Environmental Conflict and Local Knowledge in Alaska Native Politics*

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Abstract

An important tension in Alaska Native politics concerns exploiting opportunities for economic development versus protecting subsistence rights. Often, groups located near a resource (e.g., minerals, oil, fish) support commercial activities, while more distant groups fear externalities might negatively impact subsistence activities (such as caribou hunting or salmon fishing). But what inhibits groups from bargaining to resolve conflicts over resource development? Using a formal model, I show that the existing "centralized" structure of resource governance, where a government official holds approval power, reduces compensation for negative externalities and inhibits communication of local knowledge relative to a "decentralized" procedure in which the affected group holds decision-making power. These factors (inadequate compensation and less informed policy) induce conflicting preferences between Native groups. Amid the transition to a clean energy economy, utilizing both local knowledge and scientific expertise—while protecting subsistence traditions—are crucial goals of environmental policy. I suggest institutional reforms to these ends.

Keywords: bureaucracy; environmental policy; formal model; indigenous politics; local knowledge

Work in progress

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An important tension in Alaska Native politics concerns exploiting opportunities for economic development versus protecting subsistence rights. Often, groups located near a resource (e.g., minerals, oil, fish) support commercial activities that bring wealth to local communities, which are typically very poor. Meanwhile, more distant groups fear externalities might negatively impact subsistence activities (such as caribou hunting or salmon fishing) that are vital to cultural traditions and contemporary diets. Such conflicts have contributed to a recent split in the Alaska Federation of Natives (AFN) and protests at AFN's 2022 convention.

Given the importance of pursuing beneficial development opportunities while protecting subsistence rights, a basic question arises: With a large potential surplus, what inhibits Coasian bargaining between groups to resolve these conflicts and then present a unified front to policymakers? And, given this failure, how do the resulting conflicts affect the likelihood that the correct policy is chosen?

I argue that the institutional structure of development approval creates a bargaining failure, which results in Native groups holding opposed preferences toward development and inhibits the transmission of information about the potential costs of a proposal. The crux of the argument is that a government official with access to expertise faces a commitment problem in approving development. If the official were to guarantee compensation for the negatively affected group, then that group would be willing to accurately communicate their local knowledge of the effects of the proposal. However, the official always has the ability to redirect economic benefits to other priorities. This creates an asymmetry relative to the alternative in which the affected group holds decision-making power. Then, now lacking the discretion to redirect economic benefits, the official accurately communicates scientific expertise to the group (as long as the official is not too biased for or against development).

I present a model with three players: two groups and an expert official. One group directly benefits from a proposed development, while the other groups bears a cost that is

private information. This cost depends on whether the development is likely to have a large or small effect on subsistence activities, which is observed by the expert but neither group. Thus, the model incorporates both local and scientific knowledge. The problem in this setup is how actors aggregate the scientific knowledge held by the expert and the local knowledge held by citizens.

The model contrasts two procedures: (i) the official approves the project or not, or (ii) the group experiencing the negative externality approves or vetoes the project. The latter case yields more compensation for the affected group, and this creates a greater shared interest between the latter group and an unbiased official, allowing more information to be transmitted. For this reason, an unbiased official chooses to decentralize decision-making to the affected group. Despite the effect on information transmission, a biased official might nonetheless choose a centralized decision-making structure in order to tilt outcomes in either a pro- or anti-development direction.

The classic normative tradeoff in models of expert policymaking concerns a conflict between informed policy and democratic accountability, which is driven by divergent preferences between an expert and an elected official (Gailmard and Patty 2012). In the model I present, the preference divergence between citizens and experts emerges due to the allocation of an economic pie, and citizens as well as the expert have policy-relevant information. The expert's commitment problem has the flavor of longstanding arguments over monetary policy (e.g., Schnakenberg, Turner, and Uribe-McGuire 2017). Here, though, granting citizens decision-making power allows them to extract a larger portion of surplus from development, facilitating information transmission.

This argument has implications for the literature on bureaucracy and economic development (Besley et al. 2022) and, specifically, the effects of alternative allocations of development rights (cf., Holland 2023). The formal setup involving a pro-development interest and a cost-bearing group builds on prior theoretical work on housing development in urban

politics (Foster and Warren 2022). My focus on the interaction between local and scientific knowledge contributes to the formal literature distinguishing different types of knowledge (Hirsch and Shotts 2012; Ou and Tyson 2023).

A variety of ongoing efforts in Alaska seek to incorporate local and traditional knowledge into the environmental policy process.[1] This paper emphasizes an essential problem with this approach: Whether tribal input is decisive or merely advisory affects incentives to convey information. When preferences differ, local and indigenous knowledge cannot (at least in full) be merely collected and applied by outside decision-makers. Moreover, the fact that policymakers do not decentralize decision-making, and instead solicit public input while maintaining authority, evinces divergent preferences from those of the citizens being asked to participate. This results in less informed policy and more divisive conflicts among Native groups, and the institutional structure should receive primary blame.

Empirical motivation

This paper motivates the analysis with three empirical examples:

1. *Donlin Gold mine*: Six tribes in the Yukon-Kuskokwim Delta region are suing the federal government to oppose a proposed open-pit gold mine. Opposed tribes fear consequences for subsistence fishing downriver, while Calista and The Kuskokwim Corp. (the Alaska Native corporations that own the relevant land) support it due to the economic benefits—gold deposits worth an estimated $80 billion and employment for roughly 3,000 people to build and 1,400 to operate.

2. *Area M commercial fishing*: Tribes along the Yukon and Kuskokwim rivers have demanded that the Alaska Board of Fisheries restrict commercial fishing in Area M so that

1. For example, see https://www.npfmc.org/new-lktk-database.

more salmon is available for subsistence, and the Alaska Federation of Natives (AFN), at its 2022 convention, passed a resolution supporting these demands. In response, Aleutian delegates protested by standing and turning their backs to the convention, and the Aleut Corp. withdrew from AFN shortly thereafter. A few months later, the Tanana Chiefs Conference, a regional tribal organization, also withdrew, citing AFN's lack of action to protect subsistence.

3. *Arctic National Wildlife Refuge (ANWR) drilling*: The regional and village Native corporations associated with the Kaktovik tribe, the sole village within ANWR, supported a lawsuit countering the Interior Department's pause on oil and gas leases in the refuge. The Gwich'in Steering Committee, representing tribes in Interior Alaska and Canada, oppose drilling out of fear that it could harm the Porcupine caribou herd, which they utilize for subsistence hunting.

Several elements of each case are worth highlighting. First, while there are clear economic benefits to the group near the resource, there is legitimate uncertainty over the extent of negative externalities endangering subsistence resources. Second, evaluating the effects on subsistence requires incorporating two types of knowledge: on one hand, scientific expertise on the magnitude of the effect, and on the other, local knowledge among members of the affected group on the significance of the impact on subsistence. Third, not knowing the likely magnitude of effects, and not being adequately compensation for these potential effects, the negatively affected group opposes the economic activity, resulting in conflicting preferences between Native groups over the opportunity for resource extraction. Finally, opposition is expressed before state or federal policymakers with ultimate decision-making authority. Table 1 summarizes the relevant features of each case.

Table 1: Summary of key elements of each motivating example.

	Donlin gold mine	**Area M commercial fishing**	**ANWR oil drilling**
Economic benefits	Estimated $80 billion in gold deposits	In 2022, total catch valued at around $70 million	4.3 billion barrels of technically recoverable oil
Threat to subsistence	Runoff chemicals in lower Kuskokwim affecting salmon	Reduced salmon in Yukon and Kuskokwim rivers	Interference with Porcupine caribou herd
Group directly benefiting	Kuskowkim Corp. and Calista; villages near proposed mine	The Aleut Corp. and communities dependent on commercial fishing	Kaktovik Village; Kaktovik Inupiat Corp.
Group facing externality	Tribes on the lower Kuskowkim River	Tribes along Yukon and Kuskowkim rivers	Gwich'in Steering Committee; tribes in Interior Alaska and Canada
Government decision-maker	Army Corps of Engineers; Bureau of Land Management; Alaska state agencies	Alaska Board of Fisheries; Alaska Department of Fish and Game	Department of the Interior

The argument

The main claim of this paper is that observable conflicts between Alaska Native groups occur, not (necessarily) due to inexorably opposed preferences, but (sometimes) as a result of the structure of the environmental regulatory regime. There are two reasons why the existing institutional structure produces conflict. First, government officials lack an incentive to provide adequate compensation.[2] Second, officials lack the information to determine

2. The proposal to require policymakers to provide community benefits agreements, while potentially raising other concerns, can be understood as an attempt to remedy this problem (Elmendorf 2024).

sufficient measures to address concerns over subsistence. Lacking compensation, due to a failure of both incentives and knowledge, Native groups potentially harmed by commercial activities oppose these activities, which are supported by groups directly benefiting from them—inducing conflict.

Some may be surprised that an absence of local knowledge is a problem, given recent efforts to incorporate local and traditional knowledge into government decision-making. However, knowledge (unlike masks and other artifacts) cannot simply be collected and transported elsewhere. Preference divergence between Native groups and government officials inhibits credible communication. This preference divergence is driven by a commitment problem on the part of government decision-makers. Government officials (naturally) do not value the economic well-being of the groups as much as the groups themselves do and, when they hold discretionary policymaking power, can redirect the benefits of economic activity to other purposes. By inhibiting compensation in this way, officials undermine credible communication.

This argument provides a theoretical link between two prominent features of Alaska Native politics. Conflicts occur because various groups believe that an economic activity endangers subsistence and whatever existing attempts at compensation, if any, are inadequate. Part of the reason policymakers do not provide adequate compensation is because they do not know the extent of local costs. Yet the reason that groups are unable to communicate local costs is that policymakers have the discretion to redirect economic benefits from development to their own priorities.

Both problems can be solved by decentralizing decision-making. Decentralization provides a commitment device for the official, because the group experiencing the negative externality can secure compensation for themselves. In turn, more aligned preferences between the group and the official facilitates communication of expert knowledge to the group,

who now directly determines whether to allow the project or not. But decentralization only occurs when the official has sufficiently similar preferences over the economic activity as Native groups. For this reason, the *absence* of decentralization reveals a bias on the part of official decision-makers. In the Implications section below, I suggest institutional elements for successful decentralization.

A model of environmental regulation

This section generalizes from the motivating examples above to represent this strategic situation as a sequential game of incomplete information. The central problem is that knowledge of the effects of an economic activity is divided between scientific experts and affected citizens. Depending on the institutional structure, one actor must communicate relevant information to the other, who then determines whether to allow the activity or not. Conflict may arise between groups affected in different ways by the activity, and the institutional structure may ameliorate or exacerbate conflict.

Formal definitions

There are three players: an official O, a group G_1 that directly benefits from an economic activity, and a group G_2 that experiences a negative externality from the activity. There are two possible institutional structures, selected by O: a *centralized regime* in which O controls project approval and a *decentralized regime* in which G_2 controls project approval. In either regime, there is information to transmit to the decision-maker (either from G_2 to O under centralization, or from O to G_2 under decentralization).

There are two sources of uncertainty. First, the magnitude $m \in \{0, M\}$ of the effect on G_2 is observed by O (but not G_2), where $m = 0$ with probability ρ and $m = M$ with probability $1 - \rho$. Second, the degree of cost k is observed by G_2 (but not O), where k is

drawn from a uniform distribution with support $[0, K]$.

Players are allowed to divide up the benefits of the economic activity β (where $0 < \beta < K$). When player $i \in \{O, G_2\}$ controls policy, i determines the allocation of economic benefits (O under centralization, G_2 under decentralization). The term F_i is the "fee" that G_1 pays to engage in the economic activity. A portion t_i of F_i may be used to ameliorate the negative externality. A portion s_i may go to O to use as they choose. (Subscripts denote the player i choosing F_i, t_i, or s_i.)

Utility functions

The utility functions of each player are as follows:

$$
\begin{aligned}
U_{G_1} &= \beta - F_i \\
U_{G_2} &= (F_i - t_i - s_i) - \mathbb{1}\frac{m}{2}(k - t_i)^2 \\
U_O &= \theta\beta - \mathbb{1}\frac{m}{2}(k - t_i)^2 + \alpha(-F_i + F_i - t_i - s_i) + s_i
\end{aligned}
$$

Group G_1 obtains the direct benefits of the economic activity, represented by β, but must pay the fee F_i in order to proceed. Group G_2 receives F_i, minus the portion t_i used to reduce the negative externality and any share s_i going to O. The variable $\mathbb{1}$ indicates that $t_i < k$, where the externality is zero otherwise. Whether G_2 experiences local costs k depends on the magnitude m of the externality. The official O cares about the benefits of the economic activity for G_1, with a bias captured by θ, as well as the externality impacting G_2. I assume that O discounts the value of the transfer experienced by G_1 and G_2 by $\alpha \in (0, 1)$, reflecting that O favors policy priorities of their own to which they can direct s_i.

Order of moves

In the following, steps (3i) and (4i) occur under centralization, while steps (3ii) and (4ii) occur under decentralization.

1. O chooses institutional structure
2. Nature reveals the effect of the economic activity to O and its cost to G_2
3. *Information transmission*
   i. O announces the effect of the economic activity m
   ii. G_2 announces cost k
4. *Project approval*
   i. O sets fee F_O (approving the activity or not) and chooses t_O and s_O
   ii. G_2 sets fee F_{G_2} (approving the activity or not) and chooses t_{G_2} and s_{G_2}
5. G_1 shares benefit (if applicable) and the activity proceeds or not

Assumption

The following assumption eases the analysis by reducing the number of cases and avoiding (most) corner solutions:

Assumption 1. *M is large. Specifically,*

$$M > max\left\{\frac{2}{K}, \frac{1}{2\beta}, \frac{1}{2K-2\beta}\right\}$$

Equilibrium

As a sequential game of incomplete information, the appropriate equilibrium concept is Perfect Bayesian Equilibrium (PBE). However, due to the equilibrium I choose to analyze, beliefs play little role in the analysis. Specifically, I investigate the possibility of a truthful equilibrium in both regimes. As it turns out, a truthful equilibrium is possible in one regime

and not the other. In the subgame where a truthful equilibrium is *not* possible, I assume a babbling equilibrium, which always exists (Crawford and Sobel 1982). This creates the strongest possible contrast between institutional regimes.

Comments on model assumptions

O represents a government official with access to expertise. In terms of the motivating examples, O may represent BLM, ADF&G, or DOI. I assume that O values the social benefits and costs of the economic activity, but θ represents the potential that O is biased either for or against development. Additionally, O may also be concerned about other policies. This captures the sense in which the regime in which O holds policy control is "centralized," in that O is not solely concerned with the welfare of G_1 and G_2. The coefficient α makes it so that O's preferences are somewhat misaligned with those of G_1 and G_2, and the variable s_O allows O to redirect economic benefits of the commercial activity toward O's other priorities.

Players G_1 and G_2 represent Native groups who are differently affected by the commercial activity. Group G_1 directly benefits from the activity, while, for G_2, the activity potentially endangers subsistence resources on which G_2 relies. To secure approval, G_1 may pay F_i, representing fees, transfers, or community benefits agreements, which benefit either G_2 or O. Once F_i is paid, the negative externality can be reduced, or even eliminated entirely, through ameliorative measures represented by t_i. Group G_2 is assumed to be a larger group than G_1 (which is true in the motivating examples). Essentially, I assume that the negative externality affects a larger set of people than those directly benefiting from the commercial activity. I interpret the decentralized regime as a majority vote among both G_1 and G_2, and since G_2 is larger, this translates into G_2 determining whether the activity proceeds.

There are a few reasons to prefer modeling communication as cheap talk rather than costly signaling. First, it makes the two institutional regimes more parallel; while it is easy to imagine the centralized regime allowing citizens to communicate through costly signaling

(e.g., public testimony, lawsuits, protests), it is more difficult to imagine what this would look like when experts seek to communicate in the decentralized regime. Because it seems more natural to envision experts communicating via cheap talk,[3] a clean comparison requires allowing citizens to do the same. Second, for actors attempting to communicate, cheap talk is preferable when communication is possible. Finally, existing models with a similar flavor utilize costly signaling (Foster and Warren 2023).

The information held by G_2 and O, respectively, is modeled differently in each case. Specifically, G_2 observes the realization of a continuous random variable (representing local knowledge), while O observes the realization of a discrete random variable (representing scientific expertise). There is a substantive as well as expositional justification for this asymmetry. Substantively, there is reason to believe that local knowledge is more granular, and expert knowledge more "clumpy." Hayek (1945) characterizes local knowledge as subjective and variable (both across places and over time), while expert knowledge necessitates "abstracting from minor differences ... by lumping together" (p. 524).

We can observe similar claims in the context of conflicts over resource governance in Alaska. The following is a quote from Vivian Korthuis, the head of the Association of Village Council Presidents, the regional tribal consortium for the Yukon-Kuskokwim Delta, in the context of fisheries management:

> What your reports don't show are the families in western Alaska who are worrying about putting fish away to feed their children throughout the winter... And parents and grandparents who are unable to pass our way of life down to our children and future grandchildren. (Woolsey 2022)

Here, Korthuis argues that the negative effects of restricting subsistence fishing are not fully captured in scientific reports because the experience of the effects is subjective and culturally specific. This sort of knowledge, involving a subject valuation of harm, is inherently difficult

3. See, e.g., Schnakenberg (2015, 2017).

to communicate.

Additionally, the modeling approach to these types of knowledge creates a stark tradeoff for O's institutional choice. This aids in the exposition of the argument, while capturing the crucial element, which is O's commitment problem. Under centralization, when O has discretion over policy, they inevitably move policy in their own benefit, creating a larger divergence of interests between O and G_2 than occurs under decentralization. So the basic tradeoff would still hold if m were a continuous random variable.

To solve O's commitment problem, O is provided the option of decentralizing policymaking to G_2. In this way, decentralization operates as a potential commitment device. This is the standard way that delegation is conceptualized, where once a politician grants policy discretion to an expert, the expert typically need not fear the politician taking back control once they observe the expert's action in response to the signal. Substantively, a couple considerations lend plausibility to this assumption. First, veto players may make it difficult to reverse decentralization once implemented. Second, even in the absence of formal veto players, citizens or interest groups may find it easier to coordinate around an existing policy rather than a prospective policy, locking in decentralization after it is the status quo.[4]

Analysis

First, we examine the possibility of truthful communication in the subgames representing each institutional regime (centralized or decentralized). As we will see, truthful communication is only possible in the decentralized case. Yet O benefits from the centralized regime, since O is able to shift resources toward their policy priorities, and this (along with O's bias for or against the commercial activity) creates a tradeoff for O in choosing between regimes.

4. This latter point is discussed further by Foster (2023). See, more generally, the literature on policy feedback effects.

While O chooses the centralized regime when their preferences over the economic activity are sufficiently biased, this choice often increases conflict between groups.

Communication between O and G_2

Decentralization: We begin by examining the subgame in which O has selected the decentralized regime. In this case, G_2 has decision-making power over whether or not the economic activity proceeds, and G_2 determines the portion of F_{G_2} that goes to ameliorating the externality (represented by t_{G_2}) and is shared with O (represented by s_{G_2}). Any remaining portion of F_{G_2} is kept by G_2.

At the end of the game, G_1 shares F_{G_2} with G_2 if and only if $\beta - F_{G_2} > 0$. Hence, either G_2 sets fee $F_{G_2} = \beta$, G_1 pays F_{G_2}, and the activity proceeds; or G_2 sets F_{G_2} greater than β and the activity is halted.

Positing a truthful equilibrium, there are two cases for the message $\tilde{m}$ that G_2 receives from O. In the first case, where $\tilde{m} = 0$, G_2 updates their belief that $m = 0$ with probability 1. Consequently, G_2 sets $F_{G_2} = \beta$ and $t_{G_2}, s_{G_2} = 0$ and approves activity. O's expected utility of sending the message that $m = 0$ is

$$\mathbb{E}U_O^{D,0} = \theta\beta. \tag{1}$$

In the second case, where $\tilde{m} = M$, G_2 updates their belief that $m = M$ with probability 1. Hence, G_2 sets $s_{G_2} = 0$ and their choice of t_{G_2} is determined by

$$\frac{\partial}{\partial t_{G_2}}\left(\beta - t_{G_2} - \frac{M}{2}(k - t_{G_2})^2\right) = 0 \tag{2}$$

This generates $t^*_{G_2} = k - \frac{1}{M}$ when $k > \frac{1}{M}$ and $t^*_{G_2} = 0$ otherwise (and the second-order condition holds).

Given Assumption 1, there are three possibilities. First, $k \leq \frac{1}{M}$ and G_2 approves with $t^*_{G_2} = 0$. Second, $\frac{1}{M} < k \leq \frac{1+2M\beta}{2M}$ and G_2 approves with $t^*_{G_2} = k - \frac{1}{M}$. Third, $k > \frac{1+2M\beta}{2M}$ and G_2 does not approve. This allows us to state O's expected utility from sending message $m = M$:

$$\begin{aligned}(3)\quad \mathbb{E}U_O^{D,M} = &\int_0^{1/M} \left(\theta\beta - \alpha 0 - \frac{M}{2}(k-0)^2\right)\frac{1}{K}dk \\ &+ \int_{1/M}^{\frac{1+2M\beta}{2M}} \left(\theta\beta - \alpha\left(k - \frac{1}{M}\right) - \frac{M}{2}\left(k - \left(k - \frac{1}{M}\right)\right)^2\right)\frac{1}{K}dk \\ &+ \int_{\frac{1+2M\beta}{2M}}^{K} 0\frac{1}{K}dk\end{aligned}$$

Player O's expected utility from the decentralized regime when $m = M$ (denoted $\mathbb{E}U_O^{D,M}$) will be relevant when considering O's incentive to choose centralization or decentralization. For now, though, what is important to determine is whether or not O has an incentive to deviate from the strategy of sending a truthful message for both $m = 0$ or $m = M$. As it turns out, O lacks an incentive to deviate for a range of values of θ. All proofs are in Appendix A.

Lemma 1. *In the subgame in which G_2 holds decision-making power, a truthful equilibrium exists where*

$$\frac{\alpha(1-2M\beta)^2}{4M\beta(1-2KM+2M\beta)} \leq \theta \leq \frac{12M\beta + 3\alpha(1-2M\beta)^2 - 4K^3M^3 - 2}{12M\beta(1-2KM+2M\beta)}.$$

The result in Lemma 1 shows that it is possible for O to truthfully communicate to G_2. Communication fails when θ is either too small (O is overly hostile to the economic activity) or θ is too large (O is excessively favorable to the activity). But where θ is intermediate, the value O places upon the economic activity is sufficiently aligned with G_2's preference that O

lacks an incentive to misrepresent the magnitude of the externality under the decentralized regime.

Centralization: Under the centralized regime, O sets F_O and allocates t_O and s_O. Since O observes the realization of m, the challenge now is whether or not G_2 can credibly communicate the value of k.

As above, at the end of the game G_1 proceeds with the economic activity if and only if $\beta - F_O > 0$. So O sets $F_O^* = \beta$ if they want to approve the project and $F_O^* > \beta$ otherwise. The key contrast with the analysis above, however, arises due to O's choice of s_O. While G_2 places no value on s_{G_2}, O values s_O more than the economic benefits retained by G_1 and G_2 (since $\alpha < 1$). Therefore, upon approving the economic activity, O sets $s_O^* = \beta - t$, extracting as much of the surplus as they can.[5] Player O still values ameliorating the negative externality, benefiting G_2, and may choose a value of t_O greater than zero. But unlike in the decentralized regime, G_2 does not keep the remainder. This creates a preference divergence between O and G_2 and implies that G_2 always has an incentive to misrepresent the value of k.

Lemma 2. *In the subgame in which O holds decision-making power, a truthful equilibrium does not exist.*

With local knowledge *and* scientific expertise both needing to be incorporated into policy, one might intuitively expect the two cases to be symmetric: Either O decides and needs information from G_2; or G_2 decides and needs information from O, both of which, it might seem, introduce an analogous problem. Yet toward the end of the game, O moves policy in O's benefit, and O cannot commit to *not* do this. In effect, O's discretionary policymaking

5. It is no doubt simplistic that O repurposes *all* benefits. This arises due to the linear function. Yet it conveys the point that O can use their discretionary policymaking authority to redirect economic benefits.

authority creates a preference divergence between O and G_2.[6] By contrast, G_2 never allocates benefits to O, and O's transmission of information does not affect this. But O cares about the overall social costs and benefits of the economic activity (along with other policy priorities). Hence, O has an incentive to truthfully transmit information as long as they are not too biased for or against the activity.[7]

The contrast between Lemmas 1 and 2 implies a tradeoff for O when selecting the institutional structure. The official O can maintain policymaking discretion, but this entails a sacrifice of information. Going forward, I assume a babbling equilibrium, where no information is transmitted, in the case of the centralized regime. This provides the sharpest contrast to the truthful decentralized alternative. In this case, O's informational sacrifice in choosing centralization is the greatest, and yet, as we shall see, they still do so.

Institutional choice

Based on the result above, O's expected utility from the truthful equilibrium in the decentralized regime is

$$\mathbb{E}U_O^D = \rho\beta\theta + (1-\rho)\mathbb{E}U_O^{D,M} \tag{4}$$

6. The fact that commitment problems inhibit bargaining arises in a variety of political contexts. See Acemoglu (2003) on the failure of a "political Coase Theorem." My interest is in how decentralization can address this problem.

7. Another way to the same outcome would be to not allow O to force community benefits agreements. That corresponds to observable patterns, yet misses the deeper point about O's commitment problem. If both players observe a continuous random variable, the starkness of this result would no longer appear. However, the lower degree of shared interests under centralization relative to decentralization reduces the opportunity for information transmission, and therefore the basic tradeoff still holds.

where if $m = 0$ (with probability ρ), then O truthfully communicates that to G_2, who approves the project, and if $m = M$ (with probability $1 - \rho$), then O's utility depends on the expected value of k.

We must also find O's expected utility from the babbling equilibrium in the centralized regime. There are three cases. For the first case, assume $m = 0$. Then O's expected utility is $\theta\beta - \alpha\beta + \beta$. This occurs because O repurposes the fee F_O obtained from G_1. But while the negative externality experienced by G_2 does not appear (given that $m = 0$), the loss of the fee experienced by G_1 still enters O's utility, though downweighted by α. Given this, the condition for O to approve development is

$$\theta \geq \frac{-\beta(1-\alpha)}{\beta} \equiv \theta^{T1} \tag{5}$$

Continuing, assume $m = M$. As before, O chooses to repurpose the fee. But in this case, the negative externality enters O's utility and hence O may choose to set a positive t_O. Hence, O's expected utility is

$$\begin{aligned} \mathbb{E}U_O^{C,M}(t_O) = &\int_0^{t_O} \left(\theta\beta + \alpha(-\beta) + (\beta - t_O)\right) \frac{1}{K} dk \\ &+ \int_{t_O}^{K} \left(\theta\beta - \frac{M}{2}(k - t_O)^2 + \alpha(-\beta) + (\beta - t_O)\right) \frac{1}{K} dk \end{aligned} \tag{6}$$

Given O's expected utility, O's optimal choice of t is

$$t_O^* = K - \sqrt{\frac{2K}{M}} \tag{7}$$

Reinserting t_O^* into O's expected utility, we obtain

$$\mathbb{E}U_O^{C,M} = \frac{2}{3}\sqrt{\frac{2K}{M}} + \beta(1 - \alpha + \theta) - K \tag{8}$$

And the condition for O to approve the commercial activity is

$$\theta \geq -\frac{2}{3\beta}\sqrt{\frac{2K}{M}} + \frac{K-\beta(1-\alpha)}{\beta} \equiv \theta^{T2} \tag{9}$$

So we have three cases: (i) $\theta < \theta^{T1}$, (ii) $\theta^{T1} \leq \theta < \theta^{T2}$, and (iii) $\theta \geq \theta^{T2}$. In the first case, O is extremely biased against the economic activity, such that regardless of whether $m = 0$ or $m = M$, O does not approve the activity. Given this, G_2's information is irrelevant and O never chooses decentralization. Hence, we have two relevant regions to consider: when θ is greater than or less than θ^{T2}. Comparing O's expected utility on either side of this threshold to $\mathbb{E}U_O^C$, there is a region of θ in which O prefers decentralization. This allows us to state the following result:

Proposition 1 (Equilibrium)**.** *An equilibrium exists in which O grants G_2 decision-making power and sends a truthful message where $\underline{\theta} \leq \theta \leq \overline{\theta}$.*

- *If $k \leq \frac{1+2M\beta}{2M}$, G_2 chooses $F^*_{G_2} = \beta$, $s^*_{G_2} = 0$, and $t^*_{G_2} = 0$ when $k < \frac{1}{M}$ and $t^*_{G_2} = k - \frac{1}{M}$ when $\frac{1}{M} \leq k \leq \frac{1+2M\beta}{2M}$; G_1 shares F_{G_2} and engages in the economic activity.*
- *If $k > \frac{1+2M\beta}{2M}$, then $F^*_{G_2} > \beta$, $s^*_{G_2} = 0$, and $t^*_{G_2} = 0$; G_1 does not engage in the economic activity.*

Upon receiving a message from O of $\tilde{m}$, G_2 believes $m = \tilde{m}$ with probability 1.

The logic of this result is analogous to the Holmström model with an all-or-nothing delegation decision. While there are two sources of uncertainty, the fact that O can send a truthful message in this region effectively reduces the strategic problem down to one source of uncertainty. The official O does not observe the value of k, and G_2 cannot credibly communicate the value of k to O. Therefore, O faces a tradeoff between incorporating relevant information into policy by decentralizing policy control to an actor with somewhat

misaligned preferences, versus not incorporating this information but setting policy closer to O's preference in expectation.

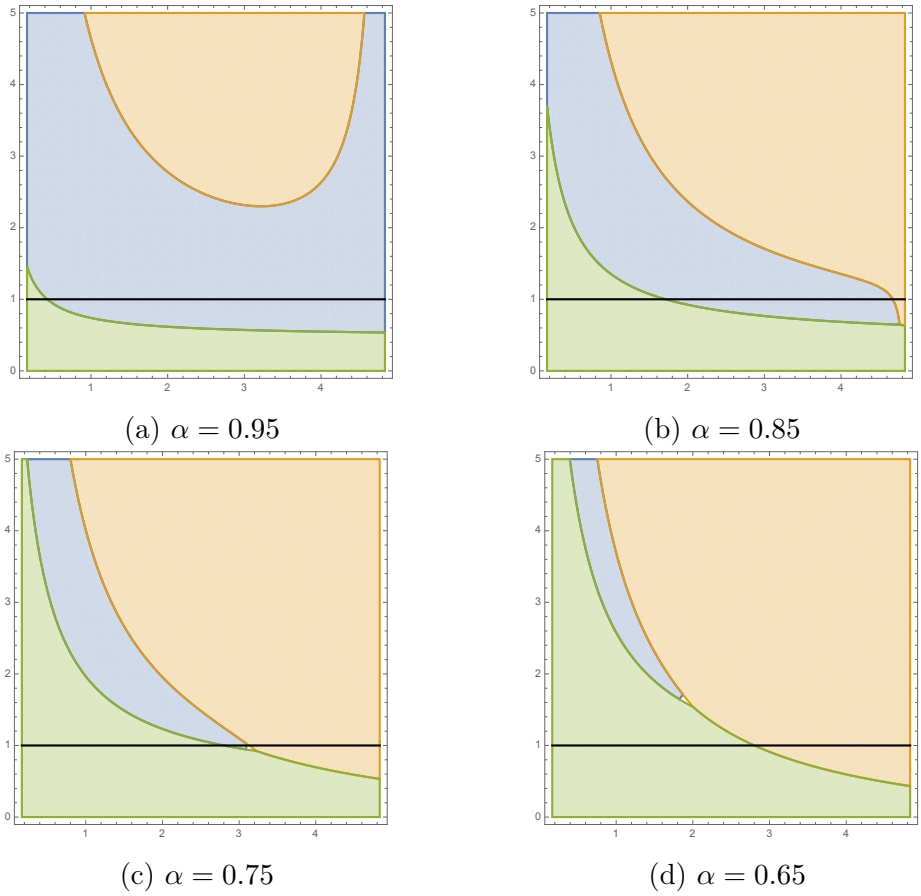
Figure 1 illustrates the regions for which O chooses the decentralized regime, rather than maintaining policy control and either approving or blocking the economic activity. The official O opts to decentralize when θ is in a middle region; when θ is too large or too small, then O is sufficiently biased for or against the activity so as to prefer to keep policy control even while giving up on incorporating G_2's information. As the plots show, this region is relatively large when α is high. This is because as α approaches 1, O values economic benefits for G_2 nearly as much as O would value repurposing such benefits through s_O. Moreover, because O values the activity itself (conditioned by θ), O effectively gains twice from approving the activity.

Conflict between G_1 and G_2

The previous section showed how O's bias leads O to select the centralized regime, reducing the amount of information incorporated into policy. The current section considers how O's institutional choice affects conflict between groups G_1 and G_2. Because G_1 directly benefits from the economic activity, potential conflict must arise with G_2's preference.[8] Consequently, we focus on whether or not G_2 prefers for the economic activity to proceed or not.

In thinking about G_2's preference for the activity, two factors are relevant. First, decentralization provides G_2 with compensation beyond the cost of ameliorating the negative externality. Second, in the centralized regime, O lacks knowledge of k and is therefore worse at targeting the cost of the externality. Both factors increase G_2's favorability toward the

8. In equilibrium, G_1 is indifferent about the economic activity proceeding because the decision-maker (either O or G_2) is able to extract the entire surplus. This is, of course, a simplification. Even if the decision-maker *could* extract the entire surplus, which is unlikely, there are plausibly positive externalities that G_1 values, like employment for local communities.



(a) $\alpha = 0.95$ (b) $\alpha = 0.85$

(c) $\alpha = 0.75$ (d) $\alpha = 0.65$

Figure 1: β is on the x-axis and θ is on the y-axis. The middle (blue) region represents where O chooses to decentralize decision-making to G_2. The horizontal line at $\theta = 1$ represents where O is neither biased for or against the economic activity. Other parameters are assigned values $K = 5$, $\pi = 10$, $M = 3$, and $\rho = 0.6$.

activity, which reduces conflict with G_1. The following result summarizes this point.

Proposition 2. *Relative to the centralized regime, G_2's support for the economic activity is weakly greater under the decentralized regime.*

Figure 2 plots G_2's utility for different values of local cost k for either institutional structure. For low values of k, G_2 strictly prefers for the economic activity to take place under decentralization, but is indifferent under centralization. In this region, G_2 is aligned with G_1 in either regime. For moderate values of k, G_2 continues to strictly prefer the activity

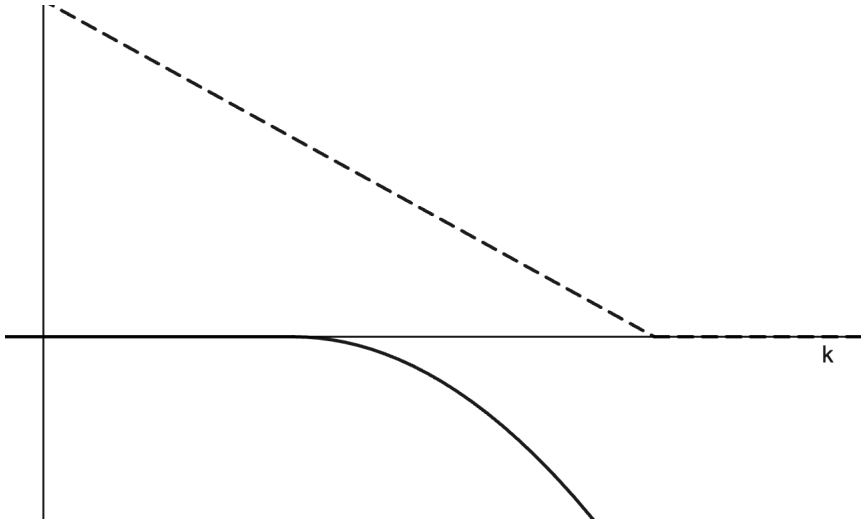


Figure 2: The dotted line represents G_2's utility under the decentralized regime upon the realization of k. The solid line represents G_2's utility under the centralized regime for a corresponding value of k. Parameter values are $K = 5$, $M = 1$, and $\beta = 4$.

take place under decentralization, but G_2's utility is strictly negative under centralization. Here, G_2 is aligned with G_1 under decentralization but *not* centralization. Finally, if k is too large, then G_2 opposes the activity in both regimes, though under decentralization G_2's utility never sinks below zero because G_2 simply does not approve the economic activity.

To emphasize, a key result of the model is that Native groups are in conflict with each other, rather than negotiating to their mutual benefit, and this arises due to the institutional structure in which outside actors hold decision-making power.

Implications

Despite recent efforts to incorporate local, traditional, and indigenous knowledge into resource governance,[9] the possibilities for credible communication are conditioned by institu-

9. For examples, see the 2016 MOU between Fish and Wildlife and the Kuskokwim River Inter-Tribal Fish Commission, the 2022 Biden Administration guidance for incorporating indigenous knowledge into federal policymaking (https://www.whitehouse.gov/wp-content/uploads/2022/12/OSTP-CEQ-IK-Guidance.pdf), and the LKTKS workplan adopted by the North Pacific Fishery Management Council in Oct. 2023.

tional incentives. Whether tribal input is decisive or merely advisory affects incentives to convey information.

The idea that institutions affect incentives to transmit information is standard fare in game theory; as is the general prescription that the actor with the information should typically be the one setting policy, because they are best positioned to most effectively utilize that information. Yet most models in political science might be thought to encapsulate a *Weberian* perspective on expertise, in which the relevant knowledge is largely or even exclusively held by experts. Due to incentive problems in communicating information, a view of expertise along these lines tends to be associated with recommendations for elected officials to delegate policymaking to experts. As expert policymakers are then able to shift policymaking toward their own preferences, this implies a tradeoff between democratic responsiveness and utilizing expertise in policymaking.

In the model of this paper, the central problem for a government official is how to obtain knowledge held by citizens. One can think of this as a *Hayekian* perspective on expertise, in which a large portion of the relevant information is dispersed among citizens. As a result, the standard argument from incentives to transmit information produces contrasting normative implications from other delegation models. Whereas before, when the most relevant knowledge was held by the expert, the politician needed to delegate to them in order to make use of such knowledge. But now, decentralizing policymaking to affected groups enables citizens to make use of their own knowledge. Rather than implying a tradeoff between expertise and democracy, this perspective sees democracy as facilitating the incorporation of (local) knowledge into policy.

Given that both citizens and experts have knowledge, it would seem that the answer is co-management.[10] Yet the model demonstrates an asymmetry. Officials are better able

10. See Ross et al. (2016) for further discussion.

to communicate expert knowledge to citizens than the reverse. One reason this occurs in the formal setup is that local knowledge is assumed to be more granular, and thus harder to communicate, than expert knowledge. But beyond this, government officials within a centralized institutional structure face a commitment problem. By caring about more issues than the conflict at hand, they are tempted to repurpose the economic benefits from the commercial activity to other priorities. In turn, this reduces compensation to those negatively affected and expands the preference divergence between the official and affected group beyond what it would be under decentralization. This incentive problem provides an additional justification to grant decision-making power to those who are directly affected.

This analysis helps explain the pervasiveness of resource conflicts in Alaska Native politics, and it directs attention away from inherent preference divergences among Alaska Native groups. Instead, the model identifies the institutional structure as a key contributor to conflicts. The lack of compensation to address concerns about the negative impact of economic activities, especially regarding subsistence resources, exacerbates conflicts between Alaska Native groups.

If institutional structure really is to blame for conflicts in Alaska Native politics, then it should be possible to restructure institutions so as to reduce these conflicts and better incorporate information in environmental policymaking. The model contrasts centralized and decentralized regimes, but leaves these regimes largely as abstractions. And while centralization is easy to envision, given that it reflect existing institutions, what might decentralization look like? In the following, I discuss a couple key problems and then suggest a potential solution.

The first problem is that in many cases (and the motivating examples specifically), environmental effects do not follow existing jurisdictional boundaries. Concerns about the negative effects of ANWR oil drilling are most dramatic in this regard, in that the Native groups concerned about threats to subsistence cross an international border. But Donlin gold

mine provides another relevant example, in that the groups affected are specifically those downstream from the proposed mine, rather than the Yukon-Kuskokwim Delta as a whole (as the region is typically defined). Here, I take the key challenge to be determining the boundaries of the group experiencing the negative externality. This is due to the uncertainty at the heart of the strategic problem. Given the uncertain effects of the economic activity, the boundaries of the group experiencing the externality are not known ex ante.[11]

A second problem is that citizens in rural Alaska often do not know the procedures for public input on environmental issues. Not only are multiple levels of government often relevant for any given issue, but there are multiple agencies at each level that might have jurisdiction in any given case. Even organized advocates for Native interests struggle to keep up with a complex calendar of public notices, periods for comments, and decision-making bodies. While subject to much criticism, a signal advantage of the National Environmental Policy Act (NEPA) lawsuit option is that anyone is allowed to claim they are affected, and they can use the court system to circumvent administrative hurdles.

To address the problem of determining who experiences the externality, my suggestion is to replicate the NEPA lawsuit process. However, rather than going to a court, the claimant proposes boundaries of the group to make the decision. From these boundaries, a large jury is drawn to decide on the economic activity. Across a few iterations, the boundaries are likely to stabilize. With a large jury, the decision will reliably reflect public opinion and hence, once the boundaries stabilize, yield a durable outcome.

Based on the theory of this paper, a decentralized regime along these lines is likely to lead to more knowledge incorporated into policy and less conflict among Alaska Native groups.

11. Ostrom (1990) sets this issue aside. A worry is that incorrectly specifying boundaries will create political pressure to re-centralize.

Conclusion

Many Alaska Native communities are poor but surrounded by resource-rich lands and water, alongside institutions like Native corporations for extracting these resources and distributing the wealth to local communities. Yet the negative externalities of such economic activities risk harming vital subsistence resources like fish or caribou. Balancing the benefits and harms of economic opportunities in rural Alaska requires aggregating local knowledge and scientific expertise. Despite recent efforts to utilize local knowledge in government decision-making, I argue that inherent incentive problems in strategic communication result in such knowledge failing to be adequately incorporated. Moreover, the institutional structure in which government officials maintain approval power exacerbates conflicts between Alaska Native groups who are affected in different ways by opportunities for economic development.

The model analyzes the strategic interactions among a government official and two Native groups: one who directly benefits from an economic activity and another who is potentially subject to a negative externality from the activity. The official selects among two institutional structures to resolve these conflicts. If centralized, then local knowledge must be communicated to the official. If decentralized, then scientific expertise must be communicated to the Native group. The official's temptation to redirect economic benefits of development according to their own priorities increases the preference divergence between the group and official whenever the official has policymaking discretion, and therefore the official faces a tradeoff. When sufficiently unbiased, the official chooses decentralization, which results in more information communicated and often reduces conflict among Native groups because the group subject to the externality is better able to obtain compensation.

The standard normative tradeoff in the political science literature on the bureaucracy between democratic responsiveness and making use of expertise in policymaking derives from a Weberian perspective on the nature of expertise. In environmental policy, there

has been a recent recognition that local and indigenous knowledge is essential for effective resource governance. Such a Hayekian perspective, focusing on local knowledge, leads to a reevaluation of the normative tradeoff regarding expert policymaking. Now, the core problem is transmitting information to the official. Despite efforts to collect indigenous knowledge and incorporate it into environmental policy decisions, the official's discretion can create a barrier to information transmission. This implies that the best way to incorporate both local knowledge and scientific expertise is to decentralize decision-making to directly affected groups. By facilitating more informed policy as well as compensation for negative externalities, this is a plausible path for reducing conflicts over resource management.

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Supporting information for "Environmental Conflict and Local Knowledge in Alaska Native Politics"

February 27, 2024

Table of Contents

A Formal proofs

Proof of Lemma 1. There are two cases to consider. First, $m = 0$ and O's expected utility from deviating by sending a message $\tilde{m} = M$ is

$$\begin{aligned}(A.1)\quad &\int_0^{1/M}\left(\theta\beta-\alpha 0-\frac{0}{2}(k-0)^2\right)\frac{1}{K}dk \\ &+\int_{1/M}^{\frac{1+2M\beta}{2M}}\left(\theta\beta-\alpha\left(k-\frac{1}{M}\right)-\frac{0}{2}\left(k-\left(k-\frac{1}{M}\right)\right)^2\right)\frac{1}{K}dk+\int_{\frac{1+2M\beta}{2M}}^{K}0\frac{1}{K}dk \\ &= \frac{4M\beta(1+2M\beta)\theta-\alpha(1-2M\beta)^2}{8KM^2}\end{aligned}$$

O prefers to send the truthful message when

$$(A.2)\qquad \beta\theta \geq \frac{4M\beta(1+2M\beta)\theta-\alpha(1-2M\beta)^2}{8KM^2}$$

$$(A.3)\qquad \theta \geq \frac{\alpha(1-2M\beta)^2}{4M\beta(1-2KM+2M\beta)}$$

Second, $m = M$ and O's expected utility from deviating by sending a message $\tilde{m} = 0$ is

$$(A.4)\qquad \int_0^K\left(\theta\beta-\alpha 0-\frac{M}{2}(k-0)^2\right)\frac{1}{K}dk = \beta\theta-\frac{K^2M}{6}$$

O prefers to send the truthful message when

$$(A.5)\qquad \mathbb{E}U_O^{D,M} \geq \beta\theta-\frac{K^2M}{6}$$

$$(A.6)\qquad \theta \leq \frac{12M\beta+3\alpha(1-2M\beta)^2-4K^3M^3-2}{12M\beta(1-2KM+2M\beta)}$$

Given the conditions of Assumption 1,

$$(A.7)\qquad \frac{\alpha(1-2M\beta)^2}{4M\beta(1-2KM+2M\beta)} < \frac{12M\beta+3\alpha(1-2M\beta)^2-4K^3M^3-2}{12M\beta(1-2KM+2M\beta)}$$

Therefore, a parameter region exists between these bounds in which O does not have an incentive to deviate from sending a truthful message under decentralization. □

Proof of Lemma 2. For purpose of contradiction, assume a truthful equilibrium exists in the centralized regime. In such an equilibrium, G_2 observes k and sends a message of $\tilde{k} = k$ to O, and O updates beliefs that $k = \tilde{k}$ with probability 1.

Consider the case in which $m = M$. O chooses t_O based on the following maximization problem:

$$\frac{\partial}{\partial t_O}\left(\theta\beta - \alpha\beta - \frac{M}{2}(k-t)^2 + \beta - t_O\right) = 0 \tag{A.8}$$

This yields $t_O = k - \frac{1}{M}$. The second derivative with respect to t_O is $-M$, and therefore the second-order condition holds.

O chooses $t_O^* = 0$ when $k < \frac{1}{M}$ and $t_O^* = k - \frac{1}{M}$ when $k \geq \frac{1}{M}$. This implies the following utility for G_2:

$$EU_{G_2} = \begin{cases} -\frac{Mk^2}{2} & k < \frac{1}{M} \\ -\frac{1}{2M} & k \geq \frac{1}{M} \end{cases}$$

Can G_2 increase their utility by sending a different value of k? Suppose G_2 sends $\tilde{k} = k+\epsilon$, where we assume $0 < \epsilon < min\{\frac{1}{M}, K-k\}$. This yields the following expected utility:

$$-\frac{M}{2}\left(k - \left((k+\epsilon) - \frac{1}{M}\right)\right)^2 = -\frac{(M\epsilon - 1)^2}{2M} \tag{A.9}$$

And $-\frac{(M\epsilon-1)^2}{2M} > -\frac{1}{2M}$ when $\epsilon < \frac{1}{M}$.

This contradicts our initial assumption of a truthful equilibrium. Therefore, no truthful equilibrium exists. □

Proof of Proposition 1. TK □

Proof of Proposition 2. TK □