Migration and the Demand for Transnational Justice

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Online Appendix: Theory

Contents

Baseline Model

Our theory is built on insights from the global games literature in economics (Carlsson and van Damme, 1993; Morris and Shin, 1998, 2003). This literature addresses equilibrium selection in games with large numbers of actors who must coordinate to achieve a common outcome. Here we focus on informally describing our assumptions, strategic behavior, and the impact of our explanatory variables on our outcome variable: whether a receiving government invokes universal jurisdiction to prosecute an alleged international crime.

Model Primitives

Our theory focuses on the behavior of two types of actors: the government of the receiving state and a group of individual migrants from a sending state. These migrants, which have mass $M > 0$, know that international crimes have previously occurred in the sending state. We let parameter $a > 0$ represent the magnitude of these atrocities. Some of these migrants may be victims, while others may be witnesses. These migrants are contemplating whether to demand that the government of the receiving state prosecute these atrocities.

We assume that the receiving state has private information about its own preferences about whether to prosecute. We refer to this private information as the government's ideology, θ. While real-world government preferences vary along many different dimensions, we use the term "ideology" to denote a government's views on human rights and internationalism. Namely, we assume that higher values of ideology indicate that the government is more willing to prosecute universal jurisdiction cases. We assume that the strategic interactions begin when Nature chooses the government's ideology, which is uniformly distributed over the unit interval; i.e. $\theta \sim U[0, 1]$. Each individual migrant then observes a private signal about the likely value of the government's ideology; $x_i \sim_{iid} U[\theta - \epsilon, \theta + \epsilon]$ for small $\epsilon > 0$. These signals are relatively accurate, meaning that migrants have relatively accurate common information about politics within the receiving state. This assumption implies that migrants can know whether the government is left-leaning or right-leaning, whether it welcomes or opposes migration, its general attitude towards criminal justice, etc.[1] However, small differences among individual migrants (which can be caused by different access to political

[1] In this model, we assume that the mass of migrants is exogenous to information about political preferences of the receiving state. We do not model the initial decision by migrants about where to go.

information, variation in education and/or language skills, etc.) create individual-level variation in their assessments of the government's willingness to prosecute.

After each individual migrant observes her private signal, she decides whether or not to demand transnational justice. These decisions are made simultaneously and can include many types of activities. For a crime victim, demanding justice can include going to the police and filing a complaint about what happened to her in the sending state. In contrast, a crime witness can provide testimony or notify the police if he/she sees the likely perpetrator of a crime in the receiving statement. All migrant can also engage in individual and group political activism, like protesting prior atrocities, supporting NGOs that provide legal assistance to migrants, or lobbying bureaucrats, judges, and politicians in the receiving state. We refer to all of the these costly actions as "demands" for transnational justice.

After migrants make their individual decisions, we assume that the receiving government observes the overall mass of migrants who demand justice, d where $0 \leq d \leq M$. The government then decides whether to prosecute an alleged crime using universal jurisdiction. Rather than considering the precise details of prosecutions, which vary dramatically across states, we use them term "prosecutions" to describe law enforcement and legal actions that are costly to the government but provide some expectation of remedial justice.

From the migrant's perspective, we assume that demands are always costly, regardless of whether the government chooses to prosecute or not. We let parameter $t > 0$ represent this demand cost. We additionally assume that a transnational prosecution generates both private and public benefits for migrants. First, we assume that a prosecution provides a private benefit $w(a, \theta) > 0$ to those who have made prior demands. This private benefit is increasing in the magnitude of atrocities in the sending state and in government ideology because we assume that prosecutions are more likely to be successful when they involve more severe atrocities in the sending state or receiving governments with higher values of ideology. Second, we assume that a prosecution provides a public benefit $v(a, \theta) > 0$ to all migrants from the sending state, regardless of whether they demanded justice. Once again, we assume that this benefit is increasing in the magnitude of atrocities and in government ideology. Finally, we normalize a migrant's payoff from not demanding and having no prosecution to be 0.

From the government's perspective, we assume that prosecution has a fixed cost, $c > 0$. Variation in this cost could represent the legal capacity of the state and/or potential political costs imposed by the sending state if a prosecution occurs. We assume that the benefit of a prosecution, $b(\theta, ard)$, varies in multiple parameters. We assume that the benefit of prosecution is increasing in the government's private ideology (θ), the magnitude of atrocities (a), and the overall mass of migrants who mobilize to demand justice (d).[2] We additionally assume that a government's responsiveness to public pressure, which is represented by parameter $r > 0$, amplifies the impact of this migrant demand.[3] We conceive of responsiveness as state-level attributes that affect the ability of individuals to shape government policy, such as the receiving state's regime-type. The overall expected payoff to the government from a prosecution is therefore $b(\theta, ard) - c$. We normalize the government's payoff from not prosecuting to be 0.[4]

Equilbrium Behavior

We solve this game to find a weak perfect Bayesian equilibrium. This solution concept requires that player's beliefs are sequentially rational given their beliefs, and that players use Bayesian updating when possible.[5]

Proposition 1: There exists an equilibrium that is characterized by θ^*, the equilibrium type of government that is indifferent between prosecuting and not prosecuting, and X^*, the equilibrium mass of migrants who must complain for a prosecution to occur.

Proof of Proposition 1:

Properties of Government Strategy

Assume that $b(0, raM) < c < b(1, 0)$ and $b_1 > 0$ and $b_2 > 0$.

- Then there exists a value $\theta_L \in (0, 1)$ that solves $b(\theta_L, raM) = c$. For all lower values,

[2]The benefit function is therefore increasing in both of its arguments, $b_1 > 0$ and $b_2 > 0$. The assumption that government utility is increasing in atrocities is not necessary for our formal results to hold. This component was included in response to reader feedback.

[3]Many thanks to Terry Chapman for suggesting this operationalization of responsiveness.

[4]As detailed in the Online Appendix, we additionally assume that $b(0, raM) < c < b(1, 0)$ to ensure existence of our equilibrium.

[5]We do not need to make assumptions about off-the-equilibrium-path beliefs in our game.

$\theta \in [0, \theta_L)$, the government will not prosecute, even if all migrants mobilize.

- There also exists a value $\theta_H \in (0,1)$ that solves $b(\theta_H, 0) = c$. For all higher values, $\theta \in (\theta_H, 1]$, the government will always prosecute, regardless of how many migrants mobilize.
- Finally, $0 < \theta_L < \theta_H < 1$.

For all intermediate values, $\theta \in [\theta_L, \theta_H]$, we can calculate the critical value of migrants who must complain for the host state to prosecute. Namely, the critical value, X, solves:

$$\Gamma \equiv b(\theta, raX) - c = 0$$

Note that this critical value X is a function of θ, and is strictly decreasing from M to 0 over the interval $[\theta_L, \theta_H]$:

$$\frac{\partial X(\theta)}{\partial \theta} = \frac{-\Gamma_\theta}{\Gamma_X} = \frac{-b_1}{rab_2} < 0$$

Monotonicity of Migrant Strategy

Choose an arbitrary player i. Assume that all players $j \neq i$ adopt a cutpoint strategy:

$$I_k = \begin{cases} \text{complain} & \text{if } k \leq x_j \\ \text{don't complain} & \text{if } x_j < k \end{cases}$$

Because there is a continuum of players, we can calculate the aggregate proportion and mass of complaints without worrying about the behavior of player i. Recall that if the true state is θ, then signals are distributed uniformly over $[\theta - \epsilon, \theta + \epsilon]$. So we can calculate the proportion of attackers for state θ and strategy I_k:

$$\mu(\theta, I_k) = \begin{cases} 0 & \text{if } \theta + \epsilon \leq k \Leftrightarrow \theta \leq k - \epsilon \\ \int_k^{\theta+\epsilon} f(x|\theta)\,dx = \frac{\theta+\epsilon-k}{2\epsilon} & \text{if } k \in (\theta - \epsilon, \theta + \epsilon) \Leftrightarrow \theta \in [k - \epsilon, k + \epsilon] \\ 1 & \text{if } k \leq \theta - \epsilon \Leftrightarrow k + \epsilon \leq \theta \end{cases}$$

This means that the total demand–the mass of complaints–is:

$$d(\theta,\, I_k) = \mu(\theta,\, I_k)\, M \;=\; \begin{cases} 0 & \text{if } \theta+\epsilon \le k \;\Leftrightarrow\; \theta \le k-\epsilon \\ \left(\frac{\theta+\epsilon-k}{2\epsilon}\right) M & \text{if } k \in (\theta-\epsilon,\, \theta+\epsilon) \;\Leftrightarrow\; \theta \in [k-\epsilon, k+\epsilon] \\ M & \text{if } k \le \theta-\epsilon \;\Leftrightarrow\; k+\epsilon \le \theta \end{cases}$$

Note that $d(\theta,\, I_k)$ is strictly increasing in θ. So there exists a unique $\widehat{\theta}_k \in [k-\epsilon,\, k+\epsilon]$ such that $d\left(\widehat{\theta}_k\right) = X\left(\widehat{\theta}_k\right)$. So player i's utility from complaining given the true state θ is:

$$u(\theta,\, I_k) \;=\; \begin{cases} -t & \text{if } \theta \le \widehat{\theta}_k \\ v(a,\theta) + w(a,\theta) - t & \text{if } \widehat{\theta}_k < \theta \end{cases}$$

Conditional on a signal x and the cutpoint strategy I_k, player i's expected utility from complaining is:

$$U_i(\text{complain}|x, I_k) \;=\; \begin{cases} -t & \text{if } x < \widehat{\theta}_k - \epsilon \\ \frac{1}{2\epsilon}\int_{\widehat{\theta}_k}^{x+\epsilon} \left[v(a,\theta) + w(a,\theta)\right] d\theta - t & \text{if } x \in \left[\widehat{\theta}_k - \epsilon,\, \widehat{\theta}_k + \epsilon\right] \\ \frac{1}{2\epsilon}\int_{x-\epsilon}^{x+\epsilon} \left[v(a,\theta) + w(a,\theta)\right] d\theta - t & \text{if } \widehat{\theta}_k + \epsilon < x \end{cases}$$

Conditional on a signal x and the cutpoint strategy I_k, player i's expected utility from not complaining is:

$$U_i(\text{don't complain}|x, I_k) \;=\; \begin{cases} 0 & \text{if } x < \widehat{\theta}_k - \epsilon \\ \frac{1}{2\epsilon}\int_{\widehat{\theta}_k}^{x+\epsilon} v(a,\theta) d\theta & \text{if } x \in \left[\widehat{\theta}_k - \epsilon,\, \widehat{\theta}_k + \epsilon\right] \\ \frac{1}{2\epsilon}\int_{x-\epsilon}^{x+\epsilon} v(a,\theta) d\theta & \text{if } \widehat{\theta}_k + \epsilon < x \end{cases}$$

Define the difference function conditional on a signal x and the cutpoint strategy I_k:

$$\begin{aligned}\Delta_i(x, I_k) &= U_i(\text{complain}|x, I_k) - U_i(\text{don't complain}|x, I_k) \\ &= = \begin{cases} -t & \text{if } x < \widehat{\theta}_k - \epsilon \\ \frac{1}{2\epsilon}\int_{\widehat{\theta}_k}^{x+\epsilon} w(a,\theta)\, d\theta - t & \text{if } x \in \left[\widehat{\theta}_k - \epsilon, \widehat{\theta}_k + \epsilon\right] \\ \frac{1}{2\epsilon}\int_{x-\epsilon}^{x+\epsilon} w(a,\theta)\, d\theta - t & \text{if } \widehat{\theta}_k + \epsilon < x \end{cases}\end{aligned}$$

Note that $\Delta_i(x, I_k)$ is increasing in x, $\Delta_i(x, I_k) < 0$ for small x, and $\Delta_i(x, I_k) > 0$ for large x. So by the intermediate value theorem, there exists a unique x such that $\Delta_i(x, I_k) = 0$. So player i wants to play a cutpoint strategy as well.

Equilibrium Existence

By Morris and Shin (1998), there exists an equilibrium in which all players in the game adopt the same cutpoint strategy, I_k.

Equilibrium Characterization

By Morris and Shin (2001), our game satisfies Laplacian equivalence. We can therefore solve for the limit of equilibrium behavior (as $\epsilon \to 0$) using the following technique.

First, define the difference function for a migrant given an expected proportion μ of migrants complain in true state θ:

$$\begin{aligned}\Delta_i(\mu, \theta) &= U_i(\text{complain}|\mu, \theta) - U_i(\text{don't complain}|\mu, \theta) \\ &= \begin{cases} w(a,\theta) - t & \text{if } X \leq d = \mu M \Leftrightarrow \frac{X}{M} \leq \mu \\ -t & \text{if } d = \mu M < X \Leftrightarrow \mu < \frac{X}{M} \end{cases}\end{aligned}$$

Second, suppose Laplacian beliefs about the true value of this proportion. That is, assume that $\mu \sim U[0,1]$.

Finally, note that:

$$
\begin{aligned}
\int_0^1 \Delta_i(\mu,\theta) f(\mu)\, d\mu &= \int_0^{\frac{X}{M}} (-t) d\mu + \int_{\frac{X}{M}}^1 [w(a,\theta) - t]\, d\mu \\
&= \left(1 - \frac{X}{M}\right) [w(a,\theta) - t] - \left(\frac{X}{M}\right) t \\
&= \left(1 - \frac{X}{M}\right) w(a,\theta) - t
\end{aligned}
$$

Morris and Shin (2001) show that as $\epsilon \to 0$, the equilibrium value of $\widehat{\theta}_k$ approaches θ^* as defined by:

$$\Upsilon \equiv \left(1 - \frac{X^*}{M}\right) w(a,\theta^*) - t = 0$$

So our equilibrium behavior is defined by two equations (Γ, Υ) and two unknowns (θ^*, X^*):

$$
\begin{aligned}
\Gamma &\equiv b(\theta^*, raX^*) - c = 0 \\
\Upsilon &\equiv \left(1 - \frac{X^*}{M}\right) w(a,\theta^*) - t = 0
\end{aligned}
$$

QED

To understand this equilibrium behavior visually, see Figure A1. The government threshold is shown by the solid line in Figure A1(a). When the government has a very low ideology (θ is small), it receives little direct benefit from prosecution. Accordingly, it will only prosecute if many migrants demand transnational justice. For extremely low ideology, the government will not prosecute even if all migrants demand justice. However, as the government's ideology increases, it receives more direct benefit from a prosecution and is therefore willing to prosecute for lower levels of migrant demand. For extremely high ideology, the government will prosecute even absent any migrant demand. This would include situations in which the government actively seeks out crimes to investigate by examining asylum requests, building partnerships with non-governmental organizations, etc., rather than being pressured to act.

[Insert Figure A1 here.]

Recall that individual migrants observe signals about the government's ideology, rather than the true value of ideology. These signals are relatively accurate, but have tiny amounts of noise (or uncertainty). We can nonetheless calculate how many migrants in aggregate will demand justice in equilibrium for each possible true value of ideology. This measure of actual migrant behavior is shown by the dashed line in Figure A1(a). When true government ideology is very low, migrants receive low signals, meaning that they believe that demands will be unsuccessful. For such low ideology values, migrants will not make demands. However, as the true government ideology increases, migrants receive higher signals, meaning that they are more likely to believe that the government wants to prosecute international crimes. These beliefs in turn make migrants more likely to demand justice to receive the expected benefit of prosecution.

Our key outcome variable is whether a prosecution occurs. This outcome happens anytime the demand for a prosecution (actual migrant behavior) exceeds the willingness of the government to supply a prosecution (the government threshold). Note that in Figure A1(a), the actual migrant behavior and government threshold lines intersect at parameter θ^*. As shown by Figure A1(b), prosecutions occur whenever ideology is larger than θ^*. This is when the mass of migrant who actually make demands exceeds the government's threshold. In contrast, the government does not prosecute if ideology is smaller than θ^*.

Comparative Statics

How do changes in our explanatory variables affect our outcome variable, whether the government prosecutes? Answering this question entails analyzing the impact of our explanatory variables on parameter θ^* in Figure A1. Each individual parameter can affect both migrant demands and government decisions about whether to supply justice.

Lemma: The determinant for the Jacobian matrix for the implicitly-defined solution is positive.

Proof of Lemma:

Suppressing the superscript, the Jacobian matrix for our implicitly-defined solution is:

$$\mathbf{J} = \begin{bmatrix} \Gamma_X & \Gamma_\theta \\ \Upsilon_X & \Upsilon_\theta \end{bmatrix} = \begin{bmatrix} rab_2 & b_1 \\ -\frac{w(a,\theta)}{M} & \left(1 - \frac{X}{M}\right) w_\theta \end{bmatrix}$$

$$\det(\mathbf{J}) = \frac{1}{M}\left[rab_2 (M - X) w_\theta + b_1 w(a,\theta)\right] > 0$$

QED

Our first explanatory variable is the mass of migrants. Recall that the mass of migrants does not directly affect the government's preferences. The government only cares about how many migrants actually mobilize. The mass of migrants therefore exerts its primary effect on actual migrant behavior (the dashed line in Figure A1). As the mass of migrants grows larger, each individual migrant will believe that more migrants are likely to demand justice. This makes the likelihood of prosecution more likely, which in turn makes each individual migrant more likely to make a demand herself, shifting parameter θ^* to the left.

Proposition 2: A larger mass of migrant from the sending to the receiving state will increase the likelihood of a prosecution. (Hypothesis 1)

Proof of Proposition 2:

$$\begin{aligned} \frac{\partial \theta^*}{\partial M} &= \frac{-\det \begin{bmatrix} \Gamma_X & \Gamma_M \\ \Upsilon_X & \Upsilon_M \end{bmatrix}}{\det(\mathbf{J})} = \frac{-\left[\Gamma_X \Upsilon_M - \Gamma_M \Upsilon_X\right]}{\det(\mathbf{J})} = \frac{-\Gamma_X \Upsilon_M}{\det(\mathbf{J})} \\ &= \frac{-rab_2 \left[\frac{Xw(a,\theta)}{M^2}\right]}{\det(\mathbf{J})} = \frac{-rab_2 X w(a,\theta)}{\det(\mathbf{J}) M^2} < 0 \end{aligned}$$

QED

Our second explanatory variable is the magnitude of atrocities in the sending state. The magnitude of atrocities affects migrant utility from prosecutions. As the sending state commits more atrocities, each individual migrant receives a higher expected utility from demanding justice. She also believes that other migrants are more likely to make demands, making her more likely to demand as well. At the same time, larger atrocities make the receiving government more likely to prosecute, independent of migrant demands. The overall effect of more atrocities is therefore to move parameter θ^* to the left.

Proposition 3: A higher amount of atrocities in the sending state will increase the likelihood of a prosecution. (Hypothesis 2)

Proof of Proposition 3:

$$\begin{aligned}
\frac{\partial \theta^*}{\partial a} &= \frac{-\det\begin{bmatrix}\Gamma_X & \Gamma_a \\ \Upsilon_X & \Upsilon_a\end{bmatrix}}{\det(\mathbf{J})} = \frac{-\left[\Gamma_X \Upsilon_a - \Gamma_a \Upsilon_X\right]}{\det(\mathbf{J})} \\
&= \frac{-\left[rab_2\left(M - X^*\right)w_1 + rXb_2 w\left(a, \theta\right)\right]}{\det(\mathbf{J})\, M} < 0
\end{aligned}$$

QED

Our third explanatory variable is the responsiveness of the government in the receiving state. Responsiveness does not directly affect individual migrant preferences. Migrants only care about whether a prosecution occurs. Government responsiveness therefore exerts its primary effect on the government threshold (the solid line in Figure A1). As government responsiveness increases, the impact of migrant demand on government utility is amplified, meaning that the government receives more benefit from a prosecution, and the government threshold decreases. This makes the likelihood of prosecution more likely, which in turn makes each individual migrant more likely to demand justice, shifting parameter θ^* to the left.

Proposition 4: A higher level of responsiveness in the receiving state will increase the likelihood of a prosecution. (Hypothesis 3)

Proof of Proposition 4:

$$\begin{aligned}
\frac{\partial \theta^*}{\partial r} &= \frac{-\det\begin{bmatrix}\Gamma_X & \Gamma_r \\ \Upsilon_X & \Upsilon_r\end{bmatrix}}{\det(\mathbf{J})} = \frac{-\left[\Gamma_X \Upsilon_r - \Gamma_r \Upsilon_X\right]}{\det(\mathbf{J})} = \frac{\Gamma_r \Upsilon_X}{\det(\mathbf{J})} \\
&= \frac{aXb_2\left(\frac{-w(a,\theta)}{M}\right)}{\det(\mathbf{J})} = \frac{-aXb_2 w\left(a, \theta\right)}{\det(\mathbf{J})\, M} < 0
\end{aligned}$$

QED

Our final explanatory variable is the cost of prosecution to the government in the receiving state. Because this cost only directly affects the government's utility function, the prosecution cost exerts its primary effect on the government threshold (the solid line in Figure A1). As the prosecution cost increases, the government receives less benefit from a prosecution, meaning that the government threshold increases. This makes the likelihood of prosecution less likely, which in turn makes each individual migrant less likely to demand justice, shifting parameter θ^* to the right.

Proposition 5: A higher prosecution cost in the receiving state will reduce the likelihood of a prosecution. (Hypothesis 4)

Proof of Proposition 5:

$$\begin{aligned}
\frac{\partial \theta^*}{\partial c} &= \frac{-\det\begin{bmatrix} \Gamma_X & \Gamma_c \\ \Upsilon_X & \Upsilon_c \end{bmatrix}}{\det(\mathbf{J})} = \frac{-\left[\Gamma_X \Upsilon_c - \Gamma_c \Upsilon_X\right]}{\det(\mathbf{J})} = \frac{\Gamma_c \Upsilon_X}{\det(\mathbf{J})} = \frac{(-1)\left(\frac{-w(a,\theta)}{M}\right)}{\det(\mathbf{J})} \\
&= \frac{w(a,\theta)}{\det(\mathbf{J})\, M} > 0
\end{aligned}$$

QED

Model Extension A: Public Goods Only

Model Primitives

Players

We assume that there is a host government and a set of migrants of number N.

Actions

Suppose that government ideology, $\theta \in [0, 1]$, is known to all actors.

1. Each migrant simultaneously decides whether to complain to the host government about her prior treatment. Define strategy $\sigma_i \in \{0,1\}$ where $\sigma_i = 1$ if migrant i complains, and $\sigma_i = 0$ otherwise. The aggregate demand from the migrants (the number of migrants who complain) in state θ is $d(\theta) = \Sigma_i \sigma_i$

2. The host government observes the aggregate demand, $d(\theta)$, and then decides whether to prosecute.

Government Preferences

As in the main model, the utility function for the host government is:

$$u = \begin{cases} b(\theta, rad) - c & \text{if prosecute} \\ 0 & \text{if don't prosecute} \end{cases}$$

where $b(0, raN) < c < b(1,0)$ and $b_1 > 0$ and $b_2 > 0$.

Migrant Preferences

The utility function for the migrants is:

	don't prosecute	prosecute
complain	$-t$	$v(a,\theta) - t$
don't complain	0	$v(a,\theta)$

Equilibrium Behavior

Proposition A1: In the subgame perfect Nash equilibrium:

- If $\theta \leq \theta_L$, no migrants complain and the government does not prosecute.
- If $\theta_H \leq \theta$, no migrants complain and the government prosecutes.
- If $\theta_L < \theta < \theta_H$, multiple strategy profiles are possible:
  - No migrant mobilize.
  - Exactly $\widehat{X}(\theta)$ migrant mobilize while the remaining migrants do not.

<u>Proof of Proposition A1.</u>

Properties of Government Strategy

Recall that $b(0, raN) < c < b(1, 0)$ and $b_1 > 0$ and $b_2 > 0$.

- Then there exists a value $\theta_L \in (0, 1)$ that solves $b(\theta_L, raN) = c$. For all lower values, $\theta \in [0, \theta_L)$, the government will not prosecute, even if all migrants mobilize.
- There also exists a value $\theta_H \in (0, 1)$ that solves $b(\theta_H, 0) = c$. For all higher values, $\theta \in (\theta_H, 1]$, the government will always prosecute, regardless of how many migrants mobilize.
- Finally, $0 < \theta_L < \theta_H < 1$.

For all intermediate values, $\theta \in [\theta_L, \theta_H]$, we can calculate the critical value of migrants who must complain for the host state to prosecute. Namely, the critical value, X, solves:

$$\Gamma \equiv b(\theta, raX) - c = 0$$

Note that this critical value X is a function of θ,and is strictly decreasing from M to 0 over the interval $[\theta_L, \theta_H]$:

$$\frac{\partial X(\theta)}{\partial \theta} = \frac{-\Gamma_\theta}{\Gamma_X} = \frac{-b_1}{rb_2} < 0$$

However, note that because migrants are discrete actors (not a continuuum), we must convert this critical value into an integer value. Let $\widehat{X}(\theta)$ denote the smallest integer that is greater than or equal to $X(\theta)$.

Monotonicity of Migrant Strategy

- Case 1: Suppose $\theta \leq \theta_L$. Then the critical value, X, exceeds the number of migrants, N. The only possible equilibrium behavior is for all migrants to not complain. There will be no prosecution.
- Case 2: Suppose $\theta_H \leq \theta$. Then the critical value, X, is 0. The only possible equilibrium behavior is for all migrants to not complain. There will be a prosecution even without migrant mobilization.
- Case 3: Suppose $\theta_L < \theta < \theta_H$. Then a prosecution occurs if $d(\theta) \geq X(\theta)$. Suppose that players adopt pure strategies:
  - Case 3a: If $d(\theta) < X(\theta)$, then a prosecution does not occur. This can only occur in equilibrium if no migrants mobilize. This is a possible equilibrium.
  - Case 3a: If $d(\theta) \geq X(\theta)$, then a prosecution occurs. This can only hold in equilibrium if exactly $\widehat{X}(\theta)$ migrants mobilize (where possible) and the remaining migrants do not.

QED

Comparative Statics

Proposition A2: Hypotheses from the main model continue to hold when some migrants mobilize.

Proof of Proposition A2:

In the equilibrium in which no migrant mobilizes, prosecution occurs iff $\theta_H < \theta$. Because θ_H is defined by $Y \equiv b(\theta_H, 0) - c = 0$, we can show that

$$\frac{\partial \theta_H}{\partial c} = \frac{-Y_c}{Y_{\theta_H}} = \frac{1}{b_1} > 0$$

In the equilibrium in which exactly $\widehat{X}(\theta)$ migrants mobilize (where possible) and the remaining migrants do not, prosecution occurs iff $\theta_L < \theta$. Because θ_L is defined by $Z \equiv b(\theta_L, raN) - c = 0$, we can show that:

$$\frac{\partial \theta_L}{\partial N} = \frac{-Z_N}{Y_{\theta_L}} = \frac{-rb_2}{b_1} < 0$$

$$\frac{\partial \theta_L}{\partial r} = \frac{-Z_r}{Y_{\theta_L}} = \frac{-Nb_2}{b_1} < 0$$

$$\frac{\partial \theta_L}{\partial c} = \frac{-Z_c}{Y_{\theta_L}} = \frac{1}{b_1} > 0$$

$$\frac{\partial \theta_L}{\partial a} = \frac{-Z_a}{Y_{\theta_L}} = \frac{-b_2 rN}{b_1} < 0$$

QED

Model Extension B: Prosecution Cost as a Function of Migration

Model Primitives

Suppose that the prosecution cost is a function of migration, M, where $c_M < 0$. Then the utility function for the host government is:

$$u = \begin{cases} b(\theta, rad) - c(M) & \text{if prosecute} \\ 0 & \text{if don't prosecute} \end{cases}$$

Assume $b(0, raM) < c(M) < b(1, 0)$ always. Let all other primitives from the main model remain the same.

Equilibrium Behavior

Proposition B1: There exists an equilibrium that is characterized by θ^*, the equilibrium type of government that is indifferent between prosecuting and not prosecuting, and X^*, the equilibrium mass of migrants who must complain for a prosecution to occur.

Proof of Proposition B1:

The Proof of Proposition 1 continues to hold. Equilibrium behavior is defined by two equations (Γ, Υ) and two unknowns (θ^*, X^*):

$$\Gamma \equiv b\left(\theta^*, raX^*\right) - c\left(M\right) = 0$$
$$\Upsilon \equiv \left(1 - \frac{X^*}{M}\right) w\left(a, \theta^*\right) - t = 0$$

QED

Comparative Statics

Proposition B2: Hypotheses from the main model continue to hold.

The Jacobian matrix for our implicitly-defined solution continues to be:

$$\mathbf{J} = \begin{bmatrix} \Gamma_X & \Gamma_\theta \\ \Upsilon_X & \Upsilon_\theta \end{bmatrix} = \begin{bmatrix} rab_2 & b_1 \\ -\frac{w(a,\theta)}{M} & \left(1 - \frac{X}{M}\right) w_\theta \end{bmatrix}$$
$$\det\left(\mathbf{J}\right) = \frac{1}{M}\left[rab_2\left(M - X\right) w_\theta + b_1 w\left(a, \theta\right)\right] > 0$$

Additionally,

$$\frac{\partial \theta^*}{\partial M} = \frac{-\det \begin{bmatrix} \Gamma_X & \Gamma_M \\ \Upsilon_X & \Upsilon_M \end{bmatrix}}{\det\left(\mathbf{J}\right)} = \frac{\Gamma_M \Upsilon_X - \Gamma_X \Upsilon_M}{\det\left(\mathbf{J}\right)}$$
$$= \frac{-c_M\left[-\frac{w(a,\theta)}{M}\right] - rab_2\left[\frac{Xw(a,\theta)}{M^2}\right]}{\det\left(\mathbf{J}\right)} = \frac{\left[c_M M - rab_2 X\right] w\left(a, \theta\right)}{\det\left(\mathbf{J}\right) M^2} < 0$$

because $c_M < 0$.

Finally, the proofs from the main model about $\frac{\partial \theta^*}{\partial r}$ and $\frac{\partial \theta^*}{\partial a}$ follow directly. QED

Model Extension C: Migration as a Function of Atrocities

Model Primitives

Suppose that migration is a function of atrocities, $M(a)$, where $M_a > 0$. Then the utility function for the host government is:

$$u = \begin{cases} b(\theta, rad) - c & \text{if prosecute} \\ 0 & \text{if don't prosecute} \end{cases}$$

Assume $b(0, raM) < c < b(1, 0)$ always. Let all other primitives from the main model remain the same.

Equilibrium Behavior

<u>Proposition C1:</u> There exists an equilibrium that is characterized by θ^*, the equilibrium type of government that is indifferent between prosecuting and not prosecuting, and X^*, the equilibrium mass of migrants who must complain for a prosecution to occur.

<u>Proof of Proposition C1:</u>

The Proof of Proposition 1 continues to hold. Equilibrium behavior is defined by two equations (Γ, Υ) and two unknowns (θ^*, X^*):

$$\Gamma \equiv b(\theta^*, raX^*) - c(M(a)) = 0$$
$$\Upsilon \equiv \left(1 - \frac{X^*}{M(a)}\right) w(a, \theta^*) - t = 0$$

QED

Comparative Statics

Proposition C2: Hypotheses from the main model continue to hold.

The Jacobian matrix for our implicitly-defined solution is:

$$\mathbf{J} = \begin{bmatrix} \Gamma_X & \Gamma_\theta \\ \Upsilon_X & \Upsilon_\theta \end{bmatrix} = \begin{bmatrix} rab_2 & b_1 \\ -\frac{w(a,\theta)}{M(a)} & \left(1 - \frac{X}{M(a)}\right) w_\theta \end{bmatrix}$$

$$\det(\mathbf{J}) = \frac{1}{M(a)} \left\{ rab_2 \left[M(a) - X \right] w_\theta + b_1 w(a,\theta) \right\} > 0$$

Additionally,

$$\Gamma_a = rX^* b_2$$

$$\Upsilon_a = \left(1 - \frac{X^*}{M(a)}\right) w_1 + \frac{X^*}{M(a)^2} M_a w(a, \theta^*)$$

$$\begin{aligned}
\frac{\partial \theta^*}{\partial a} &= \frac{-\det \begin{bmatrix} \Gamma_X & \Gamma_a \\ \Upsilon_X & \Upsilon_a \end{bmatrix}}{\det(\mathbf{J})} = \frac{-\left[\Gamma_X \Upsilon_a - \Gamma_a \Upsilon_X\right]}{\det(\mathbf{J})} \\
&= \frac{-\left\{ rab_2 \left[\left(1 - \frac{X^*}{M(a)}\right) w_1 + \frac{X^*}{M(a)^2} M_a w(a,\theta^*) \right] + rX^* b_2 \left(\frac{w(a,\theta)}{M(a)} \right) \right\}}{\det(\mathbf{J})} \\
&= \frac{-rb_2 \left[a\left(M(a) - X^*\right) w_1 + \frac{aX^*}{M(a)} M_a w(a,\theta^*) + X^* w(a,\theta) \right]}{\det(\mathbf{J}) M(a)} > 0
\end{aligned}$$

because $M_a > 0$.

Finally, the proofs from the main model about $\frac{\partial \theta^*}{\partial M}$ and $\frac{\partial \theta^*}{\partial r}$ and $\frac{\partial \theta^*}{\partial c}$ follow directly. QED

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References

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Figure A1: Theoretical Expectations