

Corruption II: Combating Corruption

14.740x: Foundations of Development Policy

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Efficiency costs

Bertrand, Djankov, Hanna, and Mullainathan 2007: "Obtaining a Driver's License in India: An Experimental Approach to Studying Corruption"

- Setting: Obtaining driver's license in India
- Question: Does corruption merely 'grease the wheels' or does it actually create inefficiency?
- Experiment: Experimentally create three groups of people:
 - "Bonus group" offered a large financial reward to obtain license in 32 days
 - "Lesson group" offered free driving lessons
 - Control
- For each group, measure driving ability with driving tests, find out about bribe paying process, whether obtained license.
- What would "efficient corruption" predict? What would "inefficient corruption" predict?

TABLE II

SUMMARY STATISTICS ON THE BUREAUCRATIC PROCESS FOR THE COMPARISON GROUP

Variable	Mean
<i>A. Final license status</i>	
Obtained a final license	0.48
Obtained a license in 32 days or less	0.15
Obtained a final license conditional on trying	0.69
Obtained a license without taking licensing exam	0.34
Obtained license & automatically failed ind. exam	0.29
<i>B. The process by which individuals obtained licenses</i>	
Number of days between temporary and final license	47.99 (29.14)
Predicted number of trips	6.46 (4.10)
Number of trips	2.50 (0.73)
Minutes spent at RTO (across all trips)	206.07 (111.86)
Number of officials spoken with	4.73 (2.90)
Lines waited in (final license)	2.51 (1.09)
Took RTO licensing exam	0.30 (0.46)

Main results

TABLE III
OBTAINING A LICENSE

	Obtained license (all tracked) (1)	Obtained license (2)	Obtained license in 32 days or less (3)	Obtained license without taking licensing exam (4)	Obtained license and did not have anyone teach them to drive (5)	Obtained license and attended a driving school (6)	Obtained license and automatically failed ind. exam (7)	Obtained license and exam score <50% (8)
Comp. group mean	0.45	0.48	0.15	0.34	0.23	0.03	0.29	0.32
Bonus group	0.24 (0.05)***	0.25 (0.05)***	0.42 (0.04)***	0.13 (0.05)**	0.29 (0.04)***	0.03 (0.02)	0.18 (0.05)***	0.22 (0.05)***
Lesson group	0.12 (0.05)**	0.15 (0.05)***	-0.05 (0.04)	-0.03 (0.05)	-0.12 (0.04)***	0.35 (0.03)**	-0.22 (0.04)***	-0.18 (0.05)***
N	731	666	666	666	666	666	666	666
R ²	0.12	0.14	0.31	0.12	0.26	0.26	0.24	0.20
Fstat	14.24	13.50	87.60	7.48	61.38	52.83	64.48	51.12
p-value	.00	.00	.00	.00	.00	.00	.00	.00

TABLE IV
PAYMENTS AND PROCESS

	Payment above official fees (1)	Tried to bribe (2)	Hired an agent (3)	Hired an agent and obtained license (4)	Payment to agent above official fees (5)	Obtained license and took more than three trips (6)
Comp. group mean	338.21	0.05	0.39	0.37	313.97	0.05
Bonus group	178.4 (46.33)***	0.02 (0.02)	0.19 (0.05)***	0.21 (0.05)***	142.4 (45.54)***	0.03 (0.02)
Lesson group	-0.24 (44.38)	-0.02 (0.02)	-0.02 (0.05)	-0.02 (0.05)	-42.22 (43.77)	0.05 (0.02)**
<i>N</i>	666	666	666	666	666	666
<i>R</i> ²	0.13	0.11	0.12	0.13	0.11	0.09
<i>F</i> -stat	12.06	2.53	14.07	16.45	11.98	2.11
<i>p</i> -value	.00	.08	.00	.00	.00	.12

Summary of results

- Bonus group was:
 - 25 pct. points more likely to obtain a license
 - 42 pct. points more likely to obtain a license quickly
 - 13 pct. points more likely to obtain a license without taking an exam
 - 18 pct. points more likely to obtain license without being able to drive
 - Paid about 50% more
- Lesson group was:
 - 15 pct. points more likely to obtain a license
 - 0 pct. points more likely to obtain a license quickly
 - 0 pct. points more likely to obtain a license without taking an exam
 - 22 pct. points less likely to obtain license without being able to drive
 - Paid no more than control
- So what do we conclude? Is corruption efficient or inefficient?

- One important result is that almost all of the change in the bonus group comes from using agents
- To study what agent can and cannot do, author conducted an "audit study":
 - Hired actors to approach agents to request assistance obtaining a drivers' license
 - Varied their situation (can drive, can't drive, etc), and measured whether agent states he can produce a license and, if so, the price

TABLE VI
AUDIT STUDY

Group	Agent can procure license (Mean = 0.57)		Final price if agent can procure license (Mean = 1,586)	
	(1)	(2)	(3)	(4)
Constant	1 (0.00)***	1.02 (0.04)***	1,277.89 (57.36)***	1,303.17 (83.21)***
Cannot drive	0 (0.00)	-0.01 (0.02)	62.65 (81.66)	110.54 (85.76)
No residential proof	-0.5 (0.08)***	-0.51 (0.08)***	1,285.26 (99.34)***	1,295.81 (102.30)***
No age proof	-0.21 (0.07)***	-0.23 (0.07)***	329 (87.18)***	366.85 (90.96)***
Cannot come back	-0.95 (0.04)***	-0.94 (0.04)***	317.11 (256.50)	411.55 (263.70)
Need license quick	-0.92 (0.05)***	-0.91 (0.05)***	855.44 (212.03)***	850.51 (214.55)***
Actor fixed effects		X		X
N	226	226	128	128

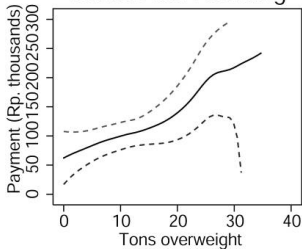
Another example: trucking

Barron and Olken (2009): "The Simple Economics of Extortion: Evidence from Trucking in Aceh"

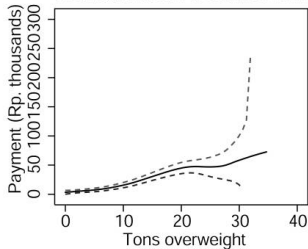
- Setting: long-distance trucking in Aceh, Indonesia
- Investigate corruption at weigh stations:
 - Engineers in the 1950s figured out that road damage rises to the 4th power of a truck's weight per axle
 - Thus weight limits on trucks are required to equate private marginal cost of additional weight with social marginal cost
 - In Indonesia, the legal rule is that all trucks more than 5% overweight supposed to be ticketed, unload excess, and appear in court
- What happens with corruption?
 - Among our 300 trips, only 3% ticketed, though 84% over weight limit (and 42% of trucks more than 50% over weight limit!)
 - The rest paid bribes
 - What do we need to know to think about efficiency?

Results

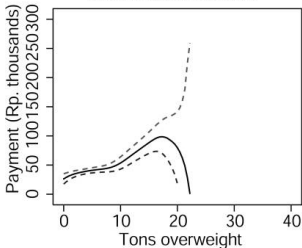
Banda Aceh Gebang



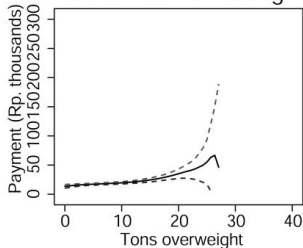
Banda Aceh Seumedam



Meulaboh Doulu



Meulaboh Sidikalang



Summary of findings

- Payments at weigh stations increasing function of truck weight
 - Note that the intercept is greater than 0 – so some extortion
 - On average, Rp. 3,400 (US \$0.3) for each ton overweight
 - Much more concave than official fine schedule
- Interesting question: how should the government design the rules, knowing they will be used as the threat point in a corrupt bargaining game?

- Four main ways to measure corruption
 - Perceptions
 - Comparing two measures of the same thing
 - Direct measurement
 - Inference from theory
- Efficiency implications
 - Depends on whether the government's interests are aligned with or against private interests
 - Efficiency costs likely to be higher when government interests are against private willingness to pay
 - Examples from trucking and drivers' licenses suggest that this may be the case
 - But understanding efficiency costs of corruption is an area for more research

References

- Mauro (1995): "Corruption and Growth"
- Reinikka and Svensson (2004): "Local Capture: Evidence from a Central Government Transfer Program in Uganda"
- Hsieh and Moretti 2006: "Did Iraq Cheat the United Nations? Underpricing, Bribes, and the Oil-for-Food Program"
- Chaudhury, Hammer, Kremer, Muralidharan, and Rogers: "Missing in Action: Teacher and Health Worker Absence in Developing Countries"
- Banerjee, Hanna, and Mullainathan (2009): "Corruption Handbook Chapter"
- Bertrand, Djankov, Hanna, and Mullainathan 2007: "Obtaining a Driver's License in India: An Experimental Approach to Studying Corruption"
- Barron and Olken (2009): "The Simple Economics of Extortion: Evidence from Trucking in Aceh"

Outline

- Do we care?
 - Magnitude and efficiency costs
- **The corrupt official's decision problem**
 - **Balancing risks, rents, and incentives**

Punishments, efficiency wages, etc

Becker and Stigler (1974): "Law Enforcement, Malfeasance, and Compensation of Enforcers"

- Setting: model of corruptible enforcers (police, auditors, etc)
- Wage w , outside wage v
- If bribed:
 - If detected, gets outside wage v (probability p)
 - If undetected, gets $b + w$ (probability $1 - p$)
- Equilibrium wage set so the agent is indifferent

$$w = pv + (1 - p)(b + w)$$

i.e.

$$w - v = \frac{1 - p}{p} b$$

Punishments, efficiency wages, etc

- One issue: this creates rents for bureaucrats
- Becker and Stigler suggest selling the job for $\frac{1-p}{p}b$ so that agent only receives market wage in equilibrium
- Suppose social cost of an audit is A . Then social cost is pA
- Then by setting $p \rightarrow 0$, can discourage corruption at no social cost!
- In practice, high entry fees would encourage state to fire workers without cause, so optimal p is not 0

Multiple equilibria

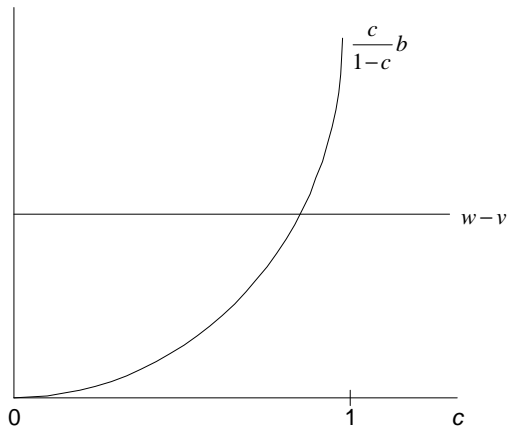
- Instead of endogenous wage, fix wage w , but suppose probability of detection p is endogenous and depends on how many other people are also corrupt
- Denote by c fraction of population that's corrupt
- Suppose $p(c) = 1 - c$
- Recall agent will steal if

$$w - v < \frac{1 - p}{p} b$$

- Substituting terms:

$$w - v < \frac{c}{1 - c} b$$

Multiple equilibria



- Implication: temporary wage increase or corruption crackdown can have permanent effects

Multiple equilibria

- Many potential reasons for multiple equilibria
 - Probability of detection
 - Enforcers (who will punish the punishers)
 - Chance of being reported in binary interaction
 - Selection into bureaucracy
 - And others....

Summary

- Key parameters of interest:
 - When you increase the probability of detection:
 - How much does corruption decrease?
 - Do corrupt officials substitute to other margins?
 - Does this increase efficiency or is it just a transfer?

Testing Becker-Stigler: Monitoring

Olken (2007): "Monitoring Corruption: Evidence from a Field Experiment in Indonesia"

- Randomized villages into one of three treatments:
 - Audits: increased probability of central government audit from 0.04 to 1
 - Invitations: increased grass-roots monitoring of corruption
 - Comments: created mechanism for anonymous comments about corruption in project by villagers
- Invitations & comment forms discussed in collective action section; we'll focus here on the audits

Measuring Corruption

- Goal
 - Measure the difference between *reported expenditures* and *actual expenditures*
- Measuring reported expenditures
 - Obtain line-item reported expenditures from village books and financial reports
- Measuring actual expenditures
 - Take core samples to measure quantity of materials
 - Survey suppliers in nearby villages to obtain prices
 - Interview villagers to determine wages paid and tasks done by voluntary labor
- Measurement conducted in treatment and control villages

Measuring Corruption



Measuring Corruption

- Measure of theft:

$$THEFT_i = \text{Log}(\text{Reported}_i) - \text{Log}(\text{Actual}_i)$$

- Can compute item-by-item, split into prices and quantities
- Assumptions
 - Loss Ratios - Material lost during construction or not all measured in survey
 - Worker Capacity - How many man-days to accomplish given quantity of work
 - Calibrated by building four small (60m) roads ourselves, measuring inputs, and then applying survey techniques
- All assumptions are constant – affect levels of theft but should not affect differences in theft across villages

- Audits

- Conducted by Government Audit Agency (BPKP)
- Auditors examine books and inspect construction site
- Penalties: results of audits to be delivered directly to village meeting and followed up by project staff, with small probability of criminal action

- Timing

- Before construction began, village implementation team in treatment villages informed they would be audited during and/or after construction of road project
- One village in each treatment subdistrict audited during construction
- All villages audited after construction
- Official letter from BPKP sent 2 months after initial announcement, and again after first round of audits

Results

Impact of audits

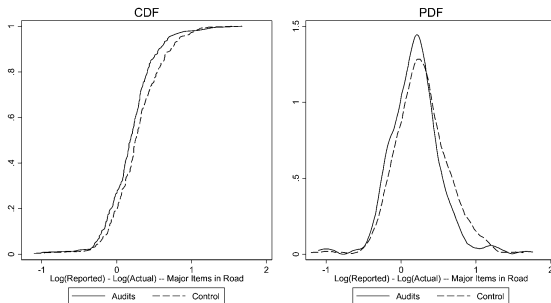


FIG. 1.—Empirical distribution of missing expenditures. The left-hand figure shows the empirical CDF of missing expenditures for the major items in a road project, separately for villages in the audit treatment group (solid line) and the control group (dashed line). The right-hand figure shows estimated PDFs of missing expenditures for both groups; PDFs are estimated using kernel density regressions using an Epanechnikov kernel.

Results

Impact of audits

TABLE 4
AUDITS: MAIN THEFT RESULTS

	CONTROL MEAN (1)	TREATMENT MEAN: AUDITS (2)	NO FIXED EFFECTS		ENGINEER FIXED EFFECTS	
			Audit Effect (3)	p-Value (4)	Audit Effect (5)	p-Value (6)
PERCENT MISSING ^a						
Major items in roads (<i>N</i> = 477)	.277 (.033)	.192 (.029)	-.085* (.044)	.058	-.076** (.036)	.039
Major items in roads and ancillary projects (<i>N</i> = 538)	.291 (.030)	.199 (.030)	-.091** (.043)	.034	-.086** (.037)	.022
Breakdown of roads:						
Materials	.240 (.038)	.162 (.036)	-.078 (.053)	.143	-.063 (.042)	.136
Unskilled labor	.312 (.080)	.231 (.072)	-.077 (.108)	.477	-.090 (.087)	.304

Why wasn't the effect bigger?

- Although audit probability went to 1, point estimates suggest 19% of funds were still missing
- Why didn't it go to 0?
- Three possibilities
 - Maybe people didn't believe the audits would take place?
 - Maybe auditors were corrupt after all?
 - Maybe audit probability of 1 doesn't imply punishment probability of 1?

Were auditors corrupt?

TABLE 6
RELATIONSHIP BETWEEN AUDITOR FINDINGS AND SURVEY TEAM FINDINGS

	Engineering Team Physical Score (1)	Engineering Team Administrative Score (2)	Percent Missing in Road Project (3)
Auditor physical score	.109** (.043)	-.067 (.071)	.024 (.033)
Auditor administrative score	.007 (.049)	.272** (.133)	-.055** (.027)
Subdistrict fixed effects	Yes	Yes	Yes
Observations	248	249	212
R^2	.83	.78	.46

What did auditors find?

TABLE 7
AUDIT FINDINGS

	Percentage of Villages with Finding
Any finding by BPKP auditors	90%
Any finding involving physical construction	58%
Any finding involving administration	80%
Daily expenditure ledger not in accordance with procedures	50%
Procurement/tendering procedures not followed properly	38%
Insufficient documentation of receipt of materials	28%
Insufficient receipts for expenditures	17%
Receipts improperly archived	17%
Insufficient documentation of labor payments	4%

Substitution to other forms of corruption

- Auditors investigate books and construction site, but not who worked on project
- Question: does hiring of family members change in response to audits?
- Investigate using household survey:
 - 4,000 households
 - Asked if anyone in household worked on project for pay
 - Asked if immediate / extended family of village government member or project official
- Specification:

$$\begin{aligned} WORKED_{hjk} = & \gamma_k + \gamma_2 AUDIT_{jk} + \gamma_3 FAMILY_{hjk} \\ & + \gamma_4 AUDIT_{jk} \times FAMILY_{hjk} + \gamma_5 X_{hjk} + \varepsilon_{hjk} \end{aligned}$$

TABLE 8
NEPOTISM

	(1)	(2)	(3)	(4)
Audit	-.011 (.023)	.004 (.021)	-.017 (.032)	-.038 (.032)
Village government family member	-.020 (.024)	.016 (.017)	.016 (.017)	-.014 (.023)
Project head family member	.051 (.032)	-.015 (.047)	.051 (.032)	-.004 (.047)
Social activities	.017*** (.006)	.017*** (.006)	.013* (.006)	.014*** (.006)
Audit × village government family member	.079** (.034)			.064* (.034)
Audit × project head family member		.138** (.060)		.115* (.061)
Audit × social activities			.010 (.008)	.008 (.008)
Stratum fixed effects	Yes	Yes	Yes	Yes
Observations	3,386	3,386	3,386	3,386
R^2	.26	.26	.26	.27
Mean dependent variable	.30	.30	.30	.30

- Audits:
 - Reduced corruption by about 8 percentage points
 - Increased actual quantities of materials, rather than decreased price markups – so an increase in efficiency, not just a transfer
 - Led to more nepotism
 - May have been limited by the degree to which auditors can prove ‘punishable’ offences

Testing Becker-Stigler: Wages

Di Tella and Schargrodsky (2003): "The Role of Wages and Auditing During a Crackdown on Corruption in the City of Buenos Aires"

- Setting: hospitals in Argentina
- Empirical idea:
 - Corruption crackdown in 1996
 - Examine differential effects depending on procurement officer's wage
- Measure corruption by examining prices pay for identical inputs
- Regression

$$LOGPRICE_{iht} = \lambda LOGSIZE_{iht} + \alpha_t \theta_t + \delta_t (w_h - w_h^0) + \Sigma_h + \varepsilon_{iht}$$

where w_h is log procurement officer's wage and w_h^0 is log of "predicted wage" based on characteristics

- Period 2 is most intense monitoring, Period 3 is less intense

TABLE 1
THE EFFECT OF THE CORRUPTION
CRACKDOWN ON PRICES

	(1)	(2)
Quantity	-.05297** (6.196)	-.04792** (5.534)
Policy	-.13076** (4.945)	
Period 2		-.15869** (5.686)
Period 3		-.10153** (3.619)
<i>F</i> -statistic ^a		8.69**
<i>R</i> ²	.79	.80

- Effect of wages only in Period 3.

TABLE 2
THE ROLE OF WAGES DURING THE CORRUPTION CRACKDOWN

Variables	(1)	(2)	(3)	(4)
Quantity	-.03714** (4.913)	-.04775** (5.538)	-.03697** (4.926)	-.04766** (5.511)
Beds	.00920 (1.020)		.00868 (.987)	
Period 2	-.15532** (5.546)	-.10420 (1.484)	-.15525** (5.545)	.90829 (1.170)
Period 3	-.10081** (3.631)	.03165 (.467)	-.10057** (3.624)	1.41566* (1.860)
Efficiency Wage	-.01020 (.216)			
Efficiency Wage × Period 2		-.10679 (.884)		
Efficiency Wage × Period 3		-.25061* (2.151)		
Wage			-.00109 (.029)	
Wage × Period 2				-.14886 (1.375)
Wage × Period 3				-.21193* (1.995)
Fixed effects	No	Yes	No	Yes
Random effects	Yes	No	Yes	No
R ²	.80	.79	.80	.78

- Is this convincing? Perhaps, but probably not the last word...

Summary

- Corrupt officials respond to incentives
 - Static incentives (punishments, output based incentives)
 - And, potentially, dynamic incentives (wages, future corruption)
- But...
 - They may substitute to other margins, and one needs to be sure that those margins have lower social cost
 - Enforcing the incentives may be difficult if the enforcers are, themselves, corrupt
 - Suggests multiple equilibria in corruption – on which there is no evidence
 - Would be nice to see output-based incentives applied to other types of corruption (esp. the ‘misaligned’ case). Why might this be different?

References

- Becker and Stigler (1974): "Law Enforcement, Malfeasance, and Compensation of Enforcers"
- Olken (2007): "Monitoring Corruption: Evidence from a Field Experiment in Indonesia"
- Di Tella and Schargrodsky (2003): "The Role of Wages and Auditing During a Crackdown on Corruption in the City of Buenos Aires"