OPTIMAL ASSIGNMENT OF BUREAUCRATS:
EVIDENCE FROM RANDOMLY ASSIGNED TAX COLLECTORS IN THE DRC

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Improving the Assignment of Public Sector Workers

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   - Hiring: often weakly tied to expected performance (examinations)
   - Promotion: often based on seniority
   - Firing: life-appointment to public service
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- Assignment: costless tool to increase performance?
Optimal Assignment of Tax Collectors in DRC

- **Setting**: 2018 property tax campaign in Kananga, DRC

- **Experiment**: two-stage random assignment
  1. 34 tax collectors to new two-person teams each month
  2. Collector teams to 180 neighborhoods (19,600 properties)
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   1. 34 tax collectors to new two-person teams each month
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► **Roadmap:** we estimate
   1. Household and collector type: local chief knowledge, observed performance
   2. **Expected tax compliance** for each combination
      ▶ Mechanism analysis using survey data
   3. **Optimal assignment:** max compliance s.t. status quo constraints
   4. **Impact of optimal assignment** compared to status quo assignment
   5. **Benchmarks:** counterfactual selection policies
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Kananga, D.R. Congo

- Fourth most populous city in the DRC
  - Population ≈ 1.6 million
- Median HH income: ≈ $106 (PPP $168) per month
A Weak State with Very Low Tax Revenue

- Provincial tax revenue extremely low: <$1 per person
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- Trying to raise revenue with property tax ($\approx 29\%$ tax revenue):  
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- Provincial tax revenue extremely low: < $1 per person
- Trying to raise revenue with property tax ($29\%$ tax revenue):  
  - Potentially easy to tax, efficient, rapid urbanization
- First systematic property tax collection in 2016:  
  - Door-to-door campaign by state agents  
  - Low tax compliance: $\approx 10\%$ (Weigel 2020)
Property Tax Details

- **Fixed annual fee** – common in LICs w/o valuation roll
  - “Low value band” (90% of prop.): 3,000 FC ($\approx 2$ USD)
  - “High value band” (10% of prop.): 13,200 FC ($\approx 9$ USD)

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<th>Low band ($1,000 value)</th>
<th>High band ($8,134 value)</th>
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ML approach

- **Delinquency**: tax + fine (1.5x), court summons

Sanctions

- Enforcement uncommon, but 52% think sanctions likely
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**Property Tax Details**

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2018 Property Tax Campaign Mechanics

- Two stages of door-to-door tax collection by teams of 2 collectors

1. Property register of full neighborhood (no valuation roll)
   - Assess tax liability based on building material
   - Property owners receive a unique tax ID and a tax letter

2. Tax visits: door-to-door tax appeals
   - Collectors use handheld printers to issue receipts to payers
   - Effort (number/timing of visits) and tactics to convince taxpayers at discretion of collectors
Status Quo Collector Assignment

- **Two-stage random assignment:**
  1. Each month, teams of 2 randomly formed
  2. Teams randomly assigned to two neighborhoods for rest of month
  - Balance Tests: Chars. of prop., owner, and neighborhood

- **Median assignment load:**
  - 6 different teammates
  - 12 different neighborhoods
  - 1,524 properties

- **Rationale:** Avoid collusion (collector-collector, collector-household)
  (Brewer 1990, Bertrand et al 2020, Chu et al 2020)
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Expected Tax Compliance by Type Combinations

- Collector type: “high” or “low” effectiveness
- Household type: “high” or “low” ability to pay
- “Match” is combination of types: e.g., \((c_1, c_2, hh) = (L, H, h)\)
- Expected Tax Compliance: compliance one would expect to observe for a particular combination
  - Experiment provides estimate for each combination
  - Randomization ensures unbiased by other factors
Optimal Assignment

- Assignment function $f$: distribution of assignments across type combinations

- Optimal assignment function ($f^*$):
  - Distribution that maximizes compliance
  - I.e., how can we reshuffle assignments to achieve the highest compliance possible?

- Status quo constraints:
  1. Non-overlapping assignment: one team of coll. per household
  2. Workload constraint: nb of assignments by coll. type same as $f^{SQ}$
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Defining Household and Collector Types

- **Household Types**: Local Chief Predictions
  - Chief predicted ability to pay of each property owner
  - Low-type = “unlikely”, High-type = “likely/very likely” to pay

- **Collector Types**: FE model + sample splitting
  - Collector’s effectiveness across random assignments
  - Estimate in holdout sample to avoid overfitting
Estimating Compliance Function and Optimal Assignment

- **Average Compliance Function:**
  - Use observed data in analysis sample to estimate average compliance for each combination
  - Five combinations: $(H, H, h), (L, H, h), (L, L, h), (H, H, l), (L, H, l)$
    - Omitted category is $(L, L, l)$

- **Optimal Assignment Function:**
  - Plug in estimates $\hat{y}_{hnt}$ in optimal assignment pb and solve for $f^*$
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Characterizing the Optimal Assignment

The diagram shows the assignment probability for different household types under the status quo. The x-axis represents different household types: LL, LH, HH for low-type households and LL, LH, HH for high-type households. The y-axis represents the assignment probability. The bar chart indicates a significantly higher assignment probability for HH households in the high-type category compared to other types.
Characterizing the Optimal Assignment
Tax Compliance by Collector and Household Type

Convex in collector type: $H_1: Y(H, H, h) - Y(L, H, h) > 0 (p = 0.037)$
Complementarities in Collector Type

Convex in collector type:

\[ H_1 : [Y(H, H, h) - Y(L, H, h)] - [Y(H, L, h) - Y(L, L, h)] > 0 \ (p=0.037) \]
Complementarities in Collector-Household Type

Convex in collector-household type:

\[ H_1 : \left[ Y(H, H, h) - Y(L, L, h) \right] - \left[ Y(H, H, l) - Y(L, L, l) \right] > 0 \quad (p < 0.001) \]
Impacts of the Optimal Assignment

Implementing the optimal assignment would increase compliance by 37%.
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Impacts of the Optimal Assignment

Collector-household and collector-collector would contribute equally
Mechanisms and Benchmarks

1. What explains complementarities?

   ✗ Collector skills: No compl. persuasion techniques

   ✔ Collector effort: Compl. in number of days hours spent collecting
      ▶ Consistent with coordination problem: if either collector is late, both don’t collect (e.g., O-Ring properties (Kremer 1993))
Mechanisms and Benchmarks

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2. Benchmark policies
   - Reallocate 62% of $c_L$ assignments to $c_H$ to = optimal assignment
   - Replacing $c_L$ cannot yield same gains
   - Increase wages by 69%, but net revenue loss

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Taking Stock on the Optimal Assignment of Collectors

- Field experiment studying the random assignment of tax collectors to neighborhoods and teammates

- Optimal assignment:
  - Assortative matching on collector type and collector-household type
  - Complementarities reflect $c^H$ exerting higher effort when matched with other $c^H$, especially for h-type properties

- Impact:
  - Implementing the optimal assignment would $\uparrow$ compliance by 37%

$\Rightarrow$ Bureaucrat assignment as a resource neutral policy to $\uparrow$ fiscal capacity
Thank you!

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