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ABSTRACT

In contrast to earlier United States policies of open war, forcible removal, and relocation to address the "Indian Problem," the Dawes Act of 1887 focused on assimilation and land severalty—making American Indians citizens of the United States with individually-titled plots of land rather than members of collective tribes with communal land. Considerable scholarship shows that the consequences of the policy differed substantially from its stated goals, and by the time of its repeal in 1934, American Indians had lost two-thirds of all native land held in 1887 (86 million acres)—and nearly two-thirds of American Indians had become landless or unable to meet subsistence needs. Complementing rich qualitative history, this paper provides new quantitative evidence on the impact of the Dawes Act on mortality among American Indian children and adults. Using 1900 and 1910 U.S. population census data to study both household and tribe-level variation in allotment timing, we find that assimilation and allotment policy increased the American Indian child mortality ratio by a little more than 15%. In secondary analyses (requiring additional assumptions) focused on total mortality, we find increases among young American Indians of nearly one-third (implying a decline in life expectancy at birth of about 20%). These results confirm contemporary critics' adamant concerns about the Dawes Act.

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1 Introduction

On February 8, 1887, the United States Congress passed "An Act to Provide for the Allotment of Lands in Severalty to Indians on the Various Reservations," a law informally known as the Dawes Act. In contrast to earlier policies of open war, forcible removal, relocation to reservations, and establishment of tribal treaties, the Dawes Act focused on assimilation and land "severalty" – making American Indians citizens of the United States with individually-titled plots of land rather than members of tribes collectively owning communal land (Land Planning Committee 1935; Carlson 1983; Hacker and Haines 2005; Leonard, Parker, and Anderson 2020). In practice, the Act seized reservation land deemed "advantageous for agricultural and grazing purposes" and divided it into parcels of private property, "allotting" between 40 and 160 acres of land to individual American Indians formerly living on those tribal reservations.[1] However, inability to obtain credit (land titles were held in trust by the federal government), fragmentation of parcels, and inheritance laws strongly incentivized the sale of these allotments after the federal government no longer held them in trust.[2] By the time that the Dawes Act was repealed on June 18, 1934 (under the U.S. Indian Reorganization Act, or Wheeler-Howard Act), American Indians had lost roughly 80 million acres of land, nearly two-thirds of all native land held in 1887—and nearly two-thirds of American Indians had become landless or unable to meet their subsistence needs (McDonnell 1991). Akee 2020 also shows that allotment of reservation land led to large declines in home ownership. Figure 1 shows American Indian reservation land in 1900 (top panel) and in 1930 (bottom panel) (Paullin 1932).

Before its repeal, critics voiced urgent concern about the impact of allotment policy on the livelihood of American Indians. In a U.S. Senate session on April 11, 1932, Utah Senator William H. King argued that "No system could be more cynically devised to strip the helpless wards of

[1] According to the Dawes Act, tribes to be allotted were those that had land deemed "conducive to farming and/or grazing." Dippel, Frye, and Leonard 2020 show that in practice, allotted lands were at lower altitudes and had better soil quality than unallotted lands.

[2] Under the Dawes Act, the federal government held allotments in trust for 25 years before giving full title (and ability to sell allotted land) to allotted American Indians. Later laws allowed for shorter periods of trusteeship. See Appendix Figure A1 for an example of federal land sales of "surplus" land. Additionally, allotments to an individual were not guaranteed to be one continuous or multiple contiguous plots of land; they were often miles apart (for example, see the United States Library of Congress archives).

the Government of their property under the shadowy form of law than the allotment system which Congress and the executive agencies have continued to maintain and enforce through successive decades." "...unless fundamental changes are instituted at once, the Indians are a doomed race" (King 1932). John Collier, Commissioner of the Bureau of Indian Affairs (BIA) from 1933 to 1945, argued that allotment policy was the primary reason that American Indian mortality rates were 95% higher than those in the rest of the U.S. population (Collier 1929; Hacker and Haines 2005). However, there has been little quantitative assessment to date of the impact of U.S. allotment policy on American Indian mortality.

In this paper, we study the impact of United States assimilation and allotment policy on the survival of American Indians, focusing on both child and adult mortality.[3] Past scholarship has documented that the Dawes Act harmed American Indian livelihood and economic well-being through land fractionalization (Berthrong 1979; Carlson 1981; Anderson and Lueck 1992; Leonard, Parker, and Anderson 2020), incomplete property rights (Trosper 1978; Carlson 1981; Carlson 1983; Anderson and Lueck 1992; Leonard, Parker, and Anderson 2020; Dippel, Frye, and Leonard 2020), reductions in wealth (Feir, Jones, and Redish 2024), and incentives for American Indians to sell their land rather than developing and farming it (Berthrong 1979; Carlson 1981; Carlson 1983; Bobroff 2001; Hacker and Haines 2005; Akee 2020). Closest to this paper, Hacker and Haines 2005 find that after controlling for household characteristics, allotted households had roughly 20% higher child mortality than unallotted households. Our paper builds on the foundation of this past research, aiming to isolate more closely the mortality impact of allotment, which presumably operated in part through channels documented by others.

We first do so using variation in age at allotment (conditional on age) among American Indian women in the 1910 population census (when roughly 80% of all allotment had been completed[4]) to identify its effects on the mortality ratio of their children. Women allotted at younger ages had greater lifetime exposure to allotment and its consequences, while women allotted at older ages

[3] Although allotment was arguably the centerpiece of federal assimilation policy, there were other assimilation efforts as well (see Hacker and Haines 2005).

[4] Authors' calculations using data from the Land Planning Committee 1935 report and the 1910 annual report of the Commissioner of Indian Affairs (Commissioner of Indian Affairs 1910).

had less lifetime exposure. This approach suggests that allotment increased the American Indian child mortality ratio (a woman's deceased children as a share of live births (Hacker 2020)) by a little more than 15% (and may be an underestimate due to selective mortality among adult women). Then, in secondary analyses requiring additional assumptions, we use variation in allotment timing across tribes to estimate its impact on changes in birth cohort size (and by implication, mortality) between the 1900 and 1910 population censuses (a decade during which more than half of all allotment occurred).[5] These secondary results suggest that over the decade, allotment increased mortality among American Indians ages 0-25 by roughly one-third (implying a reduction in life expectancy at birth of about 20% using the two-census life table framework developed by Preston and Bennett 1983). Although not directly comparable to each other, both strongly suggest that United States assimilation and allotment policy substantially increased mortality among American Indian children and adults.

2 Data and Methods

2.1 Data

2.1.a Child Mortality Ratio Data

For our analysis of the child mortality ratio, we use the IPUMS 1.4% (1 in 70) sample of the 1910 U.S. population census, which includes a 1-in-5 (20%) oversample of American Indians (and "detached" Whites and Blacks living in American Indian families) to whom the Bureau of the Census administered an "Indian schedule" (Ruggles et al. 2023).[6] This "Indian schedule" collected information about nation/tribe membership, taxation status—and importantly, year of allotment for each household allotted by the time of the census (no other census recorded information about

[5] Authors' calculations using data from the Land Planning Committee 1935 report and the 1900 and 1910 annual reports of the Commissioner of Indian Affairs (Commissioner of Indian Affairs 1900; Commissioner of Indian Affairs 1910).

[6] The specific criterion for determining if a respondent was an American Indian was "all persons of mixed blood who have any appreciable amount of Indian blood" as well as "full-blood" Indians (United States Bureau of the Census 1915).

household-level allotment timing).[7] The 1910 "Indian schedule" was administered to American Indians on reservations or living in counties in which the number of American Indians enumerated in 1900 was 20 or more, covering 92.4–95.5% of all American Indians according to weight-inflated IPUMS sample counts (and 93% according to a 1915 Bureau of the Census report (Commissioner of Indian Affairs 1910)) – see Appendix Section A.2 for more detail.

The primary outcome is the child mortality ratio reported by married American Indian women (which we calculate as the difference between women's reported number of children ever born and number of children surviving, as a percent of children ever born).[8] We restrict our sample to married or previously married women under the age of 90 who did not reside in Alaska and Hawaii (where the Dawes Act did not apply) or in states east of the Mississippi River (tribal land was generally west of the Mississippi River following the Indian Removal Act of 1830), and we assess sensitivity to restricting our sample to married women under ages 80, 70, and 60. We also exclude all "detached" Whites and Blacks living in American Indian families (although racial determinations were made by census enumerators, introducing potential ambiguity, Appendix Figures A6 and A8 and Tables A8 and A10 show that our results are robust to this choice). Moreover, we use the 1910 census measure of "blood quantum" to study how the child mortality ratio effect of the Dawes Act may have differed between American Indians categorized as "full blood" and "mixed blood."[9] Past research documents that those classified as "mixed blood" were more likely than those considered "full blood" to be deemed "competent,"[10] granting them title and ability to sell their land sooner than others whose land was initially held in trust for a period of 25 years by the

[7]Previous analyses using the 1900 census have interpreted whether or not an individual was taxed as a proxy for allotment status. Section 6 of the Dawes Act states that citizenship can be granted through allotment if an "Indian born within the territorial limits of the United States…has voluntarily taken up…his residence separate and apart from any tribe of Indians…and has adopted the habits of civilized life." However, it also states that naturalization in this way does not change "the right of any such Indian to tribal or other property." Additionally, Hacker and Haines Hacker and Haines 2010 observe that the "taxed" classification was often dependent on whether American Indians had anything to tax. See Appendix Section A.1 for more information.

[8]48% of American Indian women in the 1910 census were recorded as ever married (including divorced and widowed); 9% of ever married women were nulliparous and therefore excluded from our analysis of child mortality.

[9]We classify an individual as "full blood" if they are recorded to be 100% American Indian in the 1910 census (and consider other individuals identified as American Indian, but not as "full blood," to instead be "mixed blood.")

[10]The federal government held allotment titles in trust for an initial period of 25 years, but the Bureau of Indian Affairs (BIA) could give full control of allotted land sooner to individuals deemed "competent." This early title transfer was more common for individuals categorized as "mixed blood" (Carlson 1983; Fain and Nagle 2017).

federal government (Carlson 1983; Beaulieu 1984; Fain and Nagle 2017).[11]

To measure exposure to allotment, our child mortality ratio analysis takes advantage of household-level variation in allotment timing within allotted tribes. Although allotment began in different years for different tribes, Figure 2 shows that there was substantial variation in allotment timing within tribes as well.[12] In our analysis, variation in allotment timing is captured by each individual woman's age at allotment (which we construct as the difference between a woman's year of allotment and year of birth among women allotted by 1910).[13] Women allotted at younger ages have greater lifetime exposure to allotment and its consequences, while women allotted at older ages have less lifetime exposure. Importantly, the logic of this measure also requires conditioning on age (because age is otherwise a key determinant of women's fertility and child mortality).

Table 1 Panel A presents descriptive statistics from the 1910 population census sample that we use to study the child mortality ratio.[14] Appendix Figure A2 shows the distribution of age at allotment in the sample, highlighting the substantial variation that our approach exploits.

2.1.b Cohort Size Data

In a complementary secondary analyses of total mortality, we use samples from both the 1900 and 1910 U.S. population censuses–the only extant historical censuses to measure American Indian identity or heritage around the time of the Dawes Act (other than the 1930 census), regardless of the definition used.[15] Similar to the 1910 sample, the IPUMS 1900 sample is a 1% sample of the U.S. population which also includes a 1-in-5 (20%) oversample of American Indians to whom an

[11] Carlson 1983 shows that in practice, land sales by allotted American Indians made them more likely to become landless over time, and that because migration was uncommon, many who became landless after selling their land remained nearby, relying on family and community to support them.

[12] According to the Dawes Act, when a reservation was deemed allotted the members of that tribe/nation had 4 years to claim their allotments before the Secretary of the Interior would assign allotments to them. See Appendix Section A.3 for more information.

[13] Year of birth is constructed as 1910 minus an individual's reported age.

[14] Although there is an IPUMS/Ancestry.com digitized full-count 1910 population census, the "Indian schedule" data has not been digitized.

[15] The 1890 population census also recorded American Indian identity, but the original 1890 census documents were destroyed in a fire in 1921 and are therefore unavailable. We do not use the 1930 census because it was conducted after the 1924 Indian Citizenship Act (and we are less certain how, and to what extent, American Indian tribal membership was recorded).

"Indian schedule" was administered (Ruggles et al. 2023).[16] We also again restrict our sample to individuals not residing in Alaska, Hawaii, or states east of the Mississippi River, as well as excluding Whites or Blacks living in American Indian families.

To measure mortality among American Indian adults, we focus on changes in birth cohort size. The logic of this approach is that there are only three ways to enter or exit a birth cohort: fertility, migration, and mortality. Fertility is not relevant in our case given that we study changes in cohort size after birth,[17] and migration within the United States does not in principle influence an individual's presence in a decennial population census (there was very little international migration among American Indians during the early twentieth century (Carlson 1983)).[18] We therefore interpret changes in birth cohort size between 1900 and 1910 to reflect mortality (subject to an additional assumption which we describe in the next paragraph), following work by others (Lleras-Muney 2005; Jayachandran 2009; Miller and Urdinola 2010). To implement this approach, we construct observations at the tribe by birth year level in both 1900 and 1910.[19] Although there is inevitably sampling error in cohort size measures derived from historical population census samples, this sampling error presumably has an expectation of zero.

Because the 1910 census "Indian Schedule" was administered only to American Indians either on reservations or living in counties in which the number of American Indians enumerated in 1900 was 20 or more, an additional assumption that we make is that the number or share of American Indians outside of the "Indian Schedule" did not change differentially with allotment. Historians

[16] Unlike the 1910 census, the 1900 census "Indian schedule" only asks about a respondent's proportion of "white blood" rather than proportion of "Indian blood." Given this, we code individuals in the 1900 census as "full blood" if they are recorded as having no "white blood."

[17] Women's fertility is still potentially relevant in the case of maternal mortality, but maternal mortality is an important implicit focus of our adult mortality analysis.

[18] Although it is possible that American Indians were less likely to be recorded as American Indians after allotment, census enumerators were instructed to classify "all persons of mixed white and Indian blood who have appreciable amount of Indian blood" as American Indian, even if the "proportion of white blood [exceeded] that of Indian blood" (United States Bureau of the Census 1915).

[19] Thornton, Sandefur, and Snipp 1991 discuss challenges in consistently measuring American Indian identity and tribe identity across censuses (between the 1950 census, when census enumerators determined identity, and the 1960 census, when respondents reported their own identity, for example). We cannot rule out similar challenges in using the 1900 and 1910 census; the enumeration instructions appear to be the same for both censuses, but Hacker and Haines 2010 report that "the revised 1910 census instructions strongly encourag[e] enumerators to record the race of individuals having full or partial American Indian ancestry as Indians."

suggest that American Indian migration to urban areas was uncommon before 1930 (Shoemaker 1991; Thornton 2001), and we estimate that coverage of the "Indian Schedule" changed modestly between 1900 and 1910 (either rising from 93.7% to 95.5%, or declining from 94.0% to 92.4%, depending on the IPUMS sample and weighting approach – see Appendix Section A.2 for more detail).[20] However, if this assumption were incorrect, we could mistakenly attribute cohort size reductions to mortality when they are in fact due to migration. To the extent possible, Appendix Section A.2 investigates this possibility. Although it does not reveal clear evidence against this assumption, we nonetheless cannot rule out the possibility of selective migration related to allotment.

Our exposure measure for studying changes in cohort size focuses on tribe-level allotment timing between 1900 and 1910 (when the majority of all allotment occurred – we exclude tribes allotted prior to 1900 as reported by the 1935 Land Planning Committee report Land Planning Committee 1935).[21] As Figure 2 shows, there was substantial variation in allotment timing across tribes (as well as within tribes). Under the Dawes Act, after a reservation was deemed allotted by the federal government, members of that tribe/nation had four years to claim their allotments before the Secretary of the Interior would otherwise assign allotments to them. In practice, about 80% of those allotted did not choose for themselves, but rather were assigned land (Meriam et al. 1928). In our analyses, we therefore define the start of allotment for each tribe as four years

[20] The 1915 Bureau of the Census report does not explicitly report counts which can be used to calculate an "Indian Schedule" coverage rate in 1900 (1910)

[21] Under the Dawes Act, 246,569 parcels of individually-titled land were allotted to American Indians Land Planning Committee 1935. Among these, 55,996 (22.7%) of allotments were made by 1900, and 190,401 (77.2%) were made by 1910 (Commissioner of Indian Affairs 1900; Commissioner of Indian Affairs 1910), implying that about 55% of allotment occurred between 1900 and 1910. The tribes allotted between 1900 and 1910 that we study are the Apache, Arapaho, Arikara, Assiniboine, Bannock, Blackfoot, Brotherton, Caddo, Cahuilla, Cayuse, Chehalis, Cherokee, Chemehuevi, Chemakuan, Cheyenne, Chickasaw, Chinook, Chippewa, Choctaw, Coeur d'Alene, Colville (seemingly a reservation name), Comanche, Coos, Coquilles, Coushatta, Cowlitz, Cree, Creek, Crow, Delaware, Diegueno, Gros Ventres, Hoopa, Iowa, Iroquois (defined to include Mohawk, Oneida, Onondaga, Cayuga, and Seneca tribes), Kalispel, Kaw, Kickapoo, Kiowa, Klallam, Klamath, Konkow, Kootenai, Lumni, Luiseno, Makash, Mandan, Menominee, Miami, Mission Indians (a name given to the many California tribes), Miwok, Modoc, Mono, Navajo, Nez Perce, Nomalaki, Omaha, Osage, Otoe-Missouria, Ottawa, Paiute, Pawnee, Peoria, Pima, Pit River (seemingly a reservation name), Pomo, Ponca, Potawatomie, Pueblo, Quapaw, Quinault, Sac and Fox, Salish, Seminole, Serrano, Shasta, Shawnee, Shoshone, Siletz, Sioux, Spokane, Stockbridge, Tlingit-Haida, Tohono O'odham, Tolowa, Umatilla, Umpqua, Wailaki, Walla-Walla, Washo, Wichita, Wintu, Yakima, Yaqui, Yokuts, and Yuman tribes.

after the date on which the federal government declared a tribe to be allotted. Appendix Figure A3 presents evidence consistent with allotment in large tribes intensifying after four years (for example, among larger tribes including the Cherokee, Chickasaw, and Choctow – but not among others such as the Creek), and we also assess the sensitivity of our results to other coding of allotment timing. (Appendix Figure A4 and Appendix Table A1 also report results from repeating our child mortality ratio analysis using tribe-level allotment timing, showing that they are generally consistent with our analysis using household-level timing.)

Table 1 Panel B presents descriptive statistics from the 1900 and 1910 population census samples that we use to study changes in cohort size.

2.2 Methods

2.2.a Child Mortality Ratio Estimation

We estimate the impact of allotment on the child mortality ratio using two different approaches. First, for individual women i allotted in 5-year age groups $j \epsilon$ (15-19, 20-24, ..., 40-44) who were members of tribe t, we estimate:

$$Y_{ijt} = \alpha + \sum_{j} \beta_j Age\_Group_{ij} + \delta(Allotted\_45_i) + \nu X_i + \gamma_t + \epsilon_{ijt} \quad (1)$$

where Y is woman i's child mortality ratio, Age_Group is a dichotomous indicator for each 5-year age at allotment group, $Allotted\_45$ is a dichotomous indicator for allotment at ages 45 or older (we focus our child mortality analysis primarily on women at childbearing ages), X is a vector of woman-level covariates (age; whether or not a woman speaks English; number of births, which can influence child mortality (Bean, Mineau, and Anderton 1992; Haines 1998; Lawson, Alvergne, and Gibson 2012); and adjusted household size, defined as household size minus a woman's number of own children surviving[22]), and γ represents tribe fixed effects. The β coefficients for allot-

[22]We consider adjusted household size to proxy for the number of other potential dependents in a household. Akee Akee 2020 shows that allotment led to greater extended family cohabitation.

ment age groups are the parameters of interest (with women allotted under age 15 as the reference group), and we compute standard errors clustered at the household level given that some households include multiple mothers (given systematic variation in allotment timing across tribes, we also investigate the robustness of our estimates to computing standard errors clustered by tribe).[23] Because our age at allotment measure requires conditioning on age, we also assess the robustness of our estimates to alternative ways of controlling for age (conditioning on squared and cubic age terms as well as 5-year and 10-year age group dummy variables). Moreover, because location could influence survival, conditional on membership in a tribe, we also assess the robustness of our results to the inclusion of county-of-residence fixed effects. Finally, we assess the sensitivity of our results to restricting our sample to only one mother per household, either the spouse of the household head or the household head.

Second, to estimate an average effect of allotment on the child mortality ratio across all childbearing ages, we also use a similar framework to estimate:

$$Y_{it} = \alpha + \theta Age\_at\_Allotment_i + \delta(Allotted\_45_i) + \nu X_i + \gamma_t + \epsilon_{it} \tag{2}$$

where $Age\_at\_Allotment$ is a single variable linear in age at allotment, θ is the parameter of interest, and all other variables and parameters are defined as in Equation (1).

Finally, to investigate differences in the effect of allotment policy by "blood quantum," we re-estimate Equations (1) and (2), stratifying by "full blood" and "mixed blood" designations as reported in the 1910 census.

2.2.b Cohort Size Estimation

To estimate the impact of allotment on changes in cohort size between 1900 and 1910 (and by implication, 10-year mortality), we also use two separate approaches. First, for birth cohorts (years

[23] According to the 1910 population census enumerator instructions, a household was defined as "a group of persons living together in the same dwelling place. The persons constituting this group may or may not be related by ties of kinship."

of birth) b, tribes t, and census years y, we estimate:

$$Y_{bty} = \alpha + \lambda 1_y(Year = 1910) + \pi 1_y(Year = 1910) \times 1_t(Allotted) + \gamma_t + \eta_b + \epsilon_{bty} \quad (3)$$

where Y_{bty} is the cohort size of those born in year b belonging to tribe t and observed in census year y, $1_y(Year = 1910)$ is an indicator for being observed in the 1910 census, $1_t(Allotted)$ is an indicator for whether or not a tribe t was allotted between 1900 and 1910, and the parameter of interest is π (for the interaction between being observed in 1910 and being allotted between 1900 and 1910). We estimate Equation (3) separately for five-year birth cohort groups among those born between 1856 and 1900 (ages 0-44 in 1900) and for those born in 1855 and earlier as a single group (because birth cohort size is progressively smaller further back in time). We also repeat our cohort size estimation, stratifying by sex and also by "blood quantum," and we assess the sensitivity of our results to our coding of tribe-level allotment timing by re-estimating Equation (3) using alternative timings $\pm$ 2 years.[24]

Second, we estimate a similar equation using variation in time between when a tribe in our cohort size sample was first allotted and 1910:

$$Y_{bty} = \alpha + \lambda 1_y(Year = 1910) + \phi Time\_under\_Allotment_{ty} + \gamma_t + \eta_b + \epsilon_{bty} \quad (4)$$

where $Time\_under\_Allotment$ is a tribe's time between allotment and 1910 (0 for all tribes in our sample in 1900) and all other variables and parameters are defined as in Equation (3). We also repeat our cohort size estimation in Equation (4), stratifying by sex and by "blood quantum," and we again assess the sensitivity of our results to alternative codings of tribe-level allotment timing by $\pm$ 2 years.

To aid in the interpretation of our cohort size estimates, we also compute the change in life expectancy at birth implied by them. Specifically, we use the two-census life table framework

[24]Note that although this analysis uses a two-way fixed effects framework, we only have "pre" and "post" observations for treated groups, and all observations are untreated in the "pre" period (Callaway and Sant'Anna 2021).

developed by Preston and Bennett 1983 to generate life expectancy estimates by age group (for 5-year age groups 5-9 to 85-89, excluding those ages 90 and over) among American Indians between 1900 and 1910 (see Appendix Section A.5). This method allows us to project our two age distributions (in 1900 and 1910) to a single stationary closed population in which we assume the only method of attrition is mortality. Because we do not have reliable birth data for American Indians between 1900 and 1910 (some of the birth data in the Annual Reports of the Commissioner of Indian Affairs are labeled as "rough estimates only partially reported" (Commissioner of Indian Affairs 1900; Commissioner of Indian Affairs 1910)), we are unable to directly estimate life expectancy at birth. Instead, we use the Coale-Demeny Model West life table to estimate the implied life expectancy at birth given a life expectancy at an age greater than zero (in our case, ages 5 and greater).[25]

Given the additional assumption of no selective migration away from areas covered by "Indian Schedule" among those allotted between 1900 and 1910, we consider our cohort size analyses to be secondary (see Appendix Section A.2 for further examination of this assumption).

3 Results

3.1 The Impact of Allotment on the Child Mortality Ratio

Figure 3 shows estimates for the effect of allotment on the American Indian child mortality ratio from Equation (1). Specifically, it plots point estimates and 95% confidence intervals for each 5-year age at allotment group, 15-19 through 40-45 (as well as for allotment at ages 45+). Relative to women fully-exposed (allotted at ages under 15), women who were exposed less to allotment (because they were allotted at older ages) had lower child mortality ratios – and the gradient in child mortality ratio effects varies systematically with women's degree of partial exposure (i.e., with age at allotment). These estimates are statistically significant at conventional levels, implying

[25] Although these computations are informative about *changes* in life expectancy at birth, the *levels* of life expectancy at birth should be interpreted more cautiously (Preston and Bennett 1983). See Appendix Section A4 for more detail.

that allotment increased child mortality substantially among American Indian women. Figure 3 also shows that these estimates are generally robust to controlling for age in different ways (with squared and cubic age terms as well as 5-year and 10-year age group dummy variables) and to the inclusion of county fixed effects. Appendix Figure A5 shows that their precision is similar with standard errors clustered by tribe (given systematic variation in allotment timing across tribes), Appendix Table A2 shows that these results persist when restricting our sample to one mother per household, Appendix Table A3 shows that the results are not generally sensitive to restricting our sample to women below ages 80, 70, or 60 (older women may recall children ever born and children surviving with differential accuracy (Hacker 2020)), and Appendix Figure A6 shows that our results are robust to the inclusion of "detached" Whites and Blacks living in American Indian families.

To quantify the average linear effect of allotment age (and degree of exposure) on the child mortality ratio, Table 2 Column 1 then shows estimates from Equation (2). Each year of allotment is associated with a 0.3 percentage point increase in the child mortality ratio. This estimate implies that relative to allotment at age 35, allotment at age 18 led to roughly a 6 percentage point increase in the child mortality ratio, a relative increase of about 15%.[26] Appendix Tables A4, A5, A6, A7 and A8 also show that the results are again robust to controlling for age in different ways, to the inclusion of county fixed effects, to computing standard errors clustered by tribe, using a fractional logit model (Papke and Wooldridge 1996), and to including "detached" Whites and Blacks living in American Indian families.[27]

The child mortality ratio estimates in Figure 3 and Table 2 Column 1 are large in relative terms among American Indians in the early the 20th century. Importantly, they may also be underestimates due to selective survival among American Indian women present in the 1910 population census.[28] Independent of the Dawes Act and its consequences, however, American Indians also

[26]For a 17-year difference in allotment age, the implied child mortality ratio difference is 17*(0.00338) = 5.75 percentage points. Relative to the mean child mortality ratio among women in our sample who were allotted at age 35 (37.22%), the corresponding percent increase is (5.75/37.22)*100 = 15.4%.

[27]Some of the point estimates with alternative age controls are not statistically distinguishable from zero, but they remain close to the point estimates obtained from Equation (2) and fall within their confidence intervals.

[28]If allotment increased mortality among American Indian women (as our cohort size results in the next section sug-

faced very different population health circumstances than the rest of the American population. In 1900, for example (by when only 22.7% of all allotment had occurred),[29] the American Indian child mortality ratio was 31.4%, while for the rest of the United States, the child mortality ratio was 19.2%.[30] As a share of this already large child mortality ratio gap between American Indians and the rest of the U.S. population, the effect of allotment that we find in Table 2 Column 1 represents an additional increase of 47%.[31] In other words, U.S. allotment policy increased by nearly half the already large disparity between the survival of American Indian children and other children in the United States.

Appendix Figure A7 and Table 2 Columns 2 and 3 then show estimates from Equations (1) and (2) stratified by "blood quantum," reporting allotment effects on child mortality for "full blood" and "mixed blood" subsamples.[32] The estimates in Appendix Figure A6 appear to differ by "blood quantum" (only the estimates for "mixed blood" have 95% confidence intervals not overlapping with zero), and Table 2 Columns 2 and 3 confirm that the age at allotment estimates for child mortality are statistically different from zero only in the "mixed blood" subsample.[33] This result is consistent with historical evidence documenting that "mixed blood" American Indians were more likely to be deemed "competent," and therefore to be granted title and ability to sell their land sooner, leading to landlessness (Carlson 1983; Beaulieu 1984; Fain and Nagle 2017; Akee 2020).

gest), then allotted women surviving to 1910 may differ in unobserved ways from women who did not (Hacker 2020). On balance, surviving women are presumably stronger/healthier, and may in turn have healthier children with lower mortality rates, all else equal (Deaton 2007; Currie and Vogl 2013).

[29] Author's calculation using data from the 1935 Land Planning Committee report Land Planning Committee 1935 and the 1900 annual report of the Commissioner of Indian Affairs Commissioner of Indian Affairs 1900.

[30] Authors' calculations using the 1900 population census full count sample.

[31] The child mortality ratio gap between American Indians and the rest of the United States was 31.4-19.2=12.2 percentage points. For a 17-year difference in allotment age, the child mortality ratio estimate in Table 2 implies a 5.75 percentage point increase. Relative to the initial 12.2 percentage point gap, a 5.75 percentage point increase is an increase of 5.75/12.2 = 47.2%.

[32] Appendix Table A7 shows that our child mortality ratio estimates are generally robust to weighting observations by women's number of children born, although the magnitude declines by roughly one third.

[33] The p-value for a test of equality between the "full blood" and "mixed blood" point estimates is 0.19, meaning we cannot formally reject that they are the same, but we can reject that the "mixed blood" coefficient is zero.

3.2 The Impact of Allotment on Cohort Size

Figure 4 Panel A reports cohort size estimates from Equation (3) for those born between 1856 and 1900 (ages 0-44 in 1900) as well as for those born in 1855 or earlier (age 45 and older in 1900). In general, there are statistically significant reductions in cohort size among tribes allotted between 1900 and 1910 relative to those not allotted by 1910 among those born between 1875 and 1899 (ages 0-25 in 1900). Put differently, Figure 4 Panel A suggests that allotment reduced American Indian birth cohort size, or increased 10-year mortality, among those ages 0-25 in 1900. Panel B shows a similar pattern of statistically significant reductions in cohort size using the time under allotment exposure measure (from Equation (4)), again among those ages 0-25 in 1900. Both panels also show that our results are generally robust to using alternative codings of tribe-level allotment timing (+/- 2 years), and Appendix Figure A8 shows that they are robust to including "detached" Whites and Blacks living in American Indian families as well. Stratifying by sex, Appendix Figure A9 shows that the effect of allotment on cohort size was generally similar for females and males.

To quantify the average effect of allotment across all birth cohorts (born between 1856 and 1900) shown in Figure 4, Table 3 then reports estimates from Equations (3) and (4). The first column of Panel A shows that allotment between 1900 and 1910 reduced average cohort size among those ages 0-44 in 1900 by 33%.[34] Using our alternative time under allotment measure, Panel B shows that for mean time under allotment (5.36 years), allotment reduced cohort size by about 30%.[35] Appendix Tables A9 and A10 show that these results are generally robust to alternative codings of tribe-level allotment timing (+/- 2 years) and to including "detached" Whites and Blacks living in American Indian families (respectively). Appendix Table A11, Panels A and B, Columns (2) and (3) show that this effect did not generally differ between women and men.[36]

[34]The estimate for the absolute decline is -3.032, and mean cohort size in 1900 was 9.18, yielding a relative decline of 3.032/9.18 = 33.0%.

[35]For a time under allotment estimate of 0.516 and a mean time under allotment in 1910 (among those in our sample who were allotted between 1900 and 1910) of 5.36 years , the implied absolute effect size is 5.36(0.516) = 2.77. Relative to a mean cohort size of 9.27, this is a relative decline of 2.77/9.18 = 30.2%.

[36]There is evidence of regional variation in the effect of allotment (Leonard, Parker, and Anderson 2020), for example, due to variation in land quality, but we lack power to properly study regional variation in our analyses.

We also consider how these cohort size effects differed by "blood quantum." The second and third columns of Table 3 Panel A show that allotment between 1900 and 1910 reduced average cohort size by about 21% among "full blood" American Indians and by about 39% among those categorized as "mixed blood" (Appendix Figure A10 Panel A also shows estimates from Equation (3) stratified by "blood quantum").[37] This apparent difference is consistent with our finding that "mixed blood" American Indians had relatively greater increases in the child mortality ratio under allotment. Similarly, Table 3 Panel B (and Appendix Figure A10 Panel B) shows that using our time under allotment measure, these declines were 14% and 41%, respectively.[38] As with our child mortality ratio results, these findings are again consistent with historical evidence that "mixed blood" American Indians became landless more quickly after allotment (Carlson 1983; Beaulieu 1984; Fain and Nagle 2017; Akee 2020).

As we explain in Section A.2, interpreting these cohort size effects to reflect mortality requires an additional assumption of no selective migration away from areas covered by "Indian Schedule" among those allotted between 1900 and 1910. Appendix Section A.2 and Appendix Tables A12 and A13 assess this assumption further, finding little clear evidence against it, but we nonetheless cannot rule out the possibility of differential migration.

Finally, we then compute the implied decrement in life expectancy at birth implied by our cohort size estimates in Figure 4 Panel A. Using the two-census method developed by Preston and Bennett Preston and Bennett 1983 (see Appendix Section A.5), we find that allotment decreased American Indian life expectancy by about 14 years – roughly a 20% decline relative to unallotted tribes.

[37]The "full blood" point estimate is 1.432 and the corresponding mean cohort size is 6.81: 1.432/6.73 = 21.3%. The "mixed blood" point estimate is 2.26 and the corresponding mean cohort size is 6.03: 2.33/6.03 = 38.6%. Although these two percent declines differ substantially, the difference is not statistically significant at conventional levels.

[38]The "full blood" average time under allotment is 5.36 years, yielding an absolute effect of 0.92. For a mean cohort size of 6.81, the corresponding percent decline is 0.92/6.73 = 13.7%. For "mixed blood" American Indians, average time under allotment is 5.60 years, yielding an absolute effect of 2.44. For a mean cohort size of 6.03, the corresponding percent decline is 2.44/6.03 = 40.5%. Again, although these two percent declines differ substantially, the difference is not statistically significant at conventional levels.

4 Conclusion

This paper provides new quantitative evidence on the impact of U.S. assimilation and allotment policy under the Dawes Act of 1887 on American Indian mortality. Consistent with considerable past scholarship on the harms of allotment policy, we find that allotment increased the American Indian child mortality ratio by a little more than 15%. In secondary analyses (requiring additional assumptions) focused on total mortality, we find increases among young American Indians of nearly one third. Using standard life table methods, these increases in total mortality imply reductions in life expectancy at birth among American Indians of roughly 20% – magnitudes loosely comparable to the effect of World War I on young men in France (Héran 2014) and to the effect of Spanish Flu on residents of the United States (Smith and Bradshaw 2006). These results are also compatible with findings by others that the nadir of the American Indian population occurred around 1890 (Thornton 2001) (as American Indians inter-married and had children with others, those classified as American Indian grew mechanically, but American Indian population growth may not have otherwise begun in earnest for several decades (Snipp 1989)).

There are at least three important limitations of our analyses. First, we are unable to directly assess the role of pre-existing trends in American Indian mortality correlated with allotment timing (Roth 2022; Rambachan and Roth 2023). If allotment timing were correlated with relative increases or decreases in mortality prior to allotment, our estimates could potentially capture not only the effect of allotment, but also these pre-existing trends (or mean-reversion). Assessing this possibility directly is not generally possible without good quality representative data on American Indian mortality prior to 1900, and we are unaware of suitable data sources. However, using the 1900 population census in an exercise similar to our child mortality ratio analysis in Table 2, but instead estimating the effect of *future* age at allotment among American Indian women, we find little evidence of a significant relationship (see Appendix Table A13).[39]

[39]For this analysis, we use the 1900 population census sample, focusing on all women who were not allotted by 1900, but whose tribes were allotted before 1910. We code women's *future* age at allotment using tribe-level variation in allotment (where tribal allotment timing is defined as 4 years after the official start of allotment reported by the Land Planning Committee Land Planning Committee 1935) and then estimate a variant of Equation 2, replacing "Age at

Second, in our secondary cohort size analyses, we assume that migration between 1900 and 1910 away from areas in which the "Indian Schedule" was administered did not differ systematically between those allotted during the decade and those not allotted (substantial selective migration could otherwise lead us to mistakenly attribute cohort size reductions to mortality rather than migration). Scholars studying American Indian migration to urban areas suggest that it was uncommon before 1930 (Shoemaker 1991; Thornton 2001), and we estimate that coverage of the "Indian Schedule" changed modestly between 1900 and 1910 (either rising from 93.7% to 95.5% or declining from 94.0% to 92.4%, depending on the IPUMS sample and weighting approach – see Appendix Section A.2 for more detail). Although our cohort size results broadly align with our child mortality ratio results (a sizable and significant mortality effect of allotment, and one more clearly among "mixed blood" American Indians than among "full blood" American Indians), and our child mortality ratio analysis does not require this assumption, we nonetheless cannot rule out a potential role of selective migration in our cohort size analyses.

Third, we are unable to pinpoint the precise mechanisms, or pathways, through which allotment increased American Indian mortality. However, larger allotment effects among "mixed blood" (relative to "full blood") American Indians suggest that loss of land (or unrestricted ability to sell land) and its economic consequences may directly play an important role (given that "mixed blood" American Indians were more likely be deemed "competent," receive full title to their allotted land sooner – and in turn, have the ability to sell their allotted land sooner (Carlson 1981; Carlson 1983; Berthrong 1979; Bobroff 2001; Hacker and Haines 2005; Akee 2020; Dippel and Frye 2021)). Appendix Table A15 considers the role of individual and household characteristics measured in both the 1900 and 1910 population censuses.[40] Although not conclusive, this table also suggest that literacy, a possible proxy for cultural assimilation (Bleakley and Chin 2010; Fouka, Mazumder, and Tabellini 2021), could play some role as well.[41] We are unable to study the role of other

Allotment" with women's future age at allotment.

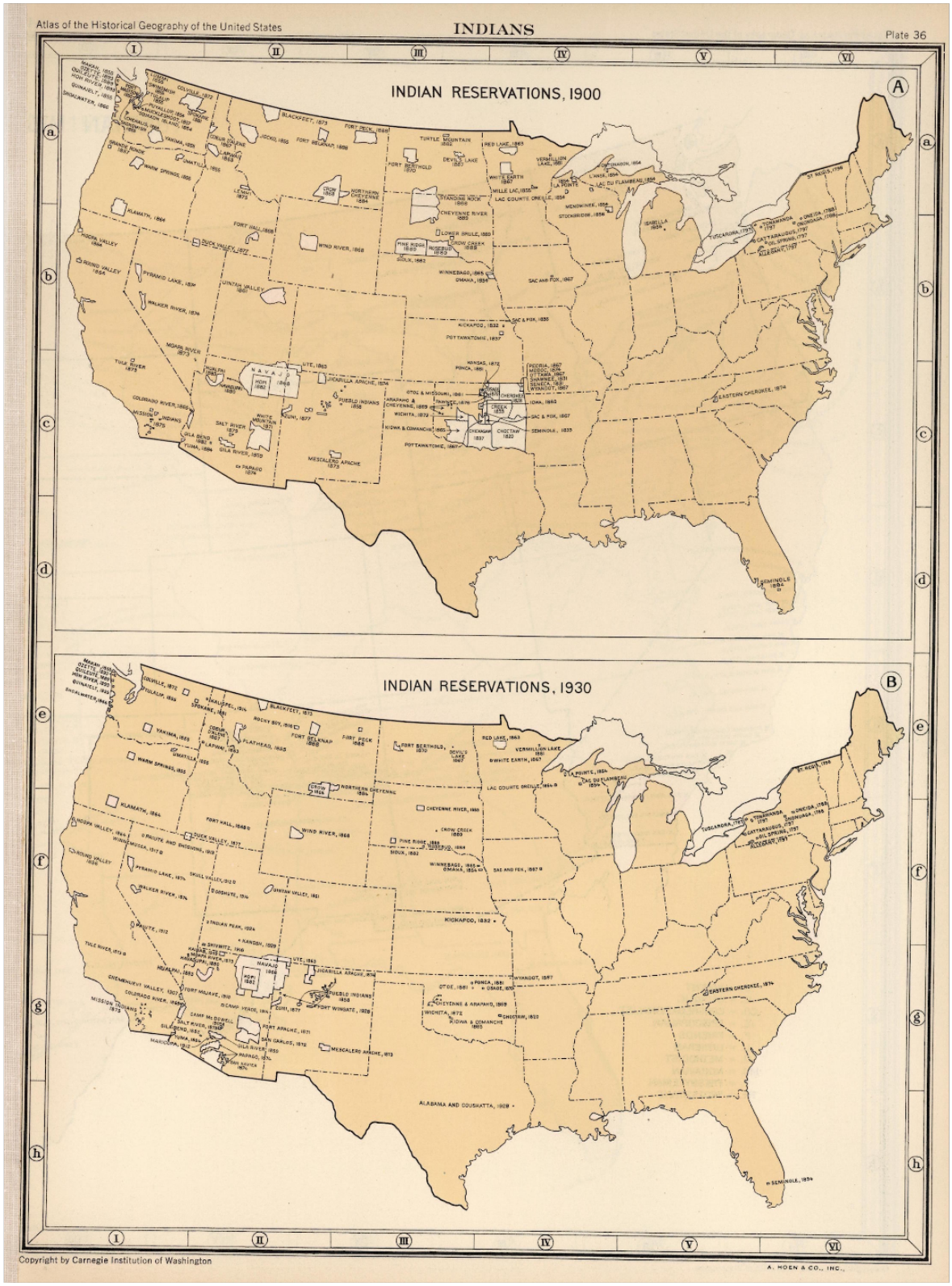
[40] This table reports results from re-estimating variants of Equations 3 and 4, controlling for each potential mechanism in a separate regression and also using each potential mechanism as a dependent variable.

[41] Maruthiah 2024 shows that American Indian children removed and sent to boarding schools experienced cultural assimilation (effects which reversed in the next generation), but few economic benefits.

potentially related factors directly, including changes in disease exposure and violence against American Indians associated with allotment.

Contemporary critics of the Dawes Act voiced urgent concern about its harms to American Indians, including to their health and survival. Although our analysis does not consider all dimensions of American Indian welfare, we provide new evidence that these concerns about health and survival were well-founded. Additional quantitative research examining the impact of U.S. policies on American Indian mortality over time is needed.

Figure 1: American Indian Reservation land in 1900 and 1930



Source: Charles O. Paullin (1932). *Atlas of the Historical Geography of the United States*. Ed. by John Wright. Carnegie Institution of Washington and The American Geographical Society of New York

Figure 2: Household-Level Allotment Timing

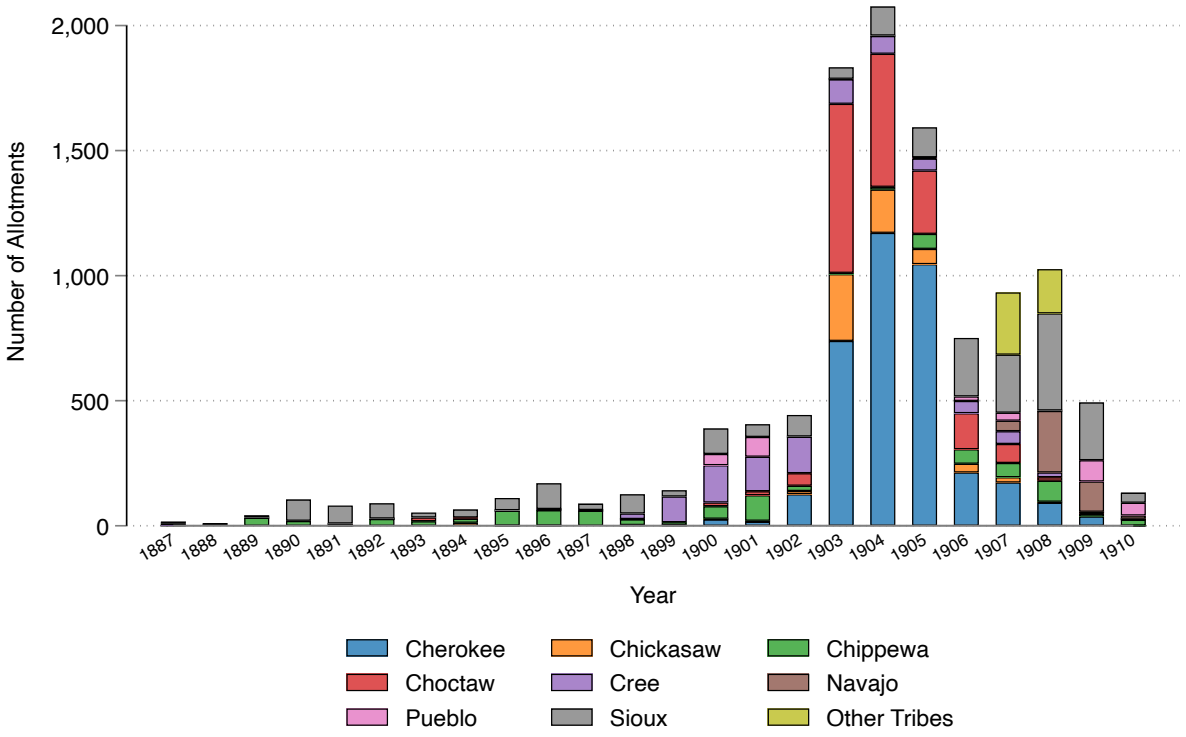


Figure 3: Child Mortality Ratio Estimates for Age-Specific Exposure to Allotment (Relative to Full Exposure), Conditional on Age

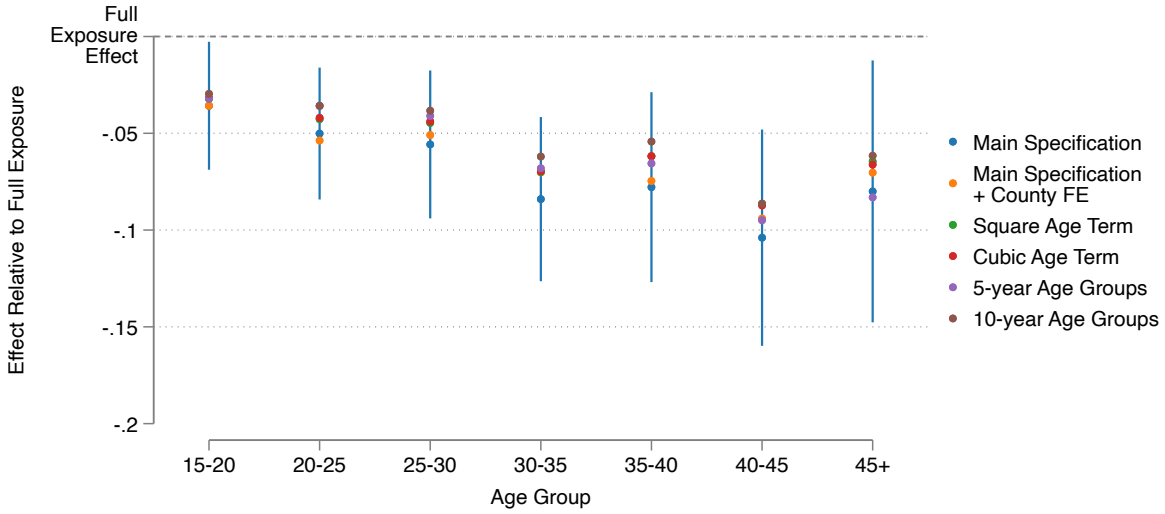
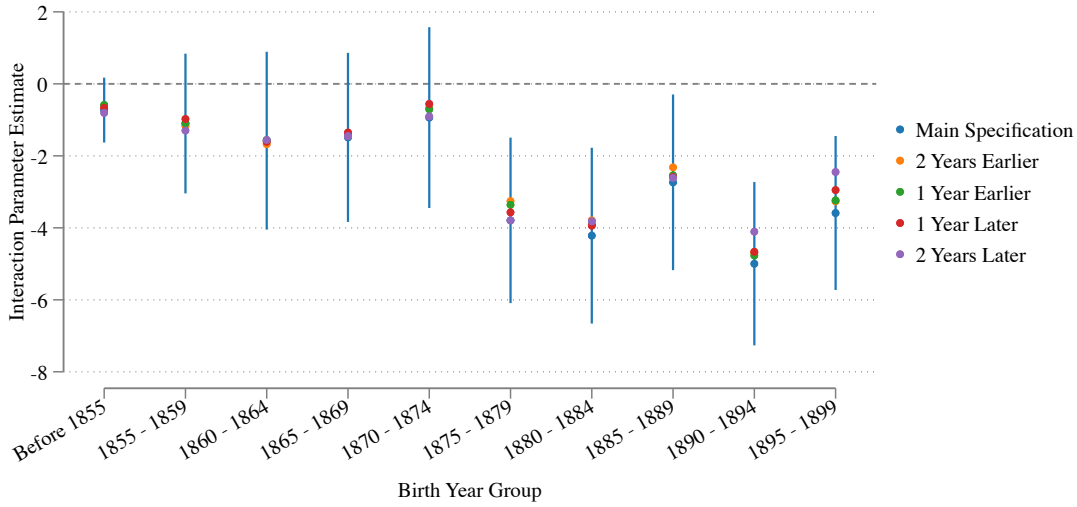


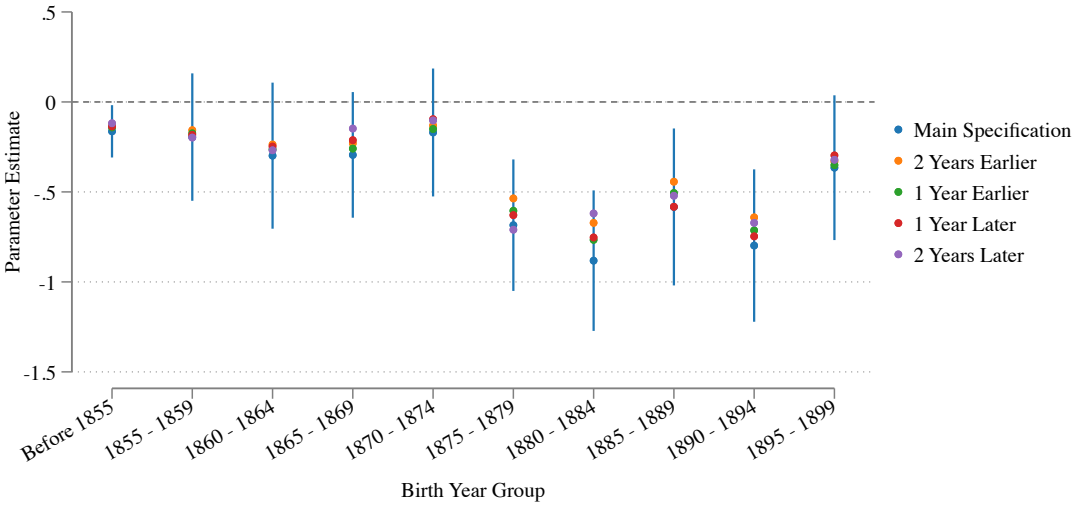
Figure 4: Cohort Size Estimates for Cohort-Specific Exposure to Allotment

(a) Interaction Model (Equation 3)



Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States and 1% sample (with a 20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Additionally, this sample omits all tribes allotted before 1900 and all individuals born after 1900. Figure shows estimates of π from Equation (3) with regressions stratified by 5-year age group. 95% confidence intervals for main specification are depicted. Main specification treats tribal allotment date as 4 years from the official allotment date, with sensitivity tests relative to this.

(b) Time under Allotment Model (Equation 4)



Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States and 1% sample (with a 20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Additionally, this sample omits all tribes allotted before 1900 and all individuals born after 1900. Figure shows estimates of ϕ from Equation (4) with regressions stratified by 5-year age group. 95% confidence intervals for main specification are depicted. Main specification treats tribal allotment date as 4 years from the official allotment date, with sensitivity tests relative to this.

Table 1: Summary Statistics

Panel A: Child Mortality Ratio Analysis (1910 Population Census)

	Mean	SD	Min	Max	Count
Age	40.64	16.40	13	90	9338
Age at Allotment	31.27	15.85	0	65	4229
Children Born	4.31	3.24	0	18	9338
Children Surviving	2.65	2.23	0	15	9338
Child Mortality Ratio	0.32	0.33	0	1	8492
Adjusted Household Size	3.12	2.57	1	48	9331
Speaks English	0.44	—	0	1	9338
Full-Blood	0.77	—	0	1	9338

Panel B: Cohort Size Analysis (1900 and 1910 Population Census)

	Mean	SD	Min	Max	Count
Birth Year	1867.51	21.63	1809	1899	5184
Allotment Date	1904.54	2.73	1902	1910	2062
Allotted Between 1900 and 1910	0.40	—	0	1	5184
Cohort Size	7.26	15.43	1	184	5184

Notes: Data come from a 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States, and a 1% sample (with a 20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Child mortality ratio is undefined for women without a child. Panel B restricts the sample to respondents born before 1900, who were not allotted before 1900. Age at Allotment is defined as year of allotment minus year of birth. Adjusted Household Size is defined as household size minus the number of own children in the household. Full-Blood is an indicator for whether or not an individual is listed as a "full blood" Indian in the Census (i.e., "BLOODI" was equal to 1000). All individuals not recorded as "full bloods" are labelled as "mixed bloods." For ease of comparison with historical documentation, we use the terms "full blood" and "mixed blood" as was common contemporaneously (e.g., United States Bureau of the Census 1915). Cohort sizes are calculated at the birth year-tribe-census level. The main specification treats tribal allotment date as 4 years from the official allotment date (see Figure 4 and Appendix Table A6 for robustness to alternative encodings). Time under allotment is defined as census year minus the year of allotment in Panel B (with all observations in 1900 defined as 0).

Table 2: The Child Mortality Ratio Impact of Exposure to Allotment (Relative to Full Exposure)

	(1) Full Sample	(2) "Full Blood"	(3) "Mixed Blood"
Age	0.00625***	0.00541***	0.00689***
	(0.00120)	(0.00148)	(0.00205)
Age at Allotment	-0.00338***	-0.00181	-0.00513**
	(0.00124)	(0.00155)	(0.00208)
Dep. Var. Mean	0.322	0.374	0.218
Observations	3855	2557	1254
R^2	0.2523	0.2387	0.2406

Notes: Heteroskedasticity-robust standard errors in parentheses. Table shows estimates of θ from Equation 2. Age at Allotment is determined using individual level allotment year data from a 1.4% sample (20% oversample of American Indians) of the 1910 census. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks, and includes only women reporting birth to at least one child. All models include a binary indicator for age at allotment greater than 45, number of children born, ability to speak English, as well as an adjusted household size variable in columns (2) and (3). Adjusted Household Size is the census's household size minus the number of own children in the household. All observations with missing household size or values greater than 100 are omitted from columns (2) and (3). "Full Blood" is an indicator for whether or not an individual is listed as a "full blood" Indian in the Census (i.e., "BLOODI" was equal to 1000). All individuals not recorded as "full bloods" are labelled as "mixed bloods." For ease of comparison with historical documentation, we use the terms "full blood" and "mixed blood" as was common contemporaneously (e.g., United States Bureau of the Census 1915).

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

Table 3: The Cohort Size Impact of Exposure to Allotment

Panel A: Interaction Model (Equation 3)			
	(1)	(2)	(3)
	Full Sample	"Full Blood"	"Mixed Blood"
$1(Year = 1910)$	0.453	0.676*	-0.162
	(0.350)	(0.398)	(0.234)
$1(Year = 1910) \times 1(Allotted)$	-3.032***	-1.432***	-2.333***
	(0.718)	(0.464)	(0.819)
Mean Cohort Size in 1900	9.18	6.73	6.03
Observations	3703	3184	1889
R^2	0.7314	0.7009	0.7148
Panel B: Time under Allotment Model (Equation 4)			
	(1)	(2)	(3)
	Full Sample	"Full Blood"	"Mixed Blood"
$1(Year = 1910)$	0.351	0.453	-0.133
	(0.319)	(0.348)	(0.216)
Time Under Allotment	-0.516***	-0.171**	-0.435**
	(0.149)	(0.067)	(0.169)
Mean Cohort Size in 1900	9.18	6.73	6.03
Observations	3703	3183	1889
R^2	0.7317	0.7006	0.7159

Notes: Heteroskedasticity-robust standard errors in parentheses. Table shows estimates of π from Equation 3 and ϕ from Equation 4. Data are from a 1.4% sample (20% oversample of American Indians) of the 1910 population census of the United States and a 1.2% sample (20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents that were already allotted by 1900 and "detached" Whites and Blacks, with observations at the birth year-tribe-census year level and including only cohorts born between 1855 and 1900. "Full Blood" is an indicator for whether or not an individual is listed as a "full blood" Indian in the Census (i.e., "BLOODI" was equal to 1000). All individuals not recorded as "full bloods" are labelled as "mixed bloods." For ease of comparison with historical documentation, we use the terms "full blood" and "mixed blood" as was common contemporaneously (e.g., United States Bureau of the Census 1915). The main specification treats tribal allotment date as 4 years from the official allotment date (see Figure 4 and Appendix Table A6 for robustness of these results to alternative encodings). Time Under Allotment is defined as census year minus the year of allotment, with all observations in 1900 defined as 0. Both Panel A and B include tribe and birth year fixed effects.

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

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Appendix

A.1 The Dawes Act

Passed on February 8, 1887, the General Allotment Act (also known as the Dawes Act, named after the author of the bill, Senator Henry Dawes) authorized the privatization of native tribal reservation land under the guise of "protection" for the American Indian population. As described in the text of the law below, allotment depended on whether or not land was "advantageous for agricultural and grazing purposes," not whether or not a tribe wanted to have their land allotted. As the Meriam Report of 1928 detailed, nearly 80% of allotments were not chosen by the recipient (Meriam et al. 1928).

When reservation land was allotted, the size of allotments varied. Heads of households received "one-quarter of a section"[1] (or 160 acres), with others receiving 40-80 acres, depending on their age and household status. Initially, wives did not receive the same allotments as their husbands, but an 1891 amendment changed this and also allowed allotments to be twice as large if the allotted land was only suitable for grazing (Carlson 1981).

Section 4 of the Dawes Act also offered a method by which members of an unallotted tribe could still receive allotments, although in practice this was rare (Meriam et al. 1928). Section 4 details that if an American Indian settled on unappropriated land, they were entitled to the title for the land if they applied to the local land branch of the General Land Office (now known as the Bureau of Land Management). In practice, lands allotted in this way were often less fertile or otherwise not conducive to agriculture, but it was nonetheless is an important (and often overlooked) aspect of the Dawes Act.

Section 5 of the Dawes Act granted the federal government the ability to purchase "surplus land" (i.e., land left over after allotments had finished) from tribes for the purpose of selling it to (mostly white) settlers. For many tribes, the size of reservations were orders of magnitude larger than their populations receiving allotments.[2] Along with sales and forfeiture of allotments, these "surplus land" sales were another significant way that American Indians lost reservation land under the Dawes Act.

The remainder of the Dawes Act authorized access to reservation land not allotted for the purposes of rights of way, irrigation, etc.

Original Text (including 1891 amendments) (Feb. 8, 1887, ch. 119, 24 Stat. 388, Feb. 28, 1891, ch. 383, §4, 26 Stat. 795)

"**An Act to provide for the allotment of lands in severalty to Indians on the various reservations, and to extend the protection of the laws of the United States and the Territories over the Indians, and for other purposes.**

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in all cases where any tribe or band of Indians has been, or shall here-

[1] A section is one square mile, or 640 acres. This is the base measurement unit within the Public Land Survey System (PLSS).

[2] Office of Indian Affairs estimates around 1887 put the national population of American Indians around a quarter of a million, while they controlled 138 million acres of reservation land, roughly 552 acres per American Indian (United States Bureau of the Census 1915; Land Planning Committee 1935).

after be, located upon any reservation created for their use, either by treaty stipulation or by virtue of an act of Congress or executive order setting apart the same for their use, the President of the United States be, and he hereby is, authorized, whenever in his opinion any reservation or any part thereof of such Indians is advantageous for agricultural and grazing purposes, to cause said reservation, or any part thereof, to be surveyed, or resurveyed if necessary, and to allot the lands in said reservation in severalty to any Indian located thereon in quantities as follows:

To each head of a family, one-quarter of a section;
To each single person over eighteen years of age, one-eighth of a section;
To each orphan child under eighteen years of age, one-eighth of a section; and
To each other single person under eighteen years now living, or who may be born prior to the date of the order of the President directing an allotment of the lands embraced in any reservation, one-sixteenth of a section:

Provided, That in case there is not sufficient land in any of said reservations to allot lands to each individual of the classes above named in quantities as above provided, the lands embraced in such reservation or reservations shall be allotted to each individual of each of said classes pro rata in accordance with the provisions of this act: And provided further, That where the treaty or act of Congress setting apart such reservation provides the allotment of lands in severalty in quantities in excess of those herein provided, the President, in making allotments upon such reservation, shall allot the lands to each individual Indian belonging thereon in quantity as specified in such treaty or act: And provided further, That when the lands allotted are only valuable for grazing purposes, an additional allotment of such grazing lands, in quantities as above provided, shall be made to each individual.

Sec. 2. That all allotments set apart under the provisions of this act shall be selected by the Indians, heads of families selecting for their minor children, and the agents shall select for each orphan child, and in such manner as to embrace the improvements of the Indians making the selection. where the improvements of two or more Indians have been made on the same legal subdivision of land, unless they shall otherwise agree, a provisional line may be run dividing said lands between them, and the amount to which each is entitled shall be equalized in the assignment of the remainder of the land to which they are entitled under his act: Provided, That if any one entitled to an allotment shall fail to make a selection within four years after the President shall direct that allotments may be made on a particular reservation, the Secretary of the Interior may direct the agent of such tribe or band, if such there be, and if there be no agent, then a special agent appointed for that purpose, to make a selection for such Indian, which selection shall be allotted as in cases where selections are made by the Indians, and patents shall issue in like manner.

Sec. 3. That the allotments provided for in this act shall be made by special agents appointed by the President for such purpose, and the agents in charge of the respective reservations on which the allotments are directed to be made, under such rules and regulations as the Secretary of the Interior may from time to time prescribe, and shall be certified by such agents to the Commissioner of Indian Affairs, in duplicate, one copy to be retained in the Indian Office and the other to be transmitted to the Secretary of the Interior for his action, and to be deposited in the General Land Office.

Sec. 4. That where any Indian not residing upon a reservation, or for whose tribe no reservation has been provided by treaty, act of Congress, or executive order, shall make settlement upon any

surveyed or unsurveyed lands of the United States not otherwise appropriated, he or she shall be entitled, upon application to the local land-office for the district in which the lands arc located, to have the same allotted to him or her, and to his or her children, in quantities and manner as provided in this act for Indians residing upon reservations; and when such settlement is made upon unsurveyed lands, the grant to such Indians shall be adjusted upon the survey of the lands so as to conform thereto; and patents shall be issued to them for such lands in the manner and with the restrictions as herein provided. And the fees to which the officers of such local land-office would have been entitled had such lands been entered under the general laws for the disposition of the public lands shall be paid to them, from any moneys in the Treasury of the United States not otherwise appropriated, upon a statement of an account in their behalf for such fees by the Commissioner of the General Land Office, and a certification of such account to the Secretary of the Treasury by the Secretary of the Interior.

Sec. 5. That upon the approval of the allotments provided for in this act by the Secretary of the Interior, he shall cause patents to issue therefor in the name of the allottees, which patents shall be of the legal effect, and declare that the United States does and will hold the land thus allotted, for the period of twenty-five years, in trust for the sole use and benefit of the Indian to whom such allotment shall have been made, or, in case of his decease, of his heirs according to the laws of the State or Territory where such land is located, and that at the expiration of said period the United States will convey the same by patent to said Indian, or his heirs as aforesaid, in fee, discharged of said trust and free of all charge or incumbrance whatsoever: Provided, That the President of the United States may in any case in his discretion extend the period. And if any conveyance shall be made of the lands set apart and allotted as herein provided, or any contract made touching the same, before the expiration of the time above mentioned, such conveyance or contract shall be absolutely null and void: Provided, That the law of descent and partition in force in the State or Territory where such lands are situate shall apply thereto after patents therefor have been executed and delivered, except as herein otherwise provided; and the laws of the State of Kansas regulating the descent and partition of real estate shall, so far as practicable, apply to all lands in the Indian Territory which may be allotted in severalty under the provisions of this act: And provided further, That at any time after lands have been allotted to all the Indians of any tribe as herein provided, or sooner if in the opinion of the President it shall be for the best interests of said tribe, it shall be lawful for the Secretary of the Interior to negotiate with such Indian tribe for the purchase and release by said tribe, in conformity with the treaty or statute under which such reservation is held, of such portions of its reservation not allotted as such tribe shall, from time to time, consent to sell, on such terms and conditions as shall be considered just and equitable between the United States and said tribe of Indians, which purchase shall not be complete until ratified by Congress, and the form and manner of executing such release prescribed by Congress: Provided however, That all lands adapted to agriculture, with or without irrigation so sold or released to the United States by any Indian tribe shall be held by the United States for the sale purpose of securing homes to actual settlers and shall be disposed of by the United States to actual and bona fide settlers only tracts not exceding one hundred and sixty acres to any one person, on such terms as Congress shall prescribe, subject to grants which Congress may make in aid of education: And provided further, That no patents shall issue therefor except to the person so taking the same as and homestead, or his heirs, and after the expiration of five years occupancy thereof as such homestead; and any conveyance of said lands taken as a homestead, or any contract touching the same, or lieu thereon, created prior to the date of such patent, shall be null and void. And the sums agreed to be paid by the United States

as purchase money for any portion of any such reservation shall be held in the Treasury of the United States for the sole use of the tribe or tribes Indians; to whom such reservations belonged; and the same, with interest thereon at three per cent per annum, shall be at all times subject to appropriation by Congress for the education and civilization of such tribe or tribes of Indians or the members thereof. The patents aforesaid shall be recorded in the General Land Office, and afterward delivered, free of charge, to the allottee entitled thereto. And if any religious society or other organization is now occupying any of the public lands to which this act is applicable, for religious or educational work among the Indians, the Secretary of the Interior is hereby authorized to confirm such occupation to such society or organization, in quantity not exceeding one hundred and sixty acres in any one tract, so long as the same shall be so occupied, on such terms as he shall deem just; but nothing herein contained shall change or alter any claim of such society for religious or educational purposes heretofore granted by law. And hereafter in the employment of Indian police, or any other employees in the public service among any of the Indian tribes or bands affected by this act, and where Indians can perform the duties required, those Indians who have availed themselves of the provisions of this act and become citizens of the United States shall be preferred.

Sec. 6. That upon the completion of said allotments and the patenting of the lands to said allottees, each and every member of the respective bands or tribes of Indians to whom allotments have been made shall have the benefit of and be subject to the laws, both civil and criminal, of the State or Territory in which they may reside; and no Territory shall pass or enforce any law denying any such Indian within its jurisdiction the equal protection of the law. And every Indian born within the territorial limits of the United States to whom allotments shall have been made under the provisions of this act, or under any law or treaty, and every Indian born within the territorial limits of the United States who has voluntarily taken up, within said limits, his residence separate and apart from any tribe of Indians therein, and has adopted the habits of civilized life, is hereby declared to be a citizen of the United States, and is entitled to all the rights, privileges, and immunities of such citizens, whether said Indian has been or not, by birth or otherwise, a member of any tribe of Indians within the territorial limits of the United States without in any manner affecting the right of any such Indian to tribal or other property.

Sec. 7. That in cases where the use of water for irrigation is necessary to render the lands within any Indian reservation available for agricultural purposes, the Secretary of the Interior be, and he is hereby, authorized to prescribe such rules and regulations as he may deem necessary to secure a just and equal distribution thereof among the Indians residing upon any such reservation; and no other appropriation or grant of water by any riparian proprietor shall permitted to the damage of any other riparian proprietor.

Sec. 8. That the provisions of this act shall not extend to the territory occupied by the Cherokees, Creeks, Choctaws, Chickasaws, Seminoles, and Osage, Miamies and Peorias, and Sacs and Foxes, in the Indian Territory, nor to any of the reservations of the Seneca Nation of New York Indians in the State of New York, nor to that strip of territory in the State of Nebraska adjoining the Sioux Nation on the south added by executive order.

Sec. 9. That for the purpose of making the surveys and resurveys mentioned in section two of this act, there be, and hereby is, appropriated, out of any moneys in the Treasury not otherwise appropriated, the sum of one hundred thousand dollars, to be repaid proportionately out of the proceeds of the sales of such land as may be acquired from the Indians under the provisions of this act.

Sec. 10. That nothing in this act contained shall be so construed to affect the right and power of Congress to grant the right of way through any lands granted to an Indian, or a tribe of Indians, for railroads or other highways, or telegraph lines, for the public use, or condemn such lands to public uses, upon making just compensation.

Sec. 11. That nothing in this act shall be so construed as to prevent the removal of the Southern Ute Indians from their present reservation in Southwestern Colorado to a new reservation by and with consent of a majority of the adult male members of said tribe."

A.2 Investigating Differential Migration between 1900 and 1910 to Areas Not Covered by the 1910 "Indian Schedule"

In principle, all American Indians were enumerated in the 1900 and 1910 censuses. However, the "Indian Schedule" in 1910 was administered to American Indians either living on reservations or residing in counties in which the number of American Indians enumerated in 1900 was 20 or more. The "Indian Schedule" sample is necessary for our analyses because, unlike other census schedules, it measured the year in which respondents received their allotment (if applicable) as well as respondents' tribe. As discussed in the paper, a concern in interpreting changes in cohort size between 1900 and 1910 measured using the "Indian Schedule" to reflect mortality is that American Indians allotted between 1900 and 1910 may have disproportionately moved off of reservations and to counties which had fewer than 20 American Indians in 1900 (and hence did not die, but rather may have been alive but were simply not captured by the 1910 "Indian Schedule"). We note that historians generally argue that American Indian migration from reservations to urban areas was uncommon before World War II (Shoemaker, 1991). Scholars studying this issue quantitatively report that by 1910, only 4.5% of American Indians had moved to cities, for example (Thornton, 2001).

To the extent possible, we investigate this issue further here. In doing so, we first discuss the data available to to do so, and we then present analyses which probe it further .

Data

Excluding Native Alaskans and the those surveyed using other Special Schedules (the Hawaiian Schedule and oversamples of selected counties), the American Indian population is measured in the 1900 and 1910 population censuses by two different schedules: the "General Schedule" (henceforth "GS") and the "Indian Schedule" (henceforth "IS"). Enumerated American Indians completed either the GS or the IS, but not both, although the IS includes all variables measured through the GS (plus additional ones). The IPUMS GS samples are 1% samples of the entire GS, and the IPUMS IS samples are 20% samples of the entire IS. To count the entire American Indian population in a given census year, the GS and IS samples must be combined, and in consultation with IPUMS staff, there appear to be two ways to do so (with neither being unambiguously preferred to the other). These correspond to the two census samples available for download on the IPUMS website, namely the the "1% sample with oversamples" and the "1% sample without oversamples".

The first approach uses the 1% GS sample with the 20% IS sample (the "1% sample with oversamples"). This approach uses IPUMS weights for the GS sample (with an average around 70,

but ranging from 4 to 125) and for the IS sample (which are either 5 or 5.2), and then combines them. Using this combined sample to recalculate "Indian Schedule" coverage rates in 1900 and 1910 (excluding Native Alaskans, Hawaiians, and individuals present in the IS but with recorded races other than American Indian), we find that in 1900, the combined GS and IS totals 232,168 individuals, with 218,635 individuals included in the IS (a coverage rate of 93.7%). In 1910, we find that the combined GS and IS totals 258,651 individuals, with 247,099 individuals included in the IS (a coverage rate of 95.5%). In other words, using the "1% sample with oversamples," the "Indian Schedule" coverage rate actually rises modestly, by 1.8 percentage points, between 1900 and 1910.[3]

The second approach uses the 1% GS sample with a 5% sample of the 20% IS sample (the "1% sample without oversamples"). Because this approach already creates near equally-weighted GS and IS observations by randomly selecting only 5% of the 20% IS sample, it then inflates both GS and IS observations by a factor of 100 (with the exception that some IS observations are inflated by a factor of 101). Also using this combined sample to recalculate "Indian Schedule" coverage rates in 1900 and 1910 (again excluding Native Alaskans, Hawaiians, and individuals present in the IS but with recorded races other than American Indian), we find that in 1900, the combined GS and IS totals 230,306 individuals, with 216,444 individuals included in the IS (a coverage rate of 94.0%). In 1910, we find that the combined GS and IS totals 262,355 individuals, with 242,389 individuals included in the IS (a coverage rate of 92.4%). In summary, in this "1% sample without oversamples," the "Indian Schedule" coverage rate declines modestly, by 1.6 percentage points, between 1900 and 1910.[4]

In consultation with IPUMS staff, because we agree that neither the "1% sample with oversamples" nor the "1% sample without oversamples" is unambiguously preferred to the other, we conducted the additional analyses requested by the Editor using both of these samples in parallel.

Analysis

We then use the two samples described above (the "1% sample with oversamples" and the "1% sample without oversamples") to investigate the possibility that American Indians allotted between 1900 and 1910 disproportionately moved off of reservations and to counties which had fewer than 20 American Indians in 1900 (counties in which the "Indian Schedule" was not administered), leading us to mistakenly interpret migration to these counties as mortality.

Specifically, we explore this concern in two ways (noting that because the GS did not record allotment status or tribe, we cannot do so definitively). First, noting that Figure 4 shows reductions in American Indian cohort sizes associated with allotment among those born between 1875 and 1899, we test if there are disproportionate changes in the share of American Indians completing the "Indian Schedule" between 1900 and 1910 among the 1875-1899 birth cohort groups ("Test 1"). Second, we test if there are disproportionate changes in the share of American Indians completing the "Indian Schedule" between 1900 and 1910 in states with greater allotment intensity (intensity

[3]Including individuals recorded in the IS but not classified explicitly by census enumerators as American Indians, the IS coverage rate in 1900 is 228,255/241,758=94.4%, and the IS coverage rate in 1910 is 258,861/270,413=95.7%, an increase in the coverage rate of 1.3 percentage points.

[4]Including individuals recorded in the IS but not classified explicitly by census enumerators as American Indians, the IS coverage rate in 1900 is 225,672/239,534=94.2%, and the IS coverage rate in 1910 is 254,116/274,082=92.7%, a decline in the coverage rate of 1.5 percentage points.

measured as described below), including such changes specifically among the 1875-1899 birth cohorts ("Test 2").

Test 1

The objective of Test 1 is to test if the share of American Indians not covered by the "Indian Schedule" changed differentially between 1900 and 1910 among the 1875-1894 birth cohorts.

Specifically, we estimate:

$$\begin{aligned} Y_{jys} = \alpha + \lambda 1_y(Year = 1910) + \sum_j \beta_j Birth\_Cohort\_Group_j \\ + \sum_j \pi_j 1_y(Year = 1910) \times Birth\_Cohort\_Group_j + \epsilon_{jy} \end{aligned} \tag{1}$$

Y_{jys} is an outcome measuring the share of American Indians covered by the "Indian Schedule" (described below) for birth cohort j (where $j \in \{< 1860, 1860\text{-}1864, ..., 1895\text{-}1899\}$) in state s and observed in census year y, $1_y(Year = 1910)$ is an indicator for being observed in the 1910 census, and $Birth\_Cohort\_Group_j$ are birth cohort fixed effects. π_j are the coefficients of interest, capturing changes in the share of American Indians not covered by the "Indian Schedule" between 1900 and 1910 for each birth cohort group.

We estimate Equation (1) using the following dependent variable:

$$Y = \frac{IS}{GS + IS} \times 100$$

where GS is the reweighted "General Schedule" American Indian cohort size and IS is the reweighted "Indian Schedule" American Indian cohort size. This variable represents the share of American Indians covered by the "Indian Schedule."

Test 2

The objective of Test 2 is to test if the share of American Indians outside of the "Indian Schedule" changed differentially between 1900 and 1910 in a way that is correlated with state-level intensity of allotment by 1910. Although our cohort size estimation framework in the paper enables us to estimate cohort size effects separately for five-year birth cohort groups, we cannot do so with Test 2. Specifically, the test lacks sufficient degrees of freedom to condition on state fixed effects, which are a necessary part of the analysis. We therefore instead pool our observations (which are at the level of five-year birth cohort group by census year), creating a full sample of all birth cohort groups, and we also create a second sample of birth cohort groups restricted to those born in years 1875-1899. Using both the full and restricted samples, we then estimate an average change in the "Indian Schedule" coverage rate across birth cohort groups (a framework within which we can condition on state fixed effects).

Specifically, we estimate:

$$\begin{aligned} Y_{jys} = \alpha + \lambda 1_y(Year = 1910) + \sum_j \beta_j Birth\_Cohort\_Group_j + \sum_s \kappa_s State_s \\ + \phi 1_y(Year = 1910) \times Allotment\_Intensity_s + \epsilon_{jys} \end{aligned} \tag{2}$$

Y_{jys} is again an outcome for birth cohort j (where $j \in \{<$ 1860, 1860-1864, ..., 1895-1899$\}$) in state s and observed in census year y, $1_y(Year = 1910)$ is an indicator for being observed in the 1910 census, $Birth\_Cohort\_Group_j$ are birth cohort fixed effects, and $State_s$ are state fixed effects. $Allotment\_Intensity_s$ is a state-level measure of allotment intensity by 1910 that we compute in three different ways (explained below), and ϕ is the coefficient of interest, capturing changes in the share of American Indians outside of the "Indian Schedule" between 1900 and 1910 that are correlated with state-level allotment intensity by 1910.

We construct three different measures of state-level allotment intensity, and we conduct Test 2 using all three. The first two are ratios of the number of American Indians allotted in a state by 1910 to the total American Indian population in that state. For the population denominator, we use the total American Indian population in a state in 1900 (because the 1910 American Indian population is potentially endogenously determined in the context of this exercise), but we also use the 1910 American Indian population in a state as well (yielding two separate measures):

$$Share\_1900 = \frac{\text{Reweighted number of allotted American Indians in a state in 1910}}{\text{Reweighted number of all American Indians in a state in 1900}}$$

$$Share\_1910 = \frac{\text{Reweighted number of allotted American Indians in a state in 1910}}{\text{Reweighted number of all American Indians in a state in 1910}}$$

For our third measure, we construct a weighted average of time under allotment for different tribes. As in our cohort size analysis, we restrict our sample to tribes allotted between 1900 and 1910. Then, we calculate the the number of years between allotment of each tribe tribe (based on the Land Planning Committee 1935 report) and 1910. Finally, we compute a weighted average, using the state-level shares of these tribes in 1900.

$$Weighted\_Time = \sum_{i=1}^{n} (Share_{i,1900} \times Time\_Since\_Allotment_i)$$

We conduct these analyses using the same dependent variable used in Test 1.

Results

Table A12 presents results from Test 1 (estimates of π from Equation (1)), and Table A13 shows results from Test 2 (estimates of ϕ from Equation (2)).

Table A12 shows that Test 1 does not yield any statistically significant cohort group size estimates. However, even though they are insignificant, the birth cohort group size estimates do generally become more negative among later birth cohorts. If more negative estimates for later birth cohort groups did in fact reflect a meaningful decline in the "Indian Schedule" coverage rate that is simply undetected, this would not necessarily imply that our cohort size analyses reflect differential migration between 1900 and 1910 by allotted American Indians – but rather, that younger American Indians were generally more likely to move to areas not captured by the 1910 "Indian Schedule" than older American Indians, regardless of allotment status. It would, however, be consistent with the concern.

Test 2 then directly examines the possibility of differential migration related to state-level allotment intensity. Table A13 presents these results, showing *positive* estimates (estimates which are

statistically significant in Panels A and B, but not Panel C) both in the full sample of all birth cohort groups (Columns 1 and 2) and also in the sample restricted to birth cohorts 1875-1899 (Columns 3 and 4). These results suggest that, if anything, coverage of the "Indian Schedule" actually *increased* in relative terms in states with more allotment by 1910, including among those born in years 1875-1899 – a result inconsistent with the concern that our cohort group size estimates reflect differential migration rather than mortality.

Taken together, these results provide little clear evidence that American Indians allotted between 1900 and 1910 disproportionately moved off of reservations and to counties which had fewer than 20 American Indians in 1900. Nonetheless, given that some of the estimates are imprecise and that neither test is definitive, we consider our cohort size analyses as secondary to our child mortality ratio analyses given the additional assumptions that the cohort size analyses require.

A.3 Allotment Timeline

1887 – Dawes Act is passed, authorizing allotment (Feb. 8, 1887, ch. 119, 24 Stat. 388)

1891 – Major amendments made to the Dawes Act (Feb. 28, 1891, ch. 383, §4, 26 Stat. 795). These include, but are not limited to:

- Wives received equal sized allotments
- If an American Indian was deemed "unable to personally benefit from the cultivation of their allotted land" they were allowed to lease it
- Allotment sizes standardized as 1/8th of a section (or 80 acres)

1898 – Curtis Act is passed. This officially ended self-governance of the "Five Civilized Tribes" (Cherokee, Choctaw, Chickasaw, Creek, and Seminole) and created the Dawes Commission to determine the tribal membership of individuals and allot land accordingly (June 28, 1898, ch. 517, 30 Stat. 502 1898)

1901 – Starting in 1901, rations could be withheld for cohabitating couples who did not obtain marriage licenses (Biolsi 1995)

1902 – Secretary of the Interior granted authority to permit heirs to sell their allotted lands rather than portioning (i.e., subdividing) them (May 27, 1902, ch. 888, §7, 32 Stat. 275)

1906 – Burke Act is passed. This removed the 25-year period for which allotments were held in trust by the federal government. Under the Act, if the Secretary of the Interior judged an allottee to be "competent and capable of managing his or her affairs," they would be granted full title to their allotment. The Act also granted American citizenship to all American Indians with allotments, making them subject to the laws of the states in which they resided (May 8, 1906, ch. 2348, 34 Stat. 182)

1907 – American Indians with allotments officially given the legal right to sell allotted land. Prior

to 1907, most alienation of land was due to failure to pay taxes on land when title was received. This extension also applied to "non-competent" American Indians (Mar. 1, 1907, ch. 2285, 34 Stat. 1018)

1910 – Amendments made to the determination of heirs, sale of allotments, and others (June 25, 1910, ch. 431, §1, 36 Stat. 855)

1928 – "The Problem of Indian Administration," also known as the Meriam Report, published by the Institute for Government Research (later known as the Brookings Institution). The report, commissioned by the Secretary of the Interior, details the failings of the United States government in their goal of protecting American Indians (Meriam et al. 1928)

1934 – President Franklin D. Roosevelt signs the Indian Reorganization Act (also known as the Wheeler-Howard Act, or the Indian New Deal). The act ended allotment and allowed tribes to reorganize governments and regain sovereignty. However, it did not restore lands previously allotted and subsequently sold, leaving many restored reservations a checkerboard, with interspersed private ownership as enclaves within communally owned land (June 18, 1934, ch. 576, 48 Stat. 984)

Reservation-Level Allotment Process

1. The President of the United States declares a reservation suitable for allotment, designating a special agent to survey the reservation for the purpose of delineating parcels of land to be allotted

2. Land surveys done (typically 1-3 years)

3. Allotment begins, and individuals to receive allotments have 4 years to choose their allotments. For individuals not choosing an allotment within these 4 years, the Secretary of the Interior then assigns them an allotment

4. Land title for new allotments is held in trust by the federal government for 25 years. American Indians deemed "competent" can receive full title to their allotments earlier.[5]

Although these steps were commonly followed, there were also exceptions. Individuals could be members of multiple tribes, and could therefore receive allotments earlier than other tribe members. Individuals could also receive allotments under Section 4 of the Dawes Act (see Section A1 above), allowing them to receive allotments before the official start of their tribe's allotment. Finally, some tribes (e.g., the Chippewa and Iroquois) had prior treaties that guaranteed allotments of land, which the Dawes Act did not supersede.

[5]Dippel and Frye (2021) suggest that households may have signaled assimilation to convey "competency." To the best of our knowledge, there were no formal guidelines for determining "competency" associated with the Burke Act of 1906.

A.4 Loss of American Indian Land under the Dawes Act

Under the Dawes Act, tribal land declined from 138 million acres in 1887 to nearly 52 million acres in 1934. Among the 213 reservations that existed in 1934, 118 of them had been allotted. The Report of the Land Planning Committee (1935) details the mechanisms by which American Indian land was alienated:

1. Roughly 38 million acres were "surplus" land sold by the government to (mostly white) settlers[6]
2. Roughly 22 million acres were "surplus" land that were opened to settlement by (mostly white) settlers. This mechanism differed from (1) as the federal government never purchased this land, but instead remunerated the tribes when homesteads began.
3. Roughly 23 million acres were alienated by sales of land by (or for) allotted individuals
4. Roughly 4 million acres were alienated by sales of heirship lands[7]

A.5 Converting Cohort Size Results to Life Expectancies

To facilitate interpretation of our cohort size estimates, we also use them to compute the decrement in life expectancy at birth that they imply. We do so using the framework developed in Preston and Bennett (1983). This method allows for life table parameters to be generated using two (cross-sectional) censuses in the absence of accompanying mortality data, assumptions about population stability, or information about survival of kin. Assuming a closed population (international migration among American Indians was rare during the early 20th century (Carlson 1983)), we can project the 1900 and 1910 censuses to a single stationary population that is representative of the intercensal range.[8] Preston and Bennett (1983) observe that these life tables are equivalent to a weighted average of all prevailing period life tables between 1900 and 1910. For empirical implementation, we use the Stata command *ilt* (Muniz 2023).

A limitation of the Preston-Bennett method is that it requires external birth data to generate a proper radix of the life table (Preston and Bennett 1983). Because we are unsure of the quality of American Indian birth data reported in the Annual Report of the Commissioner of Indian Affairs (many reports explicitly state the values are "rough estimates only partially reported," for example Commissioner of Indian Affairs (1900)), we instead use Coale-Demeny model life tables

[6] According to the report, tribal members were often remunerated at $1.25 an acre. However, according to Figure A1, an advertisement for "Indian Land for Sale," the US government was selling this land for $10-$41 per acre.

[7] Much of these sales were due to heirship laws that led to increasingly smaller plots over time. As one representative example from the Report of the Land Planning Committee (1935) shows, 37 years after the death of the original allottee, heirs held plots of land ranging from 0.11 acres to 8.88 acres. Importantly, this does not include land that was forfeited due to failure to pay taxes after the land title was received, which was yet another way lands could leave American Indian hands.

[8] Exploratory analyses led us to conclude that the Navajo may have been substantially undercounted in 1900. Johansson and Preston (1978) suggest distrust of enumerators among the Navajo during the 1900 census. We therefore exclude the Navajo from our life table computations (and we have confirmed that our other results in the paper are generally robust to the exclusion of the Navajo).

(specifically, the Model West system) to project our life expectancy back to birth (from ages 5 and above).

The specific steps of our approach are as follows:

1. Using the Preston-Bennett method, generate life expectancies for 5-year age groups (importantly, not including age group 0-4 and and excluding respondents above age 90)

2. Using these results, determine the corresponding life expectancy at birth using the Model West life table system.

   (a) Coale-Demeny model life tables are separated by sex, but because our primary cohort size estimates are for both sexes together, we average the implied life expectancies at birth for male and female life tables.

   (b) If a life expectancy for age x using the Preston-Bennett method is between two levels of the model life table, we use linear interpolation to obtain a value for life expectancy at birth.

   (c) We compute these implied life expectancies at birth for all age groups under age 60 for both sexes and then average them together to generate implied life expectancy at birth for the intercensal life table. This follows best practices as stated by the United Nations (1983).

To estimate the implied decrement in life expectancy at birth under allotment, we use estimates from Equation (3) to remove these effects from our observed age distributions of allotted tribes, treating all insignificant estimates as zero. These model-adjusted age distributions are then used with the method described above to generate model-adjusted implied life expectancy at birth for allotted tribes without the effect of allotment. The difference between life tables for allotted tribes, with and without allotment, then yields the decrement in life expectancy at birth implied by our cohort size estimates.

Figure A1: United States Department of the Interior advertisement offering "Indian Land for Sale."

INDIAN LAND FOR SALE

GET A HOME
OF
YOUR OWN

❊

EASY PAYMENTS

PERFECT TITLE

❊

POSSESSION
WITHIN
THIRTY DAYS

FINE LANDS IN THE WEST

IRRIGATED
IRRIGABLE

GRAZING

AGRICULTURAL
DRY FARMING

IN 1910 THE DEPARTMENT OF THE INTERIOR SOLD UNDER SEALED BIDS ALLOTTED INDIAN LAND AS FOLLOWS:

Location.	Acres.	Average Price per Acre.	Location.	Acres.	Average Price per Acre.
Colorado	5,211.21	$7.27	Oklahoma	34,664.00	$19.14
Idaho	17,013.00	24.85	Oregon	1,020.00	15.43
Kansas	1,684.50	33.45	South Dakota	120,445.00	16.53
Montana	11,034.00	9.86	Washington	4,879.00	41.37
Nebraska	5,641.00	36.65	Wisconsin	1,069.00	17.00
North Dakota	22,610.70	9.93	Wyoming	865.00	20.64

FOR THE YEAR 1911 IT IS ESTIMATED THAT **350,000** ACRES WILL BE OFFERED FOR SALE

For information as to the character of the land write for booklet, "INDIAN LANDS FOR SALE," to the Superintendent U. S. Indian School at any one of the following places:

CALIFORNIA:
Hoopa.
COLORADO:
Ignacio.
IDAHO:
Lapwai.
KANSAS:
Horton.
Nadeau.

MINNESOTA:
Onigum.
MONTANA:
Crow Agency.
NEBRASKA:
Macy.
Santee.
Winnebago.

NORTH DAKOTA:
Fort Totten.
Fort Yates.
OKLAHOMA:
Anadarko.
Cantonment.
Colony.
Darlington.
Muskogee,
Pawnee.

OKLAHOMA—Con.
Sac and Fox Agency.
Shawnee.
Wyandotte.
OREGON:
Klamath Agency.
Pendleton.
Roseburg.
Siletz.

SOUTH DAKOTA:
Cheyenne Agency.
Crow Creek.
Greenwood.
Lower Brule.
Pine Ridge.
Rosebud.
Sisseton.

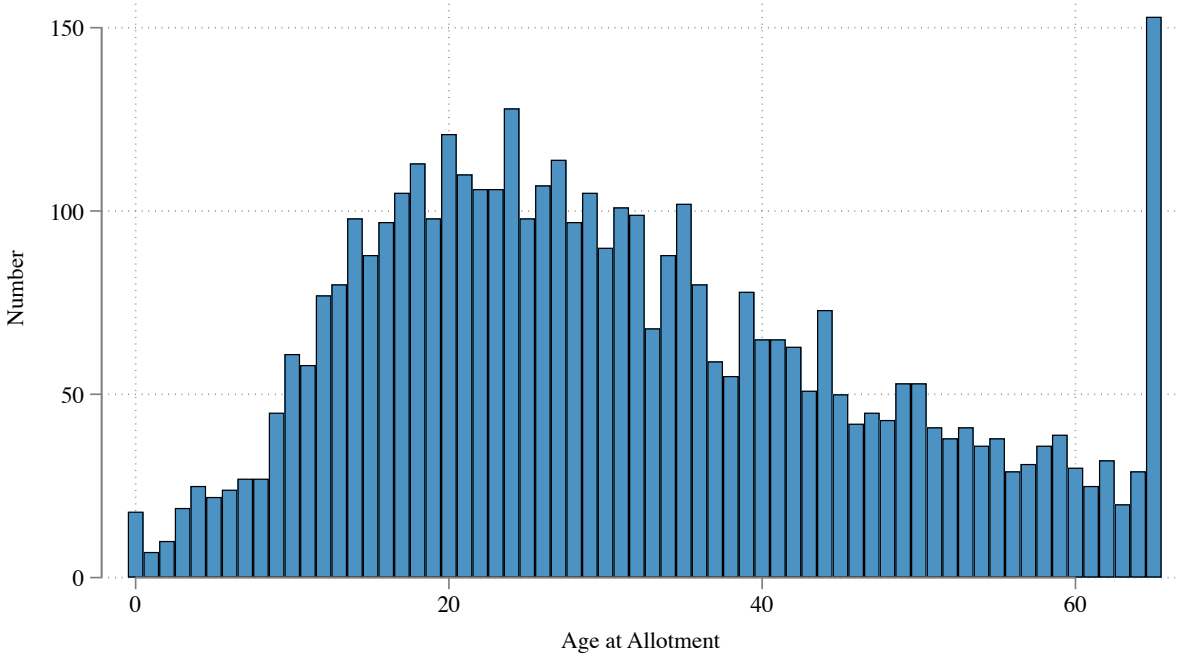
WASHINGTON:
Fort Simcoe.
Fort Spokane.
Tekoa.
Tulalip.
WISCONSIN:
Oneida.

WALTER L. FISHER,
Secretary of the Interior.

ROBERT G. VALENTINE,
Commissioner of Indian Affairs.

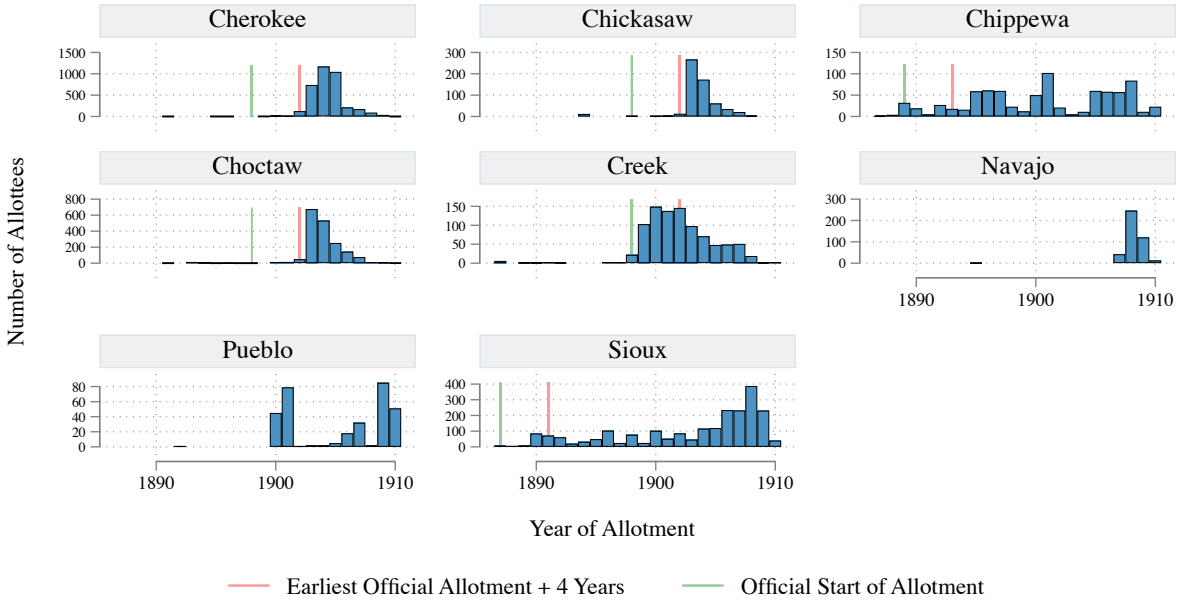
Source: Wikimedia Commons

Figure A2: Distribution of Age at Allotment in the 1910 Population Census



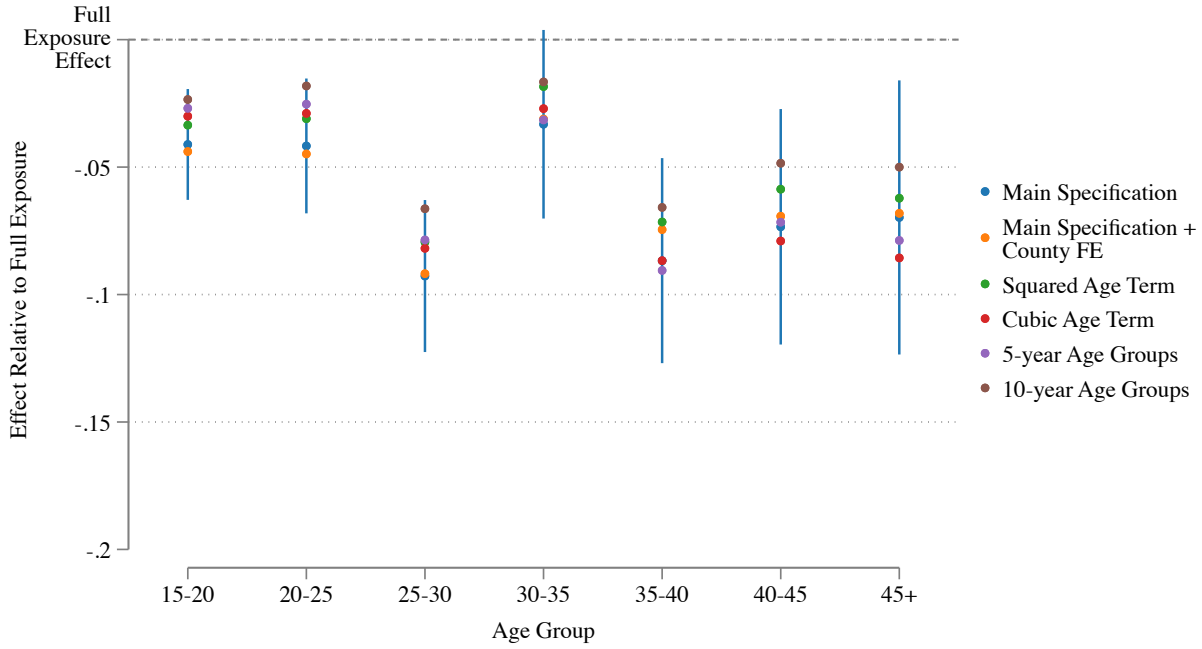
Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Age at allotment calculated as a respondent's self-reported year of allotment minus their birth year.

Figure A3: Allotment Timing within Tribes



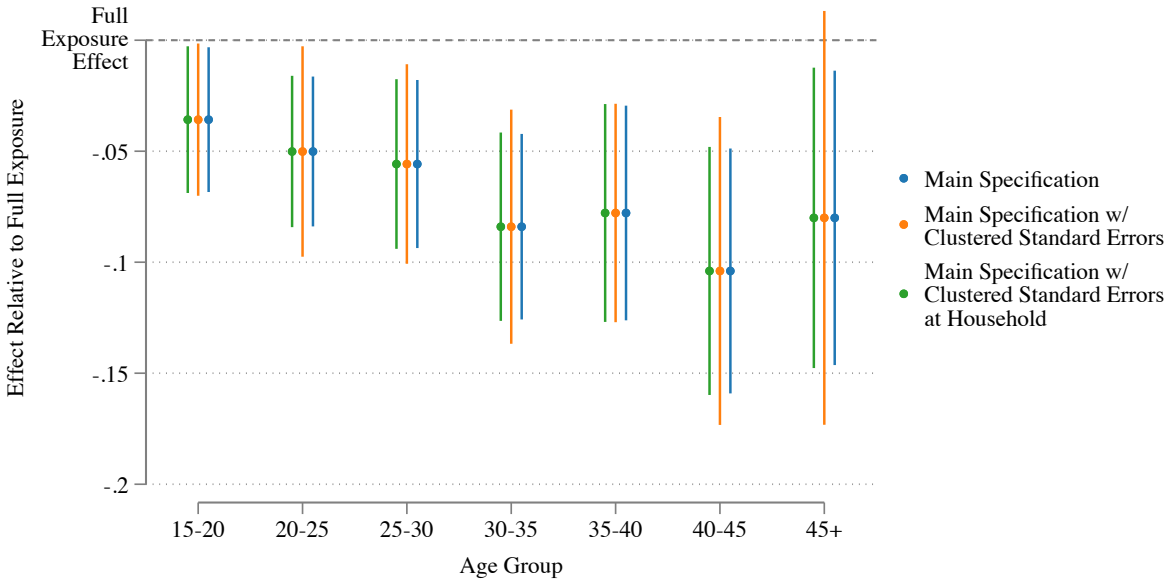
Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Allotment timing is self-reported by respondents. Figure includes top 8 tribes in terms of number of allotments in 1910 census. Chippewa were allotted by treaty prior to Dawes Act. Pueblo and Sioux are general terms that applied to multiple reservations. Pueblo and Navajo never had official declarations of allotment.

Figure A4: Robustness of Child Mortality Ratio Estimates for Age-Specific Exposure to Allotment (Relative to Full Exposure), Conditional on Age, to Tribe-Level Allotment Timing



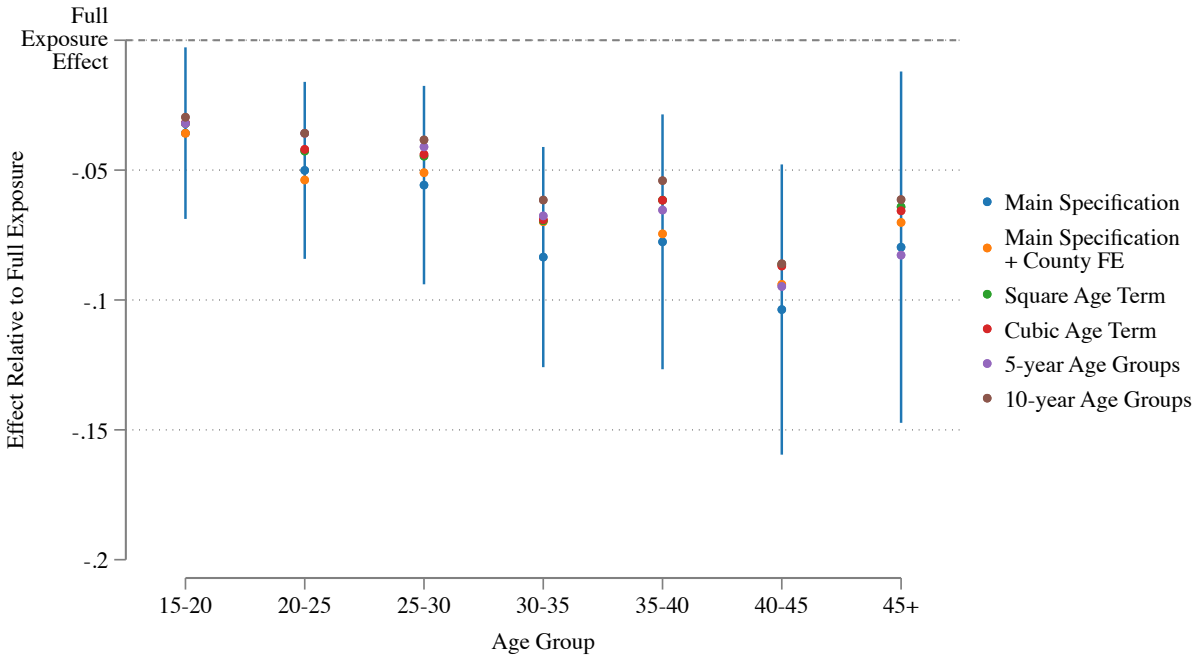
Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Allotment timing is at the tribe level. Figure shows estimates of β and δ from Equation (1). Reference category is under 15 (full exposure group). 90% confidence intervals are depicted.

Figure A5: Robustness of Child Mortality Ratio Estimates for Age-Specific Exposure to Allotment (Relative to Full Exposure), Conditional on Age to Clustering Standard Errors by Tribe



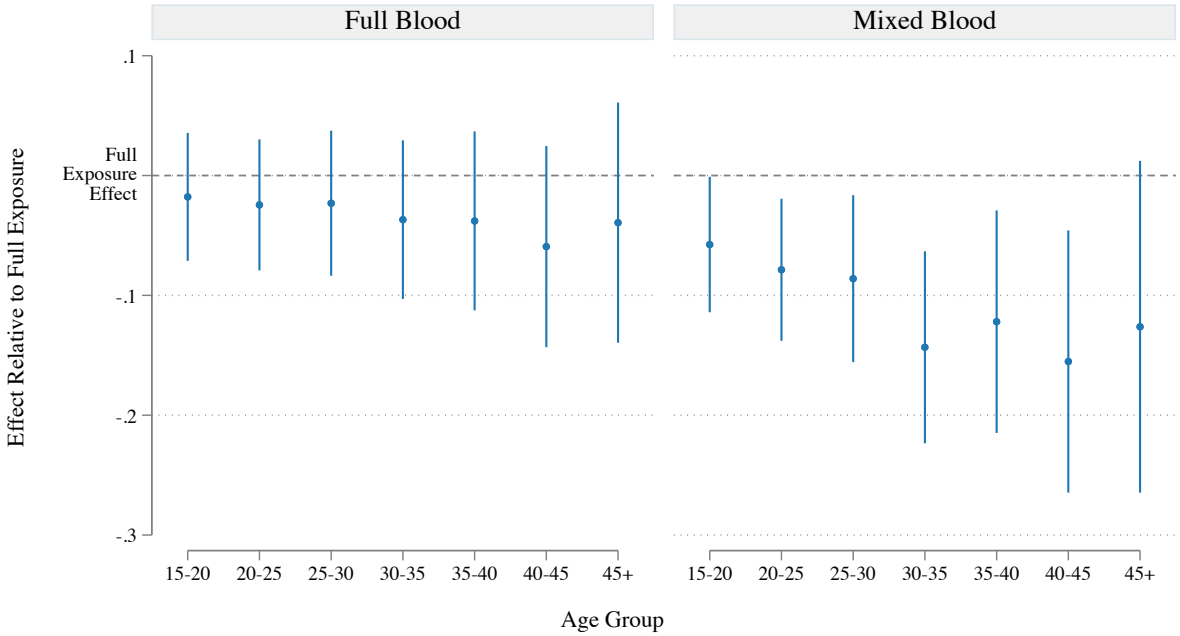
Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Figure shows estimates of β and δ from Equation (1) with and without clustered standard errors (both at tribe and household level). Reference category is under 15 (full exposure group). 90% confidence intervals are depicted.

Figure A6: Robustness of Child Mortality Ratio Estimates for Age-Specific Exposure to Allotment (Relative to Full Exposure) to the Inclusion of "Detached" Whites and Black Living with American Indian Families



Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older. Figure shows estimates of β and δ from Equation 1 with different methods of controlling for age. Reference category is under 15 (full exposure group). 90% Confidence Intervals for 5-Year Age Groups shown.

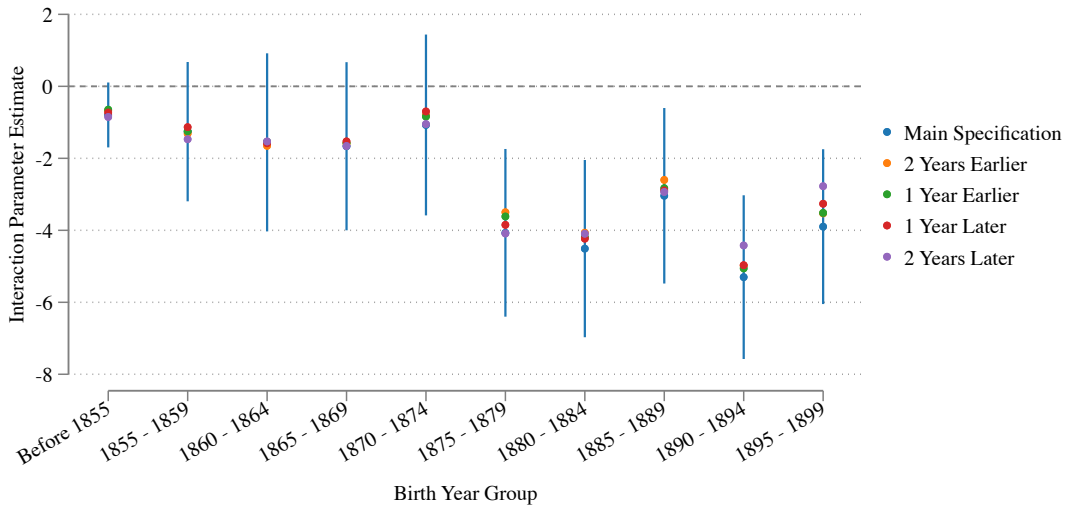
Figure A7: Child Mortality Ratio Estimates for Age- and "Blood Quantum"-Specific Exposure to Allotment (Relative to Full Exposure), Conditional on Age



Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Figure shows estimates of β and δ from Equation 1 stratified by "blood quantum." Reference category is under 15 (full exposure group). 95% Confidence Intervals are depicted.

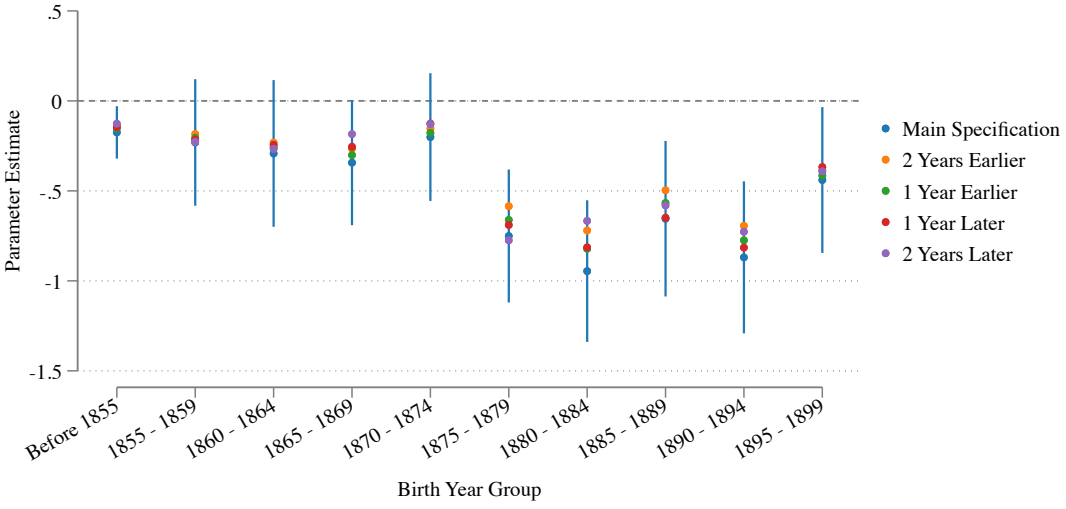
Figure A8: Robustness of Cohort Size Estimates for Cohort-Specific Exposure to Allotment to the Inclusion of "Detached" Whites and Black Living with American Indian Families

(a) Interaction Model (Equation 3)



Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States and 1% sample (with a 20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older. Additionally, this sample omits all tribes allotted before 1900 and all individuals born after 1900. Figure shows estimates of π from Equation (3) with regressions stratified by 5-year age group. 95% confidence intervals for main specification are depicted. Main specification treats tribal allotment date as 4 years from the official allotment date, with sensitivity tests relative to this.

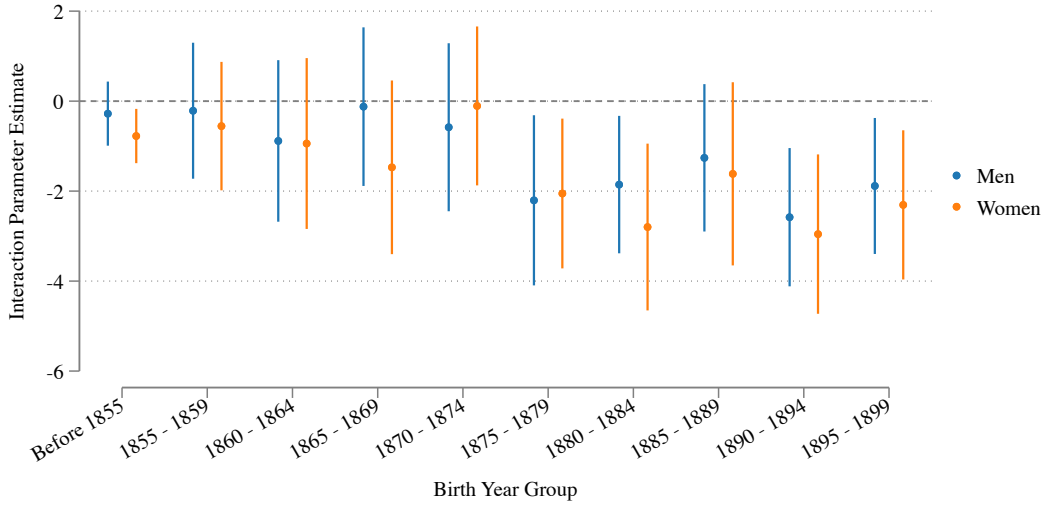
(b) Time under Allotment Model (Equation 4)



Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States and 1% sample (with a 20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older. Additionally, this sample omits all tribes allotted before 1900 and all individuals born after 1900. Figure shows estimates of ϕ from Equation (4) with regressions stratified by 5-year age group. 95% confidence intervals for main specification are depicted. Main specification treats tribal allotment date as 4 years from the official allotment date, with sensitivity tests relative to this.

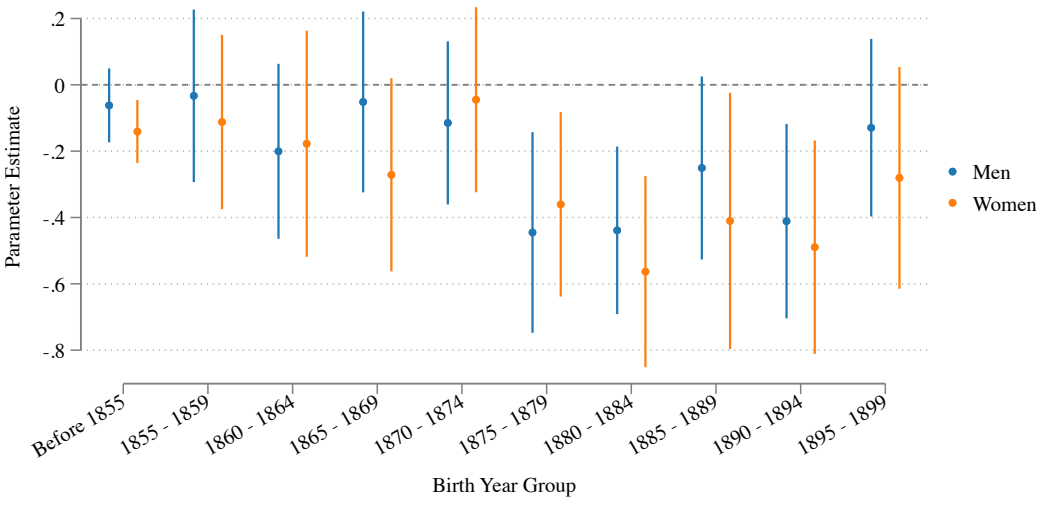
Figure A9: Cohort Size Estimates for Cohort-Specific Exposure to Allotment by Sex

(a) Interaction Model (Equation 3)



Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States and 1% sample (with a 20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Additionally, this sample omits all tribes allotted before 1900 and all individuals born after 1900. Figure shows estimates of π from Equation (3) with regressions stratified by sex. 95% confidence intervals are depicted.

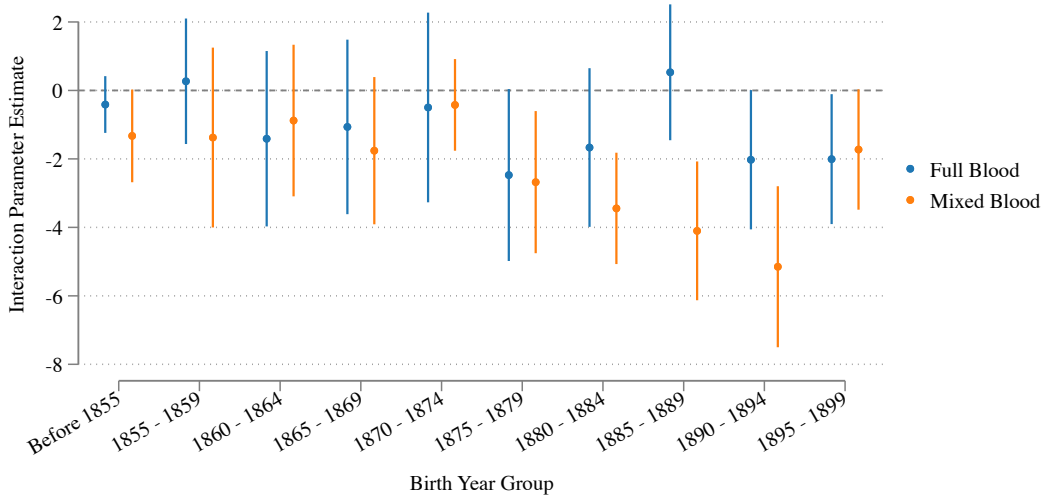
(b) Time under Allotment Model (Equation 4)



Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States and 1% sample (with a 20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Additionally, this sample omits all tribes allotted before 1900 and all individuals born after 1900. Figure shows estimates of ϕ from Equation (4) with regressions stratified by sex. 95% confidence intervals are depicted.

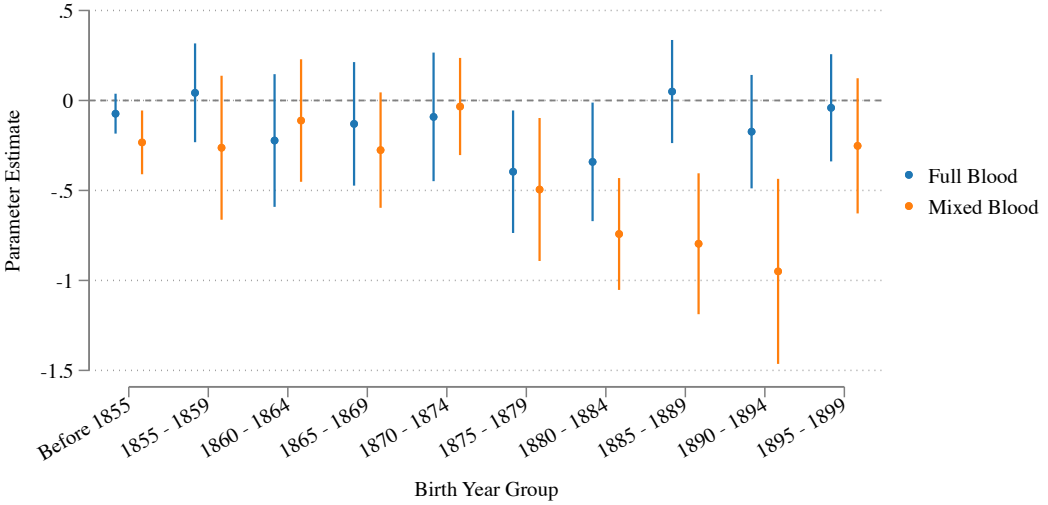
Figure A10: Cohort Size Estimates for Cohort-Specific Exposure to Allotment by "Blood Quantum"

(a) Interaction Model (Equation 3)



Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States and 1% sample (with a 20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Additionally, this sample omits all tribes allotted before 1900 and all individuals born after 1900. Figure shows estimates of π from Equation (3) with regressions stratified by "blood quantum." 95% confidence intervals are depicted.

(b) Time under Allotment Model (Equation 4)



Notes: 1.4% sample (with a 20% oversample of American Indians) of the 1910 population census of the United States and 1% sample (with a 20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks. Additionally, this sample omits all tribes allotted before 1900 and all individuals born after 1900. Figure shows estimates of ϕ from Equation (4) with regressions stratified by "blood quantum." 95% confidence intervals are depicted.

Table A1: Robustness of Child Mortality Ratio Impact of Exposure to Allotment (Relative to Full Exposure) to Tribe-Level Timing

	(1) Full Sample	(2) "Full Blood"	(3) "Mixed Blood"
Age	0.00586***	0.00583***	0.00802***
	(0.000838)	(0.000898)	(0.00188)
Age at Allotment	-0.00254***	-0.00198**	-0.00569***
	(0.000915)	(0.00101)	(0.00193)
Observations	6085	4244	1770
R^2	0.2265	0.2170	0.2211

Notes: All standard errors in parentheses are clustered at the household level. Table shows estimates of θ from Equation 2. Data are from a 1.4% sample (20% oversample of American Indians) of the 1910 census. Main specification treats tribal allotment date as 4 years from the official allotment date from the Land Planning Committee (1935). Age at Allotment is then defined as tribal allotment date minus birth year. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks, and includes only women reporting birth to at least one child. All models include a binary indicator for age at allotment greater than 45, number of children born, ability to speak English, as well as an adjusted household size variable. Adjusted Household Size is the census's household size minus the number of own children in the household. All observations with missing household size or values greater than 100 are omitted. "Full Blood" is an indicator for whether or not an individual is listed as a "full blood" Indian in the Census (i.e., "BLOODI" was equal to 1000). All individuals not recorded as "full bloods" are labelled as "mixed bloods." For ease of comparison with historical documentation, we use the terms "full blood" and "mixed blood" as was common contemporaneously (e.g., United States Bureau of the Census 1915).

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

Table A2: Robustness of the Child Mortality Ratio Impact of Exposure to Allotment (Relative to Fully Exposed), Restricting the Sample to Women Married to the Household Head

	(1) Full Sample	(2) Full Blood	(3) Mixed Blood
Age	0.00620***	0.00563***	0.00653***
	(0.00130)	(0.00166)	(0.00213)
Age at Allotment	-0.00294**	-0.00164	-0.00431**
	(0.00129)	(0.00166)	(0.00209)
Dep. Var. Mean	0.309	0.365	0.206
Observations	3326	2137	1151
R^2	0.2625	0.2487	0.2434

Notes: All standard errors in parentheses are clustered at the household level. Table shows estimates of θ from Equation 2. Age at Allotment is determined using individual level allotment year data from a 1.4% sample (20% oversample of American Indians) of the 1910 census. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks, and includes only women reporting birth to at least one child. All models include a binary indicator for age at allotment greater than 45, number of children born, ability to speak English, as well as an adjusted household size variable. Adjusted Household Size is the census's household size minus the number of own children in the household. All observations with missing household size or values greater than 100 are omitted. "Full Blood" is an indicator for whether or not an individual is listed as a "full blood" Indian in the Census (i.e., "BLOODI" was equal to 1000). All individuals not recorded as "full bloods" are labelled as "mixed bloods." For ease of comparison with historical documentation, we use the terms "full blood" and "mixed blood" as was common contemporaneously (e.g., United States Bureau of the Census 1915).

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

Table A3: Robustness of the Child Mortality Ratio Impact of Exposure to Allotment (Relative to Fully Exposed) to Alternative Age Cutoffs

Panel A: Full Sample				
	<60	<70	<80	<90
Age	0.00588***	0.00560***	0.00505***	0.00625***
	(0.00142)	(0.00134)	(0.00129)	(0.00120)
Age at Allotment	-0.00326**	-0.00275**	-0.00237*	-0.00338***
	(0.00137)	(0.00131)	(0.00129)	(0.00124)
Observations	3,359	3,667	3,805	3,855
R-squared	0.223	0.238	0.245	0.252
Panel B: Full Blood				
	<60	<70	<80	<90
Age	0.00511***	0.00476***	0.00408**	0.00541***
	(0.00183)	(0.00172)	(0.00162)	(0.00148)
Age at Allotment	-0.00145	-0.00102	-0.00063	-0.00181
	(0.00176)	(0.00167)	(0.00163)	(0.00155)
Observations	2,147	2,392	2,513	2,557
R-squared	0.215	0.229	0.233	0.239
Panel C: Mixed Blood				
	<60	<70	<80	<90
Age	0.00555**	0.00547**	0.00559***	0.00689***
	(0.00230)	(0.00219)	(0.00215)	(0.00205)
Age at Allotment	-0.00509**	-0.00435**	-0.00412*	-0.00513**
	(0.00221)	(0.00212)	(0.00211)	(0.00208)
Observations	1,175	1,231	1,248	1,254
R-squared	0.220	0.228	0.233	0.241

Notes: All standard errors in parentheses are clustered at the household level. Table shows estimates of θ from Equation 2. Age at Allotment is determined using individual level allotment year data from a 1.4% sample (20% oversample of American Indians) of the 1910 census. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents above age thresholds shown in column headings above and "detached" Whites and Blacks, and includes only women reporting birth to at least one child. All models include a binary indicator for age at allotment greater than 45, number of children born, ability to speak English, as well as an adjusted household size variable. Adjusted Household Size is the census's household size minus the number of own children in the household. All observations with missing household size or values greater than 100 are omitted. "Full Blood" is an indicator for whether or not an individual is listed as a "full blood" Indian in the Census (i.e., "BLOODI" was equal to 1000). All individuals not recorded as "full bloods" are labelled as "mixed bloods." For ease of comparison with historical documentation, we use the terms "full blood" and "mixed blood" as was common contemporaneously (e.g., United States Bureau of the Census 1915).

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

Table A4: Robustness of Child Mortality Ratio Impact of Exposure to Allotment (Relative to Full Exposure) to Alternative Age Controls

	(1) Main Specification	(2) w/ Clustering	(3) w/ County FE	(4) 5-year Age groups	(5) 10-year Age groups	(6) Squared Age Term	(7) Cubic Age Term
Age at Allotment	-0.00338***	-0.00338	-0.00356**	-0.00230*	-0.00202*	-0.00265**	-0.00268**
	(0.00124)	(0.00212)	(0.00181)	(0.00124)	(0.00105)	(0.00131)	(0.00131)
Observations	3855	3855	3855	3855	3855	3855	3855
R^2	0.2523	0.2523	0.3096	0.2577	0.2547	0.2530	0.2530

Notes: All standard errors in parentheses are clustered at the household level. Table shows estimates of θ from Equation 2. Age at Allotment is determined using individual level allotment year data from a 1.4% sample (20% oversample of American Indians) of the 1910 census. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks, and includes only women reporting birth to at least one child. All models include a binary indicator for age at allotment greater than 45, number of children born, adjusted household size, and ability to speak English. Column (2) clusters standard errors at the tribe level. Column (3) adds county fixed effects to the base specification. Columns (4) and (5) add 5-year and 10-year age group dummies, respectively, to the base model. Column (6) adds a squared age term, while Column (7) includes both a squared and a cubic age term.

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

Table A5: Robustness of Child Mortality Ratio Impact of Exposure to Allotment (Relative to Full Exposure) to Alternative Age Controls (Tribe-level Timing)

	(1) Main Specification	(2) w/ Clustering	(3) w/ County FE	(4) 5-year Age groups	(5) 10-year Age groups	(6) Squared Age Term	(7) Cubic Age Term
Age at Allotment	-0.00254***	-0.00254**	-0.00246***	-0.00203**	-0.00149*	-0.00187*	-0.00203*
	(0.000915)	(0.000966)	(0.000947)	(0.000937)	(0.000826)	(0.000967)	(0.000974)
Observations	6085	6085	6085	6085	6085	6085	6085
R^2	0.2265	0.2265	0.2882	0.2322	0.2305	0.2272	0.2276

Notes: All standard errors in parentheses are clustered at the household level. Table shows estimates of θ from Equation 2. Data are from a 1.4% sample (20% oversample of American Indians) of the 1910 census. The main specification treats tribal allotment date as 4 years from the official allotment date from the Land Planning Committee (1935). Age at Allotment is then defined as tribal allotment date minus birth year. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks, and includes only women reporting birth to at least one child. All models include a binary indicator for age at allotment greater than 45, number of children born, adjusted household size, and ability to speak English. Column (2) clusters standard errors at the tribe level. Column (3) adds county fixed effects to the base specification. Columns (4) and (5) add 5-year and 10-year age group dummies, respectively, to the base model. Column (6) adds a squared age term, while Column (7) includes both a squared and a cubic age term.

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

Table A6: Robustness of Child Mortality Ratio Impact of Exposure to Allotment (Relative to Full Exposure) to Estimation Using a Fractional Logit Model

	(1) Full Sample	(2) "Full Blood"	(3) "Mixed Blood"
Age	0.00643***	0.00589***	0.00586***
	(0.00117)	(0.00154)	(0.00163)
Age at Allotment	-0.00313**	-0.00172	-0.00392**
	(0.00124)	(0.00162)	(0.00172)
Dep. Var. Mean	0.322	0.374	0.218
Observations	3855	2557	1254

Notes: All standard errors in parentheses are clustered at the household level. Results are marginal effects at the mean, computed using the coefficients from a fractional logit model. Age at Allotment is determined using individual level allotment year data from a 1.4% sample (20% oversample of American Indians) of the 1910 census. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks, and includes only women reporting birth to at least one child. All models include a binary indicator for age at allotment greater than 45, number of children born, ability to speak English, as well as an adjusted household size variable. Adjusted Household Size is the census's household size minus the number of own children in the household. All observations with missing household size or values greater than 100 are omitted. "Full Blood" is an indicator for whether or not an individual is listed as a "full blood" Indian in the Census (i.e., "BLOODI" was equal to 1000). All individuals not recorded as "full bloods" are labelled as "mixed bloods." For ease of comparison with historical documentation, we use the terms "full blood" and "mixed blood" as was common contemporaneously (e.g., United States Bureau of the Census 1915).

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

Table A7: Robustness of the Child Mortality Ratio Impact of Exposure to Allotment (Relative to Fully Exposed) to Alternative Weighting

	(1) Full Sample	(2) "Full Blood"	(3) "Mixed Blood"
Age	0.00545***	0.00403***	0.00625***
	(0.00121)	(0.00149)	(0.00217)
Age at Allotment	-0.00239*	0.00001	-0.00529**
	(0.00125)	(0.00157)	(0.00216)
Observations	3855	2557	1254
R^2	0.2717	0.2549	0.2469

Notes: All standard errors in parentheses are clustered at the household level. Table shows estimates of θ from Equation 2 when regression is weighted by number of children ever born to a mother. Age at Allotment is determined using individual level allotment year data from a 1.4% sample (20% oversample of American Indians) of the 1910 census. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks, and includes only women reporting birth to at least one child. All models include a binary indicator for age at allotment greater than 45, number of children born, ability to speak English, as well as an adjusted household size variable. Adjusted Household Size is the census's household size minus the number of own children in the household. All observations with missing household size or values greater than 100 are omitted. "Full Blood" is an indicator for whether or not an individual is listed as a "full blood" Indian in the Census (i.e., "BLOODI" was equal to 1000). All individuals not recorded as "full bloods" are labelled as "mixed bloods." For ease of comparison with historical documentation, we use the terms "full blood" and "mixed blood" as was common contemporaneously (e.g., United States Bureau of the Census 1915).

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

Table A8: Robustness of Child Mortality Ratio Impact of Exposure to Allotment (Relative to Full Exposure) to the Inclusion of "Detached" Whites and Black Living with American Indian Families

	(1) Full Sample	(2) "Full Blood"	(3) "Mixed Blood"
Age	0.00625***	0.00541***	0.00685***
	(0.00120)	(0.00148)	(0.00205)
Age at Allotment	-0.00339***	-0.00181	-0.00512**
	(0.00124)	(0.00155)	(0.00208)
Dep. Var. Mean	0.322	0.374	0.218
Observations	3858	2557	1257
R^2	0.2522	0.2387	0.2406

Notes: All standard errors in parentheses are clustered at the household level. Table shows estimates of θ from Equation 2. Age at Allotment is determined using individual level allotment year data from a 1.4% sample (20% oversample of American Indians) of the 1910 census. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older, and includes only women reporting birth to at least one child. All models include a binary indicator for age at allotment greater than 45, number of children born, ability to speak English, as well as an adjusted household size variable. Adjusted Household Size is the census's household size minus the number of own children in the household. All observations with missing household size or values greater than 100 are omitted. "Full Blood" is an indicator for whether or not an individual is listed as a "full blood" Indian in the Census (i.e., "BLOODI" was equal to 1000). All individuals not recorded as "full bloods" are labelled as "mixed bloods." For ease of comparison with historical documentation, we use the terms "full blood" and "mixed blood" as was common contemporaneously (e.g., United States Bureau of the Census 1915).

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

Table A9: Robustness of Cohort Size Impact of Exposure to Allotment to Alternative Allotment Timing

Panel A: Interaction Model (Equation 3)

	(1) Main Specification	(2) 2 Years Earlier	(3) 1 Year Earlier	(4) 1 Year Later	(5) 2 Years Later
$1(Year = 1910)$	0.453	0.403	0.394	0.348	0.220
	(0.350)	(0.371)	(0.362)	(0.336)	(0.314)
$1(Year = 1910) \times 1(Allotted)$	-3.032***	-2.642***	-2.724***	-2.749***	-2.721***
	(0.718)	(0.683)	(0.697)	(0.711)	(0.726)
Observations	3703	3703	3703	3790	3926
R^2	0.7314	0.7310	0.7311	0.7308	0.7307

Panel B: Time Under Allotment Model (Equation 4)

	(1) Main Specification	(2) 2 Years Earlier	(3) 1 Year Earlier	(4) 1 Year Later	(5) 2 Years Later
$1(Year = 1910)$	0.351	0.458	0.412	0.169	0.0418
	(0.319)	(0.337)	(0.328)	(0.302)	(0.291)
Time Under Allotment	-0.516***	-0.409***	-0.459***	-0.453***	-0.425***
	(0.149)	(0.113)	(0.129)	(0.142)	(0.123)
Observations	3703	3703	3703	3790	3926
R^2	0.7317	0.7317	0.7317	0.7308	0.7306

Notes: Heteroskedasticity-robust standard errors in parentheses. Table shows estimates of π from Equation 3 and ϕ from Equation 4. Data are from a 1.4% sample (20% oversample of American Indians) of the 1910 population census of the United States and a 1% sample (20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents that were already allotted by 1900 and "detached" Whites and Blacks, with observations at the birth year-tribe-census year level and including only cohorts born between 1855 and 1900. Main specification treats tribe-level allotment timing as four years after official allotment date, with sensitivity tests to alternative specifications. Regression also includes tribe and birth year fixed effects.

$^{*}\ p < 0.1, ^{**}\ p < 0.05, ^{***}\ p < 0.01$

Table A10: Robustness of Cohort Size Impact of Exposure to Allotment to the Inclusion of "Detached" Whites and Black Living with American Indian Families

Panel A: Interaction Model (Equation 3)			
	(1)	(2)	(3)
	Full Sample	"Full Blood"	"Mixed Blood"
$1(Year = 1910)$	0.437	0.658*	-0.147
	(0.350)	(0.398)	(0.232)
$1(Year = 1910) \times 1(Allotted)$	-3.231***	-1.592***	-2.260***
	(0.716)	(0.465)	(0.805)
Mean Cohort Size in 1900	9.27	6.81	6.00
Observations	3711	3187	1897
R^2	0.7336	0.7010	0.7154
Panel B: Time under Allotment Model (Equation 4)			
	(1)	(2)	(3)
	Full Sample	"Full Blood"	"Mixed Blood"
$1(Year = 1910)$	0.360	0.455	-0.129
	(0.319)	(0.348)	(0.214)
Time Under Allotment	-0.564***	-0.210***	-0.414**
	(0.148)	(0.067)	(0.164)
Mean Cohort Size in 1900	9.27	6.81	6.00
Observations	3711	3187	1897
R^2	0.7341	0.7007	0.7163

Notes: Heteroskedasticity-robust standard errors in parentheses. Table shows estimates of π from Equation 3 and ϕ from Equation 4. Data are from a 1.4% sample (20% oversample of American Indians) of the 1910 population census of the United States and a 1% sample (20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents that were already allotted by 1900, with observations at the birth year-tribe-census year level and including only cohorts born between 1855 and 1900. "Full Blood" is an indicator for whether or not an individual is listed as a "full blood" Indian in the Census (i.e., "BLOODI" was equal to 1000). All individuals not recorded as "full bloods" are labelled as "mixed bloods." For ease of comparison with historical documentation, we use the terms "full blood" and "mixed blood" as was common contemporaneously (e.g., United States Bureau of the Census 1915). The main specification treats tribal allotment date as 4 years from the official allotment date. Time Under Allotment is defined as census year minus the year of allotment, with all observations in 1900 defined as 0. Both Panel A and B include tribe and birth year fixed effects.

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

Table A11: The Cohort Size Impact of Exposure to Allotment by Sex

Panel A: Interaction Model (Equation 3)			
	(1)	(2)	(3)
	Full Sample	Men	Women
$1(Year = 1910)$	0.453	0.197	0.191
	(0.350)	(0.239)	(0.241)
$1(Year = 1910) \times 1(Allotted)$	-3.023***	-1.559***	-1.728***
	(0.718)	(0.439)	(0.467)
Mean Cohort Size in 1900	9.18	5.80	5.84
Observations	3703	2976	2873
R^2	0.7314	0.7155	0.7040
Panel B: Time under Allotment Model (Equation 4)			
	(1)	(2)	(3)
	Full Sample	Men	Women
$1(Year = 1910)$	0.351	0.126	0.157
	(0.319)	(0.213)	(0.216)
Time Under Allotment	-0.516***	-0.261***	-0.310***
	(0.149)	(0.088)	(0.095)
Mean Cohort Size in 1900	9.18	5.80	5.84
Observations	3703	2976	2873
R^2	0.7317	0.7158	0.7046

Notes: Heteroskedasticity-robust standard errors in parentheses. Table shows estimates of π from Equation 3 and ϕ from Equation 4. Data are from a 1.4% sample (20% oversample of American Indians) of the 1910 population census of the United States and a 1.2% sample (20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents that were already allotted by 1900 and "detached" Whites and Blacks, with observations at the birth year-tribe-census year level and including only cohorts born between 1855 and 1900. The main specification treats tribal allotment date as 4 years from the official allotment date (see Figure 4 and Appendix Table A8 for robustness of these results to alternative encodings). Time Under Allotment is defined as census year minus the year of allotment, with all observations in 1900 defined as zero. Both Panel A and B include tribe and birth year fixed effects.

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

Table A12: Changes in the Share of American Indians outside of the "Indian Schedule" between 1900 and 1910 by Birth Cohort Group

	1% Sample	1% Sample with Oversamples
	(1)	(2)
$Birth\_Cohort\_1860 \times 1(Year = 1910)$	6.163	3.409
	(6.290)	(4.313)
$Birth\_Cohort\_1865 \times 1(Year = 1910)$	8.063	3.859
	(6.875)	(4.602)
$Birth\_Cohort\_1870 \times 1(Year = 1910)$	9.986	7.724
	(7.035)	(5.254)
$Birth\_Cohort\_1875 \times 1(Year = 1910)$	10.587	7.714
	(7.401)	(5.078)
$Birth\_Cohort\_1880 \times 1(Year = 1910)$	-1.532	-1.197
	(8.223)	(6.187)
$Birth\_Cohort\_1885 \times 1(Year = 1910)$	-9.349	-6.918
	(9.232)	(7.090)
$Birth\_Cohort\_1890 \times 1(Year = 1910)$	-2.496	-0.855
	(8.352)	(5.596)
$Birth\_Cohort\_1895 \times 1(Year = 1910)$	-7.461	-4.457
	(8.947)	(5.913)
Mean	93.486	95.455
Observations	335	380

Heteroskedasticity-robust standard errors in parentheses. Table shows estimates of π_j from Appendix Equation (1). Data are from the IPUMS 1.4% sample (20% oversample of American Indians) and 1% sample of the 1910 population census of the United States, and a 1.2% sample (20% oversample of American Indians) and a 1% sample of the 1900 population census of the United States. Sample is restricted to American Indians recorded in the "Indian Schedule" or the "General Schedule" of these samples, and residing west of the Mississippi river and not in Alaska or Hawaii. Observations are at the birth year group-census schedule-census year level and including only cohorts born between 1855 and 1900.

Table A13: Changes in the Share of American Indians outside of the "Indian Schedule" between 1900 and 1910 Correlated with State-Level Allotment Intensity

	Full Sample		1875-1899 Birth Cohorts	
	1% Sample	With Oversamples	1% Sample	With Oversamples
	(1)	(2)	(3)	(4)
Panel A: Intensity using Share of Allotted Population 1900				
$Share\_1900 \times 1(Year = 1910)$	12.753*	11.406*	19.123*	18.160*
	(7.513)	(6.844)	(11.050)	(10.457)
Mean	93.486	95.455	92.602	94.692
Observations	335	380	191	211
Panel B: Intensity using Share of Allotted Population 1910				
$Share\_1910 \times 1(Year = 1910)$	14.082*	10.589*	21.450*	16.569*
	(7.762)	(6.196)	(11.412)	(9.326)
Mean	93.486	95.455	92.602	94.692
Observations	335	380	191	211
Panel C: Intensity using Weighted Allotment Time				
$Weighted\_Time \times 1(Year = 1910)$	0.908	0.526	1.139	0.729
	(0.584)	(0.515)	(0.781)	(0.719)
Mean	93.486	95.455	92.602	94.692
Observations	335	380	191	211

Heteroskedasticity-robust standard errors in parentheses. Table shows estimates of ϕ from Appendix Equation (2). Data are from the IPUMS 1.4% sample (20% oversample of American Indians) and 1% sample of the 1910 population census of the United States, and a 1.2% sample (20% oversample of American Indians) and a 1% sample of the 1900 population census of the United States. Sample is restricted to American Indians recorded in the "Indian Schedule" or "General Schedule" of these samples, and residing west of the Mississippi river and not in Alaska or Hawaii. Observations are at the birth year group-census schedule-census year level. Columns 1-2 include cohorts born between 1855 and 1900, while columns 3-4 are restricted to cohorts born between 1875 and 1899.

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

Table A14: The Child Mortality Ratio Impact of *Future* Exposure to Allotment

	(1)
Age	-0.0097
	(0.0193)
Projected Age at Allotment	0.0124
	(0.0193)
Observations	1609
R^2	0.1248

Notes: All standard errors in parentheses are clustered at the household level. Table shows estimate of θ from a variant of Equation 2, replacing age at allotment with *future* age at allotment and using tribe (rather than individual) variation in allotment timing. Future age at allotment is defined as tribal allotment date, plus four years, minus an individual's birth year. Sample comes from a 1.2% sample (20% oversample of American Indians) of the 1900 census. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents ages 90 and older and "detached" Whites and Blacks, and includes only women reporting birth to at least one child. The sample is also restricted to women whose tribes were not allotted before 1900, but were allotted by 1910 according to the Land Planning Committee (1935). The model includes controls for projected age at allotment greater than 45, number of children born, adjusted household size, and ability to speak English.

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

Table A15: Mechanism Tests

Potential Mechanism		Allotment Effect on: Cohort Size (Conditional on Mechanism)	Allotment Effect on: Mechanism
Base Model (Table 3 Column 1)	Interaction Model (Eq. 3)	-3.032***	N/A
		(0.718)	.
	Time Under Allotment Model (Eq. 4)	-0.516***	N/A
		(0.149)	.
Multi-generational House	Interaction Model (Eq. 3)	-3.092***	0.031
		(0.739)	(0.017)
	Time Under Allotment Model (Eq. 4)	-0.519***	0.005**
		(0.153)	(0.002)
Farm	Interaction Model (Eq. 3)	-3.239***	0.159***
		(0.735)	(0.022)
	Time Under Allotment Model (Eq. 4)	-0.530***	0.012***
		(0.150)	(0.003)
Indian Home	Interaction Model (Eq. 3)	-3.097***	0.027*
		(0.737)	(0.016)
	Time Under Allotment Model (Eq. 4)	-0.519***	0.004*
		(0.152)	(0.002)
Mean Household Size	Interaction Model (Eq. 3)	-3.049***	-0.301*
		(0.722)	(0.171)
	Time Under Allotment Model (Eq. 4)	-0.518***	-0.024
		(0.150)	(0.022)
Median Household Size	Interaction Model (Eq. 3)	-3.064***	-0.062
		(0.722)	(0.143)
	Time Under Allotment Model (Eq. 4)	-0.517***	-0.039*
		(0.150)	(0.022)
Labor Force Participation	Interaction Model (Eq. 3)	-3.033***	-0.140***
		(0.742)	(0.020)
	Time Under Allotment Model (Eq. 4)	-0.512***	-0.017***
		(0.152)	(0.003)
Literacy	Interaction Model (Eq. 3)	-1.477**	0.022
		(0.703)	(0.022)
	Time Under Allotment Model (Eq. 4)	-0.185	0.008**
		(0.142)	(0.003)

Notes: Heteroskedasticity-robust standard errors shown in parentheses. "Interaction Model" references Equation (3), and "Time Under Allotment Model" references Equation (4). Column 3 shows coefficient estimates for π and ϕ, controlling for a potential mechanism. Column 4 shows coefficient estimates for π and ϕ, using a potential mechanism as the dependent variable (or outcome). Data are from a 1.4% sample (20% oversample of American Indians) of the 1910 population census of the United States and a 1.2% sample (20% oversample of American Indians) of the 1900 population census of the United States. Sample excludes individuals residing in Alaska, Hawaii, and states east of the Mississippi River as well as respondents that were already allotted by 1900 and "detached" Whites and Blacks. Multi-generational houses are defined as households with more than two generations (e.g., grandparents, parents, and children). Farm status defined as a respondent who lives and works on a farm. "Indian home" measures whether or not census respondents lived in an "Indian home" (e.g., tent, teepee, cliff dwelling, etc.). Mean and median household size are calculated excluding observations with reported household sizes exceeding 100 people. Labor force participation measures whether or not individuals older than age 10 years of age had any "gainful employment." Literacy is defined as respondents over age 10 who can read or write. For all variables, we calculate means at the birth cohort-tribe-year level.

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