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New Horizons *Festschrift* in Honor of Stephen E. Cornell and Joseph P. Kalt

Discussion Draft of September 8, 2022

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I. Introduction

The need to define the boundaries of the citizen population is one of the thorniest challenges Native Nations face today. Native populations are no longer confined to reservations designated by the United States government as the imposed resolution of an unequal military contest. Likewise, Native self-determination means that tribes (not the federal government) set the boundaries of their

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citizenry. As welcome as these facts are, these freedoms come with a consequence: the necessity of facing the culturally, politically, socially, and economically fraught implications of deciding who is and is not a tribal citizen. That task is made especially challenging by the demographic dynamics set in motion by blood-quantum policies imposed by the United States government in the nineteenth century.

A. Citizenship and Cornell and Kalt's Nation Building Framework

As Cornell and Kalt summarize in their chapter entitled "From Tribal *Members* to Native Nation *Citizens*" in Ratteree and Hill's *The Great Vanishing Act: Blood Quantum and the Future of Native Nations* (2017):

> For most indigenous peoples, the political entity known today as the tribe or nation is itself an instrument of the community. It is the community that matters, and the community consists of persons who share identity and interwoven obligations arising from their social and cultural relationships. These relationships commonly include kinship ties, cultural practices and values, history, connections to specific lands, and other elements. The community's political instrument—e.g., the tribal government—is the locus of formalized, tribal self-government and a vehicle that directly engages with the United States or other governmental bodies. But the relationships that matter most are the ones not between citizens and the tribal state but among citizens themselves. These are the ties that give identity, meaning, and life to the community. The political structure of the nation or tribe emerges out of those relationships as a tool for survival and self-defense; a means of organizing aspects of social, political, and economic life; and a vehicle for the promotion of shared interests. (Cornell & Kalt, 2017, pp. 293–294)

In part because kinship and community precede and constitute government, Cornell and Kalt go on to point out, the process of determining "bright-line formal criteria and yes/no designations [of citizenship], can be off-putting" (Cornell & Kalt, 2017, p. 299). In some communities doing so may even go against the grain of norms for welcoming and incorporating outsiders. Yet, as Cornell and Kalt further observe, the decision to exclude or include may be unavoidable in the modern era of Native nation-building:

> any self-governing community that has to make decisions over such matters as the allocation of scarce financial resources, access to limited social services, and the selection of empowered officials and representatives…[faces]…collective decisions regarding citizenship criteria…fraught with potential for intra-community conflict. (Cornell & Kalt, 2017, pp. 299–300)

Some Native nations have broadened conceptions of citizenship in recent years—even when stakes were high. Cornell and Kalt describe Ysleta del Sur's community-driven enlargement of membership in recognition that its Congressionally established one-eighth quantum was an "insult" because, among other things, it designated 1,717 descendants as enrolled and 1,598 descendants as not enrolled (Cornell & Kalt, 2017, pp. 301–302). The Osage Nation managed to write a robust new constitution in 2006, notwithstanding that a 1906 act of the US Congress had specified "membership" in a "headright" interest to the substantial oil and gas estate under the Osage Reservation, with attendant economic incentives and political idiosyncrasies.[2] The counterweights to

[2] Voting rights were determined by headright ownership and were subject to the delays of probate (barring living bequests, offspring inheritors couldn't vote until their parents' estates were settled, i.e., late in life) and to fractionation and accumulation (headrights, and therefore votes, could be split among heirs or heirs could

these success stories are the high-stakes disenrollments in which Native communities have been riven by conflicts over resources where, at least at the start, all the factions had access to political representation (Wilkins & Wilkins, 2017).

B. A Situating Comparison: Native Nations and the United States

Indian Nations are not unique among sovereigns in needing to determine who is and is not a citizen. Neither are they unique in confronting the risks of internal conflict over citizenship policy. For example, rules and regulations for conferring citizenship in the United States give rise to disagreement and conflict—as they do for American Indian nations. The points of contention, however, are different.

The United States confers citizenship as a birthright for being born in the territorial footprint of the country. It also does so through the naturalization of immigrants after a period of residency if the immigrant conforms to conditions and follows a process for attaining the privilege. US citizenship is retained through something like a lineal descent rule, with some disqualification for emigrants and their descendants who do not maintain ties to the United States. Recent conflict about citizenship rights focuses on the regulation of entry into the territory of the United States, the initial grant of citizenship to those who arrive, and the birthright to citizenship of persons born in the United States to immigrants who are not legally present. The lineal descent rule gets little widespread attention and occasions little controversy.

Native Nations face several unique circumstances that influence citizenship policy. Tribes have limited physical control of their boundaries. Parentage pools for citizens of Native nations overwhelmingly comprise persons who are not also citizens of the same Native nation. Particularly since the middle of the 20th century, global market integration and technological trends have amplified incentives for Native emigration toward high-productivity work that is often at some distance from the home territory of the tribe. The territorial centers of Native sovereignty are a diminishing focus of population settlement—both jurisdiction and demography spread beyond reservation boundaries. Native nations generally cannot bar outmigration or exogamy[3] and do not try.

Overlaid on these contemporary features is the long-lived federal policy of defining citizenship based on the quantum of Indian blood. Blood quantum limitation of federal obligations to Indian populations was a straightforward way to cap responsibilities that could conveniently—from the point of view of the United States—be imposed because of the US's unequal power over tribes. These limits were embedded in federal Indian policy and then written into many of the tribal constitutions arising under the auspices of the Indian Reorganization Act and its centralized administration by the Bureau of Indian Affairs (see, e.g., Spruhan, 2006 for a history of quantum-based policies). As the legal and policy constraints on the self-determination of Indian nations have

inherit multiple headrights). Notwithstanding significant cash flows emanating from headrights, the Osages were able to expand the definition of citizenship in a constitutional reform (see, e.g., Dennison, 2012).

[3] Though informal usage turns to *intermarriage* to name the social processes that produce offspring of mixed parentage (i.e., of Native citizen and non-citizen parentage), we use *exogamy*. *Intermarriage* puts emphasis on marriage, though marital status may be unknown to tribal enrolment officers or irrelevant to tribal enrolment policy. *Exogamy* places the emphasis on childbearing from outside the group—a core driver of population dynamics and a phenomenon germane to enrollment policy. We understand that our usage of *exogamy* here deviates slightly from its precise meanings in anthropology and biology but hope that our usage to denote reproduction (not marriage) with a partner who is not a citizen of the same Native nation is at once clear and free of irrelevant normative baggage.

shifted, blood-quantum limits on citizenship rights in Indian polities are an enduring and painful legacy bequeathed by the United States.

In this situation, Native determinations of who inherits citizenship in the geographically dispersed mixed ancestry population are the focus of contention about citizenship rights (Garroutte & Snipp, 2013). It is easy to be revolted by the whole spectacle. The language of blood-quantum is redolent of Jim Crow laws in the United States, financial red-lining in the urban United States, the historical apartheid policies of colonial and post-colonial South Africa, or German National Socialist policies of racial coercion. We expect the practical implications of transitioning from today's predominant realities of blood-quantum and lineal descent rules toward alternative ideals of Indigenous citizenship ideas are daunting to many Native leaders. Meantime, grandparents are arriving in tribal councils *today* with petitions for their descendants to be exceptions to the prevailing quantum rule. At the same time, other Native voices express concern about the potential loss of cultural and political coherence of Native communities in the current demographic and social/political context. The path forward for Native polities seeking to undo this colonial legacy presents hard choices. The imperative to do so is a stubborn structural feature of being a nation within a nation.

C. Overview of the Paper

Challenging as it may be to reconceive Native citizenship, this paper underscores the importance of doing so. This hard work needs to be done not just in response to particular challenges (as at Ysleta del Sur and Osage) but in response to more generally applicable demographic dynamics. As we show below, the standard defaults for defining tribal citizenship—blood quantum and lineal descent—pose conundrums that few non-Indigenous societies face. Section II reviews the demographic influences on population, highlighting the force of descendancy dynamics in contemporary Native communities. Section III explains our construction of a synthetic community population displaying descendancy dynamics.

Sections IV and V extract implications from the model. Beyond the widely appreciated consequences for size (decline under binding quantum constraints and growth under lineal descent policies), Section IV shows reasonably realistic exogamy patterns imply "forever young" descendancy populations with accelerated demographic momentum. Section IV also shows that quantum-restricted descendancy populations peak and then rapidly become old, as successive generations of newborns are excluded under substantial exogamy. Section V shows that an adaptive quantum policy—i.e., a policy of lowering the quantum threshold as it begins to exclude coming generations of citizens—behaves in practical effect like lineal descent policy. Lineal descent may be an unavoidable policy for Native Nations that have experienced enough exogamy over enough time.

Section VI concludes and observes from national data on exogamy that these issues may ripen quickly in the next few decades. Finally, the paper returns to Cornell and Kalt's chapter to reamplify the Native arguments in favor of new conceptions of citizenship.

II. Exogamy, Descendancy, and Blood Quantum

A. Basic Population Dynamics

Population change is mostly a simple matter: populations grow with new births and decline with deaths. This *natural increase* (or decrease, depending on the net effect of births minus deaths) is constrained and structured by the biology of reproduction and mortality. Children are born only to women between menarche and menopause, constraining the number and timing of children born. The timing of death, of course, depends on a complex interplay of disease, public health policy, access to healthcare, lifestyles, trauma, and other factors (see, e.g., Poston & Bouvier, 2017).

Migration is sometimes a third driver of population growth and decline, meaningful in some contexts and not others. Migration may matter greatly when viewed through restrictive lenses such as

residence within given territorial boundaries. Migration is less influenced by biology than birth and death and more by economics, policy, and sociology. Accordingly, migration is less predictable and orderly than natural increase and decrease. Some migration patterns—for example movement of young adults to metropolitan settings of job growth—are strong and enduring. However, directions and volumes of flows may shift, sometimes abruptly, in the face of economic shocks or political turmoil (see, e.g., Poston & Bouvier, 2017).

In thinking about the demography of the descendancy populations of Indian nations, migration is typically not directly germane because membership in the descendancy population is not dependent on residency. It primarily affects the demography of Native population growth indirectly through the dispersal of the citizen population to settings in which endogamous unions are unlikely because few potential citizen partners are present.

Because natural increase and decrease of populations are dependent on biological processes, they are strongly determined, in turn, by the age and sex structure of the population. Populations with a high proportion of women of childbearing age will often grow even if the birth rate is low. Death can occur at any age but is strongly correlated with age, being most common at the oldest ages and historically among newborn infants, though less so in the current era. Populations with a large proportion of elderly members will grow slowly or may even decline as the higher death rates of the elderly reduce the population directly, and the lower proportion of women of childbearing ages depresses replacement births (Haupt et al., 2011).

In all more developed countries today, a principal reality of current patterns of population change is that the birth rate is typically below replacement level. *Replacement-level fertility* refers to the rate of births that will reproduce the current size of the population over time, given that population's death rate. Over the long run and given typical mortality levels in developed societies, approximately 2.1 births per woman is a replacement level—essentially enough to replace each mother and father in each generation plus a small allowance for early mortality (Haupt et al., 2011).

The commonly understood population dynamics of the United States are evident in its sex-age structure (Figure 1). This figure represents the percentage distribution of the population by age in 5-year age cohorts, with men on the left hand of the pyramid in blue and women on the right in red. Each bar represents the percent of the population of each 5-year age cohort by gender. Deaths in old age are evident in the graph's triangular shape above ages 50 to 54. The approximately vertical sides of the graph give the younger age cohorts (0-50) a roughly rectangular shape, indicating that replacement fertility and migration roughly offset mortality, cohort to cohort. Stable birth rates at or near replacement level will evolve to the form of a rectangle, that is, will have roughly the same fraction of people in most age bands, from young to old (Preston, 2018). Also evident in the graph are the Baby Boom (esp. cohorts 45–49 and 50–54) and its echo (e.g., cohorts 15–19 through 25–29). As shown below, Native population dynamics are far from rectangular.

Figure 1
Sex and Age Structure of the United States, 2010 [to be updated with 2020 Census, when available]

(US Census Bureau, 2011)

Persistent, below-replacement fertility means that populations will tend to grow smaller and older in the long run (and absent substantial migration). Relatively low births imply fewer women of childbearing years a generation later, which means fewer children, and the population's median age rises (Haupt et al., 2011). In the United States, 17 percent are 65 years old or older (US Census Bureau, 2022), and without migration, this figure is projected to be 27 percent in 2060 (US Census Bureau, 2019). In Japan today, the fraction 65 and older is 29 percent (Population Reference Bureau, 2021) and will likely exceed 40 percent by 2060 (United Nations, Department of Economic and Social Affairs, Population Division, 2019).

In the United States, the fertility rate started to dip below the replacement level in 2007 and declined to 1.64 children per woman in 2020 (Osterman et al., 2021). This feature of US demography is evident in the narrowing of younger cohorts, i.e., the “roughly vertical” sides of Figure 1 are slightly cantilevered at the bottom. The most recent official population projections for the United States grow until about 2035 and then start to decline in the absence of any migration (US Census Bureau, 2021). For decades, many countries in Europe and East Asia with below-replacement level fertility have experienced natural population decline—deaths exceeding births (Population Reference Bureau, 2021).

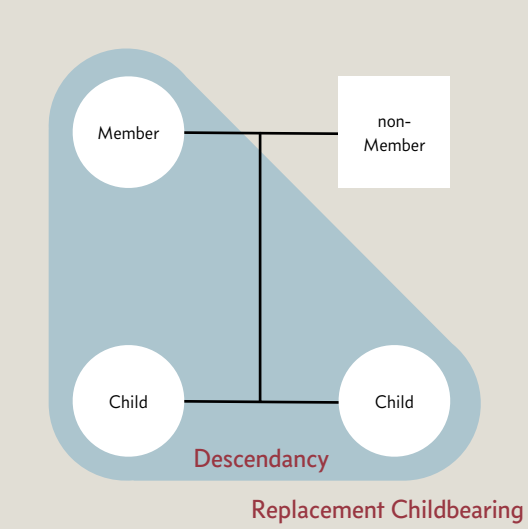
Patterns of current population change are in most respects similar for American Indian populations as for other national populations. There is one crucial difference—the high rate of exogamy.

B. Exogamy and Decendancy Populations

Demographers typically project population change with the assumption that the parents of children are both members of the same population. This assumption is reasonable for a large population like the US or Arizona. Exogamy contributes a tiny fraction of new births to national-level populations. When this is the case, demographic analysis can ignore the contribution of men to new births and focus only on the birth rates of women, which are more structured by the biological limits on reproduction than those of men. This is not to say that the role of men in reproduction is unimportant, but that in projecting future growth in a population with virtually no exogamy, the contribution of men can be ignored, and population growth studied more simply by focusing on fertility patterns of women only (Preston, 2018).

This simplifying assumption is not appropriate when predicting the future growth of a descendancy population. By "descendancy population," we mean all persons descended from an initial population such as a roll or a list of heirs. Since women and men can partner with persons who are not members of the descendancy pool to produce children, men contribute independently as parents of children who will be members of the *descendancy population*. Figure 2 illustrates this gender-neutral logic.

Figure 2
The Core of Descendancy Dynamics under Exogamy



In Figure 2, a member of the descendancy population (female or male) has two children with a non-member. The two children replace the parents in total number,[4] yet the two children double the descendancy population. Figure 2 essentially displays the population dynamics of a descendancy trust (such as those established by some of the colonizing families of Hawai'i): heirs reproduce with non-heirs.[5]

This atomic view—the vantage point of one exogamous family nucleus—makes a key feature of larger dynamics stand out. In Figure 2, replacement-level fertility *for the descendancy population* is 1, not 2, i.e., one member in the first generation and one in the second. Said another way, "regular" or "rectangular" replacement-level fertility—i.e., 2—implies extreme population growth in the descendancy population—*doubling every generation* for all exogamous pairings. This rate is equivalent to a fertility rate of 4 children per woman in a population with no exogamy—astronomical fertility not seen in the world's developed economies for a long time.

[4] For simplicity here, this discussion of Figure 2 posits replacement fertility at 2.0 children per couple. In other words, it abstracts away from the allowance for early mortality mentioned above, i.e., the approximately 0.1 greater than 2 to account for children who die before replacing themselves with offspring.

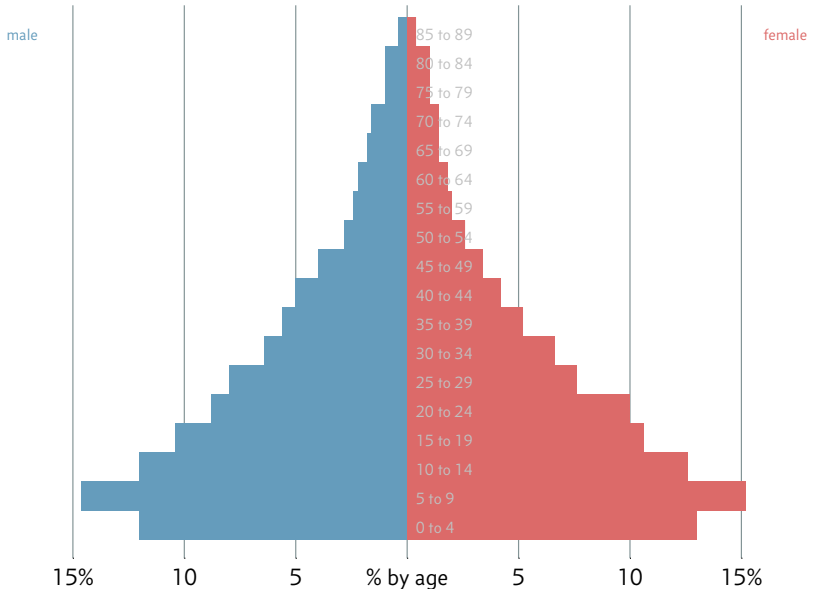
[5] While the focus of this chapter is quantum-based policies for citizenship of Native governments, the example of Hawai'ian descendancy trusts highlights how the dynamics we describe below have application elsewhere. Indeed, blood quantum complicates other spheres of Indigenous policy such as Native eligibility for shareholder status in Alaska Native Corporations created under the Alaska Native Claims Settlement Act of 1971 (see, e.g., Sealaska, n.d.) and to harvest marine mammals under the Marine Mammal Protection Act of 1972 (see, e.g., Madison, 2021).

This descendancy dynamic has important implications for Indigenous citizenship defined by parentage. First, it does not take much exogamy to quickly dwarf the trends and variation in the fertility of endogamous Indian women and men (i.e., parenting where both parents are tribal citizens). Whatever natural population growth a tribe has, in other words, exogamy accelerates it. Second, when the distribution of quanta in the community is well above the constraint—say, everyone's a full-blood, and the quantum threshold is one-quarter—exogamy doubles the *membership* of those families that practice it. Stated another way, until the quantum threshold starts disqualifying children for membership, exogamous descendancy dynamics make a population behave like it has a lineal descent policy even if it does not. Of course, the other implication of exogamy is declining blood quantum within the descendancy population and the gradual but unavoidable exclusion of people who do not meet a quantum threshold set by policy, a subject to which we will return below.

C. Demographic Momentum and Exogamy in a Descendancy Population

Populations with very high birth rates generally have pyramidal age structures. The base of the pyramid—i.e., children and young adults—has more members than the middle and top of the pyramid—i.e., middle-aged and older adults, where death rates are relatively constant or slow to change. The 1940 Census data for Indians in Arizona, for example, has such a pyramidal structure (Figure 3).

Figure 3
Arizona Indians, 1940



Visualization produced by authors from full-count 1940 census data downloaded from IPUMS (Ruggles et al., 2021).

A consequence of a youthful age structure is that rapid growth is self-sustaining. As each generation comes to maturity, the cycle of generational replacement begins anew. Young populations can grow even after fertility falls below the replacement level. Demographers call this the momentum of population growth, whereby rapid population growth is sustained for a period after fertility rates decline, as cohorts of young people pass through the portion of the life cycle where most reproduction occurs (Haupt et al., 2011).

The descendancy dynamic of Figure 2 adds to whatever demographic momentum a community experiences due to its underlying birth and death rates. In other words, the "pyramidal" dynamic of descendancy in Figure 2 (i.e., the blue triangle) adds to the pyramidal dynamic of the population (such as in Figure 3), acting to turbocharge the growth of the descendancy pool. Demographic

momentum means high exogamy rates produce "forever young" populations even if the fertility rate would otherwise fall below replacement level.[6]

III. An Illustrative Projection

To gauge the influence of these effects, we made calculations of population growth for a hypothetical "tribe" of 10,000 persons over 100 years, keeping birth rates and death rates constant and identical across projections, varying only the exogamy rate between scenarios. In particular, the scenarios set exogamy to 10%, 50%, and 90% of reproductive partnerships by Indian men and women. The purpose was to determine how the exogamy rate affected population size, age structure, and blood quantum distribution by age while holding other variables constant. In doing this exercise, we consider the results from two different points of view. The first is the point of view of the descendancy population as a whole—all descendants of the original population, regardless of blood quantum, hereinafter *lineal descent*. The second is the point of view of a Nation that has set one-quarter descent as the minimum requirement for citizenship.[7]

We represent this initial population in a conventional age-sex pyramid in Figure 4. The shape of the figure parallels that of the actual Arizona Indian data for 1940 (i.e., Figure 3), showing generally declining numbers of people in each age group—a result typical where birth and death rates are both high. The gray region demarcates the cohorts into three groups: young (ages 0 through 19), working-age (ages 20 through 64), and old (ages 65 through 90+).

[6] If birth rates are well below replacement—as they are in Japan and several European countries—the population structure may resemble an inverted pyramid, with more elderly persons than children or young adults (Preston, 2018).

[7] Assumptions for the projection follow in this note. We used the 1970 all races age-specific fertility rate schedule. (Total fertility rate, 2.42). Survival rates were from the 1970 decennial lifetable for the non-White population of the United States. (Life expectancy, 60 years for men and 69 years for women). The starting population was from the census American Indian population for Arizona in 1920, smoothed by running the projection for 100 years without exogamy, then standardized to 10,000 persons. We assumed that all persons in the starting population were 100% blood-quantum citizens of the hypothetical tribe. Other simplifying assumptions are: 1) we assume randomness in choice of spouse; and 2) fertility and death rates are not related to the race of spouse. Our projections do not reflect an attempt to model what happened between 1920 and 2020 or any other historical period. Rather, the purpose is to illustrate the impact of exogamy on population growth, age structure, and blood-quantum by age, holding fertility and mortality constant.

Figure 4
Age-Quantum Starting Point

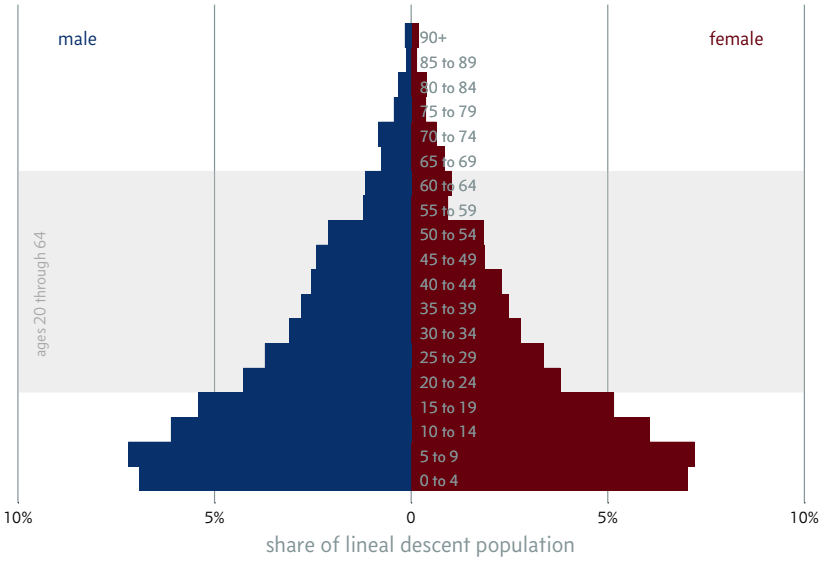
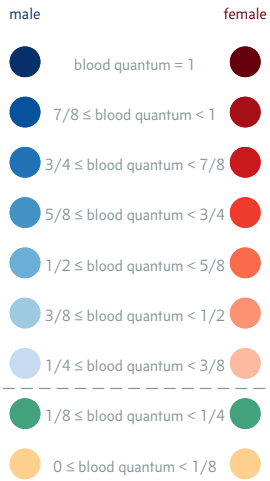


Figure 5 shows the legend applicable to Figure 4 above and Figure 7 below. The use of the darkest shades of red and blue in Figure 4 means that, by our beginning presumption, everyone in the starting population is a "full-blood" member of the tribe. That will change in subsequent figures, as children are born to exogamous unions, and blood quanta start to vary. We shift to lighter shades of red and blue for lower blood quanta and then (as indicated below the dotted line in Figure 5) to green to represent less than one-quarter but at least one-eighth, and then all remaining lineal descendants in yellow.

Figure 5
Legend for Age-Sex-Quantum Pyramids

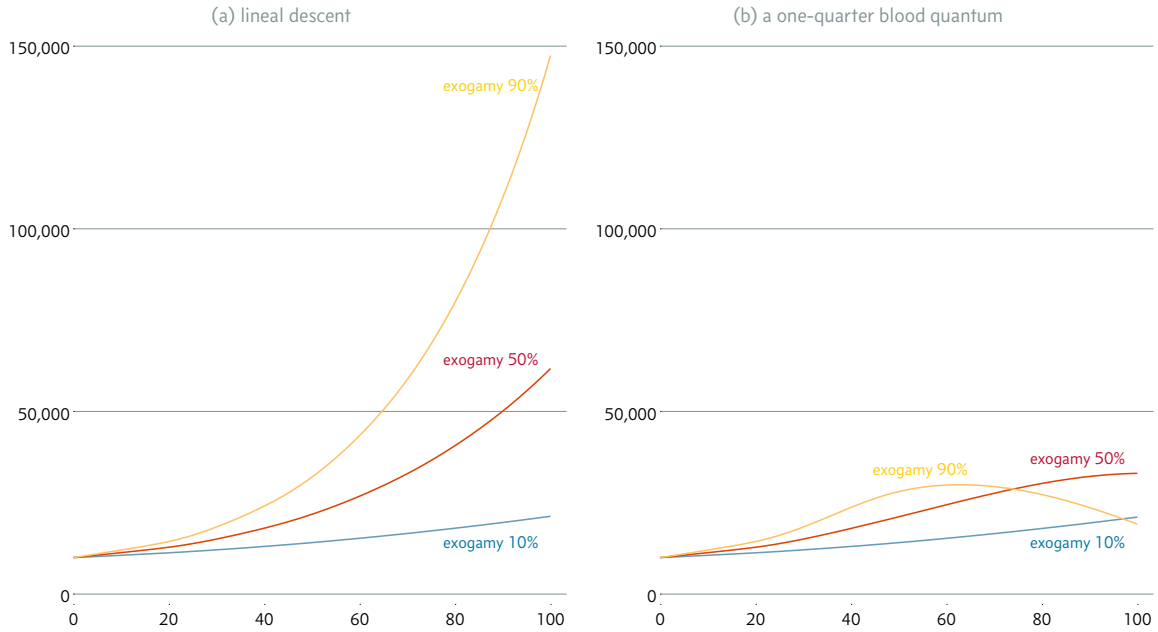


IV. Results of Illustrative Projections

A. Growth of the Descendancy Population and the Nation

The effects of variation in the exogamy rate on population growth and age structure are dramatic. Figure 101 shows population growth under each of three exogamy scenarios: low exogamy (10% parentage with non-citizens), moderate (50% parentage with non-citizens), and high (90% parentage with non-citizens). The panel on the left shows the growth of the descendancy population, and the panel on the right shows the trajectory of the enrollable citizen population, assuming a one-quarter blood-quantum requirement for citizenship.

Figure 6
100-Years of Population Growth Under Lineal Descent and One-Quarter Quantum Rolls



Under each scenario, assuming constant fertility and mortality, the descendancy population will grow exponentially. However, over time, the growth rates will diverge sharply. After 33 years with 10 percent exogamy, the population is 12,400; with 90 percent exogamy, it is nearly 20,000—1.6 times as numerous. After 100 years, the differences are much more significant: the 10% exogamy population has grown to 21,300, whereas the 90% exogamy population has grown to 147,400—nearly seven times more. Over time, these differences will continue to increase at an ever-growing rate.

The story is very different for the growth of the enrollable citizen population under a one-quarter quantum. In this scenario, at 33 years, the 90 percent exogamy citizen population has grown much more rapidly, to nearly 30,000. The 50 percent population is almost as large, at more than 26,000. The 10 percent exogamy population has continued steady, but much slower growth, to 16,000.

At 100 years from baseline, the pattern has changed sharply. At this snapshot, the 90 percent scenario population has fallen to just over 19,000—not very different from, though slightly less than, the 21,000 citizens in the 10 percent exogamy scenario. However, the trajectory is very different. Inevitably, the 90 percent exogamy citizen population will decline towards zero, and in short order. Meanwhile, the 50% exogamy citizen population increases more rapidly than the 10% scenario. However, with exogamy this high, there will inevitably be a peak and decline to zero. With 10

percent exogamy, the peak and fall will be much later and maybe off the scale of humanly meaningful time frames.

B. Age Composition

The effect of the exogamy rate on the projected age distribution is similarly dramatic (Table 1). Each exogamy scenario begins with the same year zero base: 51.1 percent of the 100% full-blood base population is under 20 years of age, while 5.2 percent is 65 years or older. Over the 100-year projection horizon in the descendancy population, the percentage under 20 drifts down to 44 percent in the low exogamy scenario and up to 61.5 percent in the high exogamy scenario. The portion over 65 evolves to 6 percent with low exogamy and below 1.8 percent with high exogamy. These differences between the low, medium, and high scenarios are driven by the "extra" births attributable to the introduction of additional partners from outside the tribe with higher exogamy—i.e., the descendancy dynamics of Figure 2.

The age distribution of the one-quarter quantum plus population (right half of Table 1) after 33 years of exogamy is virtually identical to that of the descendancy population. The divergence does not begin to take effect until the third generation as blood quanta fall below one-quarter. Likewise, the low (10 percent) exogamy scenario displays virtually identical age profiles because relatively few children fail to qualify for membership over a century, and the lineal descent and one-quarter quantum populations have nearly identical age profiles.

Table 1
Percent Young and Old by Exogamy Rate: Lineal Descent vs. One-Quarter Quantum

	Lineal Descent Population						**Population One-Quarter or Higher**					
	Exogamy Rates						Exogamy Rates					
	10%	50%	90%	10%	50%	90%	10%	50%	90%	10%	50%	90%
	Percent Under 20			**Percent 65+**			**Percent Under 20**			**Percent 65+**		
year 0	51.1	51.1	51.1	5.2	5.2	5.2	51.1	51.1	51.1	5.2	5.2	5.2
year 33	45.4	54.0	60.4	4.5	3.3	2.5	45.4	54.0	60.4	4.5	3.3	2.5
year 66	44.1	54.3	61.6	6.0	3.0	1.7	44.0	46.6	29.3	6.0	3.7	3.6
year 100	44.0	54.3	61.5	6.0	3.1	1.8	43.7	35.4	4.0	6.0	6.8	22.4

As the higher exogamy scenarios develop, however, the changes in age composition are much more dramatic and non-linear. In the 90% exogamy scenario, the percentage of young citizens falls to 29.3% at year 66 and just 4% at year 100. The 50% exogamy scenario also shows a steady decline in youth, to 46.6 percent at year 66 and 35.4% in year 100.

An opposite pattern is seen for the population aged 65 years and older. Under the 90% exogamy scenario, the proportion remains relatively constant until toward the end of the 100-year projection, at which point it explodes to almost one-quarter of the citizen population (22.5%). The 50% exogamy scenario shows the beginning of the upswing in population aging at the 100-year mark. In both cases, population aging reflects declines in enrollment at younger ages as the blood quantum excludes more and more young people. As was the case with the share of children, the low exogamy scenario (10%) leaves the share of the older population relatively constant.

In sum, a higher rate of exogamy leads to the rapid growth of the descendancy population and keeps the descendancy population young. The higher the exogamy rate, the greater the share of the child population, and the smaller the share that is elderly. This pattern directly results from the multiplier effect of exogamy on the fertility rate—a high exogamy rate increases the number of children born in each successive generation compared to the one preceding. For a time, the trend is the same in

the quantum-constrained population. Eventually, however, the blood quantum requirement for enrollment begins excluding members at the bottom of the age distribution, and the citizen population rapidly becomes disproportionately old.

C. Age and Blood Quantum

Where exogamy rates are high, cohorts move quickly to lower average blood quantum levels, beginning at the youngest echelons. Figure 7 illustrates this relationship graphically for the three projection scenarios (10%, 50%, and 90% exogamy). The shaded rectangle indicates each graph's working-aged cohorts (ages 20 through 64).

Table 2 reports the same projections quantitatively, showing the percentage of a given age group (young, working-age, old) in each of five ranges of quantum. In other words, for each time snapshot (33, 66, and 100 years), the columns sum to 100 percent except for rounding. For example, in the 10% exogamy scenario in year 33, 1.6% of youth are projected to have blood quantum between one-half and one quarter, 28% of youth between one-half and full, and 70.4% of youth remain full blood. In that same scenario and year, only 7.5% of working-age members are not full-blood members, and all old members are full-blood members. The shaded rows qualify under a one-quarter quantum policy, and the unshaded ones do not.

In Figure 7 and Table 2, the first column projects the hypothetical Indian nation with an exogamy rate of 10 percent. Even after 100 years, 86.9% of the descendancy population has a blood quantum of one-half or better, and 98.7% have a one-quarter quantum or higher. Thus, a one-quarter quantum requirement would deny citizenship to just 1.3% of descendants. These numbers would slowly start to rise in the next generation or two. Still, the percentage of descendants facing exclusion would remain small for a long time, raising few major distributional questions for ages.

The two columns to the right tell a different story. At the extreme—i.e., with an exogamy rate of 90 percent—it would take some time, at least three generations, before a population of full-blood members started to appreciably disqualify youth under a one-quarter quantum requirement (the small green region in Figure 7(g). After 33 years, more than half (56.6%) of qualifying youth will have a quantum of less than one-half, meaning that any exogamous offspring would not be eligible for enrollment. As those cohorts matured into their reproductive years, discussion about enrollment policy could be expected to intensify.

By the next interval (66 years), the effects of a quarter-blood quantum will have profoundly changed the demography of the tribe. At this point, where the fourth generation of exogamy rises, most newborns will not qualify for citizenship (e.g., bottom bars in Figure 7(h)). Given this high exogamy rate, the one-quarter quantum policy will create an aging cohort of citizens whose children will not qualify for enrollment. By 100 years, the preponderance of descendants under 65 would not be eligible. In other words, on the way to demise, a tribe with strong exogamy would become demographically dominated by the old.

Unsurprisingly, the age-quantum distributions in the middle column (50% exogamy) display age-quantum dynamics between the low and high scenarios. Through year 33, few descendants have failed to qualify. By year 66, just a small fraction (17.3%) of the descendancy population is excluded. However, the dynamic is poised to change dramatically and rapidly.

Note in the middle figure (Figure 7(e)) and the corresponding central panel (year 66 of the 50% exogamy scenario), more than two-thirds of then-eligible young people—those ages 20 or younger conforming with the one-quarter quantum—have less than one-half blood quantum, and thus will not have citizenship-eligible children in an exogamous relationship. By the 100-year mark, most members of the descendancy population will be excluded from citizenship, and a large majority of citizens under age 65, including almost all youth, will have less than one-half blood quantum. This stage represents the condition of some contemporary tribes wherein parents and grandparents are

becoming politically active about whether their offspring will be excluded from the tribe. We will return to that subject in Section V.

Figure 7
Age-Quantum Evolution with Exogamy

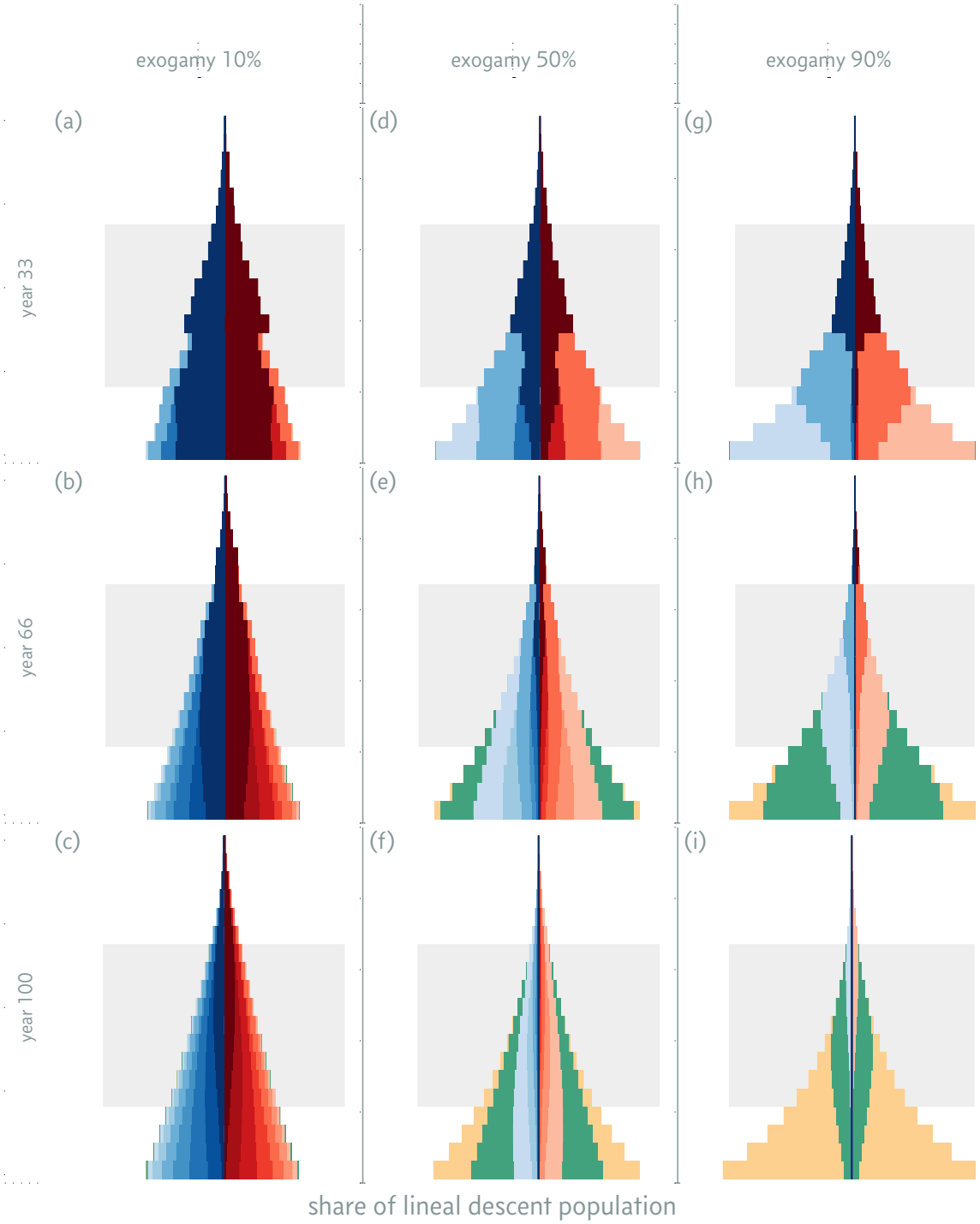


Table 2
Percent of Young (<20), Working-Age (20-64), and Old (65+) Descendancy Populations by Quantum

		Exogamy Rate											
		10%				50%				90%			
	age → quantum ↓	< 20	20 - 64	65+	All	< 20	20 - 64	65+	All	< 20	20 - 64	65+	All
year 33	< 1/8												
	1/8 < 1/4					0.1				0.3			0.2
	1/4 < 1/2	1.6			0.7	25.1			13.5	55.4			33.5
	1/2 < 1	28	7.5		16.5	58.6	32.5		45.5	42.8	51.7		45
	1	70.4	92.5	100	82.8	16.3	67.5	100	40.9	1.6	48.3	100	21.4
year 66	< 1/8					2.6			1.4	13.5			8.3
	1/8 < 1/4	0.6	0.1		0.3	26.5	3.5		15.9	63.9	13.2		44.2
	1/4 < 1/2	7.6	2.4		4.6	47.2	32		39.3	21.6	56.6		34.1
	1/2 < 1	59.2	33	1.3	42.7	23.3	52.4	6.2	35.2	1	29.1	10.9	11.5
	1	32.6	64.5	98.7	52.5	0.4	12.1	93.8	8.2		1.1	89.1	1.9
year 100	< 1/8	0.2			0.1	29.9	8		19.6	88.1	36.9		67.7
	1/8 < 1/4	1.9	0.8		1.2	40.3	29.7	0.3	34.5	11.4	46.9	1.2	24.2
	1/4 < 1/2	16.2	9	2	11.8	27.3	43.8	30.2	34.4	0.5	15.3	64.1	7.1
	1/2 < 1	76.2	62.5	30.4	66.6	2.6	18.1	56.1	10.9		0.9	33.5	1
	1	5.5	27.8	67.6	20.3		0.5	13.4	0.6			1.2	

Where exactly contemporary Native nations might fall in Figure 7 / Table 2 depends on each nation's history, roll, exogamy, and policy. It bears repeating that the columns each display *constant* exogamy for over a century. This modeling simplification is unrealistic. Over the twentieth century, changes in transportation, employment, urbanization, migration, communication, and social relations have all tended to raise Indian exogamy. Thus, the experience of Indian Country over the last 100 years has been to move diagonally from the upper left toward the lower right of Figure 7 and Table 2 rather than display a constant rate of exogamy. And while there is variation in exogamy across tribes, rising exogamy seems generally irreversible.

Notwithstanding its simplification of exogamy, this exercise highlights several dynamics worthy of tribal attention. Beyond the well-known dilemma between lineal descent explosion or quantum collapse, tribes with quantum-based policies will have to be prepared for rapid aging, accelerated demographic momentum, and the intensification of debates about citizenship policy. To reiterate, exogamy means that as the young are excluded, the old make up a larger and larger share of the population. Exogamy turbocharges demographic momentum, enlarging the bases of the pyramids at the bottom of Figure 7 by compounding underlying fertility with the descendancy dynamics of Figure 2. And after a certain time, the operation of exogamy energizes parents of less than one-half quantum to begin advocating for changes in membership policy.

V. Is Lineal Descent Avoidable?

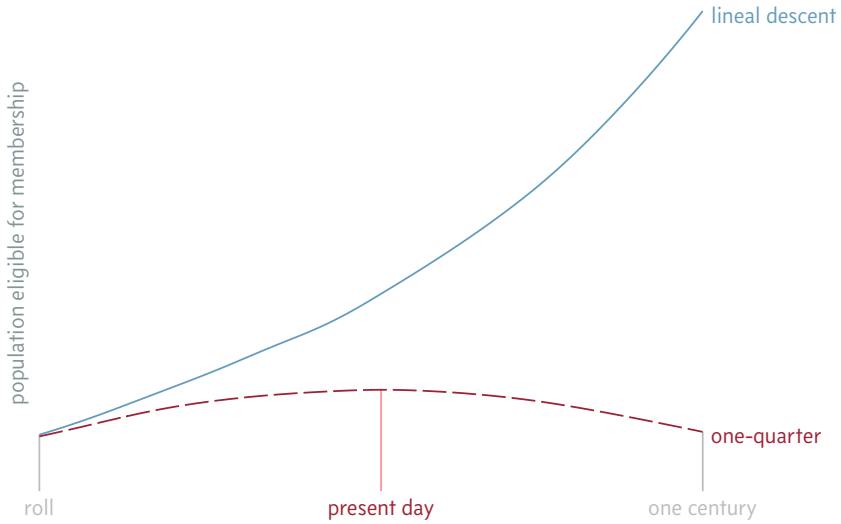
We assumed an Indian nation with a one-quarter blood quantum enrolment requirement in our hypothetical projections. One-quarter is a common threshold among many tribes that adopted a boilerplate constitution supplied by the Office of Indian Affairs during the Indian Reorganization Act era of federal-tribal relations. Regardless of its origins, demographic dynamics under high exogamy

are starting to force tribes to confront the demographic consequences of a one-quarter quantum. As we have seen, quantum-limited populations peak, and rising ineligibility brings a policy reckoning.

An obvious response would be to lower the quantum by a notch. If the constitution specifies a one-half blood quantum requirement, reduce it to one-quarter. If it is at one-quarter, drop it to one-eighth, and so on. Such a strategy may seem to address the politics of peak and decline, but Native nations' ability to "buy time" may be more problematic than it would appear.

Figure 8 portrays the two membership population trajectories schematically. The graph begins with a membership roll about a half-century ago. It displays the population eligible for membership under a one-quarter blood quantum policy (long dashes) and a lineal descent policy (solid line) for an entire century after the roll. The present day is located at the peak of the one-quarter quantum population projection, rendering it a time of reckoning.[8]

Figure 8
Membership Policies Compared: A



This peak is a time of reckoning for membership policy because the decline of eligible member children is foreseeable (if not already present). Parents and grandparents will observe and may become politically vocal that their mixed-parentage children and grandchildren won't be full-fledged citizens of the tribe. In such an eventuality, a potential "middle path" between population collapse or explosion surfaces: reduce the qualifying quantum fraction in hopes of buying some demographic breathing room.

[8] Though the depictions in Figure 8, Figure 9, and Figure 10 are schematic, we can report from experience that the shapes and timeframes are realistic. Other quantum policies (½, ⅛, etc.) display similar dynamics, albeit with different time frames depending on the historic accumulation and evolving pace of exogamy.

Figure 9
Membership Policies Compared: B

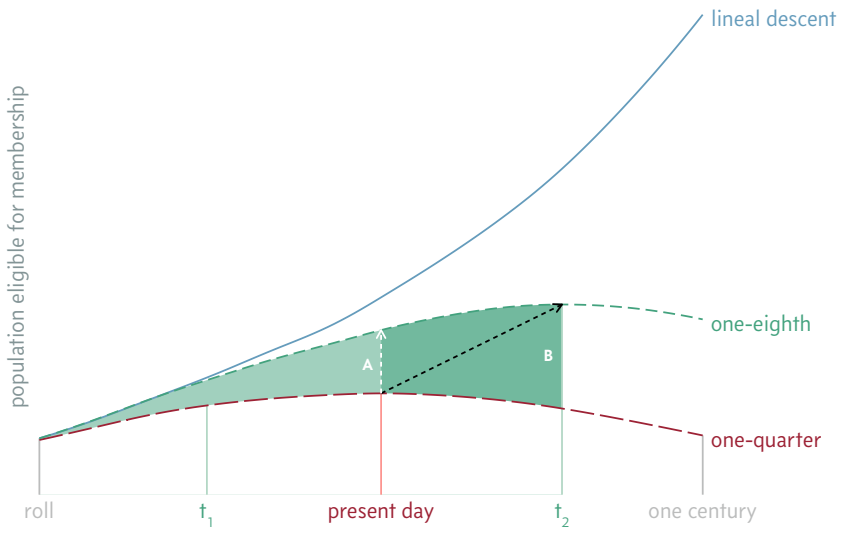


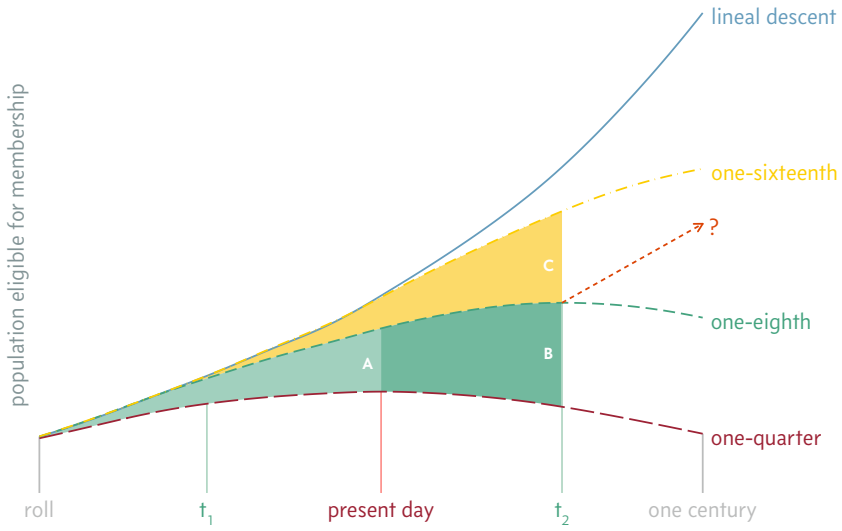
Figure 9 adds a population projection from the time of the roll forward under a one-eighth quantum policy (short-dashes). Wedge A represents the descendants of the roll who would have qualified under a one-eighth policy but were historically excluded by the one-quarter policy. Polygon B captures the eligible population looking forward from the present. The vertical arrow to the right of the letter A indicates the step-up in the eligible population resulting from the quantum reduction—that is, the then-living one-eighth descendants who become eligible on the day of the policy change. The rest of Polygon B shows the subsequent eligible population growth (diagonal arrow). The quantum reduction permits membership eligibility to rise until its peak at time t_2.[9]

Note that Wedge A fills the gap with the lineal descent trajectory closely until about time t_1 and only deviates slightly after that to the present day. In other words, the quantum reduction behaves quite similarly to a retroactive lineal descent policy. It increases the population eligible for membership in the present to most of what it would have been had the community set a lineal descent policy in the first place. Further note that the policy only buys a limited amount of demographic breathing room—the one-eighth quantum peak at t_2 arrives around a quarter-century later, well within a lifetime.

[9] The distinction between "eligible to enroll" and actually enrolled is important for all manner of tribal policies, but it is challenging to model. Some eligible people will not be interested in overcoming the documentary and other hurdles to actual enrollment. Not everyone eligible will enroll on day one. Enrollments will reflect the financial and non-financial stakes of being a member; the geographic, bureaucratic, and other barriers that must be overcome to participate in citizenship; and the tribe's efforts to encourage or discourage enrollments. The actual population trajectory will tend to fall between the vertical and diagonal arrows and may or may not fully reach the one-eighth line. The remainder of this discussion will abstract away from these nuances, focusing only on the eligible population.

At that point, t_2, the demographic decline of the tribe and the rising ineligibility of offspring will again raise the question of a quantum reduction. Figure 10 displays another reduction to one-sixteenth (dotted and dashed line). Again, the change would buy more time (i.e., the new peak looks to be about a quarter of a century to the right of the chart). But note that the reduction again retroactively behaves like a lineal descent projection. Wedge C "fills in" the membership up to the lineal descent line retroactively (just as Wedge A did).

Figure 10
Membership Policies Compared: C



While a strategy of relaxing the quantum at a later date is in play, non-qualifying lineal descendants are excluded from full participation in the life of the tribe in their youth. Then they are retroactively included for their remaining lifetimes from the policy change until their deaths. In other words, "kicking the can down the road" marginalizes the low-quantum portion of the lineal descendancy population (potential members in Wedges A and C in Figure 10) in the formative stages of their lives. At those stages, investment in their values, social connections, and human capital might have the most significant payoffs to the tribe. Then when they are older, lowering the quantum would require reintegrating them into the community later in life. Such people would grow up without the benefits of member-only public goods, services, and amenities such as culture camps, college scholarships, tribal internships, down payment assistance programs, or per capita distributions. They would also be deprived of the opportunities to make civic contributions in elections and other roles of full-status citizens. Under such marginalizing pressures, newly qualifying members could also be expected to have weaker loyalties to the community upon their admission to membership.

Figure 8, Figure 9, and Figure 10 also pose the more profound question: Is a lineal descent population trajectory unavoidable for tribes with quantum-based policies at or near their peak? Today, Native nations experience differing quantum distributions and exogamy patterns, which determine the timing of peaks (i.e., the number of years between "present day" and t_2) and the heights of the trajectories in the hypotheticals above. In other words, some tribes will encounter the question sooner rather than later.

However, unless a Native nation has a distribution of blood quanta well above its membership threshold, most tribes with blood-quantum rules are encountering the "day of reckoning" or will within current lifetimes. When they do, they will face pressures to reduce the quantum, and to work, that reduction must make more lineal descendants eligible for membership. Unless a coalition can

feasibly reduce eligibility by heavy-handed cutoffs, e.g., by birthdates or residency (in which case the policy is not a neutral quantum-based policy anymore), the reduction in quantum will add Wedges A and C, producing virtually the same demographic trend as a lineal descent policy.

Thus, a lineal descent trajectory appears unavoidable under a stepwise declining quantum policy while also being socially disruptive along the way.[10] What's more, the timetables are plausibly relatively short across a wide range of Native nations: on the order of a quarter-century between peaks. Thus, in contrast to Haudenosaunee seven-generations thinking, this dynamic risks forcing one-generation thinking in membership policy. These dynamics point to the necessity of exploring other means of determining citizenship. These might include matrilineal or patrilineal descendancy, traditional kinship relations, civic participation, residency, naturalization, and a multitude of their permutations.[11]

VI. Conclusion

The implications of descendancy dynamics under high exogamy are straightforward. 1) The descendancy population will snowball if fertility rates are in the range commonly observed in the United States today, i.e., between 1 and 2 children born to each Indian parent. 2) The descendancy population will have a youthful age structure and demographic momentum. 3) Tribal blood quanta will decrease rapidly over time and be correlated with age. 4) If blood quantum thresholds determine citizenship, the citizenship population will—after a few generations—start to shrink and skew elderly at an increasing pace. 5) As the falling blood quanta start to disqualify newborns, political pressure may grow to lower the quantum threshold—from ½ to ¼ or ¼ to ⅛. 6) Successively lowering the quantum only buys about a generation each time, puts the population virtually on a lineal descent path anyway, meanwhile disrupting lives, creating inequities, and raising internal tensions as descendants fail to qualify and then qualify, fail to qualify, then qualify.

How high are exogamy rates within Indian nations today? Census data show that racial exogamy rates for self-identified American Indians have exceeded 50 percent for decades (Sandefur & McKinnell, 1986; Wang, 2015). But census-reported American Indian race is not the same as citizenship in an American Indian nation (Thornton, 1997). These rates likely overstate the exogamy rates in a few tribal communities in areas of substantial territorial sovereignty on trust lands with large tribal populations and a high degree of spatial segregation from non-tribal populations. However, the continuing geographical dispersal of the citizen population of Indian nations is likely driving exogamy rates well above 50 percent for most nations and close to 100 percent for many smaller and highly dispersed nations. At these levels, the logic of descendancy dynamics drives the rapid growth of descendancy populations and rapid shrinkage and aging of the quantum-constrained populations (or the deliberate lowering of blood quantum thresholds). If nations are not at the time

[10] It may be argued that the roll could be re-started in some way—say, by legislating that everyone alive at the "present day" would be deemed a "full-blood" member. Doing so, however, would: a) not address the problem of the then-living offspring who would qualify under one-eighth, one-sixteenth, etc. but not qualify under one-quarter, and b) produce unequal outcomes for offspring born before and after the re-determination, e.g., two descendants of equal quanta but with different eligibility arising from their birthdates being on either side of the policy change. The ethical and practical issues emanating from such putative "work-arounds" can be expected to impede the formation of an authorizing coalition for the policy change in the first place, rendering such policies mostly theoretical—rather than politically viable—propositions.

[11] Our co-contributor to this volume, the anthropologist Jessica Cattelino, points out that many matrilineal, patrilineal, matrilocal, kinship, and other systems define human groups worldwide. She also observes that contemporary Native nations use different frameworks simultaneously. For example, the Seminole Tribe of Florida uses matrilineal rights to dance at the Corn Dance (Cattelino, personal communication, 15 Nov 2018). It also uses a quantum-based policy for membership (see, e.g., Seminole Tribe of Florida, n.d.).

of reckoning now, current exogamy patterns will likely drive them to it in the next one or two generations. Tribe's citizenship databases will, of course, provide precise data that each nation can consult for their own deliberations.

We set aside the question of whether blood quantum is meaningful from a social or moral point of view. Does the quantity of tribal blood quantum determine social connection to an Indian community? Assuredly not. It may be empirically correlated with participation in denser interaction networks between tribal community members. However, the steadily declining significance of geographic distance for social interaction in an age of instant global communication ensures that the association will be variable and shaped by the choices and preferences of individuals, not mere reproductive biology. Alas, blood quantum *remains* politically and legally meaningful because it continues to be used as a criterion for citizenship by Native nations.

In their contribution to Ratteree and Hill's *The Great Vanishing Act*, entitled "From Tribal *Members* to Native Nation *Citizens*," Steve Cornell and Joe Kalt (2017) relay several Indigenous conceptions of belonging. Among them are:

- Oren Lyons's[12] crisp formulation:

  > Are you a member of the United States? Onondaga is not a club. We don't have members. We're a nation. We have citizens. (292)

- Tipene O'Regan's[13] pointed challenge:

  > Until we come to terms with the question of what we want to be as a people, there is...no need for any strategic direction beyond making cash and distributing it more or less efficiently and more or less equitably. If that's all the membership of an Indigenous culture amounts to, then why bother? (295)

- Deron Marquez's[14] ambition for tribes "to define 'citizenhood' beyond the modem understanding," and instead root it in "an ethno-cultural understanding" of how individual and community relate to each other (294).

- Regis Pecos's[15] view

  > that citizenship for his community involves a commitment to care for, preserve, and enact the core values of community life, values with ancient roots that are seen as essential to community survival and the welfare of coming generations and that shape the organization and processes of tribal self-government." (204)

And David Wilkins's[16] observation that Tribal sovereignty emerges from:

> spiritual values [and] kinship systems...that enabled each Native nation, and the individuals, families, and clans constituting those nations, to generally rest

[12] Faithkeeper, Onondaga Nation.

[13] A senior leader in Ngai Tahu, the large *iwi* of the South Island of Aotearoa, New Zealand.

[14] Former Chairman of the San Manuel Band of Mission Indians.

[15] Former Governor of Cochiti Pueblo.

[16] McKnight Presidential Professor of American Indian Studies at the University of Minnesota.

> assured in their collective and personal identities and not have to wonder about "who" they are. (300)

These and many other Native views conceptualize *belonging* expansively. We admire these broad conceptions of the bounds of community. We endorse Native nations' unwinding of settler states' constitution of Indigenous polities on a foundation of *membership*. And we applaud (and subscribe to) the notion that *citizenship* describes multidimensional, multidirectional relationships between individuals and community.

As Cornell and Kalt have emphasized throughout their years of work with and service to Native Nations, developing structures and processes that permit the evolution of culturally appropriate solutions to governance challenges is essential to creating a context in which Native Nations can thrive.

Many Indian nations have focused on blood quantum as an objective determinant of who is in and who is out. We know that this focus is increasingly controversial in Indian communities. Many Indians are repulsed by the divisions that blood quantum thresholds create. We also know that many nations have self-consciously made the decision—or not unmade the decision—to continue to use blood quantum in this way, despite the divisions and repulsion it creates. They do this presumably because they fear that the inclusion of the entire lineal descent raises profound challenges to the integrity of Indian nations as distinct, coherent, and sustainable communities.

It is not our place to prescribe a resolution to this challenge. What this chapter does point to, however, is an empirical matter rather than a question of values: Blood quantum citizenship thresholds will be of rapidly diminishing practical value to define the boundaries of Indian nations because the logic of descendancy dynamics is increasingly likely to present a choice between the explosive growth of lineal descent or shrinkage and aging of citizen populations—a choice that may not exist at all to the extent that reducing the quantum in stages mimics lineal descent anyway. Other concepts of belonging are needed to provide more durable, equitable, effective, and culturally resonant boundaries of Indian community.

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