Optimal refugee status determination

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Abstract

To distinguish refugees from economic migrants, destination countries typically verify all asylum applications. This refugee status determination process has a fiscal cost, which is exacerbated by the large number of unfounded claims. Applying mechanism design, we propose an alternative asylum system that lets migrants choose between the standard verification procedure and a lottery of asylum-equivalent visas. In equilibrium, refugees apply for asylum, whereas economic migrants self-select into the lottery. By eliminating unfounded asylum applications, this mechanism is optimal for the government. Even with limited commitment power, offering a visa lottery remains optimal.

Keywords: asylum; refugees; mechanism design; costly verification; limited commitment.

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1 Introduction

"The biggest loophole drawing illegal aliens to our borders is the use of fraudulent or meritless asylum claims to gain entry into our great country", US President Donald Trump said in 2019 (White House, 2019). In the US, around half of immigration court decisions on asylum are denied each year (TRAC, 2022). The large number of unfounded applications has made right-wing politicians question the asylum system as a whole and sown distrust among the public towards asylum seekers. Almost 70% of Trump voters in 2020 believe that only a few, or none, of the people who claim asylum are actually fleeing persecution in their home countries (YouGov, 2022).

Unfounded asylum applications are made because rich countries severely restrict the entry of low-skilled economic migrants. In the US, employment-based visas require a full-time job offer and are mostly awarded to highly skilled individuals. Of the more than one million green cards given out in 2022, only 4 351 were specifically for unskilled workers (U.S. Department of Homeland Security, 2023). By Article 14 of the Universal Declaration of Human Rights, however, "everyone has the right to seek and to enjoy in other countries asylum from persecution".

Whether a migrant is actually persecuted, and thus entitled to asylum, is their private information. To verify this information, they are subject to a refugee status determination process, which consists of document checks, personal interviews and other measures. In the US, an initial decision is supposed to be made within six months. Given the backlog of applications and the possibility of appeal, however, it sometimes takes years until a final decision is reached (National Immigration Forum, 2019). During this time, the applicant is allowed to stay in the destination country, providing an opportunity to abscond in case of rejection. Hence, there are incentives to apply for asylum even if you know you do not qualify.

This paper argues that unfounded asylum applications can be mitigated by offering an additional channel for legal immigration. Specifically, we propose a mechanism that gives all migrants who arrive at the border of the destination country a choice between the standard asylum process and a "visa lottery". If they apply for asylum, verification is performed and reveals whether the migrant is entitled to asylum. With some probability, rejected applicants manage to abscond and stay irregularly. The second option is to participate in a lottery that awards an asylum-equivalent visa with a certain probability. There is no verification (except if needed for security reasons). Lottery participants renounce their right to apply for asylum.

The advantage of this mechanism is that migrants face incentives to self-select into one of the two options. Refugees apply for asylum because they know they will get it. Economic migrants choose the lottery if the win probability is large enough to dominate the prospect of staying irregularly after an unsuccessful asylum application. Since lottery participants are not verified, the government saves costs compared to the current mechanism, which verifies everyone. In a simple mathematical model, we prove that offering a visa lottery is indeed optimal for the government (Theorem 1).

The drawback of the optimal mechanism is that it demands strong commitment power from the government. If migrants self-select as described above, only those who qualify for asylum will apply; the remaining migrants will choose the lottery. As a result, the government staff performing verification will quickly realize that all applications are approved. They may then stop exercising due diligence and rubber-stamp some applications. Anticipating these incentives to shirk, economic migrants may decide to apply for asylum—and the whole system unravels. Indeed, we show that, if the government cannot commit at all, then the current mechanism is optimal. Accordingly, lack of commitment may explain why asylum systems around the world tend to verify all applicants instead of providing incentives for self-selection (Theorem 2).

Nonetheless, complete lack of commitment power appears implausible. One issue with the optimal mechanism under full commitment is that, ex post, the government would want to set the win probability of the visa lottery equal to zero. This change would hurt the migrants who chose the lottery and, thus, warrant legal action against the government (possibly with the help of human rights groups). For this reason, deviations from the initially announced mechanism that make migrants worse off are arguably unfeasible. Applying this notion of limited commitment, we show that a two-tier system consisting of the standard asylum procedure and a visa lottery remains optimal. In contrast to the case with full commitment, some economic migrants must apply for asylum; otherwise the government would have no incentives to verify their claims (Theorem 3).

2 Related Literature

Despite its public salience, asylum policy has received little attention from economic theorists. The existing work has focused on the strategic interaction between countries deciding how many migrants to accept (e.g. Bubb et al., 2011; Facchini et al., 2006; Fernández-Huertas Moraga & Rapoport, 2014; Hagen, 2022, 2024; Monheim-Helstroffer & Obidzinski, 2010; Rossi, 2017). Another strand of the literature applies matching theory to study how refugees with different characteristics and preferences should be distributed within a given country or wider geographic area (Ahani et al., 2021, 2023; Andersson & Ehlers, 2020; Aziz et al., 2018; Bansak et al., 2018; Delacrétaz et al., 2023; Jones & Teytelboym, 2017, 2018; van Basshuysen, 2017). Our paper, by contrast, uses mechanism design to analyze how refugees could best be distinguished from economic migrants.

Methodologically, we consider an allocation problem in which the principal cannot use monetary transfers but can verify the agents' private information at a cost (Ben-Porath et al., 2014; Erlanson & Kleiner, 2020; Kattwinkel & Knoepfle, 2023; Li, 2021). In our model, an agent (migrant) who is verified and rejected still manages to get the good (access to the destination country) with positive probability. This limits the principal's ability to punish the agent for lying, as in Mylovanov and Zapechelnyuk (2017). Their model has no verification cost, so the trade-off between optimal allocation and minimal verification, which shapes our results, is not present. Li (2020) combines costly verification and limited penalties. Our contribution, apart from providing a new application of the existing theory, is to focus on the role of commitment.

In models with costly verification, commitment power matters in two ways. First, the principal may want to change the allocation once verification has revealed the agent's type. Halac and Yared (2020) study this issue in a delegation model. Second, the principal has no incentives to perform verification if all agents report truthfully. This issue first arose in the context of tax audits (Reinganum and Wilde, 1986; Chatterjee et al., 2008) but is also relevant for procurement (Banks, 1989; Khalil, 1997), lending (Khalil & Parigi, 1998) or environmental regulation (Hiriart et al., 2011). Both issues affect our analysis, although our notion of limited commitment is not explicitly about either. Instead, we consider what Silva (2019) calls "renegotiation-proofness": all the principal can commit to is not reducing the agent's payoff compared to the initial mechanism. In Silva's model, the principal receives a costless, yet imperfect, signal about the agent's type. In our model, by contrast, the signal is costly, yet perfect.

3 Model

There is a unit mass of migrants who have arrived at the border of a destination country. Each migrant privately knows their level of hardship, represented by a type $\theta \in \Theta := [\underline{\theta}, \bar{\theta}]$, where $-\infty < \underline{\theta} < 0 < \bar{\theta} < \infty$. The cumulative distribution function of θ is commonly known and denoted by F. We assume F to be continuous and have full support on $[\underline{\theta}, \bar{\theta}]$.

The government of the destination country can verify a migrant's type at cost $c > 0$. Verification reveals the true type with probability 1. During verification, the migrant is granted access to the destination country. Should the migrant be denied asylum after verification, they manage to stay irregularly with probability $s \in (0, 1)$. By contrast, a migrant who is denied asylum without verification is not let into the destination country to begin with, eliminating the possibility of an irregular stay.

A migrant with type θ derives Bernoulli utility $u(\theta) > 0$ from getting access to the destination country, be it in the form of asylum or irregular stay. The government of the destination country obtains value $v(\theta) \in \mathbb{R}$ if migrant type θ gets access to its territory. We assume that $v\colon [\underline{\theta}, \bar{\theta}] \to \mathbb{R}$ is an increasing function with $v(0) = 0$. Accordingly, migrants with $\theta > 0$ are deemed worthy of protection, whereas migrants with $\theta < 0$ are not. We may think of these two groups as representing refugees and economic migrants. The government's objective is to maximize its expected value from granting access net of the verification costs.

This is the simplest version of the model that conveys the main insights. In Online Appendix B.2, we argue that our results remain to hold if (i) the government must pay a cost to deport rejected migrants, (ii) verification is imperfect, and (iii) migrants value asylum more than irregular stay.

4 Suboptimality of the current mechanism

This section explains why the current mechanism is not optimal for the government. Currently, all migrants apply for asylum and are verified with probability 1. Positive types get asylum for sure. Negative types are rejected for sure and manage to stay irregularly with probability s. Hence, the government's payoff is

$$\pi_0 := \int_{\underline{\theta}}^{0} \big[sv(\theta) - c\big] \,\mathrm{d}F(\theta) + \int_{0}^{\bar{\theta}} \big[v(\theta) - c\big] \,\mathrm{d}F(\theta).$$

Consider an alternative mechanism in which migrants can choose between two options: applying for asylum and participating in a visa lottery. The migrants who participate in the lottery are not verified and, with probability s, win an asylum-equivalent visa. Lottery losers are not let into the destination country, so they do not have the possibility to stay irregularly. The migrants who apply for asylum are verified as usual, except that the threshold for receiving asylum weakly increases from 0 to θ^*,[1] which is determined by

$$\theta^* := \inf\left\{\theta > 0 : v(\theta) > \frac{c}{1-s}\right\}.$$

In the alternative mechanism, migrants with $\theta > \theta^*$ apply for asylum because they get it for sure, which is the best possible outcome for them. Migrants with $\theta < \theta^*$ are indifferent between the two options because the probability of winning the lottery, s, equals the probability of staying irregularly if they apply for asylum and are rejected. We assume that indifferent migrants choose the lottery. In practice, the government could raise the win probability ever so slightly above s, in which case all migrants with $\theta < \theta^*$ would strictly prefer the lottery. The government's payoff under the alternative mechanism is

$$\begin{aligned}\pi^* &:= \int_{\underline{\theta}}^{\theta^*} sv(\theta) \,\mathrm{d}F(\theta) + \int_{\theta^*}^{\bar{\theta}} \big[v(\theta) - c\big] \,\mathrm{d}F(\theta) \\ &= \pi_0 + \underbrace{cF(0)}_{>0} + \underbrace{\int_{0}^{\theta^*} \big[c - (1-s)v(\theta)\big] \,\mathrm{d}F(\theta)}_{\geq 0}.\end{aligned}$$

[1]Since v may be discontinuous, it is possible that $\theta^* = 0$.

The alternative mechanism outperforms the current mechanism for two reasons, captured by the underbraced terms. First, negative types are not verified, which saves costs. Second, positive types below θ^* get access with probability s instead of 1. Although these types are considered worthy of asylum (because $v(\theta) > 0$ for all $\theta > 0$), the government's gain from raising their access probability by $1 - s$ is lower than the verification cost.

In the next section, we prove that the mechanism just described is optimal for the government if it has full commitment power. For ease of exposition, we assume that

$$\pi_0 > \max\Big\{0, \mathbb{E}\big[v(\theta)\big]\Big\}. \tag{1}$$

This condition says that the government prefers the current mechanism (payoff π_0) to rejecting all migrants without verification (payoff 0) and to accepting all migrants without verification (payoff $\mathbb{E}[v(\theta)]$). Both are obvious alternatives to the current system but not observed in reality.

5 Full commitment

An asylum system can be modeled as a mechanism, designed by the government, with two components: a set of messages that migrants can send to the government, and a mapping of these messages into allocations. If the government can fully commit to the mechanism, the timing is as follows:

1. The government chooses a message set M and three functions (x, y, z).
2. Each migrant sends a message $m \in M$ to the government.
3. The allocation is realized.
   - With probability $x(m) \in [0, 1]$, a migrant who sends message m receives asylum without being verified.
   - With probability $y(m) \in [0, 1]$, a migrant who sends message m is verified.

   Feasibility requires that $x(m) + y(m) \leq 1$. If a migrant is verified, their type $\theta \in \Theta$ becomes known to the government and can thus be used as an input to the allocation rule.

- With probability $z(m, \theta) \in [0, 1]$, a migrant who sends message m receives asylum, conditional on being verified and found to be of type θ.[2]

Accordingly, a migrant of type θ who sends message m receives access to the destination country with probability

$$a(m, \theta) := x(m) + y(m)\Big\{z(m, \theta) + \big[1 - z(m, \theta)\big]s\Big\}. \tag{2}$$

The migrant's expected utility is $U(m, \theta) = a(m, \theta)u(\theta)$.

By the "revelation principle", there is no loss of generality in restricting attention to mechanisms that are direct and incentive compatible (e.g. Ben-Porath et al., 2014). In a direct mechanism, the messages that migrants can send are their types, that is, $M = \Theta$. Incentive compatibility (IC) means that reporting one's true type θ is no worse than reporting any other type $\hat{\theta}$, that is, $U(\theta, \theta) \geq U(\hat{\theta}, \theta)$. Since $U(\hat{\theta}, \theta) = a(\hat{\theta}, \theta)u(\theta)$, the value of $u(\theta)$ is irrelevant for the IC constraint. What matters is the access probability:

$$\forall \theta, \forall \hat{\theta}, \quad a(\theta, \theta) \geq a(\hat{\theta}, \theta). \tag{3}$$

The government maximizes its expected value net of verification costs. In equilibrium, all migrants report their types truthfully. Hence, the government's objective function is

$$\mathbb{E}\big[a(\theta, \theta)v(\theta) - y(\theta)c\big]. \tag{4}$$

The government chooses (x, y, z) to maximize (4) subject to (2) and (3). Theorem 1 below characterizes the optimal mechanism. Recall the definition of the threshold type from Section 4:

$$\theta^* := \inf\left\{\theta > 0 : v(\theta) > \frac{c}{1 - s}\right\}.$$

[2] We are implicitly making two common restrictions on the set of available mechanisms. First, the message sent by a migrant coincides with the message received by the government. For more general communication devices, see Myerson (1982), Bester and Strausz (2007), and Doval and Skreta (2022). Second, the allocation that a migrant receives depends only on their own message, not on the messages sent by the other agents. Hence, any two migrants who send the same message get the same allocation. This assumption is standard in models with atomistic agents (e.g. Melumad and Mookherjee, 1989; Li, 2021; Pereyra and Silva, 2023). For "non-symmetric" mechanisms, see Hammond (1979).

Theorem 1 (Optimal mechanism with full commitment)**.** *Migrants who report a type below θ^* receive asylum with probability s and are not verified. Migrants who report a type above θ^* are verified. That is,*

$$x(\theta) = \begin{cases} s & \text{if } v(\theta) < \dfrac{c}{1-s}, \\ 0 & \text{if } v(\theta) > \dfrac{c}{1-s}, \end{cases} \quad \text{and} \quad y(\theta) = \begin{cases} 0 & \text{if } v(\theta) < \dfrac{c}{1-s}, \\ 1 & \text{if } v(\theta) > \dfrac{c}{1-s}. \end{cases}$$

Upon verification, truthful migrants receive asylum, whereas liars are rejected:

$$z(\hat{\theta}, \theta) = \begin{cases} 1 & \text{if } \hat{\theta} = \theta, \\ 0 & \text{if } \hat{\theta} \neq \theta. \end{cases} \tag{5}$$

The proof of Theorem 1 is relatively standard (cf. Ben-Porath et al., 2014; Kattwinkel and Knoepfle, 2023), so we relegate it to Online Appendix B.1. Let us briefly explain the intuition.

By the revelation principle, misreporting does not occur in equilibrium. To minimize migrants' incentives to deviate, the government punishes liars as hard as possible. This is the second part of (5). The first part says that honest migrants receive the largest possible reward. If a truthful report sometimes resulted in rejection, the government could verify this report less often and grant asylum more often after verification. This way, the access probability could be kept unchanged, while reducing the verification cost.

Ideally, the government would like to accept all positive types and reject all negative types. To prevent negative types from misreporting, positive types must be verified. Moreover, negative types must get asylum with probability s (or higher) to match the prospect of staying irregularly after a misreport and the subsequent rejection. There is no need to verify negative types since positive types get asylum for sure and, thus, do not have incentives to lie. Finally, the optimal mechanism treats positive types below θ^* like negative types. Granting these migrants asylum is not valuable enough for the government to incur the verification cost.[3]

Instead of asking migrants directly to report their types, the allocation described in Theorem 1 can be implemented through the indirect mecha-

[3] In practice, the rejection of genuine refugees for the sake of cost efficiency may raise humanitarian concerns. In response, we could require that all positive types get asylum for sure. The proof of Theorem 1 can be slightly adjusted to show that the only change in the optimal mechanism would be a decrease of the threshold type from θ^* to 0.

nism from Section 4. Migrants are offered two options: a visa lottery with win probability s and the standard asylum procedure involving verification. Upon verification, types above θ^* are accepted, whereas types below θ^* are rejected.

6 No commitment

The optimal mechanism from the previous section uses the government's commitment power in three ways.

(i) The types below θ^* do not apply for asylum because the government threatens to reject them after verification. This is an empty threat for all $\theta \in (0, \theta^*)$ because, once the verification cost is sunk, the government would benefit from accepting these migrants.

(ii) All migrants who apply for asylum ($\theta > \theta^*$) will get it, while those who would be rejected ($\theta < \theta^*$) choose the lottery. Due to this self-selection, the verification procedure does not reveal any additional information; it merely serves as a threat to deter the types below θ^* from applying for asylum. Hence, ex post, the government would want to save costs by not performing verification.

(iii) Recall from Section 4 that the visa-lottery mechanism outperforms "asylum for all", that is, $\pi^* > \mathbb{E}[v(\theta)]$. This inequality is equivalent to

$$\int_0^{\theta^*} v(\theta)\,\mathrm{d}F(\theta) < -\frac{c}{1-s}\big[1 - F(\theta^*)\big] \leq 0.$$

The left-hand side is the government's expected value from granting asylum to the lottery participants. Since this value is negative, the government would want to reduce the win probability from s to 0 once the migrants have self-selected.

Suppose the government cannot commit at all to the rules of the asylum system. Then the timing of the game is as follows:

1. The government chooses a message set M.

2. Each migrant sends a message $m \in M$ to the government.

3. The government takes three actions $(x(m), y(m), z(m, \theta))$, where $z(m, \theta)$ is conditional on having verified type $\theta \in \Theta$.

This would be a cheap-talk game (Crawford & Sobel, 1982) were it not for the possibility of verification. Note that all migrants, irrespective of their type, want to get access to the destination country with the largest possible probability. A standard cheap-talk game with such preferences has only "babbling equilibria", in which the messages that migrants send do not convey any information about their types. This result carries over to our model, even though differences in verification probabilities could principally make some messages more attractive for some types than for others.

Theorem 2 (Optimal mechanism without commitment)**.** *In every Perfect Bayesian Equilibrium of the game without commitment, the government takes the same action after each message. Thus, without loss of generality, M contains a single message m. The government's optimal actions are*

$$x(m) = 0, \quad y(m) = 1 \quad \textit{and} \quad z(m, \theta) = \begin{cases} 0 & \textit{if } \theta < 0, \\ 1 & \textit{if } \theta > 0. \end{cases}$$

Proof. See Appendix A.1. □

Theorem 2 says that, if the government has no commitment power whatsoever, the current mechanism is optimal: all migrants are verified, positive types get asylum, negative types are rejected. The intuition is as follows.

Upon verification, commitment issue (i) immediately yields the expression for $z(m, \theta)$: positive types are accepted, whereas negative types are rejected. Hence, all positive types have the same preferences over messages, and all negative types have the same preferences over messages.

Both groups of migrants must be indifferent between all messages. Otherwise, the government can infer that only positive types, or only negative types, have sent a given message m. In either case, commitment issue (ii) implies that the government will not verify: $y(m) = 0$. Moreover, by commitment issue (iii), the government will set the asylum probability to $x(m) = 1$ or $x(m) = 0$, depending on whether the message was sent by the positive types or the negative types. If $x(m) = 1$, the negative types would want to send that message, too. If $x(m) = 0$, the negative types would want to send a different message. Neither situation is an equilibrium.

For all migrants to be indifferent between all messages, the government's actions must be message-independent. Therefore, we can merge all messages into a single one. It follows that all migrants are verified with the same probability. Since the government's objective function is linear, the optimal verification probability is either 0 or 1. By assumption (1), the government prefers to verify everyone rather than no one. In conclusion, the current mechanism is optimal.

7 Limited commitment

The three commitment issues from the previous section are not equally concerning. If the government did not reject low positive types after verification or did not perform any verification, the migrants affected would have no reason to protest because their utility would increase or remain unchanged. Hence, commitment issues (i) and (ii) are indeed problematic. Commitment issue (iii), however, involves a conflict of interest between the government and the migrants. If the government reduced the win probability ex post, the migrants who had chosen the lottery would become worse off. They could then justifiably criticize the change of rules and, possibly with the help of NGOs, take legal action against the government. For this reason, the government may refrain from revising the win probability of the visa lottery even if it were beneficial to do so.

More generally, it appears reasonable to assume that the government can credibly commit to not changing the initially proposed mechanism in any way that would make migrants worse off. Using this notion of limited commitment, the timing is as follows:

1. The government chooses a message set M and three functions (x, y, z), as specified in Section 5.

2. Each migrant sends a message $m \in M$ to the government.

3. The government revises the functions from step 1 without reducing migrants' access probabilities, that is, it takes three actions $(\hat{x}(m), \hat{y}(m), \hat{z}(m,\theta))$ such that, for all messages $m \in M$ and all types $\theta \in \Theta$,

$$\hat{a}(m,\theta) := \hat{x}(m) + \hat{y}(m)\Big\{\hat{z}(m,\theta) + \big[1 - \hat{z}(m,\theta)\big]s\Big\} \geq a(m,\theta).$$

In every Perfect Bayesian Equilibrium of this game, migrants correctly anticipate how the government will revise the initially proposed functions. Therefore, the allocation would remain unchanged if the government chose the revised functions to begin with. Without loss of generality, we may assume that the initial functions are immune to revision, that is, there do not exist Pareto improvements after migrants have sent their messages.

Theorem 3 (Optimal mechanism with limited commitment)**.** *There are two available messages: $M = \{m_0, m_1\}$. Migrants who send message m_0 receive asylum with probability s and are not verified. Migrants who send message m_1 are verified. That is,*

$$x(m_0) = s, \qquad x(m_1) = 0,$$
$$y(m_0) = 0, \qquad y(m_1) = 1.$$

Upon verification, positive types are accepted, whereas negative types are rejected. That is, for all $m \in M$,

$$z(m, \theta) = \begin{cases} 0 & \text{if } \theta < 0, \\ 1 & \text{if } \theta > 0. \end{cases}$$

There is a threshold type $\theta^{**} \in (\underline{\theta}, 0)$ such that all migrants with $\theta \in (\theta^{**}, 0)$ send message m_0, whereas all migrants with $\theta < \theta^{**}$ or $\theta > 0$ send message m_1. The threshold type θ^{**} is uniquely determined by

$$\int_{\underline{\theta}}^{\theta^{**}} \big[c + (1 - s)v(\theta)\big]\, \mathrm{d}F(\theta) + \int_0^{\bar{\theta}} c\, \mathrm{d}F(\theta) = 0. \tag{6}$$

Proof. See Appendix A.2. □

Message m_0 effectively indicates participation in a visa lottery with win probability s, whereas message m_1 corresponds to an asylum application. In equilibrium, message m_1 is sent by all refugees ($\theta > 0$) and by some economic migrants ($\theta < \theta^{**}$). Type θ^{**} is chosen to make the government indifferent towards verification after receiving message m_1. This is the interpretation of equation (6). Upon verification, all $\theta > 0$ receive asylum for sure, whereas all $\theta < \theta^{**}$ are rejected and stay irregularly with probability s. The government may be tempted to forego verification and grant asylum for sure to all migrants who sent message m_1. This revision would save the verification cost c for all $\theta < \theta^{**}$ and $\theta > 0$. But it would also raise the access probability from s to 1 for all $\theta < \theta^{**}$, thus reducing the government's payoff by $(1 - s)v(\theta) < 0$. By (6), the two effects cancel each other out.

Loosely speaking, just enough economic migrants must apply for asylum that the government has incentives to sort them out through verification. The lower a migrant's type, the more the government benefits from verifying them and then reducing their access probability from 1 to s. For this reason, it is the *lowest* negative types ($\theta < \theta^{**}$) who apply for asylum.

The mechanisms from Theorems 2 and 3 implement the same access probabilities: 1 for all positive types, s for all negative types. Nonetheless, the government's payoff with limited commitment (π^{**}) is higher than without commitment (π_0) because the types between θ^* and 0 are not verified:

$$\begin{aligned}
\pi^{**} &:= \int_{\underline{\theta}}^{\theta^{**}} \big[sv(\theta) - c\big]\, \mathrm{d}F(\theta) + \int_{\theta^{**}}^{0} sv(\theta)\, \mathrm{d}F(\theta) + \int_{0}^{\bar{\theta}} \big[v(\theta) - c\big]\, \mathrm{d}F(\theta) \\
&= \pi_0 + \underbrace{c\big[F(0) - F(\theta^{**})\big]}_{>0} > \pi_0. \qquad (7)
\end{aligned}$$

8 Discussion

To conclude the paper, we discuss three important aspects of our results and suggest avenues for future research.

8.1 Dealing with indifference

One problem with the mechanism from Theorem 3 is that all negative types are indifferent between messages m_0 and m_1. As usual in mechanism design, we assume that the government can decide how these migrants behave. The ideal scenario is that the types below θ^{**} apply for asylum (m_1), whereas those between θ^{**} and 0 choose the lottery (m_0). How this precise type separation could be achieved in practice is unclear. Nonetheless, as long as *some* of the negative types choose the visa lottery, the government will be better off than in the status quo.

8.2 Incentives to migrate

Offering a visa lottery does not, in theory, create additional incentives to migrate to the destination country. As explained in Section 7, the access probabilities are exactly as in the status quo. Thus, every migrant who is currently unwilling to travel to the destination country would continue being so. An open question is what the optimal mechanism would be if migrants' travel decisions were taken into account. Specifically, the government might want to randomly reject asylum applicants without verification (i.e. setting $y(m_1) < 1$). This change would reduce migrants' expected utility from submitting unfounded asylum applications. Fewer economic migrants would then find it worthwhile to travel to the destination country, which would raise the government's payoff. A formal investigation of this argument is left to future research.

8.3 Commitment through reputation

An asylum system tends to be a long-lived institution rather than the one-off game that we have considered. If the government deviated from the announced mechanism, future generations of migrants would likely adjust their behavior. Repeated interaction allows the government to build a reputation, thereby sustaining mechanisms that would not be credible in a static game (cf. Abreu, 1988; Chari and Kehoe, 1990; Golosov and Iovino, 2021). A practical issue is that verification requires costly, and only partially observable, effort from government staff. The benefits from maintaining the government's credibility, however, do not fully accrue to the staff themselves unless an adequately designed incentive scheme is in place. This moral hazard problem may justify our commitment concerns. Notwithstanding, a formal analysis of commitment and reputation in an infinitely repeated game appears worthwhile.

A Appendix

A.1 Proof of Theorem 2

Upon verification, commitment issue (i) implies that positive types are accepted, whereas negative types are rejected:

$$\forall m \in M, \quad z(m,\theta) = \begin{cases} 0 & \text{if } \theta < 0, \\ 1 & \text{if } \theta > 0. \end{cases}$$

Hence, by (2), the access probability induced by any given message depends only on whether the migrant's type is negative or positive:

$$\forall m \in M, \quad a(m,\theta) = \begin{cases} x(m) + y(m)s =: a_-(m) & \text{if } \theta < 0, \\ x(m) + y(m) \quad =: a_+(m) & \text{if } \theta > 0. \end{cases}$$

Let $m, m' \in M$ be any two messages sent with positive probability.

First, we show that $a_+(m) = a_+(m')$. By contradiction, suppose $a_+(m) > a_+(m')$. Then no positive type sends message m'. Upon receiving m', the government infers that only non-positive types could have sent it. The optimal action is to reject these migrants without verification: $x(m') = y(m') = 0$. Thus, $a_-(m') = a_+(m') = 0$. Since $x(m) + y(m) = a_+(m) > a_+(m') = 0$, it must be that $x(m) > 0$ or $y(m) > 0$. In either case, $a_-(m) = x(m) + y(m)s > 0 = a_-(m')$. Hence, no negative type sends message m'. It follows that m' is sent with zero probability, a contradiction.

Next, we show that $x(m) = x(m')$. By contradiction, suppose $x(m) > x(m')$. Since also $a_+(m) = a_+(m')$, we have that

$$\begin{aligned} a_-(m) &= x(m) + y(m)s = x(m) + \big[a_+(m) - x(m)\big]s \\ &= a_+(m)s + x(m)(1-s) > a_+(m')s + x(m')(1-s) = a_-(m'). \end{aligned}$$

Thus, no negative type sends message m'. Upon receiving m', the government's optimal action is $x(m') = 1$. Hence, $x(m') \geq x(m)$, a contradiction.

Since $a_+(m) = a_+(m')$ and $x(m) = x(m')$, $y(m) = y(m')$. In conclusion, any two messages that migrants send with positive probability induce the same actions on the government's part. Without loss of generality, we may assume that M contains a single message m.

The government's payoff is

$$x(m)\,\mathbb{E}\big[v(\theta)\big] + y(m)\left\{\int_{\underline{\theta}}^{0}\big[sv(\theta)-c\big]\,\mathrm{d}F(\theta) + \int_{0}^{\bar{\theta}}\big[v(\theta)-c\big]\,\mathrm{d}F(\theta)\right\}.$$

By linearity, this function is maximized at an extreme point of the feasible set, which is described by $x(m) \geq 0$, $y(m) \geq 0$ and $x(m)+y(m) \leq 1$. There are three extreme points:

- $x(m) = 0,\ y(m) = 0 \implies \text{payoff} = 0,$
- $x(m) = 0,\ y(m) = 1 \implies \text{payoff} = \pi_0,$
- $x(m) = 1,\ y(m) = 0 \implies \text{payoff} = \mathbb{E}\big[v(\theta)\big].$

By assumption (1), $\pi_0 > \max\big\{0, \mathbb{E}[v(\theta)]\big\}$. Hence, the optimal actions are $x(m) = 0$ and $y(m) = 1$.

A.2 Proof of Theorem 3

The proof of Theorem 3 consists of 11 lemmas.

Lemma A.1. *Each message in M is sent by a positive measure of types.*

Proof. If a message m is sent by a measure zero of types, then removing m from the message set M does not affect the government's payoff. Hence, this removal is without loss of generality. □

The next lemma states that, in equilibrium, the government will not revise the initially proposed mechanism.

Lemma A.2. *$\forall m \in M$, $\forall \theta \in \Theta$, $\hat{a}(m,\theta) = a(m,\theta)$.*

Proof. By sequential rationality, the strategy of migrant type $\theta \in \Theta$ puts probability 1 on messages $m \in M$ that maximize $\hat{a}(m,\theta)$, the revised access probability. Hence, the initial access probability, $a(m,\theta)$, does not directly affect migrants' incentives. Nor does $a(m,\theta)$ enter the government's payoff. It follows that the set of equilibria would remain unchanged if the government chose $a(m,\theta) = \hat{a}(m,\theta)$ to begin with. □

Denote the set of best messages for type $\theta \in \Theta$ by

$$\bar{M}(\theta) := \arg\max_{m\in M} a(m,\theta).$$

In equilibrium, type θ's strategy puts probability 1 on messages in $\bar{M}(\theta)$. Let $\bar{a}(\theta)$ be the corresponding access probability:

$$\bar{a}(\theta) \coloneqq \max_{m \in M} a(m, \theta).$$

The next lemma states that all negative types have the same access probability, which is the lowest among all types.

Lemma A.3. *$\forall \theta < 0$, $\bar{a}(\theta) = \min_{\theta' \in \Theta} \bar{a}(\theta')$.*

Proof. Consider any $\theta < 0$. First, we show that there exists $m \in \bar{M}(\theta)$ such that $z(m, \theta) = 0$. If $y(m) = 0$ for some $m \in \bar{M}(\theta)$, then setting $z(m, \theta) = 0$ is without loss of generality. Now suppose that, for all $m \in \bar{M}(\theta)$, $y(m) > 0$ and $z(m, \theta) > 0$. Since $y(m) > 0$, a decrease in $z(m, \theta)$ will reduce $a(m, \theta)$. By adjusting these decreases in $z(m, \theta)$ across messages, we can reduce $a(m, \theta)$ by the same amount for all $m \in \bar{M}(\theta)$. If this amount is sufficiently small, then $\bar{M}(\theta)$ will remain unchanged. Hence, the incentives for type θ are as before. The incentives for every $\theta' \neq \theta$ are unaffected as well because $z(m', \theta')$ has not changed for any $m' \in M$. Given that $\theta < 0$, the decrease in $a(m, \theta)$ for all $m \in \bar{M}(\theta)$ raises the government's payoff, so the situation we started from was not optimal. In conclusion, there exists $m \in \bar{M}(\theta)$ such that $z(m, \theta) = 0$. For all $\theta' \in \Theta$, it follows that $z(m, \theta) \leq z(m, \theta')$ and, thus,

$$\begin{aligned}
\bar{a}(\theta) = a(m, \theta) &= x(m) + y(m)\big[s + (1 - s)z(m, \theta)\big] \\
&\leq x(m) + y(m)\big[s + (1 - s)z(m, \theta')\big] = a(m, \theta') \leq \bar{a}(\theta'). \square
\end{aligned}$$

The next lemma states that the asylum probability conditional on verification is 0 for negative types, and 1 for positive types—just like in the case without commitment.

Lemma A.4. *$\forall m \in M$,*

$$z(m, \theta) = \begin{cases} 0 & \text{if } \theta < 0, \\ 1 & \text{if } \theta > 0. \end{cases}$$

Proof. Consider any $m \in M$. If $y(m) = 0$, then $z(m, \theta)$ is irrelevant for all θ, so the lemma's statement is without loss of generality. From now on, suppose $y(m) > 0$.

If $\theta > 0$, then both the government's and the migrant's payoffs increase in $z(m, \theta)$. Hence, $z(m, \theta) = 1$.

If $\theta < 0$ and $m \notin \bar{M}(\theta)$, then $a(m, \theta) < \bar{a}(\theta)$, so type θ never sends message m. Since $y(m) > 0$, a reduction in $z(m, \theta)$ reduces $a(m, \theta)$ and, thus, keeps $\bar{M}(\theta)$ unaffected. Without loss of generality, $z(m, \theta) = 0$.

If $\theta < 0$ and $m \in \bar{M}(\theta)$, then $a(m, \theta) = \bar{a}(\theta)$. By (2) and Lemma A.3,

$$\begin{aligned} & a(m, \theta) = \bar{a}(\theta) \\ \iff \; & x(m) + y(m)\big[s + (1-s)z(m, \theta)\big] = \min_{\theta' \in \Theta} \bar{a}(\theta'). \end{aligned}$$

Since $y(m) > 0$, it follows that

$$z(m, \theta) = \frac{\min_{\theta' \in \Theta} \bar{a}(\theta') - x(m) - y(m)s}{y(m)(1-s)},$$

which is independent of θ. Hence, there exists $z_-(m) \in [0, 1]$ such that $z(m, \theta) = z_-(m)$ for all $\theta < 0$ with $m \in \bar{M}(\theta)$.

Summarizing the results so far, we have that

$$\begin{aligned} & a(m, \theta) \\ & = \begin{cases} x(m) + y(m) - (1-s)y(m) & \text{if } \theta < 0 \text{ and } m \notin \bar{M}(\theta), \\ x(m) + y(m) - (1-s)y(m)\big[1 - z_-(m)\big] & \text{if } \theta < 0 \text{ and } m \in \bar{M}(\theta), \\ x(m) + y(m) & \text{if } \theta > 0. \end{cases} \end{aligned} \tag{A.1}$$

The last step is to show that $z_-(m) = 0$. Since $y(m) > 0$ and $x(m) + y(m) \leq 1$, $x(m) < 1$. Let us slightly decrease $y(m)$ and increase $x(m)$ by the same amount $\epsilon > 0$. If $z_-(m) > 0$, we can additionally decrease $z_-(m)$ to keep $y(m)[1 - z_-(m)]$ constant. By (A.1), $a(m, \theta)$ remains unchanged for all $\theta > 0$ and for all $\theta < 0$ with $m \in \bar{M}(\theta)$. For all $\theta < 0$ with $m \notin \bar{M}(\theta)$, $a(m, \theta)$ increases by $(1-s)\epsilon$. If ϵ is sufficiently small, we still have that $m \notin \bar{M}(\theta)$. Hence, the incentives for all migrants are as before. The government, however, is better off because $y(m)$ has decreased and $\bar{a}(\theta)$ is unchanged for all $\theta \in \Theta$. In conclusion, $z_-(m) > 0$ cannot be optimal. □

Lemma A.4 implies that all negative types have the same preferences over messages, and so do all positive types.

Lemma A.5. *$\forall m \in M$,*

$$a(m,\theta) = \begin{cases} x(m) + y(m)s & \text{if } \theta < 0, \\ x(m) + y(m) & \text{if } \theta > 0. \end{cases}$$

Proof. Follows from Lemma A.4 and (2). □

The next lemma is the analog of Lemma A.3 for positive types: they all have the same access probability, which is the highest among all types.

Lemma A.6. *$\forall \theta > 0$, $\bar{a}(\theta) = \max_{\theta' \in \Theta} \bar{a}(\theta')$.*

Proof. Consider any $\theta > 0$ and $\theta' \in \Theta$. By Lemma A.5, $a(m,\theta) \geq a(m,\theta')$. Since this inequality holds for all $m \in M$, we get that $\bar{a}(\theta) \geq \bar{a}(\theta')$. □

The next lemma states that any message triggering verification with positive probability is optimal for *all* types.

Lemma A.7. *$\forall m \in M$, $[y(m) > 0 \implies \forall \theta \in \Theta,\ a(m,\theta) = \bar{a}(\theta)]$.*

Proof. Consider any $m \in M$ such that $y(m) > 0$. Since $x(m) + y(m) \leq 1$, $x(m) < 1$. By contradiction, suppose $a(m,\theta) < \bar{a}(\theta)$ for some $\theta \in \Theta$. Consider $\theta < 0$; the argument for $\theta > 0$ is analogous. By Lemma A.5, $a(m,\theta') < \bar{a}(\theta')$ for all $\theta' < 0$. Let us decrease $y(m)$ and increase $x(m)$ by the same amount $\epsilon > 0$. If ϵ is sufficiently small, then $a(m,\theta') < \bar{a}(\theta')$ still holds for all $\theta' < 0$. Moreover, for all $\theta'' > 0$, $a(m,\theta'') = x(m)+y(m)$ remains constant. Therefore, migrants' incentives are unchanged. The government, however, is better off because $y(m)$ has decreased. □

The next lemma states that there are only two available messages, one of which triggers verification with probability 0.

Lemma A.8. *$M = \{m_0, m_1\}$ and $y(m_0) = 0 < y(m_1) \leq 1$.*

Proof. First, consider any $m, m' \in M$ with $y(m) = y(m') = 0$. If $x(m) < x(m')$, then $a(m,\theta) = x(m) < x(m') = a(m',\theta)$ for all $\theta \in \Theta$. Hence, no type sends message m, contradicting Lemma A.1. It follows that $x(m) = x(m')$, so all messages with zero verification probability are allocationally equivalent. Without loss of generality, they can be combined into a single message, denoted m_0.

Next, consider any $m \in M$ such that $y(m) > 0$. By Lemma A.7, $a(m, \theta) = \bar{a}(\theta)$ for all $\theta \in \Theta$. Together with Lemmas A.3, A.5 and A.6, we get that

$$\forall\theta, \quad a(m,\theta) = \bar{a}(\theta) \iff \begin{cases} x(m) + y(m)s = \min_{\theta' \in \Theta} \bar{a}(\theta') & \text{if } \theta < 0, \\ x(m) + y(m) \quad = \max_{\theta' \in \Theta} \bar{a}(\theta') & \text{if } \theta > 0. \end{cases}$$

The two cases combined yield that

$$y(m) = \frac{1}{1-s}\left[\max_{\theta' \in \Theta} \bar{a}(\theta') - \min_{\theta' \in \Theta} \bar{a}(\theta')\right]$$

and

$$x(m) = \frac{1}{1-s}\left[\min_{\theta' \in \Theta} \bar{a}(\theta') - s \max_{\theta' \in \Theta} \bar{a}(\theta')\right].$$

Both expressions are independent of m, so all messages with positive verification probability are allocationally equivalent. Without loss of generality, they can be combined into a single message, denoted m_1.

By the preceding arguments, $M \subseteq \{m_0, m_1\}$. If M were a singleton, the highest possible payoff for the government would be π_0 (Theorem 2). However, by (7), $\pi^{**} > \pi_0$, which implies that offering a single message is not optimal. Therefore, $M = \{m_0, m_1\}$. □

The next lemma states that all negative types are indifferent between messages m_0 and m_1, whereas all positive types prefer m_1.

Lemma A.9.

a. $\forall\theta < 0$, $a(m_0, \theta) = a(m_1, \theta)$.

b. $\forall\theta > 0$, $a(m_0, \theta) < a(m_1, \theta)$.

Proof. First, consider any $\theta > 0$. By Lemma A.8, $y(m_0) = 0$ and $y(m_1) > 0$. Lemma A.7 implies that $a(m_1, \theta) = \bar{a}(\theta)$. By contradiction, suppose $a(m_0, \theta) \geq a(m_1, \theta)$. Then $a(m_0, \theta) = \bar{a}(\theta)$. Moreover, by Lemma A.5, $a(m_0, \theta) = x(m_0)$ and $a(m_1, \theta) = x(m_1) + y(m_1)$. Thus,

$$x(m_0) = a(m_0, \theta) = \bar{a}(\theta) = a(m_1, \theta) = x(m_1) + y(m_1).$$

Analogously, for all $\theta' < 0$,

$$x(m_0) = a(m_0, \theta') \leq \bar{a}(\theta') = a(m_1, \theta') = x(m_1) + y(m_1)s.$$

Both expressions together yield $y(m_1) = 0$, a contradiction.

Now we prove part a. By Lemma A.5, all negative types have the same preferences over messages. If $a(m_0, \theta) < a(m_1, \theta)$ for all $\theta < 0$, then no negative type sends message m_0. By part b, no positive type sends message m_0 either. Hence, Lemma A.1 is violated. It follows that $a(m_0, \theta) \geq a(m_1, \theta)$ for all $\theta < 0$. If this inequality were strict, no negative type would send message m_1. But then the government would have no incentive to verify, that is, $y(m_1) = 0$, contradicting Lemma A.8. □

The next lemma says that message m_0 is sent by all negative types above a certain threshold (θ^{**}). All other types send message m_1.

Lemma A.10.

1. *There exists a unique value* $\theta^{**} \in (\underline{\theta}, 0)$ *such that*

$$\int_{\underline{\theta}}^{\theta^{**}} \left[c + (1-s)v(\theta)\right] \mathrm{d}F(\theta) + \int_0^{\bar{\theta}} c \, \mathrm{d}F(\theta) = 0.$$

2. *All types* $\theta \in (\theta^{**}, 0)$ *send message* m_0 *with probability* 1.

3. *All types* $\theta \in [\underline{\theta}, \theta^{**}) \cup (0, \bar{\theta}]$ *send message* m_1 *with probability* 1.

Proof. Let $p_1(\theta) \in [0, 1]$ denote the probability that type $\theta \in \Theta$ sends message m_1. Lemma A.9b implies that $p_1(\theta) = 1$ for all $\theta > 0$. If $p_1(\theta) = 0$ for all $\theta < 0$, then optimally $y(m_1) = 0$, violating Lemma A.8. Hence, some negative types must send message m_1 with positive probability. We denote the set of these types by $\Theta_1 := \{\theta < 0 : p_1(\theta) > 0\}$.

If the government revises the mechanism by not performing verification after message m_1, there will be two effects:

1. The verification cost will decrease by $y(m_1)c$ for all $\theta \in \Theta_1 \cup (0, \bar{\theta}]$.

2. The access probability will increase by $y(m_1)(1 - s)$ for all $\theta \in \Theta_1$.

The explanation for the second effect is that, without verification, the migrants who send message m_1 are indistinguishable. Since the government's revision must not make anybody worse off, the access probability for all $\theta \in \Theta_1$ must increase from $x(m_1) + y(m_1)s$ to $x(m_1) + y(m_1)$.

Combining the two effects, the government's payoff changes by

$$\begin{aligned}\Delta\pi &:= y(m_1)c \int_{\Theta_1 \cup (0,\bar{\theta}]} p_1(\theta)\,\mathrm{d}F(\theta) + y(m_1)(1-s) \int_{\Theta_1} p_1(\theta)v(\theta)\,\mathrm{d}F(\theta) \\ &= \underbrace{y(m_1)}_{>0} \left[\int_{\Theta_1} p_1(\theta)\big[c + (1-s)v(\theta)\big]\,\mathrm{d}F(\theta) + \int_0^{\bar{\theta}} c\,\mathrm{d}F(\theta) \right].\end{aligned}$$

By Lemma A.2, $\Delta\pi \leq 0$. If this inequality were strict, it would still hold after a small reduction of the set Θ_1. Such a change would benefit the government because fewer types would be verified, while their access probabilities would remain the same (by Lemma A.9a). Hence, $\Delta\pi = 0$, which is equivalent to

$$\int_{\Theta_1} p_1(\theta)\big[c + (1-s)v(\theta)\big]\,\mathrm{d}F(\theta) + \int_0^{\bar{\theta}} c\,\mathrm{d}F(\theta) = 0. \tag{A.2}$$

We now show that (A.2) has a solution. Let $\theta^{**} \in [\underline{\theta}, 0]$. Suppose $\Theta_1 = [\underline{\theta}, \theta^{**})$ and $p_1(\theta) = 1$ for all $\theta \in \Theta_1$. Then (A.2) becomes

$$b(\theta^{**}) := \int_{\underline{\theta}}^{\theta^{**}} \big[c + (1-s)v(\theta)\big]\,\mathrm{d}F(\theta) + \underbrace{\int_0^{\bar{\theta}} c\,\mathrm{d}F(\theta)}_{>0} = 0.$$

The function $b\colon [\underline{\theta}, 0] \to \mathbb{R}$ is continuous and $b(\underline{\theta}) > 0$. Moreover, assumption $\mathbb{E}[v(\theta)] < \pi_0$ from Section 4 is equivalent to $b(0) < 0$. Hence, by Bolzano's Theorem, there exists $\theta^{**} \in (\underline{\theta}, 0)$ such that $b(\theta^{**}) = 0$.

Next, we show that this θ^{**} is unique. Since $v(\theta)$ is increasing in θ, $c + (1-s)v(\theta)$ is as well. If $c + (1-s)v(\underline{\theta}) \geq 0$, then b would be increasing. Since $b(\underline{\theta}) > 0$, we would get $b(0) > 0$, a contradiction. Hence, there exists $\hat{\theta} > \underline{\theta}$ such that $c + (1-s)v(\theta) < 0$ for all $\theta < \hat{\theta}$, and $c + (1-s)v(\theta) > 0$ for all $\theta > \hat{\theta}$. It follows that b is decreasing until $\hat{\theta}$ and increasing thereafter. Since $b(\underline{\theta}) > 0$ and $b(0) < 0$, b has a unique root $\theta^{**} \in (\underline{\theta}, 0)$. Moreover, $\theta^{**} \leq \hat{\theta}$, that is, $c + (1-s)v(\theta) < 0$ for all $\theta < \theta^{**}$.

Finally, we show that the optimal solution to (A.2) is $\Theta_1 = [\underline{\theta}, \theta^{**})$ and $p_1(\theta) = 1$ for all $\theta \in \Theta_1$. Otherwise, there exist θ and θ' such that $\theta < \theta^{**} < \theta' < 0$, $p_1(\theta) < 1$ and $p_1(\theta') > 0$. We can then slightly increase

$p_1(\theta)$ and decrease $p_1(\theta')$ so that (A.2) still holds, that is,

$$\underbrace{\mathrm{d}p_1(\theta)}_{>0}\big[c + (1-s)v(\theta)\big]f(\theta) + \underbrace{\mathrm{d}p_1(\theta')}_{<0}\big[c + (1-s)v(\theta')\big]f(\theta') = 0,$$

where f is the density function associated with F. Since $v(\theta) < v(\theta') < 0$, it follows that

$$\big[c + (1-s)v(\theta)\big] \cdot \big[\mathrm{d}p_1(\theta)f(\theta) + \mathrm{d}p_1(\theta')f(\theta')\big] > 0.$$

From the previous paragraph, we know that $c + (1-s)v(\theta) < 0$ because $\theta < \theta^{**}$. Hence,

$$\mathrm{d}p_1(\theta)f(\theta) + \mathrm{d}p_1(\theta')f(\theta') < 0,$$

which means that message m_1 is sent less often. Accordingly, verification occurs less often, while the access probabilities remain unchanged (by Lemma A.9a). Therefore, the government becomes better off. □

The last lemma shows that message m_0 yields asylum with probability s, whereas message m_1 triggers verification with probability 1.

Lemma A.11. *$x(m_0) = s$, $x(m_1) = 0$ and $y(m_1) = 1$.*

Proof. Combining Lemmas A.5 and A.8 to A.10, the government's payoff can be written as

$$x(m_1)\,\mathbb{E}\big[v(\theta)\big] + y(m_1)\Big\{\int_{\underline{\theta}}^{\theta^{**}} \big[sv(\theta) - c\big]\,\mathrm{d}F(\theta) + \int_{\theta^{**}}^{0} sv(\theta)\,\mathrm{d}F(\theta) + \int_0^{\bar{\theta}} \big[v(\theta) - c\big]\,\mathrm{d}F(\theta)\Big\}.$$

By linearity, this function is maximized at an extreme point of the feasible set, which is described by $x(m_1) \geq 0$, $y(m_1) \geq 0$ and $x(m_1) + y(m_1) \leq 1$. Moreover, by Lemma A.7, it must be that $y(m_1) > 0$. Among the three extreme points, the only one with $y(m_1) > 0$ is given by $y(m_1) = 1$ and $x(m_1) = 0$. Since $x(m_0) = x(m_1) + y(m_1)s$, it follows that $x(m_0) = s$. □

B Online Appendix

This appendix contains non-essential material that complements the main text. Section B.1 presents the proof of Theorem 1, which employs standard arguments. Section B.2 discusses three extensions of the model.

B.1 Proof of Theorem 1

First, we characterize the government's optimal decision upon verification:

$$z(\hat{\theta}, \theta) = \begin{cases} 1 & \text{if } \hat{\theta} = \theta, \\ 0 & \text{if } \hat{\theta} \neq \theta. \end{cases} \tag{5}$$

Proof of (5). By the revelation principle, misreporting does not occur in equilibrium. Hence, if $\hat{\theta} \neq \theta$, the value of $z(\hat{\theta}, \theta)$ does not affect the principal's payoff. Moreover, a decrease in $z(\hat{\theta}, \theta)$ relaxes the IC constraint of type θ without affecting the IC constraints of any other type. Therefore, setting $z(\hat{\theta}, \theta) = 0$ is without loss of generality.

Now we prove $z(\theta, \theta) = 1$. By (2), truthful reporting (i.e. sending message $m = \theta$) yields the following access probability:

$$a(\theta, \theta) = x(\theta) + y(\theta)\big[s + (1 - s)z(\theta, \theta)\big].$$

If $y(\theta) = 0$, the value of $z(\theta, \theta)$ is irrelevant, so we may as well set $z(\theta, \theta) = 1$. Now suppose $y(\theta) > 0$ and, by way of contradiction, $z(\theta, \theta) < 1$. We can slightly reduce $y(\theta)$ and increase $z(\theta, \theta)$ so that $a(\theta, \theta)$ stays unchanged. Hence, the government's payoff increases, while the incentives of type θ are preserved. Moreover, the incentives of any type $\hat{\theta} \neq \theta$ to report θ are lower than before because $z(\theta, \hat{\theta}) = 0$ and thus

$$\forall \hat{\theta} \neq \theta, \quad a(\theta, \hat{\theta}) = x(\theta) + y(\theta)s.$$

Since $y(\theta)$ decreases, $a(\theta, \hat{\theta})$ decreases as well. Therefore, incentive compatibility still holds. □

It remains to determine the optimal x and y. By (2) and (5), the access probability of a migrant who reports their type θ truthfully is

$$a(\theta, \theta) = x(\theta) + y(\theta). \tag{B.1}$$

For any misreport $\hat{\theta} \neq \theta$,

$$a(\hat{\theta}, \theta) = x(\hat{\theta}) + y(\hat{\theta})s = a(\hat{\theta}, \hat{\theta}) - y(\hat{\theta})(1 - s).$$

Hence, the IC constraint becomes

$$a(\theta, \theta) \geq a(\hat{\theta}, \hat{\theta}) - y(\hat{\theta})(1 - s).$$

Slightly abusing notation, let us define $a(\theta) \coloneqq a(\theta, \theta)$. Instead of x and y, we can equivalently choose a and y. Hence, the government's problem reads

$$\max_{a,y} \mathbb{E}\big[a(\theta)v(\theta) - y(\theta)c\big] \quad \text{s.t.} \quad \begin{cases} \forall\theta, \forall\hat{\theta}, & a(\theta) \geq a(\hat{\theta}) - y(\hat{\theta})(1 - s) \\ \forall\theta, & 0 \leq y(\theta) \leq a(\theta) \leq 1. \end{cases} \tag{B.2}$$

Below, we show that the solution to (B.2) is given by

$$y(\theta) = \begin{cases} 0 & \text{if } v(\theta) < \dfrac{c}{1-s}, \\ 1 & \text{if } v(\theta) > \dfrac{c}{1-s}, \end{cases} \quad \text{and} \quad a(\theta) = \begin{cases} s & \text{if } v(\theta) < \dfrac{c}{1-s}, \\ 1 & \text{if } v(\theta) > \dfrac{c}{1-s}. \end{cases} \tag{B.3}$$

Thus, by (B.1),

$$x(\theta) = a(\theta) - y(\theta) = \begin{cases} s & \text{if } v(\theta) < \dfrac{c}{1-s}, \\ 0 & \text{if } v(\theta) > \dfrac{c}{1-s}. \end{cases}$$

Proof of (B.3). Defining $\underline{a} \coloneqq \inf\big\{a(\theta) : \theta \in \Theta\big\}$, the IC constraints can be written as

$$\forall\theta, \qquad \underline{a} \geq a(\theta) - y(\theta)(1 - s). \tag{B.4}$$

In words, not even the type with the lowest access probability wants to misreport. (B.4) must hold with equality for all θ; otherwise, we could lower $y(\theta)$ while keeping $a(\theta)$ the same, which would raise the government's payoff. Therefore,

$$\forall\theta, \quad y(\theta) = \frac{a(\theta) - \underline{a}}{1-s}. \tag{B.5}$$

Using (B.5), the government's objective function becomes

$$\mathbb{E}\left[a(\theta)v(\theta) - \frac{a(\theta) - \underline{a}}{1-s}c\right] = \mathbb{E}\left[a(\theta)\left\{v(\theta) - \frac{c}{1-s}\right\}\right] + \frac{c}{1-s}\underline{a}.$$

By (B.5), the constraint $0 \leq y(\theta) \leq a(\theta)$ is equivalent to $\underline{a} \leq a(\theta) \leq \underline{a}/s$. Hence, the government's problem reads

$$\max_{a,\underline{a}}\left\{\mathbb{E}\left[a(\theta)\left\{v(\theta) - \frac{c}{1-s}\right\}\right] + \frac{c}{1-s}\underline{a}\right\} \quad \text{s.t. } 0 \leq \underline{a} \leq a(\theta) \leq \min\left\{\frac{\underline{a}}{s}, 1\right\}.$$

Fix any $\underline{a} \in [0,1]$. Maximizing pointwise, the optimal $a(\theta)$ is given by

$$a(\theta) = \begin{cases} \underline{a} & \text{if } v(\theta) < \dfrac{c}{1-s}, \\ \min\left\{\dfrac{\underline{a}}{s}, 1\right\} & \text{if } v(\theta) > \dfrac{c}{1-s}. \end{cases} \tag{B.6}$$

Plugging this expression into the objective function and performing straightforward algebra, the optimal $\underline{a} \in [0,1]$ solves

$$\max_{\underline{a}\in[0,1]} \underbrace{\left\{\underline{a}\,\mathbb{E}\big[v(\theta)\big] + \min\left\{\frac{1-s}{s}\underline{a}, 1-\underline{a}\right\}\mathbb{E}\left[\max\left\{0, v(\theta) - \frac{c}{1-s}\right\}\right]\right\}}_{=:\pi(\underline{a})}.$$

Concerning the min operator, note that $\frac{1-s}{s}\underline{a} = 1 - \underline{a}$ if and only if $\underline{a} = s$. Since π is piecewise linear in $\underline{a}$, it attains its maximum at 0, 1 or s. The respective payoffs are $\pi(0) = 0$, $\pi(1) = \mathbb{E}[v(\theta)]$ and

$$\pi(s) = s\,\mathbb{E}\big[v(\theta)\big] + (1-s)\,\mathbb{E}\left[\max\left\{0, v(\theta) - \frac{c}{1-s}\right\}\right] = \pi^*.$$

From Section 4, we know that $\pi^* > \pi_0 > \max\{0, \mathbb{E}[v(\theta)]\}$. Therefore, optimally, $\underline{a} = s$. Substituting into (B.5) and (B.6), we get (B.3). $\square$

B.2 Extensions

B.2.1 Deportation cost

In the main model (Section 3), denying asylum has no cost for the government. In practice, rejected applicants rarely leave the destination country voluntarily; they need to be deported or financially enticed to return back home. Accordingly, suppose the government incurs a cost $r > 0$ when trying to return a migrant after verification.[4] The optimal mechanism with full commitment remains unchanged because, by (5), no verified migrant is rejected in equilibrium. Under limited or no commitment, however, all migrants with $v(\theta) > -r/(1-s)$ are accepted because the cost of returning them outweighs the government's value from reducing their access probability from 1 to s. Hence, what we have called the "current mechanism" faces a commitment issue: given the cost of deportation, some economic migrants are not worth rejecting. This finding is in line with the observation that unsuccessful asylum applicants who have integrated well into their host country while their application was being processed are often not deported (e.g. Joppke, 2023).

B.2.2 Imperfect verification

In practice, the government's verification procedure may not always correctly identify migrants' types. There are different possibilities to model such imperfect verification. In the case of direct mechanisms, a natural starting point is a verification technology that generates two possible outcomes: the migrant's reported type with probability $p \in [0, 1)$, and the migrant's true type with probability $1 - p$.[5] Accordingly, truthful reports will always be correctly identified, whereas lies slip through with probability p. Compared to perfect verification, there are now additional incentives

[4] This cost does not accrue when migrants are denied asylum without verification because they are not let into destination country upon arrival and, thus, do not need to be returned.

[5] This technology has been studied by Erlanson and Kleiner (2020, Theorem 2) as well as Kattwinkel and Knoepfle (2023, Proposition 3). Ball and Kattwinkel (2023) show that it can be implemented by means of pass-fail tests.

to apply for asylum. But since the failure rate p is type-independent, the gist of our analysis carries over. The main difference is that the win probability of the visa lottery will increase from s to $p + (1 - p)s$. The latter expression captures two margins of error. First, with probability p, the verification technology fails. Second, with probability $(1 - p)s$, the verification technology succeeds but the migrant manages to stay irregularly.

B.2.3 Asylum vs. irregular stay

We have assumed that migrants are indifferent between getting asylum and staying irregularly. In practice, asylum is arguably more valuable because it comes with additional rights, such as access to the formal labor market and the social welfare system. To model such quality differences, let $u_a(\theta) \geq u_i(\theta) \geq 0$ be type θ's Bernoulli utilities from asylum and irregular stay, respectively. Our analysis goes through with little change if we assume that u_i is a constant fraction of u_a, that is, if there exists $q \in [0, 1]$ such that $u_i(\theta) = qu_a(\theta)$ for all $\theta \in \Theta$. In this case, migrants' preferences are still fully determined by the probability of getting asylum, so the Bernoulli utilities are irrelevant. The main difference is that the win probability of the visa lottery decreases from s to sq because the prospect of staying irregularly after an unsuccessful asylum application is less attractive.

If the ratio $u_i(\theta)/u_a(\theta)$ varies across types, then some migrants value irregular stay (relative to asylum) more than others. The government can use this variation to screen types. In addition to the standard asylum procedure and the visa lottery, it may be optimal to offer hybrids that randomize between these two options. The design of the optimal menu depends on the specific shape of the ratio $u_i(\theta)/u_a(\theta)$. In practice, such information is unlikely to be available to the government.

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