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# When Persistence Signals Exit: Identity, Legitimacy, and Indigenous Educational Persistence

Aggey Simons (Semenov)*

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* Department of Economics, University of Ottawa, Ottawa, Ontario, Canada. Email: aggey.simons@uottawa.ca

***Abstract***

*Why does scholarship aid sometimes fail to increase postsecondary persistence among Indigenous students, and in some settings even reduce it? Because schooling has historically been associated with residential schools, boarding schools, and assimilationist state projects, persistence can signal not only investment in human capital but also exit from the home community. I model persistence as a signaling game between a student and the home community in which community support feeds back into the student's payoff from schooling. The student privately knows whether the orientation type is community-oriented or exit-oriented, while the community observes persistence and decides whether to extend support.*

*The baseline model yields four implications. First, when schooling is culturally alienating, students most attached to the community may be the most likely to leave. Second, scholarships can crowd out persistence by weakening the inference that persistence reflects community-oriented motives. Third, Indigenous institutional design raises persistence directly and by preserving legitimacy. Fourth, legitimacy thresholds generate multiple equilibria. Extensions show that scholarship crowd-out is not generic and that sponsor mission shapes the mix between cash aid and institutional legibility.*

*I also document descriptive patterns consistent with the mechanism: large attainment gaps alongside substantial scholarship infrastructure, stronger persistence in tribally governed and culturally grounded institutions, and a strong association between support environments and educational completion. The policy implication is not that financial aid is unimportant, but that it is most effective when combined with institutional design and support structures that make persistence legible as community-serving.*

**Key words:** *Indigenous Education, Educational Persistence, Identity and Signaling, Scholarships, Institutional Design.*

**JEL Classification**: I21, I24, J15, D82, Z13.

# 1 Introduction

In Canada, according to the 2021 Census, 49.2% of Indigenous adults aged 25 to 64 had completed a postsecondary qualification, compared with 68.0% of the non-Indigenous population; the corresponding rates were 45.3% for First Nations people, 56.3% for Métis, and 33.6% for Inuit. In the United States, the college enrollment rate of 18- to 24-year-olds in 2022 was 26% for American Indian and Alaska Native youth, and six-year bachelor's completion remained far below that of White students. The stakes are large because the labor-market returns to education are also large: for example, in Canada, the employment rate for Indigenous adults aged 25 to 54 rises from about 60% for those with only a high school diploma to about 86% for those with a bachelor's degree or higher.[1]

Recent policy developments highlight the importance of understanding how financial aid interacts with institutional design and community support. For example, Canada's Budget 2024 proposes an additional $242.7 million over three years to expand access to post-secondary education for First Nations students through the Post-Secondary Student Support Program (PSSSP).

Why does scholarship aid sometimes fail to increase postsecondary persistence among Indigenous students?[2] Standard human capital theory predicts that a reduction in the private cost of schooling increases educational investment (Becker, 1964; Card, 1999). However, a large literature emphasizes that educational choices may also reflect identity, social meaning, and peer evaluation rather than purely private returns (Akerlof and Kranton, 2000, 2002; Bénabou and Tirole, 2003). In particular, when educational investment is socially interpreted, actions that increase labor market returns may simultaneously affect social belonging and community identity (Austen-Smith and Fryer Jr, 2005). In Indigenous contexts, where formal education has historically been linked to assimilationist institutions, persistence in schooling may therefore be interpreted not only as human capital investment but also as movement away from the community. This suggests that the effectiveness of financial aid depends not only on the level of support provided, but also on whether persistence remains socially legitimate within the student's home community.

This paper develops a *signaling approach* to that legitimacy problem. A student privately knows academic fit $a$ and orientation type $\theta \in \{C, X\}$, where $C$ denotes a community-oriented student and $X$ an exit-oriented student. The student chooses whether to persist in postsecondary schooling. The home community observes persistence, forms a posterior belief about the student's motive, and decides whether to extend support. Community support enters the student's payoff. Persistence is therefore both an educational investment and a social signal.

The baseline model delivers four results. First, when schooling is sufficiently culturally alienat-

[1] For Canada: Statistics Canada, *Postsecondary educational attainment and labour market outcomes among Indigenous peoples in Canada, findings from the 2021 Census* (2023), *The Daily: Postsecondary educational attainment and labour market outcomes of Indigenous peoples, 2021* (2023), and *Early career quality of employment of Indigenous graduates with a bachelor's degree, 2010 to 2018 cohorts* (2024). For the United States: National Center for Education Statistics, *College Enrollment Rates* (updated 2024) and *Indicator 23: Postsecondary Graduation Rates*.

[2] Indigenous Services Canada, *Post-Secondary Student Support Program* (2025); U.S. Department of Education, *Federal Student Aid*; and the American Indian Higher Education Consortium (AIHEC) institutional reports.

ing, students most attached to the community can be the most likely to leave. Second, scholarship aid can crowd out persistence: by drawing additional exit-oriented students into school, aid weakens the inference that persistence reflects community-oriented motives and can cause support to collapse. Third, Indigenous institutional design, including Indigenous faculty, language programming, land-based learning, community-linked curriculum, decentralized delivery, and explicit return pathways, raises persistence directly and also preserves legitimacy. Fourth, because support depends on beliefs, the same policy package can sustain either a high-support or a low-support equilibrium, depending on whether persistence is interpreted as community-serving or as signaling exit.

The paper then studies four extensions. The first allows reservation values of home to differ by type, with $R_X = 0$ and $R_C > 0$. The second makes the sponsor strategic. The third allows both student types to value community support while permitting type $C$ to value it more strongly. The fourth allows academic fit and orientation type to be correlated. These extensions show that scholarship crowd-out is not generic, clarify when it disappears or reverses, and explain why sponsor mission affects the optimal mix between cash aid and institutional legibility.

The paper also documents three descriptive patterns consistent with the mechanism. First, large Indigenous attainment gaps coexist with substantial scholarship infrastructure. Second, institutions that most closely resemble high-$q$ environments, especially Tribal Colleges and Universities, are visibly organized around Indigenous governance, cultural content, and student support. Third, survey evidence shows a strong association between support environments and educational completion. These facts do not identify the mechanism causally, but they show that the model's main objects are measurable and policy-relevant.

*Literature review:* The paper is related to economic work on social meaning, prosocial behavior, and identity. In models of prosocial behavior and social image, material incentives affect behavior not only through the budget constraint but also by changing what an action is taken to mean (Bénabou and Tirole, 2006, 2011). Identity economics similarly emphasizes that actions depend on their compatibility with valued social roles and group attachment (Akerlof and Kranton, 2002). It is also related to work on Indigenous higher education emphasizing historical distrust of schooling, family and community support, belonging, and culturally grounded institutional design as central to persistence (Guillory and Wolverton, 2008; Tachine et al., 2017; Martin et al., 2017; Kristoff and Cottrell, 2021; Cameron et al., 2024; Lopez, 2018). A useful Canadian synthesis of persistence and early leaving is provided by Herkimer (2021). Recent work also emphasizes the long-run effects of colonial and assimilation policies. For example, (Feir, 2016; Feir et al., 2021) document the intergenerational effects of residential schools on human capital and cultural attachment, while (Akee et al., 2015; Akee, 2019) highlight the role of Indigenous institutions in shaping economic and educational outcomes. These studies suggest that educational decisions are embedded in historical and institutional environments in which schooling may be perceived as culturally distant from community life. The model developed here formalizes this idea by introducing a signaling framework in which persistence can be interpreted as either community-serving or exit-oriented.

The contribution of the paper is to embed standard financial aid mechanisms within a signaling

environment with endogenous legitimacy. While financial aid relaxes budget constraints, it may also alter the social interpretation of persistence, affecting both behavior and equilibrium beliefs. This connects to models where incentives interact with identity and social signaling, and where extrinsic rewards can have unintended effects through belief formation and social evaluation (Bénabou and Tirole, 2003; Austen-Smith and Fryer Jr, 2005). In this framework, aid is an incomplete instrument whenever persistence is socially interpreted: the relevant policy margin includes not only the level of aid but also the institutional and social environment in which that aid is offered.

The remainder of the paper is organized as follows. Section 2 presents the baseline model and its equilibrium characterization. Section 3 develops the four extensions. Section 4 documents descriptive empirical patterns consistent with the mechanism. Section 5 discusses policy implications and interpretation. Section 6 concludes. All proofs are relegated to Appendix.

# 2 Baseline model

## 2.1 Setup

There are three agents: a sponsor $P$, a student, and the home community. In the baseline model the sponsor is not strategic. The sponsor sets up a policy environment $(b, q)$, where $b \geq 0$ is scholarship aid, and $q \in [0, 1]$ is Indigenous-specific institutional legibility.[3]

The student's binary decision $d = 1$ denotes persistence in postsecondary schooling, while $d = 0$ denotes dropout. Under indifference, students choose $d = 1$. The community decision is $s \in \{0, 1\}$, the support or not decision.

**Student payoffs.** We normalize the private return to persistence to be $a$. There are two student types. Type $C$ denotes a community-oriented student and type $X$ an exit-oriented student. A student also has a second dimension of heterogeneity, academic fit $a$, which captures the private return component of persistence. We assume that $(a, \theta)$, with $\theta \in \{C, X\}$, is privately known to the student. The community knows only that $\Pr(\theta = C) = \lambda \in (0, 1)$, that $a \sim U[0, 1]$, and that $a$ and $\theta$ are independent. Type $X$ cares only about the private return from schooling relative to the reservation value of home, so its net gain from persistence is[4]

$$V_X(a; b, R) = a + b - R, \tag{1}$$

where $R > 0$ denotes the value of stopping out and returning home immediately.[5]

Type $C$ also cares about whether schooling is culturally legible as community-serving rather than assimilative. Let $\nu > 0$ denote the direct value of Indigenous-specific institutional legibility,

[3] The interpretation of the parameters in Indigenous contexts is discussed in Section 5.1.

[4] We focus on the interior region where both student types face a meaningful persistence decision. A sufficient restriction is $b < R$, together with the interiority conditions stated below.

[5] This term can bundle local employment, household production, kin obligations, reciprocal insurance, land attachment, language use, and the amenity value of remaining close to country.

$\tau > 0$ is assimilation risk, and let $S > 0$ denote the payoff increment associated with legitimacy-contingent community support. For any support regime $s \in \{0, 1\}$, define

$$D_s(q, \tau) \equiv \nu q - \tau(1 - q) + sS. \tag{2}$$

This is the total community-specific net advantage of persistence for type $C$ relative to type $X$.[6] The net gain from persistence for a type-$C$ student is

$$V_C(a; b, q, \tau, R, s) = a + b - R + D_s(q, \tau). \tag{3}$$

In the baseline model, $S$ represents legitimacy-contingent community support. It captures the additional value a student receives when persistence in schooling is recognized by the home community as community-serving rather than exit-oriented. Such support may include housing, childcare, travel assistance, informal insurance, or transfers, but only insofar as these benefits depend on the community viewing persistence as legitimate.[7]

**Community payoff.** Suppose that, after observing persistence and forming posterior belief $\mu = \Pr(\theta = C \mid d = 1)$, the community receives benefit $B_C > 0$ from supporting a community-oriented persister, benefit $B_X \in [0, B_C]$ from supporting an exit-oriented persister, and pays a resource cost $\kappa > 0$ whenever support is provided. Then the community's expected payoff from support is

$$U^{\text{comm}}(s = 1 \mid \mu) = \mu B_C + (1 - \mu)B_X - \kappa, \tag{4}$$

while

$$U^{\text{comm}}(s = 0 \mid \mu) = 0. \tag{5}$$

Hence support is optimal if and only if

$$\mu \geq \bar{\mu} \equiv \frac{\kappa - B_X}{B_C - B_X}, \tag{6}$$

provided $B_C > \kappa > B_X$, so that $\bar{\mu} \in (0, 1)$.

**Timing.**

1. Nature draws $(a, \theta)$.
2. The student chooses persistence $d(a, \theta) \in \{0, 1\}$.
3. The community observes $d$, updates beliefs $\mu(d) = \Pr(\theta = C \mid d)$, and chooses support $s(d) \in \{0, 1\}$.

[6] When $q$ is high and $\tau$ is low, schooling is more easily read as nation-building or community service. When $q$ is low and $\tau$ is high, the same act of persistence is more likely to be read as culturally alienating.

[7] Section 3.3 relaxes this restriction by allowing both types to value support, with type $C$ valuing it more strongly.

This structure creates a legitimacy threshold: persistence must generate a sufficiently strong posterior belief that the student is community-oriented in order for the community to provide support. The student's persistence decision therefore serves as the signal in a signaling game in which the community is the receiver.

Thus the baseline interaction is a signaling game with multidimensional sender type. The student privately observes $(a, \theta)$, where $a$ is an idiosyncratic payoff shifter and $\theta \in \{C, X\}$ is the motive type relevant to the community. The observed action $d$ does not separately identify $a$ and $\theta$; rather, it reveals whether the pair $(a, \theta)$ lies in the equilibrium persistence region. The community therefore updates by Bayes' rule to form a posterior over $\theta$, integrating out the unobserved $a$.

Define

$$m_X \equiv 1 - R + b.$$

Suppose that

$$m_X \in (0,1) \qquad \text{and} \qquad m_X + D_s(q,\tau) \in (0,1) \quad \text{for all } s \in \{0,1\}.$$

**Lemma 1** (Cutoff strategies)**.** *1. For each type $\theta \in \{C, X\}$ and any conjectured support regime $s \in \{0,1\}$, the payoff from persistence is strictly increasing in $a$. Hence optimal student strategies are cutoff rules in $a$.*

*2. $m_X$ and $m_X + D_s(q,\tau)$ represent the masses of persisters for types $X$ and $C$.*

*3. Sequential rationality implies that support is provided if and only if this posterior exceeds the legitimacy threshold $\bar{\mu} \in (0,1)$:*

$$s(1) = \begin{cases} 1 & \text{if } \mu \geq \bar{\mu}, \\ 0 & \text{if } \mu < \bar{\mu}. \end{cases} \tag{7}$$

We are especially interested in the empirically relevant case $\bar{\mu} > \lambda$, where persistence must appear more community-oriented than the prior in order to receive support.

**Definition 1** (Perfect Bayesian equilibrium)**.** *Fix $(b, q, \tau)$. A pure-strategy PBE consists of a persistence rule $d(a, \theta)$, a support rule $s(d)$, and beliefs $\mu(d)$ such that*

*1. given $s$, the rule $d(a, \theta)$ maximizes the student's payoff for every $(a, \theta)$;*

*2. given $\mu$, the rule $s(d)$ maximizes the community's expected payoff;*

*3. beliefs $\mu(d)$ are derived from $d(a, \theta)$ by Bayes' rule whenever possible.*

## 2.2 Equilibrium characterization

Fix exogenous $(b, q, \tau)$. Under the maintained interiority conditions

$$m_X \in (0,1) \qquad \text{and} \qquad m_X + D_s(q,\tau) \in (0,1) \quad \text{for the relevant } s \in \{0,1\},$$

Lemma 1 implies that equilibrium strategies are cutoff rules. The next proposition characterizes the resulting Perfect Bayesian equilibria.

**Proposition 1** (Baseline equilibrium)**.** *Every pure-strategy PBE is characterized by a support regime* $s \in \{0, 1\}$ *and cutoff strategies*

$$d_X(a) = \mathbf{1}\{a \geq a_X\}, \qquad d_C^s(a) = \mathbf{1}\{a \geq a_C^s\},$$

*with*

$$a_X = R - b, \qquad a_C^s = R - b - D_s(q, \tau).$$

*The posterior among persisters is*

$$\mu_s = \frac{\lambda(m_X + D_s(q, \tau))}{m_X + \lambda D_s(q, \tau)}. \tag{8}$$

*1. A support equilibrium exists if and only if*

$$\mu_1 \geq \bar{\mu}.$$

*2. A no-support equilibrium exists if and only if*

$$\mu_0 < \bar{\mu}.$$

*3. Multiplicity arises whenever*

$$\mu_1 \geq \bar{\mu} > \mu_0.$$

The equilibrium conditions divide the parameter space into three regions. If $\mu_0 \geq \bar{\mu}$, persistence is sufficiently informative that the community supports persisters in equilibrium, yielding a unique support equilibrium. If $\mu_1 < \bar{\mu}$, persistence is too weak a signal of community-oriented motives and the community withdraws support, yielding a unique no-support equilibrium. The most interesting case arises when

$$\mu_1 \geq \bar{\mu} > \mu_0.$$

In this region both equilibria are feasible. Expectations about the meaning of persistence become self-fulfilling: if the community expects persistence to signal community commitment, support is provided and persistence remains legitimate; if persistence is expected to signal exit, support collapses and persistence becomes socially costly.

Proposition 1 is a regime-classification result: for a fixed policy environment $(b, q, \tau)$, it determines whether the equilibrium features support, no support, or multiplicity. Proposition 2 is conditional on an interior regime and studies how policy shifts cutoffs, posteriors, and the legitimacy frontier within that regime.

### 2.3 Comparative statics and empirical implications

Policy affects persistence through two channels. A *level effect* arises because scholarships $b$ enter payoffs directly. A *composition effect* arises because policy changes which types persist at the margin, thereby changing the posterior $\mu$ and the support regime.

**Proposition 2** (Comparative statics and empirical implications)**.** *Fix an interior equilibrium under regime $s \in \{0,1\}$. Then:*

*(i)* ***Cutoff effects.*** *The difference in persistence cutoffs is*

$$a_C^s - a_X = -D_s(q,\tau),$$

*so that*

$$\frac{\partial(a_C^s - a_X)}{\partial q} = -(\nu+\tau) < 0, \qquad \frac{\partial(a_C^s - a_X)}{\partial \tau} = 1 - q > 0.$$

*(ii)* ***Composition effects.*** *Let $\mu_s = \Pr(\theta = C \mid d = 1)$. Then*

$$\frac{\partial \mu_s}{\partial q} > 0, \qquad \frac{\partial \mu_s}{\partial \tau} < 0, \qquad \frac{\partial \mu_s}{\partial b} = -\frac{\lambda(1-\lambda)D_s(q,\tau)}{\left(m_X + \lambda D_s(q,\tau)\right)^2}.$$

*In particular, if*

$$\frac{\partial \mu_s}{\partial b} < 0,$$

*then necessarily $D_s(q,\tau) > 0$. Hence scholarship-induced crowd-out of legitimacy implies positive selection of persisters on community orientation.*

*(iii)* ***Legitimacy frontier.*** *Suppose $\bar{\mu} \in (\lambda, 1)$ and $D_1(q,\tau) > 0$. A support equilibrium exists if and only if*

$$b \le \bar{b}(q,\tau,R,S) \equiv R - 1 + \frac{\lambda(1-\bar{\mu})}{\bar{\mu}-\lambda} D_1(q,\tau),$$

*with*

$$\frac{\partial \bar{b}}{\partial q} = \frac{\lambda(1-\bar{\mu})}{\bar{\mu}-\lambda}(\nu+\tau) > 0, \qquad \frac{\partial \bar{b}}{\partial \tau} = -\frac{\lambda(1-\bar{\mu})}{\bar{\mu}-\lambda}(1-q) < 0.$$

*(iv)* ***Discrete dropout.*** *If $\mu_1 \ge \bar{\mu} > \mu_0$, moving from support to no support raises the type-C cutoff by*

$$a_C^0 - a_C^1 = S,$$

*while leaving $a_X$ unchanged. Under uniform $a$, aggregate dropout increases by $\lambda S$.*

Part (i) captures the direct effect of institutional design on relative persistence incentives. Part (ii) shows that institutional design affects both persistence and composition, while scholarships primarily operate through a level effect. It also provides a testable implication linking scholarship crowd-out to the composition of persisters. Part (iii) defines a legitimacy frontier in policy space.

Part (iv) implies that breakdowns in legitimacy generate discrete shifts in persistence rather than smooth responses.

# 3 Extensions

The baseline model delivers four empirical objects: type-specific cutoffs, the posterior among persisters, a legitimacy frontier in policy space, and a discrete dropout jump at support collapse. These are the core reduced-form predictions of the simple exogenous-$(b, q, \tau)$ environment and they are enough to organize the later extensions.

This section develops four extensions. The first allows the reservation value of home to differ by student type. The second makes the sponsor strategic. The third allows community support to have both generic and legitimacy-specific components. The fourth allows academic fit and orientation type to be correlated.

## 3.1 Asymmetric reservation values

A natural modification is that the exit-oriented student has no reservation value of home, while the community-oriented student does. This captures the idea that some students are already socially detached from the local opportunity set, whereas others face a genuine trade-off between schooling and the value of remaining embedded in community life.

Assume therefore that

$$R_X = 0, \qquad R_C > 0. \tag{9}$$

Fix exogenous $(b, q, \tau)$ with $b \geq 0$. The payoff from persistence becomes

$$V_X(a; b) = a + b, \tag{10}$$

$$V_C(a; b, q, \tau, R_C, s) = a + b - R_C + D_s(q, \tau), \tag{11}$$

where, as in the baseline model,

$$D_s(q, \tau) = \nu q - \tau(1 - q) + sS.$$

Define

$$m_C \equiv 1 - R_C + b.$$

Suppose $m_C + D_s(q, \tau) \in (0, 1)$ for the support regimes under consideration.

**Proposition 3** (Asymmetric reservation values)**.** *Every pure-strategy PBE has the following properties.*

*1.* ***Type-X behavior.*** *All type-X students persist:*

$$d_X(a) = 1 \qquad \forall a \in [0, 1].$$

2. ***Type-$C$ cutoff.*** *For any support regime $s \in \{0, 1\}$,*

$$d_C^s(a) = \mathbf{1}\{a \geq a_C^s\}, \qquad a_C^s = R_C - b - D_s(q, \tau).$$

3. ***Posterior belief.*** *The posterior among persisters is*

$$\mu_s = \frac{\lambda(m_C + D_s(q, \tau))}{(1 - \lambda) + \lambda(m_C + D_s(q, \tau))}.$$

4. ***Support condition.*** *A support equilibrium exists iff*

$$m_C + D_1(q, \tau) \geq \frac{\bar{\mu}(1 - \lambda)}{\lambda(1 - \bar{\mu})}.$$

5. ***Multiplicity.*** *Multiplicity arises whenever $\mu_1 \geq \bar{\mu} > \mu_0$.*

The key difference relative to the baseline model is that type-$X$ students always persist. Scholarships therefore no longer draw additional exit-oriented students into school. Instead, the marginal student induced by higher aid is type $C$. As a result, increases in scholarship aid strengthen rather than weaken the signal that persistence reflects community-oriented motives. In this environment the informational crowd-out mechanism disappears and financial aid raises both persistence and legitimacy.

**Lemma 2** (Comparative statics)**.** *Under the conditions of Proposition 3,*

$$\frac{\partial \mu_s}{\partial b} > 0, \qquad \frac{\partial \mu_s}{\partial q} > 0, \qquad \frac{\partial \mu_s}{\partial \tau} < 0.$$

In the baseline model scholarships can dilute the signal content of persistence because additional type-$X$ students enter school. When $R_X = 0$, that margin disappears: type-$X$ students persist regardless of academic fit. The marginal student induced by higher aid is therefore type $C$, so financial aid increases both persistence and legitimacy.

## 3.2 Strategic sponsor

We now allow the sponsor to choose policy instruments before the student–community signaling game takes place. The sponsor selects a policy package $(b, q)$ at cost $\Gamma(b, q)$ with $\Gamma_b > 0$, $\Gamma_q > 0$, and $\Gamma$ convex.

### 3.2.1 Community-oriented sponsor

Suppose the sponsor values the persistence of community-oriented students. Its payoff is

$$U_P^C(b, q) = \lambda[1 - a_C^{s^*(b,q)}] - \Gamma(b, q),$$

where $s^*(b,q) \in \{0,1\}$ is the equilibrium support regime induced by the baseline signaling game.

The next result is local to the support branch of the sponsor's problem. It compares the two instruments $(b,q)$ holding fixed the equilibrium-selection issue highlighted in Proposition 1(iii).

**Proposition 4** (Instrument choice)**.** *Consider the region where a support equilibrium is relevant and $D_1(q,\tau) > 0$.*

1. *Both instruments lower the type-C cutoff*

$$\frac{\partial a_C^1}{\partial b} = -1, \qquad \frac{\partial a_C^1}{\partial q} = -(\nu + \tau) < 0.$$

2. *Their legitimacy effects differ:*

$$\frac{\partial \mu_1}{\partial q} > 0, \qquad \frac{\partial \mu_1}{\partial b} < 0.$$

3. *Holding the type-C cutoff fixed,*

$$da_C^1 = 0 \quad \Longleftrightarrow \quad db = -(\nu + \tau)dq.$$

*Along such variations, a marginal increase in $q$ financed by a marginal reduction in $b$ strictly raises legitimacy:*

$$dq > 0 \implies d\mu_1 > 0.$$

*Hence near the legitimacy frontier $\mu_1 = \bar{\mu}$, increasing $q$ is more effective than increasing $b$ at sustaining support.*

The proposition highlights the different roles of the two policy instruments. Both scholarships $b$ and institutional design $q$ raise persistence by lowering the type-$C$ cutoff. However, they affect legitimacy in opposite directions. Institutional legibility strengthens the signal that persistence serves the community, whereas scholarships weaken that signal by drawing additional exit-oriented students into school. Near the legitimacy frontier, a sponsor concerned with community-oriented persistence therefore prefers policies that raise $q$ rather than policies that expand financial aid alone.

### 3.2.2 Assimilationist sponsor

Suppose instead the sponsor values enrollment independent of community attachment. Its objective is

$$U_P^X(b,q) = (1-\lambda)[1 - a_X(b)] - \Gamma(b,q).$$

**Lemma 3** (Assimilationist policy)**.** *If sponsor type is observable and $\Gamma_q > 0$, the sponsor sets $q$ at its minimum feasible level and chooses $b$ according to the standard marginal-benefit/marginal-cost condition for type-X persistence.*

*Relative to a community-oriented sponsor, the resulting policy is strictly less $q$-intensive whenever legitimacy affects type-C persistence.*

Historically, assimilationist schooling institutions had little reason to invest in institutional features that made schooling compatible with community belonging. In the model this corresponds to low $q$ and reliance on scholarships or compulsory enrollment.

#### 3.2.3 Policy as a signal

If sponsor type were privately known, the policy package $(b, q)$ itself would become informative about sponsor intent. High-$q$ policies are more consistent with community-oriented sponsors, while low-$q$/high-$b$ packages are more consistent with assimilationist ones. In such environments the community would infer both student motives and sponsor intent from observed policies.

### 3.3 Heterogeneous valuation of community support

The baseline model assumes that community support benefits only community-oriented students. A more general specification allows both types to value support.

Let $S_X \geq 0$ denote generic support valued by any student and let $S_C \geq S_X$ denote the value of support to community-oriented students. Fix $(b, q, \tau, S_X, S_C)$ with $S_C \geq S_X \geq 0$. Payoffs become

$$V_X(a; b, R, s) = a + b - R + sS_X, \tag{12}$$

$$V_C(a; b, q, \tau, R, s) = a + b - R + \nu q - \tau(1 - q) + sS_C. \tag{13}$$

Define

$$\widetilde{D}_s(q, \tau) = \nu q - \tau(1 - q) + s(S_C - S_X), \qquad m_X \equiv 1 - R + b,$$

and suppose

$$m_X + sS_X \in (0, 1), \qquad m_X + sS_X + \widetilde{D}_s(q, \tau) \in (0, 1)$$

for the support regimes under consideration.

**Proposition 5** (Support valued by both types)**.** *Every pure-strategy PBE has cutoffs*

$$a_X^s = R - b - sS_X, \qquad a_C^s = R - b - sS_X - \widetilde{D}_s(q, \tau),$$

*posterior*

$$\mu_s = \frac{\lambda[m_X + sS_X + \widetilde{D}_s(q, \tau)]}{m_X + sS_X + \lambda\widetilde{D}_s(q, \tau)},$$

*and scholarship crowd-out occurs if and only if $\widetilde{D}_s(q, \tau) > 0$.*

The baseline model is the special case $S_X = 0$ and $S_C = S$, so this extension separates generic material support from legitimacy-specific support.

Allowing both student types to value community support separates two distinct effects. Generic support ($S_X$) increases persistence mechanically but weakens the informational content of persistence because both types respond to it. Legitimacy-specific support ($S_C - S_X$) strengthens the signal that persistence reflects community-oriented motives. The informational crowd-out result therefore depends on whether support primarily reflects material benefits available to all students or legitimacy that is tied specifically to community commitment.

### 3.4 Correlation between academic fit and orientation type

This final extension is a robustness exercise rather than a full re-solution of the game: it shows how the informational content of persistence changes when academic fit and orientation type are statistically related.

The baseline model assumes that academic fit $a$ and orientation type $\theta$ are independent. Under that assumption, and with $a \sim U[0,1]$, the posterior among persisters has the closed form

$$\mu_s = \frac{\lambda(m_X + D_s(q,\tau))}{m_X + \lambda D_s(q,\tau)}, \qquad m_X = 1 - R + b.$$

A natural extension allows academic fit to depend on orientation type. Let

$$a \mid \theta = C \sim F_C, \qquad a \mid \theta = X \sim F_X,$$

where $F_C$ and $F_X$ are type-specific distributions on $[0,1]$. The cutoff structure is unchanged:

$$a_X = R - b, \qquad a_C^s = R - b - D_s(q,\tau).$$

But the posterior among persisters becomes

$$\mu_s = \frac{\lambda\left[1 - F_C(a_C^s)\right]}{\lambda\left[1 - F_C(a_C^s)\right] + (1-\lambda)\left[1 - F_X(a_X)\right]}.$$

This extension preserves the cutoff structure while enriching the comparative statics. If exit-oriented students are positively selected on academic fit, so that $F_X$ is shifted to the right relative to $F_C$, persistence becomes less informative about community-oriented motives. In that case support is harder to sustain, and the no-support or multiplicity region expands. Intuitively, the community assigns more weight to the possibility that a persisting student remains in school because he is high-fit and exit-oriented rather than because he is community-oriented. Conversely, if community-oriented students are positively selected on fit, persistence becomes more informative about legitimacy and support is easier to sustain.

An additional implication is that the clean baseline scholarship result need not survive unchanged. Under independence, scholarship crowd-out is pinned down by the sign of $D_s(q,\tau)$. With type-specific fit distributions, the sign of the scholarship effect on the posterior generally depends on the relative shapes of $F_C$ and $F_X$. By contrast, the qualitative effects of stronger institutional

Table 1: Illustrative attainment and completion gaps

| Measure | Indigenous / AIAN (%) | Comparator (%) |
|---|---|---|
| Canada: postsecondary attainment, ages 25–64 (2021) | 49.2 | 68.0 (non-Indigenous) |
| First Nations | 45.3 | – |
| Métis | 56.3 | – |
| Inuit | 33.6 | – |
| U.S.: college enrollment, ages 18–24 (2022) | 26 | 41 (White) |
| U.S.: 6-year bachelor's graduation, 4-year institutions | 39 | 64 (White) |

legibility $q$ and lower assimilation risk $\tau$ continue to operate through the same legitimacy channel.

This extension shows that the baseline independence assumption mainly simplifies the algebra. When academic fit and orientation type are correlated, persistence remains a signal, but its informational content depends on how the two dimensions of private information are related.

This extension may be relevant in settings where academically stronger students are also more likely to study away from home and therefore are more easily perceived as exit-oriented. For example, Statistics Canada reports that many Indigenous people with postsecondary credentials relocated to pursue education: about 40% of off-reserve First Nations, 50% of Inuit, and 42% of Métis—and that among off-reserve First Nations with university degrees, the relocation rate was even higher, at 61%.[8]

# 4 Empirical patterns

## 4.1 Indigenous attainment gaps alongside substantial scholarship infrastructure

Table 1 collects a few official benchmark facts for Canada and the United States.[9] The first point is simply that large gaps remain. In Canada, just under half of Indigenous adults aged 25 to 64 had completed a postsecondary credential in 2021, well below the corresponding rate for the non-Indigenous population. In the United States, American Indian and Alaska Native young adults also remained below White students in both current enrollment and bachelor's completion.

These gaps coexist with substantial scholarship infrastructure rather than with its absence. In Canada, Indigenous Services Canada states that the Post-Secondary Student Support Program (PSSSP) covers eligible costs including tuition, books, travel support, and living allowances, and that Budget 2024 proposed an additional $242.7 million over three years to expand support for First Nations postsecondary students through the PSSSP.[10] A narrower but useful Statistics Canada fact

[8]Statistics Canada: The Education and Employment Experiences of First Nations People Living Off Reserve, Inuit, and Métis: Selected Findings from the 2012 Aboriginal Peoples Survey

[9]Canada: Statistics Canada, *The Daily: Postsecondary educational attainment and labour market outcomes of Indigenous peoples, 2021*, October 27, 2023. United States: National Center for Education Statistics, *College Enrollment Rates* (updated 2024), and *Indicator 23: Postsecondary Graduation Rates*. The U.S. graduation figure is the most recent race-specific 6-year bachelor's completion figure reported on that NCES indicator page and refers to the fall 2010 entry cohort.

[10]Indigenous Services Canada, *Post-Secondary Student Support Program*, modified January 30, 2025; Indigenous Services Canada, *Post-secondary education*, modified November 28, 2024.

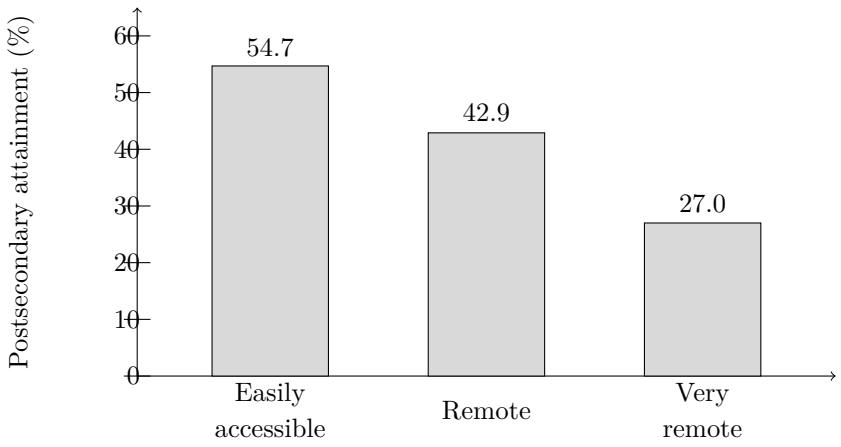


Figure 1: Indigenous postsecondary attainment in Canada by remoteness, 2021

points in the same direction. Among off-reserve First Nations women aged 25 to 64 who had taken postsecondary education, 60% had applied for financial assistance; among applicants, 92% reported receiving some form of funding; yet only 75% of funded recipients completed their postsecondary studies.[11] The claim here is not that aid "does not work." It is that the existence of aid, even when substantial, does not by itself eliminate the attainment gap.

A second descriptive pattern is spatial. Figure 1 shows that Indigenous postsecondary attainment in Canada declines sharply with remoteness.[12] This matters for the model because remoteness is one environment in which education is more likely to require relocation and hence to sharpen the tension between persistence and belonging. Statistics Canada also reports that among Indigenous people with postsecondary credentials, roughly 40% of off-reserve First Nations people, 50% of Inuit, and 42% of Métis moved to pursue their education.[13] In other words, schooling often literally entails distance from home, not just tuition and fees.

The model does not require that every such gap be caused by legitimacy. Liquidity constraints, academic preparation, transport costs, housing shortages, childcare, and local labor-market opportunities all matter. The narrower point is that the raw facts leave room for the paper's mechanism. Large gaps persist even in the presence of scholarship support, and those gaps are especially pronounced in settings where staying in school is more likely to involve separation from community.

## 4.2 Institutional design and persistence: evidence from Tribal Colleges and Universities

The model's institutional-design variable $q$ is meant to capture whether schooling is organized so that persistence is legible as community-serving rather than assimilative. In practice, the clearest

[11] Statistics Canada, *First Nations Women and Postsecondary Education: Findings from the 2006 Aboriginal Peoples Survey*, 2009.

[12] Statistics Canada, *The Daily: Postsecondary educational attainment and labour market outcomes of Indigenous peoples, 2021*, October 27, 2023.

[13] Statistics Canada, *Selected Findings from the 2012 Aboriginal Peoples Survey*, January 21, 2016.

Table 2: Illustrative high-$q$ institutions: selected TCU examples

| Institution | Reported design and support features | Reported persistence / retention |
|---|---|---|
| United Tribes Technical College (North Dakota) | Governed by five tribal nations; urban residential campus; family housing, childcare, transportation, food pantry, student health and wellness; 95% Native American, 65% first-generation, 80% low-income student body. | 70% persistence, 49% retention, 25% 6-year graduation |
| Stone Child College (Montana) | Free childcare, transportation, tutoring, advising, weekly engagement activities, and retention services; programs include Native American art and community-oriented workforce training. | 66% fall-to-spring persistence |
| Oglala Lakota College (South Dakota) | Decentralized system with 11 instructional sites; van transportation and gas vouchers when classes are not locally available; academic counseling, tutoring, free meals, laptops and hotspots for distance learning; programs explicitly tied to Lakota nation-building and local labor-market needs. | 73% fall-to-spring persistence, 68% spring-to-fall persistence |

*Note:* The table is descriptive. The metrics are institution-reported and the campuses differ in mission, student mix, and measurement conventions. The point is not to claim a clean "TCU effect," but to show that the model's institutional-legibility margin has a clear empirical analogue.

observable proxy for high $q$ is the presence of institutions that are tribally governed, culturally grounded, and organized around visible student support. American Indian Higher Education Consortium (AIHEC) materials explicitly describe Tribal Colleges and Universities (TCUs) as institutions "founded on Native languages, culture, and philosophy with strong student support systems and community engagement."[14]

Table 2 reports three descriptive examples.[15] These are institution-level facts rather than causal estimates, and the reported persistence or retention metrics are not perfectly comparable across campuses. But the examples are informative because they show how the model's $q$ appears in real institutions: not as an abstract taste shifter, but as a bundle of governance, language, community access, transport, childcare, advising, and return pathways.

Two features of these institutions are especially relevant for the theory. First, they are visibly community-facing. Oglala Lakota College, for example, explicitly states that its decentralized structure is intended to bring instruction and support services to students rather than requiring students to travel. Second, they build in concrete support services that make persistence compatible with family and community life. Those design features line up closely with the role played by $q$ in the model. They affect the direct return to staying in school, but they also change what staying in

[14] American Indian Higher Education Consortium, *Oglala Lakota College: Priorities for the 119th Congress* (February 2025). Similar language appears in other 2025 AIHEC institutional impact sheets.

[15] American Indian Higher Education Consortium, *United Tribes Technical College: Priorities for the 119th Congress* (February 2025); American Indian Higher Education Consortium, *Stone Child College: Priorities for the 119th Congress* (February 2025); American Indian Higher Education Consortium, *Oglala Lakota College: Priorities for the 119th Congress* (February 2025).

Table 3: Support environments and educational completion: off-reserve First Nations, ages 18–44

| Indicator from 2012 APS | Completers (%) | Leavers (%) |
|---|---|---|
| Parents attended a school event in which the student participated | 55 | 32 |
| "Most" or "all" close friends thought completing high school was very important | 77 | 51 |
| Received needed support from teachers, guidance counsellors, or other school staff | 76 | 63 |
| Did *not* live full-time with family during last year of school | 19 | 31 |
| Had a postsecondary credential | 54 | 16 |

*Note:* "Completers" and "leavers" refer to high-school completion status. The table therefore does not identify postsecondary persistence directly. Its purpose is to show that family involvement, peer aspirations, school support, and later educational completion move together in the direction implied by the model's support variable $s$.

school means.

The same sources also suggest why $q$ should not be treated as a soft or purely symbolic variable. These institutions are not simply places with Indigenous iconography. They combine cultural content with operational support: transport, childcare, tutoring, advising, distributed campuses, partnerships with local employers, and explicit service-area placement. In the model, that is exactly why $q$ matters: it changes both the payoff from persistence and its social interpretation.

### 4.3 Community encouragement and educational completion

Direct large-sample postsecondary measures of home-community support are scarce. The best official Canadian evidence comes from the 2012 Aboriginal Peoples Survey for off-reserve First Nations respondents. These data concern school completion more broadly rather than postsecondary persistence alone, but they are still informative because they measure the kind of support environment represented by $s$ in the model.

Table 3 summarizes several margins.[16] Off-reserve First Nations completers were much more likely than leavers to report parental involvement at school, high-aspiration peer groups, and support from teachers or counselors. They were also more likely to have lived full-time with family during their last year of school. Finally, the same APS source reports a strong postsecondary difference downstream: 54% of high-school completers had postsecondary credentials, compared with only 16% of leavers.

These patterns are not a test of the precise signaling game, but they are difficult to reconcile with a view of educational persistence as only a liquidity problem. The raw APS facts suggest that social support and educational completion are tightly linked. That is exactly the object the model is designed to capture. Once persistence is interpreted socially, the value of remaining in school depends not just on tuition support, but also on whether family, peers, and the surrounding

[16]Statistics Canada, *Part A: The education and employment experiences of First Nations people living off reserve*, based on the 2012 Aboriginal Peoples Survey, January 21, 2016.

community read the choice as legitimate.

Taken together, the descriptive evidence suggests a concrete empirical strategy for future work. A direct reduced-form test would interact financial aid measures with proxies for $q$ and $s$. For $q$, plausible proxies include Tribal College attendance, and other culturally grounded institutional features. For $s$, plausible proxies include family involvement, peer aspirations, distance from home, survey measures of expected support, or whether the student remains embedded in family and community networks while enrolled. The model predicts that the marginal effect of aid should be weaker, and may even turn negative, in low-$q$/low-$s$ environments.

# 5 Discussion and policy interpretation

The empirical patterns documented above show that the theory's main objects are observable and policy-relevant: large attainment gaps coexist with substantial scholarship infrastructure, institutions that most closely resemble high-$q$ environments are visibly organized around Indigenous governance and student support, and educational completion is strongly associated with support from family, peers, and school staff.

The central policy implication is not that scholarship aid should be replaced by institutional design. Financial support remains necessary. The narrower point is that, when persistence is socially interpreted, aid alone is an incomplete policy. In the baseline model, especially near the legitimacy frontier, an increase in $q$ can be more effective than an equal increase in $b$ because it raises persistence directly while also preserving legitimacy. In the asymmetric-reservation-value extension, by contrast, additional aid can strengthen legitimacy rather than weaken it. The relevant policy question is therefore not whether money or institutional design matters more in general, but which students are marginal and how the surrounding environment shapes the meaning of persistence.

Several practical implications follow. First, where legitimacy is fragile, policy should invest not only in tuition support but also in the institutional features that make schooling visibly compatible with community belonging: institutionally legible, community-linked design. Second, policy can reduce the effective social tax on persistence by limiting the extent to which education requires separation from home. Decentralized instructional sites, transport support, family housing, and flexible delivery do not eliminate historical distrust $\tau$, but they can reduce the extent to which persistence is experienced as assimilative. Third, because the empirical evidence suggests that support environments matter, policy should treat family and community support as part of the persistence technology rather than as an external background condition. Home-going support, family-inclusive programming, childcare, and other forms of social infrastructure may therefore complement student-level aid.

The sponsor extension sharpens this point. A community-oriented sponsor has reason to internalize the legitimacy effects of policy and to invest in $q$ rather than relying on cash aid alone. An assimilationist or externally oriented sponsor does not. Historically, that distinction matters. Underinvestment in culturally grounded institutional design need not reflect ignorance or admin-

istrative failure; it may reflect the objectives of the actor designing education. For that reason, policy evaluation should consider not only how much aid is offered, but also who controls program design, whether institutions are perceived as community-compatible, and whether students can persist without signaling exit from home.

### 5.1 Interpretation of model parameters in Indigenous contexts

The model is intentionally parsimonious, but its parameters map to real institutional and historical features of Indigenous education. This subsection clarifies that mapping and distinguishes the narrow baseline interpretation of support from the more general support extension.

**Assimilation risk $\tau$.** The parameter $\tau$ captures the extent to which schooling is perceived as culturally assimilative or as movement away from the home community rather than as a community-serving investment. It is meant to summarize a historically grounded distrust of external schooling institutions. In Canada, the residential school system was explicitly designed to separate Indigenous children from their families, languages, and communities, and in 1920 the Indian Act made attendance compulsory for many children. In the United States, the federal boarding-school system likewise pursued forced assimilation through removal, confinement, punishment, and the suppression of language and cultural practice. More broadly, federal policies such as the Indian Act in Canada and removal policies in the United States, including the Trail of Tears, made state intervention in Indigenous life inseparable from coercion, displacement, and administrative control.[17] In reduced form, a higher $\tau$ means that the same act of persistence is more likely to be interpreted as assimilationist.

**Reservation value of home $R$.** The parameter $R$ is the value of stopping out and returning home rather than continuing in school. It includes local employment and household production, but also kinship obligations, language use, land attachment, political belonging, and the value of remaining embedded in community life. For many Indigenous students, postsecondary education requires physical mobility: Statistics Canada reports that about 40% of off-reserve First Nations people, 50% of Inuit, and 42% of Métis with postsecondary credentials had moved to pursue their education. In the United States, Indian Affairs states that over one-half of American Indian and Alaska Native people live away from their tribal lands, but that most return home for relatives, family gatherings, cultural and religious activities, tribal work, voting, retirement, or burial.[18] These facts support a nontrivial reservation value of home even when students do relocate for schooling.

[17] National Centre for Truth and Reconciliation, *Residential School History*; U.S. Department of the Interior, *Department of the Interior Releases Investigative Report, Outlines Next Steps in Federal Indian Boarding School Initiative*; Justice Laws Website, *Indian Act*; National Park Service, *History & Culture – Trail of Tears National Historic Trail*; and Statistics Canada, *Status First Nations people in Canada: A snapshot from the 2021 Census.*

[18] Statistics Canada, *Selected findings from the 2012 Aboriginal Peoples Survey*; Statistics Canada, *Indigenous People – Canada at a Glance, 2022*; and Indian Affairs, *Frequently Asked Questions.*

According to the 2021 Census, about 44% of First Nations people in Canada lived on reserve, while the remainder lived off reserve but often maintained strong social and family ties with their home communities. This pattern is consistent with interpreting $R$ as the value of remaining embedded in community life even when individuals temporarily relocate for education or work.

**Institutional legibility $q$.** The parameter $q$ captures the extent to which education is institutionally organized so that persistence is legible as compatible with community belonging. High-$q$ environments are not merely schools with Indigenous symbolism. They are institutions in which governance, curriculum, staffing, and support systems visibly connect education to Indigenous community life. Examples include Tribal Colleges and Universities, decentralized instructional sites, Indigenous faculty and mentors, language programming, land-based learning, community-linked curricula, transport and family-support systems that reduce the need to sever ties to home, and explicit return-to-community pathways. Low-$q$ environments are those in which Indigenous presence is thin, educational governance is externally controlled, and the institutional meaning of schooling remains culturally distant or assimilationist. In the empirical section, the TCU examples serve precisely as observable proxies for high $q$.

**Support in the baseline model: $S$.** In the baseline model, $S$ is deliberately narrow. It is the incremental value of *legitimacy-contingent community support*: the additional rent that accrues when persistence is read as community-serving and therefore endorsed by the home community. This may include material components such as family housing, childcare, travel help, informal insurance, or direct transfers, but only insofar as those forms of help are conditional on persistence being viewed as legitimate. That is why $S$ enters the payoff of type $C$ but not type $X$ in the baseline model. Generic financial aid belongs in $b$; generic attraction of remaining at home belongs in $R$; and $S$ captures the additional value of recognition and endorsement.

**Support in the general extension: $S_X$ and $S_C$.** The support extension relaxes this restriction by allowing both types to value support:

$$V_X(a; b, R, s) = a + b - R + sS_X, \qquad V_C(a; b, q, \tau, R, s) = a + b - R + \nu q - \tau(1 - q) + sS_C,$$

with $S_C \geq S_X \geq 0$. Under this interpretation, $S_X$ is the generic material value of support to any persisting student, while $S_C - S_X$ is the extra legitimacy-specific value of support for a community-oriented student. This distinction is useful empirically. Observed housing, food, transport, or childcare support may partly load on $S_X$, while family endorsement, reciprocal backing, and support that depends on schooling being read as "for the community" map more naturally into $S_C - S_X$.

**The support decision $s$ and community cost.** The binary decision $s \in \{0, 1\}$ indicates whether support is extended. The point of the community problem is not that the community is mechanically punitive. Support is costly. It uses scarce resources, time, housing space, political

endorsement, and reciprocal effort. The community therefore has reason to distinguish between supporting a student whose persistence is expected to benefit the community and supporting a student whose persistence is expected to facilitate exit. That is exactly what the threshold rule formalizes: support is granted only when the posterior belief that persistence reflects community-oriented motives is high enough to justify the cost.

**Academic fit $a$ and scholarship aid $b$.** The parameter $a$ captures the private return to schooling through labor-market opportunities and educational success. The scholarship term $b$ captures direct financial aid programs such as the Post-Secondary Student Support Program in Canada and federal, tribal, or institution-specific aid in the United States. The theoretical point is not that these incentives are unimportant. It is that their effect depends on the social environment in which they operate. Aid changes the private return to persistence, but it may also change the composition of persisters and therefore the inference that the community draws from persistence.

# 6 Conclusion

This paper develops a signaling theory of Indigenous postsecondary persistence. The central idea is that persistence in school is evaluated not only by educational institutions and labor markets, but also by home communities for whom schooling may carry the historical meaning of assimilation. When community support depends on the inferred motive for persistence, staying in school becomes a problem of legitimacy as well as a problem of cost.

The baseline model delivers four results. First, when schooling is culturally alienating, students most attached to the community may be the most likely to leave. Second, scholarship aid can crowd out persistence by weakening the inference that persistence reflects community-oriented motives. Third, Indigenous institutional design raises persistence directly and also preserves legitimacy. Fourth, legitimacy thresholds generate multiple equilibria.

The extensions clarify the scope of these results. When the relevant margin of adjustment comes mainly from community-oriented students, scholarship crowd-out disappears and can reverse. When sponsors differ in mission, the policy mix changes as well: community-oriented sponsors tilt toward institutional legibility, whereas assimilationist sponsors underinvest in it.

The empirical section is descriptive rather than causal, but it shows that the model's core objects are observable. Large attainment gaps coexist with substantial scholarship infrastructure, institutions that resemble high-$q$ environments are visibly organized around Indigenous governance and support, and educational completion is strongly associated with supportive environments.

The broader implication is that postsecondary persistence cannot always be understood as a standard human-capital problem. In contexts shaped by identity, historical distrust, and community accountability, the social meaning of schooling is part of the incentive structure. Financial aid remains necessary, but its effect depends on the institutional and social setting in which it is offered. Where persistence must be made legitimate as well as affordable, institutional design and

community support are part of the mechanism determining whether students remain in school.

# Appendix: Proofs

## Proof of Lemma 1

*Proof.* 1. Both $V_X(a; b, R)$ and $V_C(a; b, q, \tau, R, s)$ are linear in $a$ with derivative one. Hence the persistence decision is monotone in $a$.

2. For type $X$, persistence occurs if $a \geq R - b$. Since $a \sim U[0, 1]$,

$$\Pr(d = 1 \mid \theta = X) = 1 - (R - b) = 1 - R + b \equiv m_X.$$

For type $C$, persistence occurs if $a \geq R - b - D_s(q, \tau)$. Hence,

$$\Pr(d = 1 \mid \theta = C) = 1 - (R - b - D_s(q, \tau)) = m_X + D_s(q, \tau).$$

3. The community prefers $s = 1$ to $s = 0$ iff

$$\mu B_C + (1 - \mu)B_X - \kappa \geq 0,$$

which is equivalent to $\mu \geq \bar{\mu}$.

□

## Proof of Proposition 1

*Proof.* Given $s$, each type chooses persistence to maximize its payoff. For type $X$, persistence requires $a+b-R \geq 0$, yielding $a_X = R-b$. For type $C$, persistence requires $a+b-R+D_s(q, \tau) \geq 0$, yielding $a_C^s = R - b - D_s(q, \tau)$.

Applying Bayes' rule to the induced cutoffs gives

$$\mu_s = \frac{\lambda(1 - a_C^s)}{\lambda(1 - a_C^s) + (1 - \lambda)(1 - a_X)}.$$

Substituting the cutoff expressions yields the stated formula. Sequential rationality implies support iff $\mu_s \geq \bar{\mu}$, which establishes the equilibrium conditions. □

## Proof of Proposition 2

(i) From the cutoff conditions, $a_X = R - b$ and $a_C^s = R - b - D_s(q, \tau)$, so $a_C^s - a_X = -D_s(q, \tau)$; derivatives follow from $D_s = \nu q - \tau(1 - q) + sS$.

(ii) Using $\mu_s = \frac{\lambda(m_X + D_s)}{m_X + \lambda D_s}$, direct differentiation yields the stated signs.

(iii) A support equilibrium requires $\mu_1 \geq \bar{\mu}$. Solving $\mu_1 = \bar{\mu}$ for $b$ using $m_X = 1 - R + b$ gives $\bar{b}(q, \tau, R, S)$; derivatives follow from part (i).

(iv) Since $D_1 = D_0 + S$, we have $a_C^0 - a_C^1 = S$ while $a_X$ is unchanged; with $a \sim U[0,1]$, masses follow immediately. □

## Proof of Proposition 3

*Proof.* Since $R_X = 0$, type $X$ has payoff

$$V_X(a; b) = a + b \geq 0 \qquad \text{for all } a \in [0,1],$$

so

$$d_X(a) = 1 \qquad \text{for all } a \in [0,1].$$

Type $C$ persists if and only if

$$a + b - R_C + D_s(q, \tau) \geq 0,$$

so

$$a_C^s = R_C - b - D_s(q, \tau).$$

Bayes' rule then gives

$$\mu_s = \frac{\lambda(1 - a_C^s)}{(1-\lambda) + \lambda(1 - a_C^s)} = \frac{\lambda[m_C + D_s(q,\tau)]}{(1-\lambda) + \lambda[m_C + D_s(q,\tau)]},$$

where $m_C = 1 - R_C + b$.

Sequential rationality implies that support occurs if and only if $\mu_s \geq \bar{\mu}$. Substituting the posterior formula and rearranging yields

$$m_C + D_1(q, \tau) \geq \frac{\bar{\mu}(1-\lambda)}{\lambda(1-\bar{\mu})}.$$

Multiplicity follows exactly as in Proposition 1. □

## Proof of Lemma 2

*Proof.* Write the posterior as

$$\mu_s = \frac{\lambda y}{(1-\lambda) + \lambda y}, \qquad y = m_C + D_s(q, \tau).$$

Since

$$\frac{d\mu_s}{dy} = \frac{\lambda(1-\lambda)}{\big((1-\lambda) + \lambda y\big)^2} > 0,$$

and $\partial y / \partial b = 1$, $\partial y / \partial q = \nu + \tau$, and $\partial y / \partial \tau = -(1-q)$, the signs follow immediately. □

## Proof of Proposition 4

*Proof.* Under support,

$$a_C^1 = R - b - D_1(q, \tau).$$

Hence

$$\frac{\partial a_C^1}{\partial b} = -1, \qquad \frac{\partial a_C^1}{\partial q} = -(\nu + \tau).$$

From the posterior formula,

$$\frac{\partial \mu_1}{\partial q} > 0, \qquad \frac{\partial \mu_1}{\partial b} < 0$$

whenever $D_1(q, \tau) > 0$.

Holding $a_C^1$ fixed implies

$$db = -(\nu + \tau)dq.$$

Substituting this variation into the posterior expression shows that $d\mu_1 > 0$ whenever $dq > 0$, completing the argument. □

## Proof of Lemma 3

*Proof.* In the baseline model

$$a_X(b) = R - b, \qquad 1 - a_X(b) = m_X = 1 - R + b.$$

Hence an observable-type assimilationist sponsor solves

$$\max_{b,q} \; U_P^X(b, q) = (1 - \lambda)m_X - \Gamma(b, q).$$

For any fixed $b$,

$$\frac{\partial U_P^X}{\partial q} = -\Gamma_q(b, q) < 0,$$

so the sponsor chooses $q$ at its minimum feasible level.

Conditional on this choice, the problem reduces to choosing $b$. If the optimum is interior, the first-order condition is

$$\Gamma_b(b, q) = 1 - \lambda.$$

Because a type-$C$ sponsor internalizes legitimacy and benefits from higher $q$ on the support margin (Proposition 4), the assimilationist sponsor's policy is strictly less $q$-intensive whenever legitimacy affects type-$C$ persistence. □

### Proof of Proposition 5

*Proof.* Fix a support regime $s \in \{0, 1\}$. Type $X$ persists if and only if

$$a + b - R + sS_X \geq 0,$$

which yields

$$a_X^s = R - b - sS_X.$$

Type $C$ persists if and only if

$$a + b - R + \nu q - \tau(1 - q) + sS_C \geq 0.$$

Using

$$\widetilde{D}_s(q, \tau) = \nu q - \tau(1 - q) + s(S_C - S_X),$$

this condition becomes

$$a + b - R + sS_X + \widetilde{D}_s(q, \tau) \geq 0,$$

so

$$a_C^s = R - b - sS_X - \widetilde{D}_s(q, \tau).$$

Bayes' rule then gives

$$\mu_s = \frac{\lambda(1 - a_C^s)}{\lambda(1 - a_C^s) + (1 - \lambda)(1 - a_X^s)}.$$

Substituting the cutoff expressions and $m_X = 1 - R + b$ yields

$$\mu_s = \frac{\lambda[m_X + sS_X + \widetilde{D}_s(q, \tau)]}{m_X + sS_X + \lambda\widetilde{D}_s(q, \tau)}.$$

Differentiating with respect to $b$ gives

$$\frac{\partial \mu_s}{\partial b} = -\frac{\lambda(1 - \lambda)\widetilde{D}_s(q, \tau)}{(m_X + sS_X + \lambda\widetilde{D}_s(q, \tau))^2}.$$

Hence scholarship crowd-out occurs if and only if

$$\frac{\partial \mu_s}{\partial b} < 0 \quad \Longleftrightarrow \quad \widetilde{D}_s(q, \tau) > 0.$$

□

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