Temporary Foreign Work Permits: honing the tools to defeat human smuggling

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Motivations

- More than 2.5 million people smuggled each year → feeds illegal activities (UNODC, 2018)
- Public opinion strongly against irregular migration, but more divided about legal migration (Hatton, 2017)
- Labour market needs are not all met by resident workers
  OECD, 2018 ; Fasani and Mazza, 2020
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Can we weaken human smuggling and regulate economic migration flows?

→ towards SDG 2030 target 10.7

“to facilitate orderly, safe, regular and responsible migration”
This paper

- Proposes a scheme of temporary visas \( (p^L, \tau) \) to:
  - throttle smugglers’ activities
  - attract low skilled workers at low price
    - in contrast to Auriol and Mesnard 2016, Becker proposal
  - AND limit migration flows

- This scheme relies on existing legal frameworks
  - e.g. TFWP: Cyprus, Israel, Canada, GCC, S-E Asia, ...

  Often criticised and analysed
  - Djajic, 2013 ; Djajic and Vinogradova, 2015 ; Barsbai et al., 2021

- We model the decisions of migrants facing high risks of failure
  - Bah and Batista, 2018 ; Arcand and Mbaye, 2013

  with distorted risk perceptions (Tversky and Kahneman, 1992)
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risk taken by irregular migrants is key to design "workable" visas
The smuggling market
  the supply
  the demand

Temporary visas scheme
  pricing out smugglers
  self-enforceable visas

Results
  Policies to regulate migration
  Numerical applications
The smuggling market
Market concentration: a few criminal networks provide services
Aronowitz, 2001; Futo and Jandl, 2007; Guerette and Clark, 2005; Lundgren, 2008

- Competition à la Cournot with \( N \) agents
- Generalised Cournot price:
  \[
  \frac{p^I - c}{p^I} = \frac{1}{N} \frac{1}{\epsilon_D(p^I)}
  \]
  \[
  D^I(p^m) < D^I(p^I) < D^I(c)
  \]
Workers with heterogeneous skills, \( \theta \sim F(\theta) \) over \([0, +\infty)\), who

- behave rationally (under standard EUT) or with behavioural traits, according to Cumulative Prospect Theory CPT) (Tversky and Kahneman, 1992)
- face the following lottery if they migrate

\[
\begin{align*}
1 - q & \quad d w_f - p^l \\
q & \quad \Delta_h(\theta) w_h - p^l
\end{align*}
\]
The smuggling market: the demand

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- face the following lottery if they migrate

\[
1 - q \quad dw_f - p^l - \Delta_h(\theta)w_h
\]

\[
q \quad \Delta_h(\theta)w_h - p^l - \Delta_h(\theta)w_h = -p^l
\]

- which they compare to a payoff \( \Delta_h(\theta)w_h \) if they stay home.
The smuggling market: the demand

\[ \omega^+(1 - q)u(dw_f - p' - \Delta_h(\theta')w_h) + \omega^-(q)u(-p') = 0 \]
The smuggling market: the demand

\[ \omega^+(1 - q)u(df - p^I - \Delta_h(\theta^I)w_h) + \omega^-(q)u(-p^I) = 0 \] (1)

- Migration demand: \( D^I(p^I) = \int_0^{\theta^I} \theta dF(\theta) = F(\theta^I) \)
The smuggling market: the demand

\[ \omega^+(1 - q)u(dw_f - p^l - \Delta_h(\theta^l)w_h) + \omega^-(q)u(-p^l) = 0 \] (1)

- Migration demand: \( D^l(p^l) = \int_0^{\theta^l} \theta dF(\theta) = F(\theta^l) \)
- Low-pay jobs abroad: negative selection
Temporary visas scheme
1. Government sells visas \((p^L, \tau)\) s.t. migrants prefer to... 

\((\text{IR})\) migrate legally rather than stay home 

\[
u(\tau w_f + (1 - \tau)\Delta_h(\theta) w_h - p^L) > u(\Delta_h(\theta) w_h)
\]
1. Government sells visas \((p^L, \tau)\) s.t. migrants prefer to...
   (IR) migrate legally rather than stay home
   (IC) migrate legally rather than irregularly

\[ \theta_{LI} = 0 \text{ for } p_I = c \]

\[ \theta_L \]

\[ \theta_{IL} \]

\[ \theta_{IL} \]

\[ \theta_{IL} \]
1. Government sells visas \((p^L, \tau)\) s.t. migrants prefer to...
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   (IC) migrate legally rather than irregularly
2. Smugglers react by lowering their price \(p^I(p^L, \tau)\)
Temporary visas scheme: pricing out smugglers

1. Government sells visas \((p^L, \tau)\) s.t. migrants prefer to...
   (IR) migrate legally rather than stay home
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2. Smugglers react by lowering their price \(p^I(p^L, \tau)\)

→ to price out smugglers, *eviction price* lower than \(p^L\), s.t.

\[ \theta^{LI} = 0 \text{ for } p^I = c \]
Temporary visas scheme: self-enforceable visas

(SE) workers return home after visa expires: Detail

- retain share of income earned abroad, \( s \),
- increase risk of deportation, \( \delta \).

**Proposition 1: self-enforceability**

- Always possible, as long as \( \delta \) is "high enough".
- Minimum deportation threshold \( \delta(\tau, s, d) < 1 \)
  - decreasing with \( s \) and \( \tau \)
  - increasing with \( d \)

\( \diamond \) complementary instruments to \( \delta \)
Results
Policies to regulate migration

**Proposition 2: adjusting eviction price**

The eviction price $p^L(\tau)$ of temporary visas of duration $\tau$ below which smugglers exit the market is implicitly defined by

$$
\omega^+(1 - q)u \left[ (d - \tau)w_f - (1 - \tau)w_h - c + p^L \right] + \omega^-(q)u \left[ p^L - c - \tau (w_f - w_h) \right] = 0
$$

- increases with $\tau$, $c$, $q$
- decreases with $d$.  

{complementary instruments to regulate legal flows}
Policies to regulate migration

A government may want to maintain at least the same skill diversity of foreign workers following the sale of visa \((\tau, p^L(\tau))\).

**Proposition 4: increasing skill diversity**

→ Set the visa duration below a threshold \(\tilde{\tau}(q, c, d) \in [0, 1]\)

solution to

\[
\frac{p^L(\tau)}{\tau} = \Delta_f(\theta^I)w_f - \Delta_h(\theta^I)w_h
\]  

(1)

\(\tilde{\tau}\) decreases with \(q, c\) and increases with \(d\).
A government may want to maintain at least the same skill diversity of foreign workers following the sale of visa \((\tau, p^L(\tau))\).

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\[
\frac{p^L(\tau)}{\tau} = \Delta_f(\theta^I)w_f - \Delta_h(\theta^I)w_h
\]

(1)

\(\tilde{\tau}\) decreases with \(q, c\) and increases with \(d\).

**Proposition 5: cost-effective visas**

A government may seek to minimise its budget, combining optimally enforcement of internal and external controls \((d(l_1^*), c(l_2^*), q(l_3^*))\) with sale of visa \((\tau, p^L(\tau))\) to reach its migration target.
Numerical applications

- Mincer (1970) specification

\[
\begin{align*}
\ln (R_h(\theta)) &= \ln w_h + D_h \theta \\
\ln (R_f(\theta)) &= \ln w_f
\end{align*}
\]

- Income follows a log-normal distribution
  → calibrated using Gini coefficient and GDP per capita (WDI)
  Grogger and Hanson (2011)

- Using the Tversky and Kahneman (1992) utility and risk distortions specifications
### Table 1: Benchmark parameter values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Year</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wages (monthly)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRC</td>
<td>36 PPP</td>
<td>32,806 FC</td>
<td>2020</td>
</tr>
<tr>
<td>Senegal</td>
<td>88 PPP</td>
<td>21,666 Fcfa</td>
<td>2007</td>
</tr>
<tr>
<td>South Africa</td>
<td>155 PPP</td>
<td>1,074 R</td>
<td>2020</td>
</tr>
<tr>
<td><strong>Marginal costs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senegal to Spain</td>
<td>1,150 PPP</td>
<td>266,666 Fcfa</td>
<td>2007</td>
</tr>
<tr>
<td>DRC to South Africa</td>
<td>830 PPP</td>
<td>408 USD</td>
<td>2020</td>
</tr>
<tr>
<td><strong>Smuggling prices</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senegal to Spain</td>
<td>1,690 PPP</td>
<td>391,981 Fcfa</td>
<td>2007</td>
</tr>
<tr>
<td>DRC to South Africa</td>
<td>1,220 PPP</td>
<td>600 USD</td>
<td>2020</td>
</tr>
</tbody>
</table>

Conversion rates between PPP and LCU, for private consumption, were retrieved from World Bank (2020).
Numerical applications – Eviction prices

SENEGAL TO SPAIN

DRC TO SOUTH AFRICA

Risk of failure $q$
Numerical applications– Self-enforcement

**SENEGAL TO SPAIN**

\[ d = 0.8 \]

**DRC TO SOUTH AFRICA**

\[ d = 0.8 \]

- **s = 30\%**
- **s = 60\%**

- **Probability of deportation \( \delta \)**

- **Share of income retention**

- **Visa duration in years**
To conclude...
Wrapping up

• optimal “Policy-Mix”
  ◦ Sale of temporary visas
  ◦ Enforcement of internal and border controls

• No longer “Policy Trade-off”
  ◦ Legalise
  ◦ AND regulate

• BUT self-enforceability is a very strong constraint
  (esp. for South-North migration with high wage differential)
Wrapping up

● optimal “Policy-Mix”
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● No longer “Policy Trade-off”
  ◦ Legalise
  ◦ AND regulate

● BUT self-enforceability is a very strong constraint
  (esp. for South-North migration with high wage differential)

● Ways forward
  ◦ Sanctions against employers of irregular migrants
  ◦ Visa renewal (such as in Canada)
Thank you!

Questions? Comments? Contact us!

alice.mesnard.1@city.ac.uk
Figure 1: Ad on Facebook
"To everyone asking about the way and the price. Travelling straight to Europe by plane costs between 4,000 and 8,000 euros.
If you only want a passport and pay for the plane ticket yourself, and you take the consequences, then the price is 4,000 euro for a 100% genuine passport belonging to someone who looks like you. But if you want to pay after arriving in Europe, the price is 8,000 euro and we will pay for everything and take all the risk.
Just send your picture and your number via Facebook message so we can find a passport belonging to someone who looks like you, and then we will call you."

Figure 1: Ad on Facebook
Appendix
Model gains and losses rather than final wealth

- Loss aversion
- Diminishing sensitivity for gains and losses (S-shaped)
- Diminishing sensitivity regarding probabilities (distortions)
Value function $u(.)$ is S-shaped, with an inflection point in zero, and shows a kink at the origin.

$$u(x) = \begin{cases} 
  x^\alpha, & \text{if } x > 0 \\
  -\lambda(-x)^\beta, & \text{if } x \leq 0 
\end{cases}$$

with $\alpha, \beta > 0$

Remarks:

- Looks like CRRA for $x > 0$;
- $\alpha$, risk-aversion parameter for gains: individuals are risk-averse for gains;
- $\beta$, risk-aversion parameter for losses: individuals are risk-seeking for losses;
- In practice, $\alpha = \beta$. 
Weighting functions are concave near 0 and convex near 1.

\[ \omega(q) = \frac{q^\gamma}{(q^\gamma + (1 - q)^\gamma)^{\frac{1}{\gamma}}} \]

- Individuals overestimate the probabilities related to rare salient events (e.g. successful irregular migration to Europe).
- They underestimate the probability of frequent but non salient events (e.g. failed irregular migration).
- \( \gamma \) captures this distorted perception of reality.
- \( \gamma \rightarrow 0 \) means distortion is high.
- \( \gamma = 1 \) means no distortion.
Figure 2: Probability weighting functions for $\gamma \in (0, 1]$
Workers still face the following lottery if they migrate irregularly:

\[
\begin{align*}
(1 - q) & \quad dw_f - p^l \\
q & \quad \Delta h(\theta) w_h - p^l
\end{align*}
\]
Characterising the threshold type $\theta^{Ll}$, indifferent between legal and irregular migration

- Workers still face the following lottery if they migrate irregularly
  $$1 - q \cdot dw_f - p^l - (\tau w_f + (1 - \tau) \Delta_h(\theta) w_h - p^L)$$
  $$q \cdot \Delta_h(\theta) w_h - p^l - (\tau w_f + (1 - \tau) \Delta_h(\theta) w_h - p^L)$$

- but compare it to the payoff $\tau w_f + (1 - \tau) \Delta_h(\theta) w_h - p^L$
  $\sim$ legal temporary migration of duration $\tau$ and price $p^L$
Characterising the threshold type $\theta^{LI}$ with returns to skills

Generalisation: returns to skill in foreign country

(IR) incentivise workers to migrate legally rather than stay home

$$u\left(\tau \Delta_f(\theta) w_f + (1 - \tau) \Delta_h(\theta) w_h - p^L\right) > u(\Delta_h(\theta)w_h)$$

\[ \Delta_f(\theta) < \Delta_h(\theta) \] \hspace{1cm} \[ \Delta'_f(\theta)w_f - \Delta'_h(\theta)w_h < 0 \]
(SE) incentivise workers to return home after visa expires

- face the following lottery if they overstay to work illegally

\[
\begin{align*}
\text{\(1 - \delta\)} & \quad \tau(1 - s)w_f + (1 - \tau)d w_f - p^L \\
\text{\(\delta\)} & \quad \tau(1 - s)w_f + (1 - \tau)\Delta_h(\theta)w_h - p^L
\end{align*}
\]
(SE) incentivise workers to return home after visa expires

- face the following lottery if they overstay to work illegally

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\delta & \quad \tau(1 - s)w_f + (1 - \tau)\Delta_h(\theta)w_h - p^L
\end{align*}
\]

- which they compare to a payoff \( \tau w_f + (1 - \tau)\Delta_h(\theta)w_h - p^L \) if they comply with visa rules.

- Self Enforcement condition is:

\[
\omega^+(1 - \delta)u \left[ (1 - \tau)(d_wf - \Delta_h(\theta)w_h) - s\tau w_f \right] + \omega^-(\delta)u \left[ -s\tau w_f \right] \leq 0
\]  \hspace{1cm} (2)
A government may want to maintain at least the same skill diversity of foreign workers following the scheme.

**Proposition 4: increasing skill diversity**

If the visa is short enough, below a threshold \( \tilde{\tau}(q, c, d) \in [0, 1] \) solution to

\[
\frac{p^L(\tilde{\tau})}{\tilde{\tau}} = w_f - \Delta_h(\theta^I) w_h
\]

the scheme increases the skill diversity of migrants.

This threshold decreases with \( q, c \) and increases with \( d \).
We follow Grogger and Hanson (2011).

Relationship between Gini coefficient $\Gamma$, average income and distribution parameters, when income is log-normal.

For $\ln R \sim \mathcal{N}(\mu, \sigma^2)$,

$$\sigma = \sqrt{2}\Phi^{-1}\left(\frac{\Gamma + 1}{2}\right)$$

and

$$E(R) = \exp\left(\mu + \frac{\sigma^2}{2}\right)$$
## Calibrating the distribution

<table>
<thead>
<tr>
<th>Country</th>
<th>Parameter</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal</td>
<td>Gini</td>
<td>39.2%</td>
<td>WDI (2005)</td>
</tr>
<tr>
<td></td>
<td>GDP / capita / annum</td>
<td>2526.4</td>
<td>WDI (2007)</td>
</tr>
<tr>
<td>Spain</td>
<td>Gini</td>
<td>31.4%</td>
<td>WDI (2007)</td>
</tr>
<tr>
<td></td>
<td>GDP / capita / annum</td>
<td>32430.1</td>
<td>WDI (2007)</td>
</tr>
</tbody>
</table>

Note: GDP in 2017 PPP
Calibrating the distribution

Figure 3: Calibrated log-income in SN and SP (in 2017 PPP per annum)

→ lifetime income \approx \text{income per annum} \times 40
Variation in demand

- Log-revenue is linear in $\theta$ and follows a normal distribution.

- $$\frac{F(\theta^L) - F(\theta^I)}{F(\theta^I)} = \frac{G(\ln R^L_h) - G(\ln R^I_h)}{G(\ln R^I_h)}$$

where $G$ denotes the cumulative density function of the distribution $\mathcal{N}(\mu_h, \sigma_h)$, while $R^L_h = \Delta_h(\theta^L) w_h$ and $R^I_h = \Delta_h(\theta^I) w_h$ are the incomes of individuals $\theta^L$ and $\theta^I$ in the home country.
Variation in demand

• Using the Tversky and Kahneman (1992) functional forms, condition on irregular migrant threshold ($\theta^l$) yields:

$$R^l_h = dw_f - p^l - \left( \lambda \frac{\omega^{-}(q)}{\omega^{+}(1 - q)} \right)^{\frac{1}{\alpha}} p^l$$

• Individual Rationality constraint yields

$$R^L_h = w_f - \frac{p^L(\tau)}{\tau}$$
Predicting eviction prices

- Using the Tversky and Kahneman (1992) functional form

- Closed-form expression for eviction price

\[ p^L(\tau) = c + \tau(w_f - w_h) + \left(1 + \left(\frac{\omega^-(q)}{\omega^+(1 - q)}\right)^{\frac{1}{\alpha}}\right)^{-1}(w_h - dw_f) \]

- Compute the minimum retention share \( s \) using an iterative solver on SE applied to \( \theta = 0 \):

\[
\omega^+(1 - \delta)u \left[(1 - \tau)(dw_f - w_h) - s\tau w_f \right] + \omega^-(\delta)u \left[-s\tau w_f \right] = 0
\]

- Variation in share of migrants:

\[
\frac{F(\theta^L) - F(\theta^I)}{F(\theta^I)} \text{ retrieved from variation in income}
\]
DRC TO SOUTH AFRICA

Eviction prices

Corresponding variations in the share of migrants
DRC TO SOUTH AFRICA

$p^L = 250$ PPP ($125$ USD)

$p^L = 1200$ PPP ($600$ USD)
**Table 2: Eviction schemes: Senegal to Spain**

<table>
<thead>
<tr>
<th>Duration in years</th>
<th>Risk of failure</th>
<th>Eviction price</th>
<th>Variation in the share of migrants</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>60%</td>
<td>-25,050*</td>
<td>1%</td>
</tr>
<tr>
<td>4</td>
<td>75%</td>
<td>-3,221*</td>
<td>1%</td>
</tr>
<tr>
<td>4</td>
<td>90%</td>
<td>120</td>
<td>1%</td>
</tr>
<tr>
<td>4</td>
<td>90%</td>
<td>250</td>
<td>1%</td>
</tr>
<tr>
<td>4</td>
<td>90%</td>
<td>18,214*</td>
<td>-2%</td>
</tr>
<tr>
<td>6</td>
<td>60%</td>
<td>-5,273*</td>
<td>1%</td>
</tr>
<tr>
<td>6</td>
<td>75%</td>
<td>120</td>
<td>1%</td>
</tr>
<tr>
<td>6</td>
<td>75%</td>
<td>250</td>
<td>1%</td>
</tr>
<tr>
<td>6</td>
<td>75%</td>
<td>16,555*</td>
<td>0%</td>
</tr>
<tr>
<td>6</td>
<td>90%</td>
<td>120</td>
<td>1%</td>
</tr>
<tr>
<td>6</td>
<td>90%</td>
<td>250</td>
<td>1%</td>
</tr>
<tr>
<td>6</td>
<td>90%</td>
<td>37,991*</td>
<td>-9%</td>
</tr>
<tr>
<td>8</td>
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<td>8</td>
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<td>1%</td>
</tr>
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<td>8</td>
<td>60%</td>
<td>14,502*</td>
<td>0%</td>
</tr>
<tr>
<td>8</td>
<td>75%</td>
<td>120</td>
<td>1%</td>
</tr>
<tr>
<td>8</td>
<td>75%</td>
<td>250</td>
<td>1%</td>
</tr>
<tr>
<td>8</td>
<td>75%</td>
<td>36,332*</td>
<td>-2%</td>
</tr>
<tr>
<td>8</td>
<td>90%</td>
<td>120</td>
<td>1%</td>
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<tr>
<td>8</td>
<td>90%</td>
<td>250</td>
<td>1%</td>
</tr>
<tr>
<td>8</td>
<td>90%</td>
<td>57,768*</td>
<td>-16%</td>
</tr>
</tbody>
</table>
Table 3: Eviction schemes: DRC to South Africa

<table>
<thead>
<tr>
<th>Duration in years</th>
<th>Risk of failure</th>
<th>Eviction price</th>
<th>Variation in the share of migrants</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>60%</td>
<td>-2,495*</td>
<td>25%</td>
</tr>
<tr>
<td>4</td>
<td>75%</td>
<td>120</td>
<td>19%</td>
</tr>
<tr>
<td>4</td>
<td>75%</td>
<td>250</td>
<td>18%</td>
</tr>
<tr>
<td>4</td>
<td>75%</td>
<td>511*</td>
<td>16%</td>
</tr>
<tr>
<td>4</td>
<td>90%</td>
<td>120</td>
<td>34%</td>
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<td>4</td>
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<td>15%</td>
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<td>250</td>
<td>15%</td>
</tr>
<tr>
<td>6</td>
<td>60%</td>
<td>371*</td>
<td>14%</td>
</tr>
<tr>
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<td>75%</td>
<td>120</td>
<td>19%</td>
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<tr>
<td>6</td>
<td>75%</td>
<td>250</td>
<td>18%</td>
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<tr>
<td>6</td>
<td>75%</td>
<td>3,378*</td>
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Mbaye, Linguère Mously, ““Barcelona or die”: understanding illegal migration from Senegal,” IZA J Migration, Nov 2014, 3 (1), 21–19.


World Bank, “International Comparison Program,” 2020. data retrieved from World Development Indicators, World Bank and Eurostat-OECD PPP Programme: