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Abstract

The socioeconomic condition of Indigenous Peoples in North America is the worst among all ethnic and racial groups. I propose a theory that attributes their health condition to the steady erosion of their culture and the attendant damage to their identity. The analysis, instead of positing a preconceived neoclassical view of Indigenous Peoples’ objectives, attempts to capture what they themselves consider to be the essence of their culture that is based on a deep attachment to their land. In a simple model of an Indigenous economy that produces food and a cultural good, I show, surprisingly, that a band’s wellbeing can be higher with communal property than with private property, despite the standard free-riding problem associated with communal property—a result that is consistent with the Theory of the Second Best. Drawing on studies in psychology, psychiatry, and neuroscience that characterize the effect of trauma on behavior, I then set out a very simple intertemporal model that illustrates the wellbeing and health consequences (like lifespan and suicide rates) to contemporary Indigenous Peoples of the unremitting assault on their identity over centuries.

Key Words: Indigenous, property rights, communal land, identity, trauma, substance abuse and suicide

JEL Classification Nos.: P14, P51, Q15, J15, Z1, D10, D12, I10, I12

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1. Introduction

Indigenous Peoples (a term I will use for peoples called American Indian/Alaskan Native in the U.S. and as First Nations peoples, the Métis, and the Inuit in Canada) are unambiguously the ethnic/racial groups that have the worst statistics of all North American groups in the terms of socioeconomic status and health outcomes. The life expectancy of Indigenous Americans is about 5 years less than that of non-Indigenous peoples. The incidence of most of the highly prevalent diseases (heart disease, diabetes, respiratory disease, liver disease, alcohol-related disease, PTSD, and many others) is higher than those among the rest of the population. In 2018, the poverty rate was 25.1% for Indigenous Americans, as opposed to 8.1% for whites, and the unemployment rates were 6.6% and 3.5%, respectively. In Canada, the life expectancy is considerably lower (up to nine years) for the First Nations peoples than the non-Indigenous people; infant mortality rates are much higher in regions with high concentration of Indigenous peoples. In 2016, the community wellbeing index, which aggregates community averages over four socioeconomic measures (income, education, labor force activity, and housing) was 19.1 points lower (on a scale of 0 to 100) for First Nations communities relative to non-Indigenous ones, which amounted to about 25% difference between the two indices. In this paper, I offer a theory that takes a step towards answering the question: Why is this the case?

In proposing an explanation, I take into account what is special about the cultures and the long history of Indigenous Peoples in North America. I investigate the possibility that it is the erosion of Indigenous culture and identity that is a root cause of their contemporary predicament. To do so, instead of foisting standard neoclassical theory in identifying the most proximate causes, I adopt an approach that takes a more deliberate view of what Indigenous Peoples themselves say about the essential aspects of their culture. At the heart of their view is the recurring claim that land is of central importance in their societies, and this not just because they were traditionally hunting/gathering and farming societies. Rather, land was the lynch-pin around which their entire

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3 Tjepkema, Bushnik, and Bougie (2019); Key Health Inequalities in Canada: A National Portrait. See Feir and Akee (2019) for a detailed analysis on mortality.
5 What seems rational from the point of view of neoclassical economics may not so in an Indigenous culture [Hill (1966)].
identities and cultures were built. This is reflected in their claim often made about Indigenous land, “I belong to the land,” in sharp contrast to the western (neoclassical) view of property that asserts “This land belongs to me” [Noble (2008)].

Using the analytic tools but not necessarily the underlying premises of neoclassical economics, I model how this difference in the concept of property rights translates into the unique functioning of the Indigenous Peoples’ economy. In the model I propose, culture is a collective activity that contributes to the Indigenous Peoples’ sense of self or identity (the concept that responds to the question, “Who am I?”). I compare the performance in terms of wellbeing of the traditional Indigenous tribe with that of one based on private property, all else constant. I demonstrate the welfare superiority of communal ownership of land over that of private ownership, despite the standard neoclassical argument about free-riding when ownership is common. This superiority stems from the fact that, when there are two externalities at play that undermine efficiency in the neoclassical sense, eliminating one (by privatizing land, in this instance) can actually worsen the outcome when culture is important—in line with the Theory of the Second Best [Lipsey and Lancaster (1956)].

Social psychologists have documented strong evidence that there are two components to the sense of self: the individual component (“I” or “me”) and the social or collective aspect (“Us”) [Tajfel (1982), Tajfel and Turner (1979)]. The extent of the ‘I’ and ‘Us’ dichotomy depends on culture and the nature of the activities that facilitate production and survival. The analysis I present in this paper lends itself to the construction of a proxy for the concept of identity, a proxy that embodies Indigenous Peoples’ attachment to land, to cultural beliefs and practices, and to their land-centered religion. It is this identity that is undermined and seriously fragmented when Indigenous Peoples have their land taken away, when they are uprooted from the traditional lands and relegated to reserves, when western notions of property are forced on them, when their children taken away forcibly and put into boarding schools to purge the “Indigenousness” out of them, when their languages are systematically discouraged in favor of English or French, and when their traditional religions are sought to be replaced by Christianity.

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6 For an evolutionary rationale for the origin of these components of self, see Eaton, Eswaran, and Oxoby (2011).
For reasons that my model will make clear, I offer the erosion of identity as the core reason that the U.S. government’s subsequent allotment of reserve land as private property to Indigenous Peoples (The Dawes Act of 1887) was an abject failure.\(^7\) Had the Indian Act in Canada attempted the same thing as a way to incentivize Indigenous Peoples (in standard neoclassical fashion), it would likely have been met with the same results.

Indigenous Peoples were subjected to a great deal of historical trauma, which was the result of a continuous series of upheavals they encountered over the past five centuries that left them no time to recover their cultural roots. There is an established literature in economics that has demonstrated the persistent effects of major historical events\(^8\), and the concept of ‘historical trauma’ has been applied to long-term psychological and health consequences of trauma over generations.\(^9\) In the context of Indigenous Peoples, Feir, Gillezeau, and Jones (2021) have recently demonstrated that Indigenous groups that were very bison-dependent and so were most affected by the extinction of the bison towards the end of the 19\textsuperscript{th} Century still show diminished physical stature and also a proclivity for higher suicide rates. Traumatic events very likely increased the salience of the cultures to the Indigenous Peoples because, as social psychology has demonstrated with studies across countries, an important aspect of culture is that it serves as a buffer against existential anxiety [Greenberg, Solomon, and Pyszczynski (1997)]. Studies from neuroscience, psychology and psychiatry have recently been coming up with robust evidence on how trauma is associated with PTSD and chronic illness [Thayer et al (2017), Bremner (2006)]. I glean from these studies the changes that trauma brings about in behavior that would impinge on economic and health behavior due to the erosion of their culture.

Using these studies, I finally set out a simple intertemporal problem that illustrates what effects these traumas have on economic choices and health among Indigenous Peoples. The model shows that trauma tilts choice away from healthy consumption that boosts human capital (health) and reduces the life expectancy of Indigenous Peoples. In this manner, I illustrate how the erosion of Indigenous identity, centered on land and their culture, may be contributing to their present economic, social, and health conditions. My view emphasizing the crucial role of identity

\(^7\) Part of the reason for forced farming reservations and individual plots is to force Indigenous Peoples into sedentary settlement as opposed to being nomadic.
\(^8\) See Nunn (2009) for a review of the literature.
in this context is consonant with that of the psychologists Chandler and Ball (1990), Chandler and Lalonde (1998).

Canada’s *Truth and Reconciliation Report* (2015) has unambiguously stated that the reservation school system by which Indigenous children were removed from their parents’ homes and educated in boarding schools was an explicit mechanism intended to force assimilation of Indigenous children into white culture. In a careful piece of pioneering research, Feir (2016a) has demonstrated that those who went through the reserve schools graduated with higher frequency, were employed at higher rates, and were more likely to live off-reserves subsequently. More recently, Feir and Auld (2021) found that residential schooling in Canada had salutary effects on the adult health (height and body-mass index), especially in Indigenous children born after the 1960s. In a manner complementary to Feir’s (2016a) work on Canada, Gregg (2018) has performed a similar exercise for the U.S. Forced assimilation does seem to have succeeded, to some extent, in assimilating Indigenous Peoples into mainstream society in Canada and the U.S. Feir (2016a) and Gregg (2018) also empirically show the negative effect of this success on Indigenous languages. Feir (2016b) shows that the residential school attendance by mothers had a negative intergenerational effect. Jones (2016) showed the effects on smoking, drinking, greater social distance and concern for suicidal thoughts. These are some of the empirically documented downsides of assimilation.

My paper attempts to take a theoretical step towards identifying the sources of the costs of Indigenous assimilation. The current health status of Indigenous Peoples relative to the rest of North Americans, I argue, may be the cumulative effect of not only the reserve school system but a whole host of events in Indigenous history that have left their imprints of the historical trauma that shapes subsequent behavior. The important and complex nature of the subject of this paper does not lend itself to a one-dimensional approach in theorizing. So, although I adopt a fundamentally economic methodology here, I endeavor to draw on insights and findings from anthropology, psychology, and history, and work them into my modelling.

To demonstrate the theoretical possibility that the erosion of self-concept can explain the adverse health effects in Indigenous peoples, I proceed in two broad steps. I first mathematically model

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10 The role of identity was introduced into economics by Akerlof and Kranton (2000).
what an Indigenous economy might look like when attachment to land is taken seriously and forms the lynch-pin of the culture. Although the results of this model are of independent interest, my primary goal is on health outcomes. From the equilibrium welfare that is generated in such a cultural setting for a tribe, I identify a measure of a sense of self that would emerge. In the next step, I take this characterization of the strength of self and, after outlining the traumatic events foisted on the Indigenous peoples of North America, I model how the trauma affects underlying parameters of the self-concept and work out how it impinges on subsequent behavior. In making the assumptions that my models invoke, I stay “close to the ground” as it were, consulting studies in ethnography, anthropology, and psychology in order to incorporate them into a model that is fundamentally economic.

The rest of the paper is as follows. In Section 2, a basic model of a hypothetical Indigenous band’s economy is modeled and the welfare under communal property is compared to that under private property, with that in the former shown to be superior when culture is an important component of preferences. The special status of land in Indigenous culture is described in Section 3, and Section 4 formally incorporates this aspect into the model. The welfare superiority of the Indigenous cultural arrangements is seen to be strengthened. Section 5 briefly shows how the model throws up a measure of identity that captures Indigenous culture and identity. Section 6 offers a brief review of the major traumatic events that were inflicted on the Indigenous peoples of North America and the current wisdom in the field of psychology of the effects of such trauma. In Section 7, using a simple intertemporal model, I illustrate the long term responses that impinge on lifespans and suicide rates induced by the historical trauma of Indigenous Peoples and work out the health consequences in their present predicament. I conclude with Section 8, where I briefly discuss the importance of revitalizing the Indigenous Peoples’ languages and preventing their extinction in view of the intimate link between language and identity.

2. A Simple Model of an Indigenous Tribe’s Economy

In this section, I propose a simple model of the economic choices in an Indigenous band. (I use the terms tribe and band synonymously in this paper, which may be appropriate at the level of
abstraction in the model.) There is a great deal of variation across the bands of various Indigenous Peoples, and it would be a mistake to attempt to homogenize them. For the purpose of theorizing, however, in the interest of simplification I set up a model of a hypothetical Indigenous band. Depending on the band in question, there will be varying degrees to which this model conforms to the reality. The purpose in this and the next two sections of this paper is to model production in an Indigenous band in a manner that would resonate with the world view of at least some of the bands in order to bring out important features of these Indigenous cultures. I must emphasize that I am constrained here by what is expedient for economic modeling; the ability to allow for heterogeneity is limited by the needs of tractability. There is no intention here to “essentialize” particular features of cultures as defining Indigenous Peoples.

From my reading of the literature, what stands out clearly is that the Indigenous economy is not a thing apart from Indigenous culture; economic life is woven into the fabric of everyday cultural life. One sharp difference from the western tradition is that, in contrast to the individualism and the nuclear families that is characteristic of Western Europeans (and European immigrants to North America, Australia, and New Zealand), the kinship system was one of extended families [Red Horse et al. (1978), Killsback (2019)]. Thus the allocation of food, childcare activities, etc. is best modeled as a sharing arrangement. The sharing aspect of the culture is built into the model in this section.

Another aspect of Indigenous life is the importance of land in daily life. This is not just because hunting, gathering, farming all require land as an essential input. It also stems from the view that Indigenous Peoples see themselves not as individuals in possession of themselves but as individuals who commonly owed their existence to the land. (This special role of land is discussed in detail in Sections 3 and 4) Thus land forms an integral part of the lives of Indigenous Peoples, and their language and numerous cultural activities (storytelling, ceremonies, rituals, etc.) were largely collective activities. Of course, there is a strictly individual consumption of food and leisure (like individual flute playing, for example) because the evolutionary process of natural selection has also shaped humans to be individuals. Individual leisure activity is dictated by the “I” aspect of the sense of self; the collective cultural activities are more influenced by the “Us” aspect of self.
Before spelling out the model, I should clarify the land tenure system I shall be assuming here for the analysis. It may be argued that, in reality, Indigenous tribes did and do have various forms of property rights, including private property\textsuperscript{11,12}. This is indeed correct: they do have a variety of property rights depending on the circumstances and the nature of the resource. Bailey (1992) has examined the various land tenure systems that exist within Indigenous bands and identified conditions under which incentives are maximized by private property and by common property. If there are scale economies, advantages to group production, risky outputs etc., the latter is favored. Otherwise, private property is assigned. In horticulture, for example, the land used is almost always privately cultivated. But it has to be emphasized that when a tribe gives its resources for private use (housing, fishing, hunting, agriculture, etc.), it is always on a usufruct basis [Hoelle (2011)].\textsuperscript{13} That is, the private “owners” can only receive the flow benefits of the resources, but this right can be revoked by the tribe because of disuse or abuse. The person or family with these rights cannot appropriate the Indigenous Peoples’ land and sell it for profit. This important distinction has to be kept in mind because the explicitly usufruct nature of the resource among Indigenous Peoples does not inculcate a sense of exclusive ownership as in the western, economic concept of private property. Thus, to keep the modeling tractable below, I compare only two scenarios: common property and private property in the neoclassical sense. In my analysis, I shall simply model Indigenous food production using land (hunting/fishing and/or farming) as communal.

In the light of the above, we may write down the utility function, \( u(c, G, \ell) \) of a typical person in an Indigenous band as a function of their consumption of food \( (c) \), their group cultural activity \( (G) \), and their private leisure activity \( (\ell) \). For tractability, I shall work with the following simple Cobb-Douglas form, \( u(c, G, \ell) \), of the utility function:

\[
(1) \quad u(c, g, \ell) = c^a G^b \ell^c,
\]

\textsuperscript{11} Many examples can be found in the volume edited by Anderson (1992) and in the paper by Hoelle (2011).

\textsuperscript{12} Alcantara (2003) gives an informative history of the evolution of Indigenous property rights in Canada and describes its strengths and weaknesses.

\textsuperscript{13} Sometimes Indigenous tribes have private property with institutional practices like the potlatch. Johnsen (1986) has argued that the ostentatious gift-giving activity observed among Southern Kwakiutl Indians was, in fact, a mechanism for protecting the property rights of their tribes in the salmon fishery from encroachers. I offer an alternative explanation. The inefficiency of over-exploitation associated with a common property fishery is corrected by private property in a usufruct sense. The mutual sharing, in my view, in competitive potlatches may well have been a way of maintaining the equal sharing ethic common in Indigenous cultures while fixing the common property inefficiency at the same time.
where the exogenous parameters in the exponents satisfy $0 < \alpha < 1, 0 < \beta < 1,$ and $0 < \gamma < 1,$ restrictions that ensure diminishing marginal utility. I assume that each person has 1 unit of time available. If $t$ is the amount of time she devotes to production, $g$ that devoted to the group cultural activity and $\ell$ to the private leisure activity, the time constraint may be written as $t + g + \ell = 1.$ I shall refer to the function in (1) as the “egoistic” utility function of a typical band member in order to distinguish it from one that incorporates other-regarding preferences (to be introduced later).

I model hunting/gathering/farming as the core economic activity of the band. For brevity, I shall refer to this activity as production. Assume there are $n$ ($\geq 2$) people in the Indigenous band. I posit that the output, $Q,$ of food is given by the production function

$Q = AL^{1-\mu}T^\mu,$

where $L$ and $T$ denote, respectively, the land area and total effort applied, and $A$ the total factor productivity of the technology, and $0 < \mu < 1.$ The total amount of land in the economy is normalized to 1 unit.

I model an Indigenous band operating under two different regimes of property rights. The one taken as the norm among Indigenous Peoples is common property, for reasons explained. The land cannot be claimed exclusively in the sense that it can be privately sold or disposed of. The other scenario modeled is one in which they operate—or are forced operate—under the notion of private property as understood in the western, neoclassical sense of exclusive property rights. In this case, the Indigenous Peoples hypothetically abandon their cultural notion “I belong to the land,” and reverse it by claiming “I own this land” and food production occurs on individual plots.

### 2.1 Model with Common Property

Here I take the land of an Indigenous band as commonly owned and food production is jointly undertaken. Denoting the production effort of individual $i$ by $t_i,$ $i = 1,2,\ldots,n,$ we may write the total effort as $T = \sum_{i=1}^{n} t_i.$ With an ethic of equal sharing, the consumption, $c_i,$ of person $i$ will be given by $c_i = Q/n.$
Thus the utility maximizing problem of a person $i$ can be written as

$$
\max_{t_i, g_i, \ell_i} \quad (A(t_i + T_{-i})^\mu / n)^\alpha (g_i + G_{-i})^\beta (\ell_i)^\gamma \\
\text{subject to} \quad t_i + g_i + \ell_i = 1,
$$

where $T_{-i}$ and $G_{-i}$ are the total time contributions to production and to the group cultural activity, respectively, by all members other than $i$. That is, $T_{-i} = \sum_{j \neq i} t_j$ and $G_{-i} = \sum_{j \neq i} g_j$. We shall eliminate the time constraint by setting $\ell_i = 1 - t_i - g_i$.

Note that there are two activities of the Indigenous band in this model that entail externalities: production for consumption and participation in group cultural activities. Increase in individual effort in each case benefits the individual and also benefits the group. Of the two, in food production any shirking by an individual lowers output but the shirker bears only $1/n$ of the fall in output because of the equal-sharing arrangement. In the cultural activity, any shirking lowers the cultural output but the shirker bears the full fall in this output. The cultural good is a pure public good for the band. Therefore, shirking in the contribution to the cultural good is more serious, all else constant. This emphasizes the need to incorporate culture in the model, which is so important to Indigenous Peoples.

It is easy to show that, in the symmetric Nash equilibrium, the time allocations $\{t^*, g^*, \ell^*\}$ of any member of the band is given by

$$
\max_{t_i, g_i} \quad \alpha \mu \ln(t_i + T_{-i}) + \beta \ln(g_i + G_{-i}) + \gamma \ln(1 - t_i - g_i).
$$

The first order conditions are as follows:

- $t_i$: \[ \frac{\alpha \mu}{t_i + T_{-i}} = \frac{\gamma}{1 - t_i - g_i}. \]
- $g_i$: \[ \frac{\beta}{g_i + G_{-i}} = \frac{\gamma}{1 - t_i - g_i}. \]

The second order conditions for a maximum are satisfied because the objective function is strictly concave. Invoking symmetry and dropping subscripts, we see from the two first order conditions that
An increase in the band size reduces the time devoted to the common production and to group cultural activities, which may be expected given our standard intuition of moral hard of teams [Alchian and Demsetz (1972)]. This captures the self-interested aspect of the production of the consumption good and the cultural good: free-riding off the common effort makes more time available for private leisure.

The equilibrium egoistic utility, $U^*$, of a member of this band can be readily shown by substitution of (4) into (1) as

$$U^* = \frac{A^\alpha}{n^{\alpha-\gamma}} \frac{(\alpha\mu)^\alpha}{(\alpha\mu+\beta+ny)^{\alpha+\beta+ny}}.$$

2.2 Model with Private Property

Land as private property in the neoclassical concept is not the norm among Indigenous Peoples. Nevertheless, the U.S. and Canada on various occasions have sought to privatize land on reserves by dividing up the common land into individual parcels. To investigate the effect of this, assume that of the total land of 1 unit, each member gets a private allocation of $1/n$ unit. The difference now is that each member is the sole proprietor of their own food production, apply their own effort on it, and solely consume the output without sharing. Since the fixed factor land goes from 1 to $1/n$ in this case, the output, $q_i$, of person $i$’s assigned land becomes

$$q_i = A(1/n)^{1-\mu}(t_i)^\mu.$$

Thus the (egoistic) utility maximizing problem of a person $i$ can be written in this case as

$$\max_{t_i, g_i, l_i} (A(t_i)^\mu/n^{1-\mu})^\alpha (g_i + G_{-i})^\beta (l_i)^\gamma$$

subject to $t_i + g_i + l_i = 1.$
As before, we can eliminate by using the time constraint and setting \( t_i = 1 - t_i - g_i \). By mimicking the steps that led to (4), we obtain the solution, denoted by \( \{t^+, g^+, \ell^+\} \), as

\[
(8) \quad t^+ = \frac{na\mu}{na\mu + \beta + ny}; \quad g^+ = \frac{\beta}{na\mu + \beta + ny}; \quad \ell^+ = \frac{ny}{na\mu + \beta + ny}.
\]

Using (1), (6), and (8), we obtain the Nash equilibrium utility, \( U^+ \), of a typical member of the band as

\[
(9) \quad U^+ = \frac{A^a}{n^{(1-\rho)\mu - \alpha\mu - \beta - \gamma}} \frac{(\alpha\mu)^{a\mu} \beta^{\gamma} \gamma}{(na\mu + \beta + ny)^{a\mu + \beta + \gamma}}.
\]

By comparing the equilibrium solutions in (4) and (8), we obtain the following proposition.

*Proposition 1: When the common land of an Indigenous band is privatized through allotment to its members, the time devoted (i) to food production increases, (ii) to group cultural activity decreases, and (iii) to private leisure decreases.*

The reason behind the above result is that, with privatization of land, the rewards to individual effort in food production are not diluted by sharing with others, thereby increasing production effort at the cost of cultural activities (which also entails team production) and private leisure.

Standard neoclassical arguments suggest that privatization of land should curb the moral hazard in team production à la Alchian and Demsetz (1972). Naturally, as a corollary, the consumption of food will increase and if, this is a measure of the standard of living, this should register an increase, too.

The crucial question, however, is not what happens to the production output with privatization (which is obvious), but rather what happens to the level of wellbeing, that is, the utility in the equilibrium. It might appear that the privatization of land should certainly lead to a higher welfare because an externality involving team production has been remedied. But this is not necessarily so, as we see when we compare (5) with (9). Since this comparison entails expressions that are highly nonlinear in the parameters, I make the point with a simple simulation that has a compelling intuitive explanation.

In Figure 1, the equilibrium utilities of the representative Indigenous person is compared in the privatized equilibrium (blue) and the communal equilibrium (green) as a function of the
parameter $\beta$, which measures the importance of the cultural good in the preferences. The U-shaped nature of the two schedules is irrelevant because, when $\beta$ changes, the functional form changes and so comparisons of the utilities for different values of this parameter are meaningless. However, the comparison of the utilities in the private and communal equilibria for the same value of $\beta$ is meaningful. When $\beta$ is “low”, that is below about $\approx 0.55$ in the Figure, the privatized outcome dominates in ordinal ranking. However, for higher values of $\beta$, the communal equilibrium dominates in ranking. In other words, the privatized equilibrium is better when the cultural activity is relatively unimportant but the communal equilibrium is better when the cultural activity is important in the preferences. In the latter case, private land allotment of the common land of an Indigenous band lowers the utility of a typical band member in the Nash equilibrium.

Figure 1: Equilibrium (egoistic) utilities under privatized and communal land ownership as a function of the importance of cultural activities. (Parameter values: $A = 1$, $\alpha = 0.3$, $\gamma = 0.3$, $\mu = 0.6$, $n = 5$)

The reason for this is interesting. Private allotment increases food production effort at the expense of cultural effort and private leisure. But since this outcome is the result of endogenous choices, one may think that the private land outcome should be better than the common land one—as, indeed, it is when $\beta$ is low. However, cultural activity entails team production, too, and the reallocation of individual effort to private food production ignores the externality inflicted on other band members in the generation of the group cultural good. In going from two activities that entail team production to only one does not guarantee and increase in the equilibrium utility.
This, in fact, is but an example of the influential Theory of the Second Best of Lipsey and Lancaster (1956). Their general insight was that when there is one irremovable distortion in an economic system, there is no guarantee that getting rid of other distortions would improve welfare. In fact, welfare may be improved by introducing more distortions, depending on the context. Moral hazard in team production is one such distortion from the standard assumptions under which the competitive equilibrium is Pareto optimal. In the present context, since there is an externality in the team production of cultural activities, the introduction of a second activity with team production (hunting & gathering) actually increases welfare.\footnote{Iannaccone’s (1992) model showing that sacrifice and stigma could raise the welfare of a sect may also be viewed as another example of the Theory of the Second Best.}

When land is privatized, effort gets redirected to private production, exacerbating the problem of moral hazard in cultural production. In Nash behavior, under the assumed premise of purely egoistic preferences, each person does not take into account this negative externality on other band members. When the cultural good is important, the equilibrium outcome can be worse than when land becomes privatized. Since the switch in the ordinal ranking of the welfares occurs only at high values of $\beta$, we see why this outcome is particularly relevant to Indigenous bands.

In the light of the above results, we see that even if we assume the U.S. government’s intention of private allotment of reserve lands through the Dawes Act of 1887 was to improve the standard of living of the Indigenous Peoples, we see that it need not have worked—as, indeed, it did not [Carlson (1981a), Roback (2008)]. The reformers in the Dawes Act sought to weaken the culture of the tribe because sharing was perceived as an ethic that thwarts economic development; enlightened self-interest was seen as the driver of development [Carlson (1981b, Chapter 4)]. The policy initiative, driven by standard neoclassical thinking, ignored the core principle of connectedness that is repeatedly emphasized by Indigenous Peoples. While focusing on the well-known externality involved in the production of collective food production, it ignored the more important externality (for Indigenous Peoples) of cultural activities. In fact, for the Indigenous Peoples, it appears that these cultural activities are almost a way of living. Ignoring this and foisting a standard economists’ solution is one of the egregious wrongs of the economic notion of property rights in the context of Indigenous culture.
Carlson (1981a), based on a standard model of agricultural production offered a theoretical reason for why the Dawes Act actually discouraged American Indians from becoming farmers. The land plots that they were allotted had so many restrictions on them (such as initially not being able to use them as collateral or lease them) that they had no option but to learn farming by doing. They were better off selling their land when they could and minimize the time they devoted to farming. In my explanation, it is the destruction of culture engendered by private plots that was their undoing.

In a recent study, Akee (2020) examined the effect of the Nelson Act of 1899 (a modified application of the Dawes Act to the state of Minnesota) that provided private plots to the indigenous people to encourage farming. He found that farming actually declined among individuals who were allotted private land. In fact, land- and home-ownership among them declined, which Akee attributes to lack of experience in dealing with property taxes, land sales, and accessing credit. As a result, peoples belonging to the poorest groups in the country lost a most important asset. They became renters and increased their participation in the labor market, which were not intended goals of the Nelson Act. This graphically reveals some of the unintended consequences of foisting standard neoclassical thinking in the zeal for assimilation of the Indigenous Peoples without respecting the relevant cultures.

The move in Canada to privatize Indigenous land on reserves, as espoused by Flanagan, Alcantara, and Dressay (2010), should be accompanied with some caution for it may result in similar consequences for Indigenous wellbeing if their culture (“I belong to the land.”) is dismantled. The authors, however, are aware the Dawes Act failed in accomplishing its goals and are not recommending a replication of it. Nevertheless, it is hard to see how fee-simple property rights can prevent sales to non-Indigenous peoples (say, due to involuntary default on mortgage payments to banks), which would ultimately dismantle an Indigenous band’s culture. In any case, the limited evidence to date on the effects of western property rights on the welfare of the Indigenous peoples is not encouraging [Aragòn (2015), Aragòn and Kessler (2020)]

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Where does the important Indigenous idea “we belong to the land” figure in this analysis? Thus far, it is not accounted for. I turn to this in the next section.

3. The Importance of Land to Indigenous Peoples

A reading of the testimony of Indigenous Peoples from the U.S. and Canada reveals an unusually deep attachment to the land that they lost. Since this is especially crucial to understanding the historical trauma that still plagues Indigenous Peoples, it is important to learn about the source of this attachment to land. In this section, I provide a brief overview of the reasons.

In Western economies, land is largely but not entirely viewed mainly as an input in production—whether agricultural, manufacturing, retail, or residential services. Much of its value stems from the fact that it is viewed as an economic asset that can be bought and sold in land markets. One’s attachment to a piece of land is built into one’s assessment of its present value, which may somewhat exceed what others are willing to pay for it—a phenomenon that is not uncommon and is referred to as the endowment effect [Kahneman, Knetsch, and Thaler (1990)]. The unwillingness of Indigenous Peoples to entertain the idea of trading their land for money can be viewed as an extreme case of the endowment effect, but there is much more to it than this. The reluctance to trade would especially arise because there is no adequate substitute available for land deemed sacred. Individuals can obviously own land as private property in all liberal democracies. This owes its roots to Locke’s (1698/1967) theory of private property. Even though Locke conceded, in alignment with the Judeo-Christian tradition, that the Creator granted humans the collective dominion over all land, he argued that each individual had a right to survive and thus to do what was needful for survival. From this, Locke derived his theory that when a person confers labor on piece of common land, it may be appropriated as private property—provided there is enough left over for others.

In sharp contrast to the neoclassical view, among Indigenous Peoples the view is that it is not individuals who own the land; rather it is they who belong to the land. This special meaning of land to Indigenous Peoples has even been recognized by the Supreme Court’s decisions in

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18 Land is not always viewed entirely in monetary terms. So as not to “otherize” the Indigenous Peoples, we may note that people from the general population are generally willing to defend, and often die, to protect their countries against foreign aggression.
Canada [Slattery (2000)]. If land is claimed by an Indigenous band as theirs, the claim is a collective one, not an individual one [Akiwenzie-Damm (1996), Noble (2008)].

The reason why land cannot be typically claimed by individuals and bought and sold resides in the belief that their land is sacred. The economy is not compartmentalized in Indigenous society, but is inextricably interwoven into their religion and culture.

People adhering to many of the world religions exhibit an attachment to land, but usually it is to specific spots within a country or region—like Mecca to Muslims, Benares to Hindus, Gaya to Buddhists, Rome to Christians, Jerusalem to Jews, Christians, and Muslims, etc. But among Indigenous Peoples, it is the entire nation that is considered sacred. Why is this? Indigenous religions largely have Creation stories that interpret their land as a gift from the Creator, and it is a deeply embedded belief of tribes that they should live within the bounds of the land thus gifted and act as its stewards. Therefore, there arose numerous bands in North America, each localized in a particular geographical area that is deemed sacred to them. The culture and religion that subsequently arose were specific to the land, even though there are broad commonalities across them. This geographical specificity of the culture and belongingness gave rise to a deep attachment among Indigenous bands to the land of their forebears, and is the source of the belief “We belong to the land”.

Furthermore, Indigenous culture is infused with the idea of mutual belongingness to their particular landscape, the animals, and the earth through an indivisible but conscious bond—for, in this view, what others may construe as inanimate is seen by Indigenous Peoples as conscious [Booth (2003)]. From this arises a deep sense of the sacred that informs their lives in entirety. It is for this reason that, when the particular land Indigenous Peoples believe has been given to them as its stewards is taken away, the loss is accompanied by a profound sense of grieving and

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19 Here is a quote from Akiwenzie-Damm (1996, p. 21): “We are fundamentally different from anyone else in this land, fundamentally different from Canadians. The basis of the difference is the land, our passion for it and our understanding of our relationship with it. We belong to this land. The land does not belong to us; we belong to this land. We believe that this land recognizes us and knows us. In the broadest and most fundamental ways we are inextricably connected to this land. It holds the bones of our ancestors. This land provides for us and for our children. It is a birthright granted to us by the Creator. In return it is our responsibility to care for and protect the land. It is our connection to the land that makes us who we are, that shapes our thinking, our cultural practices, our spiritual, emotional, physical and social lives. Our cultures and spirituality arise from our relationship with the land.”

20 There were other usufruct uses of property, as noted before [Bailey (1992), Hoelle (2011)].
a deep longing for its return. Their identity is so deeply fused with the land and everything they perceive it contains, visible and invisible, that they feel it is their very self.

The attachment to land is reinforced by the performance of collective rituals, storytelling, drama, and other social activities among Indigenous Peoples [Akiwenzie-Damm (1996)] and also in most religions [Mazumdar and Mazumdar (2004)]. These activities would acquire an even greater significance when the land and nature itself form the basis of a group’s daily cultural and religious life. The collective activities would lead to the forging of even stronger interpersonal bonds. These activities, by their very nature, would tend to diminish the “I” component of identity and to enhance the “Us” component.

The strength of family ties is an important characteristic of societies. Recently, Schultz et al. (2019) demonstrated a correlation between kindship ties and individuality, among other things. Societies with strong kinship ties—arising from marriages between cousins, for example—exhibit a greater cultural proclivity for obedience, respect towards elders, etc. This arises because, when kindship ties are strong, people reside in extended families, not nuclear ones. Since Indigenous Peoples live in extended families within the tribes, their interpersonal ties were stronger than those of the European colonizers.

In sum, the above discussion shows why land is of utmost importance to Indigenous tribes. The importance far exceeds that which might be attributed to a society with an economy that merely relies on land for hunting, gathering, and farming. Since the culture is essentially holistic, land, interpersonal relations, culture, and spirituality are interwoven in generating a sense of identity and wellbeing among the Indigenous Peoples.

### 4. Analytically Conceptualizing “Belonging to the Land”

21 As Booth (2003, p. 333) puts it: “A sense of embeddedness in the rest of the world has profound implications for how one chooses to live and interact with others. It is also one reason why the displacement of Native Americans from their lands, and the subsequent damage to the land, was and is so socially and psychically devastating.”

22 “It is not a matter of ‘worshiping nature,’ as anthropologists suggest: to worship nature, one must stand apart from it and call it ‘nature’ or ‘the human habitat’ or ‘the environment.’ For the Indian, there is no separation. Man is an aspect of nature ...” Matthiessen, quoted in Booth (2003, p. 334)

23 Scannell and Gifford (2017) offer experimental evidence that visualizing a place of attachment increases a sense of belonging and self-esteem in their experimental participants. They also argue that place attachment serves psychological purposes similar to those of interpersonal attachments. These two attachments may, then, be construed to be complementary, with one reinforcing the other.
In this section I make an attempt to incorporate into a model, however inadequately, but in a manner consistent with the persistently articulated Indigenous belief outlined in the previous section that they belong to the land, not the other way around. In the field of social psychology, the need to belong is recognized as one of the most fundamental human needs [Baumeister and Leary (1995)]. By belonging is meant the actions of interacting positively with a significant number of others on a regular basis. There are many ways in which humans fulfill this need. The Indigenous Peoples seem to have fulfilled this with the holistic manner they conceived their cultures.

In an essay entitled ‘Owning as Belonging/Owning as Property’, Noble (2008) brings home the importance of the distinction between the two approaches. In economics, by “owning” is meant the right to exclusive use of an object, which can be alienated as disposed of at will. By contrast, when owning is conceived as belonging, as in Indigenous traditions, the emphasis is on the nature of the transactions and obligations accompanying the property that is deemed communal.

To my understanding, the Indigenous concept of “belonging to the land” automatically brings into one’s preferences others who also belong to the same land because mutual belonging requires mutual respect. Right away, we see that this conception requires a departure from the egoistic perspective that is articulated by the claim, “The land belongs to me.” The Indigenous cultural belief of belonging immediately attenuates the “I” aspect of self and expands the “Us” aspect. Working collectively on the land and engaging in cultural activities could be seen as sacred in themselves, thereby increasing their utility worth because they enhance the sense of belonging.24

Furthermore, it is significant that, in sharp contrast to western societies, Indigenous tribes are organized according to lineages and clans, where a substantial proportion of the people belonging to the tribe or band are related by blood or marriage even in contemporary urban settings [Red Horse et al. (1978), Killsback (2019)]. These social arrangements themselves engender feelings of concern for others in the tribe, partly by serving as informal enforcement mechanisms that ensure norm conformity. There are also evolutionary reasons for being more

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24 The idea that people may work even for modern organizations in a manner that bolsters their sense of belongingness is foreign to standard economic modeling but, nevertheless, there is empirical evidence to suggest its importance [Green, Gino, and Staats (2017)].
favorably disposed through preferences towards members of the same group [Eaton, Eswaran, and Oxoby (2011)]. Castenello (2002) in an insightful review identifies the extended family as the primary institution for mediating individual, social, and political interactions.

In a rare piece of empirical work on the subjective wellbeing (life satisfaction) of Indigenous Peoples, Barrington-Leigh and Sloman (2016), examined the difference in this self-perceived measure of wellbeing between Aboriginals and non-Aboriginals in the Canadian prairies. The authors find that Aboriginals (especially on reserves) place much more weight on family and friends than the general population. This lends support for the other-regarding preferences that I posit below. Furthermore, while income correlates positively with life satisfaction in the general population the world over, the correlation is insignificant for off-reserve Aboriginals and significantly negative for on-reserve Aboriginals. This cautions us to not assume that higher incomes necessarily increase subjective wellbeing among the Indigenous Peoples.

In the light of this discussion, it is not a great leap to infer that, in Indigenous Peoples’ societies, the very nature of the cultures implies that other regarding preferences are important. A person is not concerned exclusively with their consumption of various goods, as encapsulated by the egoistic utility function in (1), but also places some importance on those of others in the band. Subscripting the individual-specific consumptions of person \( i \) by \( i \), as before, we may write the utility of this person with other-regarding preferences, \( v_i(\tilde{c}, G, \tilde{\ell}) \), as given by

\[
v_i(\tilde{c}, G, \tilde{\ell}) = u_i(c_i, G, \ell_i) + \sigma \sum_{j \neq i} u_j(c_j, G, \ell_j),
\]

where \( \tilde{c} \) and \( \tilde{\ell} \) denote the vectors of consumption levels of the production output and private leisure of the entire band, respectively. The functions \( u_i(c_i, G, \ell_i) \) are assumed to retain the form given in (1). The parameter \( \sigma \), with \( 0 \leq \sigma \leq 1 \), captures the extent of a band member’s concern for all the others who also belong to the same land. We may refer to \( \sigma \) as the ‘belongingness’ parameter and, for simplicity, it is assumed to be the same for all individuals in the band, with its magnitude being determined by the specific culture. The first term on the right hand side of (10) captures person \( i \)’s egoistic concern for oneself, and the remaining terms capture the person’s concern for others in the band. When \( \sigma = 0 \), we are back in the scenario considered earlier with purely egoistic preferences. At the other extreme where \( \sigma = 1 \), each member places the wellbeing of every other member on par with their own (that is, they treat their neighbors as
themselves). In this extreme case, each member’s objective would clearly coincide with the Benthamite social planner’s.

Person $i$ has control only over their own decisions, and so under Nash conjectures will maximize (10) by their choice of $t_i$, $g_i$, and $\ell_i$ subject to the time constraint $t_i + g_i + \ell_i = 1$. As before this constraint can be used to eliminate $\ell_i$ and perform an unconstrained optimization with respect to $t_i$ and $g_i$. Taking the derivatives of (10) with respect to $t_i$ and $g_i$, simplifying the corresponding expressions after invoking symmetry and dropping the subscripts, solving the two first order conditions and using the time constraint we obtain the solution for the “belonging equilibrium”, denoted by the triplet $(\tilde{t}^*, \tilde{g}^*, \tilde{\ell}^*)$, as

$$
(11) \quad \tilde{t}^* = \frac{\alpha\mu\rho}{\alpha\mu\rho + \beta\rho + ny} ; \quad \tilde{g}^* = \frac{\beta\rho}{\alpha\mu\rho + \beta\rho + ny} ; \quad \tilde{\ell}^* = \frac{ny}{\alpha\mu\rho + \beta\rho + ny},
$$

where $\rho = 1 + (n - 1)\sigma$.

The egoistic component of the individual utility, $\bar{U}^*$, for a typical band member generated in the Nash equilibrium is given by

$$
(12) \quad \bar{U}^* = \frac{\Lambda^\alpha}{n^{(1-\mu)\alpha - \beta - \gamma}} \cdot \frac{(\alpha\mu\rho)^\alpha(\beta\rho)^\beta\gamma}{(\alpha\mu\rho + \beta\rho + ny)^{\alpha\mu\rho + \beta + \gamma}}.
$$

From the above, the following result immediately follows.

**Proposition 2:** An increase in the parameter $\sigma$ that captures belongingness monotonically increases the equilibrium component of the egoistic utility of each band member.

Thus, the belief that they ‘belong to the land’—rather than the other way around—is a conception of ownership that induces greater cooperation amongst Indigenous Peoples. This

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25 Mimicking the steps in subsection 2.1, the following are the two first order conditions after symmetry is invoked:

$$
ed_i: \quad \frac{\alpha\mu\rho}{n\tilde{t}} = \frac{\gamma}{1 - e^{-\rho}},$$
$$
egd_i: \quad \frac{\beta\rho}{n\tilde{g}} = \frac{\gamma}{1 - e^{-\rho}},$$

where $\rho = 1 + (n - 1)\sigma$. With some manipulation, we can easily derive the allocations in (11).

26 This can be readily seen by rewriting the expression in (12) as $\bar{U}^* = \frac{\Lambda^\alpha}{n^{(1-\mu)\alpha - \beta - \gamma}} \cdot \frac{(\alpha\mu\rho(\beta\rho)^\beta\gamma}{(\alpha\mu\rho + \beta\rho + ny)^{\alpha\mu\rho + \beta + \gamma}}$. An increase in $\sigma$ leads to an increase in $\rho \equiv 1 + (n - 1)\sigma$, and this reduces the denominator.
occurs by reducing the free-riding in the activities of food production and cultural production at the expense of private leisure. The result in Proposition 2 further strengthens what we saw earlier even without the sense of belongingness to land, which says that an Indigenous band with private property can be welfare dominated by one that has common property.

Figure 2: Compares the egoistic component of equilibrium utilities in privatized, communal and belongingness scenarios as a function of the belongingness parameter $\sigma$. (Parameter values: $A = 1$, $\alpha = 0.3$, $\beta = 0.3$, $\gamma = 0.3$, $\mu = 0.6$, and $n = 5$)

Suppose without a sense of belongingness (that is, $\sigma = 0$), the private property equilibrium welfare dominates the communal equilibrium because the cultural good is not sufficiently important in the preferences. Even in this case, a sense of belonging to the land can induce concern for other band members so as to render the egoistic component of equilibrium welfare higher than in the private equilibrium. Figure 2 compares the egoistic components of the utility in the privatized (blue), communal (green), and belongingness equilibria (red) as a function of the parameter $\sigma$.\(^{27}\) Naturally, the two former outcomes are independent of $\sigma$. For the parameter values indicated in the Figure, the privatized welfare dominates the communal welfare, both of which are entirely egoistic and, therefore, independent of $\sigma$. But as $\sigma$ increases from 0, the egoistic component of the belongingness equilibrium increases. When $\sigma$ is sufficiently high, the belongingness equilibrium welfare dominates the privatized equilibrium. Thus if land is

\(^{27}\) When the belongingness parameter $\sigma$ changes, the functional form of the utility function naturally changes because the weights put on the egoistic and other-regarding components of the utility change. In Figure 2, I am plotting only the equilibrium levels of the egoistic component of the utility function as $\sigma$ changes. The functional form of the egoistic component is independent of sigma, though its value in equilibrium most certainly depends on $\sigma$. 

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privatized and the collective sense of belonging is demolished, welfare would decline. This is the *cost of ignoring culture* when it is important to the Indigenous peoples.

Is it conceivable that greater cooperation through the cultural perspective of belonging to the land reduces the inefficiency in common food production and perhaps eliminates it altogether? Yes, it can reduce the inefficiency but never relative to the private property outcome of subsection 2.2. The reason is that the private property equilibrium is not the correct benchmark of efficiency; in that equilibrium, there is *overproduction*. To see this, consider the limiting scenario where $\sigma = 1$, which as we have seen would reproduce the Benthamite social planner’s solution. In this case, we have $\rho = n$. Using (11), we obtain the output of the band in the belonging equilibrium for $\sigma = 1$, denoted by $\tilde{Q}^*$, as

$$\tilde{Q}^* = A \left( \frac{\alpha \mu}{\alpha \mu + \beta + \gamma} \right)^\mu.$$  (13)

In the private property equilibrium, the total output is the sum of outputs on $n$ individual plots, each of size $1/n$. Thus, the total output of the band in the private property equilibrium, denoted by $Q^\dagger$, is given by $Q^\dagger = nA \left( \frac{1}{n} \right)^{1-\mu} (t^\dagger)^\mu$. Substituting from (8), this reduces to

$$Q^\dagger = An^\mu \left( \frac{\frac{n \alpha \mu}{n \alpha \mu + \beta + \gamma}}{n \alpha \mu + \beta + \gamma} \right)^\mu.$$  (14)

Comparing the expressions in (13) and (14), we obtain the following result.

*Proposition 3:* *In the private property equilibrium, the production output of the Indigenous band exceeds that in the Benthamite welfare optimum.*

Comparing the increase in output of Indigenous land due to its reallocation as private property says nothing about welfare. Since the private production is excessive, the welfare is lower than what could be generated if the time devoted to food production were reduced and that devoted to cultural production increased. In the light of the above proposition, it may be pointed out we cannot take the private property output as the efficient benchmark against which to compare the Indigenous food output in the belongingness equilibrium.

As an empirical matter, how does income compare across various tenure regimes on Indigenous land? Aragòn and Kessler (2020) investigated in First Nations reserves in Canada the effect of
creating individual land holdings that could be transferred, though these fell short of the fee
simple rights that would be construed as private property in the usual sense in the rest of Canada.
In particular, they examine two sorts of property rights: certificate of possession, which confer
legality to possessions, and land leases. They found that, while the land tenures improved
investment in housing, it did not improve the incomes of those who were living on the reserves.28
Pendakur and Pendakur (2018) extended the analysis to a broader range of treaties, and in
Pendakur and Pendakur (2021), they confirmed these results and also demonstrate that self-
government decreases income inequality.29

The privatization of land among the Indigenous Peoples based on a western concept of property
rights contributes to the loss of culture that is cherished by Indigenous bands. It is difficult for a
person to claim “This is my land” in an exclusive sense and also adhere to the belief “I belong to
this land” at the same time. The adoption of an egoistic perspective must come at the expense of
the societal perspective. Apart from a decline in their welfare, replacing communal property by
private property led to difficulties for generations of Indigenous Peoples, as we shall see.

The erroneously presumed efficiency of private property rights in the Indigenous context bears
repeating. It assumes that the goal of the society is exclusively wealth maximization, that this is
the proxy for human wellbeing. The claim that the equilibrium it engenders is a Pareto optimal
allocation of resources in turn suggests the standard claim that, if we allow for taxes and
subsidies, a move towards private property would make no one worse off and some strictly better
off. In fact, this is the claim of de Soto (2003) in his view that private property, especially land,
would lead to development because it can be used as collateral to finance improvements in
income. This claim may have validity in other societies and economies. In my analysis above of
Indigenous tribes, which takes their own goals seriously, the maximization of income or wealth
is not a priority. More importantly, privatizing property rights would necessarily lead to a de
facto abandonment of the deep cultural belief “I belong to the land”. When the value system is

28 Using data from areas in Canada with modern treaties between First Nations people and the federal government
regarding land in the neighborhood of Indigenous reserves, where the jurisdictions of the First Nations, the
government, and between various Indigenous bands were previously unclear, Aragón (2015) found that the treaties
increased incomes in these areas, with positive spillovers.
29 One might wonder why these bands opted for some forms of private property if, as I claim, they can lower
welfare. I believe that it is because these changes were accompanied by self-government, a very empowering
transition—and this is very different from private property being thrust on them by the state government (as in the
Dawes Act). For a different but insightful reason, based on the role played by Canadian government bureaucrats in
masking privatization as restorative justice, see Schmidt (2018).
itself dismantled, to argue that taxes and subsidies can reinstate this value system and make people better off in their own terms is to push a point that is illogical and incorrect in the context of Indigenous societies.

The result above tells us why the re-allotment of Reserve land as private property among Indigenous Peoples undertaken by the Dawes Act in 1887 in the U.S., which we discussed earlier, did more damage than good. Carlson (2008) pointed out that, contrary to the view that Indigenous Peoples had no property rights system in place before 1887, the truth was that the Dawes Act merely replaced an earlier system by theirs. Roback (2008) insightfully observes that the Dawes Act essentially dismantled Indigenous systems of dealing with externalities without replacing them.30

Anderson and Lueck (1992) compare the agricultural performances of land under three different land tenure systems in Indian Land in the US. These three are the standard fee-simple land (common elsewhere in the economy as private property), individual trust land and tribal trust land. The latter two have various constraints that, among other things, prevent them from accessing credit in the manner that fee-simple property does. They find that the agricultural productivity of an acre of land, compared to that in fee-simple land, is 85-90% for tribal trust land and 30-40% for individual trust land. But the authors do not jump to the conclusion that trust land systems should be replaced by fee-simple system because culture and tribal integrity considerations may be important. In this, I am in complete agreement with them. As my analysis above indicates, there is nothing normative about output reduction when culture matters; the fee-simple outcome is not the right benchmark.

In the current climate, as noted, there is a move in Canada towards establishing private property in Indigenous land, on the basis of de Soto’s view that economic development will be facilitated by making Indigenous land individual private property by allowing it to be used as collateral to

30 More fully: “Allotment failed because it privatized land among individuals without understanding the existing family and tribal structure or the property rights structure that accompanied it. The Indians had developed these structures to solve their own problems and to internalize the externalities they faced. When the Department of the Interior made a conscious policy to break down Indian tribal and family life, these problem-solving structures were broken down as well... The irony is that the culture dissolved in its ability to keep order and produce wealth among its members, but this was not accompanied by a transfer of loyalty to white institutions and culture.” (p. 23)
The model spelled out above points to some dangers of doing this. Private property would not be conducive to revitalizing and perpetuating Indigenous culture, which is premised on the centrality of communal belongingness to the land. We cannot ignore the history of the fur trade in bringing devastation on the lives of the Indigenous Peoples through market forces. It induced them to abandon their traditional ways of life to specialize in hunting to supply the European demand for fur that ultimately led to the undoing of the Indigenous suppliers according to Innis (1962) and the dismantling of informal property rights regimes that conserved beaver stocks [Carlos and Lewis (1999)]. In an illuminating analysis, Taylor (2011) brings home the importance of international trade in decimating the American bison stock, though he does not examine the effect of the extinction of the bison on Indigenous tribes per se. Feir et al. (2021) have recently demonstrated the persistent effect of this resource loss on the wellbeing of Indigenous peoples.

5. The Sense of Identity

The purpose of this brief section is to establish the connection between the cultural attachment to land and the formation of traditional Indigenous identity. Culture plays a crucial role in determining dominant psychological traits of its people, as shown recently by Schultz et al. (2019). Repeated actions cement a sense of identity. If the actions are largely egoistic, that is, directed towards oneself, the sense of “I” would become the dominant component of identity, and the sense of “Us” would be weak. This is often construed as a good characterization of the culture of Europeans (and its emigrants to North America, Australia, and New Zealand). On the other hand, if most of the actions are directed towards the collective, the sense of “Us” would be dominant and the component of “I” would be weak. East Asian societies are seen as examples of cultures of this kind.

Furthermore, identity is crucial to the making of economic decisions that maximize preferences, for identity gets to the issue of whose preferences are being maximized. Identity is determined by family, social and cultural conditioning, and past history, not just by past economic circumstances. So when we wish to consider the present condition of the Indigenous Peoples and

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31 As mentioned, this is espoused by Flanagan, Alcantara, and Dressay (2010).
their responses to them, we have to first examine what circumstances shaped their identities. For, it is these identities that will inform their preferences over economic and consumption choices.

We may posit, then, that identity is conditioned by the belief systems and by the proportion of the relative amounts of time routinely spent in the various activities. A culture that emphasizes self-orientation in actions would shape preferences with small $\beta$ relative to $\alpha$ and $\gamma$ in the utility function (1). Contrariwise, a culture that emphasizes collective actions would inculcate values that make large $\beta$ compared to $\alpha$ and $\gamma$. In the light of the above, we may take person $i$’s valuation of private consumption, $(c_i)^\alpha$, as given in (1) by the variable, $S_i$, which we may posit as a measure of the person’s self or identity:

$$S_i = (G)^\beta (l_i)^\gamma.$$  

(15)

The belongingness equilibrium value, $S$, of this measure of identity of a person in the Indigenous band would be given by $S = (n\tilde{g}^*)^\beta (\tilde{t}^*)^\gamma$. This value will embody the relative self-orientation and community-orientation in the identity of the members of the band. Due its dependence on the belongingness parameter, $\sigma$, we would expect $S$ to exhibit a substantial communal component (as determined by contributions to the cultural good). In what follows, it is $S$ that I shall identify as embodying the culturally determined sense of self in traditional Indigenous bands, a sense of self cemented through centuries of repeated actions and passed down over generations. This characterization in terms of identity as expressed in (15) above allows us to write person $i$’s utility (1) in the alternative form $v(S, c_i)$ given by

$$v(S, c_i) = S c_i^\alpha,$$  

(16)

where the function $c_i^\alpha$ of consumption could be replaced by any other function that is increasing at a diminishing rate in $c_i$. A more secure sense of identity (that is, a higher value of $S$) enhances the utility and marginal utility derived from a given level of consumption; a diminished sense of identity, due to persistent shocks, would have the opposite effect. Since a healthy self-image is a sign of good health, (16) is consistent with the empirical finding by Finkelstein, Luttmer, and Notowidigdo (2013) revealing diminishing marginal utility because of ill-health.

The simple characterization in (16), then, enables us to say that an Indigenous person’s valuation of consumption depends on their identity as shaped by the culture of Indigenous bands. Their
sense of belonging to the land, their language, their rituals, their religion, or their culture in
general will be encapsulated in the identity, $S$, which will color the perception of their
subsequent circumstances and determine their wellbeing. The utility function of an Indigenous
person in (16) embodies these core values, albeit in a simplified form. If these core values are
violated in their subsequent treatment, it will show up as an undermined sense of identity that, in
turn, will have consequences for their wellbeing and choices. The next section considers what the
historical events in North American Indigenous history that have led to precisely this.

6. The Historical Trauma of the Indigenous Peoples and Its Psychological Effects

A Very Brief Summary of the Major Traumatic Events

The phenomenon of what has been called ‘historical trauma’ that plagues Indigenous Peoples is
well documented by psychologists, neuroscientists and psychiatrists. To understand their
predicament of Indigenous Peoples, it is important to recognize the effects of colonization but
that was only the beginning. Since 1492, Indigenous Peoples increasingly lost their land to
Europeans, to be sure, but what accompanied their colonization is no less important. There has
been a series of upheavals in the lives of the Indigenous Peoples over a period of five hundred
years. I offer a brief overview of the main events that led to the ‘historical trauma’ of Indigenous
Peoples—trauma that has been ongoing for generations because they have never been resolved.\(^{32}\)

The first great source of trauma of the Indigenous Peoples was the depopulation that followed
after 1492 due to disease. The arrival of Europeans brought to the New World diseases that were
alien and so they had no immunity against. The most devastating was small pox, but there were
also plague, influenza, measles, among others. One consequence of these diseases was that the
Indigenous population declined dramatically after European contact.\(^ {33}\) Thornton (1987, p. 43)
estimates that there were more than 5 million Indigenous Peoples in the U.S. before Europeans
arrived and the population was down, for various reasons, to 250,000 by the end of the 19\(^{th}\)
Century. The frequencies of epidemics ranged from 7 to 14 years, a period that is not long enough

\(^{32}\) A detailed description of these events is beyond the scope of this paper. An excellent treatment of this is provided
in the scholarly work of Wesley-Esquimaux and Smolewski (2004), on which this section draws somewhat.
\(^{33}\) Stannard (1992) refers to this as the ‘500 year Holocaust’.
for populations to recover, much less achieve a semblance of their lives before the epidemic [Wesley-Esquimaux and Smolewski (2004)]. The trauma of losing parents, children, mentors, shamans, and relatives in extended families would have been deeply felt but not recovered from before the next epidemic struck. The unresolved trauma is passed on by the actions of parents to their children, resulting in historical trauma [Wiechelt and Gryczynski (2019), Herman (2002), Walls and Whitbeck (2011)]. In fact, there is historical trauma not only because of individual family histories; there can also be what has been called cultural trauma, which arises when a group’s culture is under serious and persistent threat of destruction [Wiechelt and Gryczynski (2019)].

Since children’s culture is shaped by that of their parents and, in this manner, culture is intangible collective knowledge that becomes durable over centuries. Serious upheavals precipitated by invasions, epidemics, pandemics, and the like can unleash chaos and undermine cultural norms that take time to recover from. Even medieval Europe experienced bubonic plagues that devastated populations. However, the average duration between successive episodes was around 30 to 40 years, which left enough time for regions to recover their cultural roots and pass on their cultural identities [Wesley-Esquimaux and Smolewski (2004)]. Since epidemics were much more frequent for Indigenous Peoples, there has been a steady erosion of their cultures—their world views, their languages, their land, their practices, and their traditional means of livelihood. As summarized by Saltzman (2001), there is considerable evidence for the view that culture is a buffer against existential anxiety stemming from one’s inevitable mortality.

The American Indian Wars started pretty much when colonization of North America began, the European protagonists being not just Spain, England, and France but even countries like Sweden. Several dozen wars took place before and after U.S. War of Revolution; they started in 1609 and ended in 1924. In the process, Indigenous land was systematically appropriated, the Indigenous Peoples were relocated, confined to reserves, and put under the federal government’s jurisdiction. Land from the Indigenous Peoples still had to be acquired by the U.S. government through negotiations and treaties—though many were reneged on. Illegal white settlers, of course, appropriated land through violence.

After Indigenous Peoples were relegated to reserves, they were overseen by the U.S. government in the hope of assimilating them into American culture and “civilizing” them. The Dawes Act of
1887 sought to benefit Indigenous Peoples economically by implementing the western notion of property rights, and this led to the private allotment of reserve land. What followed on the reservations was a ban on Indigenous traditions, ceremonies, rituals, and spiritual practices. Missionary activities on the reserves sought to actively convert Indigenous Peoples to Christianity, which had had devastating consequences for Indigenous spirituality.

The government then forcibly uprooted children on reserves from their families and were put into boarding schools. These were not public schools in which all children could enroll; these boarding schools were earmarked for Indigenous children only. In these schools, Christianity was the only religion allowed. Children could not wear their customary clothes, have long hair, speak in the native tongues, and follow their traditional ways. This was essentially forced assimilation into the dominant white society by bleaching out the ‘Indigenousness’ of the children. These schools inflicted lasting damage by also dismantling the extended family system that was an essential part of kinship relationships of the Indigenous Peoples [Killsback (2019)]. In many of these residential schools, horrific crimes, sexual and otherwise, were committed against the children, and these routinely come to light even today. Wolfe (2006) has persuasively argued why such measures were taken with Indigenous children but not, for example, with the children of Blacks. The reason he suggests, is that Black children had no claim to being the original owners of the land whereas the Indigenous people had precisely that claim. The forced assimilation of Indigenous children, in other words, was a way to eliminate future claims being made on the appropriated land.

As was mentioned above, in the boarding schools where Indigenous children were forcibly enrolled, only English was spoken and all speech in Indigenous languages were discouraged. What is more, in the summer, the children were often sent to live with white families so as to acclimatize them to western culture and distance them from their own. This, along with the steady decline in Indigenous populations, led the loss of Indigenous languages. Of course, the

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34 Commissioner of Indigenous Affairs John Q. Smith in 1876 doubted that “any high degree of civilization is possible without individual ownership of land.” [Oberg (2015, p. 249)]
35 See e.g. Naomi Klein’s illuminating article entitled “Stealing Children to Steal Land,” on the mass unmarked graves of 215 children found in a former residential school in Kamloops, British Columbia, Canada, in 2021. This is the largest residential school in Canada and is on the largest piece of unceded land (that is, not land that was ever surrendered to the Crown, or ever under a treaty or an agreement) in the country. One of the interviewees drew a clear link between the residential school system and the act of appropriating Indigenous land. See Klein’s article at https://theintercept.com/2021/06/16/intercepted-mass-grave-kamloops-residential-school/
switch to English was not all forced; much of this was also because Indigenous parents saw that it was better for their children’s future to invest in English, so it was “voluntary”. But it became voluntary only after circumstances were so dramatically changed that their own way of living was no longer available to them. Loss of language through these means also led to a loss of identity.

In sum, over a period of 400 years, the Indigenous peoples suffered from huge losses in population from epidemics, the loss of land, the loss of their traditional way of life, the loss of their rituals and spirituality, and the loss of languages. Since all of these are integral parts of their identity as Indigenous Peoples, in effect there was continuous assault on their identity with little success in acquiring a new identity by assimilating. These are some of the core ingredients of the systemically perpetrated historical trauma that contemporary Indigenous Peoples are burdened with.

**Psychological Consequences of the Trauma**

What are the consequences of the trauma inflicted on Indigenous Peoples? In a review of the literature on the trauma of the Indigenous peoples of America trauma, Basset et al (2014) concluded that there is a high incidence of post-traumatic stress syndrome (PTSD) among American Indians and Alaskan Natives, far higher than in whites in the U.S. Among ethnic and racial groups, they have the highest incidence of traumatic life incidents, more than twice that of the general population. The main triggering events that led to PTSD included military combat, interpersonal violence (including rape and physical violence), and childhood sexual abuse. Substance abuse, alcohol disorders, nicotine dependence, depression, and psychiatric disorders are also among the risk factors. Emerson et al (2017) find that, among Indigenous Peoples, PTSD and alcohol disorders are correlated.

Thayer et al (2016) find that, among Indigenous Peoples, there is an association between trauma in early life and the development of PTSD in later life. The basic idea behind the explanation seems to be that short-run responses invoked to cope with current stress may have long term effects especially if the stressful condition is very threatening. And if the stress is protracted, the short-term adaptive response leads to a wearing down of the biological system through the
development of PTSD, thereby undermining later health.\textsuperscript{36} In a review of the literature, Lohr et al (2015) find that the majority of the studies reviewed find that PTSD may be associated with accelerated aging. PTSD also increased the chances of comorbidity, which included conditions like cardiovascular disease, type 2 diabetes mellitus, and dementia.

An important correlate of trauma is chronic pain, both physical and psychological. Brennstuhl et al (2015) review evidence showing that PTSD and chronic pain occur together, possibly with mutual causation, but both occur invariably in response to trauma. They suggest that PTSD and chronic pain may be two alternative responses to trauma.

Culture arises because of many reasons, some of which have evolutionary underpinnings. One of the purposes, especially emphasized by economists and anthropologists, is that culture can induce cooperation within a group [e.g. Boyd and Richerson (2009)]. But culture also arises to serve another very important function that is less emphasized by economists: it to buffer existential anxiety, which is the anxiety that arises in humans by dint of the knowledge of their mortality. There is a well-documented view in psychology (called terror management theory) which asserts that the shared beliefs, customs, and practices constituting the culture of a society, when accompanied by a strong self-image, protect people against this anxiety [Greenberg, Solomon, and Pyszczynski (1997)]. A strong self-image is obtained by conforming to the standards and norms of the culture. This aspect of culture would have made it particularly salient to Indigenous Peoples when their culture was assaulted by the steady dismantling of its institutions over several centuries even as their very physical existence was simultaneously threatened.

Fuller-Thomson et al. (2020) have recently shown, using a nation-wide sample from Canada, that only two-third of the Aboriginals living off-reserve exhibit complete mental health (CMH), compared to 73% for the general Canadian population.\textsuperscript{37} This demonstrates that, while the Indigenous population has been resilient, nevertheless even those who are apparently assimilated

\textsuperscript{36} In an illuminating discussion, Brenner (2006) explains how PTSD affects the brain circuitry. The specific symptoms that characterize PTSD include hyperarousal, flashbacks, lack of concentration, intrusive thoughts, etc. It is believed PTSD affects the brain’s circuitry in several regions (mainly, the hippocampus, the amygdala, and the medial pre-frontal cortex) that produce long-term effects.

\textsuperscript{37} The CMH measure is based on three attributes: (1) absence of major depression, anxiety, bipolar disorder, suicidal thoughts, substance abuse in the past year, (2) happiness and/or life satisfaction in the past month, and (3) psychological and social wellbeing.
with white society show a deficiency in mental health. Furthermore, as the authors point out, the figure for off-reserve Aboriginals may be an overestimate because of sample selection. Participation in the survey was around 68%, but those who suffer from mental health issues were probably less likely to have participated. It is a reasonable conjecture that a smaller percentage of those living on reserves would exhibit CMH than those living off-reserve. This is because, even though the former would have more cultural connections, they are less educated and also do not have the same access to healthcare as the latter.

It must be noted that mental health issues of the Indigenous Peoples of North America are not unique to them. As Kirmayer, Brass, and Tait (2000) point out, Indigenous Peoples around the world have very similar issues, suggesting that they arise from common causes such as colonization, marginalization, destruction of culture, and exposure to a rapidly globalizing world.

7. Long Term Health Consequences of Indigenous Trauma: A Simple Model

In Section 5 a measure of the sense of self that conforms to a culture where land and community are of primary importance and in the previous section I outlined the core traumatic events that were systemically inflicted on the Indigenous peoples of North America. In this section, consulting the findings of psychologists, I identify how a few of the important basic parameters characterizing the self-concept are affected by serious trauma. Using a simple dynamic model, I then demonstrate some of the adverse health consequences of the systemic trauma inflicted on Indigenous peoples.

Trauma has been documented to have deleterious long-term consequences irrespective of race (though the extent may differ), as revealed by the literature cited in what follows in this section. Why, then, are the health and suicide statistics of Indigenous Peoples unquestionably worse than those of other minorities in North America? This section attempts to provide a tentative answer to this question. I model here the consequences of the trauma in the light of the effects on Indigenous identity.

A simple rational choice model is presented to make sense of the poor health condition of the Indigenous Peoples, relative to the rest of the non-Indigenous population, based on the idea of
erosion of their culture. I do this by starting with the empirical fact that historical trauma results in permanent changes in brain circuitry and behavior unless addressed by therapy. There are two effects of a diminished sense of self due to the trauma that, as an economist, I wish to focus on here. The first is the effect on time discounting and the other is the consumption preference for drugs to alleviate psychological pain, both of which are backed by firm evidence. My treatment differs from those in two recent papers on the effects of the somewhat related phenomenon of depression. De Quindt and Haushorf (2016) characterize depression at its core as an erroneous exogenous belief that the returns to labor are lower than what is factual. In a static model, they show that this induces lower effort, less investment, and greater spending on temptation goods. In a more elaborate dynamic model, Strulik (2019) models depression as an exogenous reduction in life satisfaction and examines its effect on lifespan and unhealthy choices. My dynamic model here, though simpler, is complementary to those of these authors but I examine the link between identity, trauma, and health. In particular, I examine how trauma and chronic pain (not considered by these models) contribute to health choices, suicide, longevity. The mechanisms posited here are quite different from those of the two approaches, and are particularly relevant to Indigenous Peoples.

There is an increasing amount of evidence suggesting the link between trauma and intertemporal behavior.\footnote{See Voors et al (2012) for evidence from Burundi, Imas, Kuhn, and Mironova (2015) for experimental evidence from the Democratic Republic of Congo, Akesaka (2019) and Matsuyama et al (2020) for evidence from Japan.} In an insightful view of the trauma of the Indigenous Peoples, Chandler and Lalonde (1998) have argued that trauma weakens the continuity of self. This is a manifestation of a general phenomenon where trauma dismantles the cohesiveness of the self-concept and weakens the sense of continuity [Zepinic (2016)]. Any activity that is in the nature of investment (health or human capital in my model here) requires implicitly that there be a continuity of the entity on whose behalf that investment is being undertaken. The second aspect of trauma I wish to incorporate is the fact that it inflicts both psychological and physical pain. The psychological aspect comes from the persistent re-living of the experience and the hyperarousal characteristic of PTSD. The chronic physical pain often reported of PTSD patients comes from a continuous or frequent tensing of muscles that unconsciously comes from hyperarousal.\footnote{See \url{https://www.ptsduk.org/chronic-pain-ptsd/}} I denote the strength of the sense of self here as a function of trauma experienced by $S(\tau)$, with $S'(\tau) < 0$ and $\tau$ is
taken as exogenous at this point. If this were the only effect of trauma on the self-concept, trauma would merely scale down the lifetime satisfaction in the model that follows below. However, as we have seen, there are two more effects of trauma on aspects of self that have serious health consequences.

If the sense of self is weakened, the incentive to invest will be weakened in favor of present consumption. I denote the discount rate by $\delta$, which will depend on the cumulative amount of past trauma experienced.

Psychological and chronic physical pain induces a person to use pain-killers, alcohol, and drugs for relief. The association between pain and substance abuse is well-known. We denote the expenditure on painkillers (alcohol, drugs, etc.) denoted by $p$, with higher levels of $p$ yielding higher levels of relief that do not extend past the present. In any given period, a person can allocate their income between consumption, $c$, towards their food and wellbeing (human capital) and painkillers offering relief from the effects of trauma. I refer to $c$ as healthful consumption. (Prices are fixed, for simplicity, and normalized to 1.) I posit the utility function in a period is a modified form of (16):

\[
S(\tau)c^\alpha p^\varphi,
\]

where $0 < \alpha < 1$, $0 < \varphi < 1$. I set $\omega \equiv \alpha + \varphi$, and assume $0 < \omega < 1$. These restrictions ensure diminishing marginal utility and strict concavity of the utility function in $c$ and $p$. We expect that the exponent $\varphi$ is actually a function of trauma.

From the evidence I have described, we see that the discount rate is a decreasing function of the strength of self: the more solid the sense of self, the greater is the continuity and the importance of the future. Also, from the evidence presented, the importance of pain killers is a declining function of strength of continuity of self: the more solid our perceived existence, the less the pain felt and the less is the need for pain killers. So, an *exogenous* increase in trauma (which undermines the strength of self) will increase the discount rate and elevate the importance of pain killers. Therefore, we may capture the effect of trauma on the discount rate by writing $\delta = \delta(\tau)$, with $\delta'(\tau) > 0$. And likewise, we may capture the effect of trauma on the importance of drugs by setting $\varphi = \varphi(\tau)$, with $\varphi'(\tau) > 0$. Note that the effect of trauma impinges on both $\delta$ and $\varphi$ through its effect on the strength and continuity of self.
In summary, we can conceive of trauma as having its effects on lifetime wellbeing through three avenues: one on the level of wellbeing directly through its effect on \( S(\tau) \); another, indirectly, through the discount rate \( \delta(\tau) \); and a third, indirectly, through the preference for pain-killers \( \varphi(\tau) \). The latter two avenues affect choices. The qualitative dynamic effects would work in the same manner for even undermined selves that were shaped in purely egoistic cultures. In that sense, this simple dynamic model can be generally applied, and the Indigenous Peoples cannot be treated as the “Other”. What makes this model particularly relevant to the Indigenous Peoples of North America is the duration and intensity of the trauma they have endured.

I consider the simplest intertemporal model to examine how trauma in general and in particular may partly explain the health condition of Indigenous Peoples. In this model, an Indigenous person allocates a given amount of wealth, say \( Z_0 \), over a lifetime that is determined endogenously, depending on how rapidly the wealth is exhausted. I assume that this is done rationally, just to get the point across; if one were to model the more complicated scenario of addiction—where choices become compelled and put outside the control of rational calculations—the effects would be much worse. I also assume that, to sustain the body, the healthful consumption has to remain above the minimum level denoted by \( \bar{c} \) and that death follows immediately after it falls below this level.

The individual has to choose the time profiles \( \{c(t), p(t)\} \) so as to maximize their discounted lifetime utility. For simplicity, I assume that the rate of interest funds earn at the bank is zero (but the discount rate of the individual is not, for reasons discussed). The intertemporal maximization problem may be written

\[
\begin{align*}
\text{Max} \quad & S(\tau) \int_0^T e^{-\delta t} [c^\alpha(t)p^\varphi(t)] dt \\
\text{s.t.} \quad & \int_0^T [c(t) + p(t)] dt = Z_0 \text{ and } c(t) \geq \bar{c},
\end{align*}
\]

where \( T \) is the endogenous time horizon.

If the stock of wealth remaining at time \( t \) is \( Z(t) \), the equation of motion of the \( Z(t) \) is

\[
\dot{Z}(t) = -c(t) - p(t),
\]

where a dot over a variable denotes its rate of change over time.
The associated present-value Hamiltonian, assuming the consumption constraint is non-binding, is

\[ H = e^{-\delta t}S(\tau)c^\alpha(t)p^\varphi(t) - \lambda(t)[c(t) + p(t)], \]

where \( \lambda(t) \) is the co-state variable associated with \( Z(t) \).

The first order necessary conditions with respect to \( c(t) \) and \( p(t) \), respectively, are

\begin{align*}
(21a) & \quad e^{-\delta t}S(\tau)c^\alpha(t)p^\varphi(t) = \lambda(t), \\
(21b) & \quad e^{-\delta t}S(\tau)p^\alpha(t)p^{\varphi-1}(t) = \lambda(t).
\end{align*}

The equation of motion for the co-state variable is

\[ \dot{\lambda}(t) = -\frac{\partial H}{\partial z(t)} = 0, \]

From (21a) and (21b) we see that \( p(t) = \left(\frac{\varphi}{\alpha}\right)c(t) \). From (21c), we see that \( \lambda(t) = \text{constant} \). To economize on notation, I shall simply drop the time argument of the shadow price \( \lambda \).

If the total expenditure at period \( t \) is denoted by \( y(t) \), it follows that and \( c(t) = \left(\frac{\alpha}{\omega}\right)y(t) \) and \( p(t) = \left(\frac{\varphi}{\alpha}\right)y(t) \). Substituting these in (21a) or (21b), we obtain

Solving this last equation, we obtain

\[ y(t) = \left(\frac{S(\tau)K\omega}{\lambda}\right)^{\frac{1}{1-\omega}}e^{-\frac{\delta}{1-\omega}t}, \]

where \( K \equiv (\alpha^\alpha\varphi^\varphi)/\omega^\omega \).

To determine the constant \( \lambda \), we use the fact that the total expenditure over the period \( T \) must be equal to \( Z_0 \):

\[ \int_0^T y(t)dt = Z_0, \]

\[ 40 \text{ This is a property, which is a characteristic of the Cobb-Douglas function in a static model retains this here because there is no addictive behavior in this model. If there were, this feature would not obtain.} \]
from which we can show that the shadow price is given by

\[ \lambda = \frac{S(t)K\omega}{z_0^{1-\omega}} \frac{1}{\delta} \left[ 1 - e^{-\frac{\delta}{1-\omega}T} \right]. \]

Thus the income path may be rewritten

\[ y(t) = \frac{z_0}{(1-\omega) \delta} \left[ e^{-\frac{\delta}{1-\omega}t} \right]. \]

The time path of the consumption good and pain killers are given by

\[ c(t) = \frac{\alpha}{\omega} y(t); \quad p(t) = \frac{\varphi}{\omega} y(t). \]

Healthful consumption (or human capital investment) and pain killer consumption are declining over time. We still have to endogenize the rational choice of \( T \). Recall that death follows when consumption falls below the minimum subsistence level, \( \bar{c} \). Then the terminal time \( T \) will be the determined as the time when the declining consumption over time reaches \( \bar{c} \), and so \( T \) is solution to the equation

\[ c(T) = \bar{c}. \]

Solving this, we obtain the terminal time, \( \bar{T} \), in terms of the primitive parameters as

\[ \bar{T} = \frac{1-\omega}{\delta} \ln \left( 1 + \frac{\alpha z_0}{\omega \bar{c}^{1-\omega}} \right). \]

The final solution is obtained by substituting (26) for \( T \) in (24) and (25). The path of the total expenditure is finally given by

\[ y(t) = \begin{cases} (\frac{z_0}{1-\omega} + \frac{\bar{c} \omega}{\alpha}) e^{-\frac{\delta}{1-\omega}t}, & 0 \leq t \leq \bar{T} \\ 0, & t > \bar{T}. \end{cases} \]

At time \( t = \bar{T} \) the consumption level of the person would be \( \bar{c} \), and the initial stock of wealth, \( Z_0 \), would be simultaneously exhausted.

When \( \varphi \) increases, so will \( \omega \) (recall that \( \omega \equiv \alpha + \varphi \)) and this will naturally reduce \( \bar{T} \) because more of the stock is being consumed per period. To be a meaningful exercise, I assume \( \omega \) is held
constant while $\varphi$ increases and so $\alpha$ decreases commensurately. That is, the weight put on pain alleviation due to trauma increases and that put on consumption for human capital decreases. From the above expression, we obtain the comparative static results that when $\omega$ is held constant,

$$
\frac{d\bar{r}}{d\delta} < 0; \quad \frac{d\bar{r}}{d\varphi} < 0.
$$

Since both $\delta$ and $\varphi$ are increasing in the amount of trauma, $\tau$, it follows from (28) that trauma reduces life expectancy, and for two reasons. The first is that psychological trauma increases the discount rate because it undermines the continuity of self and Indigenous identity. Since this increases the importance of the present relative to the future, the stock of wealth is exhausted sooner and life expectancy declines. The second reason is that trauma causes physical pain in the body and psychological damage to the sense of who one is. This increases the need to divert expenditures that would otherwise be dedicated to healthy living and human capital towards painkillers and numbing agents like drugs and alcohol. As a result, healthy consumption reaches the minimal subsistence consumption, $\bar{c}$, sooner. This implication of the model is consistent with the empirical findings reviewed by Lohr et al (2015), which show that people suffering from PTSD have lower life expectancies. Using Dutch data, Guven (2012) causally estimates that higher life satisfaction leads people to spend less, plan for longer time horizons, and save more. We would, of course, expect those suffering from trauma to also register lower levels of happiness or life satisfaction measures, first simply because $S'(\tau) < 0$ and also because of the induced psychological and physical pain.

Notice from (27) that as $\varphi$ increases holding $\omega$ constant (and $\alpha$ decreases commensurately), the time profile of the total expenditure path shifts up. This is in contrast to a static model in which preferences are the Cobb Douglas kind: the total expenditure would remain constant if $\omega$ is constant and only the composition of the expenditure between healthy consumption and painkillers would change. Here, however, total expenditure at each point in time before $\bar{T}$ increases because $\bar{T}$ decreases when $\varphi$ increases. That is, when the emphasis in preferences increases on dealing with trauma and pain at the expense of healthy living, the consumption profile of expenditure on healthful living reaches the subsistence level, $\bar{c}$, sooner and so the stock of wealth is exhausted over a shorter period of time. This suggests that people who have been exposed to severe trauma, as Indigenous Peoples undoubtedly have, there is a tendency to save
less for the future. This is consistent with some evidence that comes from a different quarter. Torres-Garcia et al (2018) analyzed savings behavior using data from 55 countries over the period 1980 to 2015. They found that among people exposed to armed conflict (and hence likely to be traumatized), reduced life expectancy and savings. In my model, the reduction in Indigenous Peoples’ life expectancy comes not from continuing armed conflict but rather from having to deal with their trauma and pain from the past.

These implications are recorded as follows.

Proposition 4:
(a) The higher the level of trauma experienced by a person, the lower is their lifespan.
(b) Trauma that induces chronic pain diverts expenditure from healthy consumption and the lowers lifespan, raises total consumption per period (reducing savings), and results in greater substance abuse.

There is a small literature linking time discounting and long-term outcomes. Using longitudinal Swedish data, Golsteyn, Gronqvist, and Lindahl (2013) show that high discount rates when young has adverse long term outcomes on education, earnings, and health. These effects, they find, work mainly through investments in human capital. The mechanism operating in my model, however, is more than discounting. In fact, there are two avenues relevant to the outcome here, as already noted but worth emphasizing. First, serious trauma undermines the notion of a continuous entity on whose behalf investments are to be undertaken; it damages the sense of self. This reduces the importance of the future and raises the discount rate. Second, the intense pain from the fragmented sense of identity makes a person divert resources by reaching for numbing substances to alleviate present misery.

Strulik (2019), in his treatment on the effects of depression, finds similar results to those in part (a) of Proposition 4 above. Depression reduces longevity, healthy choices and savings. But in his model, the mechanism there is that depression exogenously lowers life satisfaction and, since this makes a person less interested in life as such, is less motivated to eat healthily, do exercise, etc. In the model I present, I draw on the empirical facts that PTSD and trauma increase the discount rate and that trauma is often also accompanied by chronic pain that needs to be alleviated. As a result, in part (b) of the Proposition we see why substance abuse and lower life
expectancy are simultaneous and endogenous consequences of trauma, explaining two important—and hitherto unexplained—facts about traumatized people in general and the Indigenous Peoples in particular.

Given the well-documented evidence on the much higher levels of trauma experienced by Indigenous Peoples relative to non-indigenous people, the results in Part (b) of the above proposition contribute towards an explanation of the poor health condition of Indigenous Peoples. They are consistent with the evidence in Spillane et al (2020) on the excessive alcohol-related deaths in the U.S. of American Indians relative to other groups during the period 2000-2016; with Barnes et al (2010) on poorer health and higher levels of risky behavior; and with Espey and Cobb (2014) on the higher mortality and risky behaviors of the Indigenous peoples of America. In a recent paper, Blanchflower and Feir (2020) have documented that, between 1993 and 2019, the mental health condition of Native Americans relative to other races in the US. Furthermore, Native Americans experienced significantly more physical pain and depression than the other races (see, especially, the results in their Table 9). Another interesting finding of Blanchflower and Feir (2021) is that the seven U.S. states with the highest percentages of Native Americans exhibited the lowest levels of extreme mental distress.

Pollock et al (2018) in their review find elevated levels of Indigenous suicides relative to non-Indigenous populations in Australia, New Zealand, Canada, USA, and other Arctic countries. Curtin and Hedegaard (2019) find suicide rates are much higher in the U.S. for American Indians and Alaskan natives than for other ethnic groups. Kumar and Tjepkema (2019) find that suicide rates among the First nations, the Métis, and the Inuit is much higher than among non-Aboriginals. Pescosolido, Lee, and Kafadarc (2020) find that, for most ethnic groups in the U.S., the higher the proportion of groups with similar characteristics, the lower is the risk of suicide. They also find that at the county level that a higher proportions of Native Indian peoples (and Blacks) is associated with a higher risk of suicide. They argue that when a group is geographically isolated and traumatized, a higher proportion of people with similar backgrounds can actually “reverse the traditionally protective effect of ethnic culture”.

With a little bit of latitude in interpretation, the results of my model can be seen as being consistent also with these findings on Indigenous suicide rates. Excessive trauma can arguably lead to constant and intolerable pain and an almost complete discounting of the future—to the
point that the consumption of drugs and alcohol result in a dramatically premature death of the individual. In this model, we may loosely interpret such a steep fall in life expectancy following willful actions as ‘suicide’. This interpretation would be easier to accept if we eschew, as did Durkheim (1897/1951) in his classic work on the subject, the link between suicide and a decisive action intended to end life. In fact, his definition of suicide was this: “The term suicide is applied to all cases of death resulting directly or indirectly from a positive or negative act of the victim himself, which he knows will produce this result.” [Durkheim (1897/1951, Ch. 1), emphasis added] The rational choice of excessive abuse of substances with the foreknowledge of its consequences can be construed to satisfy Durkheim’s definition of suicide. Furthermore, I am applying the identity-based theory to Indigenous Peoples as a whole rather than to individuals because of their collective history of trauma (appropriation of land, relegation to reserves, separation of children from parents and enrolment in residential schools, dismantling of the extended family, effacing of customs and languages, among other atrocities that include sexual). Thus, the theory is also consistent with Durkheim’s insight that suicide is a sociological phenomenon.

Alternatively, following Case and Deaton (2020), we could club suicide and fatalities from substance abuse as “deaths of despair”. The devastation of identity is correlated with psychological conditions that may be contributing to despair. If we accept this position, the simple analysis above based on identity loss of Indigenous Peoples would also explain the high incidence of suicide among them. During the period 2011-2016 in Canada, the number of suicides per 100,000 of the population was 24.3 for Indigenous peoples and 8.0 for the non-Indigenous population.41 More specifically, my result may be seen as providing a theoretical underpinning for the empirical finding by Feir et al. (2021) that former bison-dependent tribes, who would have been traumatized by the extinction of the bison, exhibit higher suicide rates today. More generally, it also provides a rigorous rationale through the lens of economics for the claims made by Brave Heart and DeBruyn (1998) on the profound effects on Indigenous Peoples of their historical trauma, a concept originally based on the experiences of Holocaust survivors. The theoretical framework provided in this paper may go some distance in explaining the data for Canada and the U.S. But suicide among the Indigenous Peoples, however, is not merely a

North American phenomenon [Pollock et al (2018)]. Future research will need to unearth whether historical trauma and an identity-based theory offer a plausible explanation elsewhere.

The most direct evidence on the connection between the strength of self and suicide risk is provided by Chandler and Lalonde (1998). They use data from the 196 Indigenous bands in British Columbia, but were aggregated into few tribal groups because many of the bands had very small population sizes. For each aggregate group they computed six binary variables that measured cultural continuity (initiation of land claims, initiation of self-government, control over education, control over police and healthcare, and cultural centers), and summed them to produce a variable on a scale that went from 0 to 6. They found that this aggregate measure was inversely correlated with suicide rate in the group. Although there wasn’t enough data to perform controlled regression analysis, the correlation is very suggestive. It is this result of Chandler and Lalonde (1998), in fact, that was the cue motivating my formal theory.

Generally, given the theory I have presented, we would expect that Indigenous tribes that exhibit greater amounts of land ownership in common would also exhibit better health, \textit{all else constant}, because of the greater protection stemming from community culture. But testing this proposition empirically, of course, would require data on Indigenous tribes where other sources of support (access to healthcare, self-determination, education levels, etc.) can be controlled for.

We might also expect that, all else constant, Indigenous people living on reserves may have lower suicide rates than Indigenous people living off reserves, because the former have more by way of cultural. However, this is not necessarily the case for several offsetting reasons. All else may not be constant and social institutions such as health clinics, help centers, etc. may be less available on reserves than off-reserves. Also, a concentration of similarly traumatized individuals may increase the probability of suicide, as seen in some counties in the U.S. [Pescosolido, Lee, and Kafadarc (2020)]. In Canada, Kumar and Tjepkema (2019) report that the suicide rate among First Nations Peoples is twice as high for those living on-reserve than for those living off-reserve (see their Table A.2). Such a possibility was foreseen by Durkheim (see Mueller et al (2021)).

Note that the health consequences shown above obtain even in a model that does not incorporate the addictive behavior that frequently occurs with PTSD and chronic pain; they obtain even in a model of rational choice. In reality, matters would likely be much worse because many of the
affected are irrationally compelled by their addictions.

8. Concluding Thoughts with a Policy Implication

This paper articulates the view that the erosion of Indigenous Peoples’ identities has much to do with their current wellbeing and health status, peoples who occupied Canada and the United States long before 1492. I have sought to capture the idea that Indigenous cultures are intimately bound up with their land and to trace how the loss of their lands and cultures through centuries of oppression has led to their present predicament. The core idea pursued is not that the Indigenous Peoples are “damaged”—to use a phrase from Tuck’s (2009) critique on “damage-centered” research—but that these resilient peoples have been systematically subjected to adverse circumstances over centuries. It is appropriate to mention at least one policy implication that follows from this paper’s theory which would facilitate a resumption of their innate vitality.

Whatever policies work towards salvaging and reinstating the dignity and pride in their culture and their identity should contribute towards the improved physical and mental health of Indigenous Peoples. Since their present condition has been several centuries in the making, the policies, too, will have to be in place for the long haul before they can have their effects.

One non-obvious policy that would make a difference pertains to the reinstatement of Indigenous languages. Language is unique to the human species, and a localized group’s language is often unique to the group, an important source of its identity. The loss of an Indigenous band’s language is a loss of that collective uniqueness or identity as a group, the collective sense of ‘Us’ that, in this case, cannot be replenished through immigration. It is not without reason that, in the reservation schools that Indigenous children in North American were forced to go to in order to assimilate into white society, the speaking of Indigenous languages was banned. Indigenous languages are becoming extinct at a very rapid rate. Of the languages that were in use in 1950 in the U.S., Canada, and Australia, more than three-quarters are either dead or are on the verge of dying [Simons and Lewis (2013)], the extinct and endangered languages obviously being Indigenous ones. This is consistent with the hypothesis that the incidence of language loss is greatest in settler colonies as opposed to exploitative colonies or those for trade [Mufwene (2002)]. This also conforms to Wolfe’s (2006) insight that settler colonists ultimately seek to
eradicate Aboriginal land claims—but not necessarily through genocide. In these cases, it was through attempting to stamp out their separate identities as the original occupants of their lands.

To economists, it may seem that the death of languages is just a matter of the scale economies and network externalities associated with language and that it is inefficient to have too many languages in an increasingly globalized world. But language impinges on identity and that identity, as we have seen, is fundamental to wellbeing. There is a substantial cost associated with the loss of languages that need to be acknowledged before we can perform any cost-benefit analysis of revitalizing and preserving Indigenous languages.

Language is important not merely because it obviously facilitates communication. It is indispensable for transmitting world views, myths, philosophies, sacred songs, and the like—all the things that make an individual realize that they are not isolated but belong to a community with a tradition. It follows that language is instrumental in enabling individuals to form a self-concept. In the case of Indigenous Peoples, we have seen the social component of this identity is much greater than it is for individuals from western society. The strong link between this identity and the health consequences of its dismantling is what I have endeavored to bring out in this paper. In the light of the human costs of identity loss, we see that stock arguments of economists about network externalities, scale economies, and the like are so incomplete as to be misguided. The health implications of language revitalization are now recognized even by the health profession [see the reviews in *Lancet* by Gracey and King (2009) and King, Smith, and Gracey (2009)].

Chandler and Lalonde (1998) argued that cultural continuity, of which language is surely a vehicle, is a buffer against suicide. Hallett, Chandler, and Lalonde (2007) examined data from 152 Aboriginal bands in British Columbia, Canada, in which youth suicide rates varied considerably across bands. They found that, relative to other markers of identity, knowledge of their heritage language had the most predictive power with regard to the suicide rate in the band. The higher the proportion of the band population that spoke their native language, the lower was the youth suicide rate. In fact, bands where only the minority of the people (< 50%) spoke the heritage language had six times the suicide rate of bands where the majority spoke the language.

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42 See Schultz et al. (2019) for the evolution of the western concept of individuality.
While causality is not established and the data are insufficient to perform regression analysis with suitable controls, the results are strongly suggestive that being embedded in their culture through language is associated with lower youth suicide rates among Indigenous Peoples. The very high suicide rates among youths of the First Nations, the Métis, and the Inuit that Kumar and Tjepkema (2019) document may well be related to the rapid language loss among the Indigenous Peoples, an issue that could bear more investigation.

The positive effects of the mother tongue on identity show up even in children. Performance in immersion programs in Indigenous languages as compared to English-language instruction have been compared in some studies across Canada. Using data on 4-6 year old children on Manitoulin Island, Ontario, Morcom (2017) has shown that strong immersion in Aboriginal language schools fosters a healthy self-image in kindergarteners that facilitates effective learning, without engendering either a superiority or inferiority towards children from other ethnic groups.43

The No Child Left Behind policy implemented in the U.S. has had limited benefits for Indigenous children in America [see e.g. Balter and Grossman (2009)]. This offers a lesson for both the U.S. and Canada: merely spending more money to educate children in English or French is unlikely to work for Indigenous Peoples. Evidence on schools with immersion in Indigenous languages shows very promising benefits that will pay off not only in terms of education but also in terms of inculcating a strong self-concept in children. But this requires funding earmarked for the purpose. The U.S. passed the Native American Languages Act in 1990 to protect Indigenous languages. It allows schools to be conducted in Indigenous languages and gives children the right to express themselves in their language. In Canada, a similar Act was passed in 2019. These Acts promise to provide funding to revitalize Indigenous languages. The results of this paper indicate that the benefits to doing so far exceed the educational ones: they would also improve the health outcomes of Indigenous Peoples.

43 See the citations in this paper for other studies that show the benefits of educating Indigenous Peoples in their heritage language.
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