The State Capacity Ceiling on Tax Rates: Evidence from Randomized Tax Abatements in the DRC

Augustin Bergeron, Gabriel Z. Tourek & Jonathan L. Weigel

February 18, 2024

Introduction

- We discussed in an earlier class that tax enforcement is crucial. You just not only need to detect but also recover evasion.

- However, changes in tax enforcement effectively increase effective tax rates as reporting increases. Therefore, there can be a trade off between tax enforcement vs tax rates.

- If you need to raise R new dollars, either increase enforcement or increase tax rates

- In Jensen paper we discussed that imperfect enforcement through informality can be redistributive, therefore it might be sometimes better to increase taxes rather than enforcement.

This paper

- How tax enforcement and tax rates jointly effect fiscal capacity in low income countries?
- Tax compliance is low: on average, 8.8% of property owners paid the property tax in 2018.
- Randomly assign 38,028 property owners to the status quo tax rate or to a rate reduction.
- Changes in reported tax liabilities indicate that current rate was above revenue maximizing threshold.
- Then, through randomized enforcement letters and random assignment of tax collectors shows that the RMTR increases with enforcement.
- Tax rates and enforcement are thus complementary levers.

Experiment

- ▶ Exploit random variation in the joint distribution of tax rates and tax enforcement in the DRC, a very low capacity state and one of the world's poorest countries.

- ▶ In its 2018 property tax campaign, the Provincial Government of Kasaï-Central randomly assigned tax abatements at the property level.

- ▶ The 38,028 properties in the city were randomly assigned to the status quo annual tax liability (control) or a reduction of 17%, 33%, or 50%.

- ▶ Taxpayers were just informed about their liability.

- ▶ Use this variation to estimate the elasticity of tax compliance and revenue with respect to the tax rate as well as the RMTR.

- ▶ Randomized enforcement messages on tax notices and random assignment of tax collectors to neighborhoods to study how the RMTR responds to changes in the enforcement environment.

Results: Does lower tax rates increase compliance?

TABLE 1: TREATMENT EFFECTS ON TAX COMPLIANCE AND REVENUE

	Outcome: Tax Compliance (Indicator)				Outcome: Tax Revenue (in CF)			
	All properties		Low-value properties	High-value properties	All properties		Low-value properties	High-value properties
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Treatment Effects								
50% Reduction	0.074***	0.073***	0.076***	0.050***	28.675**	24.711*	28.270**	16.743
	(0.004)	(0.004)	(0.004)	(0.012)	(14.145)	(13.828)	(9.201)	(109.071)
33% Reduction	0.044***	0.044***	0.046***	0.026**	35.616**	34.069**	35.327***	17.659
	(0.004)	(0.004)	(0.004)	(0.010)	(15.316)	(14.937)	(9.837)	(113.175)
17% Reduction	0.011**	0.011***	0.014***	-0.013	-20.518	-20.202	6.404	-253.891**
	(0.003)	(0.003)	(0.004)	(0.009)	(14.750)	(14.420)	(10.034)	(109.150)
Mean (control)	0.056	0.056	0.057	0.046	216.903	216.903	170.611	611.74
Panel B: Marginal Effects								
ln(Tax Rate in CF)	-0.112***	-0.110***	-0.114***	-0.085***	-62.089***	-55.870**	-47.027***	-170.321
	(0.006)	(0.006)	(0.006)	(0.016)	(18.669)	(18.274)	(12.267)	(142.544)
Mean (sample)	0.088	0.088	0.092	0.062	229.662	229.662	188.888	560.547
Panel C: Elasticities								
Elasticity	-1.266	-1.246	-1.241	-1.37	-0.270	-0.243	-0.249	-0.304
	(0.063)	(0.061)	(0.063)	(0.232)	(0.083)	(0.081)	(0.065)	(0.247)
p-value (elasticity=0)					0.0011	0.0026	0.0001	0.2195
Observations	38028	38028	33856	4172	38028	38028	33856	4172
Sample	All properties	All properties	Low-value properties	High-value properties	All properties	All properties	Low-value properties	High-value properties
FE: Property Value Band	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE: Neighborhood	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Notes: This table reports estimates from Equations (1), (2), and (3). The dependent variable is an indicator for compliance in Columns 1–4 and tax revenues (in Congolese Francs) in Columns 5–8. Panel A reports treatment effects from Equation (1), comparing property tax compliance and revenue for the tax abatement treatment groups relative to the status quo property tax rate (the excluded category). Panel B reports the mean tax compliance and revenue as well as the marginal effect of changes in tax rates (in CF) on tax compliance and revenue from Equation (2). These two estimates are used in Panel C to compute the elasticities of tax compliance and revenue with respect to the tax rate following Equation (3) and to calculate the p-value associated with the elasticity of tax revenue. All regressions include an indicator for the property value band

Mechansims

TABLE 2: TREATMENT EFFECTS ON COMPLIANCE — ROBUSTNESS: ACCOUNTING FOR KNOWLEDGE OF OTHERS' RATES, PAST RATES, AND PAST TAX COLLECTION

					Outcome: Tax Compliance (Indicator)					
	Neighbors' rate		Neighbors' rate		Discounts		Past rates		Past tax campaign	
	Ctrl for 5	Ctrl for 10	Doesn't Know	Knows	Doesn't Know	Knows	Doesn't Know	Knows	No	Yes
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Treatment Effects										
50% Reduction	0.073***	0.073***	0.084***	0.093***	0.062***	0.241	0.113***	0.159*	0.081***	0.069***
	(0.004)	(0.004)	(0.008)	(0.022)	(0.012)	(0.221)	(0.023)	(0.085)	(0.007)	(0.005)
33% Reduction	0.044***	0.044***	0.055***	0.067**	0.043***	0.094	0.046**	0.084	0.042***	0.045***
	(0.004)	(0.004)	(0.007)	(0.022)	(0.011)	(0.195)	(0.022)	(0.089)	(0.006)	(0.005)
17% Reduction	0.011**	0.011**	0.006	-0.002	0.002	-0.013	-0.016	0.027	0.008	0.013**
	(0.003)	(0.003)	(0.006)	(0.020)	(0.010)	(0.161)	(0.019)	(0.088)	(0.005)	(0.004)
Mean (control)	0.056	0.056	0.071	0.104	0.064	0.114	0.079	0.143	0.055	0.056
Tests of coef. equality:										
50% Reduction			$p_{50\%}$ =0.687		$p_{50\%}$ =0.617		$p_{50\%}$ =0.455		$p_{50\%}$ =0.102	
33% Reduction			$p_{33\%}$ =0.562		$p_{33\%}$ =0.565		$p_{33\%}$ =0.551		$p_{33\%}$ =0.855	
17% Reduction			$p_{17\%}$ =0.260		$p_{17\%}$ =0.769		$p_{17\%}$ =0.487		$p_{17\%}$ =0.768	
All Reductions			$p_{All\%}$ =0.780		$p_{All\%}$ =0.785		$p_{All\%}$ =0.873		$p_{All\%}$ =0.265	
Panel B: Marginal Effects										
ln(Tax Rate in CF)	-0.110***	-0.110***	-0.132***	-0.152***	-0.099***	-0.358	-0.184***	-0.237**	-0.122***	-0.103***
	(0.006)	(0.006)	(0.010)	(0.030)	(0.016)	(0.282)	(0.032)	(0.114)	(0.009)	(0.007)
Mean (sample)	0.088	0.088	0.110	0.136	0.089	0.156	0.125	0.157	0.089	0.088
Panel C: Elasticities										
Elasticity	-1.247	-1.247	-1.202	-1.117	-1.111	-2.286	-1.471	-1.507	-1.369	-1.176
	(0.061)	(0.061)	(0.148)	(1.906)	(0.166)	(1.928)	(0.254)	(0.713)	(0.099)	(0.079)
Observations	38028	38028	13046	2158	5098	147	2069	401	14590	23296
Sample	All properties	All properties	Midline Sample	Midline Sample	Midline Sample	Midline Sample	Baseline Sample	Baseline Sample	All properties	All properties
FE: Property Value Band	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE: Neighborhood	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Neighbor Rate Controls	Yes	Yes	No	No	No	No	No	No	No	No

Notes: This table explores whether other components of the experimental design could have influenced taxpayers' responses to tax abatements. It reports estimates from Equations (1), (2), and (3). The dependent variable is an indicator for tax compliance. Panel A reports treatment effects from Equation (1) comparing property tax compliance for the tax abatement treatment groups relative to the status quo property tax rate (the excluded category). It also reports the p-values associated with F-tests for equality of the treatment effects when considering heterogeneity by knowledge of others' rates (Columns 3, 4), tax reduction (Columns 5, 6)
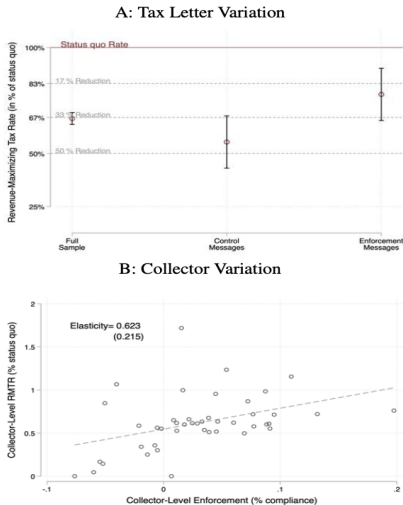
RMTR

TABLE 3: THE REVENUE-MAXIMIZING TAX RATE

	Linear Specification		Quadratic Specification	
	(1)	(2)	(3)	(4)
Panel A: Effect of Tax Rates on Tax Compliance				
Tax Rate (in % of status quo)	-0.154***	-0.152***	-0.410***	-0.391***
	(0.008)	(0.008)	(0.080)	(0.077)
Tax Rate Squared (in % of status quo)			0.171***	0.160**
			(0.051)	(0.049)
Constant	0.203***	0.202***	0.293***	0.293***
	(0.006)	(0.006)	(0.029)	(0.028)
Panel B: Revenue-Maximizing Tax Rate (RMTR)				
RMTR (in % of status quo rate)	0.661	0.665	0.541	0.553
	(0.014)	(0.014)	(0.045)	(0.046)
Implied Reduction in Tax Rate	33.93%	33.50%	45.95%	44.71%
Observations	38028	38028	38028	38028
Sample	All properties	All properties	All properties	All properties
FE: Property Value Band	Yes	Yes	Yes	Yes
FE: Neighborhood	No	Yes	No	Yes
Quadratic Tax Rate Term	No	No	Yes	Yes

Notes: This table reports estimates of the revenue-maximizing tax rate (RMTR) using the expression in Equation (4). Columns 1 and 2 assume linearity of tax compliance with respect to the tax rate. Panel A reports estimates from regression specification (6), and Panel B the corresponding RMTR estimates from Equation (5). Columns 3 and 4 assume a quadratic relationship between tax compliance and tax rate. Panel A reports estimates from a quadratic regression specification, and Panel B reports the corresponding RMTR estimates. All estimates in Panels A and B are expressed as a percentage of the status quo tax rate. All regressions include an indicator for the property value band, and Columns 2 and 4 also include randomization stratum (neighborhood) fixed effects. In Panel A, we report robust standard errors. Standard errors in Panel B are computed using the delta method. The data include all non-exempt properties registered by tax collectors merged with the government's property tax database.

RMTR and Enforcement

FIGURE 1: REVENUE-MAXIMIZING TAX RATE BY ENFORCEMENT CAPACITY

A: Tax Letter Variation

B: Collector Variation

Notes: This figure examines how the revenue-maximizing tax rate (RMTR) varies by enforcement capacity. Panel A uses the variation in the messages embedded in the tax letters. It assumes that tax compliance is linear with respect to the tax rate so the RMTR is given by Equation (5) and estimated using regression specification (6). The quadratic analog is shown in Figure A4, Panel A. All estimates of the RMTR are expressed as a percentage of the status quo tax rate. All regressions include an indicator for the property
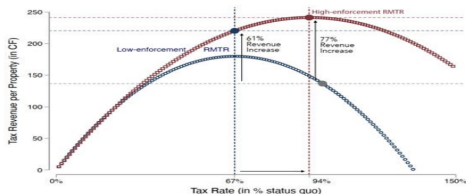
Rates and Enforcement as Complements

FIGURE 2: RATES AND ENFORCEMENT AS COMPLEMENTS
REVENUE IMPLICATIONS (COLLECTOR VARIATION)

A: Setting Tax Rates at the Revenue-Maximizing Rate
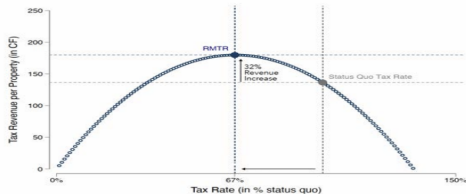
B: Increasing Enforcement Capacity
Naive vs Sophisticated Government

Notes: This figure reports estimates of the relationship between tax rates (x-axis) and tax revenue per property owner (y-axis). We predict tax revenue $T \cdot \mathbb{P}(\overline{T}, \alpha)$ by predicting $\mathbb{P}(T, \alpha)$ at every tax rate T using Equation (6). Panel A estimates this relationship in the current enforcement environment in Kananga. Panel B then compares the predicted relationship between tax rates and tax revenues in the current enforcement environment (blue dotted curve) and after the government increases its enforcement capacity by replacing collectors in the bottom quartile of enforcement capacity with average tax collectors (red dotted curve). In both panels, vertical lines indicate different potential tax rates, while horizontal lines indicate the corresponding revenue levels. In our example, a naive government would sequentially increase rates and increase enforcement,

- ▶ Does it mean that when tax rate is lower, it is not optimal for taxpayers to evade it and therefore they pay it?

Conclusions

- ▶ Tax rates and enforcement are thus complementary levers.
- ▶ Jointly optimizing tax rates and enforcement would lead to 26% higher revenue gains than optimizing them independently.
- ▶ These findings provide experimental evidence that low government enforcement capacity sets a binding ceiling on the revenue-maximizing tax rate in some developing countries, thereby demonstrating the value of increasing tax rates in tandem with enforcement to expand fiscal capacity