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

Augustin Bergeron[1] Pedro Bessone[2]
John Kabeya Kabeya[3] Gabriel Tourek[4] Jonathan Weigel[5]

[1]University of Southern California [2]Uber [3]Direction Générale des Recettes du Kasaï Central
[4]University of Pittsburgh [5]UC Berkeley

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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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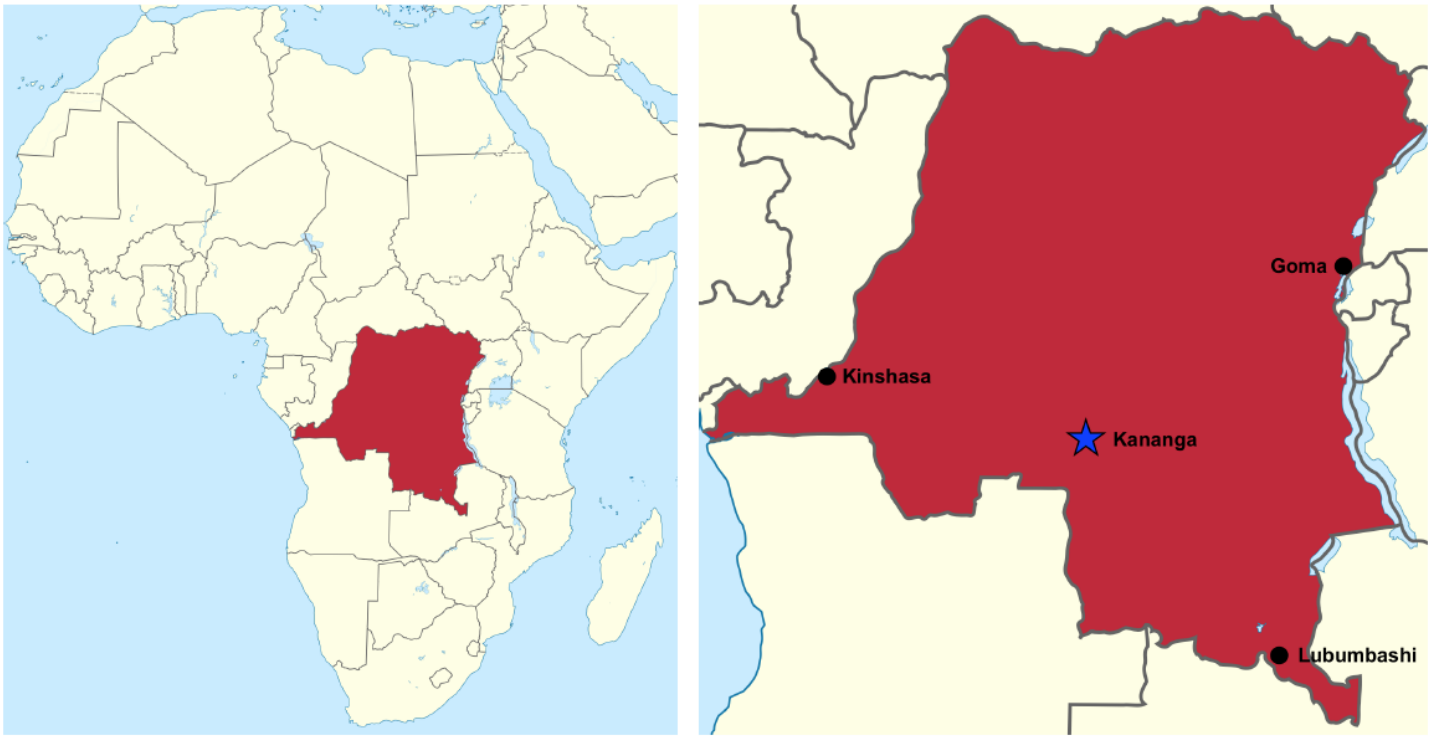
- Experiment: two-stage random assignment
  1. 34 tax collectors to new two-person teams each month
  2. Collector teams to 180 neighborhoods (19,600 properties)
- Roadmap: we estimate
  1. Household and collector type: local chief knowledge, observed performance
  2. Expected tax compliance for each 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

Outline

Kananga, D.R. Congo



- Fourth most populous city in the DRC
  - Population $\approx$ 1.6 million
- Median HH income: $\approx$ \$106 (PPP \$168) per month

A Weak State with Very Low Tax Revenue

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- Trying to raise revenue with property tax ($\approx$ 29% tax revenue Go):
  - 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) Comparisons

Property Tax Details

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

Low band ($1,000 value)

High band ($8,134 value)

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- Rate: $\approx$ 0.34% of property value (US 0.27% – 2.44%) ML approach
- Delinquency: tax + fine (1.5x), court summons Sanctions
  - Enforcement uncommon, but 52% think sanctions likely

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 Balance Tests

- 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)

Outline

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

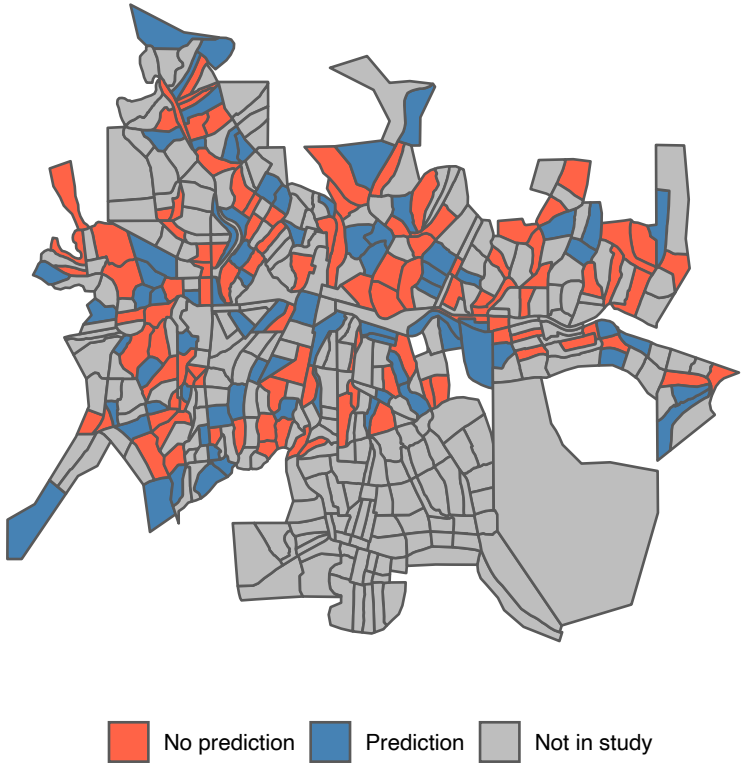
Optimal Assignment

- 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}

Outline

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



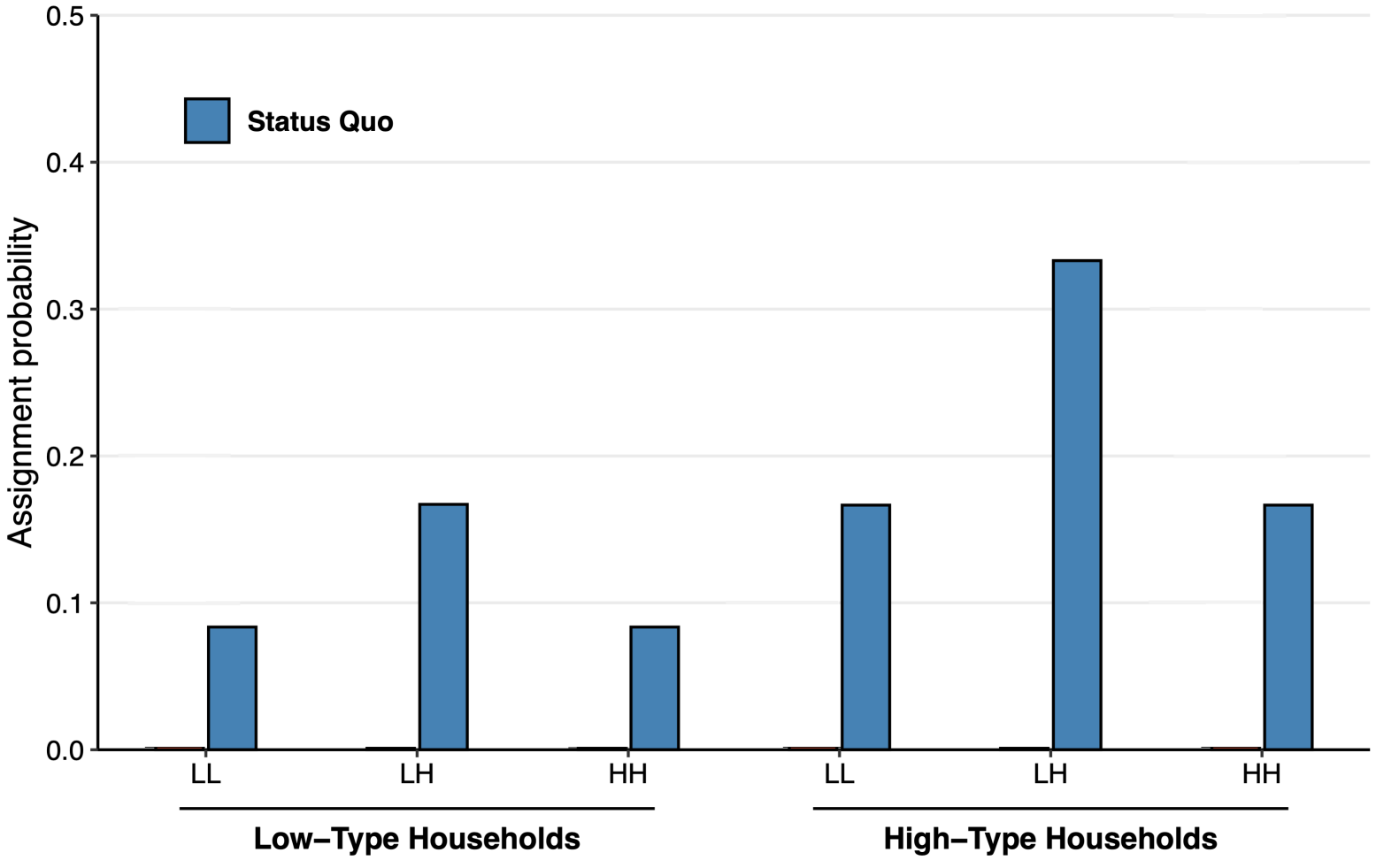
HH Col.

Estimating Compliance Function and Optimal Assignment

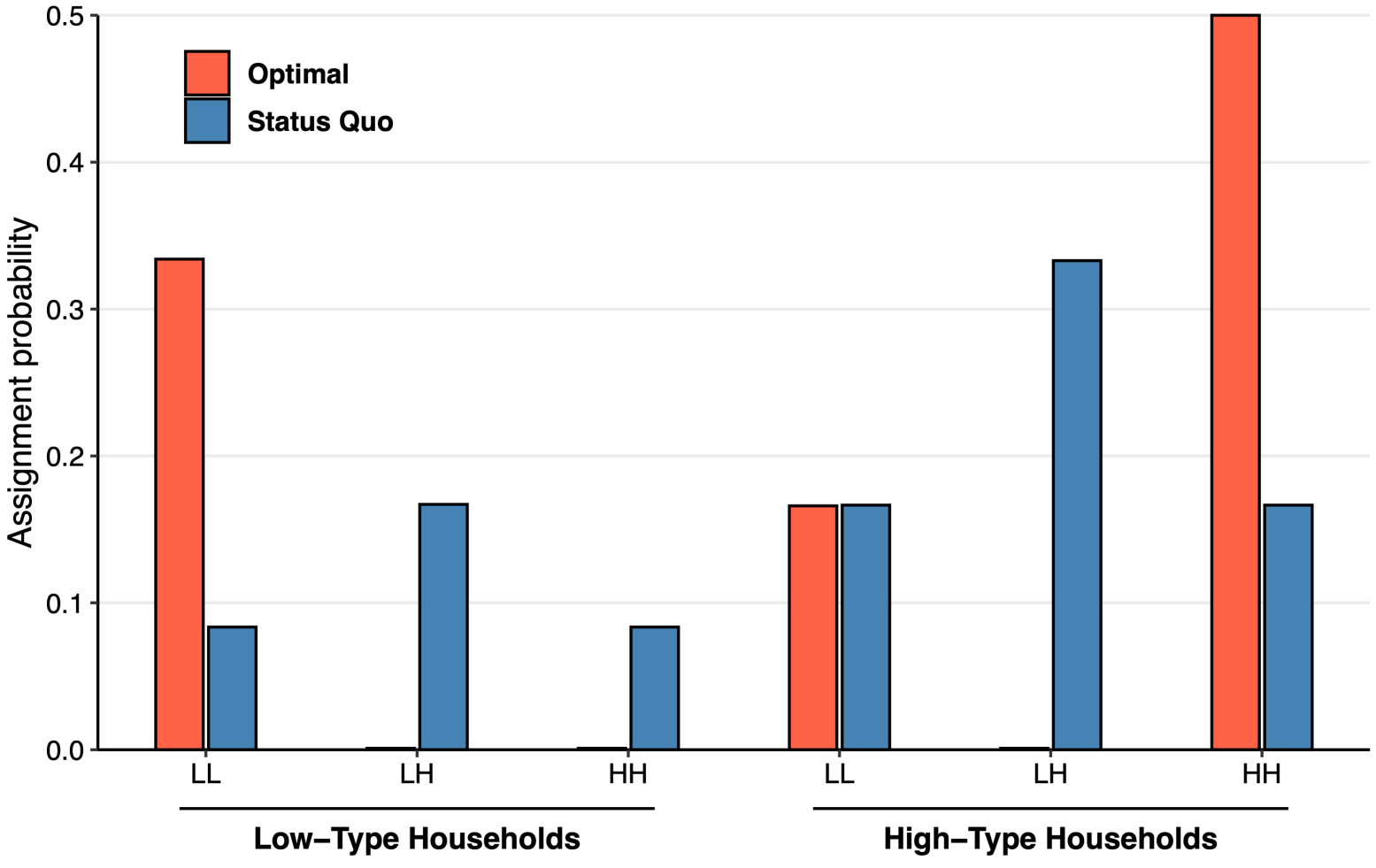
- Average Compliance Function:
  - Use observed data in analysis sample to estimate average compliance for each combination
  - Five combinations: $(H, H, h), (L, H, h), (L, L, h), (H, H, l), (L, H, l)$
    - Omitted category is (L, L, l)
- Optimal Assignment Function:
  - Plug in estimates $\hat{y}_{hnt}$ in optimal assignment pb and solve for f^*

Outline

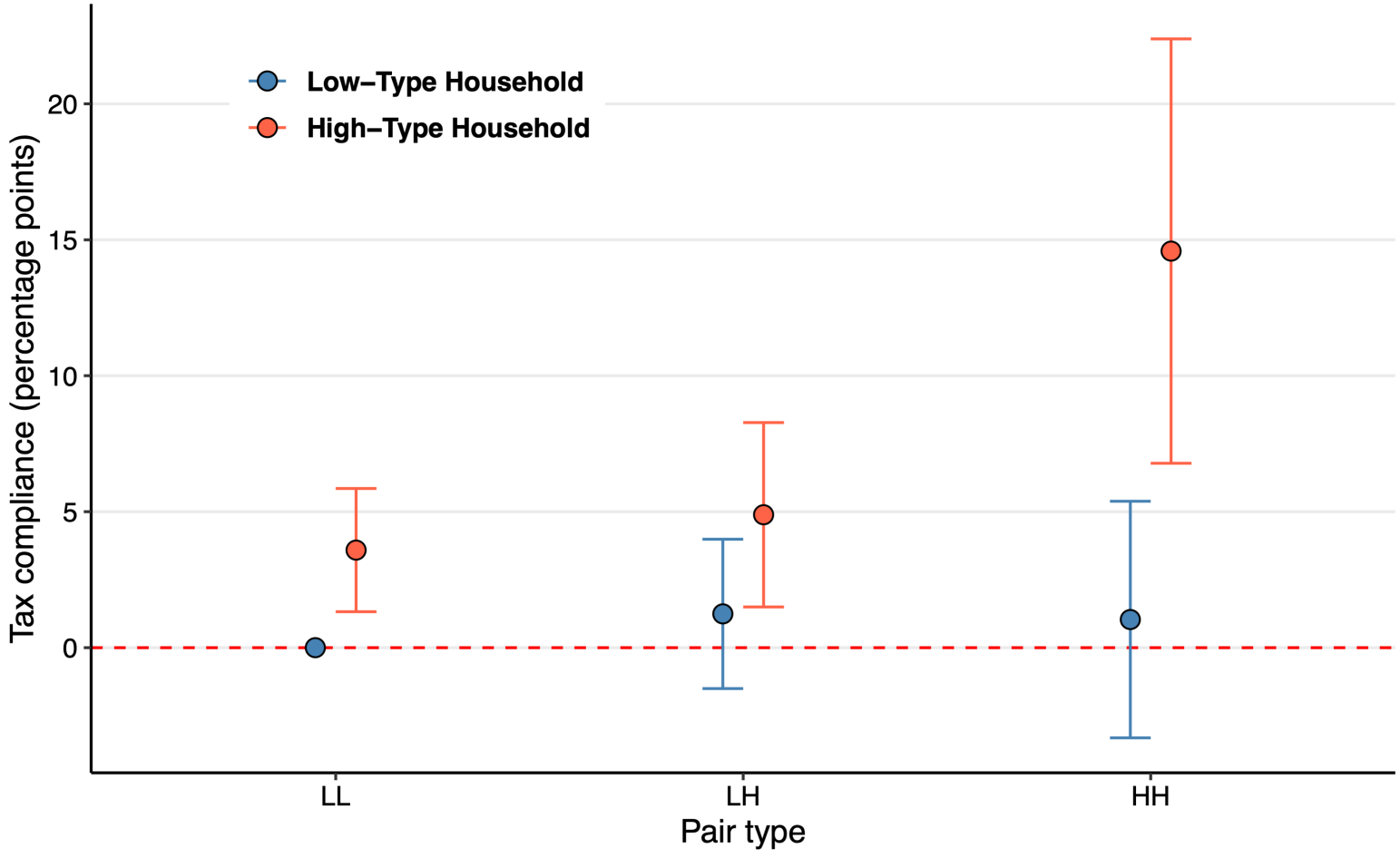
Characterizing the Optimal Assignment



Characterizing the Optimal Assignment

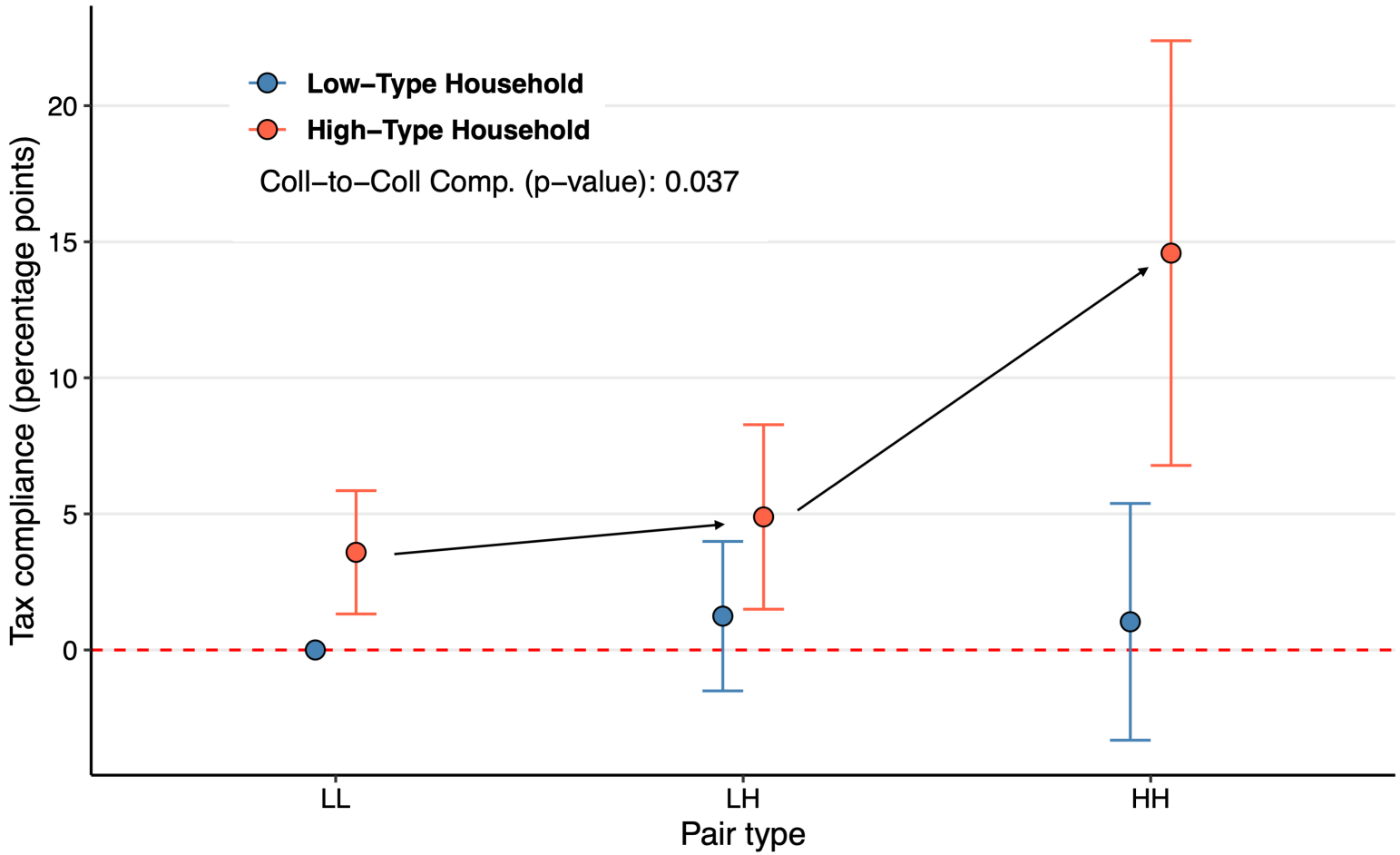


Tax Compliance by Collector and Household Type



Bayesian Bootstrap SEs | Tax Revenue

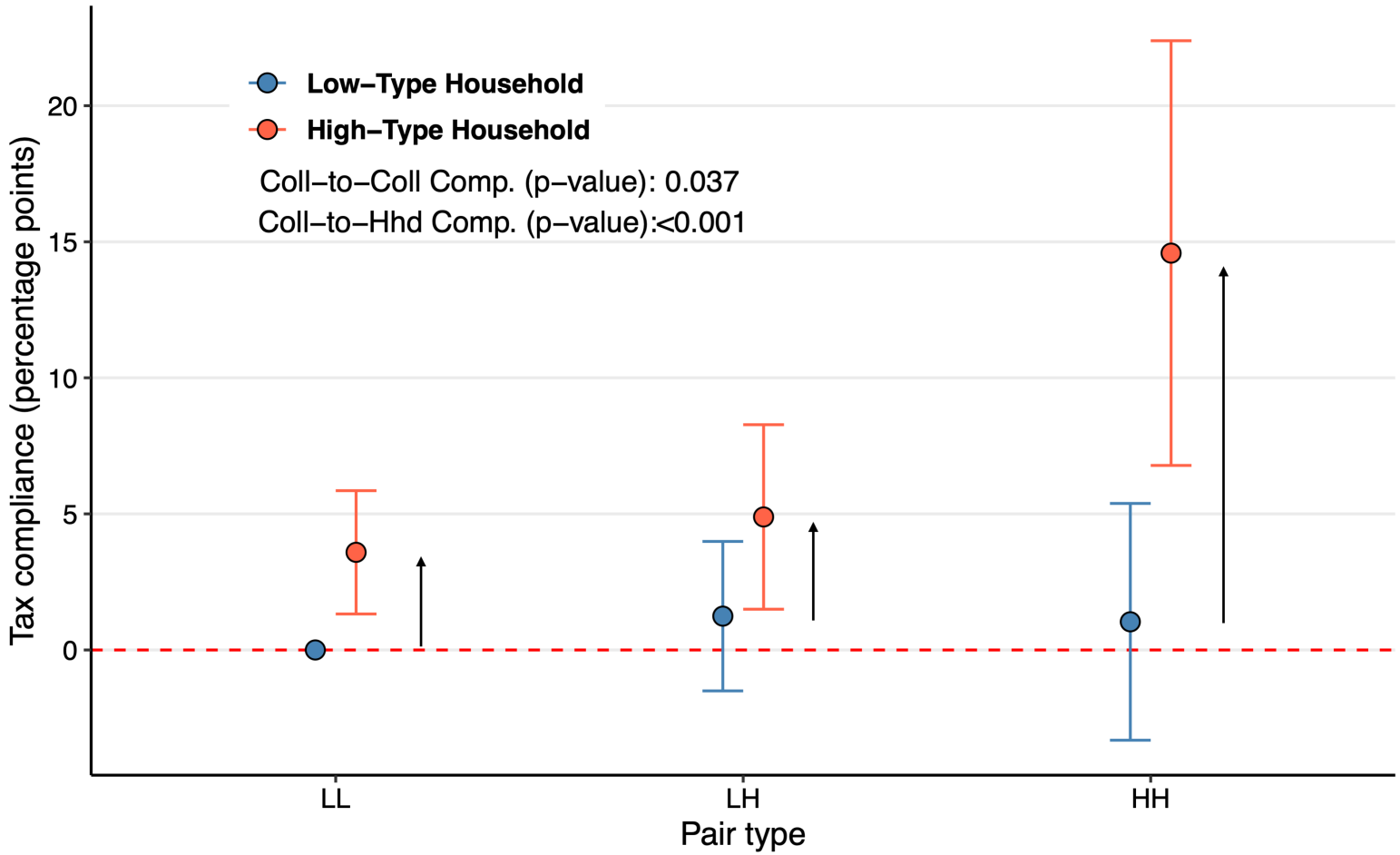
Complementarities in Collector Type



- 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)

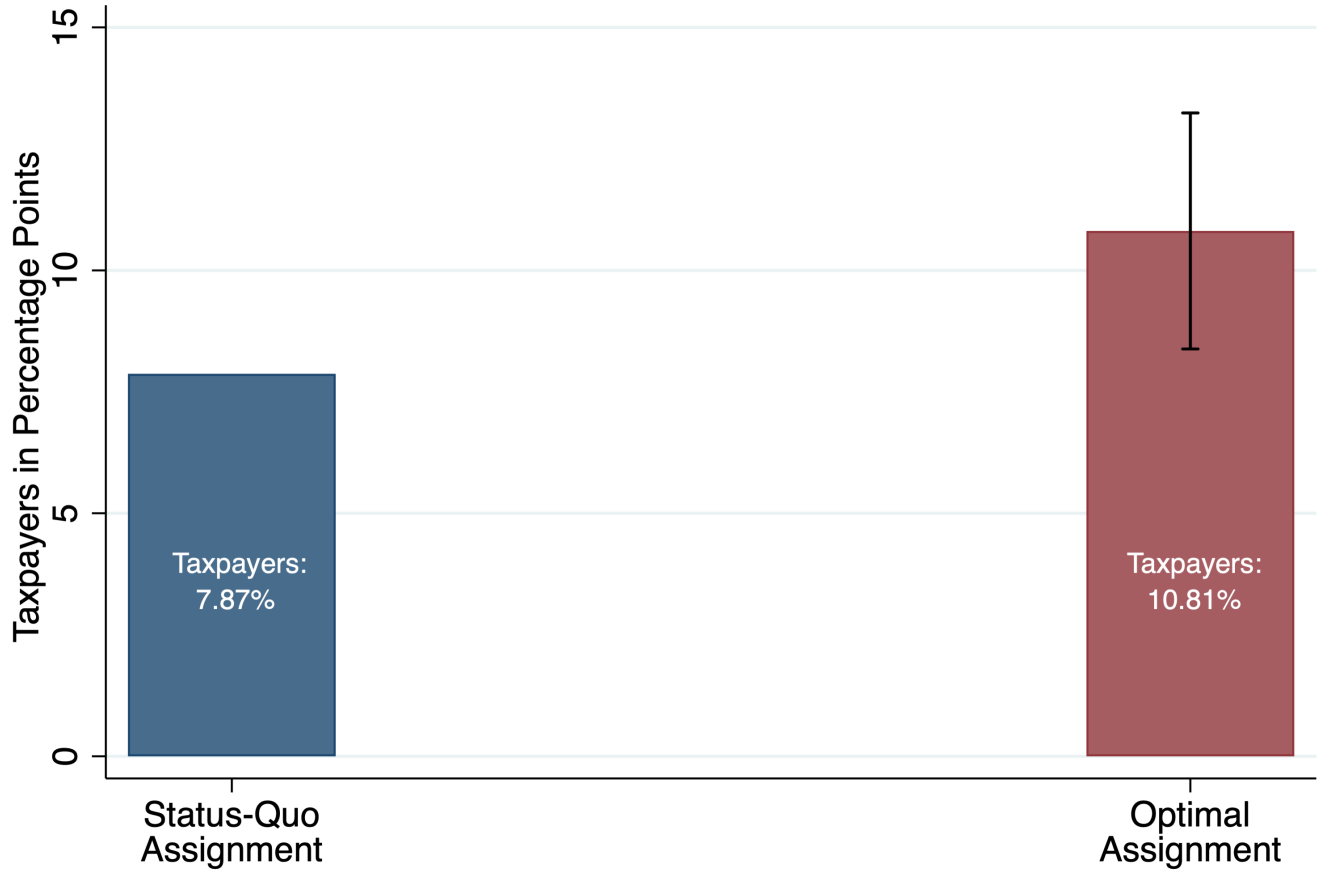
Complementarities in Collector-Household Type



- Convex in collector-household type:

$H_1 : [Y(H,H,h) - Y(L,L,h)] - [Y(H,H,l) - Y(L,L,l)] > 0$ (p < 0.001)

Impacts of the Optimal Assignment



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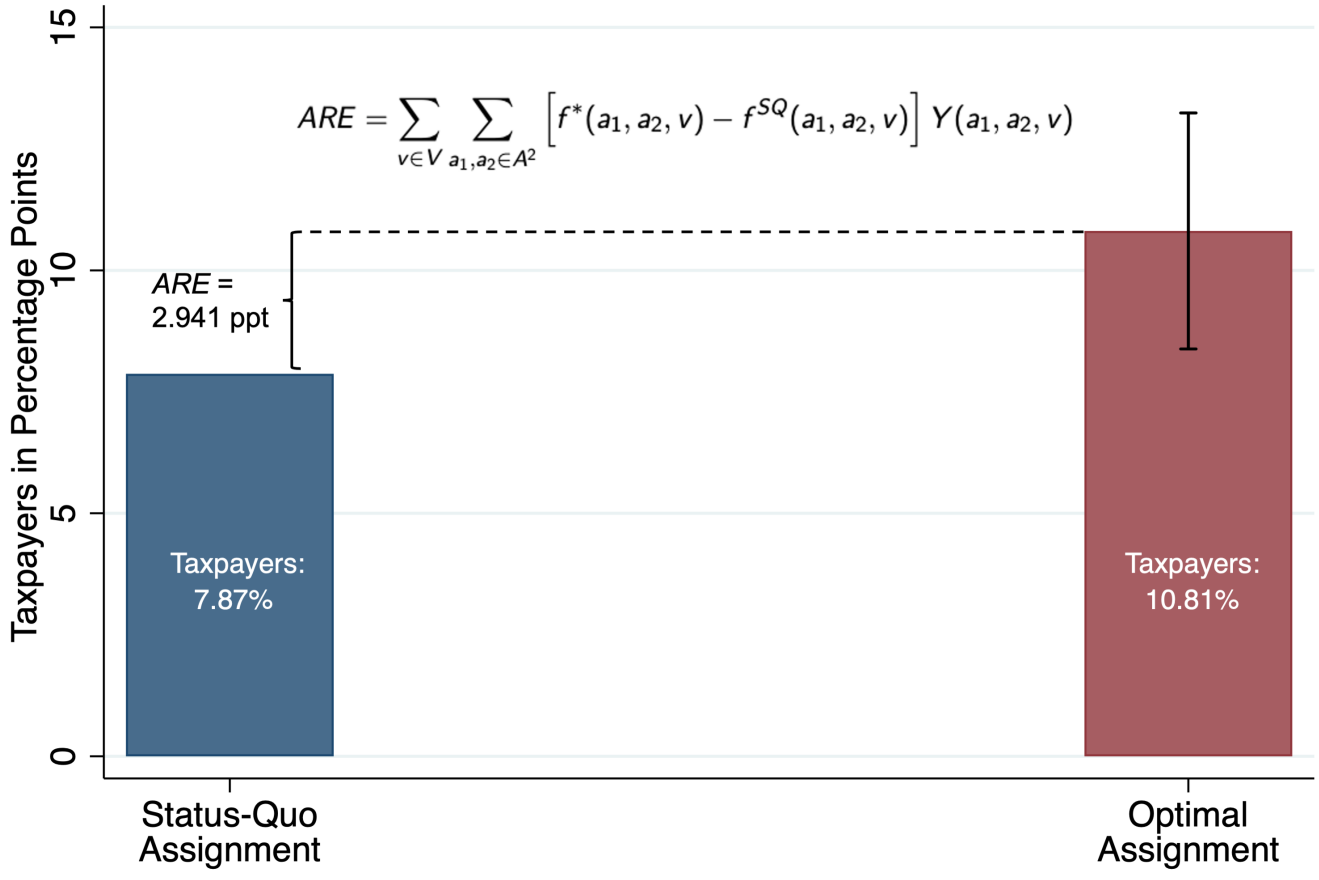

- Implementing the optimal assignment would ↑ compliance by 37% Table

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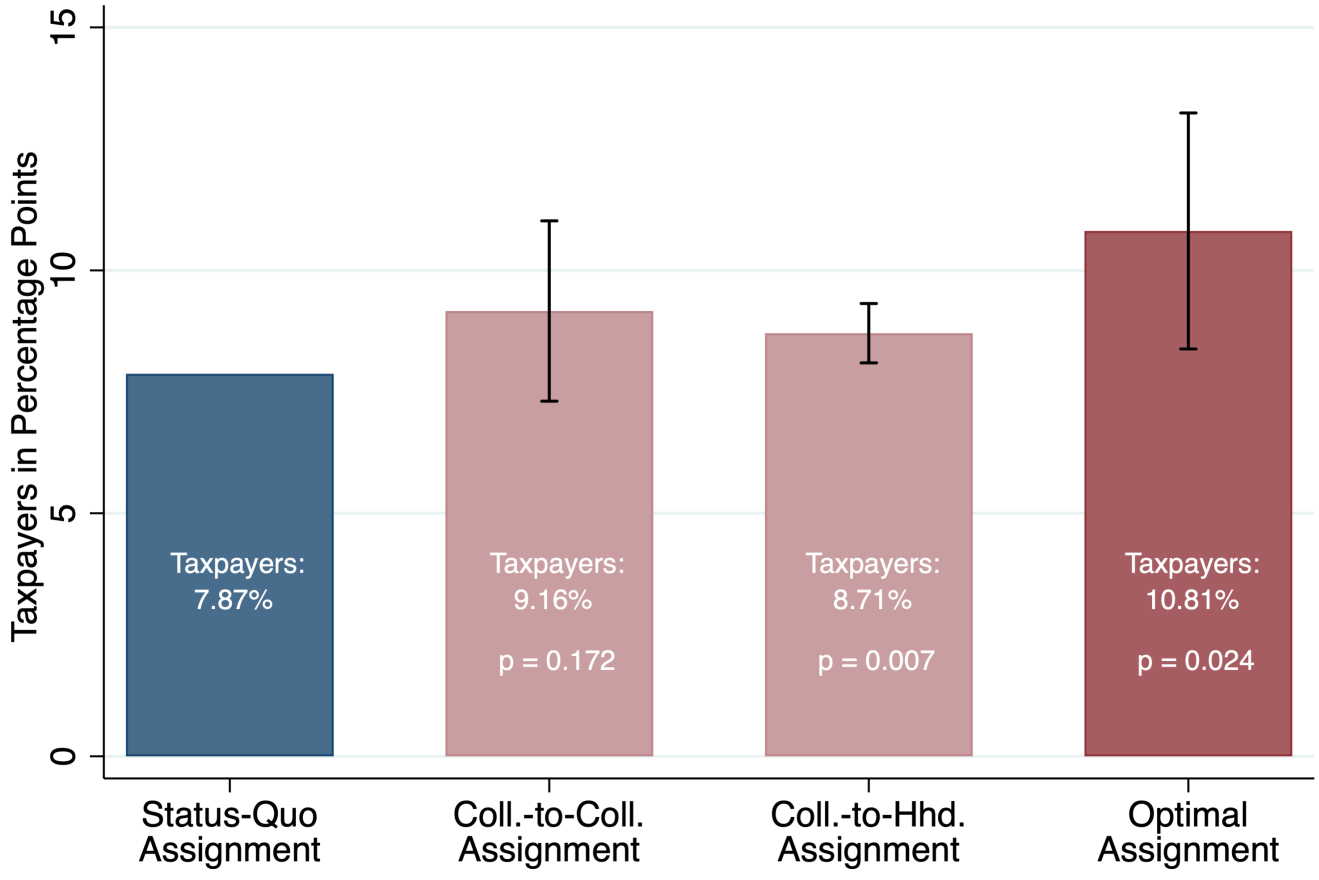

- Collector-household and collector-collector would contribute equally Table

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))

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2. Benchmark policies Detail
   - 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

Conclusion

Outline

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!

gabriel.tourek@pitt.edu