaches presented in Sections IV-VI, while each having their own unique data limitations, consistently confirmed many of these suppositions, including that families of the "treatment" group were significantly less educated, less wealthy, and larger. Most damaging to Almond's inference, each of these characteristics is a direct or theoretical sign of low quality parentage that can impact a child's later life health, wealth, and educational outcomes. While this paper in no way comments on the legitimacy of the fetal-origins hypothesis, it does assert that its most seminal work in economics has large enough identification ambiguity to make its estimates untenable.

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X Tables and Figures

Table 1—Estimates of 1919 Cohort Effects on Health Outcomes

Outcome	1919 coefficient
Health (1 to 5)	0.070
	(0.026)
Fair or poor health	0.037
	(0.011)
Trouble hearing	0.025
	(0.008)
Trouble speaking	0.008
	(0.004)
Trouble lifting	0.030
	(0.011)
Trouble walking at all	0.024
	(0.009)
Diabetes	0.010
	(0.005)
Stroke	0.010
	(0.004)

Notes: Standard errors are in parentheses. Equations include survey year dummies and survey year interacted with quadratic in age.

TABLE 2—ESTIMATES OF 1919 QUARTER OF BIRTH EFFECTS ON HEALTH OUTCOMES

	Quarter			
Outcome	1919:1	1919:2	1919:3	1919:4
Health (1–5)	0.050	**0.141**	0.053	0.043
	(0.049)	**(0.050)**	(0.050)	(0.047)
Fair or poor health	**0.040**	**0.065**	0.035	0.013
	(0.021)	**(0.021)**	(0.021)	(0.020)
Trouble hearing	**0.031**	0.023	0.017	**0.029**
	(0.016)	(0.016)	(0.016)	**(0.015)**
Trouble speaking	**0.012**	0.008	−0.002	**0.011**
	(0.007)	(0.007)	(0.007)	**(0.007)**
Trouble lifting	0.021	**0.039**	0.025	0.030
	(0.020)	**(0.020)**	(0.020)	(0.019)
Trouble walking at all	**0.034**	0.013	0.004	**0.043**
	(0.017)	(0.017)	(0.017)	**(0.016)**
Diabetes	0.005	**0.023**	−0.003	**0.016**
	(0.009)	**(0.009)**	(0.009)	**(0.008)**
Stroke	0.007	0.011	**0.014**	0.010
	(0.007)	(0.007)	**(0.007)**	(0.007)

Notes: Standard errors are in parentheses. Results in bold are significant at the 10-percent level. Equations include survey year dummies, survey year interacted with quadratic in age, and dummies for quarter of birth to absorb seasonal effects.

Table 3

DEPARTURE OF 1919 MALE BIRTH COHORT OUTCOMES FROM 1912–22 TREND

	CENSUS YEAR		
OUTCOME	1960	1970	1980
High school graduate	−.021***	−.020***	−.014***
	[.005]	[.003]	[.003]
Years of education	−.150***	−.176***	−.117***
	[.038]	[.023]	[.019]
Total income	−573*	−1,236***	−1,065***
	[295]	[253]	[191]
Wage income	−812***	−875***	−688***
	[261]	[233]	[179]
Poor (below 150% of the poverty level)	.010**	.009***	.006***
	[.005]	[.002]	[.002]
Neighbors' income ($N =$ 102,948)		−875***	
		[197]	
Socioeconomic status (Duncan's socioeconomic index)	−.640**	−.808***	−.816***
	[.259]	[.157]	[.137]
Disability limits work		.006***	.005**
		[.002]	[.002]
Disability prevents work		.004***	.001
		[.001]	[.002]
Years of disability		.092***	
		[.025]	
Social Security income		1	83***
		[2]	[19]
Welfare income		12**	17**
		[6]	[7]
Observations	114,031	308,785	471,803

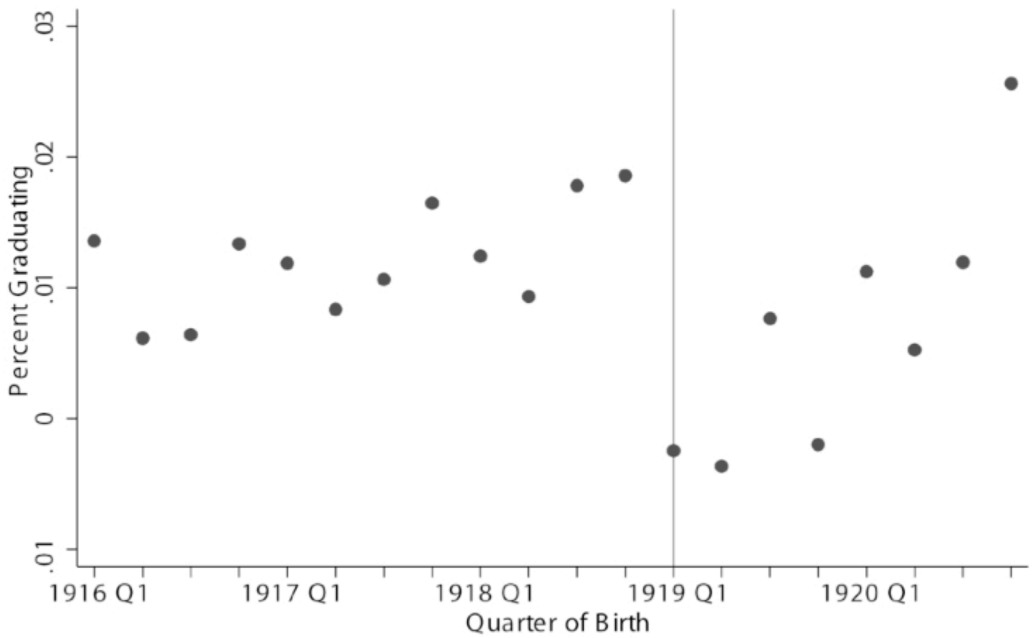
NOTE.—Robust standard errors are in brackets. All income figures are given in 2005 dollars.

* Significant at 10 percent.

** Significant at 5 percent.

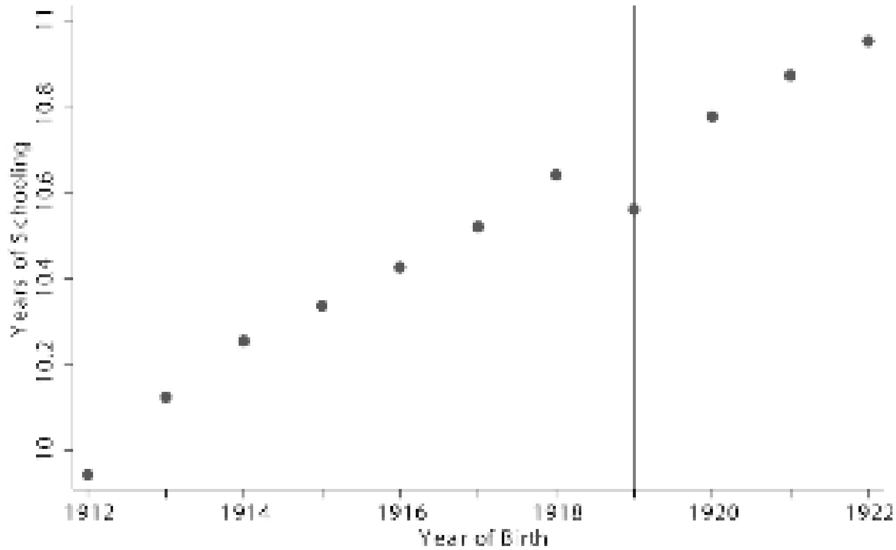
*** Significant at 1 percent.

Figure 1



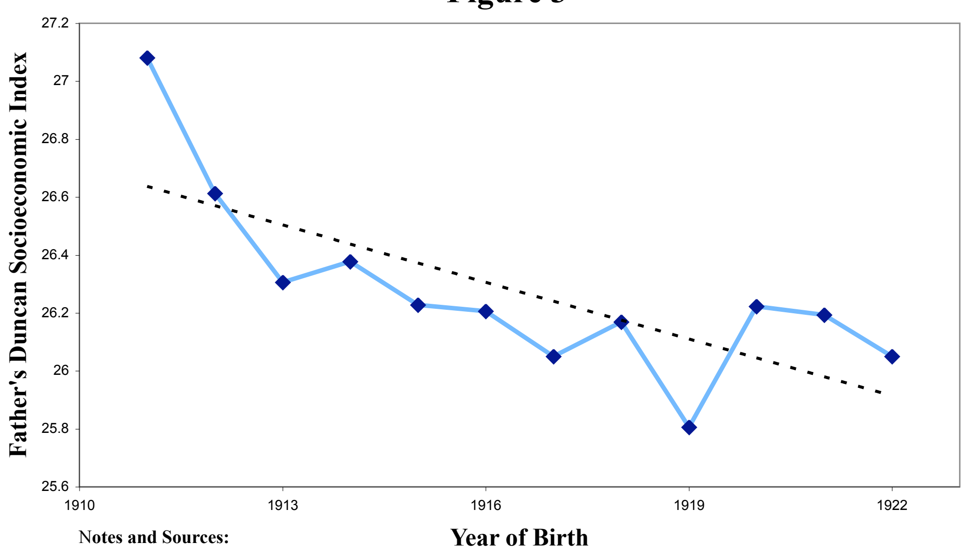
Note: Regression-adjusted 1980 high school graduation rate by quarter of birth

Figure 2



Note: 1960 average years of schooling; men and women born in the United States

Figure 3



Notes and Sources:
Data obtained from 1 percent sample of 1930 U.S. Census
Year of birth covers 4/1/YOB - 3/31/YOB+1

Table 4
Departure of 1919 Birth Cohort[1] Parental Characteristics from 1912-1922 Trend[2]
Using 1930 U.S. Census Data

Parental Characteristics	Observations	Mean	Born in 1919[1]
Father's Literacy	237,785	92.8%	-0.001 (0.002)
Mother's Literacy	252,565	93.1%	-0.002 (0.002)
Father in the Labor Force	237,783	97.5%	-0.002 ** (0.001)
Father's Duncan SEI	233,865	26.2	-0.266 * (0.158)
Father's Occupation Income Score	233,865	23.6	-0.134 * (0.077)
Father's Occupation Earnings Score	233,714	44.6	-0.286 (0.230)
Parents Own a Radio	281,463	34.6%	-0.009 ** (0.003)
Number of Father's Children in HH	237,785	4.1	0.068 *** (0.016)
Number of Mother's Children in HH	252,565	4.1	0.067 *** (0.015)
Father's Age at Birth	237,785	32.1	0.250 *** (0.059)
Mother's Age at Birth	252,556	27.6	0.237 *** (0.050)
Father's a WWI Veteran	237,785	6.9%	-0.011 *** (0.002)
Parents are White	281,463	87.6%	-0.008 *** (0.002)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, 1919 birth cohort consists of people born between April 1, 1919 and March 31, 1920.
[2]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.

Table 5
Departure of 1919 Birth Cohort[1] Parental Characteristics from 1913-1922 Trend[2]
Using 1930 U.S. Census Data

Parental Characteristics	Observations	Mean	Born in 1919[1]
Father's Literacy	222,545	92.8%	-0.001
			(0.002)
Mother's Literacy	235,817	93.2%	-0.003
			(0.002)
Father in the Labor Force	222,543	97.6%	-0.002 *
			(0.001)
Father's Duncan SEI	219,098	26.2	-0.309 *
			(0.160)
Father's Occupation Income Score	219,098	23.6	-0.157 **
			(0.078)
Father's Occupation Earnings Score	218,955	44.6	-0.362
			(0.232)
Parents Own a Radio	259,062	34.4%	-0.009 **
			(0.003)
Number of Father's Children in HH	222,545	4.1	0.067 ***
			(0.016)
Number of Mother's Children in HH	235,817	4.1	0.069 ***
			(0.015)
Father's Age at Birth	222,545	32.1	0.254 ***
			(0.059)
Mother's Age at Birth	235,813	27.6	0.217 ***
			(0.050)
Father's a WWI Veteran	222,545	7.2%	-0.010 ***
			(0.002)
Parents are White	259,062	87.7%	-0.007 **
			(0.002)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, 1919 birth cohort consists of people born between April 1, 1919 and March 31, 1920.
[2]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1912 to March 31, 1923.

Table 6
Departure of 1919 Male Birth Cohort[1] Parental Characteristics from 1912-1922 Male Trend[2] Using 1930 U.S. Census Data

Parental Characteristics	Observations	Mean	Born in 1919[1]
Father's Literacy	121,164	92.8%	-0.001
			(0.003)
Mother's Literacy	128,431	93.1%	-0.002
			(0.003)
Father in the Labor Force	121,164	97.5%	-0.001
			(0.002)
Father's Duncan SEI	119,197	26.1	-0.229
			(0.222)
Father's Occupation Income Score	119,197	23.5	-0.190 *
			(0.108)
Father's Occupation Earnings Score	119,121	44.3	-0.373
			(0.323)
Parents Own a Radio	141,658	34.8%	-0.013 **
			(0.005)
Number of Father's Children in HH	121,164	4.1	0.088 ***
			(0.022)
Number of Mother's Children in HH	128,431	4.1	0.086 ***
			(0.021)
Father's Age at Birth	121,164	32.1	0.226 **
			(0.082)
Mother's Age at Birth	128,427	27.6	0.205 **
			(0.070)
Father's a WWI Veteran	121,164	6.8%	-0.011 ***
			(0.003)
Parents are White	141,658	87.8%	-0.011 ***
			(0.003)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, 1919 birth cohort consists of people born between April 1, 1919 and March 31, 1920.
[2]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.

Table 7
Departure of 1919 Birth Cohort Parental Characteristics from 1912-1919 Trend Using 1920 U.S. Census Data

Parental Characteristics	Observations	Mean	Born in 1919
Father's Literacy	171,030	90.7%	-0.013 ***
			(0.004)
Mother's Literacy	176,502	90.5%	-0.014 ***
			(0.004)
Father in the Labor Force	171,028	98.8%	0.001
			(0.001)
Father's Duncan SEI	169,133	24.4	-0.820 **
			(0.254)
Father's Occupation Income Score	169,133	22.7	-0.361 **
			(0.130)
Father's Occupation Earnings Score	168,988	42.1	-1.029 **
			(0.389)
Number of Father's Children in HH	171,030	3.7	0.342 ***
			(0.026)
Number of Mother's Children in HH	176,502	3.7	0.335 ***
			(0.025)
Father's Age at Birth	171,030	32.9	0.491 ***
			(0.103)
Mother's Age at Birth	176,502	28.1	0.420 ***
			(0.084)
Parents are White	183,456	88.6%	-0.016 ***
			(0.004)

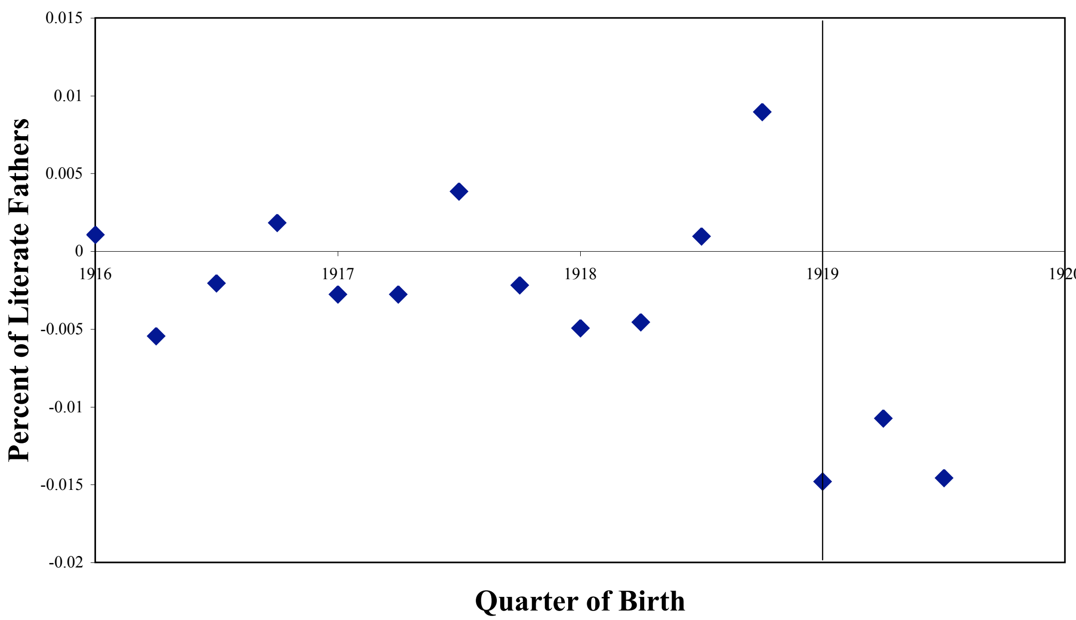
Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent

Table 8
Departure of 1919 Birth Cohort by Quarter Parental Characteristics from 1915-1919 Trend Using 1920 U.S. Census Data

Parental Characteristics	Observations	Mean	Born 1Q1919	Born 2Q1919	Born 3Q1919	Born 4Q1919
Father's Literacy	107,836	91.0%	-0.016 **	-0.010	-0.018 **	-0.005
			(0.007)	(0.007)	(0.007)	(0.007)
Mother's Literacy	111,143	90.9%	-0.027 ***	-0.011 *	-0.024 ***	-0.010
			(0.007)	(0.007)	(0.007)	(0.007)
Father in the Labor Force	107,834	98.9%	-0.004 *	-0.003	-0.002	-0.001
			(0.003)	(0.002)	(0.002)	(0.002)
Father's Duncan SEI	106,733	24.4	-1.281 **	-1.294 **	-1.129 **	-0.240
			(0.487)	(0.480)	(0.482)	(0.492)
Father's Occupation Income Score	106,733	22.8	-0.690 **	-0.745 **	-0.494 **	-0.263
			(0.248)	(0.244)	(0.246)	(0.250)
Father's Occupation Earnings Score	106,628	42.3	-1.937 **	-2.397 **	-1.238 *	-0.378
			(0.742)	(0.734)	(0.738)	(0.754)
Number of Father's Children in HH	107,836	3.4	0.295 ***	0.439 ***	0.428 ***	0.329 ***
			(0.049)	(0.049)	(0.049)	(0.050)
Number of Mother's Children in HH	111,143	3.4	0.307 ***	0.434 ***	0.423 ***	0.343 ***
			(0.048)	(0.048)	(0.048)	(0.049)
Father's Age at Birth	107,836	32.9	0.422 **	0.733 ***	0.660 ***	0.110
			(0.196)	(0.194)	(0.195)	(0.200)
Mother's Age at Birth	111,143	28.1	0.435 **	0.573 ***	0.370 **	0.083
			(0.160)	(0.158)	(0.157)	(0.162)
Parents are White	114,443	89.1%	-0.027 ***	-0.023 **	-0.020 **	-0.003
			(0.007)	(0.007)	(0.007)	(0.007)

Notes:
Specification includes quarter of birth fixed effects.
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent

Figure 4



Note: Regression-adjusted 1920 literacy rate of fathers by quarter of child's birth.

Table 9
Departure of 1919 Birth Cohort Parental Characteristics from 1912-1922 Trend[1]
Using Combined 1920 and 1930 U.S. Census Data[2]
and Model to Account for Child's Age at Survey[3]

Parental Characteristics	Observations	Mean	Born in 1919
Father's Literacy	238,768	92.0%	-0.007 **
			(0.003)
Mother's Literacy	250,778	92.2%	-0.005 *
			(0.003)
Father in the Labor Force	238,765	98.0%	0.001
			(0.001)
Father's Duncan SEI	235,282	25.5	-0.559 **
			(0.209)
Father's Occupation Income Score	235,282	23.3	-0.244 **
			(0.106)
Father's Occupation Earnings Score	235,097	43.7	-0.674 **
			(0.320)
Number of Father's Children in HH	238,768	3.8	0.212 ***
			(0.021)
Number of Mother's Children in HH	250,778	3.8	0.214 ***
			(0.021)
Father's Age at Birth	238,768	32.5	0.571 ***
			(0.085)
Mother's Age at Birth	250,770	27.8	0.509 ***
			(0.069)
Parents are White	273,457	88.0%	-0.005
			(0.003)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
[2]Data for people born between April 1, 1911 and March 31, 1915 or April 1, 1920 and March 31, 1923 is taken from 1930 U.S. Census. Data for people born between April 1, 1915 and December 31, 1919 is taken from the 1920 U.S. Census. Data on people born between January 1, 1920 and March 31, 1920 is unavailable.
[3]Model uses birth year, birth year squared, 1930 census year dummy, 1930 census year dummy interacted with quadratic in age at survey, and 1919 birth cohort dummy as right hand side variables.
Age at survey was determined as the age of the child as of April 1st of the census year.

Table 10
Departure of 1919 Birth Cohort Parental Characteristics from 1913-1922 Trend[1]
Using Combined 1920 and 1930 U.S. Census Data[2]
and Model to Account for Child's Age at Survey[3]

Parental Characteristics	Observations	Mean	Born in 1919
Father's Literacy	223,528	92.0%	-0.007 **
			(0.003)
Mother's Literacy	234,030	92.2%	-0.005
			(0.003)
Father in the Labor Force	223,525	98.1%	0.001
			(0.001)
Father's Duncan SEI	220,515	25.4	-0.513 **
			(0.210)
Father's Occupation Income Score	220,515	23.2	-0.217 **
			(0.107)
Father's Occupation Earnings Score	220,338	43.6	-0.586 *
			(0.322)
Number of Father's Children in HH	223,528	3.8	0.210 ***
			(0.021)
Number of Mother's Children in HH	234,030	3.7	0.210 ***
			(0.021)
Father's Age at Birth	223,528	32.5	0.563 ***
			(0.085)
Mother's Age at Birth	234,027	27.8	0.520 ***
			(0.002)
Parents are White	251,056	88.1%	-0.006 *
			(0.003)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1912 to March 31, 1923.
[2]Data for people born between April 1, 1912 and March 31, 1915 or April 1, 1920 and March 31, 1923 is taken from 1930 U.S. Census. Data for people born between April 1, 1915 and December 31, 1919 is taken from the 1920 U.S. Census. Data on people born between January 1, 1920 and March 31, 1920 is unavailable.
[3]Model uses birth year, birth year squared, 1930 census year dummy, 1930 census year dummy interacted with quadratic in age at survey, and 1919 birth cohort dummy as right hand side variables.
Age at survey was determined as the age of the child as of April 1st of the census year.

Table 11
Departure of 1919 Male Birth Cohort Parental Characteristics from 1912-1922 Male Trend[1]
Using Combined 1920 and 1930 U.S. Census Data[2]
and Model to Account for Child's Age at Survey[3]

Parental Characteristics	Observations	Mean	Born in 1919
Father's Literacy	122,612	92.1%	-0.009 **
			(0.004)
Mother's Literacy	128,561	92.3%	-0.007 *
			(0.004)
Father in the Labor Force	122,611	98.0%	0.001
			(0.002)
Father's Duncan SEI	120,866	25.4	-0.822 **
			(0.293)
Father's Occupation Income Score	120,866	23.2	-0.329 **
			(0.148)
Father's Occupation Earnings Score	120,777	43.6	-0.946 **
			(0.447)
Number of Father's Children in HH	122,612	3.8	0.222 ***
			(0.030)
Number of Mother's Children in HH	128,561	3.8	0.223 ***
			(0.029)
Father's Age at Birth	122,612	32.4	0.575 ***
			(0.118)
Mother's Age at Birth	128,558	27.8	0.512 ***
			(0.096)
Parents are White	138,575	88.3%	-0.009 **
			(0.004)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
[2]Data for people born between April 1, 1911 and March 31, 1915 or April 1, 1920 and March 31, 1923 is taken from 1930 U.S. Census. Data for people born between April 1, 1915 and December 31, 1919 is taken from the 1920 U.S. Census. Data on people born between January 1, 1920 and March 31, 1920 is unavailable.
[3]Model uses birth year, birth year squared, 1930 census year dummy, 1930 census year dummy interacted with quadratic in age at survey, and 1919 birth cohort dummy as right hand side variables.
Age at survey was determined as the age of the child as of April 1st of the census year.

Table 12
Analysis of the Magnitude and Significance of the Almond 2006 Estimates of the Impact of Being Born in 1919 for Men When Adding Place of Birth Indicators, a Race Indicator, as well as their Interaction[1]

	1960 U.S. Census		1970 U.S. Census		1980 U.S. Census	
Long-Term Outcome	Magnitude Reduction[2]	Still Sig. at 5%[3]	Magnitude Reduction[2]	Still Sig. at 5%[3]	Magnitude Reduction[2]	Still Sig. at 5%[3]
High School Graduate	26%	YES	33%	YES	41%	YES
Years of Education	40%	YES	35%	YES	46%	YES
Total Income	62%	n/a	46%	YES	27%	YES
Wage Income	48%	**NO**	44%	YES	28%	YES
Poor (below 150% of the poverty level)	52%	**NO**	47%	YES	86%	**NO**
Neighbors' Income			41%	YES		
Duncan's Socioeconomic Index	41%	**NO**	35%	YES	36%	**NO**
Disability Limits Work			19%	YES	35%	**NO**
Disability Prevents Work			46%	**NO[4]**	92%	n/a
Social Security Income			955%	n/a	-7%	YES
Welfare Income			23%	**NO[5]**	33%	**NO[6]**

Notes:
Comparison regressions use the same models as in Almond's 2006 paper and data is taken from IPUMS sample noted in the column header.
IPUMS data used for all regressions was cleaned of respondents born outside the U.S. and no value with a quality flag above 3 is used (i.e. "hot deck" and "cold deck" allocated values are not used).
[1]A dummy variable for whether the respondent was white was used as the race indicator.
[2]Reduction is calculated as (Orig. Coeff. - New Coeff.)/(Orig. Coeff.). Negative reduction indicates the point estimate became larger in absolute terms.
[3]"YES"/"NO" indicates whether being born in 1919 remained significant at or below the 5% level in the fixed effect specification of Almond's model. "n/a" indicates that the 1919 dummy variable was not significant in Almond's original specification.
[4]When limiting to only higher quality values, the replicated non-fixed effect regression no longer was significant at or below the 5% level as in the Almond 2006 paper (p-value of replication is .09). The fixed effects specification further increases the p-value to .35.
[5]As in footnote 4, replication of Almond's regression gives p-value no longer at or below .05 (p-value of replication is .06). The fixed effects specification further increases the p-value to .14.
[6]As in footnote 4, replication of Almond's regression gives p-value no longer at or below .05 (p-value of replication is .07). The fixed effects specification further increases the p-value to .30.

Table 13

Analysis of the Magnitude and Significance of the Almond 2006 Estimates of the Impact of Being Born in 1919 for Women When Adding Place of Birth Indicators, a Race Indicator, as well as their Interaction[1]

	1960 U.S. Census		1970 U.S. Census		1980 U.S. Census	
Long-Term Outcome	Magnitude Reduction[2]	Still Sig. at 5%[3]	Magnitude Reduction[2]	Still Sig. at 5%[3]	Magnitude Reduction[2]	Still Sig. at 5%[3]
High School Graduate	29%	YES	32%	YES	35%	YES
Years of Education	40%	YES	38%	YES	54%	YES
Total Income	-21%	Other[4]	34%	n/a	24%	YES
Wage Income	-57%	n/a	53%	n/a	36%	n/a
Poor (below 150% of the poverty level)	64%	**NO**	57%	**NO**	70%	**NO[7]**
Neighbors' Income			73%	**NO**		
Duncan's Socioeconomic Index	60%	**NO[5]**	50%	**NO**	41%	YES
Disability Limits Work			71%	n/a	72%	n/a
Disability Prevents Work			47%	**NO[6]**	71%	n/a
Social Security Income			158%	n/a	6%	YES[8]
Welfare Income			36%	**NO**	64%	n/a

Notes:
Comparison regressions use the same models as in Almond's 2006 paper and data is taken from IPUMS sample noted in the column header.
IPUMS data used for all regressions was cleaned of respondents born outside the U.S. and no value with a quality flag above 3 is used (i.e. "hot deck" and "cold deck" allocated values are not used)
[1]A dummy variable for whether the respondent was white was used as the race indicator.
[2]Reduction is calculated as (Orig. Coeff. - New Coeff.)/(Orig. Coeff.). Negative reduction indicates the point estimate became larger in absolute terms.
[3]"YES"/"NO" indicates whether being born in 1919 remained significant at or below the 5% level in the fixed effect specification of Almond's model. "n/a" indicates that the 1919 dummy variable was not significant in Almond's original specification.
[4]In Almond 2006 total income is significant at the 10% level, but the sign of the coefficient, contradicting his hypothesis, is positive. Using the fixed effects specification the point estimate remains positive and becomes significant at the 5% level.
[5]When limiting to only higher quality values, the replicated non-fixed effect regression was significant at the 5% level, while in the Almond 2006 paper it was not. The fixed effects specification increases the p-value to .31.
[6]When limiting to only higher quality values, the replicated non-fixed effect regression no longer was significant at or below the 5% level as in the Almond 2006 paper (p-value of replication is .16) The fixed effects specification further increases the p-value to .45.
[7]As in footnote 5, the replicated non-fixed effect regression was significant at the 5% level, while in the Almond 2006 paper it was not. The fixed effects specification increases the p-value to .34.
[8]In Almond 2006 SS income is significant at or below the 5% level, but the sign of the coefficient, contradicting his hypothesis, is negative. Using the fixed effects specification the point estimate remains negative and significant at or below the 5% level.

XI Appendix

Table A1
Departure of 1919 Birth Cohort[1] Parental Characteristics from 1912-1922 Trend[2]
Using 1930 U.S. Census Data and Alternative Specification[3]

Parental Characteristics	Observations	Mean	Born in 1919[1]
Father's Literacy	237,785	92.8%	-0.002
			(0.002)
Mother's Literacy	252,565	93.1%	-0.003
			(0.002)
Father in the Labor Force	237,783	97.5%	-0.001
			(0.001)
Father's Duncan SEI	233,865	26.2	-0.356 **
			(0.155)
Father's Occupation Income Score	233,865	23.6	-0.174 **
			(0.076)
Father's Occupation Earnings Score	233,714	44.6	-0.410 *
			(0.225)
Parents Own a Radio	281,463	34.6%	-0.010 **
			(0.003)
Number of Father's Children in HH	237,785	4.1	0.118 ***
			(0.015)
Number of Mother's Children in HH	252,565	4.1	0.121 ***
			(0.015)
Father's Age at Birth	237,785	32.1	0.226 ***
			(0.058)
Mother's Age at Birth	252,556	27.6	0.225 ***
			(0.049)
Father's a WWI Veteran	237,785	6.9%	-0.027 ***
			(0.002)
Parents are White	281,463	87.6%	-0.004 *
			(0.002)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, 1919 birth cohort consists of people born between April 1, 1919 and March 31, 1920.
[2]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
[3]Model excludes quadratic in year of birth.

Table A2
Departure of 1919 Birth Cohort[1] Parental Characteristics from 1913-1922 Trend[2] Using 1930 U.S. Census Data and Alternative Specification[3]

Parental Characteristics	Observations	Mean	Born in 1919[1]
Father's Literacy	222,545	92.8%	-0.002
			(0.002)
Mother's Literacy	235,817	93.2%	-0.003
			(0.002)
Father in the Labor Force	222,543	97.6%	-0.001
			(0.001)
Father's Duncan SEI	219,098	26.2	-0.360 **
			(0.155)
Father's Occupation Income Score	219,098	23.6	-0.176 **
			(0.076)
Father's Occupation Earnings Score	218,955	44.6	-0.416 *
			(0.225)
Parents Own a Radio	259,062	34.4%	-0.010 **
			(0.003)
Number of Father's Children in HH	222,545	4.1	0.119 ***
			(0.015)
Number of Mother's Children in HH	235,817	4.1	0.123 ***
			(0.015)
Father's Age at Birth	222,545	32.1	0.225 ***
			(0.058)
Mother's Age at Birth	235,813	27.6	0.224 ***
			(0.049)
Father's a WWI Veteran	222,545	7.2%	-0.027 ***
			(0.002)
Parents are White	259,062	87.7%	-0.004
			(0.002)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, 1919 birth cohort consists of people born between April 1, 1919 and March 31, 1920.
[2]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1912 to March 31, 1923.
[3]Model excludes quadratic in year of birth.

Table A3
Departure of 1919 Male Birth Cohort[1] Parental Characteristics from 1912-1922 Male Trend[2] Using 1930 U.S. Census Data and Alternative Specification[3]

Parental Characteristics	Observations	Mean	Born in 1919[1]
Father's Literacy	121,164	92.8%	-0.002
			(0.003)
Mother's Literacy	128,431	93.1%	-0.003
			(0.003)
Father in the Labor Force	121,164	97.5%	0.000
			(0.001)
Father's Duncan SEI	119,197	26.1	-0.247
			(0.218)
Father's Occupation Income Score	119,197	23.5	-0.204 *
			(0.106)
Father's Occupation Earnings Score	119,121	44.3	-0.456
			(0.317)
Parents Own a Radio	141,658	34.8%	-0.015 ***
			(0.005)
Number of Father's Children in HH	121,164	4.1	0.136 ***
			(0.021)
Number of Mother's Children in HH	128,431	4.1	0.137 ***
			(0.021)
Father's Age at Birth	121,164	32.1	0.211 **
			(0.081)
Mother's Age at Birth	128,427	27.6	0.208 **
			(0.069)
Father's a WWI Veteran	121,164	6.8%	-0.027 ***
			(0.003)
Parents are White	141,658	87.8%	-0.008 **
			(0.003)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, 1919 birth cohort consists of people born between April 1, 1919 and March 31, 1920.
[2]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
[3]Model excludes quadratic in year of birth.

Table A4
Departure of White Fathers and World War I Veteran Fathers from All Fathers in 1912 to 1922[1]
Using 1930 U.S. Census Data

Parental Characteristics	Observations	Mean	White	WWI Veteran
Father's Literacy	237,785	92.8%	0.161 ***	0.030 ***
			(0.003)	(0.001)
Father's Duncan SEI	233,865	26.2	11.040 ***	6.503 ***
			(0.114)	(0.195)
Father's Occupation Income Score	233,865	23.6	4.985 ***	2.955 ***
			(0.061)	(0.095)
Father's Occupation Earnings Score	233,714	44.6	13.618 ***	7.905 ***
			(0.186)	(0.240)
Parents Own a Radio	281,463	34.6%	0.155 ***	0.093 ***
			(0.002)	(0.004)
Number of Father's Children in HH	237,785	4.1	-0.574 ***	-0.850 ***
			(0.017)	(0.014)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
Specification uses age of father, age of father squared, state of birth fixed effects, dummy for white, and dummy for WWI veteran as the right hand side variables.

Table A5
Departure of 1917 Birth Cohort[1] Parental Characteristics from 1912-1922 Trend[2]
Using 1930 U.S. Census Data

Parental Characteristics	Observations	Mean	Born in 1917[1]
Father's Literacy	237,785	92.8%	0.000
			(0.002)
Mother's Literacy	252,565	93.1%	-0.003
			(0.002)
Father in the Labor Force	237,783	97.5%	0.000
			(0.001)
Father's Duncan SEI	233,865	26.2	-0.031
			(0.165)
Father's Occupation Income Score	233,865	23.6	-0.042
			(0.081)
Father's Occupation Earnings Score	233,714	44.6	-0.133
			(0.239)
Parents Own a Radio	281,463	34.6%	0.004
			(0.003)
Number of Father's Children in HH	237,785	4.1	0.008
			(0.016)
Number of Mother's Children in HH	252,565	4.1	0.001
			(0.016)
Father's Age at Birth	237,785	32.1	-0.124 **
			(0.060)
Mother's Age at Birth	252,556	27.6	-0.062
			(0.052)
Father's a WWI Veteran	237,785	6.9%	-0.015 ***
			(0.001)
Parents are White	281,463	87.6%	-0.005 **
			(0.002)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, 1917 birth cohort consists of people born between April 1, 1917 and March 31, 1918.
[2]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.

Table A6
Departure of 1920 Birth Cohort[1] Parental Characteristics from 1912-1922 Trend[2]
Using 1930 U.S. Census Data

Parental Characteristics	Observations	Mean	Born in 1920[1]
Father's Literacy	237,785	92.8%	0.001
			(0.002)
Mother's Literacy	252,565	93.1%	0.003
			(0.002)
Father in the Labor Force	237,783	97.5%	0.001
			(0.001)
Father's Duncan SEI	233,865	26.2	0.208
			(0.159)
Father's Occupation Income Score	233,865	23.6	0.137 *
			(0.078)
Father's Occupation Earnings Score	233,714	44.6	0.431 *
			(0.228)
Parents Own a Radio	281,463	34.6%	0.009 **
			(0.003)
Number of Father's Children in HH	237,785	4.1	-0.061 ***
			(0.015)
Number of Mother's Children in HH	252,565	4.1	-0.063 ***
			(0.015)
Father's Age at Birth	237,785	32.1	-0.191 **
			(0.059)
Mother's Age at Birth	252,556	27.6	-0.108 **
			(0.050)
Father's a WWI Veteran	237,785	6.9%	0.034 ***
			(0.003)
Parents are White	281,463	87.6%	-0.002
			(0.002)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, 1920 birth cohort consists of people born between April 1, 1920 and March 31, 1921.
[2]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.

Table B1
Departure of 1919 Birth Cohort Parental Characteristics from 1912-1919 Trend Using 1920 U.S. Census Data and Alternative Specification[1]

Parental Characteristics	Observations	Mean	Born in 1919
Father's Literacy	171,030	90.7%	-0.007 **
			(0.003)
Mother's Literacy	176,502	90.5%	-0.003
			(0.003)
Father in the Labor Force	171,028	98.8%	-0.001
			(0.001)
Father's Duncan SEI	169,133	24.4	-0.646 ***
			(0.178)
Father's Occupation Income Score	169,133	22.7	-0.356 ***
			(0.091)
Father's Occupation Earnings Score	168,988	42.1	-0.979 ***
			(0.274)
Number of Father's Children in HH	171,030	3.7	0.176 ***
			(0.018)
Number of Mother's Children in HH	176,502	3.7	0.177 ***
			(0.018)
Father's Age at Birth	171,030	32.9	0.527 ***
			(0.073)
Mother's Age at Birth	176,502	28.1	0.418 ***
			(0.059)
Parents are White	183,456	88.6%	-0.013 ***
			(0.003)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Model excludes quadratic in year of birth.

Table B2
Departure of 1919 Birth Cohort by Quarter Parental Characteristics from 1915-1919 Trend Using 1920 U.S. Census Data and Alternative Specification[1]

Parental Characteristics	Observations	Mean	Born 1Q1919	Born 2Q1919	Born 3Q1919	Born 4Q1919
Father's Literacy	107,836	91.0%	-0.013 **	-0.007	-0.015 **	-0.002
			(0.005)	(0.005)	(0.005)	(0.005)
Mother's Literacy	111,143	90.9%	-0.017 ***	-0.001	-0.013 **	0.001
			(0.005)	(0.005)	(0.005)	(0.005)
Father in the Labor Force	107,834	98.9%	-0.001	0.001	0.001	0.002
			(0.002)	(0.002)	(0.002)	(0.002)
Father's Duncan SEI	106,733	24.4	-0.893 **	-0.908 **	-0.745 **	0.146
			(0.342)	(0.335)	(0.338)	(0.350)
Father's Occupation Income Score	106,733	22.8	-0.428 **	-0.484 **	-0.235	-0.001
			(0.174)	(0.169)	(0.173)	(0.177)
Father's Occupation Earnings Score	106,628	42.3	-1.224 **	-1.687 ***	-0.533	0.333
			(0.521)	(0.513)	(0.520)	(0.540)
Number of Father's Children in HH	107,836	3.4	0.188 ***	0.333 ***	0.322 ***	0.223 ***
			(0.035)	(0.035)	(0.035)	(0.036)
Number of Mother's Children in HH	111,143	3.4	0.197 ***	0.324 ***	0.314 ***	0.233 ***
			(0.034)	(0.034)	(0.034)	(0.036)
Father's Age at Birth	107,836	32.9	0.467 ***	0.778 ***	0.705 ***	0.155
			(0.138)	(0.136)	(0.139)	(0.145)
Mother's Age at Birth	111,143	28.1	0.546 ***	0.684 ***	0.480 ***	0.193 *
			(0.113)	(0.111)	(0.111)	(0.116)
Parents are White	114,443	89.1%	-0.020 ***	-0.016 **	-0.014 **	0.003
			(0.005)	(0.005)	(0.005)	(0.005)

Notes:
Specification includes quarter of birth fixed effects.
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Model excludes quadratic in year of birth.

Table B3
Departure of 1918 Birth Cohort Parental Characteristics from 1912-1919 Trend
Using 1920 U.S. Census Data

Parental Characteristics	Observations	Mean	Born in 1918
Father's Literacy	171,030	90.7%	0.006 **
			(0.002)
Mother's Literacy	176,502	90.5%	0.008 ***
			(0.002)
Father in the Labor Force	171,028	98.8%	0.000
			(0.001)
Father's Duncan SEI	169,133	24.4	0.531 **
			(0.162)
Father's Occupation Income Score	169,133	22.7	0.285 ***
			(0.082)
Father's Occupation Earnings Score	168,988	42.1	0.804 **
			(0.247)
Number of Father's Children in HH	171,030	3.7	-0.183 ***
			(0.016)
Number of Mother's Children in HH	176,502	3.7	-0.186 ***
			(0.016)
Father's Age at Birth	171,030	32.9	-0.258 ***
			(0.065)
Mother's Age at Birth	176,502	28.1	-0.232 ***
			(0.053)
Parents are White	183,456	88.6%	0.008 ***
			(0.002)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent

Table C1
Departure of 1919 Birth Cohort Parental Characteristics from 1912-1922 Trend[1]
Using Combined 1920 and 1930 U.S. Census Data[2]
and Alternative Model to Account for Child's Age at Survey[3]

Parental Characteristics	Observations	Mean	Born in 1919
Father's Literacy	238,768	92.0%	-0.007 **
			(0.003)
Mother's Literacy	250,778	92.2%	-0.005 *
			(0.003)
Father in the Labor Force	238,765	98.0%	0.002
			(0.001)
Father's Duncan SEI	235,282	25.5	-0.599 **
			(0.208)
Father's Occupation Income Score	235,282	23.3	-0.261 **
			(0.105)
Father's Occupation Earnings Score	235,097	43.7	-0.727 **
			(0.317)
Number of Father's Children in HH	238,768	3.8	0.205 ***
			(0.021)
Number of Mother's Children in HH	250,778	3.8	0.210 ***
			(0.021)
Father's Age at Birth	238,768	32.5	0.534 ***
			(0.084)
Mother's Age at Birth	250,770	27.8	0.474 ***
			(0.068)
Parents are White	273,457	88.0%	-0.002
			(0.003)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
[2]Data for people born between April 1, 1911 and March 31, 1915 or April 1, 1920 and March 31, 1923 is taken from 1930 U.S. Census. Data for people born between April 1, 1915 and December 31, 1919 is taken from the 1920 U.S. Census. Data on people born between January 1, 1920 and March 31, 1920 is unavailable.
[3]Same model as in Table 9 except quadratic in birth year is excluded from right hand side variables. Age at survey was determined as the age of the child as of April 1st of the census year.

Table C2
Departure of 1919 Birth Cohort Parental Characteristics from 1913-1922 Trend[1]
Using Combined 1920 and 1930 U.S. Census Data[2]
and Alternative Model to Account for Child's Age at Survey[3]

Parental Characteristics	Observations	Mean	Born in 1919
Father's Literacy	223,528	92.0%	-0.007 **
			(0.003)
Mother's Literacy	234,030	92.2%	-0.005
			(0.003)
Father in the Labor Force	223,525	98.1%	0.001
			(0.001)
Father's Duncan SEI	220,515	25.4	-0.512 **
			(0.210)
Father's Occupation Income Score	220,515	23.2	-0.215 **
			(0.107)
Father's Occupation Earnings Score	220,338	43.6	-0.579 *
			(0.321)
Number of Father's Children in HH	223,528	3.8	0.208 ***
			(0.021)
Number of Mother's Children in HH	234,030	3.7	0.208 ***
			(0.021)
Father's Age at Birth	223,528	32.5	0.553 ***
			(0.085)
Mother's Age at Birth	234,027	27.8	0.514 ***
			(0.069)
Parents are White	251,056	88.1%	-0.005
			(0.003)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1912 to March 31, 1923.
[2]Data for people born between April 1, 1912 and March 31, 1915 or April 1, 1920 and March 31, 1923 is taken from 1930 U.S. Census. Data for people born between April 1, 1915 and December 31, 1919 is taken from the 1920 U.S. Census. Data on people born between January 1, 1920 and March 31, 1920 is unavailable.
[3]Same model as in Table 10 except quadratic in birth year is excluded from right hand side variables. Age at survey was determined as the age of the child as of April 1st of the census year.

Table C3
Departure of 1919 Male Birth Cohort Parental Characteristics from 1912-1922 Male Trend[1]
Using Combined 1920 and 1930 U.S. Census Data[2]
and Alternative Model to Account for Child's Age at Survey[3]

Parental Characteristics	Observations	Mean	Born in 1919	
Father's Literacy	122,612	92.1%	-0.009	**
			(0.004)	
Mother's Literacy	128,561	92.3%	-0.008	*
			(0.004)	
Father in the Labor Force	122,611	98.0%	0.001	
			(0.002)	
Father's Duncan SEI	120,866	25.4	-0.774	**
			(0.291)	
Father's Occupation Income Score	120,866	23.2	-0.320	**
			(0.147)	
Father's Occupation Earnings Score	120,777	43.6	-0.961	**
			(0.444)	
Number of Father's Children in HH	122,612	3.8	0.213	***
			(0.030)	
Number of Mother's Children in HH	128,561	3.8	0.216	***
			(0.029)	
Father's Age at Birth	122,612	32.4	0.539	***
			(0.117)	
Mother's Age at Birth	128,558	27.8	0.490	***
			(0.095)	
Parents are White	138,575	88.3%	-0.006	
			(0.004)	

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
[2]Data for people born between April 1, 1911 and March 31, 1915 or April 1, 1920 and March 31, 1923 is taken from 1930 U.S. Census. Data for people born between April 1, 1915 and December 31, 1919 is taken from the 1920 U.S. Census. Data on people born between January 1, 1920 and March 31, 1920 is unavailable.
[3]Same model as in Table 11 except quadratic in birth year is excluded from right hand side variables. Age at survey was determined as the age of the child as of April 1st of the census year.

Table C4
Departure of 1919 Birth Cohort Parental Characteristics from 1912-1922 Trend[1]
Using Combined 1920 and 1930 U.S. Census Data[2]
and Alternative Model to Account for Child's Age at Survey[3]

Parental Characteristics	Observations	Mean	Born in 1919
Father's Literacy	238,768	92.0%	-0.007 **
			(0.003)
Mother's Literacy	250,778	92.2%	-0.005 *
			(0.003)
Father in the Labor Force	238,765	98.0%	0.001
			(0.001)
Father's Duncan SEI	235,282	25.5	-0.561 **
			(0.216)
Father's Occupation Income Score	235,282	23.3	-0.241 **
			(0.110)
Father's Occupation Earnings Score	235,097	43.7	-0.667 **
			(0.330)
Number of Father's Children in HH	238,768	3.8	0.239 ***
			(0.022)
Number of Mother's Children in HH	250,778	3.8	0.241 ***
			(0.022)
Father's Age at Birth	238,768	32.5	0.593 ***
			(0.087)
Mother's Age at Birth	250,770	27.8	0.525 ***
			(0.071)
Parents are White	273,457	88.0%	-0.005
			(0.003)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
[2]Data for people born between April 1, 1911 and March 31, 1915 or April 1, 1920 and March 31, 1923 is taken from 1930 U.S. Census. Data for people born between April 1, 1915 and December 31, 1919 is taken from the 1920 U.S. Census. Data on people born between January 1, 1920 and March 31, 1920 is unavailable.
[3]Model uses birth year, birth year squared, 1930 census year dummy, 1930 census year dummy interacted with age at survey, and 1919 birth cohort dummy as right hand side variables.
Age at survey was determined as the age of the child as of April 1st of the census year.

Table C5
Departure of 1919 Birth Cohort Parental Characteristics from 1912-1922 Trend[1]
Using Combined 1920 and 1930 U.S. Census Data[2]
and Alternative Model to Account for Child's Age at Survey[3]

Parental Characteristics	Observations	Mean	Born in 1919
Father's Literacy	238,768	92.0%	-0.007 **
			(0.003)
Mother's Literacy	250,778	92.2%	-0.005 *
			(0.003)
Father in the Labor Force	238,765	98.0%	0.001
			(0.001)
Father's Duncan SEI	235,282	25.5	-0.561 **
			(0.216)
Father's Occupation Income Score	235,282	23.3	-0.241 **
			(0.110)
Father's Occupation Earnings Score	235,097	43.7	-0.667 **
			(0.330)
Number of Father's Children in HH	238,768	3.8	0.239 ***
			(0.022)
Number of Mother's Children in HH	250,778	3.8	0.241 ***
			(0.022)
Father's Age at Birth	238,768	32.5	0.593 ***
			(0.087)
Mother's Age at Birth	250,770	27.8	0.525 ***
			(0.071)
Parents are White	273,457	88.0%	-0.005
			(0.003)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
[2]Data for people born between April 1, 1911 and March 31, 1915 or April 1, 1920 and March 31, 1923 is taken from 1930 U.S. Census. Data for people born between April 1, 1915 and December 31, 1919 is taken from the 1920 U.S. Census. Data on people born between January 1, 1920 and March 31, 1920 is unavailable.
[3]Model uses birth year, birth year squared, age at survey, age at survey squared, and 1919 birth cohort dummy as right hand side variables. Age at survey was determined as the age of the child as of April 1st of the census year.

Table C6
Departure of 1919 Birth Cohort Parental Characteristics from 1912-1922 Trend[1]
Using Combined 1920 and 1930 U.S. Census Data[2]
and Alternative Model to Account for Child's Age at Survey[3]

Parental Characteristics	Observations	Mean	Born in 1919
Father's Literacy	238,768	92.0%	-0.007 **
			(0.003)
Mother's Literacy	250,778	92.2%	-0.006 *
			(0.003)
Father in the Labor Force	238,765	98.0%	0.002 *
			(0.001)
Father's Duncan SEI	235,282	25.5	-0.621 **
			(0.212)
Father's Occupation Income Score	235,282	23.3	-0.267 **
			(0.108)
Father's Occupation Earnings Score	235,097	43.7	-0.748 **
			(0.324)
Number of Father's Children in HH	238,768	3.8	0.217 ***
			(0.022)
Number of Mother's Children in HH	250,778	3.8	0.222 ***
			(0.021)
Father's Age at Birth	238,768	32.5	0.529 ***
			(0.085)
Mother's Age at Birth	250,770	27.8	0.468 ***
			(0.070)
Parents are White	273,457	88.0%	0.000
			(0.003)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
[2]Data for people born between April 1, 1911 and March 31, 1915 or April 1, 1920 and March 31, 1923 is taken from 1930 U.S. Census. Data for people born between April 1, 1915 and December 31, 1919 is taken from the 1920 U.S. Census. Data on people born between January 1, 1920 and March 31, 1920 is unavailable.
[3]Model uses age at survey, age at survey squared, 1930 census year dummy, and 1919 birth cohort dummy as right hand side variables. Age at survey was determined as the age of the child as of April 1st of the census year.

Table C7
Departure of 1918 Birth Cohort Parental Characteristics from 1912-1922 Trend[1]
Using Combined 1920 and 1930 U.S. Census Data[2]
and Model to Account for Child's Age at Survey[3]

Parental Characteristics	Observations	Mean	Born in 1918
Father's Literacy	238,768	92.0%	0.007 **
			(0.002)
Mother's Literacy	250,778	92.2%	0.009 ***
			(0.002)
Father in the Labor Force	238,765	98.0%	0.000
			(0.001)
Father's Duncan SEI	235,282	25.5	0.630 ***
			(0.165)
Father's Occupation Income Score	235,282	23.3	0.348 ***
			(0.084)
Father's Occupation Earnings Score	235,097	43.7	0.992 ***
			(0.252)
Number of Father's Children in HH	238,768	3.8	-0.194 ***
			(0.017)
Number of Mother's Children in HH	250,778	3.8	-0.198 ***
			(0.016)
Father's Age at Birth	238,768	32.5	-0.230 ***
			(0.066)
Mother's Age at Birth	250,770	27.8	-0.201 ***
			(0.054)
Parents are White	273,457	88.0%	0.010 ***
			(0.002)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
[2]Data for people born between April 1, 1911 and March 31, 1915 or April 1, 1920 and March 31, 1923 is taken from 1930 U.S. Census. Data for people born between April 1, 1915 and December 31, 1919 is taken from the 1920 U.S. Census. Data on people born between January 1, 1920 and March 31, 1920 is unavailable.
[3]Model uses birth year, birth year squared, 1930 census year dummy, 1930 census year dummy interacted with quadratic in age at survey, and 1918 birth cohort dummy as right hand side variables.
Age at survey was determined as the age of the child as of April 1st of the census year.

Table C8
Departure of 1920 Birth Cohort Parental Characteristics from 1912-1922 Trend[1,2]
Using Combined 1920 and 1930 U.S. Census Data[3]
and Model to Account for Child's Age at Survey[4]

Parental Characteristics	Observations	Mean	Born in 1920[1]
Father's Literacy	238,768	92.0%	0.001
			(0.002)
Mother's Literacy	250,778	92.2%	0.004 *
			(0.002)
Father in the Labor Force	238,765	98.0%	0.001
			(0.001)
Father's Duncan SEI	235,282	25.5	0.203
			(0.186)
Father's Occupation Income Score	235,282	23.3	0.124
			(0.091)
Father's Occupation Earnings Score	235,097	43.7	0.437
			(0.268)
Number of Father's Children in HH	238,768	3.8	-0.042 **
			(0.018)
Number of Mother's Children in HH	250,778	3.8	-0.050 **
			(0.018)
Father's Age at Birth	238,768	32.5	-0.127 *
			(0.068)
Mother's Age at Birth	250,770	27.8	0.028
			(0.058)
Parents are White	273,457	88.0%	-0.004
			(0.003)

Notes:
Robust standard errors are in parenthesis.
* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent
[1]Due to the timing of the 1930 U.S. Census, 1920 birth cohort consists of people born between April 1, 1920 and March 31, 1921.
[2]Due to the timing of the 1930 U.S. Census, trend is from April 1, 1911 to March 31, 1923.
[3]Data for people born between April 1, 1911 and March 31, 1915 or April 1, 1920 and March 31, 1923 is taken from 1930 U.S. Census. Data for people born between April 1, 1915 and December 31, 1919 is taken from the 1920 U.S. Census. Data on people born between January 1, 1920 and March 31, 1920 is unavailable.
[4]Model uses birth year, birth year squared, 1930 census year dummy, 1930 census year dummy interacted with quadratic in age at survey, and 1920 birth cohort dummy as right hand side variables.
Age at survey was determined as the age of the child as of April 1st of the census year.