

A bargaining experiment under weak property rights, with implications for indigenous title claims[☆]

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ABSTRACT

We explore how three parties bargain over a windfall created by a development project given negative spillover on only one party's property. We compare how weak and strong property rights affect negotiation outcomes and fairness. With strong property rights, parties secure equal payment. With weak rights, parties reimburse costs and divide surplus so the developer is simply indifferent, nothing more. These results are meaningful for Indigenous in Canada: without strong property rights, the Crown's duty to consult may still yield dissatisfaction because of improper compensation.

In my view, the doctrine of aboriginal rights exists, and is recognized and affirmed by s. 35(1), because of one simple fact: when Europeans arrived in North America, aboriginal peoples were already here, living in communities on the land, and participating in distinctive cultures, as they had done for centuries.

- Chief Justice Antonio Lamer, 16th Chief Justice of the Supreme Court of Canada.

1. Introduction

What is good for the majority can be costly for the individual. This is particularly true with the historical development of many common property resources on the frontier (Mueller, 1997; Allen, 2019). Given power disparities and the lack of clear rules, newcomers' activities

imposed negative externalities on others, including indigenous peoples. Strong property rights tend to emerge as the result of an evolutionary process (Alston et al., 2012; Wakamatsu and Anderson, 2018), but institutional changes take time, especially given the unique relationship between indigenous tribes and governments (Nemoto, 2002).

Without the guardrail of private property rights, Aboriginals lacked the ability to shape or reject the development process and to be compensated for the loss of traditional land and resources. Development might be socially desirable, but without proper compensation to Aboriginals, in no way can it represent Pareto-improvement. This led to dissatisfaction among tribes, as any compensation received depended on the social preferences of the population, governments, and more powerful interests. This inability of indigenous - hereafter Aboriginal - peoples to have a say in development is still present today. In Canada,

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the USA, Australia and New Zealand, the laws defining Aboriginal rights and ownership are complex, but they may be the only way to ensure a continuing dialogue between Aboriginal and non-Aboriginals (Nemoto, 2002). The legal status of traditional lands may not grant tribes the right to allocate that land to its preferred economic use, as we discuss in the next section. When someone else imposes development, Aboriginals still struggle to obtain full compensation from development for lost rights and for their share of natural resource rents. This matters as well-managed development and its associated revenues may help Aboriginals' lodging issues and food insecurity (Deaton et al., 2020). The choice of regulatory regimes is not only a way to ensure efficiency in resource allocation, it is also a matter of social justice (Paavola, 2007).

Herein we design an experiment to explore the bargaining behavior under two cases: weak and strong property rights. We explore how three parties (A, B, and C) bargain over a windfall created by private development of a resource that imposes disproportionate costs on individual A (e.g., Aboriginal lands with timber concessions, hydropower development and salmon fishermen).¹ Development is too capital-intensive for A to develop alone. The three owners form a governing body to decide whether to develop and how to distribute the associated benefits. We examine how they divide development benefits when A (Aboriginals) have weak or strong property rights given that only A bears private costs from development (e.g., lost economic value of traditional lands and rights on these lands). With weak property rights, A alone cannot prevent development. Benefit shares follow from consultations and negotiations with B and C. Strong property rights give A the power to (i) veto unacceptable development proposals and benefit shares and (ii) enforce his outside option, status quo. We associate weak property rights with our majority-vote treatment, and we associate strong property rights with our veto treatment; we use those associated terms interchangeably.

Using a three-person bargaining experiment (Cherry and Shogren, 2008), we find that with strong property rights, all owners get an equal net share. With weak rights, we find B and C reimburse A's costs and distribute the remaining surplus such that A is indifferent between developing or not. Our results suggest that only strong property rights ensure a landowner equitable compensation from development. Without strong rights, significant inequity is avoided only if the other parties have sufficiently large social preferences (see e.g., Rubinstein, 1982; Rand et al., 2013).

Our paper is presented as follows: Section 2 further develops the motivation for our experiment, Section 3 presents our equilibrium concepts, Section 4 explains our experimental design, Sections 5 and 6 present our results and subsequent discussion, and we conclude in Section 7.

2. Aboriginal background

In this section we present a summary of the Aboriginal context relevant to the interpretation of our experiment.² Then, we present historical examples and how courts have acted.

2.1. Aboriginal summary

The Aboriginal context is complex and our goal is to summarize *some* key features of property rights and bargaining related to our experimental framework. We focus on the Canadian case, but there are

¹ The resource is a private good, where the benefits of development are both rival and excludable. The benefits obtained through development of the resource are not private, however, and parties bargain over the distribution of the associated revenue from the sale of the good.

² As hinted in Section 2.1, Aboriginal questions are complex and many issues in indigenous economic development arise because of other reasons, either legal, historical, geographic or economic (Hanna, 2017).

similarities in other common law jurisdictions.³ The legal landscape for Aboriginals in Canada has been shaped by a variety of rulings by the Supreme Court of Canada (SCC), including on the relationship with the Crown, rights, and consultations⁴

When Aboriginal land claims are legally recognized, the granted *Aboriginal title* provides the holder the right to (i) exclusive use of the land; (ii) the choice of preferred land use, provided that the land's capacity to sustain future generations is preserved; and (iii) the economic fruits of the land (SCC Delgamuuk para. 166, SCC Tsilhqot' in para. 120). This is consistent with the bundle of rights of a proprietor of the land (Schlager and Ostrom, 1992; Ostrom, 2003). Such title is very difficult to prove before the courts: it relies on the continuous occupation of the land prior to – and since – European occupation, which, aside from the necessary archeological evidence, is a stretch for many nomadic tribes. Unsurprisingly, only one title has ever been recognized, and the title holder, the Tsilhqot' in First Nation of British Columbia, had to challenge the provincial government over logging rights on the land all the way to the Supreme Court. An Aboriginal title also comes with restrictions, most notably that it is “it is collective title held not only for the present generation but for all succeeding generations” (SCC Tsilhqot' in para. 74). This means that the land must be sustainably managed so that future generations can enjoy it. Possible uses include traditional activities, but also modern ones, provided sustainability is not hindered.

An Aboriginal title is as close as Aboriginal property rights get to *fee simple* ownership, even if, in very specific circumstances, First Nations may still not have the final say over their land.⁵ In our experiment, possession of an Aboriginal title is what we label as strong property rights; a situation in which Aboriginals effectively have veto power over the development decision and benefit dispersal.

One important cause of Aboriginal dissatisfaction with development projects is that the Crown has competing obligations; it “wears many hats” (SCC Wewaykum para. 96). The Crown has a fiduciary relationship with the First Nations, meaning that the duty to protect Aboriginals' interest is vested in the Crown. This unique, or *sui generis*, trust-like relationship with Aboriginals exists because “of one simple fact: when Europeans arrived in North America, aboriginal peoples were already here [...]” (SCC Van der Peet para. 30). Paradoxically, the Crown must also be the guardian of the public interest. In that role, it comes between and considers the interests of Aboriginal groups and third parties (SCC Gu'erin para. 387d) with regards to development.⁶

The SCC repeatedly ruled that the Crown has an honorable duty to consult and accommodate Aboriginals when their rights may be

³ See Go'cke (2013) for a summary of the differences in the history and legal framework between the common law jurisdiction of Canada, USA, Australia and New Zealand.

⁴ SCC rulings clarify the fiduciary relationship between the Crown and Aboriginals (Gu'erin v The Queen [1984] 2 S.C.R. 335); the extent of the constitutional protection of unextinguished Aboriginal rights (R v Sparrow [1990] 1 S.C.R.1075, R v Van der Peet [1996] 2 S.C.R. 507, R v Gladstone [1996] 2 S.C.R. 723, R v Marshall [1999] 3 S.C.R. 456); land claims and titles (Delgamuukw v British Columbia [1997] 3 S.C.R. 1010, Tsilhqot' in Nation v British Columbia [2014] 2 S.C.R. 256); on good faith consultations when developing on Aboriginal lands (Haida Nation v British Columbia [2004] 3 S.C.R. 511, Clyde River (Hamlet) v Petroleum Geo-Services Inc. [2017] 1 S.C.R. 1069, Chippewas of the Thames First Nation v Enbridge Pipelines Inc. [2017] 1 S.C.R. 1099).

⁵ Similar to expropriation with regular property rights, the Crown may still infringe an aboriginal title on “the basis on of the broader public good” provided (1) it conducted good faith consultation; (2) it is in the public interest; and (3) public benefits are proportionate to the adverse effect on Aboriginals (SCC Tsilhqot' in para. 77 & 125).

⁶ In Platinex 2006, the Ontario Superior Court authorized an injunction stopping Platinex, a drilling company, to drill on Aboriginal land subject to a treaty land entitlement claim. A year later in Platinex 2007, the judge did not extend that injunction on the ground that the firm would likely not survive until a trial. The judge had to balance competing rights (ON S.C. Platinex [2006], ON S.C. Platinex [2007]).

affected. Aboriginals must be given “formal participation in the decision-making process” (SCC Haida para. 44). Meetings are held in affected communities and people can publicly voice their concerns. The duty to consult applies to land covered by strong property rights (Aboriginal title), discussed below, as well as to land with weaker property rights (unproven Aboriginal title claims): the Crown “must respect these potential, yet unproven, interests” (SCC Haida para. 25). The depth of the meaningful consultations vary with respect to the adverse impacts and with the strength of the land claim. Fig. 1 summarizes the duty to consult with weak, strong or established claims (adapted from [Aboriginal and Northern Affairs Canada, 2011](#)).

While consultation is mandatory to ensure that concerns are heard and that compromises and compensation are discussed, the “Crown is not under a duty to reach an agreement” over development or benefit sharing-rules (SCC Haida para. 10). Without proven Aboriginal title, Aboriginals have no “‘veto’ over final Crown decisions” (SCC Chippewas, 2017, para. 59). In our experiment, this is what we call weak property rights: Aboriginals are publicly consulted and are part of the decision-making process, but they lack veto power regarding both the development decision and benefit dispersal.

2.2. Relevant cases

In this section, we present three recent cases that went to courts. It has been documented that over the years, consent by Aboriginals has been sought by developers or the governments early on in project planning. With such a consent, there can be no breach to the Crown's duty to consult (SCC, *Tsilhqot'in*, para. 97). Aboriginals and developers can sign an impact benefit agreement, specifying how benefits from the economic activity will be channeled to the First Nation members. Despite this consent, the project still has to be evaluated and approved by the usual regulatory bodies.

In 2014, the SCC recognized the first Aboriginal title to the *Tsilhqot'in* Nation in the Province of British Columbia, over an area of 1700 km², almost the size of Kuwait. The First Nation and the Province disagreed on logging concessions on traditional lands. Using oral evidence, combined with archeological and historical evidence, the SCC awarded the First Nation an Aboriginal title. The court recognized the lack of good faith consultations and accommodation. The title comes with the right “to proactively use and manage the land” (SCC *Tsilhqot'in* 2014, para. 94) but also with the duty to sustainably manage the land so that it can sustain future generations.

In two simultaneous rulings in 2017, Chippewas and Hamlet, the SCC reiterated the importance of consultation when Aboriginal rights can be affected by development. In Chippewas 2017, the SCC analyzed whether the Chippewas of the Thames, a First Nation in Southwestern Ontario, were adequately consulted on a project by Enbridge that would have changed the flow, capacity and oil type carried by an existing pipeline. The court ruled that irrespective of the strength of the Aboriginal title claim, the Crown fulfilled its duty to consult through its regulatory arm, the National Energy Board (NEB). The agency, the ruling said, has the expertise to evaluate risks and require project modifications to mitigate those risks, including those, identified in their consultation of the Chippewas, to have the potential to affect Aboriginal rights and title claims. The SCC found the NEB fulfilled its duty to consult with the Chippewas, despite the NEB's dismissal that the Chippewas' concerns could not be sufficient to stop the project. The SCC dismissed the appeal and awarded costs to Enbridge.

In Hamlet 2017, the SCC analyzed the case of the Inuit of Clyde River, a hamlet on Baffin Island, in the Canadian territory of Nunavut. The NEB was responsible for granting authorization for oil and gas seismic testing, which would have adverse impacts on the subsistence resources of the Inuit. The SCC found in favor of the Inuit, and the NEB authorization was revoked. The court reasoned that the potential impacts to the subsistence resource were severe, the efforts to advise and consult the Inuit were insufficient, and that it was not clear to the Inuit

that the NEB, a federal regulatory agency, was responsible for the Crown's duty to consult.

These final cases show that in the absence of strong property rights (e.g. Aboriginal title) the decision of whether to allow resource development may depend upon ill-defined social preferences. Additionally, it is unclear that local communities will be sufficiently compensated for their costs under weak property rights when a resource is developed. This contrasts with the first case, where the First Nation had strong property rights and was able to prevent development and gain permanent control of the resource.

3. Literature and equilibrium concepts

Individuals have prosocial preferences ([Fehr and Schmidt, 1999](#)), such that their utility level depends upon both their own net income and the net income to other players in the game. In our setup, owners B and C care about their private gains from development, but following [Fehr and Schmidt \(1999\)](#) they also care about owner A's gain after development, net of the costs he faces. Development cannot be bad for B and C, irrespective of the subsequent allocation of the gains. This cannot be true for owner A, being left uncompensated by a society imposing development changes his reference point ([Kahneman and Tversky, 1979](#)). Consequently, the simultaneous negotiation of development and benefit shares means owner A is also negotiating over his reference point. Fairness of the final outcomes should also account for A's position with respect to his reference point.

[Güth and van Damme \(1998\)](#) use a three-person bargaining game combining both the dictator and ultimatum games. This is similar to the majority-rule version of our game where the proposer only needs the approval of one specific outside member. For example, if A proposes, she would only need the approval of B for the proposal to pass, and the outside member C has no say in the proposal. They find that little compensation is offered to the outside member (C). In contrast, our experimental design does not preform coalitions and the offering individual must choose to form a coalition with another individual or appeal to all individuals. [Fréchette et al. \(2003\)](#) use a legislative bargaining game with five parties under majority-rule and find that 67% of accepted offers only compensate three of the five members, the minimum number of ‘yes’ votes needed for the proposal to pass. [Fréchette et al. \(2003\)](#) also focus on how open versus closed amendment rules impact the allocation of resources in a legislative bargaining game. Their paper focuses on the proposal of the distribution of resources rather than the voting rule (they use a majority vote rule). The present paper differs from their experiment by focusing on the voting structure (where we use a closed amendment rule). [Rodríguez-Lara \(2016\)](#) looks at how bargaining power (using the ultimatum and no-veto-cost games) impacts how equitable each party is, finding that participants tend to be equitable, and making a point to distinguish this from ‘being fair.’ The paper finds that responders are equitable only when the no-veto-cost game is played first. We find weak evidence of order effects.

[Fréchette \(2012\)](#) gives guidance on how to control for session effects, i.e. the potential for correlation among observations within a session, by using clustering standard errors at the session level. In our case, we have 7 sessions which is usually considered too low to cluster at that level ([Fréchette, 2012](#); [Cameron et al., 2008](#)). We rather choose to cluster at the participant-level, and will take care of possible correlation across the error terms, since for each participant we observe 6 different outcomes.

Our attention is on intuitive focal points⁷ in which coalitions of owners receive either the same gross or net benefits, i.e., “fair” outcomes for players with social preferences. The three focal points are: (1) A, B,

⁷ The literature shows a gap between the theoretical predictions of bargaining games and the outcomes of the experiments. Likewise, our paper also shows such a gap in the outcome of our bargaining and our theoretical model presented in Appendix A1.

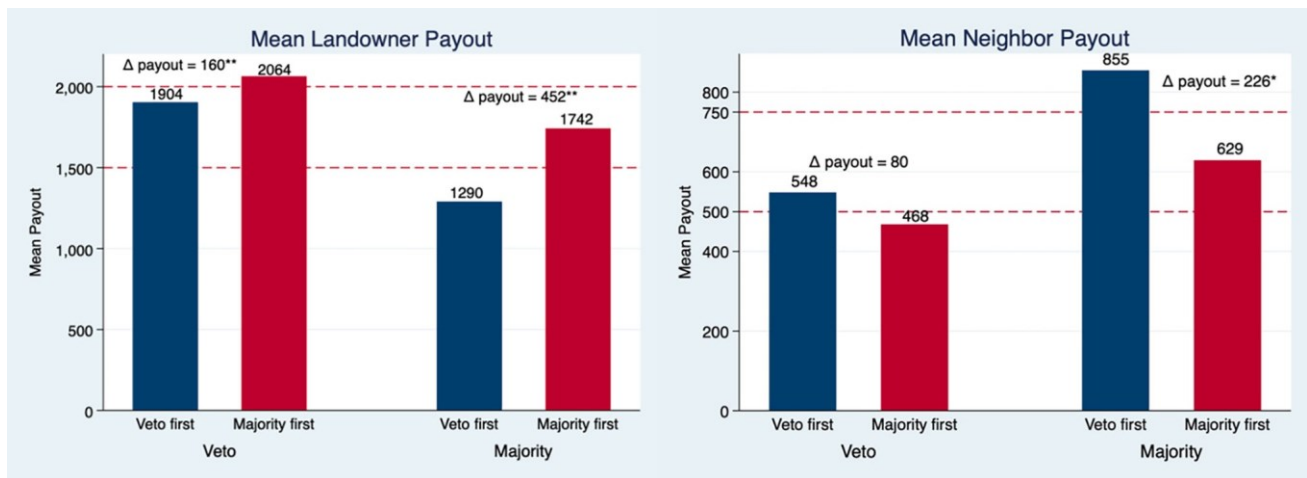


Fig. 2. Mean Landowner and Neighbor payouts by treatment.

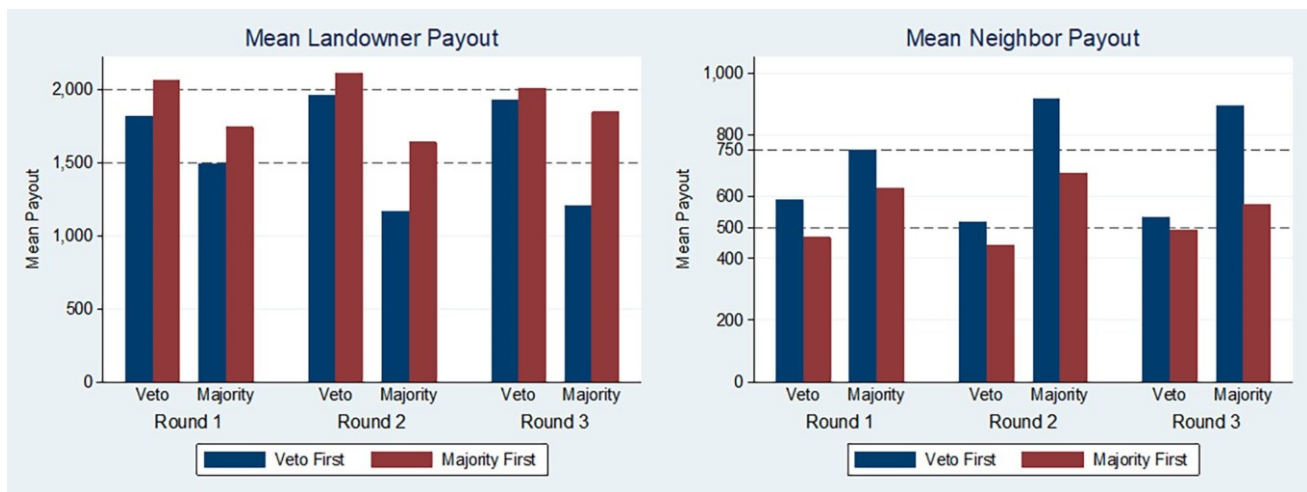


Fig. 3. Mean Landowner and Neighbor payouts by treatment.

Table 1

Summary statistics (with development).

	(1)	(2)	(3)	(4)	(5)
Treatment	Gini Coefficient	Owner A Gross Payout	Owner B Gross Payout	Owner C Gross Payout	Transaction Costs
Veto-Rule <i>N</i> = 61	0.041 (0.067)	1969.39 (268.10)	557.92 (227.17)	472.69 (222.53)	34.97 (23.47)
Majority-Rule <i>N</i> = 62	0.079 (0.101)	1479.84 (770.32)	766.13 (373.81)	754.03 (416.89)	29.45 (17.99)
Difference	−0.0378** (0.016)	489.55*** (104.35)	−208.21*** (55.89)	−281.34*** (60.40)	5.52 (3.76)

Standard deviation reported in parentheses, *p*-values represented by stars (* = 0.1, ** = 0.05, *** = 0.01).

Tables 2 and 3 are the results of regression analyses performed on payouts of Owner A and Owner B & C (together). We include various specifications allowing for different controls or fixed effects. All standard-errors are clustered at the participant-level. Both for Owner A

and Owners B & C, the results appear constituent with our focal points. A positive coefficient on Majority-Rule means the treatment leads to a larger gross payout to that owner. Our results are robust to various controls.¹⁰ When A has a veto, the mean outcome is more equitable: A

¹⁰ Controls include: transaction costs, number of offers in a round, round dummies, whether participants have met in a prior round, and others. We find evidence of learning leading to less equitable outcomes across rounds: this is investigated in the appendix in specification (7) of Table A1, in Table A2 and briefly discussed in the appendix.

Table 2
Regression of the Landowner payout.

	Landowner payout					
	(1)	(2)	(3)	(4)	(5)	(6)
	Pay	Pay	Pay	Pay	Pay	Pay
Majority-Rule	−489.555*** (99.03)	−439.48*** (74.77)	−439.48*** (75.60)	−435.07*** (77.00)	−459.848*** (99.11)	−422.50*** (83.64)
Transaction cost		−3.86 (2.58)	−3.86 (2.69)	−3.84 (2.56)		−6.69* (3.44)
Negotiation specific variables	No	Yes	Yes	Yes	No	Yes
Round trend	No	Yes	Yes	Yes	No	Yes
Round-specific variables	No	Yes	No	No	No	Yes
Round FE	No	No	Yes	Yes	No	No
Session-specific variables	No	Yes	Yes	No	No	Yes
Session FE	No	No	No	Yes	No	No
Participant-specific controls	No	No	No	No	Yes	Yes
_cons	1969.39*** (38.63)	1761.80*** (187.10)	1497.40*** (190.42)	1419.10*** (274.92)	2244.82*** (494.02)	1438.34*** (504.13)
N	123	123	123	123	120	120
adj. R-sq	0.15	0.31	0.30	0.31	0.12	0.29
AIC	1915.8	1899.3	1903.3	1905.9	1877.9	1860.9
BIC	1921.4	1935.9	1945.5	1959.3	1916.9	1930.6

Standard deviation reported in parentheses, p-values represented by stars (* = 0.1, ** = 0.05, *** = 0.01).

Table 3
Regression of the Neighbor payout (players B & C).

	Neighbor payout					
	(1)	(2)	(3)	(4)	(5)	(6)
	Pay	Pay	Pay	Pay	Pay	Pay
Majority-Rule	244.777*** (42.27)	220.06*** (38.27)	221.37*** (38.48)	220.08*** (38.78)	240.50*** (43.81)	214.24*** (39.28)
Transaction cost		2.10** (1.04)	1.92* (1.04)	2.00* (1.07)		1.67 (1.17)
Negotiation specific variables	No	Yes	Yes	Yes	No	Yes
Round trend	No	Yes	Yes	Yes	No	Yes
Round-specific variables	No	Yes	No	No	No	Yes
Round FE	No	No	Yes	Yes	No	No
Session-specific variables	No	Yes	Yes	No	No	Yes
Session FE	No	No	No	Yes	No	No
Participant-specific controls	No	No	No	No	Yes	Yes
_cons	515.30*** (21.69)	605.65*** (88.31)	667.23*** (79.44)	683.46*** (129.52)	404.47* (212.07)	434.48* (250.38)
N	246	246	246	246	237	237
adj. R-sq	0.12	0.22	0.22	0.22	0.13	0.22
AIC	3542.4	3525.2	3526.9	3529.0	3419.26	3401.75
BIC	3549.4	3570.7	3579.52	3595.6	3467.8	3488.5

Standard deviation reported in parentheses, p-values represented by stars (* = 0.1, ** = 0.05, *** = 0.01).

exercises her right to compensation for development cost.

Second, with weak property rights, B and C compensate A for lost value from development, and they distribute the remaining surplus equally such that A is indifferent on developing. We cannot reject (p -value = 0.717) that these payouts are consistent with Focal Point #3, leaving A in an “on-net no harm” position. We hypothesize that social preferences motivate B and C’s compensation of A for her costs incurred by development.

6. Discussion

The observation that the resource is developed no matter the property rights regime is consistent with economic efficiency. Given that development costs 1000 tokens and yields 3000 tokens, development is efficient from a society standpoint irrespective of the distribution of the windfall. The three players are, as a whole, aware of this constant-sum game when developing. Inefficiencies can arise with incomplete property rights in the case of common resources, since it disincentivizes an efficient resource use. In our case, efficiency is retained, but the issue arising is one of fairness, or more precisely unequal rights changing the

distribution of payoffs.

In the majority-vote treatment, the neighbors (B, C) leave the landowner (A) out of the coalition, but reimburse them for the cost of development. The landowner receives net profits of zero and is left in a no net harm position while the neighbors split the net profit. In the veto treatment, the landowner forms a coalition with at least one other player, and behaves as if all players are within the coalition, sharing the profits equally. All players are left in a better than no net harm position. A question then arises as to why the landowner agrees to share profits equally when they could leave one neighbor in a no net harm position, and behave the same way as the neighbors in the majority rule treatment? Our results suggest that individuals are behaving consistent with reference dependence. The neighbors behave relative to a reference point where the resource is developed and the landowner pays a cost. Therefore, the landowner has already benefited from the distribution of revenues. The landowner behaves relative to the case where the resource is not developed, therefore the only situation where everyone has benefited is where everyone makes a positive profit.

This provides insight into the intermingling of ideas concerning fairness and property rights in the development of resources on the

frontier. Unequal benefits from the development and use of resources are not necessarily a result of bad intentions. Imperfect property rights leave uncertainty about the relevant private costs and reference point for individuals facing development. Strong property rights clarify the relevant reference point by allowing individuals to say no. By removing the right to say no to development, poor property rights also remove the information such an ability would transmit about the costs associated with development.

Veto power empowers the veto holder and non-veto holders tend to seek compromise, outcomes are more equal than predicted by theory (Kagel et al., 2010). We find that when gains from development come with private costs, participants tend to converge toward equalitarian outcomes even if majority-rule means they could increase their private gains and leave Owner A uncompensated. Although our experiment is centered around negotiation, parallels can be drawn between our results and those from Czap et al. (2018). They find that assigning water rights to victims (water users) instead of the water polluter leads to lower pollution levels and a more equal distribution of the income generated by the polluting activities. Our experiment is designed so that development should always occur. However, with strong property rights, preferences for equalitarian outcomes, backed by the threat of a landowner veto, allows for a more equal distribution of the windfall. This difference in landowner income between the two treatments can measure the willingness-to-pay for stronger rights on his part and explain possible dissatisfaction from the outcome when property rights are weak. There is a demand for stronger property rights, but without thorough legal change, the government supply remains low (Alston et al., 2012).

Our results can also shed light on other situations in which property rights are either not well defined, or insecure. With insecure property rights, complete or partial land seizure can, just like it did in our experiment, generate dissatisfaction from unequal wealth distribution. Dissatisfaction can spark reactions, from public unrest to actual conflicts, which in turn can hinder development (Gonzalez, 2007). On the

Colombian frontier, weak property rights appeared when strong property rights were hard to establish and when titling costs were high, slowing economic growth (Sa'ñchez et al., 2010). The inability for owners to get compensation for private damages because of corruption or judicial inefficiencies, like slow courts and untimely compensation, also slows economic growth (Amirapu, 2021).

We are aware that a lab experiment cannot do full justice to the complexities surrounding aboriginal property rights. Some policies have been shown to be blatant attempts to assimilate Aboriginals, notably residential schools¹¹ (Fontaine, 2017) and Indian reserves (Jacobs, 2012). We view recent sustained efforts toward reconciliation with Aboriginal peoples as evidence of increased awareness, leading to more pro-social preferences today compared to not so long ago.

7. Concluding remarks

Our results are consistent with the historical development of resources on the frontier and on Aboriginal lands in Canada. While recent SCC rulings clarified the Crown's responsibilities, only an Aboriginal title ensures Aboriginals have an outside option that guarantees their bargaining power when development occurs on traditional land. Without such leverage, compensation depends on the social preferences of those promoting development. Without the ability to stop development, indigenous users are not compensated for the shadow value of the resource. Even with compensation for lost value, a lack of compensation for the loss of the ability to say "no" can explain Aboriginal dissatisfaction with resource development on traditional lands.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Equilibrium

Our baseline predictions follow from the models of Ali et al. (2019), Haller (1986), Kagel et al. (2010), and Bradfield and Kagel (2015). Kagel et al. (2010) specifically study veto power in committees, and theoretically develop the expectation that only minimum winning coalitions will form in equilibrium (i.e., the veto holder and one other player). Experimentally, they find that these minimum winning coalitions form in the veto treatment between 78.4% and 79.7% of the time when the veto holder is the proposer; however, the rate drops approximately 20% to 30% either when a non-veto holder is a proposer or when in the non-veto treatment. The failure to form minimum winning coalitions is common in the experimental literature, as summarized by Herings et al. (2018). Bradfield and Kagel (2015) study a three-player bargaining game focused on individual versus team behavior. Their theoretical model finds a stationary subgame perfect equilibrium (SSPE) where (1) proposals are accepted immediately, (2) they only involve the minimum needed to pass, and (3) the proposer has negotiation power (i.e., the proposer takes two-thirds of the partition and the other player in the coalition receives the remaining third). Bradfield and Kagel (2015) have a key difference from Kagel et al. (2010) and this study: repeated negotiations with the same players (and no veto treatment).

Most closely aligned with our model, Ali et al. (2019) theoretically derive stationary subgame perfect equilibrium in a game where future proposers are known showing that, in the unique SSPE, the proposer takes the full payoff. This result is different from most of the legislative bargaining literature where the next proposer is chosen at random. Since each of the other players has a positive possibility of choosing the proposal next, thus having a positive expected payout from negotiations continuing to the next round. This means that in order for a proposal to be accepted, enough of the other players must be compensated by this expected value to accept the proposal. Our model differs in that one of the players incurs a cost of development. However, the development cost does not play an active factor in that player's strategy as any passed offer requires this cost.

Assume a sequential game where players $i(t)$, $i = A, B, C$, make sequential repeated offers over time $t \in \{1, 2, 3, \dots\}$ on how to distribute the gains from the development of a resource. Some form of a majority vote is required to develop the resource and distribute the gains and the game ends if the proposal passes. Player A (the landowner) faces a cost η when the resource is developed while players B and C do not face any development cost. However, this development cost is constant in every successful negotiation and, hence, does not meaningfully impact the decision of player A to accept or reject an offer. There are two treatments of the game:

- 1) Majority Rule (Treatment 1): any two (or more) players voting "yes" to an offer develops the resource;

¹¹ A fuller accounting than a journal article can provide is necessary and available from the National Centre for Truth and Reconciliation and the associated Truth and Reconciliation reports, available at <https://nctr.ca/records/reports/#trc-reports>

2) Landowner Veto (Treatment 2): identical to Majority Rule treatment with the exception that if player A votes “no,” the resource cannot be developed.

The game proceeds as follows. Player $j(t)$ makes offers to players $i \neq j(t)$. Players then vote simultaneously. As in Haller (1986), it is assumed each player's vote is unknown to other players until the end of the round. In treatment 1, if player $j(t)$ and either of the other two players vote “yes,” the resource is developed. In treatment 2, if player $j(t)$ makes an offer, the resource is developed if one of the other two players votes “yes,” and as long as either player $j(t)$ or the other assenting player is the landowner. These two treatments lead to two notable outcomes.

Let us assume players who consider only their own payout and seek to maximize their income. The proposing player's offer is summarized as $X^i = (x_A^i, x_B^i, x_C^i)$,

where superscript i denotes the round number, subscripts denote the receiving player and $x_A^i + x_B^i + x_C^i = 3000$. The corresponding payouts are, $(x_A^i - \eta - (i-1)T, x_B^i - (i-1)T, x_C^i - (i-1)T)$,

where η is the landowner's cost of development and T is the transaction cost which increases with each round of negotiations. If there is not development, then $x_A^i = x_B^i = x_C^i = 0$, and the development cost η is not incurred. In treatment 1, an offer requires the participation (a vote of agreement) of two players, the one making the initial offer and one other, to develop the resource. Players make offers in a known order. This setup is similar to what is described in Ali et al. (2019). We assume that the first player to make an offer is A, then B, then C (if the landowner is not A, then the development cost η moves to the respective player's payout). If no offer is accepted then the order repeats itself. There are participation constraints for any player to join the coalition voting in favor of development. For any player i , participation requires that a player receives more this period than they can expect if they vote down the offer. Since we only need two players for the offer to pass, the proposer needs to only meet the participation constraint of one player. Player B will accept A's offer if it is greater than what B gives themselves in the next period, $x_B^1 > x_B^2 - T$, and, likewise, player C accepts A's offer if $x_C^1 > x_C^2 - T$ as player C expects the offer in the following period. Despite the landowner's sunk cost for development, the landowner cannot require a premium for development in the majority vote treatment.

Consider a stationary equilibrium where the proposer keeps the entire development benefits of 3000 and the other players receive nothing. In the first round, $X^1 = (3000, 0, 0)$. Player C accepts the offer as their expected payoff in the next period from voting it down is $x_C^2 = 0 - T < 0 = x_C^1$ (the stationary offer being $X^2 = (0, 3000, 0)$ in the following period). Player B turns down the offer since $x_B^1 = 0 < 3000 - T = x_B^2$, but their vote is not needed for the offer X^1 to be passed. This differs from the random ordering bargaining games that offer more equal payouts as the players not making the initial offer have a chance to make the next offer and each have a positive, non-zero expected earnings if negotiations continue. When the order is known, one of the players (player C in this case) knows that they will receive 0 in the next offer that B makes. So, in order to minimize negotiation costs, C prefers to receive 0 in the first offer from A rather than $-T$ in the following period.

In the landowner veto treatment, we need to consider three cases: the landowner in each of the three offer positions A, B, and C. If the landowner is A, then the stationary equilibrium is the same as the majority rule treatment. If the landowner is in the second position B, then the stationary equilibrium includes $X^1 = (T, 3000 - T, 0)$. Player A needs the landowner's (in position B) approval for development. The landowner, who makes the second offer, expects to offer $X^2 = (0, 3000, 0)$ in the second period with expected payout of $3000 - T$. So, player A proposes a split that just equals the expected payout and is only able to keep the transaction cost for themselves. Coincidentally, though not necessary for the offer to be passed, player C also votes to approve this offer to avoid transaction costs as they expect nothing if negotiations continue to the next round. If the landowner is player C, then the stationary equilibrium is player A proposes $X^1 = (2T, 0, 3000 - 2T)$. In this case, A gets slightly more compensation as the landowner's offer is two periods later. In the veto treatment, the bargaining power is shifted from the first proposer to the veto holder.

Prosocial preferences. If, however, players show prosocial preferences, their utility function will consider the payouts to the other players. One such utility function (that only accounts for gross payouts) for players in which each player's payout is weighted equally is

$$U = \frac{1}{3}x_A + \frac{1}{3}x_B + \frac{1}{3}x_C$$

where maximization of the utility function is subject to $3000 = x_A + x_B + x_C$.¹² The solution to this problem is an equal offer of (1000, 1000, 1000). If, however, the prosocial utility function accounts for net payouts, that is $U_i = \frac{1}{3}x_A - 1500 + \frac{1}{3}x_B = \frac{1}{3}x_C$ the proposed split which maximizes utility is (2000, 500, 500), a 500 net surplus to all three players. The third focal point is realized if players' utility functions are $U_i = \frac{1}{3}x_A - 750 + \frac{1}{3}x_B + \frac{1}{3}x_C$, which results in payoffs of (1500, 750, 750), only just compensating the development cost. Irrespective of voting rules, if players share the same prosocial preferences, then the first proposal will be passed as it will maximize all player's utility functions and minimize transaction costs.

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¹² A Cobb-Douglas utility function yields the same results.

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