A Supplement

In this supplement, I provide a more detailed development of the model and comparative statics discussed in the paper. I begin with an overview of the model of civil war used in the article, then develop the three-player game sketched in the article and provide additional detail on the useful comparative statics.

A.1 Model of Civil War

In the development of the article, I make use of a variation of a model of civil war which is drawn from the rent seeking literature.[1] Since this model of conflict is used extensively in the literature, many scholars provide proofs of existence and uniqueness of equilibria and axiomatization of criteria for the models. I note the relevant work for proofs and extensions.[2]

In the model of civil war, there are two warring parties. Each party has an endowment of resources, E_i to allocate between investments in fighting, G_i, and investments in production, X_i. The parties simultaneously choose investments. They fight and the winner takes all the spoils, that is, the resources that were devoted to production.

I consider two warring parties that have different conflict technology. To incorporate this asymmetry, I use a weighted lottery over the contest. The probability of winning the war, p_i, is a function of the investment in fighting, G_i, and the conflict technology, α_i. Thus, the probability that a party wins the war is:

$$p_i = \frac{\alpha_i G_i}{\alpha_i G_i + \alpha_{-i} G_{-i}}. \tag{1}$$

Each party optimizes the expected value of winning,

$$V_i = \frac{\alpha_i G_i}{\alpha_i G_i + \alpha_{-i} G_{-i}} \left[E_i - G_i + E_{-i} - G_{-i}\right], \tag{2}$$

and solves the first order condition,

$$\frac{\alpha_{-i} G_{-i}}{[(\alpha_i G_i + \alpha_{-i} G_{-i}]^2} \left[E_i - G_i + E_{-i} - G_{-i}\right] - \frac{\alpha_i G_i}{\alpha_i G_i + \alpha_{-i} G_{-i}} = 0; \tag{3}$$

using $i = O, R$ and substituting yields,

$$\frac{G_O}{\alpha_R G_R} = \frac{G_R}{\alpha_O G_O}, \tag{4}$$

1. I selected this model for a substantive reason—being able to incorporate a refugee border camp as technology—and a technical reason of the model itself. The model is relatively simple. Unlike bargaining models of war, there is complete information, and there are no commitment problems. This makes the three-player game more tractable. This model also precludes the possibility of no war. This is a problem to the extent that we might believe that anticipation of refugee-related intervention in a civil war could prevent the civil war to begin with. On the other hand, if a rebel group—even strategically anticipating losing the war—chooses not to engage in violence or investment in war, they would not be considered a rebel group at all, but political opposition. For this reason, the assumption that there has to be some violence for the situation to qualify as a civil war seems sufficiently reasonable.

2. Useful summaries of this class of models can be found in Garfinkel and Skaperdas (2007) and Chowdhury and Sheremeta (2011).

which simplifies:

$$G_O^{**} = G_R^{**}\sqrt{\frac{\alpha_R}{\alpha_O}}. \tag{5}$$

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The condition in Equation 5 can be written in terms of resources and scaled by the weighted lottery.

For the government,

$$G_O^{**} = \frac{E_O + E_R}{2\left(1+\sqrt{\frac{\alpha_O}{\alpha_R}}\right)}, \tag{6}$$

and for the rebels,

$$G_R^{**} = \frac{E_R + E_O}{2\left(1+\sqrt{\frac{\alpha_R}{\alpha_O}}\right)}. \tag{7}$$

The existence and uniqueness of the equilibria follow directly from the proofs in Skaperdas and Syropoulos (1997) and the axiomatization of the contest success function in Skaperdas (1996) and Clark and Riis (1998).

A.2 Outline of Three-Player Game

A.2.1 Definition of the Game

I define the game in terms of the players, sequence of play, and strategies with their associated utility functions. Figure 1 summarizes the game.

1. Players: There are three players in this model, the refugee receiving country (A), the rebel group in the country of origin (R), and the government of the country of origin, (O).

2. Sequence of Play: First, Players O and R select their investment, G_i, simultaneously. Second, Player A selects its policy (**D** or **B**).

3. Players O and R in the first stage play an economic civil war game by choosing their investment in fighting, G_i. They optimize the expected value of the war subject to their resource constraint, where the conflict technology of Player R differs according to whether there is a border refugee camp or not (i.e., whether they are at node **B** or **D**). In particular their objective is:

$$V_i = p_{i,x}(G_i, G_{-i})\left[(R_i - G_i) + (R_{-i} - G_{-i})\right] \text{ where } i = O, R \text{ and } x = B, D \tag{8}$$

where $p_{i,x}(G_i, G_{-i})$ is a weighted lottery as follows:

$$p_{i,x} = \frac{\alpha_i G_i}{\alpha_i G_i + \alpha_{-i} G_{-i}} \tag{9}$$

and $\alpha_R(x)$ is a discrete mapping from $\{D, B\} \to \{\hat{\alpha}_R, \tau\hat{\alpha}_R\}$, with $\tau > 1$.

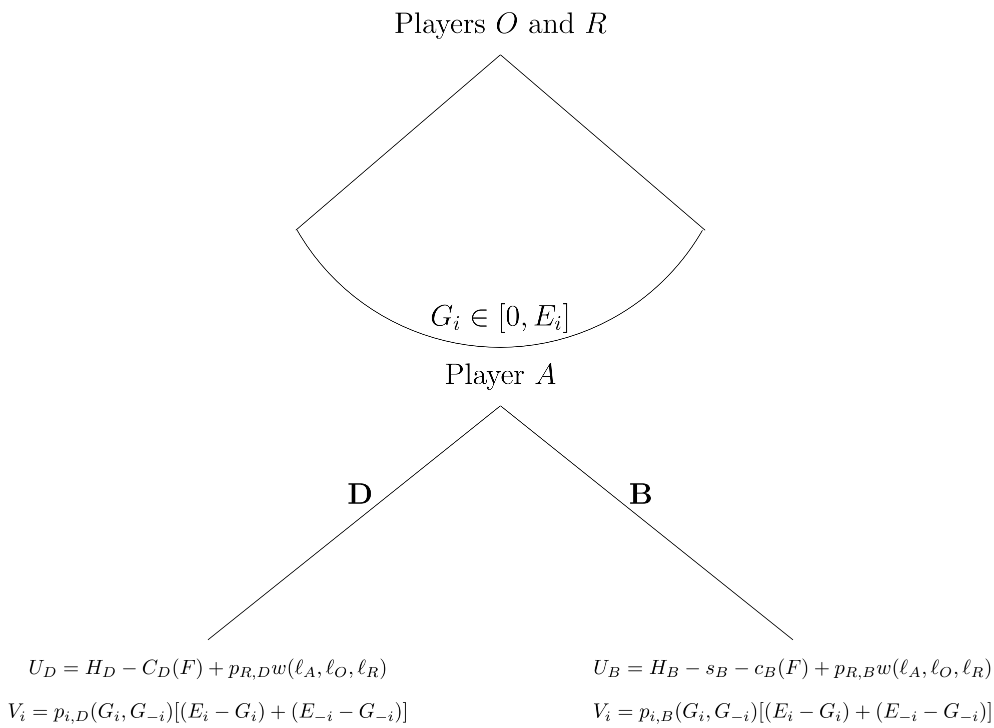

Figure 1: Extensive Form Game Tree for Refugee Policy as Foreign Policy

Specifically,

$$\alpha_R(x) = \begin{cases} \hat{\alpha}_R & \text{if } \mathbf{D} \\ \tau\hat{\alpha}_R & \text{if } \mathbf{B} \end{cases} \tag{10}$$

Note that $\alpha_R(D) = \hat{\alpha}_R$ is like the case in which $\tau = 1$.

Therefore, each party $i = O, R$ has a strategy pair $(G_{i,D}, G_{i,B})$ which is conditional on the policy selection of the Player A.

4. Player A, the asylum country, chooses between two discrete policy choices, Dispersal, **D**, or Border Camps, **B**. Where they take into account international reputation and aid, H_x, set-up cost, s_x, incremental costs of expanding (a function of population F), $c_x(F)$; the probability of a rebel win, $p_{R,x}$, in the civil war, and the value of a regime change, w, in the country of origin.

   In particular, A's utility can be characterized as:

$$U_x = H_x - s_x - c_x(F) + p_{R,x}w, \; x = D, B \tag{11}$$

   I impose the following assumptions to ensure that the domestic calculus, $H_x - s_x - c_x(F)$, is well ordered as population increases:[3]

3. These assumptions were chosen because they will establish single crossing, while being realistic in the context studied.

(a) International reputation and aid on net is greater with a border camp $H_D \leq H_C$. The set-up costs of a border camp are greater than dispersal $s_D \leq s_C$ and without loss of generality, $s_D = 0$.

(b) The incremental cost of dispersal is increasing and convex in population $c'_D(F) > 0$, $c''_D(F) > 0$.

(c) The incremental cost of border camps is increasing and concave in population $c'_B(F) > 0$, $c''_B(F) < 0$.

(d) There exists some small enough population, $\tilde{F} > 0$, such that on domestic grounds, dispersal is preferred to border camps. i.e., $H_D - c_D(\tilde{F}) > H_B - s_B - c_B(\tilde{F})$.

Finally, the value of a regime, w, developed in the main article, has the following foundations. I use a unidimensional policy space to capture preferences for regional coordination. Each player has an ideal point, ℓ. I assume quadratic loss over distance. The value of a regime change incorporates a deviation from the status quo. Thus, $w = (\ell_O - \ell_A)^2 - (\ell_R - \ell_A)^2$. Note that when the asylum country (A) has an ideal point closer to the rebel group (R), $w > 0$. When the asylum country (A) has an ideal point closer to the government of the country of origin (O), $w < 0$.

Since Player A moves second, A's strategy is a single choice **D** or **B**.

A.2.2 Equilibrium of the Game

Earlier in this supplement, I describe the equilibrium of the civil war. Equation 5 can be rewritten, substituting the function for border camp technology in Equation 10. Therefore, at each node, Player O's and R's best response is defined by $G^*_O = G^*_R \sqrt{\frac{\alpha_R(x)}{\alpha_O}}$.

Explicitly: $G^*_{O,x} = \frac{E_O + E_R}{2\left(1+\sqrt{\frac{\alpha_O}{\alpha_R(x)}}\right)}$ and $G^*_{R,x} = \frac{E_O + E_R}{2\left(1+\sqrt{\frac{\alpha_R(x)}{\alpha_O}}\right)}$.

To characterize A's best response, I define a threshold.

Definition 1. *Let* $\bar{w} = \dfrac{H_B - H_D - (s_B + c_B(F) - c_D(F))}{p^*_{R,D} - p^*_{R,B}}$.

When $w > \bar{w}$, A's best response is to choose **B**. When $w \leq \bar{w}$, A's best response is to choose **D**. I note two preliminaries:

Lemma 1. *In the civil war subgame in equilibrium, the probability of a rebel win is increasing in* τ.

Proof. From substitution, $p_R = \frac{\sqrt{\tau\hat{\alpha}_R}}{\sqrt{\tau\hat{\alpha}_R} + \sqrt{\alpha_O}}$. Further, $\frac{\partial p_R}{\partial \tau} = \frac{\hat{\alpha}_R\sqrt{\alpha_O}}{2\sqrt{\tau\hat{\alpha}_R}}\left(\frac{1}{\sqrt{\tau\hat{\alpha}_R}+\sqrt{\alpha_O}}\right)^2$.
Since $\alpha_O > 0$, $\hat{\alpha}_R > 0$, $\tau > 0$ by assumption $\frac{\partial p_R}{\partial \tau} > 0$ □

Lemma 2. $p^*_{R,D} - p^*_{R,B} < 0$.

Proof. Since in $p^*_{R,D}, \tau = 1$ and in $p^*_{R,B}, \tau > 1$ and $P'_R(\tau) > 0$, $p^*_{R,D} < p^*_{R,B}$. □

I now describe the Subgame Perfect Nash Equilibria (SPNE) of the model.

Proposition 1. *If $w > \bar{w}$ then there is a unique subgame perfect equilibrium in which O will invest $G^*_{O,D}$ if A chooses D, $G^{**}_{O,B}$ if A chooses B, and R will invest $G^*_{R,D}$ if A chooses D, and $G^*_{R,B}$ if A chooses B. A will choose B.*

Proof. For Player A since $w > \bar{w}$, $\frac{H_B - H_D - (s_B + c_B(F) - c_D(F))}{p^*_{R,D} - p^*_{R,B}}$. Because of Lemma 2, $H_B - (s_B - c_B(F)) + p^*_{R,B} w > H_D - c_D(F)) + p^*_{R,D}$ and $U_B > U_D$. If Player A were to deviate, he would be worse off. See Appendix for proof of Player R and O's best response. □

Proposition 2. *If $w < \bar{w}$, then there is a unique subgame perfect equilibrium in which O will invest $G^*_{O,D}$ if A chooses D, $G^{**}_{O,B}$ if A chooses B, and R will invest $G^*_{R,D}$ if A chooses D and $G^*_{R,B}$ if A chooses B. A will choose D.*

Proof. For Player A since $w < \bar{w}$, $w < \frac{H_B - H_D - (s_B + c_B(F) - c_D(F))}{p^*_{R,D} - p^*_{R,B}}$. Because of Lemma 2, $H_B - (s_B - c_B(F)) + p^*_{R,B} w < H_D - c_D(F)) + p^*_{R,D}$ and $U_B < U_D$. If Player A were to deviate, he would be worse off. See Appendix for proof of Player R and O's best response. □

A.3 Comparative Statics of Technology (τ)

Proposition 3. *If $H_B - (s_B - c_B(F)) < H_D - c_D(F))$, then $\bar{w}$ is decreasing in τ.*

Proof. $\frac{\partial \bar{w}}{\partial \tau} = (H_B - H_D - (s_B + c_B(F) - c_D(F)) \left(0 - \frac{\sqrt{\alpha_O}}{2\sqrt{\tau \hat{\alpha}_R}}\right) \left(\frac{1}{\frac{\sqrt{\hat{\alpha}_R}}{\sqrt{\hat{\alpha}_R} + \sqrt{\alpha_O}} - \frac{\sqrt{\tau \hat{\alpha}_R}}{\sqrt{\tau \hat{\alpha}_R} + \sqrt{\alpha_O}}}\right)^2$. Since $H_B - (s_B - c_B(F)) < H_D - c_D(F))$, $\frac{\partial \bar{w}}{\partial \tau} < 0$ □

When $H_B - (s_B - c_B(F)) < H_D - c_D(F))$, on domestic grounds alone, the asylum country should choose dispersal. If border camps are nevertheless chosen, it must be because of the foreign policy interest. The smaller the threshold $\bar{w}$, the more likely border camps will be chosen. Since the threshold, $\bar{w}$, is decreasing in τ, alternatives that make τ larger make $\bar{w}$ smaller.

The study posits a number of reasons that the border refugee camp may offer more efficiency to the rebel group (i.e., increase τ.) Two of these are highlighted in the cases as plausible choice variables, the distance to the border and the extent of enforcement at the camp. By decreasing the distance to the border or increasing enforcement, the asylum country increases the likelihood that their foreign policy preferences will prevail (this is the denominator of $\bar{w}$). Thus, when foreign policy interests are driving the asylum country's policy ($H_B - (s_B - c_B(F)) < H_D - c_D(F))$), the asylum country can do best by increasing τ, that is decreasing the camp's distance to the border or increasing enforcement.

Proposition 4. *If $H_B - (s_B - c_B(F)) > H_D - c_D(F))$, then $\bar{w}$ is increasing in τ.*

Proof. $\frac{\partial \bar{w}}{\partial \tau} = (H_B - H_D - (s_B + c_B(F) - c_D(F)) \left(0 - \frac{\sqrt{\alpha_O}}{2\sqrt{\tau \hat{\alpha}_R}}\right) \left(\frac{1}{\frac{\sqrt{\hat{\alpha}_R}}{\sqrt{\hat{\alpha}_R} + \sqrt{\alpha_O}} - \frac{\sqrt{\tau \hat{\alpha}_R}}{\sqrt{\tau \hat{\alpha}_R} + \sqrt{\alpha_O}}}\right)^2$. Since $H_B - (s_B - c_B(F)) > H_D - c_D(F))$, $\frac{\partial \bar{w}}{\partial \tau} > 0$ □

Through a similar logic as discussed above in Proposition 3. When $H_B - (s_B - c_B(F)) > H_D - c_D(F))$, the cost of the border camp, on domestic grounds alone, is greater than that of dispersal. This means that if border camps were chosen, it is because domestic interests were consistent with or dominated foreign policy interests. This is most likely to occur when the threshold, $\bar{w}$, is large. Since in this case, $\bar{w}$ is increasing in τ, alternatives that decrease τ make foreign policy interests less salient. Thus, when domestic policy interests are driving the asylum country's policy ($H_B - (s_B - c_B(F)) < H_D - c_D(F))$ and $w < 0$), the asylum country can do best by decreasing τ, that is, increasing the camp's distance to the border or decreasing enforcement.

A.4 Comparative Statics of Refugee Population (F)

In the final part of the article, I consider camp population density as one indicator of the efficiency given to the rebel group, τ, now a function of F. In the context of a fixed camp, as the refugee population F increases, so does the density of the camp. Thus, I assume $\tau'(F) >= 0$ and re-examine the comparative statics of $\bar{w}$, in terms of F.

I note two preliminaries. First, building on Lemma 2, as population density of the camp increases, or as population increases, the difference in probability of a rebel win given a border camp (the denominator of the threshold, $\bar{w}$) is decreasing (getting larger in magnitude, but negative).

Lemma 3. $\frac{\partial}{\partial F}\left(p^*_{R,D} - p^*_{R,B}\right) < 0$.

Proof. Since $p^*_{R,D}$ is not a function of F, $\frac{\partial}{\partial F}\left(p^*_{R,D} - p^*_{R,B}\right) = \frac{\partial}{\partial F}\left(-p^*_{R,B}\right) = -\frac{\partial}{\partial F}\left(\frac{\sqrt{\hat{\alpha}_R \tau(F)}}{\sqrt{\hat{\alpha}_R \tau(F)} + \sqrt{\alpha_O}}\right)$
$= -\frac{\hat{\alpha}_R \tau'(F)}{2\left(\sqrt{\hat{\alpha}_R \tau(F)} + \sqrt{\alpha_O}\right)}\left(\frac{1}{\sqrt{\hat{\alpha}_R \tau(F)}} - \frac{1}{\sqrt{\hat{\alpha}_R \tau(F)} + \sqrt{\alpha_O}}\right)$. Since $\tau'(F), \tau(F), \alpha_O, \hat{\alpha}_R > 0$,
$\frac{\hat{\alpha}_R \tau'(F)}{2\left(\sqrt{\hat{\alpha}_R \tau(F)} + \sqrt{\alpha_O}\right)} > 0$ and $\left(\frac{1}{\sqrt{\hat{\alpha}_R \tau(F)}} - \frac{1}{\sqrt{\hat{\alpha}_R \tau(F)} + \sqrt{\alpha_O}}\right) > 0$. Therefore, $\frac{\partial}{\partial F}\left(p^*_{R,D} - p^*_{R,B}\right) < 0$. $\square$

Second, I draw out implication from the assumptions (4b and 4c) from the development of Player A's domestic calculus. Namely since the cost of dispersal is increasing and and convex in refugee population and the cost of the border camp is increasing but concave in refugee population, for large enough F, the difference between the costs, $c'_D(F) - c'_B(F)$, will be arbitrarily large.[4]

Remark 1. *Since $c'_D(F) > 0$ and $c''_D(F) > 0$, $c'_D(F)$ is increasing in F and $\lim_{F \to \inf} c'_D(F) = \inf$. Meanwhile since $c'_B(F) > 0$ and $c''_D(F) < 0$, $c'_D(F)$ is decreasing in F and $\lim_{F \to \inf} c'_D(F) = -\inf$. Thus, for a large number, M, $\exists F$ such that $c'_D(F) - c'_B(F) > M$.*

Proposition 5. *If $H_B - (s_B - c_B(F)) < H_D - c_D(F))$, then $\bar{w}$ is decreasing in F.*

Proof. $\frac{\partial}{\partial F}\bar{w} = \frac{\partial}{\partial F}\left(\frac{(H_B - H_D) - (s_B + c_B(F) - c_D(F))}{p^*_{R,D} - p^*_{R,B}(F)}\right)$

$$= \frac{\left(p^*_{R,D} - p^*_{R,B}(F)\right)\left(c'_D(F) - c'_B(F)\right) - \left((H_B - H_D) - (s_B + c_B(F) - c_D(F))\right)\left(-\frac{\partial}{\partial F}\left(p^*_{R,B}(F)\right)\right)}{\left(p^*_{R,D} - p^*_{R,B}(F)\right)^2}$$

4. Implicitly, I argue in the main article that hundreds of thousands of refugees is sufficiently large, for the difference in marginal costs, $c'_D(F) - c'_B(F)$, to dominate.

Because of Lemma 2 and Assumptions 4b and 4c (as discussed in Remark 1), $\left(p^*_{R,D} - p^*_{R,B}(F)\right)(c'_D(F) - c'_B(F)) < 0$. Because of Lemma 3, if $H_B - (s_B - c_B(F)) < H_D - c_D(F))$, then $-((H_B - H_D) - (s_B + c_B(F) - c_D(F)))\left(-\frac{\partial}{\partial F}\left(p^*_{R,B}(F)\right)\right) < 0$. Therefore, $\frac{\partial}{\partial F}\bar{w} < 0$, and $\bar{w}$ is decreasing in F. □

The intuition of this finding is similar to that in Proposition 3. When $H_B - (s_B - c_B(F)) < H_D - c_D(F))$, on domestic grounds alone, the asylum country should choose dispersal. If border camps are nevertheless chosen, it must be because of the foreign policy interest. The smaller the threshold $\bar{w}$, the more likely border camps will be chosen. Since the threshold, $\bar{w}$, is decreasing in F, alternatives that make the population larger, or the population density of the camp higher, make $\bar{w}$ smaller, and it is easier to choose border camps.

Proposition 6. *If $H_B - (s_B - c_B(F)) > H_D - c_D(F))$, for sufficiently large F, $\bar{w}$ is decreasing in F.*

Proof. Since $\frac{\partial}{\partial F}\bar{w} = \frac{\left(p^*_{R,D} - p^*_{R,B}(F)\right)(c'_D(F) - c'_B(F)) - ((H_B - H_D) - (s_B + c_B(F) - c_D(F)))\left(-\frac{\partial}{\partial F}\left(p^*_{R,B}(F)\right)\right)}{\left(p^*_{R,D} - p^*_{R,B}(F)\right)^2}$, like in Propositions 5, because of Lemma 2 and Assumptions 4b and 4c, $\left(p^*_{R,D} - p^*_{R,B}(F)\right)(c'_D(F) - c'_B(F)) < 0$. However now, because of Lemma 3, if $H_B - (s_B - c_B(F)) < H_D - c_D(F))$, then $-((H_B - H_D) - (s_B + c_B(F) - c_D(F)))\left(-\frac{\partial}{\partial F}\left(p^*_{R,B}(F)\right)\right) > 0$. Remark 1, establishes for large enough F, $\left(p^*_{R,D} - p^*_{R,B}(F)\right)(c'_D(F) - c'_B(F))$ will dominate and $\frac{\partial}{\partial F}\bar{w} < 0$, i.e., $\bar{w}$ is decreasing in F. □

The intuition of this finding is similar to Proposition 4, but more nuanced. In this case, as population increases there are two forces. First, the cost of dispersal goes up and therefore, border camps are more attractive and the threshold becomes lower. However, to still be considering dispersal, for large enough F, it must be the case that foreign policy interests are in line with the government, and not the rebels. Therefore, as camp population density increases, so does the efficiency given to the rebel group, which is a foreign policy cost. This should make the hurdle to choose a border camp higher, however, the domestic costs of dispersal dominates for large enough F.

Nevertheless, foreign policy interests are moderating the threshold. Note that when τ is not a function of refugee population, $\frac{\partial}{\partial F}\bar{w} = \frac{\partial}{\partial F}\left(\frac{(H_B - H_D) - (s_B + c_B(F) - c_D(F))}{p^*_{R,D} - p^*_{R,B}}\right) = \frac{1}{p^*_{R,D} - p^*_{R,B}}(c'_D(F) - c'_B(F)) < 0$. Note that for a fixed F this quantity is larger in magnitude (but negative), than the partial in Proposition 6. Thus, a sharper decline.

Finally, a marginal utility analysis reinforces the intuition discussed in the main article. Under the assumption that efficiency of the border camp is increasing in population, when foreign policy matters enough and there are border camps, the marginal refugee can be a net benefit (when $w > 0$) or a net cost ($w < 0$).

Remark 2. *When border camps are chosen, the in equilibrium marginal utility of an additional refugee is* $\frac{\partial U^*_B(F)}{\partial F} = \frac{\partial}{\partial F}\left(H_B - s_B - c_B(F) + w\left(\frac{\sqrt{\hat{\alpha}_R \tau(F)}}{\sqrt{\hat{\alpha}_R \tau(F)} + \sqrt{\alpha_O}}\right)\right)$

$$= -c'_B(F) + w\frac{\hat{\alpha}_R \tau'(F)}{2\left(\sqrt{\hat{\alpha}_R \tau(F)} + \sqrt{\alpha_O}\right)}\left(\frac{1}{\sqrt{\hat{\alpha}_R \tau(F)}} - \frac{1}{\sqrt{\hat{\alpha}_R \tau(F)} + \sqrt{\alpha_O}}\right).$$

When w is large in magnitude, foreign policy interests will dominate. When w is positive, or the rebels are preferred, the marginal refugee is a benefit. When w is negative, or the government is preferred, the marginal refugee is a cost. Furthermore, when F is large, since $c''_B(F) < 0$, the country of asylum may do better by selecting a camp arrangement that incurs more domestic costs while, decreasing the efficiency provided to the rebels with each additional refugee (slope on τ).

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