Online Appendix for:

“Stopping the violence but blocking the peace: Dilemmas of foreign-imposed nation-building after ethnic war”

Kevin Russell*   Nicholas Sambanis[†][‡]

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*Email: kevin.d.russell@gmail.com

[†]Department of Political Science, University of Pennsylvania, Philadelphia, PA. Email: sambanis@upenn.edu.

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Appendix

Proofs

Derivation of Lemma For group A with $I_a = 0$ then utility is maximized where

$$\frac{dw_a}{df_a} = \left[\frac{1}{f_a + f_b} - \frac{f_a}{(f_a + f_b)^2}\right](1-\kappa)Y - 1 = 0 \tag{1}$$

given that the second order condition

$$\frac{d^2 w_a}{df_a^2} = \frac{-2f_b}{(f_a + f_b)^3}(1-\kappa)Y < 0 \tag{2}$$

holds. In the symmetric context where $f_a = f_b$ the maximum utility ethnic fighting level for both groups reduces to $f^e = \frac{(1-\kappa)Y}{4}$. This will be an ethnic fighting equilibrium as long as

$$w_a(f_a(\kappa), f_b(\kappa), I_a(\kappa), I_b(\kappa)) = w_a(f^e, f^e, 0, 0) \geq w_a(f^e, f^e, 1, 0) \tag{3}$$

This will be the case as long as $\beta(f_a + f_b) \geq \alpha$, which at $f_a = f_b = f^e$ implies $\kappa \leq 1 - \frac{2\alpha}{\beta Y}$. Following the same steps, there is a nationalist fighting equilibrium at $f^n = \frac{(1-\kappa)Y}{4(1+\beta)}$. This satisfies $w_a(f_a(\kappa), f_b(\kappa), I_a(\kappa), I_b(\kappa)) = w_a(f^n, f^n, 1, 1) \geq w_a(f^n, f^n, 0, 1)$ as long as $\beta(f_a + f_b) \leq \alpha$, which at $f_a = f_b = f^n$ implies $\kappa \geq 1 - \frac{2\alpha(1+\beta)}{\beta Y}$.

Explanation of figure two

The results in lemma one give us figure two in the main text for the non-intervention case, drawn there with $Y = 4, \beta = 1, \alpha = 0.5$, which means $\hat{\kappa} = 0.5$.

Under intervention, for group A with $I_a = 0$, then utility is maximized where

$$\frac{dw_a}{df_a} = \left[\frac{f_b + f_c}{(f_a + f_b + f_c)^2}\right](1-\kappa)Y - 1 = 0 \tag{4}$$

where second order conditions are satisfied, given that the f's and $(1-\kappa)Y$ are positive.

Additionally, equation (4) implies $\left[\frac{f_b+f_c}{(f_a+f_b+f_c)^2}\right] = \frac{1}{(1-\kappa)Y}$ and following the same steps for $\frac{dw_b}{df_b}$ gives $\left[\frac{f_a+f_c}{(f_a+f_b+f_c)^2}\right] = \frac{1}{(1-\kappa)Y}$, which together imply that the fighting levels are symmetric across the two groups, $f_a = f_b = f^e$. As f_c increases, f^e will decrease until it reaches zero when $f_c = (1-\kappa)Y$. We can say generally that for $0 \leq f_c \leq (1-\kappa)Y$ then $0 \leq f^{e\prime} \leq \frac{(1-\kappa)Y}{4}$, where $f^{e\prime}$ is the optimal fighting level given ethnic identities under intervention. Solving equation (4), we find (utilizing symmetry),

$$f_a = \frac{(1-\kappa)Y - 4f_c + (((1-\kappa)Y)^2 + 8f_c(1-\kappa)Y)^{\frac{1}{2}}}{8}. \tag{5}$$

Similarly, for the fighting equilibrium under national identity, $I_a = 1$, group A maximizes utility where

$$\frac{dw_a}{df_a} = \left[\frac{f_b + f_c}{(f_a + f_b + f_c)^2}\right](1-\kappa)Y - 1 - \beta = 0 \tag{6}$$

where again second order conditions are negative and again following the same steps for f_b shows symmetry: equation (6) gives $\left[\frac{f_b+f_c}{(f_a+f_b+f_c)^2}\right] = \frac{1+\beta}{(1-\kappa)Y}$ and $\frac{dw_b}{df_b}$ gives $\left[\frac{f_a+f_c}{(f_a+f_b+f_c)^2}\right] = \frac{1+\beta}{(1-\kappa)Y}$.

Generally, for $0 \leq f_c \leq \frac{(1-\kappa)Y}{1+\beta}$ then $0 \leq f^{n\prime} \leq \frac{(1-\kappa)Y}{4(1+\beta)}$, where $f^{n\prime}$ is the optimal fighting level given national identities under intervention. Solving equation (6), we find, utilizing symmetry,

$$f_a = \frac{\frac{(1-\kappa)Y}{1+\beta} - 4f_c + \left[\left(\frac{(1-\kappa)Y}{1+\beta}\right)^2 + 8f_c\frac{(1-\kappa)Y}{1+\beta}\right]^{\frac{1}{2}}}{8} \tag{7}$$

where each factor of $(1-\kappa)Y$ is reduced by a factor of $1/(1+\beta)$ relative to the ethnic identity case and f_c enters in the same way to bring down fighting levels.

The $f^{n\prime}$ equilibrium will be stable when $f^{n\prime} \leq \frac{\alpha}{2\beta}$. If f_c is set just high enough to make this a stable nationalist equilibrium it means that fighting levels drop from f^e to $f^{n\prime}$ as a result of intervention; we define this level of f_c as $\hat{f}_c$. Substituting equation (7) into the inequality and recognizing that $\hat{f}_c$ is the boundary condition gives

$$\hat{f}_c = \frac{(1-\kappa)Y}{2(1+\beta)} - \frac{\alpha}{\beta} + \left[\frac{((1-\kappa)Y)^2}{4(1+\beta)^2} - \frac{\alpha(1-\kappa)Y}{2\beta(1+\beta)}\right]^{\frac{1}{2}} \tag{8}$$

Because equation (8) is the boundary condition for nationalism with $f_a = \frac{\alpha}{2\beta}$ it means that $\kappa = \hat{\kappa}'$, the institutional threshold for national identity under intervention. In other words, the intervening force can increase f_c and therefore decrease $\hat{\kappa}$ until it equals $\kappa^{t=1}$ and induces a nationalist shift (i.e. where equation (8) is satisfied with $\kappa = \kappa^1$). Inverting equation (8), this occurs where $\kappa^1 = \hat{\kappa} = 1 - \frac{(\hat{f}_c+\frac{\alpha}{\beta})^2}{\hat{f}_c+\frac{\alpha}{2\beta}}\frac{1+\beta}{Y}$. By a similar logic, if the intervening force "overshoots" so that $f_c > \hat{f}_c$, then f_a decreases holding other parameters constant ($\frac{df_a}{df_c} < 0$ for $f_c > 0$ in equation (7)) and $f_a = \frac{\alpha}{2\beta}$ at a lower value of κ so that the $\hat{\kappa}$ threshold has moved below κ^1. While in our model this choice would be a waste of resources for the intervener because it doesn't change leader choices, it means that the intervener doesn't need to choose f_c precisely as $\hat{f}_c$, which in practice would be difficult (as noted below, this overshoot does not qualitatively change the propositions below).

While equation (7) is more complicated than the non-intervention counterpart, some limits are apparent from the boundary conditions that give an intuitive sense of the corresponding graph in figure 2. Specifically, where $\kappa = 1$, then $f_a = \frac{-f_c}{2}$; where $f_a = 0$, then $\kappa = 1 - \frac{f_c(1+\beta)}{Y}$ so that for $\kappa > 0$, we require $f_c < \frac{Y}{1+\beta}$ (or more generally for $0 < \kappa < 1$ then $f_c < \frac{(1-\kappa)Y}{1+\beta}$ as noted above).

Finally, we can graph equation (7) with the same parameter values as the non-intervention case ($\alpha = \frac{1}{2}, \beta = 1, Y = 4$) and with $f_c = \hat{f}_c$ to show that the model applies within the boundary conditions. We make the additional choice to set $\kappa^1 = \frac{1}{4}$ so that it falls below the non-intervention threshold (i.e. there is ethnic identification before intervention). This gives $f_c = \hat{f}_c = \frac{1+\sqrt{3}}{4}$ and we graph equation (7) in figure 2, giving back the equilibrium at $\kappa^1 = \hat{\kappa}'$ and $f_a = \frac{\alpha}{2\beta}$. Unlike the non-intervention case, equation (7) is non-linear and becomes more so as κ approaches 1 (and turns imaginary for a domain above $\kappa = 1$ with these parameter values, though we are not interested in what occurs when $f_a \leq 0$).

Proof of Proposition One.

For the non-intervention case, we first consider the conditions under which leaders will choose public goods in period two, which implies an end state where leader choices and institution-building are re-enforcing and peace is therefore self-enforcing (i.e. "success"). Under the case of interest where the population identifies ethnically in period one, this will require some degree of institution building in period one. Our overall approach is to show how much institution building is required (as reflected in how malleable institutions must be, given by γ); we then demonstrate that, depending on parameters, the game can have two different structures that ultimately lead to reinforcing peace: (1) a case where the parameters define a dominant strategy to provide public goods by both leaders, leading to a self-enforcing peace; (2) a case in which parameters define a coordination game, in which self-enforcing peace is one of two equilibria. Further, we discuss the conditions that lead to these two different structures.

To first determine the conditions for period two success, and how that depends on social identities of the population, assume that the investments in the first period were enough to increase κ to $\hat{\kappa}$ such that the population chooses to identify nationally in the second period.

For the one shot game in period two with $\boldsymbol{f}^t = (f_a^n, f_b^n)$ and $\boldsymbol{I}^t = (1, 1)$ we find, independent of leader ℓ_B's choice,

$$u_a(c_A = 1) - u_a(c_A = 0) = \frac{\psi\kappa(X_0 + \kappa Y)}{2} - (1 - \mu)\frac{X_0 + \kappa Y}{2}. \tag{9}$$

We therefore find that leader ℓ_A, and leader ℓ_B by symmetry, will choose $c^{t=2} = 1$ as long as $\kappa^{t=2} \geq \frac{1-\mu}{\psi}$ when the population identifies nationally.

If the population does not identify nationally, we find

$$u_a(c_A = 1) - u_a(c_A = 0) = \frac{\psi\kappa(X_0 + \kappa Y)}{2} - \frac{X_0 + \kappa Y}{2}. \tag{10}$$

This will be positive when $\kappa > \frac{1}{\psi}$.

In sum, in the second period when leaders consider a one shot game, they will choose $c_j^2 = 1$ when $\kappa^2 \geq \hat{\kappa}$ and $\frac{1-\mu}{\psi} \leq \hat{\kappa} \leq \frac{1}{\psi}$. If $\kappa^2 < \frac{1-\mu}{\psi}$, then leaders will choose $c_j^2 = 0$ even though the population identifies nationally (i.e. $\kappa^2 \geq \hat{\kappa}$), and conversely, if $\kappa^2 > \frac{1}{\psi}$ leaders will choose $c_j^2 = 1$ even if the population identifies ethnically (i.e. $\kappa^2 \leq \hat{\kappa}$). To focus on the case of interest, we henceforth assume $\frac{1-\mu}{\psi} \leq \hat{\kappa} \leq \frac{1}{\psi}$ while noting the critical role that potential for cross-ethnic support, μ, plays in creating the space for the nation-building path to peace and the critical role that efficient translation of resources to public goods, ψ, plays in creating the possibility for a state-building path to peace that operates through elites who are less sensitive to population preferences. To enforce the scope condition that the population identifies ethnically in period one, we require that $\kappa^1 < \hat{\kappa} < \frac{1}{\psi}$. In the non-intervention cases, to keep the discussion as general as possible, we do not require that $\kappa^1 > \frac{1-\mu}{\psi}$, only that $\frac{1-\mu}{\psi} < \hat{\kappa} < \frac{1}{\psi}$ so that leader choices in the second period one-shot game turn on social identities and far-sighted leaders factor that in even in period one. However, in the intervention case, we are most interested in where the reduction in resources available to fighting and violence affects leader choices through the social identity channel even in period one payoffs for short-sighted leaders, and hence assume $\frac{1-\mu}{\psi} < \kappa^1 < \hat{\kappa} < \frac{1}{\psi}$.

We are therefore interested in when $\kappa^{t=2} \geq \hat{\kappa}$ or when

$$\gamma \kappa^{t=1} + \frac{c_A^{t=1} + c_B^{t=1}}{2}(1-\gamma) \geq 1 - \frac{2\alpha(1+\beta)}{\beta Y}. \tag{11}$$

This inequality allows us to define two thresholds for γ based on whether it is possible for a single leader or two leaders together through their investments in period one to achieve a level of institutional strength in period two that can sustain a national identity equilibrium. Specifically, these are

$$\gamma \leq \frac{2\alpha(1+\beta)}{\beta Y(1-\kappa^1)} \equiv \bar{\gamma}; \tag{12}$$

$$\gamma \leq \frac{1}{\frac{1}{2} - \kappa^1} \Big[\frac{2\alpha(1+\beta)}{\beta Y} - \frac{1}{2} \Big] \equiv \bar{\bar{\gamma}}. \tag{13}$$

The latter case is only relevant where $\kappa^1 < \hat{\kappa} < \frac{1}{2}$ such that a single leader's investment will increase institutional capacity and can exceed $\hat{\kappa}$. These definitions also imply $\bar{\bar{\gamma}} < \bar{\gamma}$ given $\kappa^1 < \hat{\kappa}$ and $\gamma \leq 1$. These thresholds increase with α and κ^1 and decrease with Y and β (for $\beta > 0$). These parameters define the state-building "distance" that has to be traversed to reach $\hat{\kappa}$, i.e. the starting point κ^1 and the depth of the ethnic conflict (α, β, Y). Here it is worth noting again that Y raises the propensity of conflict as it raises the rewards for fighting for given κ. A higher income country will nonetheless have lower risk of conflict, consistent with the literature, if κ is higher and the rewards available for ethnic fighting are lower.

Having defined these thresholds, the second part of our approach is to determine the conditions under which leaders will choose the period one investments that move κ above $\hat{\kappa}$ when γ is below the thresholds that would allow it.

We define four possible combinations of leader choices in period one (Table 1).

Table 1: Possible Leader Choices in Period 1

		c_B	
		0	1
c_A	0	(A) (0,0);	(C) (0,1)
	1	(B) (1,0);	(D) (1,1)

The conditions described in proposition one are those where both leaders must invest in public goods to build state-capacity enough for self-enforcing peace, specifically, $\bar{\bar{\gamma}} < \gamma < \bar{\gamma}$. This implies that $I^2 = (1,1)$ only in case (D); by assumption of the value of κ^1, $I^1 = (0,0)$. Leaders are strategic and thus anticipate that they will choose to invest in public goods in the second period when $\kappa^2 \geq \hat{\kappa}$ and the population identifies nationally.

For simplicity, let $[*]_t = \frac{X_0+\kappa^t Y}{2}$, $[**]_t = \frac{(1-\kappa^t)Y}{4}$, and $[***] = \left(1 - \frac{\beta}{1+\beta} - \frac{1}{2(1+\beta)}\right)$. The utilities for leader ℓ_A for each case are then:

$$(A) : u_a = u_a^1(\boldsymbol{c}^1 = (0,0), \boldsymbol{I}^1 = (0,0)) + \delta u_a^2(\boldsymbol{c}^2 = (0,0), \boldsymbol{I}^2 = (0,0)) \tag{14}$$

$$= [*]_1 + [**]_1 + \delta\left([*]_2 + [**]_2\right) \tag{15}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma$

$$(B) : u_a = u_a^1(\boldsymbol{c}^1 = (1,0), \boldsymbol{I}^1 = (0,0)) + \delta u_a^2(\boldsymbol{c}^2 = (0,0), \boldsymbol{I}^2 = (0,0)) \tag{16}$$

$$= \psi\kappa^1[*]_1 + [**]_1 + \delta\left([*]_2 + [**]_2\right) \tag{17}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + \frac{1-\gamma}{2}$

$$(C) : u_a = u_a^1(\boldsymbol{c}^1 = (0,1), \boldsymbol{I}^1 = (0,0)) + \delta u_a^2(\boldsymbol{c}^2 = (0,0), \boldsymbol{I}^2 = (0,0)) \tag{18}$$

$$= (\psi\kappa^1 + 1)[*]_1 + [**]_1 + \delta\left([*]_2 + [**]_2\right) \tag{19}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + \frac{1-\gamma}{2}$

$$(D) : u_a = u_a^1(\boldsymbol{c}^1 = (1,1), \boldsymbol{I}^1 = (0,0)) + \delta u_a^2(\boldsymbol{c}^2 = (1,1), \boldsymbol{I}^2 = (1,1)) \tag{20}$$

$$= 2\psi\kappa^1[*]_1 + [**]_1 + \delta\left(2\psi\kappa^2[*]_2 + \alpha + 2[**]_2[***]\right) \tag{21}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + 1 - \gamma$

Leader ℓ_A will consider (A) compared to (B) under conditions where $c_B^1 = 0$ and (C) to

(D) under conditions where $c_B^1 = 1$. In the former case, $(A) > (B)$ when

$$(1 - \psi\kappa^1)[*]_1 > \delta\left(\frac{1-\gamma}{8}Y\right). \tag{22}$$

In the latter case, $(C) > (D)$ when

$$(1 - \psi\kappa^1)[*]_1 > \delta\left(\alpha + (2\psi\kappa^2 - 1)[*]_2 + (2[***] - 1)[**]_2 + \frac{(1-\gamma)Y}{8}\right) \tag{23}$$

where $\kappa^2 = \kappa^1\gamma + (1-\gamma)$, including where it appears in $[*]_2$ and $[**]_2$.

To systematically consider the conditions under which these inequalities hold it is useful to define:

$(F) \equiv (1 - \psi\kappa^1)[*]_1$

$(G) \equiv \delta\left(\frac{(1-\gamma)Y}{8}\right)$

$(H) \equiv \delta\left((2\psi\kappa^2 - 1)[*]_2\right)$

$(I) \equiv \delta\left(\alpha + (2[***] - 1)[**]_2\right)$, where again for purposes of definition in all cases $\kappa^2 = \gamma\kappa^1 + (1-\gamma)$.

Substantively, (F) reflects the short term gain of ethnic goods under ethnic identity (compared to public goods under ethnic identity); (G) reflects the (far-sighted) gain of being able to deliver ethnic goods rather than fight for them in period two, so depends on having positive institutional malleability ($\gamma < 1$) that leaders can strengthen through their choices; (H) reflects the material payoff benefit from delivering public goods under national identity vs. ethnic goods under ethnic identity (and so appears only in (C) vs. (D)); and (I) is the fighting and psychological payoffs under national identity vs. ethnic identity (and so again appears only in (C) vs. (D)).

Four possibilities result based on the comparisons of the payoffs represented by the choices in table 1, specifically whether $(A) > (B)$ or $(A) < (B)$ and for each of these, whether $(C) > (D)$ or $(C) < (D)$. First, when leaders are short-sighted (i.e. δ approaches 0), both inequalities $(A) > (B)$ and $(C) > (D)$ reduce to $(F) > 0$, or $\kappa^1 < \frac{1}{\psi}$, which is the case. Under these conditions, $c^1 = (0,0)$ as it reflects the dominant strategy for both leaders among the reduced form options. This result is also possible when δ is non-zero as long as conditions aren't too favorable toward nationalism. For example, when $X_0 = 0, Y = 4, \kappa^1 = 0.2, \gamma = 0.5, \alpha = 0.75, \beta = 10, \psi = 1$, the result (i.e. $(F) > (G) + (H) + (I)$) still holds with δ up to 0.36. But if either α increases to 1, β drops to 4, or Y drops to 3, it no longer holds at that level of δ. Increasing X_0 above zero reduces the relative period two benefit of institutional strength, since relatively fewer resources are at stake, so increases the threshold of δ for which a dominant ethnic goods solution holds at these values for the other parameters; for example, when X_0 goes to 0.2, the threshold for δ increases to 0.45.

Table 2: Set of Examples Used in the Proofs

	Dominant ethnic		*Dominant Nationalist*		*Coordination*		*Chicken*
	(A)>(B), (C)>(D)		**(A)<(B), (C)<(D)**		**(A)>(B), (C)<(D)**		**(A)<(B), (C)>(D)**
Prop 1	F>G, F>G+H+I		F<G+H+I and F<G		G<F<G+H+I		0<G-F<-(H+I)
X_0	0	0.2	0	0	0	0	No solutions
Y	4	4	4	4	4	4	
kappa_1	0.2	0.2	0.125	0.875	0.125	0.875	
gamma	0.5	0.5	0.5	0.5	0.5	0.5	
alpha	0.75	0.75	0.5	0.1	0.5	0.1	
beta	10	10	1	1	1	1	
delta	0.36	0.45	1	1	0.5	0.5	
psi	1	1	1	1	1	1	
Prop 2	F>G+H+I, F>J-K		F<G+H+I and F<J-K		G+H+I<F<J-K		J-K<F<G+H+I
X_0	0		3	0	0		100
Y	4		4	4	4		4
kappa_1	0.125		0.1	0.1	0.1		0.19
gamma	0.125		0.25	0.25	0.25		0.56
lpha	1		1	1	1		0.9
beta	2		2	2	2		2
delta	0		1	0.15	0.1		0.022
psi	1.5		1.5	1.5	1.5		5

The second possibility, $(A) < (B)$ and $(C) < (D)$, can be the case when leaders are far sighted. Consider when leaders are far-sighted. We find $(F) < (G)$ when δ goes to 1 and $\kappa^1 < \frac{1-\sqrt{1-(1-\gamma)\psi}}{2\psi}$ or $\kappa^1 > \frac{1+\sqrt{1-(1-\gamma)\psi}}{2\psi}$, in both cases where $X_0 = 0$. These two conditions reflect the benefit of strengthening institutions (with payoffs captured in period two) if either κ^1 is relatively small and there are few resources already under the control of politicians ($\kappa^1 Y$ is small) or κ^1 is relatively high and there is not much at stake in the difference between ethnic and public goods in period one (κ approaches $\frac{1}{\psi}$), and in both cases there is high potential to strengthen institutions for period two (γ relatively low). That is, the lower γ allows a single leader to enhance ethnic goods payoffs by more than what is lost from lower fighting levels under ethnic identity in period two. Both the high and low κ^1 scenarios allow $(F) < (G)$, for example, for low κ^1 with $X_0 = 0, \gamma = \frac{1}{2}, \psi = 1$ we find $\kappa^1 < 0.15$, which from equation (12) implies that $\gamma < \frac{2\alpha(1+\beta)}{\beta Y(0.85)} < 1$ (which implies for $\gamma = \frac{1}{2}$ that $0.425 < \hat{\kappa} < 0.85$). This is consistent with an ethnic equilibrium in period one, for example with $\kappa^1 = 0.125, \alpha = \frac{1}{2}, \beta = 1, Y = 4$, which implies $\hat{\kappa} = \frac{1}{2}$ (and therefore $\kappa^1 < \hat{\kappa}$), and $\kappa^2 = 0.56$; and it is consistent with $\bar{\bar{\gamma}} < \gamma$, ensuring that proposition one applies when $\hat{\kappa} \leq \frac{1}{2}$. For the high κ^1 range, the same parameter values for X_0, γ, and ψ require κ^1 to be above 0.85. Equation (12) then implies $\frac{1}{2} < \frac{2\alpha(1+\beta)}{\beta Y(0.15)} < 1$. This is consistent with an ethnic equilibrium in period one, for example with $\kappa^1 = 0.875, \alpha = 0.1, \beta = 1, Y = 4$, which implies $\hat{\kappa} = 0.9$ (and $\kappa^1 < \hat{\kappa}$) and $\kappa^2 = 0.94$.

Under either of these conditions, $(A) < (B)$, and $(C) < (D)$ as long as $(H) + (I)$ is positive. (H) is positive because κ^2, again defined here as $\gamma\kappa^1 + (1-\gamma)$ is greater than $\hat{\kappa}$ by assumption, and $\frac{1-\mu}{\psi} < \hat{\kappa}$ implies $\frac{1}{2\psi} < \hat{\kappa}$ since $\mu < \frac{1}{2}$. And again recalling that $\alpha \geq \beta(2f^n)$ under the period two nationalist equilibrium, we find $(I) \geq \left(1 - \frac{1}{1+\beta}\right)[**]_2$, which is positive. As a result, $(F) < (G)$ implies $(A) < (B)$ and $(C) < (D)$, making $c^1 = (1, 1)$ the dominant strategies for the reduced form options, which are the state-building conditions enabled by malleable institutions, empowering politicians and allowing them to benefit from the state they anticipate and create. That said, the range of conditions for $\hat{\kappa}$ that allow this possibility is limited and requires high δ.

Third, we can consider when $(A) > (B)$ and $(C) < (D)$, which is a coordination game. Intuitively this will be the case when national identity has high payoffs, materially and psychologically, relative to ethnic identity and leaders are far-sighted enough to value the difference in period two. Mathematically it is the case when $0 < (F) - (G) < (H) + (I)$ or $(G) < (F) < (G) + (H) + (I)$. Structuring the inequality this way and recognizing that

$(H) + (I)$ is positive, we can see that for any case where $(C) < (D)$ and therefore $(F) < (G) + (H) + (I)$ with $\delta = 1$, there is a value of $\delta < 1$ for which $(G) < (F) < (G) + (H) + (I)$. In other words, (F) can be "tuned" to increase in value relative to the other terms above (G) but below $(G) + (H) + (I)$. This can be the case, for example with the parameter values that gave dominant strategies for public goods at high and low κ^1 described above but with $\delta = \frac{1}{2}$ instead of 1. (Specifically, for $\kappa^1 = 0.125, \gamma = \frac{1}{2}, \psi = 1, X_0 = 0, Y = 4, \alpha = \frac{1}{2}, \beta = 1$ we find, $\hat{\kappa} = 0.5, \kappa^2 = 0.56$ and for $\kappa^1 = 0.875, \gamma = \frac{1}{2}, \psi = 1, X_0 = 0, Y = 4, \alpha = 0.1, \beta = 1$ we find, $\hat{\kappa} = 0.9, \kappa^2 = 0.94$ and in both cases $(G) < (F) < (G) + (H) + (I)$ and $\bar{\bar{\gamma}} < \gamma < \bar{\gamma}$ as we require in the former case). We can therefore say generally that for a given set of parameters, increasing the discount rate from $\delta = 0$ to a middle range and then to $\delta = 1$ changes the game from one where leaders both choose ethnic goods no matter what, to a coordination game, and then to one where both leaders choose public goods no matter what, highlighting the critical role of far-sightedness for breaking a conflict-trap with no intervention.

Keeping the discount rate at $\delta = 1$ can still generate a coordination game. For example, keeping the parameters the same as in the case where both leaders choose public goods no matter what, we can consider the complementary range of κ^1, specifically $0.15 < \kappa^1 < 0.85$. With adjustments to α, β, Y to ensure $\gamma < \bar{\gamma}$ the coordination game requirement of $(G) < (F) < (G) + (H) + (I)$ holds throughout this range of κ^1. Alternatively, both of the above examples where both leaders always choose public goods with $\delta = 1$ becomes a coordination game (i.e. makes "success" harder) when X_0 increases to 1, since the payoff of (F) depends on leader choices that scale with X_0 and (G) does not (it depends only on institutional malleability and contestable resources).

In words, when leaders foresee a nationalist choice by the other leader and can reach a nationalist identity future with high payoffs by also choosing public goods, they will do so. Furthermore, $(C) > (A)$ unambiguously such that when $(D) > (C)$ it implies $(D) > (A)$, meaning that the nationalist equilibrium is preferable to the ethnic one and leaders have a reason to coordinate to reach it.

And finally fourth, we can consider when $(A) < (B)$ and $(C) > (D)$, which is a game of chicken. This will be the case when $0 < (G) - (F) < -((H) + (I))$, which requires that $(H) + (I)$ is negative. However, we have already shown that $(H) + (I)$ is positive when $\kappa^2 > \hat{\kappa} > \frac{1-\mu}{\psi}$, precluding this possibility.

End proof

Proof of Proposition Two.

The conditions described in proposition two are those where one leader's investment in public goods builds enough state-capacity for self-enforcing peace, specifically, $\gamma < \bar{\bar{\gamma}}$. This implies that $\boldsymbol{I}^2 = (1, 1)$ in cases $(B), (C)$, and (D); by assumption conditions are such that $\boldsymbol{I}^1 = (0, 0)$. Leaders are strategic and thus anticipate that they will choose to invest in public goods in the second period when $\kappa^2 \geq \hat{\kappa}$ and the population identifies nationally.

Again, let $[*]_t = \frac{X_0 + \kappa^t Y}{2}$, $[**]_t = \frac{(1-\kappa^t)Y}{4}$, and $[***] = \left(1 - \frac{\beta}{1+\beta} - \frac{1}{2(1+\beta)}\right)$. The utilities for leader ℓ_A for each case are then:

$$(A) : u_a = u_a^1(\boldsymbol{c}^1 = (0, 0), \boldsymbol{I}^1 = (0, 0)) + \delta u_a^2(\boldsymbol{c}^2 = (0, 0), \boldsymbol{I}^2 = (0, 0)) \tag{24}$$

$$= [*]_1 + [**]_1 + \delta\left([*]_2 + [**]_2\right) \tag{25}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma$

$$(B) : u_a = u_a^1(\boldsymbol{c}^1 = (1, 0), \boldsymbol{I}^1 = (0, 0)) + \delta u_a^2(\boldsymbol{c}^2 = (1, 1), \boldsymbol{I}^2 = (1, 1)) \tag{26}$$

$$= \psi\kappa^1[*]_1 + [**]_1 + \delta\left(2\psi\kappa^2[*]_2 + \alpha + 2[**]_2[***]\right) \tag{27}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + \frac{1-\gamma}{2}$

$$(C) : u_a = u_a^1(\boldsymbol{c}^1 = (0, 1), \boldsymbol{I}^1 = (0, 0)) + \delta u_a^2(\boldsymbol{c}^2 = (1, 1), \boldsymbol{I}^2 = (1, 1)) \tag{28}$$

$$= (\psi\kappa^1 + 1)[*]_1 + [**]_1 + \delta\left(2\psi\kappa^2[*]_2 + \alpha + 2[**]_2[***]\right) \tag{29}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + \frac{1-\gamma}{2}$

$$(D) : u_a = u_a^1(\boldsymbol{c}^1 = (1,1), \boldsymbol{I}^1 = (0,0)) + \delta u_a^2(\boldsymbol{c}^2 = (1,1), \boldsymbol{I}^2 = (1,1)) \tag{30}$$

$$= 2\psi\kappa^1[*]_1 + [**]_1 + \delta\left(2\psi\kappa^2[*]_2 + \alpha + 2[**]_2[***]\right) \tag{31}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + 1 - \gamma$.

The difference from proposition one is mainly that leader ℓ_A's choice determines the social identity equilibrium when leader ℓ_B's choice is $c_B^1 = 0$, whereas in proposition one, it is when leader ℓ_B's choice is $c_B^1 = 1$.

As a result, we have $(A) > (B)$ when

$$(1 - \psi\kappa^1)[*]_1 > \delta\left((2\psi\kappa^2 - 1)[*]_2 + \alpha + (2[***] - 1)[**]_2 + \frac{(1-\gamma)Y}{8}\right) \tag{32}$$

where $\kappa^2 = \kappa^1\gamma + \frac{(1-\gamma)}{2}$, including where it appears in $[*]_2$ and $[**]_2$. (Note this is almost the same as $(C) > (D)$ in proposition one except κ^2 is smaller by a term of $\frac{1-\gamma}{2}$ since the national identity switch is achieved with just one leader's boost to institutional strength). And then we have $(C) > (D)$ when

$$(1 - \psi\kappa^1)[*]_1 > \delta\left(\psi\,(1-\gamma)\left([*]_2 + \frac{\gamma\kappa^1 Y}{2} + \frac{(1-\gamma)Y}{4}\right) - 2[***]\frac{(1-\gamma)Y}{8}\right) \tag{33}$$

where $\kappa^2 = \kappa^1\gamma + 1 - \gamma$, including where it appears in $[*]_2$.

To systematically consider the conditions under which these inequalities hold it is useful to define the quantities for $(F), (G), (H), (I)$ in the same way as in the proof for proposition one, but where for purposes of definition in these cases $\kappa^2 = \gamma\kappa^1 + \frac{(1-\gamma)}{2}$ where it appears in (H) and (I). For the cases where leaders are far-sighted, the comparison of (C) vs. (D) is now between two nationalist outcomes in period two, so new terms arise and we define $(J) \equiv \delta\left(\psi\left(1-\gamma\right)\left([*]_2 + \frac{\gamma\kappa^1 Y}{2} + \frac{(1-\gamma)Y}{4}\right)\right)$ and $(K) \equiv \delta 2[***]\frac{(1-\gamma)Y}{8}$, where $\kappa^2 = \kappa^1\gamma + 1 - \gamma$, including where it appears in $[*]_2$.

We again consider four possibilities based on the possible combinations of leader choices reflected in Table 1. First, when leaders are short-sighted (i.e. $\delta = 0$), both inequalities $(A) > (B)$ and $(C) > (D)$ again reduce to $(F) > 0$ or $\kappa^1 < \frac{1}{\psi}$, which is the case, making $\boldsymbol{c}^1 = (0,0), \boldsymbol{c}^2 = (0,0)$ a pair of dominant strategies among the reduced form options.

Second, far-sighted leaders will instead choose $\boldsymbol{c}^1 = (1, c_{-j})$ when $(A) < (B)$ and $(C) < (D)$, which is when $(F) < (G) + (H) + (I)$ and $(F) < (J) - (K)$, respectively. If δ is high enough, the quadratic nature of equation (32) again allows for both high and low values of κ^1 for which $(F) < (G) + (H) + (I)$, similar to the proof of proposition one. Indeed at the limit where δ approaches 1, most values of the parameters exclude $(F) > (G) + (H) + (I)$ and it is only with low enough α, high β, high γ, and low ψ within their allowed values (including $\gamma < \bar{\bar{\gamma}}$ and $(H) > 0$) and a high X_0 that it is possible. For example, with $\delta = 1, \kappa^1 = 0.1, \gamma = \frac{1}{4}, \psi = 1.5, Y = 4, \alpha = 1, \beta = 2$ we find $(F) > (G) + (H) + (I)$ only when X_0 reaches 3. When $X_0 = 0$ we recover $(F) > (G) + (H) + (I)$ only when δ drops below 0.15 and $(A) < (B)$ otherwise. The conditions satisfying $(C) < (D)$ (i.e. $(F) < (J) - (K)$) are even less constrained. For example under the same parameter values with $X_0 = 0$ we find $(C) > (D)$ only when δ drops below 0.07. So with these parameter values, both $(A) < (B)$ and $(C) < (D)$ are satisfied with $\delta > 0.15$. This value increases as γ increases (which requires κ^1 to increase to keep $\gamma < \bar{\bar{\gamma}}$), as leaders need to be more far-sighted and value payoffs more in period two when their absolute level is lower because institutional strength does not increase by as much from period one to two. Solutions of this type are also bounded by $\kappa^1 < \hat{\kappa}$ as our scope conditions no longer apply if κ^1 is above $\hat{\kappa}$, but for the range of κ^1 where this is not the case, $\gamma < \bar{\bar{\gamma}}$, and δ is high enough, solutions exist as the above example proves. Such a case means that one far-sighted leader sees a strong incentive to invest and as a result both do by symmetry (resulting in $\kappa^2 = 0.775$ and $\hat{\kappa} = 0.25$ in the example).

Third, a coordination game where $(A) > (B)$ and $(C) < (D)$ will be the case when $(F) > (G) + (H) + (I)$ and $(F) < (J) - (K)$. This will be the case when one leader can shift the equilibrium alone, but they won't do it unilaterally. Any situation where $0 < (G) + (H) + (I) < (J) - (K)$ can yield this case because δ can be "tuned" to fit (F) between the other two quantities so that $0 < (G) + (H) + (I) < (F) < (J) - (K)$. In other words, leaders will care about the second period payoffs enough to value outcomes with the institutional boost from both leaders (more than first period ethnic payoffs for ethnic choices) but not enough to value the outcome of a single leader institutional boost, even though it creates nationalism in the second period. For example, using the parameter values in the case above where leaders choose $c^1 = (1, 1)$, we already showed that $0.07 < \delta < 0.15$ satisfies the condition. This window again increases with γ and κ^1 since (F) increases with κ^1 at this low level of κ^1 (with (F) peaking as a quadratic function of κ^1 at $\kappa^1 = 0.33$ with these parameter values and then decreasing to zero when $\kappa^1 = \frac{1}{\psi}$; only the lower κ^1 values are relevant since $\hat{\kappa} = 0.25$ at these parameter values).

Fourth, a game of chicken where $(A) < (B)$ and $(C) > (D)$ will be the case when $(F) < (G) + (H) + (I)$ and $(F) > (J) - (K)$. Intuitively, the game of chicken would arise here because inducing the other leader to choose nationalism allows a leader to reap ethnic rewards from providing ethnic goods under ethnic conditions in period 1 and still get nationalist rewards under nationalist conditions in period 2; in proposition 1, where both leaders need to create institutions to get nationalism in period two, this isn't an option. Again solutions will exist as long as $(J) - (K) < (G) + (H) + (I)$, since δ can be adjusted so that (F) is in between. The inequality $(J) - (K) < (G) + (H) + (I)$ can be reduced to

$$\frac{X_0}{2Y}\left(1 - 2\psi\gamma\kappa^1\right) + \frac{\kappa^1\gamma}{2}\left(\frac{1}{2} + [***] - 2\psi\gamma\kappa^1\right) < \frac{\alpha}{Y} - \frac{\beta}{2(1+\beta)} + \frac{1}{4}\left(1 - \frac{1}{1+\beta}\right) - \psi\frac{(1-\gamma)^2}{2}. \tag{34}$$

As β decreases toward zero, the left-hand side increases (and therefore narrows possibilities for solutions) and reduces further to $\left(\frac{X_0}{2Y} + \frac{\kappa^1\gamma}{2}\right)(1 - 2\psi\gamma\kappa^1)$. Furthermore, the first three terms on the right-hand side are constrained by the requirement that $\frac{1}{2} < \frac{2\alpha(1+\beta)}{\beta Y} < 1$, limiting the total quantity of the right-hand side since the fourth term is also negative. Guided by these intuitions, a solution is most likely where the left-hand side is negative, requiring $\kappa^1 > 2\psi\gamma$, noting also the scope condition that $\kappa^1 < \frac{1}{\psi}$, and large in magnitude, e.g. with high X_0. Indeed, we then find a solution with $X_0 = 100, Y = 4, \kappa^1 = 0.19, \gamma = 0.56, \alpha = 0.9, \beta = 2, \psi = 5, \delta = 0.022$. Noting that this requires γ very close to $\bar{\bar{\gamma}}$ (which is 0.565) and that δ is very small and X_0 very big, this solution is unlikely, but it represents an interesting possibility under conditions where one leader can shift the social identity equilibrium but prefers that the other leader shift it.

End proof.

Proof of Proposition Three.

For the intervention case without third party state-building assistance, all of the institution-building thresholds are the same: to have self-enforcing peace in period two after the occupier has left requires $\kappa^2 > \hat{\kappa}$, which is possible when one leader invests in public goods when $\gamma < \bar{\bar{\gamma}}$ and $\hat{\kappa} < \frac{1}{2}$ and is possible when both leaders invest in public goods and $\bar{\bar{\gamma}} < \gamma < \bar{\gamma}$. The latter reflects the conditions of proposition three.

The main difference from the non-intervention case is that violence levels are reduced and support a national equilibrium for social identities in period one, such that $\boldsymbol{I}^1 = (1, 1)$. With this adjustment, we follow the same systematic consideration of leader ℓ_A's choices, which are the same as those of ℓ_B by symmetry.

Specifically, we assume that the intervention force chooses $f_c = \hat{f}_c$ as determined by equations (6)-(8), which means that both groups reduce fighting levels to $\frac{\alpha}{2\beta}$ in a stable nationalist equilibrium, as long as $\alpha > 0$. At this level of intervention, the psychological cost of fighting under national identities is exactly zero, simplifying the expressions in the utility functions as follows.

Again, let $[*]_t = \frac{X_0+\kappa^t Y}{2}$, $[**]_t = \frac{(1-\kappa^t)Y}{4}$, and $[***] = \left(1 - \frac{\beta}{1+\beta} - \frac{1}{2(1+\beta)}\right)$. In addition, let $[**']_t = \left[\frac{\alpha(1-\kappa^t)Y}{2(\alpha+\beta f_c)} - \frac{\alpha}{2\beta}\right]$.

$$(A) : u_a = u_a^1(\boldsymbol{c}^1 = (0,0), \boldsymbol{I}^1 = (1,1)) + \delta u_a^2(\boldsymbol{c}^2 = (0,0), \boldsymbol{I}^2 = (0,0)) \tag{35}$$

$$= [*]_1 + [**']_1 + \delta\left([*]_2 + [**]_2\right) \tag{36}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma$;

$$(B) : u_a = u_a^1(\boldsymbol{c}^1 = (1,0), \boldsymbol{I}^1 = (1,1)) + \delta u_a^2(\boldsymbol{c}^2 = (0,0), \boldsymbol{I}^2 = (0,0)) \tag{37}$$

$$= (\psi\kappa^1 + \mu)[*]_1 + [**']_1 + \delta\left([*]_2 + [**]_2\right) \tag{38}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + \frac{1-\gamma}{2}$;

$$(C) : u_a = u_a^1(\boldsymbol{c}^1 = (0,1), \boldsymbol{I}^1 = (1,1)) + \delta u_a^2(\boldsymbol{c}^2 = (0,0), \boldsymbol{I}^2 = (0,0)) \tag{39}$$

$$= (\psi\kappa^1 + (1-\mu))[*]_1 + [**']_1 + \delta\left([*]_2 + [**]_2\right) \tag{40}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + \frac{1-\gamma}{2}$;

$$(D) : u_a = u_a^1(\boldsymbol{c}^1 = (1,1), \boldsymbol{I}^1 = (1,1)) + \delta u_a^2(\boldsymbol{c}^2 = (1,1), \boldsymbol{I}^2 = (1,1)) \tag{41}$$

$$= 2\psi\kappa^1[*]_1 + [**']_1 + \delta\left(2\psi\kappa^2[*]_2 + \alpha + 2[**]_2[***]\right) \tag{42}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + (1-\gamma)$.

It is worth noting that if intervention "overshoots" and $f_c > \hat{f}_c$ then f_a decreases (as discussed above) ensuring that a nationalist identity remains stable but none of the below results change qualitatively because $[**']_1$ enters in the same way, even though the number changes. Specifically, it would include all of the terms from the group payoff not otherwise captured, i.e. $[**']_1 = \frac{(1-\kappa^1)Y}{2+\frac{f_c}{f_a}} - f_a + \alpha - \beta(2f_a)$.

The important question that proposition three answers is how the above results compare to the prospects for success under proposition one. Consider that the period two payoffs in both the non-intervention and intervention scenarios are the same (i.e. if we compare $(A), (B), (C), (D)$ without intervention in the proof of proposition one to $(A), (B), (C), (D)$ with intervention above, etc.), since there is no occupation force in period two in either case and we have not introduced any third party impact on state-building effectiveness (so κ^2 is the same in both cases). This means that any differences in leader choices will come from consideration of the period one payoffs. For both $(A) > (B)$ (comparing the left-hand side of equation (22) in the proof of proposition one to the difference in the first terms of equations (36) and (38)) and $(C) > (D)$ (comparing the left-hand side of equation (23) to the difference in the first terms of equations (40) and (42)) those period one payoff differences are $\mu(\frac{X_0+\kappa^1 Y}{2})$. That is, in the intervention case for a short-sighted leader we have $c_A^1 = 1$ when $\frac{1-\mu}{\psi} < \kappa^1$ for both $c_B^1 = 0$ and $c_B^1 = 1$, which is the case and for non-intervention (proposition one), we have $c_A^1 = 0$ when $\kappa^1 < \frac{1}{\psi}$ for both $c_B^1 = 0$ and $c_B^1 = 1$, which is the case. In other words, for short-sighted leaders, the intervention flips leader choices from delivering ethnic goods to public goods. More generally, since period two payoffs are the same under propositions one and three, intervention will always add $\mu(\frac{X_0+\kappa^1 Y}{2})$ to the payoff for (B) compared to (A) and (D) compared to (C), widening the space for leaders to choose public goods. This space scales with all of the factors in $\mu(\frac{X_0+\kappa^1 Y}{2})$, μ doesn't appear anywhere else in $(A) > (B)$ or $(C) > (D)$, meaning that such interventions are more likely to be successful, the larger is μ.

End proof.

Proof of Proposition Four.

To have self-enforcing peace in period two after the occupier has left under the conditions of proposition four requires $\kappa^2 > \hat{\kappa}$, which is possible when one leader invests in public goods, i.e. when $\gamma < \bar{\bar{\gamma}}$ and $\hat{\kappa} < \frac{1}{2}$.

The main difference from the case of proposition three is that for cases (B) and (C), $\kappa^2 \geq \hat{\kappa}$, resulting in $c^2 = (1,1), I^2 = (1,1)$.

Again, let $[*]_t = \frac{X_0+\kappa^t Y}{2}$, $[**]_t = \frac{(1-\kappa^t)Y}{4}$, $[***] = \left(1 - \frac{\beta}{1+\beta} - \frac{1}{2(1+\beta)}\right)$, and $[**']_t = \left[\frac{\alpha(1-\kappa^t)Y}{2(\alpha+\beta f_c)} - \frac{\alpha}{2\beta}\right]$. Then,

$$(A) : u_a = u_a^1(\boldsymbol{c}^1 = (0,0), \boldsymbol{I}^1 = (1,1)) + \delta u_a^2(\boldsymbol{c}^2 = (0,0), \boldsymbol{I}^2 = (0,0)) \tag{43}$$

$$= [*]_1 + [**']_1 + \delta\left([*]_2 + [**]_2\right) \tag{44}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma$;

$$(B) : u_a = u_a^1(\boldsymbol{c}^1 = (1,0), \boldsymbol{I}^1 = (1,1)) + \delta u_a^2(\boldsymbol{c}^2 = (1,1), \boldsymbol{I}^2 = (1,1)) \tag{45}$$

$$= (\psi\kappa^1 + \mu)[*]_1 + [**']_1 + \delta\left(2\psi\kappa^2[*]_2 + \alpha + 2[**]_2[***]\right) \tag{46}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + \frac{1-\gamma}{2}$;

$$(C) : u_a = u_a^1(\boldsymbol{c}^1 = (0,1), \boldsymbol{I}^1 = (1,1)) + \delta u_a^2(\boldsymbol{c}^2 = (1,1), \boldsymbol{I}^2 = (1,1)) \tag{47}$$

$$= (\psi\kappa^1 + (1-\mu))[*]_1 + [**']_1 + \delta\left(2\psi\kappa^2[*]_2 + \alpha + 2[**]_2[***]\right) \tag{48}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + \frac{1-\gamma}{2}$;

$$(D) : u_a = u_a^1(\boldsymbol{c}^1 = (1,1), \boldsymbol{I}^1 = (1,1)) + \delta u_a^2(\boldsymbol{c}^2 = (1,1), \boldsymbol{I}^2 = (1,1)) \tag{49}$$

$$= 2\psi\kappa^1[*]_1 + [**']_1 + \delta\left(2\psi\kappa^2[*]_2 + \alpha + 2[**]_2[***]\right) \tag{50}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + 1 - \gamma$.

Similar to proposition three, the important question that proposition four answers is how the above results compare to the prospects for success under proposition two. Again, since there is no occupation force in period two and no third party state-building, κ^2 is the same in both propositions across $(A), (B), (C), (D)$ as are the payoffs; differences will be from the period one payoffs. The difference from proposition two in the comparison of both $(A) > (B)$ (the left-hand side of equation (32) compared to the difference in first terms of equations (44) and (46)) and $(C) > (D)$ (the left-hand side of equation (33) compared to the difference in first terms of equations (48) and (50)) again, like proposition three, adds a term of $\mu(\frac{X_0+\kappa^1 Y}{2})$ to the right-hand side. Again this widens the space for leaders to choose public goods in period one, and for the short-sighted leader, flips the choice from one of $c^1 = 0$ (because $\kappa^1 < \frac{1}{\psi}$) to $c^1 = 1$ (because $\kappa^1 > \frac{1-\mu}{\psi}$).

End proof.

Proof of Proposition Five.

Under conditions where $\gamma > \bar{\gamma}$ and where $f_c = \hat{f}_c$ then we need to evaluate u_a with $\boldsymbol{I}^1 = (1,1)$ and $\boldsymbol{I}^2 = (0,0)$ for all cases, $(A), (B), (C), (D)$. This gives the same outcomes for $(A), (B)$, and (C) as in the proof for proposition three. The only difference is that we find for (D):

$$(D) : u_a = u_a^1(\boldsymbol{c}^1 = (1,1), \boldsymbol{I}^1 = (1,1)) + \delta u_a^2(\boldsymbol{c}^2 = (0,0), \boldsymbol{I}^2 = (0,0)) \tag{51}$$

$$= 2\psi\kappa^1[*]_1 + [**'] + \delta\left([*]_2 + [**]_2\right) \tag{52}$$

where in $[*]_2$ and $[**]_2$, $\kappa^2 = \kappa^1\gamma + 1 - \gamma$.

As a result, $(D) > (C)$ when $(\psi\kappa^1 - (1-\mu))\,[*]_1 > -\delta\left(\frac{(1-\gamma)Y}{8}\right)$, which is the case since the left hand side is positive and the right hand side is negative. Since we also know from the proof of proposition three that there are conditions where $(B) > (A)$ (for example, short-sighted leaders), we find that $\boldsymbol{c}^1 = (1,1)$ is a dominant strategy under those conditions even though it leads to $\boldsymbol{c}^2 = (0,0)$ since $\gamma > \bar{\gamma}$ by assumption.

End proof

Proof of Proposition Six.

Institutional development is given by equation (8) of the main text as:

$$\kappa^{t+1} = \gamma\kappa^t + (1-\gamma)\frac{c_A + c_B + c_C(\chi) - \omega(\chi)}{2}. \tag{53}$$

This has a maximum where

$$\frac{\partial\kappa^{t+1}}{\partial\chi} = \frac{\partial c_C(\chi)}{\partial\chi} - \frac{\partial\omega(\chi)}{\partial\chi} = 0. \tag{54}$$

The solution at $c_C'(\chi) = \omega'(\chi)$ we define as χ^*. For state-building to be possible requires that $c_C'(0) > \omega'(0)$. There is a global maximum at χ^* as long as

$$\frac{\partial^2\kappa^{t+1}}{\partial\chi^2} = \frac{\partial c_C^2(\chi)}{\partial\chi^2} - \frac{\partial^2\omega(\chi)}{\partial\chi^2} < 0, \tag{55}$$

which is the case as long as $c_C(\chi)$ has linear or diminishing returns to scale and $\omega(\chi)$ has increasing returns to scale (as we specified for the institutional dilemma since the underlying factors of leader experience and ability of the public to see who is steering resources become even more severe as the proportion of resources under the leader's control becomes small and, at large enough χ, negligible). Under these conditions, where a third party provides χ^* resources and $\chi^* > 0$, for $\kappa^{t=2}$ to reach the same level as that required for successful intervention as defined by proposition three implies

$$\kappa^2 = \hat{\kappa} = \bar{\gamma}\kappa^1 + (1 - \bar{\gamma}) = \bar{\gamma}'\kappa^1 + (1 - \bar{\gamma}')\left(1 + \frac{R}{2}\right), \tag{56}$$

where $R = c_C(\bar{\chi}) - \omega(\bar{\chi})$ and $\bar{\gamma}'$ is the new threshold for defining solutions in proposition three. This produces a linear relationship between the old and new thresholds:

$$\bar{\gamma}' = \bar{\gamma}\frac{1 - \kappa^1}{1 - \kappa^1 + \frac{R}{2}} + \frac{\frac{R}{2}}{1 - \kappa^1 + \frac{R}{2}}. \tag{57}$$

This implies that at $\bar{\gamma} = 1$, $\bar{\gamma} = \bar{\gamma}'$, and that for $0 \leq \bar{\gamma} < 1$, $\bar{\gamma}' > \bar{\gamma}$ and that the impact of third party assistance in terms of expanding the chances for success for a given institutional development difficulty, γ, will be higher the less severe is the institutional dilemma (higher R), the higher is κ^1 and the lower is $\bar{\gamma}$ itself.

End proof