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THE INTERGENERATIONAL HEALTH EFFECTS OF FORCED DISPLACEMENT: JAPANESE AMERICAN INCARCERATION DURING WWII

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ABSTRACT

We study the intergenerational health consequences of forced displacement and incarceration of Japanese Americans in the US during WWII. Incarcerated mothers had babies who were less healthy at birth. This decrease in health represents a shift in the entire birthweight distribution due to exposure to prison camps. Imprisoned individuals were less likely to have children with fathers of other ethnic groups but were more likely to receive prenatal care, invest in education, and participate in the labor market. To the extent human capital effects mitigate the full negative effects of incarceration on intergenerational health, our results are a lower bound.

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1 Introduction

Forced migration uproots communities: the experiences of trauma, losing physical assets, and being displaced against one's will have long-lasting effects on the targeted group.[1] While the empirical literature on the legacy of displacement and forced migration has recently grown, it has focused predominantly on labor market or political outcomes. The health consequences of such events are still relatively understudied, despite having deep and long-term effects that likely carry on across generations (Almond et al., 2010).

In this paper, we evaluate the effects of the forced displacement of Japanese Americans during WWII by studying the birth outcomes, human capital accumulation, and marital matching patterns of Japanese women decades after exposure to incarceration. This episode represents one of the largest state-led removal of civilians in US history: more than 110,000 Japanese Americans were forcibly evacuated from their homes and imprisoned in camps located in remote areas of the US, managed by the US War Relocation Authority. This policy, combined with the prohibition of emigrating, resulted in an average incarceration of three and a half years.[2]

Two historical features of this policy are particularly important for our empirical design. First, Japanese American imprisonment was largely an unanticipated event, given that before the attack on Pearl Harbor there were no expectations that Japanese Americans would be incarcerated en masse. Second, incarceration targeted only people of Japanese ancestry residing in mainland US but not those living in Hawaii. This resulted in the de facto complete displacement of the former, but not of the latter, thus providing us with an ideal comparison group, where similar coevolution of outcomes sans treatment is more likely to hold given common heritage and other ethnicity-specific unobservables.[3]

[1] See Becker et al. (2020) for an excellent survey of the recent literature on forced migration.

[2] The Los Angeles Times recently announced a change to using the term incarceration for accuracy over the previously used, euphemistic "internment" (Watanabe, 2023). This followed a push from Daniels (2005) and others to use more precise language.

[3] Approximately 97% of the population of Japanese descent living on the West Coast, in California, Oregon, Washington, and Arizona was incarcerated. Conversely of the more than 150,000

We implement a non-staggered, difference-in-differences design, where Japanese American mothers on the West Coast born in and before 1946 represent the treated group. Additionally, we use Japanese American mothers born within ten years post-imprisonment as an alternative, partial treatment group.[4] Vital Statistics data from 1970-1988 provide parental race/ethnicity (Japanese ancestry) as well as the mother's place of birth, including state. We restrict our sample to only US-born mothers to ensure more accurate assignment to treatment (state of birth).[5]

We find that Japanese mothers who were incarcerated in camps during their childhood gave birth to babies who were 77 grams lighter compared to Japanese mothers living in Hawaii. Using other Asian mothers on the West Coast as the comparison group, the effect size drops to 59 grams, potentially due to general anti-Asian discrimination on the mainland in the decades around WWII. We also estimate a 1 percentage point (pp) higher likelihood of a low birthweight (LBW) baby for the treated group, which translates to a relative effect size of around 15% relative to the prevalence in the control group.[6] Considering Japanese American mothers born between 1947 to 1956 as a second treatment group, we document slightly diminished, though still substantial effects. This is likely because the transition process post-incarceration was particularly harsh: families were on the move with few possessions, and no steady source of income or residence because their property and place of residence pre-treatment had been seized (Kashima, 1980).

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individuals of Japanese descent living in Hawaii just under 1% were interned.

[4]See Figure A.1 for more information on treated cohorts.

[5] The 1924 Immigration Act excluded immigration from Asia, making it highly unlikely that Japanese-born women, who were also incarcerated, would be giving birth in 1970 due to their age. We exclude women born in Japan who emigrated to the US and gave birth during 1970-1988 since they would have faced very different conditions in post-WWII Japan, making them a poor comparison group.

[6]Low birthweight is defined as weight at birth less than 2500 grams and is associated with increased morbidity and mortality. The relative magnitude is calculated based on the Hawaiian sample in the non-treatment period.

When using Hawaiian Japanese mothers as a comparison group our estimates can be interpreted as an upper bound on the treatment effect, purely due to the direct experience of imprisonment itself as opposed to the general anti-Asian bias prevalent on the West Coast during this time period. To bolster our results we also employ two alternative comparison groups: mothers of Asian descent other than Japanese and White mothers living on the West Coast. The former group provides lower-bound estimates that combine both anti-Asian discrimination as well as the direct effect of incarceration.[7]

The primary theoretical mechanism behind the above findings is likely nutritional deprivation and other physiological and psychological health deficiencies that mothers would have suffered while they themselves were in utero or in early childhood while incarcerated. Previous literature has documented how severe shocks to health, disease environment, and food availability can have long-run consequences for adult outcomes.[8] However, the experience of uprootedness has also been associated to preference changes among forced migrants, for instance in investment behavior (Brenner and Kiefer, 1981). Specifically, recent studies have identified a shift in preferences from tangible to non-tangible assets, making forced migrants more likely to increase investments in human capital (Caudill and Mixon, 2012; Becker et al., 2020). Such a mechanism may mitigate the negative health effects of incarceration via an increase in maternal education which can lead to healthier behaviors during pregnancy(Currie and Moretti, 2003).

Our analysis explores the aforementioned behavioral channel in two ways. First, we find empirical evidence for improvements in female educational attainment using US Census data. Second, we show that our treated cohort engaged in better health behaviors during pregnancy. Japanese American women born in or before 1946, as well as those born immediately after, were more likely to start prenatal care earlier in pregnancy and less likely to have

[7]Racial discrimination may affect health through several channels including worse mental health, distrust of health providers, and increased stress (see e.g., Williams et al. 2019; Alsan and Wanamaker 2018).

[8]See e.g. Almond et al. (2018); Almond and Currie (2011); Veenendaal et al. (2013); Stein and Susser (1975); Hoynes et al. (2016); Guven et al. (2021).

no prenatal care compared to their Hawaiian counterparts. These results highlight that even though populations exposed to forced displacement may end up having higher human capital accumulation in adulthood, these effects may only partially mitigate the negative effects of deprivation on intergenerational health. Additionally, our estimates include any selection into fertility or compositional shifts in the population of potential mothers, which we argue is part of the overall effect. We discuss potential selection in more detail in section 6.

We also provide evidence that incarceration affected interpersonal relationships and household stability of the treated population later in life. We show that incarcerated Japanese Americans were substantially less likely to have a White partner and to have a non-Japanese partner (or same ethnic group partner). An important potential mechanism behind this finding is long-term distrust among Japanese Americans towards those who incarcerated them (Nagata et al., 2015), which has been shown to have long-lasting, negative effects in other contexts.[9] This decreased likelihood of intermarriage may have been further amplified by internees' refusal to discuss their experiences, even with family members (Nagata et al., 2015; Kashima, 1980).

Finally, we also extend the average effects above in two dimensions. First, we implement the changes-in-changes estimator of Athey and Imbens (2006) to study quantile treatment effects (QTE) for the continuous measure of birthweight. For the treated group of women born in or before 1946, we estimate strongly negative quantile treatment effects between -70 to -114 grams (relative to the Hawaiian comparison group). These results suggest that the entire distribution of birthweight, for babies born to the incarcerated population, shifted due to imprisonment. Indeed, we fail to reject the hypothesis of first-order stochastic dominance even at the 1% level. For women born within 10 years post-release, we estimate slightly muted QTEs hovering around -50 grams for all deciles. Second, we implement event-study style specifications using 5-year bins of maternal birth cohorts. This allows us to separately identify the effects for women who were in their early childhood when interned, those who were born in the camps, and those who were born right after, in the transition period. As hypothesized, we estimate strong negative effects for treated cohorts and non-statistically

[9]See, for example, Nunn and Wantchekon (2011); Bhattacharya and Mukhopadhyay (2022); Alsan et al. (2020); Alsan and Wanamaker (2018).

significant differences for cohorts born in the non-treated years.

We contribute to various literatures. First, we speak to the literature on the long-term consequences of forced migration, focusing on long-lasting health effects (Bauer et al., 2019; Becker et al., 2020; Haukka et al., 2017; Lavy et al., 2016; Saarela and Finnäs, 2009). Second, we contribute to the broad literature on the negative effects of early life shocks on health and human capital development (Almond et al., 2010, 2018), and to the relatively small subset of studies exploring the intergenerational transmission of such shocks on health outcomes (East et al., 2023; Guven et al., 2021; Veenendaal et al., 2013). Finally, we expand recent work studying the socioeconomic outcomes of incarcerated Japanese Americans, which has documented higher incomes and better educational attainment for some of the exposed cohorts (Saavedra, 2015; Chin, 2005; Caudill and Mixon, 2012). Our results establish that these positive mediators for birth outcomes fail to offset the harsh negative consequences of early life nutritional, psychological, and economic deprivation suffered during incarceration, even across generations. Such findings are in line with existing studies documenting the importance of accounting for intergenerational effects in social safety net programs (Hoynes et al., 2016; East et al., 2023). Further, our study provides support for the limited success of mitigating harm from discriminatory and/or nutritional shocks, and suggests additional interventions must be undertaken to counter the structural, intergenerational negative effects of trauma.

2 Historical background

The process of incarceration was formalized with the passing of Executive Order n. 9066 by President Franklin Roosevelt, which was motivated by national security concerns against the potential threat of Japanese sabotage and espionage (Nagata, 2013). Consequently, nearly all Japanese Americans residing on the West Coast of the US were first placed into temporary assembly centers and later incarcerated in camps managed by the War Relocation Authority (WRA).[10] Just 1% of the Japanese population of Hawaii, which composed more than one-

[10]Geographically, the US population of Japanese descent was concentrated in California, Oregon, Washington and the territory of Hawaii. Of those incarcerated, the vast majority were held in

third of the total population of the island, were incarcerated.[11]

Ethnic Japanese faced various forms of discrimination in the US: prejudice and hostility were part of a broader anti-Asian sentiment directed also at Chinese migrants (Daniels, 1977). This included the prohibition to intermarry with Whites, ineligibility for citizenship, and prohibition to own land (Nagata, 2013).[12] Other anti-Japanese activities involved segregation in housing and education, rental price discrimination, physical attacks, and anti-Japanese political campaigns (Ng, 2002). Discrimination culminated with the 1908 "Gentlemen Agreement" severely restricting Japanese migration to the US.[13] The Immigration Act of 1924 completely stopped Japanese migration to US until 1965.

2.1 Evacuation, incarceration and living conditions in the camps

Evacuation of the population of Japanese ancestry started with transportation to temporary assembly centers from March to August 1942. It was followed by incarceration in permanent camps.[14] Table A.1 provides details on the ten WRA-operated permanent camps. Imprisonment negatively affected individuals and the community as a whole, causing trauma that persisted intergenerationally (Nagata et al., 2019, 2015).

WRA centers. Others, such as identifiable community leaders, were detained at Department of Justice camps: for details see (Ng, 2002, pp. 49-51).

[11] Incarcerating this group would have severely disrupted the Hawaiian economy and hence was not implemented (Daniels, 2002).

[12] First-generation Japanese were not granted citizenship, but second-generation Japanese were, due to *jus soli*, or birthright citizenship.

[13] Japanese migration to the US started in the mid-1800s and was directed predominantly to Hawaii, where migrants worked as cheap labor on sugar plantations. By 1900 39.7% of the Hawaiian population was of Japanese descent (Ng, 2002). When plantation contract work was outlawed in 1900, migration to Hawaii declined: new migrants from Japan as well as those of Japanese descent from Hawaii began traveling to the US mainland, where a majority of them worked in agriculture, fishing, and forestry (Daniels, 2011).

[14] Sixteen assembly centers were located in California; one each in Oregon, Washington, and Arizona.

The evacuation process was sudden, leaving little scope to prepare for the move. Given only a few days' notice to evacuate, individuals had to sell personal possessions hastily, and below market price when at all possible. Evacuees took with them what they could carry by hand. Living conditions were harsh: many assembly centers were converted race tracks and fairgrounds, meaning the Japanese evacuees had to live in horse stalls and animal quarters (Nagata, 2013); in the camps, housing was barrack-style, overcrowded, and without running water. Blocks of 12 to 14 barracks shared cooking facilities, toilets, and a recreation hall (Daniels, 2011). Furthermore, given the remote geographical location of the camps, temperatures were often extreme, with frequent dust storms.[15]

Food supply was inadequate: dairy products were scarce and meat was unavailable for several days each week, thus leading to nutritional deficiencies in the incarcerees' diets. Furthermore, food to face cold winters was in short supply and generally poorly prepared (Lillquist, 2007).[16] Medical facilities were under-equipped and under-stocked, particularly for the sick, elderly and mothers with infants: medical furnishings and supplies were insufficient and qualified medical staff was often lacking.[17]

Sanitation was poor, leading to widespread outbreaks of intestinal flu (Lillquist, 2007) and regular epidemics of dysentery, typhoid and tuberculosis across several camps (Nagata, 2013); episodes of diarrhea were so common in the Topaz and Manzanar relocation centers that the condition gained the label of the "Topaz trots" and the "Manzanar runs".[18] Further

[15]Frequent blowing dust caused overall respiratory issues and breathing difficulties. Heatstroke and dehydration were also common (Lillquist, 2007).

[16]For details, see for example Mackey (2000) on conditions in the Heart Mountain camp and Hansen (1999) on the Gila River camp.

[17]For instance, the camp in Arkansas had only 7 doctors for a population of 10,000 (Nagata, 2013). Tateishi (2012) documents that below-standard medical facilities likely attributed to preventable deaths.

[18]Diarrhea, gastric ulcers and stomach flu due to poor sanitation were de facto reported in all camps: see for instance Taylor (1993) on Topaz, Harvey (2003) on Amache, (Mackey, 2000) on Heart Mountain, (Hausler, 1964) on Minidoka.

medical issues included: infantile paralysis associated with polio, ptomaine poisoning, desert silicosis, respiratory problems, malaria and sleeping sickness (Lillquist, 2007).

The camps were fenced with barbed wire and guarded by the military: there was no freedom of movement nor the possibility of accessing supplies from outside. Overall, poor living conditions were the causes of many of the illnesses that afflicted the internees' overall health, including women's reproductive health.

2.2 Resettlement

On December 17, 1944, Public Proclamation 21 allowed all persons of Japanese ancestry cleared by military authorities to leave the camps. Initially, internees could not return to their West Coast homes, so they moved to the Midwest and to the East. The government encouraged Japanese Americans to resettle in areas throughout the US: the WRA told them not to congregate as a group in public and to avoid having Japanese neighbours (Ng, 2002). The process of relocation was lengthy: by the end of 1945 only the very young and very old were left in the camps, which closed in 1946. Evacuees who returned to their old homes underwent varied experiences: some were welcomed back by their old communities, while others encountered hostility and discrimination (Ng, 2002; Kashima, 1980). Many displayed an unwillingness to speak about the traumas suffered during their incarceration (Kashima, 1980). Many had difficulties finding new housing and work, given the very limited financial resources they had in the camps. Social scientists who have studied various effects of incarceration on the Japanese American evacuees consider the period that followed the closing of the camps as years of transition, during which the Japanese population had to adapt to these new realities (Kitano, 2013). Movement across state lines was common. Pre-WWII, 90% of individuals of Japanese ancestry living in the continental US lived in California, Oregon, and Washington (Ruggles et al., 2022). Immediately post detention, less than 50% lived in all three states (War Relocation Authority, 1946), yet, by the 1950 Census, approximately 2/3 resided in the three states. This movement may have re-optimized the location and professional choices of incarcerated individuals (Arellano-Bover, 2022), though incarceration location may have had long-term effects on migration and economic outcomes (Chetty et al., 2014; Shoag and Carollo, 2016).

2.3 Economics Literature on Japanese American Incarceration

Previous economics literature on Japanese American incarceration during WWII generally focuses on human capital and labor market outcomes or cultural assimilation (Chin, 2005; Saavedra, 2015, 2021; Arellano-Bover, 2022; Caudill and Mixon, 2012). Interestingly, the defined treated and control cohort samples vary substantially in this literature because the exact time and overall exposure to treatment cannot be precisely determined. This is important as each cohort would have been differently aged at the time of incarceration. While these studies focus on different socioeconomic outcomes, a common feature of their identification strategy is the use of cohorts born before 1945. This approach neglects potential continued treatment post-1945 birth cohorts, attributable to post-release uncertainty, and unresolved trauma suffered during incarceration (Kashima, 1980; Ng, 2002; Kitano, 2013). Because the main focus of our study is the intergenerational transmission of imprisonment, any baby born post-1945 would be at least indirectly affected by their parent's incarceration.

3 Data

We obtain birth data from the National Center for Health Statistics (NCHS) and additional human capital measures from Decennial Censuses.

We use NCHS birth data from 1970 to 1988 to investigate maternal health behaviors and health outcomes at birth. These data contain either 50 or 100% samples of births by state. They include birthweight, gestational age, location of birth, state and/or country of birth for mothers, and demographic characteristics of both the mother and father including their race, age, and, in some places, educational attainment. Race information includes whether mothers and fathers were of Japanese ancestry, an integral measure in our study, as well as Chinese or Filipino ancestry, which we use for our Asian American comparison sample. We use country of birth to limit our sample to only those mothers who were born in the US.[19]

[19]This is a necessary restriction as these data do not provide information about when individuals immigrated to the US, thus we do not know if a woman born in Japan was incarcerated in the US, or came to the US post-WWII. See footnote 5 for additional information.

This variable is only available in the birth records from 1970 onward and is missing for 1972 hence our final sample is determined by these constraints.

The historical nature of the data creates several limitations. The state of California used a 50% sample of births over this time period and did not capture maternal educational attainment. Because of the geographic preferences of Japanese Americans, California has outsize importance for our analyses and these limitations prevent us from using educational attainment in analyses using birth data. Additionally, we cannot capture full information on all births of women potentially incarcerated in camps during their childhood given our data began in 1970. Women giving birth in 1970 who grew up in a camp would likely be between ages 24-45 (birth cohorts 1925-1946). Thus, we are undoubtedly missing a large portion of births for this group which occurred before 1970. However, we do capture births for a nearly 20-year period which includes births to cohorts of women who were directly affected by growing up in camps as well as women who were likely discriminated against post-incarceration (Appendix Figure A.1).

We use US decennial census data from 1980, 1990, and 2000 5% samples to investigate socioeconomic and marital matching outcomes. These data include measures of educational attainment, marital status, intermarriage, female labor force participation, and number of children for 1980 and 1990. Additionally, they provide detailed information about year of birth, and state or country of birth. Importantly, they allow us to investigate these additional outcomes for the same cohorts of mothers we identify in the vital statistics data, using the same sample inclusion criteria.

4 Methods

We limit our main sample to American-born individuals of Japanese ancestry and American-born individuals of Chinese and Filipino ancestry.[20] As a sensitivity analysis, we also use an American-born White sample as an alternative comparison group. Our treatment is defined

[20]We also restrict to all births with gestation $\geq$ 25 weeks and limit our sample to mothers who did not migrate between mainland US and Hawaii to avoid contamination and uncertainty about the timing of migration and therefore the likelihood of incarceration.

as any individual who was likely incarcerated either at birth or in early childhood (baseline sample), or born immediately following the incarceration period (extended treatment sample). We follow previous literature which documents that more than 97% of Japanese Americans living on the West Coast (CA, OR, WA, AZ) were imprisoned in camps compared to just 1% of Japanese Americans living in Hawaii (see Table 1 of Chin 2005). Thus, we consider Japanese Americans born in one of these West Coast states in or before 1946 as treated and Hawaiian-born Japanese Americans as controls. An alternate specification uses West Coast-born Asian Americans other than those of Japanese ancestry who would have grown up facing well-documented discrimination, but were not subject to incarceration (see e.g. Daniels (2011)).

We estimate both a difference-in-differences analysis and an event study style analysis. The former, limiting to Japanese Americans born on the West Coast or Hawaii, takes the following form:

$$\begin{aligned} Y_{ist} = \alpha_0 + \alpha_1 Born46_{ist} + \alpha_2 Born47-56_{ist} + \alpha_3 WestCoast_{ist} + \beta_1 Born46_{ist} \\ * WestCoast_{ist} + \beta_2 Born47-56_{ist} * WestCoast_{ist} + \gamma' X_{ist} + \Theta_t + \lambda_s + \varepsilon_{ist} \end{aligned} \quad (1)$$

Where i indexes individual birth, s indexes the county of residence at the time of birth, and t indexes the baby's year of birth. Y represents birthweight or other measures of health or human capital. $Born46$ is an indicator taking the value 1 if the mother is born before or in 1946 and $Born47-56$ takes the value 1 if the mother was born between 1947 and 1956. $WestCoast$ is an indicator of the mother's state of birth being CA, OR, WA, or AZ, while X includes maternal and paternal age in 5-year bins. The comparison group in this regression is Japanese Americans born in Hawaii.

While the release of the internees started in 1945, we define our baseline treatment group to align with the final shutdown of all camps in 1946. Our extended treatment group aims to capture the lingering effects on the newly released population as they transition to lives outside the camps. β_1 and β_2 represent our parameters of interest.

We use a comparison group of other Asian American individuals born in the West Coast in equation 2:

$$
\begin{aligned}
Y_{ist} = \alpha_0 + \alpha_1 Born46_{ist} + \alpha_2 Born47 - 56_{ist} + \alpha_3 JapaneseAmerican_{ist} \\
+ \beta_1 Born46_{ist} * JapaneseAmerican_{ist} + \beta_2 Born47 \\
- 56_{ist} * JapaneseAmerican_{ist} + \gamma^{'} X_{ist} + \Theta_t + \lambda_s + \varepsilon_{ist}
\end{aligned} \tag{2}
$$

This equation takes the same form as equation 1, but it is limited to West Coast-born Japanese, Chinese, and Filipino Americans. The parameters of interest are specified by the same notation.

Finally, we estimate an event study-style DID where we interact mother's 5-year birth cohort indicators with the treated group designation:

$$
\begin{aligned}
Y_{its} = \alpha_0 + \beta_1 WestCoast_{its} + \sum_{j \in J, (j \neq 1957-1961)} \beta_j MBCohort^{j}_{its} \\
* JapaneseAmerican_i + \gamma^{'} X_{its} + \theta_t + \lambda_s + \varepsilon_{its}
\end{aligned} \tag{3}
$$

where J is the set of 5-year mothers' birth cohorts, $MBCohort$, treating 1957-1961 as the reference category. Thus all β_j are relative to the cohort born just after the end of the "transition" period (Kitano, 2013). We perform this analysis using both the Hawaiian Japanese American and West Coast Asian American comparison groups. Equation 3 represents the notation for the latter specification for brevity.

5 Results

5.1 Baseline Analysis

In Table 1, Panel A, we estimate equations 1 and 2 (and an equation using White mothers as the comparison group) with birthweight and low birthweight (LBW) as the dependent variables. We find consistent evidence of a decrease in birthweight among babies born to mothers who were likely incarcerated. The magnitude of this effect varies based on the comparison group, ranging between a decrease of 60 grams to over 120 grams in columns 1-3. These are sizable effects varying from approximately 1.8 to 2.4% of the average birthweight of the control group in the non-treatment period. Estimating LBW, we find a consistently positive effect, meaning exposure to a camp is associated with a greater number of LBW

babies, though the statistical significance of the effect varies. Compared to Hawaiian-born Japanese Americans, the effect implies one additional LBW baby per 100 births for women exposed to the camps. This is the same effect size as compared to other Asian Americans on the West Coast, but only the latter is statistically significant. Compared to White mothers, the effect of exposure increases LBW babies by nearly 2 per 100 births. These point estimates amount to a relative effect size of around 15%.[21]

An important aspect of this study is that the exact time and overall exposure to treatment cannot be precisely determined. As mentioned in section 2.3, the existing literature has used different measures of exposure to camps and has excluded cohorts born after 1945 (Chin, 2005; Saavedra, 2015; Arellano-Bover, 2022). We argue that these cohorts are partially treated due to continued racial discrimination and the uncertainty of finding jobs, property, and housing post-incarceration (Kashima, 1980; Ng, 2002; Kitano, 2013). Thus we still expect to find attenuated effects of incarceration.

For this second treatment group, birthweight effects are slightly smaller (-51 to a little over -100 grams) than those using the pre-1946 treatment definition but remain statistically significant. However, results for LBW are substantially reduced and lack consistent statistical significance. Overall this underscores the importance of considering the experience of Japanese Americans born immediately after the official end of the internment policy.

Interestingly, the effects on health *behaviors* do not match these decreases in the health of babies born to treated mothers. We present these results in Panel B of Table 1. Rather, mothers exposed to camps were more likely to receive any prenatal care and more likely to start prenatal care within the first two trimesters of pregnancy. These effects persist for the partially treated group born post-release as they continued to record better engagement in prenatal care services. These positive effects, which may be due to an increase in human capital accumulation associated with populations exposed to forced migration (Becker et al., 2020), may partially mitigate the negative intergenerational health effects of incarceration.

Unfortunately, the Vital Statistics data lacks any credible measures on human capital

[21] As Table A.2 notes, control group mothers on average are younger due to the sample time period under consideration. We restrict our sample to mothers between 24 and 45 years, to align with the age profile of treated mothers in 1970, and repeat the baseline analysis. Results remain robust.

outcomes. We therefore supplement our analysis using US Decennial Census data, closely following the empirical setup employed above. The results from this exercise for both men and women are presented in Table 2 and for women only in Table A.4. We find individuals incarcerated during their childhood were 7 to 8 pp more likely to migrate, defined as living in a different state than that of their birth. This is a somewhat mechanical effect given that many families were incarcerated in camps outside of their residence, but it also identifies that post-release, imprisoned cohorts were less likely to return to their former homes relative to controls (Arellano-Bover, 2022). This instability in living situations also provides a potential pathway for worse measured birth outcomes among treated mothers.

However, cohorts of displaced Japanese Americans were also more likely to complete schooling past high school compared to the Hawaiian sample.[22] This aligns with the recent findings of Becker et al. (2020), which established much higher levels of human capital accumulation among the Kresy ethnic group that underwent forced migration in Poland after WWII. These findings help rationalize our earlier results on higher engagement with prenatal care as better-educated mothers have been shown to engage in healthier behavior during pregnancy (Currie and Moretti, 2003).

In columns (1) and (2), Panel A of Table 2, we show that Japanese Americans who were incarcerated were substantially less likely to marry someone of a different ethnic or racial group than those who were born in Hawaii or other Asian Americans. They were also substantially less likely to specifically marry White individuals.[23] The estimated effects for marital patterns, unsurprisingly, are salient only for the cohorts who were directly incarcerated. This underscores difficulties in cultural assimilation for imprisoned mothers, which

[22]While this is partially consistent with previous work by Saavedra (2015), our samples differ: we compare those born before 1946 (treatment) to those after (control), while Saavedra (2015) compares internees who were more likely to attend school in the prison camps (treatment) to those who were incarcerated but too young to attend school (control).

[23]The Vital Statistics data provides information on father's race and appendix table A.3 uses this information to study paternity miscegenation. These results align with the Census findings although the impacts are stronger for the post-internment treated group.

have also been linked in the literature with mediators of health outcomes (Meng and Gregory, 2005; Tegunimataka, 2021).

5.2 Event Study Analyses

Next we perform an event study analysis to non-parametrically estimate the effect of incarceration across the sample period, compared to 1957-1961. This event study assesses whether outcome variables follow common trends outside the treatment regime. However, note in our current setup the treatment actually turns *off* in 1956, thus, we are actually looking for parallel *post*-trends. We present these results in Figure 1 and Appendix Figure A.2, Panel A. We find that birthweight estimates for the post-period are not statistically significant. Compared to Japanese Americans born in Hawaii, those who were likely incarcerated had consistently lower birthweight, with effect sizes varying from 50 to 100 grams throughout the incarceration cohorts. This effect continued at 100 grams for the 1947-1951 cohorts and reduced to approximately 35 grams for the 1952-1956 cohorts, demonstrating negative effects of incarceration combined with difficulties post-release. Appendix Figure A.2 results are more mixed, with the other Asian American comparison group not differing on birthweight in the early cohorts, but showing large negative effects between 70 and 90 grams for the 1942-1951 cohorts, and decreasing to 35 grams for the 1952-1956 cohorts.

5.3 Treatment Effect Distribution

We establish above a negative and substantial average effect of incarceration on birthweight. Next, we estimate whether this negative effect differs across the entire distribution of birthweight, using the changes-in-changes estimator (Athey and Imbens, 2006). This allows us to study quantile treatment effects (QTE) for the continuous measure of birthweight. In Figure 1, panel C, we estimate the QTEs for the treated group of women born in or before 1946 relative to the Hawaiian comparison group, while Appendix Figure A.2, panel C provides the analog for the other Asian American comparison group. Compared to the Hawaiian group, we estimate substantial negative QTEs ranging between 70 to 114 grams across the entire distribution of birthweight. Indeed, we fail to reject the hypothesis of first-order stochastic

dominance even at the 1% level. These results hold for the alternative comparison group, although the effect size varies across the distribution. Panels D of Figure 1 and Appendix Figure A.2 provide the QTE estimates for the 1947-1956 sample, using Hawaiian and other Asian American comparison groups, respectively. Effects are diminished, though still statistically significant in nearly all cases, across the entire birthweight distribution.

6 Discussion and Conclusion

In this study, we find that Japanese American women who were incarcerated during their childhood and/or were born in camps had babies who were in worse health than comparison groups. Negative health effects for those born in the ten years post-incarceration are still substantial, though somewhat diminished. Despite this negative health effect on later generations, we find positive effects on health behaviors during pregnancy and on human capital development, which are generally associated with positive health effects on the next generation. This aligns with the previous literature that has shown better human capital outcomes for populations exposed to similar episodes. However, we show that these gains are not nearly large enough to mitigate the negative intergenerational health effects of the forced displacement of Japanese Americans during WWII.

We recognize two key limitations. First, we cannot definitively state whether an individual was incarcerated in their childhood. Our choice of using women of Japanese ancestry born on the West Coast follows the existing literature and rests on the assumption of limited interstate migration prior to WWII.[24] Second, birth data including information on maternal place of birth is unavailable pre-1970, making it nearly impossible to study fertility outcomes of mothers born before 1930 because they likely had children starting well before 1970. To alleviate this limitation, we support our results by using complementary Census data on Japanese Americans. Finding consistent results using this alternative data source bolsters our analyses and confirms that, despite data limitations, these are the best available data to answer our research question. While selection into fertility and compositional changes caused by incarceration are part of our reduced form estimate by design, here we attempt

[24]See for instance Chin (2005); Saavedra (2015); Arellano-Bover (2022).

to sign any potential biases. First, we investigate changes in the quality-quantity tradeoff in fertility (Becker and Lewis, 1973), showing treated women do not have substantially different number of children overall or by age 30 in Appendix Table A.5. Moreover, there is little evidence of increased mortality during or following incarceration, thus little reason to expect a compositional change in the population of potential mothers.[25]

The birthweight effect sizes we find are relatively large. In Table 3 we compare our results to a non-exhaustive sample of relevant studies. We limit the comparison to studies with birthweight or LBW outcomes focusing on US samples. Currie and Moretti (2007) show that a mother's own birthweight is predictive of babies' birthweight, with an elasticity of 0.17. Additionally, East et al. (2023) show that increasing Medicaid eligibility for pregnant women reduces LBW for both first and second-generation children, despite finding no change in birthweight in the first generation. The implied treatment on the treated birthweight effects are of a similar magnitude, to our estimates.[26] Compared to other negative shocks, such as smoking during pregnancy and intimate partner violence (Almond et al., 2005; Aizer, 2011), our results are modest, yet they are large compared to bereavement (Black et al., 2016). Additional results from mothers born during years with particularly high neonatal death rates suggest long-term negative effects on socioeconomic status in adulthood, reduced likelihood of out-of-wedlock births, increased antenatal smoking, and higher risk of low birthweight (Almond et al., 2012).

Turning to our results on other outcomes, we highlight the importance of intermarriage as a proxy of cultural assimilation, but also a potential mediator of health (Meng and Gregory, 2005; Tegunimataka, 2021). While exclusion laws reduced the likelihood of intermarriage pre-WWII (Ono and Berg, 2010; Tinker, 1973), "heightened exclusion" continued after their

[25] A shift in the distribution towards worse health due to exposure to incarceration would act as a mechanism behind our findings (Almond and Currie, 2011). On the other hand, an increase in deaths among our treated population, i.e., a culling of the weakest individuals would bias us towards zero implying that we have a lower bound on the effect of incarceration.

[26] The sign of the effect in East et al. (2023) is opposite to ours, given the positive nature of their intervention.

removal, well into the post-war period (Ono and Berg, 2010). By using a West Coast-born, Asian American comparison group we are able to partially control for anti-Asian sentiment compared to specific anti-Japanese sentiment and still show a substantially reduced likelihood of intermarriage among incarcerated Japanese Americans compared to other Asian Americans. The resulting effects may reflect either bias from Whites or differences in acceptability within Japanese American communities, though we cannot separately identify these potential reasons/mechanisms.

This study demonstrates that trauma suffered during childhood has long-lasting impacts not just for the individuals directly impacted, but also for their children. We establish long-term negative consequences of the largest forced displacement episode in the United States when individuals of Japanese ancestry, the vast majority of whom were US citizens, were suddenly incarcerated.

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Table 1: Baseline Estimates for Incarceration on Birth and Pregnancy Outcomes

Panel A: Birth Outcomes	Birthweight (in grams)			LBW (per 100 births)		
	(1)	(2)	(3)	(4)	(5)	(6)
Born Before 1946	-76.86***	-59.56***	-124.27***	1.000	1.136**	1.912**
	(14.738)	(15.121)	(14.030)	(0.910)	(0.512)	(0.872)
Born Between 1947 to 1956	-54.34***	-51.32***	-102.91***	0.252	0.694**	0.407
	(6.421)	(4.824)	(7.849)	(0.266)	(0.339)	(0.249)
Observations	40,163	30,169	3,815,184	40,163	30,169	3,815,184
Panel B: Behavior During Pregnancy	No Prenatal Care (per 100 births)			Prenatal Care Started within Two Trimesters (per 100 births)		
Born Before 1946	-0.966***	-0.021	-0.916***	1.061*	1.572**	2.400***
	(0.089)	(0.208)	(0.225)	(0.613)	(0.757)	(0.435)
Born Between 1947 to 1956	-0.669***	-0.237	-0.310*	1.126***	0.419***	0.804***
	(0.113)	(0.260)	(0.170)	(0.228)	(0.125)	(0.161)
Observations	30,041	24,129	2,868,099	30,041	24,129	2,868,099
Comparison Group						
Japanese in Hawaii	✓	×	×	✓	×	×
Other Asians	×	✓	×	×	✓	×
White	×	×	✓	×	×	✓

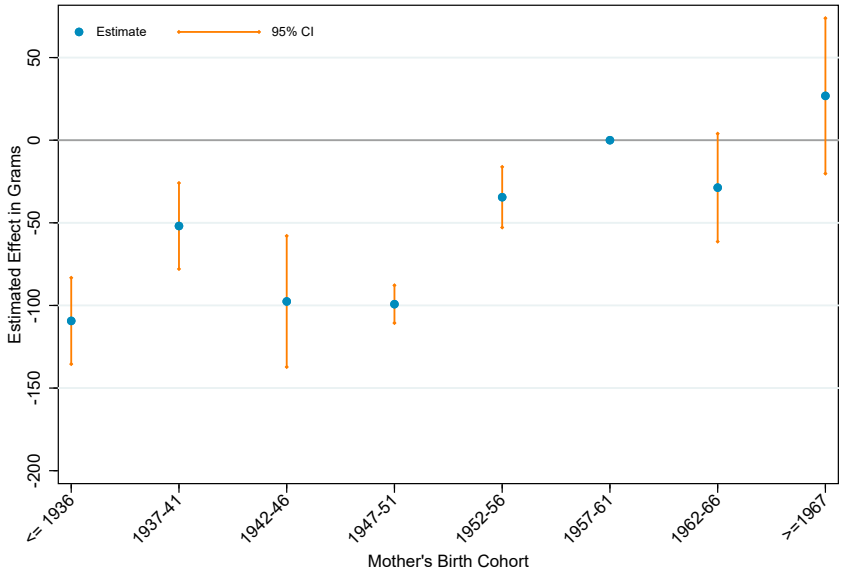
***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. Vital statistics data from 1970 to 1988. All regressions include 5-year maternal and paternal age bins along with county and year fixed effects. Standard errors are clustered at the current state of residence level.

Table 2: Baseline Estimates for Incarceration on Interpersonal and Human Capital Outcomes for Men and Women

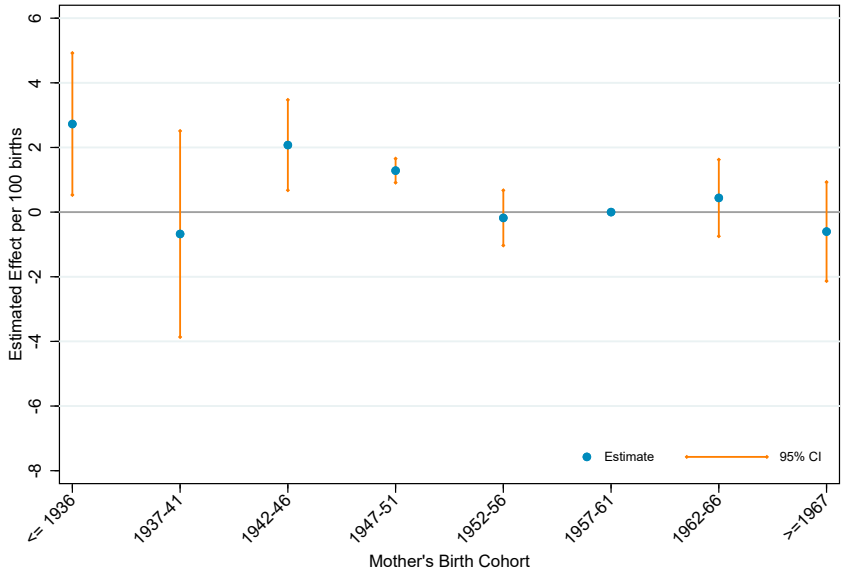
Panel A	Never Moved		More than HS		Married	
	(1)	(2)	(3)	(4)	(5)	(6)
Born In or Before 1946	-0.0706***	-0.0768***	0.0904***	0.00380	-0.0721***	0.0254
	(0.0145)	(0.00700)	(0.00637)	(0.00953)	(0.0170)	(0.0168)
Born Between 1947 to 1956	-0.00452	-0.0158**	-0.0115***	0.00507	-0.0456***	-0.000429
	(0.0123)	(0.00684)	(0.00401)	(0.00473)	(0.0138)	(0.00970)
Panel B	Intermarriage		Married White		Labor Force Participation	
Born In or Before 1946	-0.129***	-0.155***	-0.136***	-0.117***	0.0460***	0.0116
	(0.00890)	(0.0194)	(0.0131)	(0.0214)	(0.00940)	(0.0162)
Born Between 1947 to 1956	-0.000285	-0.0459***	0.00342	-0.0147	0.00669	-0.00190
	(0.00539)	(0.00941)	(0.00892)	(0.0132)	(0.00579)	(0.00756)
	Conditional on Being Married					
Panel C	Intermarriage		Married White		Labor Force Participation	
Born In or Before 1946	-0.200***	-0.260***	-0.296***	-0.204***	0.0392***	0.0165
	(0.00853)	(0.0102)	(0.0138)	(0.0177)	(0.0101)	(0.0161)
Born Between 1947 to 1956	-0.00329	-0.0887***	-0.0570***	-0.0392***	-0.0120*	0.00610
	(0.0119)	(0.00915)	(0.00599)	(0.0113)	(0.00665)	(0.00914)
Comparison Group						
Japanese in Hawaii	✓	×	✓	×	✓	×
Other Asians	×	✓	×	✓	×	✓

***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. Data from the 5% 1980, 1990, and 2000 Decennial Census. All regressions include 5-year age bins along with state and year fixed effects. Standard errors are clustered at the current state of residence level.

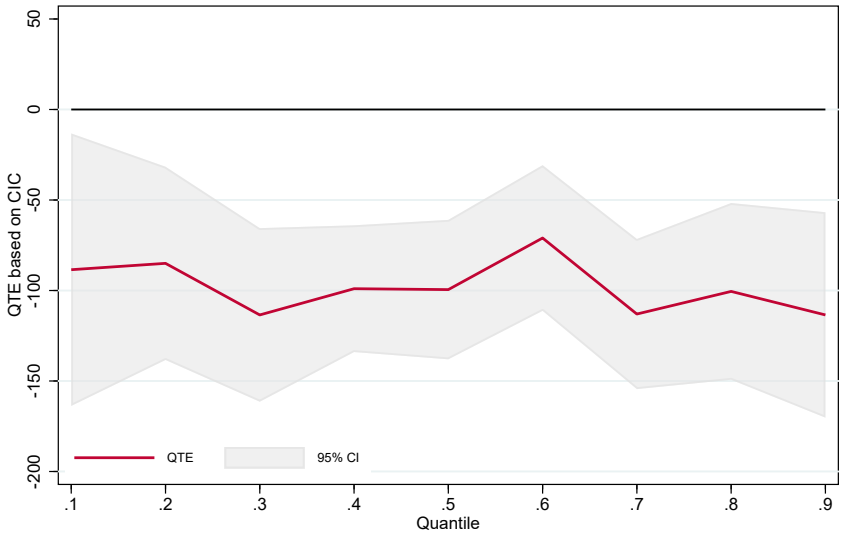
Figure 1: Beyond the Average Effect: Changes-in-Changes and Event Study Estimates



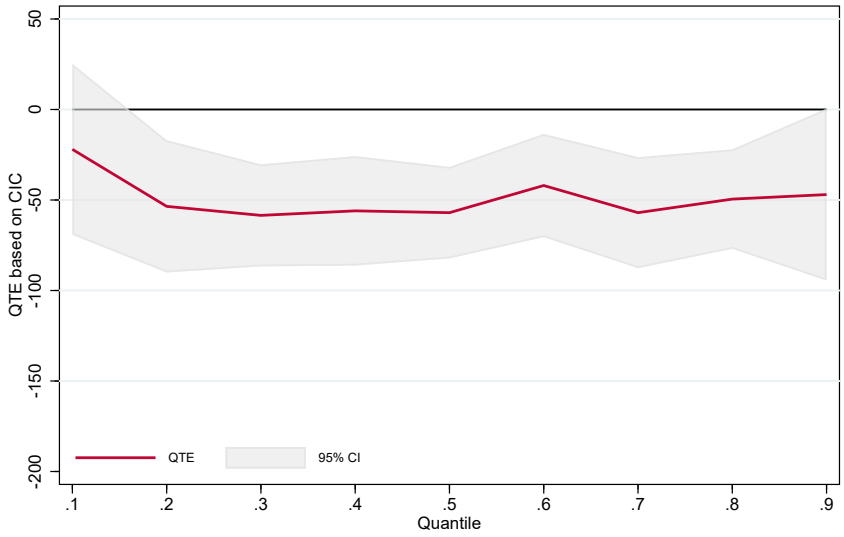
(a) Event DID - Birthweight



(b) Event DID - LBW



(c) CIC - Born Before 1946



(d) CIC - Born Between 1947-56

Note: The control group in the above plots are Japanese Americans living in the State of Hawaii. CIC refers to the Changes-in-Changes estimator of Athey and Imbens (2006)

Table 3: Comparison to Birth Outcomes of Various Treatments in the Literature

Treatment/Intervention	Birthweight	LBW	Reference
Incarceration during WWII	-76.86 [2.4]	1.00[1] [15.38]	This paper
Domestic Abuse Victimization	-163.0 [4.85]		(Aizer, 2011)
Bereavement due to Death of a Loved One	-20.9 [0.58]		(Black et al., 2016)
Smoking During Pregnancy	-203.0 [6.03]	34.7 [56.9]	(Almond et al., 2005)
Mom's birthweight (Intergenerational)	-20.1[2] [17.0]	-0.29 [46.0]	(Currie and Moretti, 2007)
Additional Neonatal Death During First Year		[0.6]	(Almond et al., 2012)
Medicaid Eligibility (First Generation)		0.37 [2.6]	(Currie and Gruber, 1996)
Medicaid Eligibility (First Generation)		-0.37 [5.0]	(East et al., 2023)
Medicaid Eligibility (Intergenerational)	71.0[3] [2.0]	-1.8 [23.9]	(East et al., 2023)
WIC Participation	17.6 [0.56]	-8.2 [8.58]	(Chorniy et al., 2020)

This table provides comparisons of effect sizes from positive and negative shocks to WWII both to a child and intergenerationally. Additionally, we reprint our results from Table 1 for the specifications with Japanese-Hawaiian mothers as the control group. Blank entries occur if a particular parameter was not estimated in that study. The number inside the square bracket represents the percentage change of the parameter estimate relative to the relevant sample mean within the respective study.

[1] Result is not statistically significant for this specification but is more precisely estimated when Other Asians and White mothers are used as a control group. Refer to Table 1.

[2] This result is interpretable as a 100 gram increase in maternal birthweight is associated with a 20 gram increase in child's birthweight, while the low birthweight effect is the effect of having a mother who was low birthweight on child's low birthweight status.

[3] The implied treatment on the treated from providing eligibility to an additional pregnant woman of the previous generation.

Appendix A Online Appendix

Here we report some additional tables and figures supporting our main findings.

Table A.1: WRA-operated WWII internment camps

WRA camp name	Opened	Closed	Maximum population
Gila River, Arizona	07-20-1942	11-10-1945	13,348
Grenada, Colorado	08-24-1942	10-15-1945	7,318
Heart Mountain, Wyoming	08-12-1942	11-10-1945	10,767
Jerome, Arkanas	10-06-1942	06-30-1944	8,497
Manzanar, California	06-01-1942	11-21-1945	10,046
Minidoka, Idaho	08-10-1942	10-28-1945	9,397
Poston, Arizona	05-08-1942	11-28-1945	17,814
Rohwer, Arkanas	09-18-1942	11-30-1945	8,475
Topaz, Utah	09-11-1942	10-31-1945	8,130
Tule Lake, California	05-27-1942	03-20-1946	18,789

Source: Daniels et al. (2013)

Table A.2: Descriptive Statistics By Treatment Status

	(1)	(2)	(3)	(4)	(5)	(6)
	Mainland Japanese		Hawaiian Japanese		Other Asians (Mainland)	
Mother Birth Year	≤1956	>1956	≤1956	>1956	≤1956	>1956
Birth Weight (in grams)	3236 (505.6)	3306 (517.7)	3178 (482.9)	3180 (483.5)	3226 (501.1)	3241 (518.8)
LBW (per 100 births)	6.183 (24.09)	5.550 (22.90)	6.675 (24.96)	6.649 (24.91)	6.231 (24.17)	6.593 (24.82)
No Prenatal Care (per 100 births)	0.284 (5.322)	1.050 (10.19)	0.150 (3.865)	0.397 (6.288)	0.346 (5.876)	1.043 (10.16)
Prenatal Two Trim (per 100 births)	99.26 (8.562)	96.36 (18.75)	98.99 (10.01)	96.44 (18.53)	98.41 (12.52)	94.90 (22.00)
Paternity Miscegenation (per 100 births)	49.69 (50.00)	77.71 (41.62)	31.22 (46.34)	54.55 (49.80)	54.84 (49.77)	70.53 (45.59)
Father White (per 100 births)	38.82 (48.74)	61.13 (48.75)	9.568 (29.42)	10.12 (30.16)	39.44 (48.88)	48.81 (49.99)
Mother's Age (in years)	30.65 (4.294)	24.75 (3.951)	29.68 (4.430)	23.81 (3.832)	29.71 (4.930)	23.14 (4.049)
Father's Age (in years)	32.69 (5.227)	27.75 (5.173)	31.75 (5.370)	26.98 (5.262)	31.82 (6.105)	25.96 (5.269)
Total Birth Order	1.947 (1.084)	1.642 (0.951)	2.209 (1.209)	1.879 (1.085)	2.156 (1.336)	1.771 (1.062)
Live Birth Order	1.753 (0.901)	1.439 (0.710)	1.888 (0.959)	1.489 (0.722)	1.949 (1.120)	1.572 (0.827)
Number of Observations	7,569	3,964	21,362	7,430	10,415	8,464

Notes: Sample size corresponds to the observations for which our main outcome of interest, birthweight, is available. There is slight variation across outcomes in the sample size depending on availability across survey years.

Table A.3: Baseline Estimates for Internment on Paternity Miscegenation

	(1)	(2)	(3)	(4)	(5)	(6)
	Father Different Race			Father is White		
Born Before 1946	-13.868***	-19.565***	-45.270***	-30.127***	-18.368***	-43.359***
	(1.196)	(0.966)	(1.217)	(2.499)	(1.096)	(1.359)
Born Between 1947 to 1956	-2.929*	-12.601***	-22.406***	-16.980***	-11.814***	-22.593***
	(1.507)	(1.042)	(1.443)	(2.344)	(1.170)	(1.296)
Observations	38,750	29,293	3,586,403	40,163	30,169	3,815,184
Control Group						
Japanese in Hawaii	✓	×	×	✓	×	×
Other Asians	×	✓	×	×	✓	×
White	×	×	✓	×	×	✓

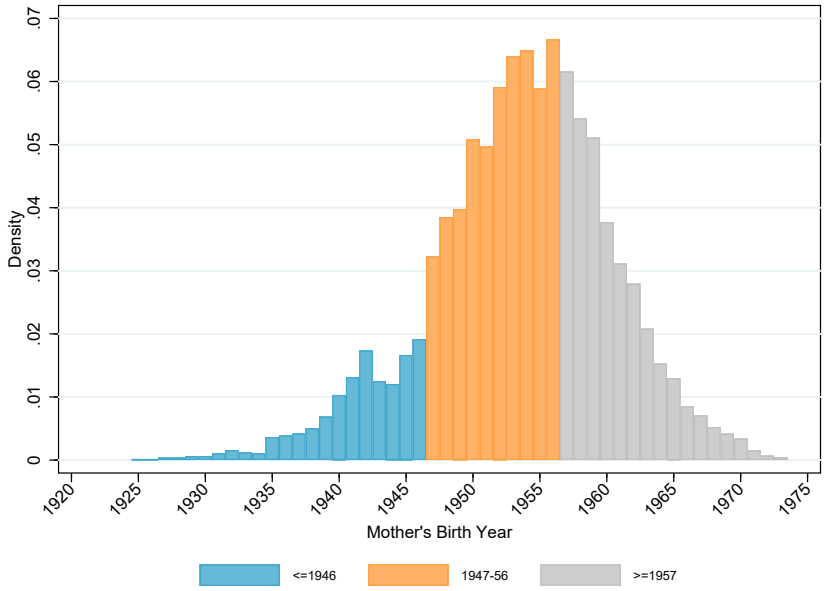
***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. Vital statistics data from 1970 to 1988. All regressions include 5-year maternal and paternal age bins along with county and year fixed effects. Standard errors are clustered at the current state of residence level.

Table A.4: Baseline Estimates for Incarceration on Migration, Education, Intermarriage, and Labor Force Participation Outcomes for Women Only

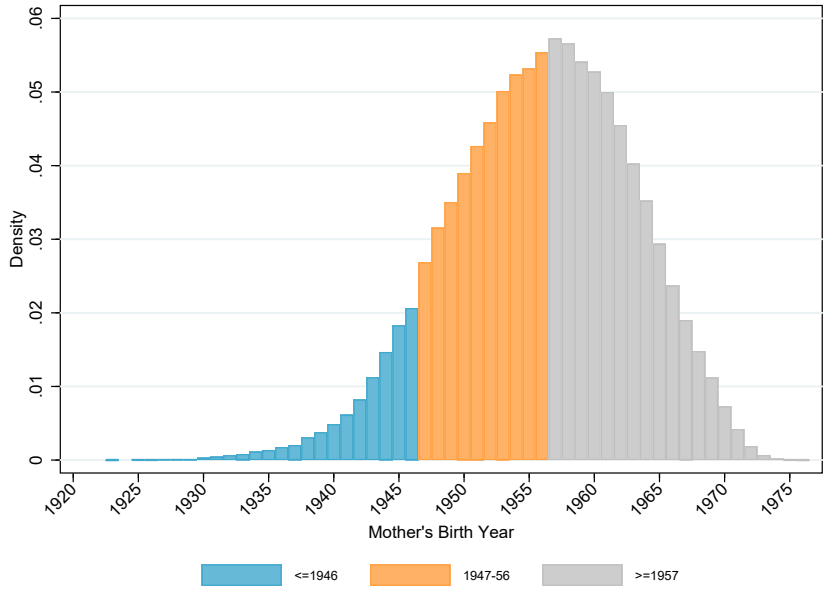
Panel A	Never Moved		More than HS		Married	
	(1)	(2)	(3)	(4)	(5)	(6)
Born In or Before 1946	-0.0911***	-0.0714***	0.0677***	-0.0227***	0.0152*	0.148***
	(0.0129)	(0.0122)	(0.00493)	(0.00801)	(0.00830)	(0.00853)
Born Between 1947 to 1956	-0.0150	-0.00605	-0.0349***	0.00547	-0.0106	0.0565***
	(0.0143)	(0.00563)	(0.00408)	(0.0100)	(0.00888)	(0.00812)
Panel B	Intermarriage		Married White		Labor Force Participation	
Born In or Before 1946	-0.129***	-0.119***	-0.166***	-0.0879***	0.0502***	0.0256
	(0.0116)	(0.0254)	(0.0210)	(0.0293)	(0.0118)	(0.0168)
Born Between 1947 to 1956	0.0339***	-0.0255**	-0.00263	-0.0311*	-0.00190	0.00678
	(0.00568)	(0.0104)	(0.0104)	(0.0164)	(0.00562)	(0.00719)
			Conditional on Being Married			
Panel C	Intermarriage		Married White		Labor Force Participation	
Born In or Before 1946	-0.241***	-0.260***	-0.312***	-0.191***	0.0490***	0.0227
	(0.0136)	(0.0351)	(0.0314)	(0.0437)	(0.0142)	(0.0198)
Born Between 1947 to 1956	-0.000485	-0.0864***	-0.0684***	-0.0759***	-0.0151*	0.00556
	(0.00735)	(0.0111)	(0.0142)	(0.0221)	(0.00756)	(0.0112)
Comparison Group						
Japanese in Hawaii	✓	×	✓	×	✓	×
Other Asians	×	✓	×	✓	×	✓

***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. Data from the 5% 1980, 1990, and 2000 Decennial Census. All regressions include 5-year age bins along with state and year fixed effects. Standard errors are clustered at the current state of residence level.

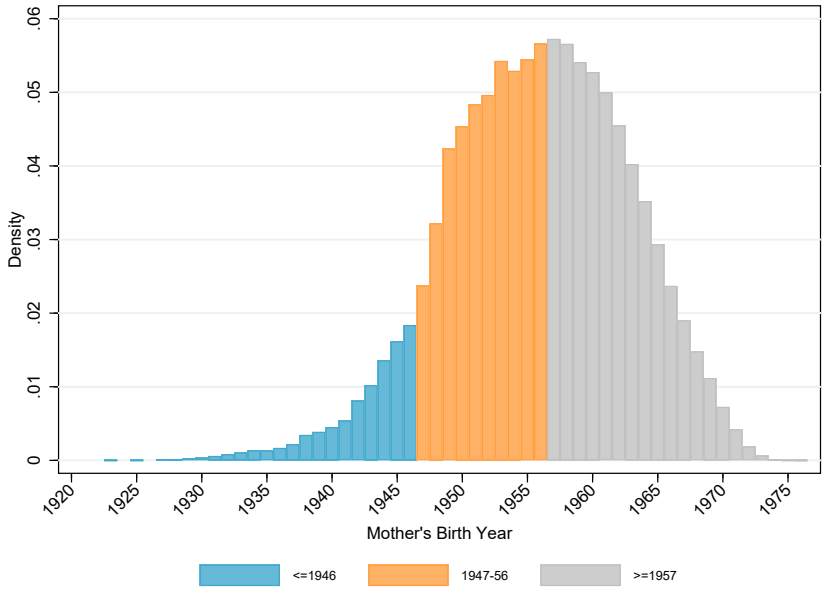
Figure A.1: Density of Mothers by Birth Year



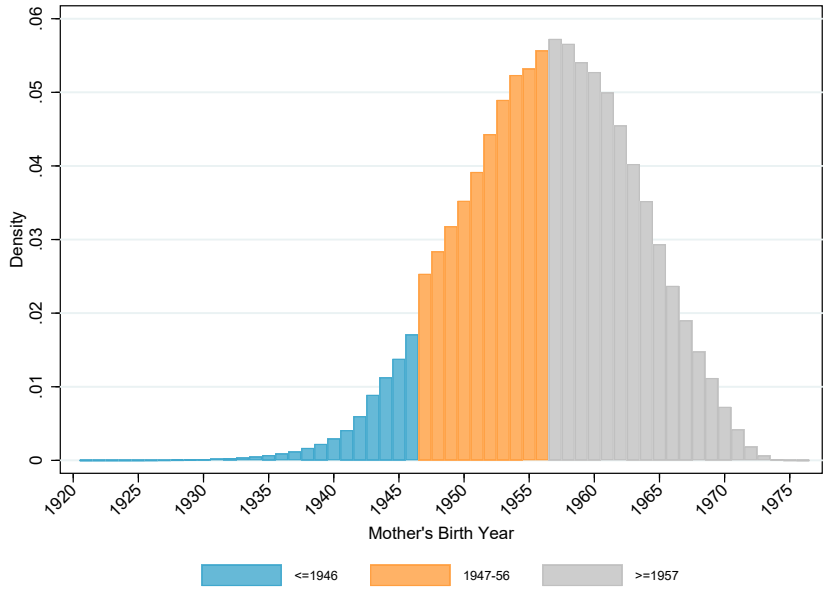
(a) Japanese, Mainland



(b) Japanese, Hawaii



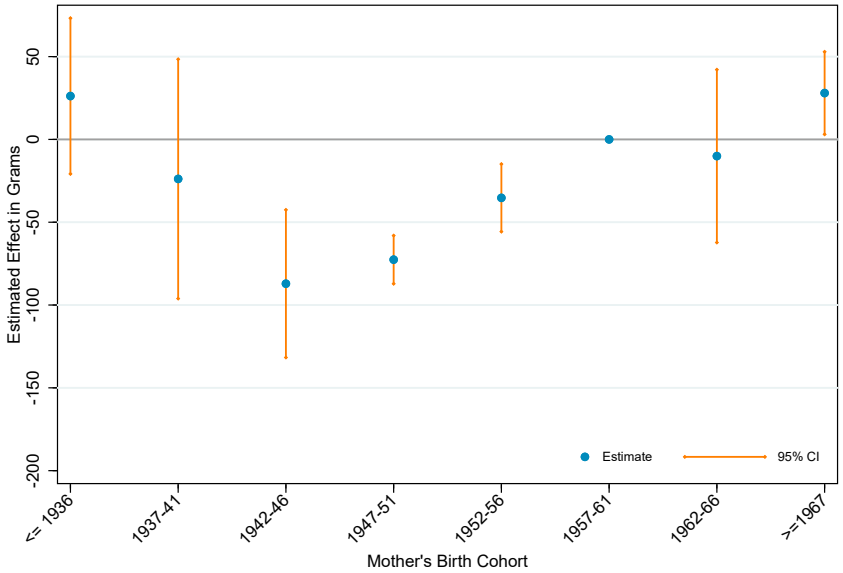
(c) Other Asian, Mainland



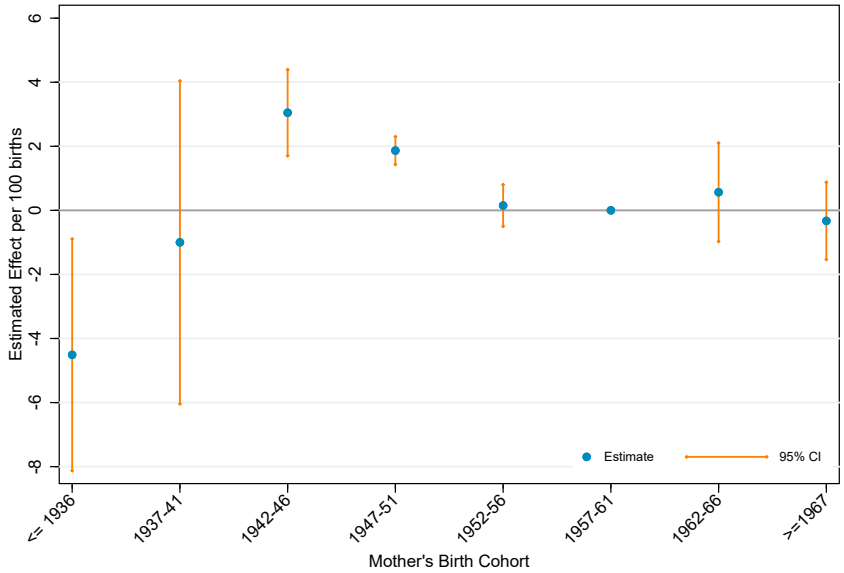
(d) White, Mainland

Note: Histogram plotting the density of mothers in our sample by maternal year of birth. Based on Vital Statistics data from 1970 to 1988.

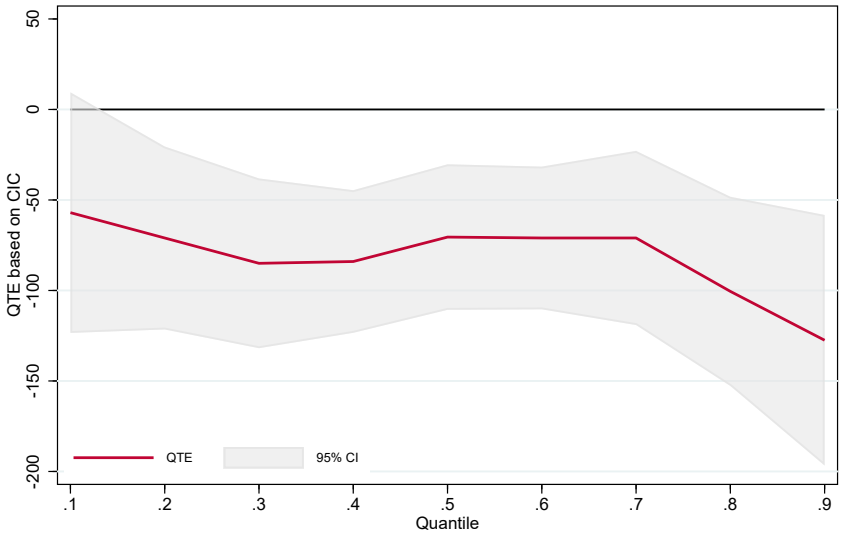
Figure A.2: Beyond the Average Effect: Changes-in-Changes and Event Study Estimates



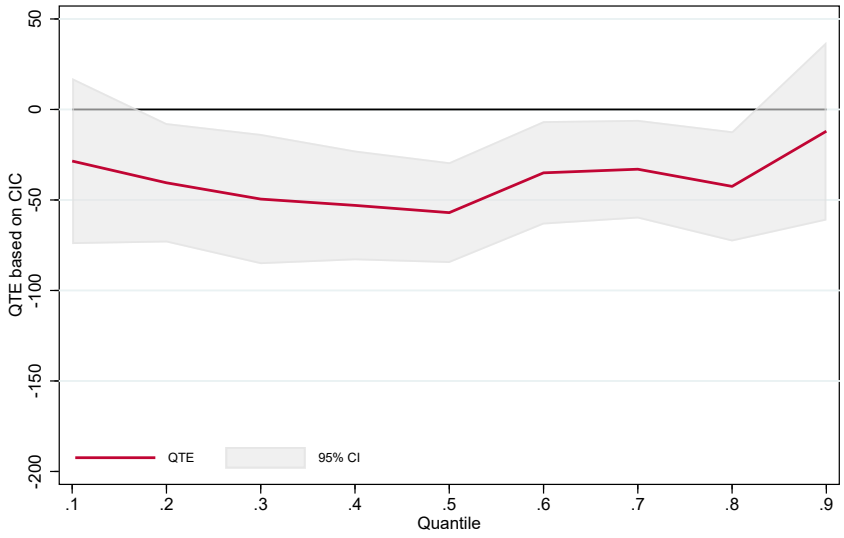
(a)



(b) Event DID - LBW



(c) CIC - Born Before 1946



(d) CIC - Born Between 1947-56

Note: The control group in the above plots are Other Asian Americans living on the West Coast. CIC refers to the Changes-in-Changes estimator of Athey and Imbens (2006)

Table A.5: Baseline Estimates for Incarceration on Number of Children for Women Only

	Full Sample		Age $\geq$ 30	
Born In or Before 1946	-0.0864	-0.0341	0.0436	0.105
	(0.0551)	(0.0756)	(0.0696)	(0.0910)
Born Between 1947 to 1956	-0.0742***	-0.0595**	0.0275	-0.0699*
	(0.0138)	(0.0225)	(0.0249)	(0.0412)
Comparison Group				
Japanese in Hawaii	✓	×	✓	×
Other Asians	×	✓	×	✓

***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. Data from the 5% 1980 and 1990 Decennial Census. All regressions include 5-year age bins along with state and year fixed effects. Standard errors are clustered at the current state of residence level.