The Effects of Coerced Sterilization: Evidence from Native American Women*

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Very Preliminary Draft - Not for Circulation

Abstract

Forced sterilization represents one of several coercive population control measures enacted during the 20th century. This paper sheds light on the short- and long-run effects of coercive population control policies, drawing evidence from the experience of Native American women in the 1970s. It is estimated that between 25 and 40 percent of Native American women were coercively sterilized, either through tubal ligation or hysterectomy, in the 1970s, often without consent or full understanding of the procedure. We provide evidence that women exposed to forced sterilization experienced lower parity, worse health outcomes, lower labor market participation, lower income, and decreased investment in their children's education. We also investigate the intergenerational transmission of fertility choices among children whose mothers were potentially exposed to forced sterilization.

JEL Classification: I15; J13; J15; N32; O12.

Keywords: Sterilization; fertility; human capital; intergenerational transmission.

*We wish to express our gratitude to seminar participants at the UCD-TCD-QUB Economic History workshop and HHDI-NIDE Joint Workshop on Persistence and Cultural Transmission in Belfast.

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1 Introduction

Forced sterilization represents one of several coercive population control measures enacted during the 20th century. Many of these measures were informed by eugenic belief that certain human traits should be *'bred out'*, a notion that gained traction with the rise of the eugenics movement in the early 20th century (Kluchin 2020). While no official statistics are available, forced sterilization and coercive contraception are likely to have affected millions of individuals across the world over the past century: Afro- and Native American women in the U.S. (Kluchin 2020), men in India (Singh & Vincent 2024) indigenous women in Peru (Vasquez Del Aguila 2022) and Canada (Stote 2012), and Aboriginal women in Australia (Rademaker 2024). Notwithstanding these numbers, the full-scale effects of forced sterilization have yet to be fully understood.

This paper sheds light on the short- and long-run effects of coercive population control policies, drawing evidence from the experience of Native American women in the 1970s. It is estimated that between 25 and 40 percent of Native American women were coercively sterilized, either through tubal ligation or hysterectomy, in the 1970s, often without consent or full understanding of the procedure or its physical and psychological effects (Ralstin-Lewis 2005, Kluchin 2020). Our analysis evaluates the effects on parity, health, labor market outcomes, and investment in children for women exposed to such measures and policies. We also investigate the intergenerational transmission of fertility choices among children whose mothers were potentially exposed to forced sterilization.

Identifying American Indian households affected by forced sterilization is a significant challenge, as individual-level data on Native American women forcibly sterilized in the 1970s are not available. We address this issue by capturing the likelihood of exposure to coerced sterilization through proxies for the loss of reproductive autonomy during this period. According to numerous evidence (Kluchin 2020), tubal ligations or hysterectomies were performed on women at the time of giving birth or together with other abdominal surgeries, such as appendectomies. Therefore, we define the treatment group as the cohort of Native American women whose youngest child was born during the 1970s, or alternatively, women whose fertility ceased during this time frame. We mitigate the influence of potential confounding factors, such as menopause or broader fertility trends, by comparing women of the same cohort.

We test the validity of our treatment definition in three ways. First, we provide evidence that the timing of the last birth is a reasonable proxy for exposure to forced sterilization by showing that the age at last birth for Native American women in peak fertility declines markedly during the period under consideration, suggesting a higher probability that their final birth occurred during this period of time. Controlling for

cohort effects, we show that the average age at last birth for Native American women entering childbearing age in the 1970s is almost 1.2 years lower than that of the comparison group. By contrast, the age at last birth for Native American women unlikely to have been affected by sterilization (i.e., those entering childbearing age either before or after the period of interest) tends to be relatively higher than the reference group.

Next, we exploit the 1973 moratorium on sterilization for women under the age of 21. Using a sharp age-based cutoff, we show that, for women who turned 20 around the time of the moratorium, the probability of having a last child increased just above the age threshold specified by the policy. In other words, women who turned 20 after the moratorium were more likely to have their last child at age 21 (to comply with the regulation), whereas those who turned 20 before the moratorium were more likely to have their last child at age 20, which would have been against regulation after the moratorium.

Finally, we rely on medical evidence pointing to a higher probability of genital disorders among women who have undergone permanent sterilization, and on data from the National Health Interview Survey (NHIS), to show that the treatment is strongly associated with an increased probability of reporting genital health problems. Overall, we find that Native American women whose last child was born in the 1970s have an almost 3 percentage point higher probability of reporting genital disorders in the 12 months preceding the interview, which—relative to the sample mean (3.3 percent)—corresponds to a substantial increase in the share of women reporting such issues.

Having assessed the validity of the treatment definition, we explore the short-run effect of exposure to forced sterilization. We use retrospective household data from the 1990 5% U.S. Census State Sample, combined with the National Health Interview Survey (NHIS) data, and exploit variation across treated and untreated cohorts as well as variation across races.[1] We provide evidence that Native American women potentially exposed to forced sterilization have a lower number of children. The probability of having more than one child for treated women decreases by approximately 6.1 percentage points, corresponding to an 8 percent reduction relative to the sample mean. The probability of having more than two children decreases by nearly 11 percent, and the estimated probability of having more than three children drops by roughly 6. This reduction in parity becomes even more pronounced when American Indian women are compared to white women (hence excluding all other minorities): in this case, the reduction in the probability of having more than one child is close to 10 percent, while the probability of having more than two children decreases by nearly 13 percent relative to the mean.

[1]Data for the IPUMS 5% U.S. Census State Sample are provided by Ruggles et al. (2024), Data for the National Health Interview Survey are provided by Blewett et al. (2024).

The effect on parity varies by tribe and is much more pronounced among tribes with traditionally shorter birth spacing, and thus among women who were likely to have a larger number of children. This latter result is in line with the evidence of a selective use of forced sterilization, to conform American Indian families to traditional white family norms and to keep their population growth under control (Kluchin 2020). Our analysis disentangles the effect of family planning from forced sterilization by exploiting the timing of the provision of family planning at IHS facilities in 1965, and conducting an event study. We show that family planning had no impact on fertility, in line with the anecdotal and medical evidence of low contraception adoption among Native American women (Lawrence 2000, Temkin-Greener et al. 1981). The effect of exposure to forced sterilization begins to manifest in households whose last child was born in 1969, with fertility continuing to decline among successive cohorts, consistent with the anecdotal evidence.

Next, we investigate the long-run effects of exposure to forced sterilization on health and socioeconomic outcomes. Using data from the NHIS, we show that Native American women exposed to coerced sterilization experience worse health outcomes. The probability of self-reporting poor health increases by almost 1.7 percentage points. They are also more likely to report existing health conditions (by 4.3 percentage points), to have spent more than a week bedridden due to disability, and to report drinking alcohol in the past two weeks, which we use as a proxy for mental health. Using data from the 5% Census, we find that treated women are more likely to live in single-headed households (i.e., a proxy for divorce or separation), have a higher probability of work disability (i.e., receiving benefits), and, consequently, a lower probability of labor force participation, which in turn negatively affects both personal and household income.

As a second step, we evaluate the effect of exposure to forced sterilization on children's human capital. Controlling for birth cohort and current school enrollment, we find that for children of treated mothers, the probability of completing a high school diploma (grade 12) or at least one year of college decreases by 2.9 and 4.3 percentage points, respectively. As a placebo test, we examine whether treatment exposure affects the probability of completing free compulsory education (i.e., middle school) and find no effect. These findings are robust when controlling for the household head's education level, labor force participation, and socioeconomic status.

Finally, we estimate the intergenerational transmission of fertility to children born in households exposed to the treatment using data from the IPUMS 2000 US census (5% sample) and the Panel Study of Income Dynamics - Social, Health, and Economic Longitudinal File (PSID-SHELF).[2] We provide exploratory evidence that children born into

[2]Data for the PSID-SHELF is provided by Pfeffer et al. (2023).

households exposed to forced sterilization have higher fertility later in life. We interpret these results as consistent with potentially adverse attitudes toward contraception and a change in fertility preference in response to the declining Native American population. However, formal testing of these two channels is not possible due to data limitations, and we regard these latter results as exploratory.

To the best of our knowledge, this is the first study to provide a quantitative estimate of the short- and long-term economic effects of forced sterilization. We contribute to three main strands of literature. First, this paper is closely related to the literature on the long-term effects of medical malpractice and medical abuse. Gaston & Alleyne-Green (2013) conduct a systematic review to examine the legacy of abuse from medical experimentation on slaves and African Americans, finding significant effects of these past experiences on attitudes toward HIV-related health care. Alsan & Wanamaker (2018) evaluate the lasting impact of the Tuskegee Study of Untreated Syphilis on the behavior and health of older Black men, documenting enduring effects on medical mistrust and mortality. Chang (2018) study the impact of the controversy surrounding the measles-mumps-rubella (MMR) vaccine on vaccination rates among subsequent cohorts and observe spillover effects on the uptake of other vaccines. Similarly, Qian et al. (2020) provide evidence of confirmatory bias in health decisions following the MMR-autism vaccine controversy. Lowes & Montero (2021) find lower vaccination rates and diminished trust in medicine in areas heavily exposed to the French medical campaign to treat and prevent sleeping sickness in Africa. Martinez-Bravo & Stegmann (2022) examine the effects of the anti-vaccination campaign led by the Taliban after news emerged that the CIA had used a vaccination program as cover to capture Osama Bin Laden. Finally, Archibong & Annan (2023) investigate the impact of the 1996 Pfizer human trials in Kano, Northern Nigeria, where an experimental antibiotic for meningitis led to the deaths of 11 children.

Second, this study relates to the literature on racial discrimination in the US. A large part of this literature has focused on the effect of slavery (Fogel & Engerman 1995, Nunn 2008, Naidu 2010, Engerman & Sokoloff 2012, Bertocchi & Dimico 2014, Boustan & Margo 2014, Acharya et al. 2016, Levine et al. 2020, Ager et al. 2021, Wright 2022, Bleakley & Rhode 2024), the impact of the Jim Crow laws (Margo 1982, 1984, 1987, 1990, Collins 2003, Bertocchi & Dimico 2017, Carruthers & Wanamaker 2017, Ruef & Grigoryeva 2018, Althoff & Reichardt 2024) and consequences of racial violence (Collins & Margo 2004, 2007, Cook 2014, Cook et al. 2018, Albright et al. 2021, Williams 2022). A small part of this literature has focused instead on discrimination against American Indians. Feir (2016) evaluates the impact of residential schools on cultural and economic assimilation and finds that children who attended residential schools shows a higher level of assimilation. Maruthiah (2024) looks at cohort variation in the exposure to

boarding schools and finds that children in reservations are more likely to speak English, have a Western name and be perceived as white. Gregg (2018) shows that children in reservations that sent a larger share of students to off-reservation boarding schools have better educational and economic outcomes, lower fertility, and a higher probability to speak English. Kopriva (2024) finds that the Indian Relocation Policies in the late 1950s and 1960s promoted the redistribution of Indigenous Peoples to the urban centers selected for relocation. Frye & Parker (2021) looks at close elections following the formation of Indigenous self-government units as part of the Indian Reorganization Act (IRA)and argue that adopting an IRA constitution have implied more federal oversight and lower income. Anderson & Lueck (1992) argues that the low agricultural productivity across Indian reservations is the result of constraints imposed by the federal government over Indian land. Dippel (2014) studies the impact of American Indian reservation and finds that force coexistence led to a reduction in income per capita on reservations today by about 30%. Leonard et al. (2020) evaluate the impact of land titling following the General Allotment Act of 1887 and find a non-linear effect on income across reservations. Feir et al. (2023) look at discrimination in the mortgage market, while Feir et al. (2023) evaluate the impact on health of the Slaughter of the Bison toward the end of the 19th century on health. Watson (2006) evaluates the impact of federal sanitation interventions in reservations using a staggered DiD and find a substantial effect on child mortality. Anderson & Parker (2008), Brown et al. (2019), Cookson (2010) examine the effect of the 1953 Public Law 280. Feir (2025) and Carlos et al. (2022) provide a broad review of the historical and economic literature related to Native American.

The paper also contributes to the literature investigating the impact of parental job loss, maternal mental health, negative family environment on children's outcomes (Heckman 2007, Oreopoulos et al. 2008, Frank & Meara 2009, Aizer et al. 2016, Dahlen 2016, Persson & Rossin-Slater 2018, Mörk et al. 2020, Carneiro et al. 2021, Willage & Willén 2022, Eshaghnia et al. 2022, Carneiro et al. 2024, Huttunen & Riukula 2024, Salvanes et al. 2024). In line with the literature, we find evidence a significant relationship between negative family environment and child outcome.

The paper is structured as follows. Section 2 provides a discussion of the historical background regarding coerced sterilization of American Indian women. Section 3 presents the data sources and outlines the estimation strategy. Section 4 provides evidence on the validity of the treatment definition. The effect of forced sterilization exposure on health and economic outcomes is explored in Section 5, while Section 6 investigates the potential intergenerational transmission channel. Finally, Section 7 concludes.

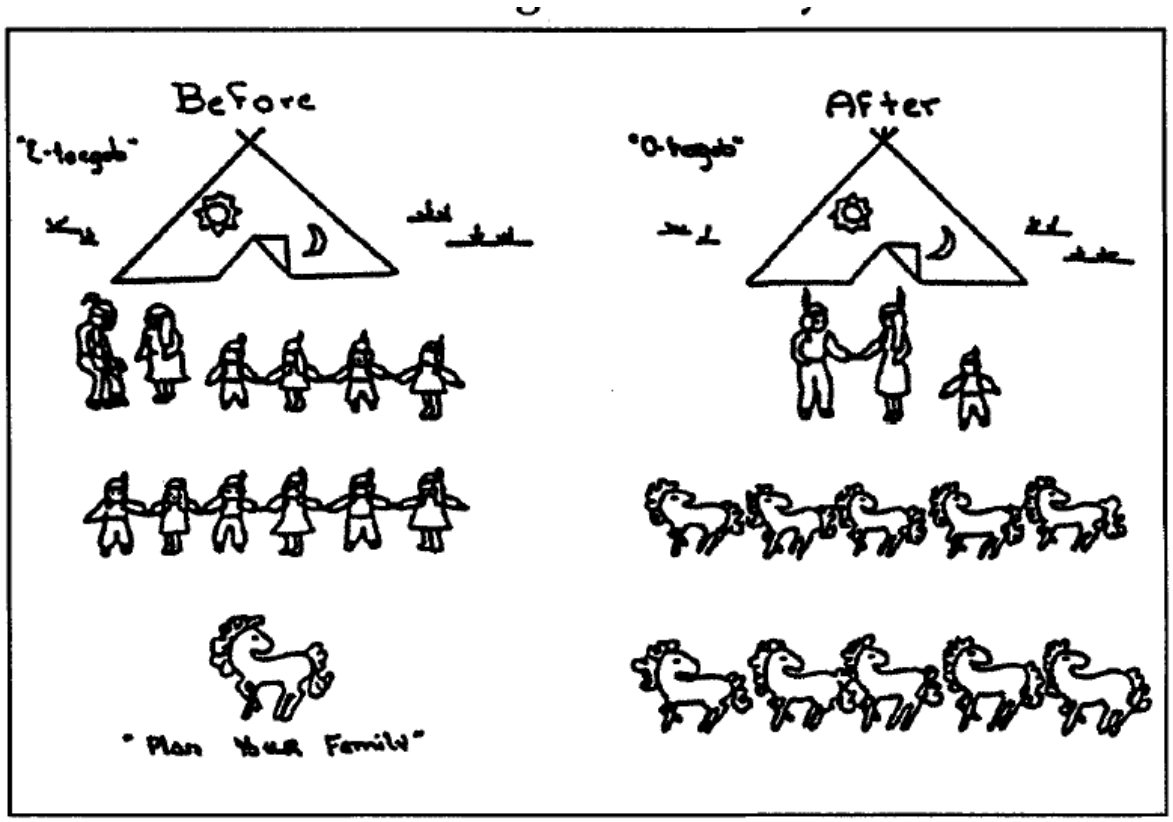
2 Background

On March 25, 1974, the Court for the Western District of Pennsylvania received a civil action (No. 74-313) filed by the lawyer of Norma Jean Serena. A bilateral salpingectomy was performed on her without her knowledge or consent after the delivery of her third child on August 16, 1970. The procedure was deemed necessary for her health, based on the belief that she had enough children and that further pregnancies could result in children with disabilities (USDC WDPA 1974). Like Serena, thousands of American Indian women were sterilized in the 1970s, often without consent or full understanding of the procedure or its physical and psychological effects. According to Dr. Constance Redbird Pinkerton-Uri, a Choctaw-Cherokee physician, nearly 25 percent of Native women of childbearing age in the U.S. underwent forced sterilization between the 1960s and 1970s. This loss of reproductive autonomy not only disrupted traditional family structures but also led to significant economic, psychological, and emotional consequences. Many marriages ended in divorce, friendships dissolved, and an increasing number of women faced marital conflicts, alcoholism, and physical and mental health challenges (Lawrence 2000).

The 1960s marked a period of significant change for many American women, particularly in terms of reproductive rights. President Lyndon B. Johnson's War on Poverty provided unprecedented access to family planning programs, under the expectation that increased reproductive autonomy would foster greater economic mobility and equality. For many women, the ability to control their fertility represented an opportunity for self-sufficiency, enabling them to take advantage of the educational and economic prospects created by the program. While many American women benefited from these policies, reports of reproductive rights abuses involving American Indian women at Indian Health Service (IHS) hospitals began to surface in the 1970s. Several women from various tribes came forward with accounts of forced sterilizations. The growing number of such reports, along with allegations of questionable sterilization practices at the Claremore IHS hospital in Oklahoma, prompted Dr. Constance Redbird Pinkerton-Uri, a physician with the IHS, to conduct her own inquiry. By examining records from 26 of the 35 Indian Health Service hospitals across the country with obstetric wards, she estimated that approximately 25 percent of American Indian women had been sterilized (Shepherd 2021). Dr. Uri's findings led to an investigation by the Government Accountability Office (GAO) in four of the twelve IHS program areas: Aberdeen, Albuquerque, Oklahoma City, and Phoenix (Lawrence 2000). The resulting report, released in 1976, revealed that the IHS performed 3,406 sterilizations between 1973 and 1976 and highlighted potential issues in terms of: *(1) sterilization of persons under 21 years of age* - despite the Department of Health, Education, and Welfare moratorium on underage sterilizations, introduced in 1973 *(2)*

non-standard consent forms, (3) lack of widespread physician understanding of the regulations, and *(4) lack of definitive requirements for informed consent for sterilizations performed by contract doctors.* (Government Accountability Office 1976).

Figure 1: Family Planning and American Indians

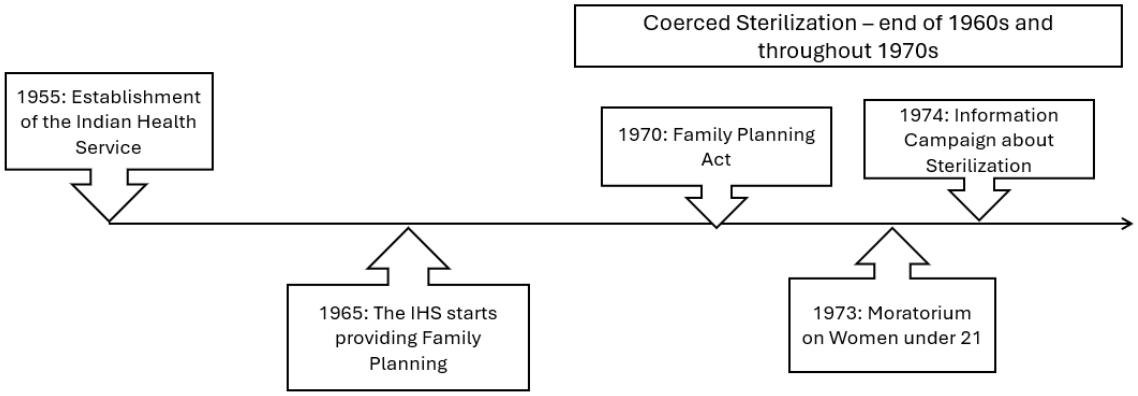


Note: A 1974 Department of Health Education and Welfare pamphlet.

The resurgence of eugenic movements in the 1960s, following their decline after World War II, alongside Malthusian fears about overpopulation, resource scarcity, and the social burdens of a growing population, seems to provide the most plausible explanation for the sterilizations at the Indian Health Service facilities. President Nixon identified population growth as *'one of the most serious challenges to human destiny in the last third of this century'* (Nixon 1969) and viewed birth control methods of *all types* as a potential solution to this issue. The Department of Health, Education, and Welfare was tasked, under the Economic Opportunity Act of 1964, with administering family planning programs targeted at poor and disadvantaged populations. The following year, the Indian Health Service (IHS), established in 1955 as part of the Department of Health, Education and Welfare, began offering family planning services to American Indians.

Native Americans were considered a primary target for family planning programs due

Figure 2: Timeline



to their high fertility rates and the poor economic conditions of women on reservations (Ralstin-Lewis 2005). Lawrence (2000) reports that the average number of children per woman among American Indians was above three, compared to an average of two children among white women.[3] Despite the availability of free family planning services, contraceptive use among American Indian women remained strikingly low (Temkin-Greener et al. 1981). To incentivize their use, the 1970 Family Planning Services and Population Research Act fully subsidized (up to 90 percent) the cost of sterilization to Medicaid and Indian Health Service patients, hence indirectly providing financial incentives for physicians to perform sterilization (Shepherd 2021). At the same time, the Department of Health, Education and Welfare launched information campaigns in the early 1970s promoting the benefits of sterilization (Figure 1). While directives required that sterilizations should only be performed on individuals at risk, and with valid informed consent, physicians at Indian Health Service facilities frequently disregarded these requirements, with doctors pressurizing women into sterilizations (Kluchin 2020).

Over the 1973-1976 period considered by the Government Accountability Office, the reported rates of female sterilization procedures at the four Indian Health Service centers under investigation ranged from approximately 3 percent of women sterilized at the IHS Albuquerque center to nearly 7 percent at the IHS Oklahoma center, with an average across the four centers of around 6 percent (Government Accountability Office 1976). Considering that sterilizations likely began in the early 1970s and continued until 1979, Dr. Uri's estimates of 25 percent of women of reproductive age being sterilized over the entire period seem very plausible. Recent studies (i.e., Ralstin-Lewis (2005)) have revised this estimate of the share of Native American women subject to forced sterilization up

[3]The average number of children per woman among some tribes, e.g., Navajo and Apache, was even higher, around 4.

to 40 percent.

Figure 2 presents the timeline of policies related to birth control over this period that may confound the effect of sterilization. Coerced sterilization was carried out in the late 1960s and throughout the 1970s. This implies that coerced sterilization began prior to the 1970 Family Planning Act and a few years after the IHS started providing family planning services, thereby allowing us to evaluate the impact of these potentially confounding policies when examining dynamic treatment effects.

3 Data and Empirical Model

We use four main data sources. First, we collect retrospective fertility information from the IPUMS 1990 5% U.S. State Sample, which reports the total number of children ever born to each female respondent.[4] Our sample includes parents (the household head and their spouse/partner) and household head's parents, within the age of 15 and 90.[5]

Our second data source is the National Health Interview Survey (NHIS), an annual survey that collects information on health, healthcare access, and health behaviors. We use the sample over the period 1980-1995, which includes more than $7,000$ American Indians. Data on American Indians as a racial category is only available from 1979 onward, hence preventing the use of earlier survey waves. In line with recent censuses, the NHIS includes information only on children still residing in the household. By limiting the sample to years up to 1995, we assume that the eldest children in a treated household were in their mid-twenties by 1995 and hence still likely to be household members.

Finally, to evaluate the intergenerational transmission of fertility choices, we use the IPUMS 2000 5% sample of the U.S. Census and the 2023 Panel Study of Income Dynamics - Social, Health, and Economic Longitudinal File (PSID-SHELF).[6] Both datasets have potential issues: the IPUMS 2000 5% sample allows us to analyze the children of treated households who are still residing within the household. However, this may lead to sample selection: for instance, children in extended families are more likely to remain in the household longer, potentially causing an upward bias since they are also more likely to

[4]The 1980 Census reports the total number of children ever born. However, this sample is too close to the treatment period, leading to a censored fertility distribution because children born after the treatment period (i.e., after 1980) are not reported. Conversely, more recent censuses (since 2000) report only the number of children currently in the household, leading to an undercount of children who have already left.

[5]We exclude individuals who are not yet of reproductive age (i.e., below 15) and those above 90 (i.e., born before 1900) as they are unlikely to have had children during the treatment period (1970s) and, therefore, unlikely to provide cohort variation. In one of the robustness checks, we restrict the sample to women between the age oF 20 and 75. The results hold across the two samples.

[6]Children of households potentially exposed to forced sterilization are of a reproductive age (i.e. between 20 and 35 years old) in 2000.

have more children. The PSID-SHELF dataset, on the other hand, includes only a small number of American Indians (372 in our sample), and the number of treated individuals is even smaller, raising concerns about sample representativeness. Appendix A provides details about the construction of these datasets. Tables A1-A4 report summary statistics for the relevant variables.

Using the four datasets, we estimate a classical difference-in-differences model as follows:

$$Y_{mrtc} = \alpha + \beta \mathbb{I}70_c * NA_r + \sigma_r + \gamma_c + \delta_t + \rho X_{mrtc} + \epsilon_{mrtc}$$

where Y_{mrtc} is the outcome variable for mother m, of race r, from birth cohort t, with youngest child's birth cohort c (i.e. parity, health outcomes, labour market outcomes). The variable $\mathbb{I}70_c$ is an indicator taking the value of 1 if the youngest child was born between 1965 and 1979 and 0 otherwise, while NA_r is an indicator for Native American. Ageing and changes in fertility preferences are other potential reasons why women might stop having children during the period under consideration, and hence could be correlated with exposure to forced sterilization. To attenuate the bias, the model also includes mother's cohort fixed effects (δ_t). Differences across races and cohort effects related to the loss of reproductive autonomy are captured by race fixed effects (σ_r) and youngest child's cohort fixed effects(γ_c). Finally, the specification includes a set of control variables, X_{mrtc}, namely Public Use Microdata Areas (PUMAs) boundaries fixed effects, birth place fixed effects, marital status, urban/rural residency, citizenship, gender, and relation to the head (i.e., whether the individual is the spouse, mother, partner, etc.). Standard errors are clustered at the primary sampling units, depending on the dataset used.

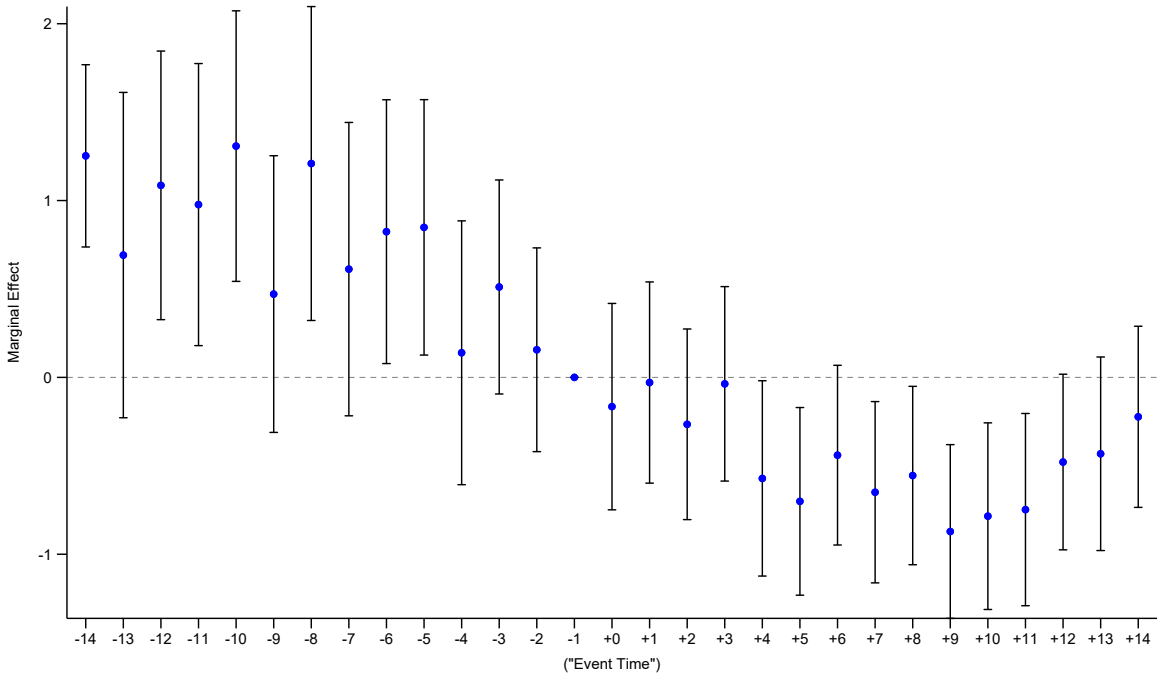
4 Treatment Definition

Identifying American Indian households impacted by forced sterilization is a major challenge, since individual-level data on Native American women forcibly sterilized are not available. As discussed in Section 2 (Figure 2), Indian Health Service (IHS) hospitals began operating in 1955, providing family planning services to Native Americans starting from 1965. It was only later, toward the end of the 1960s and in the 1970s that forced sterilization was practiced at a larger scale in IHS facilities. According to extensive evidence (Kluchin 2020), American Indian women underwent tubal ligations or hysterectomies at the time of childbirth or alongside other abdominal surgeries, often without their informed consent. On the basis of this evidence, we measure the likelihood of exposure to coerced sterilization using proxies for the loss of fertility during this period. The treatment group, therefore, is defined as the cohort of Native American

women whose youngest child was born during the 1970s, or alternatively, Native American women whose fertility ended during that period. Of course, the probability of having the last child in the 1970s is largely affected by aging, however such confounding factors can be ruled out when comparing women born in the same year.

Figure B1 in Appendix B shows the distribution of mothers' age at last birth in our sample[7]. The average age at last birth is around 28, which compares reasonably well with the average in the population. Carlson & Guzzo (2021), for example, report that the median age at last birth among women aged 45–49 in 2021 is close to 31, which—considering changes in the distribution of age at motherhood over recent decades—appears broadly consistent with the average in our sample.

Figure 3: Age at Last Birth



Note: The dependent variable is age at last birth. The horizontal axis reports years when a mother turns 15 with 0 denoting Native American women who turn 15 in 1965, +1 women who turn 15 one year after 1965, -1 women who turn 15 one year before 1965 and so on. The vertical axis reports changes in the age at last birth. Variation over cohorts and between Native American and White women is exploited. Hence the sample includes Native American and White women. Controls include: *i*) Region FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Survey year FE; *v*) Marital status; *vi*) Race; *vii*) Relation to the head; *viii*) Number of children. Clustered standard errors at a primary sampling unit. 95% CI reported.

To test the validity of the treatment, we conduct a series of exercises. First, we exploit

[7]We trim the top and bottom 1 percent of the distribution because the age at last birth appears to fall outside feasible ranges.

information on women's age at last birth to test whether using the year of birth of the last child is a reasonable proxy for identifying women likely to have been sterilized. Medical evidence shows that peak fertility occurs from the late teens through the late 20s, with a gradual decline beginning around age 30. Coerced sterilization, therefore, should lead to a marked reduction in the age at last birth for women whose peak fertility occurred during the 1970s. In other words, in the 1970s the last child should be born when fertility is at its highest. Figure 3 shows exactly such a marked decline in the age at last birth for Native American women who were in their peak fertility during the 1970s, compared to White mothers and across cohorts. Relative to Native American women who turned 15 in 1965 (i.e., event period 0), the age at last birth for women who were in their 30s by 1965 (i.e., event period -14), and thus unlikely to have been exposed to sterilization because at the end of peak fertility, is almost 1.3 years higher. The age at last birth begins to decrease for women likely to have been exposed to sterilization, and declines significantly for those in their peak fertility during the 1970s. The reduction becomes statistically significant for women who turned 15 in 1969 (i.e., event period +4) and decreases further for those who turned 15 in subsequent periods. When coerced sterilization ceased to be practiced, the age at last birth begins to increase again (i.e., starting with women who turned 15 in 1977). This reduction in the age at last birth for Native American women during this specific period suggests a higher probability of having a last birth during the years when mass sterilization at IHS facilities was practiced, and supports the use of the youngest child's birth cohort as a proxy for treatment definition.

The second test we conduct to verify whether the youngest child's birth cohort is a valid proxy for treatment exploits exposure to the 1973 moratorium on sterilizations for women under the age of 21. The moratorium, introduced in 1973 (Figure 2), creates a sharp age-based cutoff that allows us to compare women who turned 20 in cohorts around 1973 and to test whether the moratorium shifted the age at last birth in response to the regulation. Specifically, we examine whether the age at last birth for women aged 20 (i.e., those unlikely to be sterilized after the moratorium) increases above the age threshold specified in the regulation. Table 1, Model 1, shows that women who turned 20 before the moratorium (i.e., age 20 in 1972) were more likely to have their last child at age 20 (i.e., when sterilization before age 21 was still possible). Model 2, by contrast, shows that women who turned 20 after the moratorium (i.e., age 20 in 1975) were more likely to have their last child at age 21 (i.e., when sterilization became possible after the moratorium).

Finally, we rely on the medical literature (Clarke-Pearson & Geller 2013), which focuses on the genital disorders associated with permanent sterilization to validate the treatment. For a small number of women in the sample (almost 9%), the 1980-1995 National Health Interview Survey (NHIS) provides information on whether the woman experienced genital

Table 1: The Effect of the Moratorium on Age at Last Birth

	(1) Age at Last Birth = 20	(2) Age at Last Birth = 21
NA*Aged 20 in 1975	0.0125	0.0180*
	(0.00858)	(0.0101)
NA*Aged 20 in 1974	0.00501	-0.00391
	(0.00841)	(0.0102)
NA*Aged 20 in 1973	0	0
	(.)	(.)
NA*Aged 20 in 1972	0.0161*	-0.0000543
	(0.00941)	(0.0106)
NA*Aged 20 in 1971	-0.00773	0.00804
	(0.00782)	(0.0110)
Adj.R-squared	0.006	0.006
Observation	313514	313514
Clusters	1723	1723
Sample Mean	.0209783	.0283273
Mother Cohort FE		
Race FE		
Other FE		

Notes: The dependent variable is a dummy equal to one if the last child was born at the age of 20 (Model 1) or at the age of 21 (Model 1). The treatment variable is a dummy indicating whether a woman turned 20 in a given year, interacted with a dummy for American Indian women. White and Native American women are kept in the sample. Controls include: *i*) Region FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Survey year FE; *v*) Marital status; *vi*) Race; *vii*) Relation to the head; *viii*) Number of children. Clustered standard errors at a primary sampling unit. *** p<0.01, ** p<0.05, * p<0.1.

organ issues in the last year, such as inflammatory disorders, infertility, and chronic gynecological conditions, which can be caused by sterilization (**?**). For this reason, to assess the validity of our treatment, in Table 2 we estimate the treatment effect on whether the woman had any disorder in the last year. Controlling for the number of children in the household to exclude the effect of parity (another likely cause), we find that the probability of treated women having genital organ issues in the last year increases by almost 3 percentage points, which compared to the mean represents a quite large increase. Thus, the treatment nearly doubles the probability of experiencing genital issues. Even though the estimated sample includes only 180 treated women out of 388 American Indian women, this result seems to support the validity of the treatment as a proxy for (coerced) sterilization of Native American women.

Table 2: The Effect of the Moratorium on Age at Last Birth

	(1) Female Genital Issues	(2) Female Genital Issues
Coerced Sterilization	0.0295** (0.0149)	0.0295** (0.0149)
Adj.R-squared	0.003	0.004
Observation	48075	48075
Clusters	298	298
Treated	176	176
Sample Mean	0.033	0.033
Mother Cohort FE	Yes	Yes
Race FE	Yes	Yes
Child Cohort FE	Yes	Yes
Year FE	Yes	Yes
Other FE	No	Yes

Notes: The dependent variable is a dummy equal if the woman experienced any genital issues in the previous 12 months. Controls include: *i*) PUMAs FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Race; *v*) Marital status; *vi*) Citizenship; *vii*) Birth place; *viii*) Relation to the head; *ix*) Urban/rural residency. Clustered standard errors at a PUMAs level. *** p<0.01, ** p<0.05, * p<0.1.

5 Fertility and Coerced Sterilization

We begin by analyzing retrospective information on the total number of children ever born from the 1990 US Census to evaluate the effect of coerced sterilization on fertility. Figure B2 in Appendix B shows the overall trend in the average number of children ever born for Whites, African Americans, and American Indians, based on the birth year of the last child, to illustrate the variance exploited by the treatment. The average number of children decreases across groups for cohorts born after the 1960s, which, as documented in the literature, is likely the result of family planning methods introduced during that decade following the approval of Enovid (i.e., birth control pill) by the FDA. However, the reduction in the average number of children ever born for American Indians is significantly larger, declining from nearly five children per woman to fewer than three. The reduction among African Americans is also larger compared to Whites but is not as pronounced as that of American Indians. While African Americans were also targeted by sterilization programs in the 1950s and 1960s, the reduction in fertility for this group is unlikely to be primarily due to such programs, as the relative number of African American women forcibly sterilized appears to have been relatively small.

The possibility of heterogenous treatment arising from the cohort variation in the treatment represents a potential concern when estimating the average treatment effect

Table 3: The Effect of Sterilization on Fertility

	(1) Nr Children	(2) Nr Children> 1	(3) Nr Children> 2	(4) Nr Children> 3	(5) Nr Children
𝕀70*NA	-0.0719***	-0.0625***	-0.0483***	-0.0129*	0.291***
	(0.0214)	(0.00674)	(0.00814)	(0.00708)	(0.0511)
𝕀70*NA*Age<= 28					-0.627***
					(0.0786)
Adj.R-squared	0.267	0.109	0.179	0.210	0.267
Observation	2088643	2088643	2088643	2088643	2088643
Treated	7214	7214	7214	7214	7214
Sample Mean	2.586396	.7655957	.4093873	.1986874	2.586396
Clusters	509.000	509.000	509.000	509.000	509.000
Mother Cohort FE	Yes	Yes	Yes	Yes	Yes
Race FE	Yes	Yes	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes	Yes	Yes
Other FE	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is the number of children ever born (Model 1) and dummies for more than one children in the household (Model 2), more than 2 children in the household (Model 3), more than 3 children in the households (Model 4), and the number of children ever born (Model 5). Controls include: *i*) PUMAs FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Race; *v*) Marital status; *vi*) Citizenship; *vii*) Birth place; *viii*) Relation to the head; *ix*) Urban/rural residency. Clustered standard errors at a PUMAs level. *** p<0.01, ** p<0.05, * p<0.1.

on the treated (ATT). To decide whether the TWFE is a feasible estimator, or whether an estimator robust to heterogenous treatment would be preferable, we follow the approach outlined by De Chaisemartin & d'Haultfoeuille (2020) to evaluate the impact of negative weighting. The test reveals that 16 ATTs receive a positive weight, and none receive negative weights. Therefore negative weighting does not affect the computation of the ATT. Moreover, the the minimum standard deviation of the treatment effect ($\sigma(\Delta)$), across the treated (g, t) cells required for the ATT to be zero is approximately 9.3. This value is substantially larger than zero, indicating that the ATT could only be zero under an implausibly high degree of treatment heterogeneity. This, in turn, suggests that the TWFE estimates (B_{fe}) can be given a causal interpretation.

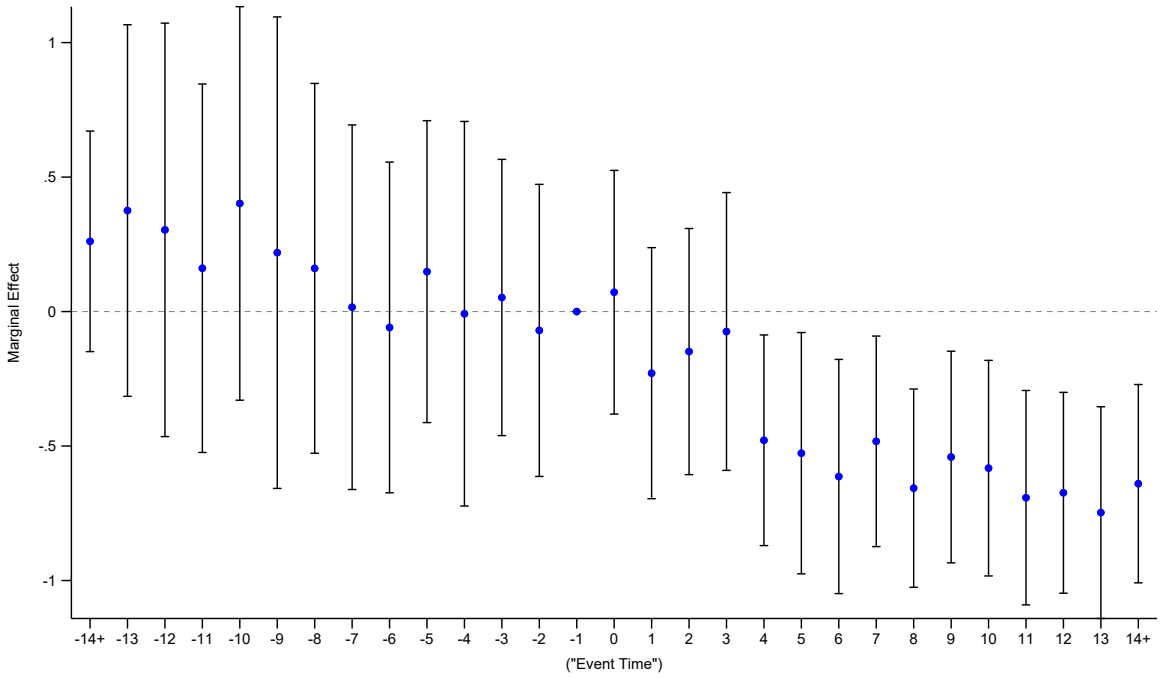
Table 3 reports the average treatment effects on the treated. In Model 1, the depen-

dent variable is the total number of children ever born. The effect of the treatment (i.e., whether the woman is likely to have been sterilized) in Model 1 is significant at the 5 percent level, with a coefficient of -0.072. This corresponds to a reduction of approximately 2.8 percent in the total number of children when compared to the sample average. In Model 2, we replace the dependent variable with a dummy indicating whether the woman reports having more than one child. For treated women, the probability of having more than one child decreases by nearly 6.3 percentage points, or approximately 8.2 percent relative to the mean. In Models 3 and 4, we estimate the change in the probabilities of having more than two children and more than three children, respectively. The probability of having more than two children decreases by approximately 11.7 percent in Model 3, while the probability of having more than three children decreases by 6.5 percent in Model 4, both relative to the mean. These results suggest that sterilization was significantly more likely to occur after the second child, seemingly to force American Indian families to conform to the family size norms prevalent among White families[8]. Model 5 reports heterogeneity effects depending on whether the age at last birth of the woman is 28 or below (i.e., below the sample mean). Despite the imprecision of these estimates driven by the collinearity due to the low number of treated women who had a last born after 28, the effects are consistent with trends reported in 3. The effect on parity is concentrated among women still in their peak fertility.

Figure 4 reports the dynamic treatment effect, using the year before the IHS began providing family planning programs as the reference point. Prior to the treatment, there is no significant difference in the number of children ever born between treated and untreated women. The treatment effect becomes statistically significant for households whose youngest child was born after 1969 — almost five years after the IHS started providing family planning services — and remains relatively constant in subsequent event periods. The lack of significant effects for early cohorts (i.e., up to 1969) suggests that any potential impact of family planning is minimal, excluding demand effects for sterilization. This aligns with existing literature indicating a limited use of contraceptive methods among American Indians due to cultural and gender norms. Doran (1972), for instance, interviewed Navajo women who had delivered at the Gallup Indian Medical Center (GIMC) and found that traditional beliefs — such as the idea that a woman is of no worth to a man unless she can bear him children — were key barriers to contraception adoption. The timing of the observed treatment effect also coincides with the *Jessin v. County of Shasta* ruling in 1969, which recognized sterilization as an acceptable family planning method, providing to doctors legal foundation to perform a sterilization. Quite

[8]Table C1 in Appendix C reports estimates restricting the sample to women of age between 25 and 70 by 1990.

Figure 4: Dynamic Treatment

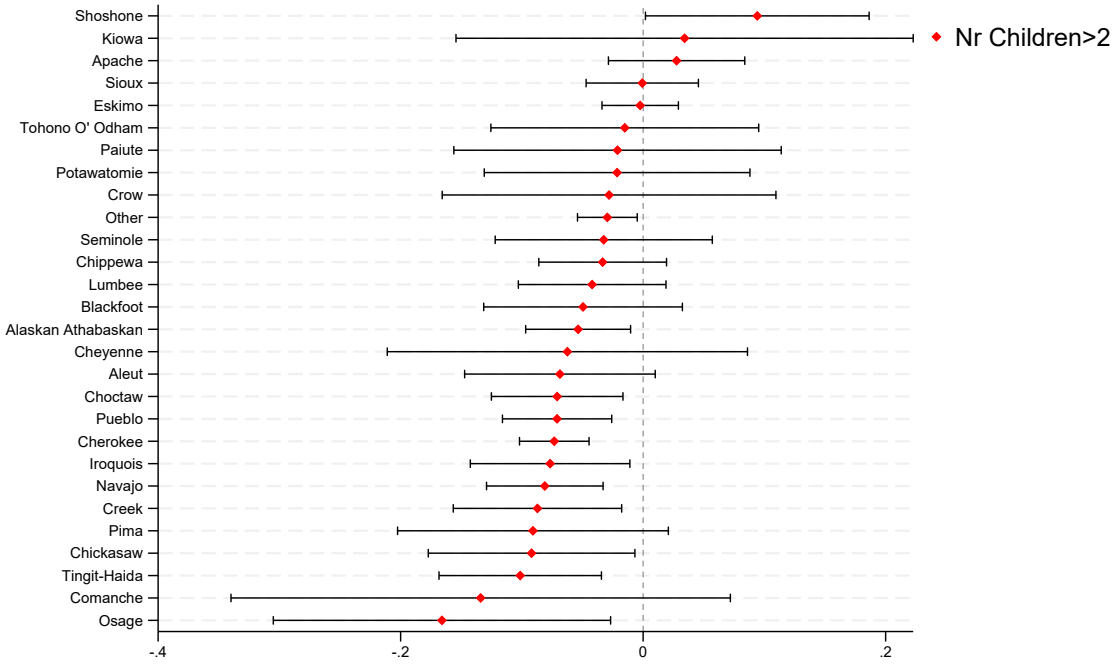


Note: The dependent variable is the number of children ever born. The vertical axis reports changes in the number of children ever born. The horizontal reports event periods. Controls include: *i*) PUMAs FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Race; *v*) Marital status; *vi*) Citizenship; *vii*) Birth place; *viii*)Relation to the head; *ix*) Urban/rural residency. Clustered standard errors at a PUMAs level. 5% confidence intervals. .

interestingly, the effect precedes the 1970 Family Planning Act, which subsidized sterilizations at Medicaid and Indian Health Service, and the the information campaign about sterilization which started around 1974. For instance, point estimates seem to suggest that these two initiative had little additional effect on fertility.

In Figure 5, we exploit information on tribal affiliation to estimate the impact of sterilization by tribe, focusing on the probability of having more than two children — the measure with the largest observed change in probability. While small sample sizes for some tribes result in large standard errors, several important patterns emerge. The Osage tribe is the most affected, with the probability of having more than two children decreasing by nearly 17 percentage points. For the Comanche and Chickasaw tribes, the reduction ranges from approximately 10 to 15 percentage points. Other tribes, including the Tlingit-Haida, Aleut, Iroquois, Pima, Choctaw, Cherokee, Chippewa, Navajo, and Creek, also experience significant declines. In contrast, the Shoshone and Apache tribes are the only groups where the probability of having more than two children increases. This increase is likely due to the broader provision of health care by the Indian Health Service (IHS): according to Kunitz (1976), the Shoshone and Apache tribes experienced the highest infant mortality in the 1960s. Hence, access to the IHS might have reduced infant

Figure 5: Average Treatment Effect by Tribe



Note: The dependent variable is a dummy for whether the number of children ever born is above two. The horizontal axis reports changes in the probability of having more than two children. Controls include: *i*) PUMAs FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Race; *v*) Marital status; *vi*) Citizenship; *vii*) Birth place; *viii*)Relation to the head; *ix*) Urban/rural residency. Clustered standard errors at a PUMAs level. 5% confidence intervals .

mortality among these two tribes, leading, eventually, to an increase in the probability of having more than two children, as shown in Figure 5.[9]

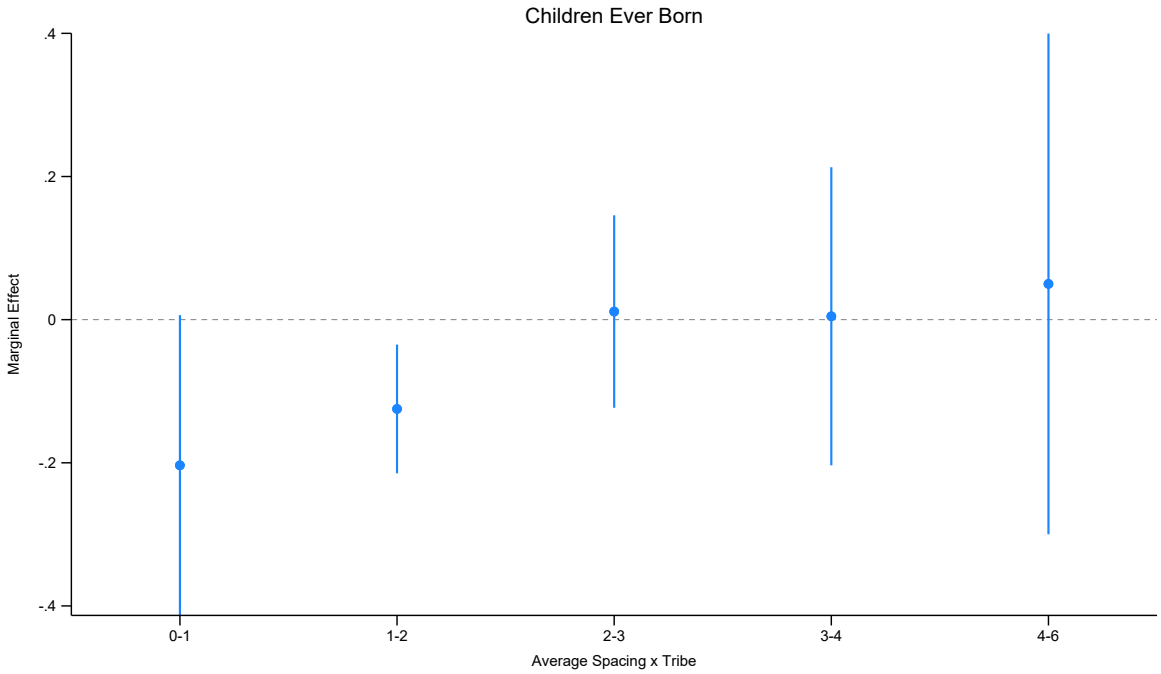
To gain a better understanding of treatment heterogeneity by tribe, we construct a rough proxy for traditional family planning at the tribal level, measured as the average birth spacing across tribes for women who were at least 35 years old by 1965—that is, women close to the end of their childbearing years[10]. The idea is to test whether tribes with a larger expected number of children were more likely to be targeted. Figure 6 reports heterogeneous treatment effects by average birth spacing at the tribal level. Tribes with a birth interval shorter than one year tend to have about 0.2 fewer children relative to the untreated sample, and this effect is significant at the 10 percent level despite the large standard errors resulting from the small number of observations in such bracket. The change in the number of children for tribes with average spacing above one and below two years is approximately -0.12 and is significant at the 5 percent level. The

[9]Figure B2 in Appendix B shows changes in the probability of having more than one, two, and three children across tribes.

[10]Ideally, such a measure of traditional family planning would be based on women who have completed their fertility (i.e., above 45). However, there are very few American Native women born before 1920 in the sample.

treatment effect is not statistically significant for tribes with longer birth intervals. This heterogeneity of the treatment effect is consistent with the idea that eugenic believes and Malthusian fear were some of the most important reasons which induced such a practice.

Figure 6: Heterogenous Effect Depending on Traditional Family Planning



Note: The dependent variable is a the number of children ever born. The horizontal axis reports the birth-interval by tribe. The vertical axis reports changes in the number of children ever born. Controls include: *i*) PUMAs FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Race; *v*) Marital status; *vi*) Citizenship; *vii*) Birth place; *viii*)Relation to the head; *ix*) Urban/rural residency. Clustered standard errors at a PUMAs level. 5% confidence intervals .

Kluchin (2020) argues that the civil and reproductive rights movements of the 1950s and 1960s provided *"neo-eugenic"* advocates with new opportunities, leading to a renewed wave of sterilizations among African Americans. For example, Sinderbrand (2005) notes that African Americans accounted for 60 percent of those sterilized in North Carolina during the 1950s. However, by the late 1960s, the total number of sterilizations in the state had declined significantly, with only 290 procedures performed between 1966 and 1968 (State Library of North Carolina 1968). This equates to roughly 90 annual sterilizations among African Americans in a population of about 1.2 million, a rate unlikely to significantly impact the estimated effects. In Appendix C, we test the effect of sterilization among American Indians compared to either Whites (Table C2) or African Americans (Table C3). For treated American Indian women, the average number of children ever born decreases by approximately 2.7 percent relative to the mean when compared to White women. Additionally, the probability of having more than two children decreases

by 13.6 percent relative to the mean. When compared to African Americans, the reduction in the probability of children ever born is not that different, with a decrease near 2.9 percent relative to the mean.

In Table C4 in Appendix C, we test the robustness of the effect using data from the NHIS for the period 1980–1995. Unlike the 1990 US Census, the NHIS provides information only about the number of children currently residing in the household, which is likely to influence both the mean and variance of the fertility distribution. This bias in the distribution of fertility is also likely to be group-specific. For instance, children in extended families are more likely to remain in the household for longer periods, which could lead to an upward bias[11]. The results in Table C4 largely confirm the negative effect of sterilization on fertility. As expected, the estimated effect is larger than the one obtained using data on the total number of children ever born. In Model 1, the total number of children in the household decreases by nearly 8 percent relative to the mean, compared to a 2.6 percent reduction in the total number of children ever born. Similarly, the probability of having more than two children decreases by approximately 25 percent, compared to an 11.2 percent reduction reported in Table 3.

6 The Impact on Health and Economic Outcomes

6.1 Health and Labour Outcomes

Lawrence (2000) argues that the inability to conceive and bear children had profound emotional and psychological consequences, affecting not only the women themselves but also their families, friends, and the broader Indian community. To evaluate the consequences of coerced sterilization, we use health information from the NHIS and socioeconomic data from the 1990 US Census.

Table **??** reports the estimated effects of sterilization on health outcomes using the same empirical methodology applied to fertility. Model 1 examines the probability of individuals self-reporting poor health conditions. Treated households are nearly 1.7 percentage points more likely to self-report a health level classified as poor. When compared to the mean, this effect corresponds to an increase of almost 15 percent. In Model 2, we replace the dependent with a dummy denoting whether the woman reports any health condition in the previous 12 months. The change in the probability of reporting health conditions for women likely to be exposed to sterilization increases by almost 4.3 percent-

[11] For example, if White children are more likely to leave the household earlier, the observed change in fertility due to sterilization would be compared to a smaller change in fertility in the untreated group. This difference would result in an upward bias.

age points. In Model 3, the probability of having more than one week of bed disability in the past year rises by nearly 2.5 percentage points, or otherwise, almost 19 percent when compared to the mean. Lastly, in Model 4, the probability of being drunk in the last fourteen days, which we use as a proxy for alcoholism and mental health is almost 7 percentage points larger. All these effects are significant at the 5 percent level except the effect on on bed disability which is significant at a 10 percent level.

Table 4: Health and Socioeconomic Consequences

	(1) Health	(2) Nr Conditions	(3) Bed Disability	(4) Alcol Cons.
$\mathbb{I}$70*NA	0.0172***	0.0419**	0.0252*	0.0716***
	(0.00548)	(0.0187)	(0.0141)	(0.0182)
Adj.R-squared	0.035	0.032	0.011	0.153
Observation	291497	257274	290679	23435
Treated	1035	899	1030	63
Sample Mean	.0269505	.7941378	.134547	.7633028
Clusters	298.000	298.000	298.000	288.000
Mother Cohort FE	Yes	Yes	Yes	Yes
Race FE	Yes	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes	Yes
Other FE	Yes	Yes	Yes	Yes

Notes: The dependent variable is a dummy for whether self-reported health is poor (Model 1), whether the reported number health conditions is larger than zero (Model 2), a dummy for at least one week of bed disability in the last 12 months (Model 3), and whether the individuals has drunk alcohol in the last 2 weeks (Model 4). Controls include: *i*) Region FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Survey year FE; *v*) Marital status; *vi*) Race; *vii*) Gender; *viii*) Relation to the head. Clustered standard errors at a primary sampling unit. *** p<0.01, ** p<0.05, * p<0.1.

Table **??** presents the impact of sterilization on socioeconomic conditions. In Model 1, we estimate the effect on whether the spouse is present in the household, which we use as a proxy for single-headed households and, consequently, as a measure of family disruption. The probability of a single-headed household increases by nearly 7 percent compared to the mean. In Model 2, the probability of work disability[12] increases by approximately 3.2 percentage points, or nearly 37 percent relative to the mean. Model 3 examines the effect on labor force participation, which decreases by more than 2.9 percentage points (equivalent to a 4.4 percent reduction relative to the mean). This reduced labor force participation leads to a decrease in total family income in Model 4 of almost $1770, nearly 4 percent. This effect is relatively larger - around 5.3 percent - when family income is replace with a measure of personal income for the woman (Model 5).

These results confirm the large ramifications for women experiencing such a trauma.

[12]Work disability is a binary variable equal to one if the individual reports any work-related disability.

Table 5: Health and Socioeconomic Consequences

	(1) Spouse Away	(2) Disability	(3) LFP	(4) Income	(5) Income
$\mathbb{I}$70*NA	0.0154***	0.0327***	-0.0288***	-1767.0***	-512.8***
	(0.00290)	(0.00534)	(0.00714)	(382.4)	(165.3)
Adj.R-squared	0.915	0.140	0.164	0.298	0.118
Observation	2088643	2088643	2088595	2088643	2088595
Treated	7214	7214	7214	7214	7214
Sample Mean	.2256949	.0865323	.6385374	43238.87	9619.943
Clusters	1726.000	1726.000	1726.000	1726.000	1726.000
Mother Cohort FE	Yes	Yes	Yes	Yes	Yes
Race FE	Yes	Yes	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes	Yes	Yes
Other FE	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variables are whether the spouse is present in the household (Model 1), a dummy for reported work disability (Model 2), labour force participation (Model 3), family income (Model 4), and personal income (Model 5). Estimates in Model 5 are confined to women. Controls include: *i*) PUMAs FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Race; *v*) Marital status; *vi*) Citizenship; *vii*) Birth place; *viii*) Gender;*ix*) Relation to the head; *x*) Urban/rural residency. Clustered standard errors at a PUMAs level. *** p<0.01, ** p<0.05, * p<0.1.

Family structure was undermined. Health was badly affected. As a result, labour force participation and income both decreased.

6.2 Investment in Children

According to the quantity-quality (Q-Q) trade-off, parents are likely to devote more resources to investing in their children when fertility declines. However, the Q-Q framework considers ceteris paribus conditions, where socioeconomic factors remain constant. Consequently, the positive effect on child investment becomes less certain in scenarios where family dynamics, health, and economic conditions are negatively impacted.

We use data from the 1990 US census again to examine the consequences in terms of investment in children. Specifically, we focus on children of the household head and merge data on children's characteristics with information about the household head to evaluate the impact on children of parents who are likely to be treated[13]. The fact that we can only look at children within the household may introduce issues related to sample selection, as these children are likely to be those with fewer opt-out options. However, given the prevalent family structure, White children should be much more likely to leave the household than American Indian children. Consequently, the mean and variance of the distribution of education in the sample for the control group may be relatively lower, which could potentially bias the estimates toward zero.

Treated children in 1990 should be between the ages of 10 and 21[14]. Some of these children are likely to have completed their education, while others may still be enrolled in educational programs. For this reason, the estimated model includes a control for whether the child is still in education. Table **??** Panel A, reports the estimated impact of a parent being treated on the probability of the child completing the 8^{th} degree (Model 1), the 12^{th} degree (Model 2) and any college (Model 3). Panel B reports the estimated effect on treated parents controlling for the household head labour force participation, education, and Duncan Socioeconomic index. Compulsory education in most states is between the ages of 6 and 16[15]. For this reason, the probability of the child completing at least the 8th grade[16] is not significantly affected. However, the probability of completing either the 12th grade or any college significantly decreases by nearly 2.6 and 4.3 percentage points,

[13]The treatment will capture whether a Native American parent's last child was born between 1965 and 1980.

[14]Figure 2 shows that households most likely to be affected by sterilization are those with the youngest child born after 1969.

[15]Compulsory school attendance laws in the U.S. vary by state, with some states requiring attendance to start at age 5, while others impose a minimum drop-out age of 17.

[16]We look at the probability of completing the 8th grade (rather than the 9th grade) for consistency with estimates using data from the NHIS reported in Appendix C, where grades 9, 10, and 11 are grouped together.

Table 6: Investment in Children

	Panel A		
	(1)	(2)	(3)
	Grade 8	Grade 12	College
$\mathbb{I}70*NA$	-0.00392*	-0.0293***	-0.0446***
	(0.00226)	(0.00356)	(0.00483)
Adj.R-squared	0.882	0.752	0.422
Observation	3283888	3283888	3283888
Treated	13491	13491	13491
Sample Mean	.5823213	.2262894	.1129965
Clusters	1726.000	1726.000	1726.000
Cohort FE	Yes	Yes	Yes
Race FE	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes
Other FE	Yes	Yes	Yes
	Panel B		
	(1)	(2)	(3)
	Grade 8	Grade 12	College
$\mathbb{I}70*NA$	-0.00296	-0.0261***	-0.0428***
	(0.00228)	(0.00379)	(0.00395)
Adj.R-squared	0.883	0.755	0.432
Observation	3283888	3283888	3283888
Treated	13491	13491	13491
Sample Mean	.5823213	.2262894	.1129965
Clusters	1726.000	1726.000	1726.000
Cohort FE	Yes	Yes	Yes
Race FE	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes
Other FE	Yes	Yes	Yes

Notes: Panel A reports estimates without controlling for the education level, labour force participation, and Duncan socioeconomic Index of the household head. Panel B includes these controls. The dependent variable is a dummy for whether the highest completed level of education is grade 8 (Model 1), grade 12 (Model 2), or any college (Model 3). Controls include: *i*) PUMAs FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Race; *v*) Birthplace; *vi*) Household head marital status; *vii*) Household head citizenship; *viii*) Gender; *ix*) Household head gender; *x*) Household head urban/rural residency; *xi*) Household head Duncan Socioeconomic Index; *xii*) Household head highest education Level; *xiii*) Household head labour force participation; *xiv*) School attendance. Clustered standard errors at a PUMAs level. *** p<0.01, ** p<0.05, * p<0.1.

respectively. These changes in probability amount to a reduction in the likelihood of completing the 12th grade by almost 12.6 percent compared to the mean, and a reduction in completing any college of close to 38 percent.

To evaluate the robustness of these results, we repeat the same exercise using survey data from the NHIS over the period 1980-1995, which allows me to exploit the annual variation. Looking again at children of parents who have been exposed to the treatment, we find a similar negative effect on the probability of completing further education. The probability of completing the 8^{th} grade in Table C5 in Appendix C is not significantly affected, nor is the probability of completing the 12^{th} grade. However, there is a significant reduction in the probability of completing any college, which amounts to almost 2.9 percentage points, or a reduction of nearly 27 percent compared to the mean; not far from the reduction in the probability of completing any college estimated using data from the US Census.

7 Intergenerational Transmission

The economic evidence on medical negligence shows a long-lasting culture of medical distrust (Alsan & Wanamaker 2018), which can potentially spread to future generations. If children of parents likely exposed to the treatment tend to avoid family planning methods because of their parents' experiences, then one should expect them to have more children compared to a control group that tends to use contraception.

To estimate the intergenerational transmission, we begin with the 2023 Panel Study of Income Dynamics - Social, Health, and Economic Longitudinal File (PSID-SHELF). The PSID-SHELF is a longitudinal study that follows the descendants of panel families originally sampled in 1968. It reports information about children, which can then be linked back to the original family. After linking children to parents, the sample includes 74 treated individuals out of 342 American Indians in the dataset. The relatively small number of treated individuals is likely to cause issues in terms of representativeness. For this reason, to increase the reliability from a representativeness perspective, we supplement results from the PSID-SHELF with estimates using the IPUMS 2000 5 percent sample of the US Census. We use the 2000 sample because children of parents likely exposed to the treatment should be between 20 and 35 years old by 2000 and therefore all of reproductive age. The issue with the 5 percent US Census is that we can only look at children who are still living with their parents, which, of course, will cause sample selection problems again. However, the two sources together should provide a clear indication of the potential intergenerational effect of such a trauma.

Table 7: Intergenerational Transmission of Fertility

Panel A				
	(1)	(2)	(3)	(4)
	Nr of Children	Children 1	Children 2	Children 3
$\mathbb{I}$70*NA	0.517**	0.157**	0.102*	0.0388
	(0.196)	(0.0741)	(0.0581)	(0.0446)
Adj.R-squared	0.255	0.242	0.125	0.067
Observation	20643	20643	20643	20643
Treated	58	58	58	58
Sample Mean	1.045148	.3214649	.1530785	.0618127
Clusters	52.000	52.000	52.000	52.000
Parent Cohort FE	Yes	Yes	Yes	Yes
Race FE	Yes	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes	Yes
Other FE	Yes	Yes	Yes	Yes
Panel B				
	(1)	(2)	(3)	(4)
	Nr of Children	Children 1	Children 2	Children 3
$\mathbb{I}$70*NA	0.0830***	0.0285***	0.00918	0.00646*
	(0.0263)	(0.00915)	(0.00574)	(0.00377)
Adj.R-squared	0.149	0.085	0.038	0.017
Observation	370516	370516	370516	370516
Treated	1867	1867	1867	1867
Sample Mean	.1874629	.0442491	.0128928	.0035707
Clusters	2071.000	2071.000	2071.000	2071.000
Parent Cohort FE	Yes	Yes	Yes	Yes
Race FE	Yes	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes	Yes
Other FE	Yes	Yes	Yes	Yes

Notes:The dependent variable is the number of children ever born (Model 1) and dummies for more than one children in the household (Model 2), more than 2 children in the household (Model 3), and more than 3 children in the households (Model 4).

Panel A reports the impact of sterilization fertility using data from the IPUMS-SHELF. Controls include: *i*) Individual cohort FE for the parent and his/her child; *ii*) Youngest child birth cohort FE; *iii*) State FE for the parent and his/her child; *iv*) Parent's race; *v*) Parent's education; *vi*) Parent's number of children; *vii*) Parent's employment status; *viii*) Parent's salary income and wage ; *ix*) Children's gender ;*x*) Children's married; *xi*) Children education level; *xii*) Children's relation to the head; *xiii*) Children's employment status; *xiv*) Children's salary income and wage. Clustered standard errors at a state level. *** p<0.01, ** p<0.05, * p<0.1.

Panel B reports estimates using data from the 2000 US Census. Controls include: *i*) Individual Cohort FE for the parent and his/her child; *ii*) Youngest child birth cohort FE; *iii*) PUMAs FE; *iv*) Child race; *v*) Child gender; *vi*) Child Duncan socioeconomic index; *vii*) Child education; *viii*) Gender of the household head ; *vii*) Marital status of the head ;*ix*) Number of children of the head; *x*) Duncan socioeconomic index of the head; ; *xi*) Education level of the head; *xii*) An indicator for extended family. Clustered standard errors at a PUMAs level. *** p<0.01, ** p<0.05, * p<0.1.

Table 7, Panel A reports estimates using the PSID-SHELF. The number of treated individuals, after including controls, drops further to 58. The estimated number of children in Model 1 for treated individuals increases by almost 0.5, which, compared to the average number of children in the sample, corresponds to an average increase of nearly 50 percent (i.e., instead of having 2 children, treated individuals will only have one). The probability of having more than one child (Model 2) increases by almost 15.7 percentage points (nearly 50 percent compared to the mean), and the probability of having more than two children (Model 3) increases by almost 10 percentage points (significant at a 10 percent level). The effect on the probability of having more than three children (Model 4), on the other hand, is not significantly affected by the treatment. However, this loss of significance for the latter reflects the relatively low number of women in the sample (and hence in the treatment group) with more than three children.

Panel B reports estimates using the 5 percent US Census sample and focusing on individuals of age 20 or above. The average number of children in this sample is much smaller (i.e., close to 0.19 children). Hence the majority of individuals in the sample are childless, which reflects the selection issue in this sample. This sample selection is likely to generate an upward bias. However, the estimates confirm the positive impact of parents' trauma on their children's fertility. The estimated number of children in Model 1 drops by almost 44 percent. The probability of having more than one child (Model 2) increases by almost 2.9 percentage points. Estimated effects in Model 3 and 4 on the other hand are barely significant, reflecting the relative low variation among individuals in the sample having more than 2 and more than 3 children.

8 Conclusions

The IHS has provided an important healthcare service for American Indians since it was founded in 1955. However, physicians working at IHS facilities often operated under the assumption that Native people were morally, mentally, and socially defective (Lawrence 2000). This presumption, combined with a government narrative that birth rates should be reduced due to Malthusian fears, led to the mass sterilization of American Indians. Women who went into hospitals for tonsillectomies or appendectomies often came out with tubal ligations or salpingectomies.

Using different data sources, we show that this mass sterilization had a large impact on fertility, which then led to deep social and economic ramifications. Future generations may also have been affected by the creation of a culture of medical mistrust and lower reliance on family planning methods.

These social and economic consequences persist today, with American Indians having some of the highest rates of suicide and alcoholism in the nation (Leavitt et al. 2018). To what extent this trauma explains such poor health outcomes is something that still needs to be better understood.

Appendix A - Data Description

IPUMS 1990 5% US Census State Sample

The 1990 5% State sample is a 1-in-20 national random sample of the population. The file is hierarchical in structure, meaning that a housing unit record is followed in sequence by records for the persons in that housing unit. The variable *relate* identifies household members and their relation to the head of the household.

We keep the head of the household, the spouse, parents, and partners of the head (*relate=1, 2, 5, 11*) for the analysis related to fertility and economic consequences. This choice is justified by the fact that data on children ever born is only reported for women. This means that information on children ever born is reported for the head if she is female or the spouse if the head is male. Parents and partners will also report information on children ever born if they are women and have had children. We also exclude household members aged below 15 because they are unlikely to have children, and those aged above 90.

For the analysis related to investment in children, on the other hand, we only keep observations related to children of the household head (*relate=3*), excluding children-in-law. We then merge children's characteristics with information about the household head (*relate=1*) using the household identifier (*serial*) to control for parental characteristics. Children for whom information on school attendance is not available (i.e., children under 3) are dropped from the sample.

IPUMS NHIS 1980-1995

The National Health Interview Survey is a survey that collects information on the health, health care access, and health behaviors of the U.S. population. Each record represents an individual, and similar to the U.S. Census, person records are organized into households. To evaluate health consequences, we keep observations related to the household head and their spouse (*relate=10, 21, 22*).

To evaluate investment in children, we follow the same steps as for the U.S. Census 5% sample, which are: *i)* we keep individual characteristics related to the child of the householder (*relate=41*); *ii)* we merge children's characteristics with information related to the head of the household (*relate=10*) using the household identifier (*serial*) to control for parental characteristics.

PSID-SHELF

The Panel Study of Income Dynamics–Social, Health, and Economic Longitudinal File (PSID-SHELF) provides an easy-to-use, harmonized longitudinal dataset for the Panel Study of Income Dynamics (PSID). The dataset covers the period from 1968 to 2019. I use the long version of the file, which provides information for each person over time.

To link children's information to parents, we first reshape the dataset using child identifiers to capture fertility information for each child over time. Since characteristics may change over time and we only need to exploit cross-sectional variation, we generate the mode or the maximum value of variables to obtain the most frequent or maximal values for each variable. For example, for variables like employment status and marital status, we generate the mode to reflect the prevalent employment and marital status over the period. For variables like the number of children, education levels, and family size, we take the maximum value to capture the total number of children or the highest educational level, for instance. We then collapse the dataset (at the median value) by child ID to avoid inflating standard errors. This information is subsequently merged with data about the child's parent to obtain a measure of the last child born to a given parent. Therefore, we will have a single observation for each child, along with information about the parent of that child.

IPUMS 2000 5% US Census Sample

We use the 2000 5% US sample to complement the analysis on the intergenerational transmission of fertility. To obtain a measure of fertility of children born to given parents, we follow the same procedure used to evaluate investment in children, which is: *i)* we keep observations related to children of the household head (*relate=3*), excluding children in law; *ii)* we then merge children characteristics with information about the household head (*relate=1*) using the household identifier (*serial*). Only children of age 20 or above are kept in the sample.

Table A1: Summaries 1990 US Census

	Overall Sample				
	count	mean	sd	min	max
Child Ever Born	4146387	2.209684	1.860645	0	12
Nr Children> 1	4146387	.6404173	.4798781	0	1
Nr Children> 2	4146387	.3621063	.4806094	0	1
Nr Children> 3	4146387	.1842824	.3877143	0	1
Spouse not Present	4146387	.3183933	.4658531	0	1
Work Disability	4146387	.1312941	.3377217	0	1
Labour Force Participation	4145924	.560807	.4962888	0	1
Wage and Salary Income	4145924	9203.807	13319.58	0	197927
$\mathbb{I}$70*NA	4146387	.0017398	.0416749	0	1
Mother Birth Cohort	4146387	1942.288	17.59329	1900	1975
Last Child Birth Cohort	2088643	1977.33	12.04638	1915	1990
Race	4146387	1.367969	1.186539	1	7
group(stateicp countyicp)	4146387	220.6873	126.7404	1	434
Gender	4146387	2	0	2	2
Relation to the Head	4146387	2.05534	1.915723	1	11
Marital Status	4146387	2.342047	1.902419	1	6
Urban/Rural	4146387	1.674472	.468572	1	2
Citizenship	4146387	.2188718	.7191139	0	3
Birth Place	4146387	1.470421	1.729411	1	800

Table A2: Summaries 1990 US Census

	Education Sample				
	count	mean	sd	min	max
grade8	3444513	.5867099	.4924241	0	1
grade12	3444513	.2303815	.4210771	0	1
college	3444513	.1142832	.318155	0	1
treatment	3444513	.0039167	.0624606	0	1
Children Birth Cohort	3444513	1975.8	9.051618	1902	1987
Race	3444513	1.577327	1.490005	1	7
Gender	3444513	1.472111	.4992217	1	2
sex	3444513	1.249699	.4328386	1	2
Head Marital Status	3444513	1.803982	1.497874	1	6
Last Child Birth Cohort	3283889	1978.709	9.231024	1915	1990
Head Highest Education Level	3444513	6.587933	2.53712	0	11
Head Duncan Socioeconomic Index	3444513	37.15589	26.11956	0	96
Head Labour Force Participation	3444513	1.850223	.3568696	0	2
Head Urban/Rural	3444513	1.653855	.4757403	1	2
Citizenship	3444513	.2813367	.812586	0	3
School Attendance	3444513	1.705402	.455862	1	2

Table A3: Summaries NHIS

	Overall Sample				
	count	mean	sd	min	max
Genital Organ Issues	96511	.0298826	.1702643	0	1
Number of Children	584326	.9718873	1.211885	0	9
Nr Children > 1	584326	.2963791	.4566606	0	1
Nr Children > 2	584326	.1138611	.3176428	0	1
Nr Children > 3	584326	.0366302	.1878524	0	1
Poor Health Dummy	581788	.0394181	.1945878	0	1
number of reported conditions	514672	1.027752	1.473851	0	23
Bed Disability	579451	.1411319	.3481578	0	1
Drunk in last 2 weeks	50537	.7811307	.4134839	0	1
Coerced Sterilization	584326	.0017747	.0420898	0	1
Parent Birth Cohort	584326	1941.42	17.90897	1881	1981
Race	580493	1.408558	1.693042	1	15
region of residence	584326	2.529169	1.036303	1	4
Relation to Household Head	584326	16.63332	5.390668	10	22
Gender	584326	2	0	2	2
Last Son Birth Cohort	294112	1976.516	11.22016	1906	1995
Relation to Household Head	584326	16.63332	5.390668	10	22
Marital Status	584326	18.3369	13.39511	0	99

Table A4: Summaries PSID-SHELF

	PSID-SHELF				
	count	mean	sd	min	max
Nr of Child	40488	.5717497	1.159129	0	16
Children >1	40488	.1753112	.3802378	0	1
Children >2	40488	.083358	.276426	0	1
Children >3	40488	.0337137	.1804934	0	1
Parent Earning (real $ 2022)	40352	41866.54	40640.4	0	1185335
Children Earning (real $ 2022)	39913	46353.64	50170.7	0	1567172
Last Son Birth Cohort	40488	1988.324	17.96034	1915	2019
Children Birth Cohort	40486	1984.468	18.84357	1893	2019
Parent Birth Cohort	40486	1957.797	19.42352	1889	2003
Parent Race	37489	3.206514	3.741925	1	14
Children Gender	40488	1.491948	.4999413	1	2
Children Married	39094	.693994	.4608381	0	1
Parent Highest Education Level	40239	1.650339	1.161863	0	4
Children Highest Education Level	22888	1.501442	1.10986	0	4
Children Relation to Ref. Pers	39411	291.3441	67.7563	100	490
Parent Nr of Children	40488	3.670569	2.241832	1	20
Parent Employment Status	40387	.6733231	.4527859	0	1
Children Employment Status	22779	.5646868	.4760685	0	1

Table A5: Summaries 2000 5% Sample

	Children Sample				
	count	mean	sd	min	max
Nr of Children	1479495	.1263634	.4902299	0	9
Children > 1	1479495	.0295053	.1692182	0	1
Children > 2	1479495	.0095141	.097075	0	1
Children > 3	1479495	.0029436	.0541748	0	1
Coerced Sterilization	1479495	.0012619	.0355011	0	1
Individual cohort FE	1479495	1977.252	9.406428	1911	1985
H. Head cohort FE	1475177	1949.261	11.11948	1911	1983
Race	1479495	1.949421	1.992738	1	9
Gender	1479495	1.456493	.4981037	1	2
Head gender	1475177	1.325372	.4685138	1	2
Head marital status	1475177	2.100272	1.653042	1	6
Last son cohort FE	891371	1982.539	8.87549	1928	2000
Head nr of chidlren	1475177	2.122941	1.214987	1	9
Duncan Socioeconomic Index	1479495	22.58586	23.25934	0	96
Head Duncan Soc. Index	1475177	34.71881	26.4308	0	96
Education level	1479495	5.283282	2.075918	0	11
Head education level	1475177	6.474473	2.583755	0	11
Dummy for extended family	1479495	.0807911	.2725141	0	1

Appendix B - Figures

Figure B1: Age at Last Birth

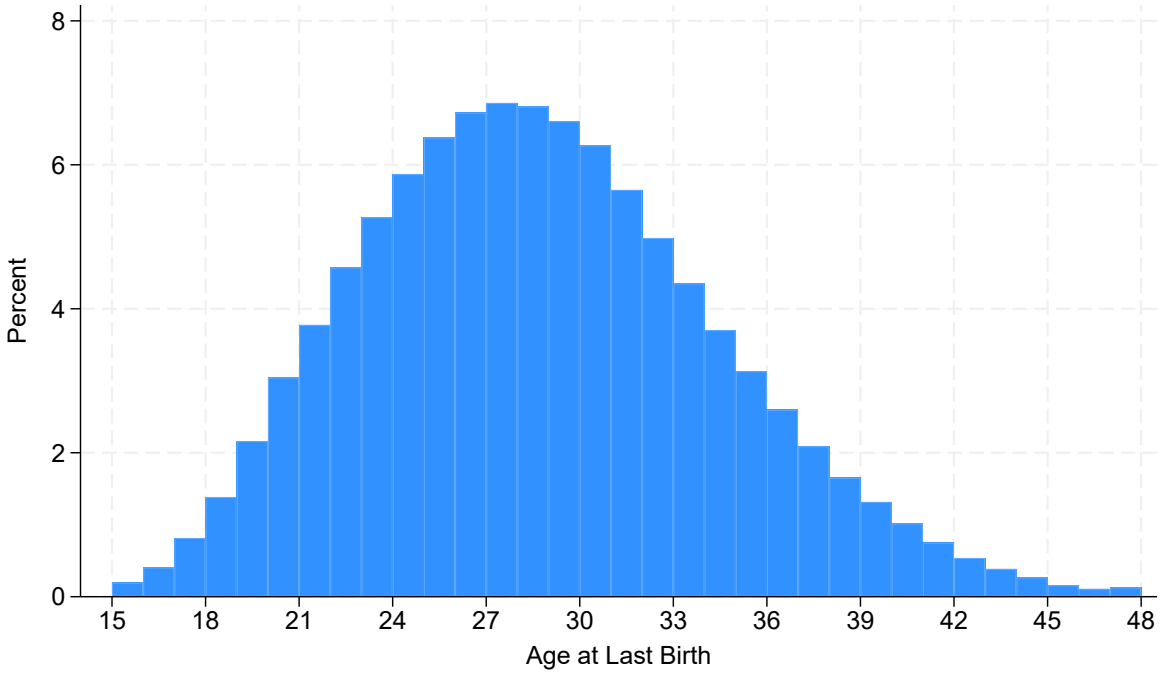
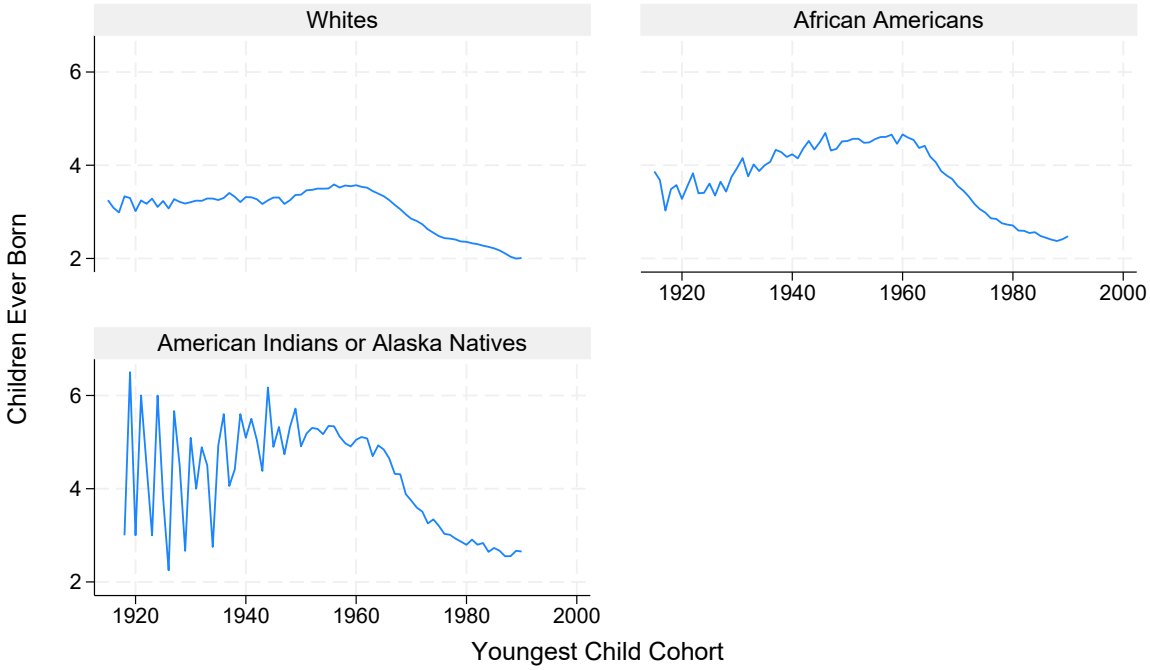
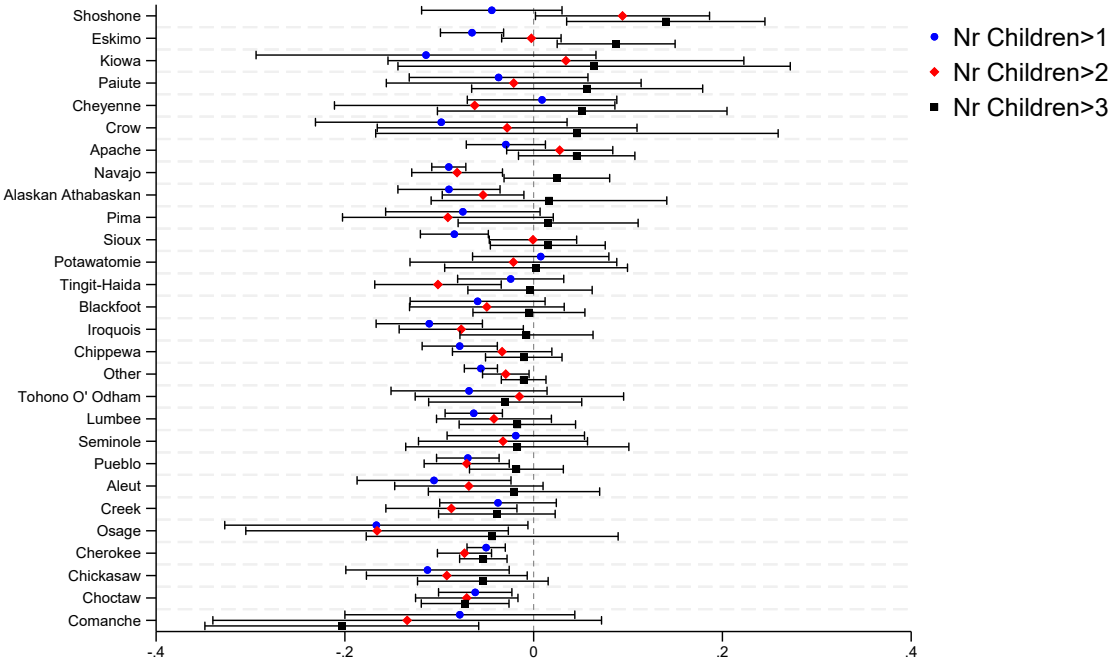


Figure B2: Children Ever Born by Race



Note: The graph shows the average number of children ever born by race and over the birth year of the last child. The plot reports number of children for Whites, African Americans, and American Indians. Other races are excluded. The larger variability for earlier cohorts among American Indians is due to the relative small number of observations for those years.

Figure B3: Average Treatment Effect by Tribe



Note: The dependent variable is the number of children ever born. The vertical axis reports changes in the number of children ever born. The horizontal reports periods to/from the birth year of the youngest children. Controls include: *i*) Region FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Survey year FE; *v*) Marital status; *vi*) Race; *vii*) Gender; *viii*) Relation to the head; *ix*) Number of children. Clustered standard errors at a primary sampling unit. 5% confidence intervals. .

Appendix C - Tables

Table C1: The Effect of Sterilization on Fertility - Estimates Confined to Women of age between 25 and 70 in 1990

	(1) Nr Children	(2) Nr Children 1	(3) Nr Children 2	(4) Nr Children 3
Coerced Sterilization	-0.0829***	-0.0575***	-0.0598***	-0.0247***
	(0.0316)	(0.00569)	(0.00771)	(0.00722)
Adj.R-squared	0.259	0.080	0.166	0.204
Observation	1904565	1904565	1904565	1904565
Treated	7272	7272	7272	7272
Sample Mean	2.60601	.7833815	.4194107	.2009283
Clusters	1726.000	1726.000	1726.000	1726.000
Mother Cohort FE	Yes	Yes	Yes	Yes
Race FE	Yes	Yes	Yes	Yes
Last Son FE	Yes	Yes	Yes	Yes
Other FE	Yes	Yes	Yes	Yes

Notes: The dependent variable is the number of children ever born (Model 1) and dummies for more than one children in the household (Model 2), more than 2 children in the household (Model 3), and more than 3 children in the households (Model 4). Controls include: *i*) PUMAs FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Race; *v*) Marital status; *vi*) Citizenship; *vii*) Birth place; *viii*) Relation to the head; *ix*) Urban/rural residency. Clustered standard errors at a PUMAs level. *** p<0.01, ** p<0.05, * p<0.1.

Table C2: The Effect of Sterilization on Fertility

	(1) Nr Children	(2) Nr Children 1	(3) Nr Children 2	(4) Nr Children 3
$\mathbb{I}$70*NA	-0.0661**	-0.0785***	-0.0535***	-0.0113*
	(0.0316)	(0.00600)	(0.00751)	(0.00660)
Adj.R-squared	0.249	0.116	0.176	0.197
Observation	1709559	1709559	1709559	1709559
Treated	7214	7214	7214	7214
Sample Mean	2.49145	.7631179	.3915132	.1785905
Clusters	1726	1726	1726	1726
Mother Cohort FE	Yes	Yes	Yes	Yes
Race FE	Yes	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes	Yes
Other FE	Yes	Yes	Yes	Yes

Notes: The table reports estimates using only Whites as a control group. The dependent variable is the number of children ever born (Model 1) and dummies for more than one children in the household (Model 2), more than 2 children in the household (Model 3), and more than 3 children in the households (Model 4). Controls include: *i*) PUMAs FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Race; *v*) Marital status; *vi*) Citizenship; *vii*) Birth place; *viii*) Relation to the head; *ix*) Urban/rural residency. Clustered standard errors at a primary sampling unit. *** p<0.01, ** p<0.05, * p<0.1.

Table C3: The Effect of Sterilization on Fertility

	(1) Nr Children	(2) Nr Children 1	(3) Nr Children 2	(4) Nr Children 3
$\mathbb{I}$70*NA	-0.0878***	0.00671	-0.0244***	-0.0241***
	(0.0313)	(0.00592)	(0.00680)	(0.00688)
Adj.R-squared	0.292	0.096	0.169	0.221
Observation	251694	251694	251694	251694
Treated	7213	7213	7213	7213
Sample Mean	3.06432	.7728432	.4990385	.3007064
Clusters	1719	1719	1719	1719
Mother Cohort FE	Yes	Yes	Yes	Yes
Race FE	Yes	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes	Yes
Other FE	Yes	Yes	Yes	Yes

Notes: The table reports estimates using only Blacks as a control group. The dependent variable is the number of children ever born (Model 1) and dummies for more than one children in the household (Model 2), more than 2 children in the household (Model 3), and more than 3 children in the households (Model 4). Controls include: *i*) PUMAs FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Race; *v*) Marital status; *vi*) Citizenship; *vii*) Birth place; *viii*) Relation to the head; *ix*) Urban/rural residency. Clustered standard errors at a primary sampling unit. *** p<0.01, ** p<0.05, * p<0.1.

Table C4: The Effect of Sterilization on Fertility Using Data from the NHIS

	(1) Nr Children	(2) Nr Children¿1	(3) Nr Children¿2	(4) Nr Children¿3
𝕀70*NA	-0.149***	-0.0309*	-0.0567***	-0.0276*
	(0.0475)	(0.0186)	(0.0197)	(0.0160)
Adj.R-squared	0.182	0.174	0.109	0.065
Observation	292429	292429	292429	292429
Treated	1037	1037	1037	1037
Sample Mean	1.921246	.5866928	.2251589	.0722398
Clusters	298	298	298	298
Mother Cohort FE	Yes	Yes	Yes	Yes
Race FE	Yes	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes	Yes
Other FE	Yes	Yes	Yes	Yes

Notes: The dependent variable is the number of children in the household (Model 1 and dummies for more than one children in the household (Model 2), more than 2 children in the household (Model 3), and more than 3 children in the households (Model 4). Controls include: *i*) Region FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Survey year FE; *v*) Marital status; *vi*) Race; *vii*) Gender; *viii*) Relation to the head. Clustered standard errors at a primary sampling unit. *** p<0.01, ** p<0.05, * p<0.1.

Table C5: Investment in Children Using Data from the NHIS

	Panel A		
	(1)	(2)	(3)
	Grade 8	Grade 12	College
$\mathbb{I}$70*NA	-0.0111	0.00111	-0.0363***
	(0.0111)	(0.0104)	(0.0114)
Adj.R-squared	0.667	0.543	0.232
Observation	122958	391380	391380
Treated	681	1623	1623
Sample Mean	.5157289	.2456385	.1062752
Clusters	298	298	298
Cohort FE	Yes	Yes	Yes
Race FE	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes
Other FE	Yes	Yes	Yes
	Panel B		
	(1)	(2)	(3)
	Grade 8	Grade 12	College
$\mathbb{I}$70*NA	0.0137	0.00635	-0.0291**
	(0.00954)	(0.0112)	(0.0127)
Adj.R-squared	0.689	0.550	0.255
Observation	389312	389312	389312
Treated	1599	1599	1599
Sample Mean	.4931957	.2448448	.1062695
Clusters	298	298	298
Cohort FE	Yes	Yes	Yes
Race FE	Yes	Yes	Yes
Child Cohort FE	Yes	Yes	Yes
Other FE	Yes	Yes	Yes

Notes: Panel A reports estimates without controlling for the education level and the employment status of the head. Panel B includes these controls. The dependent variable is a dummy for whether the highest completed level of education is grade 8 (Model 1), grade 12 (Model 2), or any college (Model 3). Controls include: *i*) Region FE; *ii*) Individual cohort FE; *iii*) Youngest child cohort FE; *iv*) Survey year FE; *v*) Marital status of the head; *vi*) Gender; *vii*) Gender of the head; ; *viii*) Race; *ix*) Employment status of the head; *x*) Education level of the head. Clustered standard errors at a primary sample unit level. *** p<0.01, ** p<0.05, * p<0.1.

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