14.75 : Corruption Lecture 2

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Outline

- Do we care?
  - Magnitude and efficiency costs
- **The corrupt official's decision problem**
  - **Balancing risks, rents, and incentives**
- Embedding corruption into larger structures
  - The IO of corruption: embedding the decision problem into a market structure
  - Corruption and politics
  - Corruption's general equilibrium effects on the economy

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 $p \longrightarrow 0$, 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

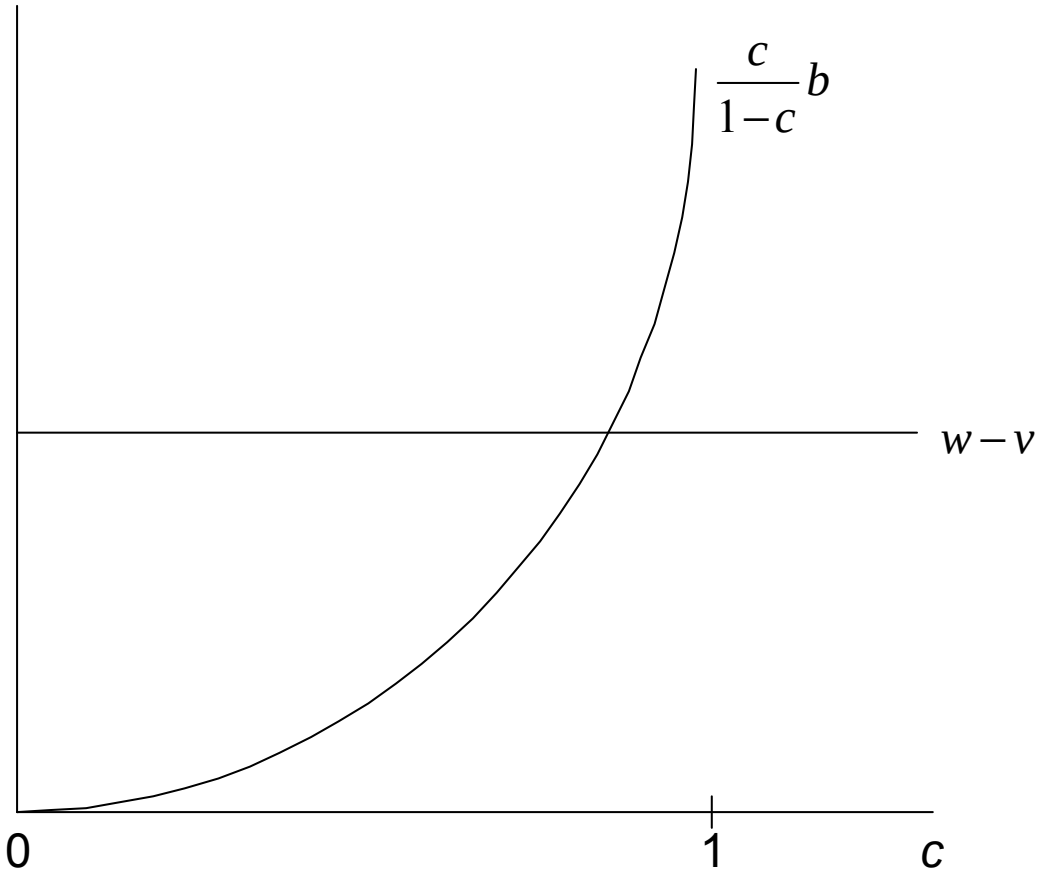
- Instead of endogenous wage, fix wage w, but suppose probability of detection p is endogenous and depends on how many other people are also corrupt
- Denote by c fraction of population that's corrupt
- Suppose $p(c) = 1 - c$
- Recall agent will steal if

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

- 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 official substitute to other margins?
    - Does this increase efficiency or is it just a transfer?
  - Testing Becker-Stigler:
    - Do officials think about future rents when deciding how much to steal?
    - Does increasing wages per se reduce corruption?
  - Can output-based incentives reduce corruption?
  - Are there multiple equilibria? If so, which theory governs them?

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:

$$THEFT_i = Log(Reported_i) - Log(Actual_i)$$

  - 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

- 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

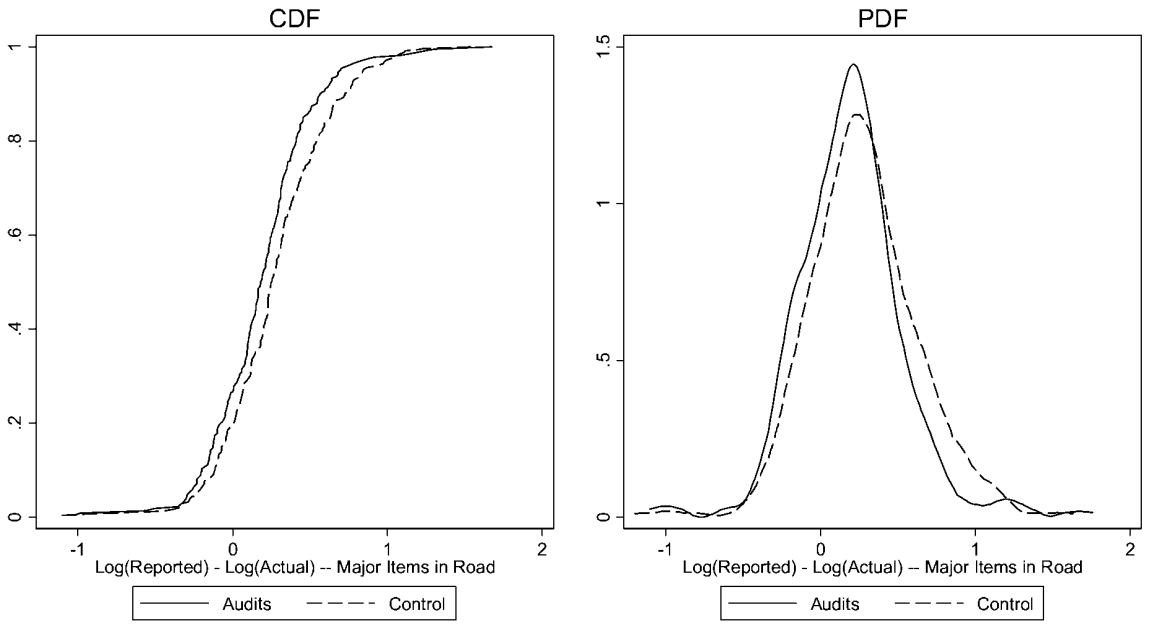


FIG. 1.—Empirical distribution of missing expenditures. The left-hand figure shows the empirical CDF of missing expenditures for the major items in a road project, separately for villages in the audit treatment group (solid line) and the control group (dashed line). The right-hand figure shows estimated 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

Percent Missing[a]	Control Mean (1)	Treatment Mean: Audits (2)	No Fixed Effects: Audit Effect (3)	No Fixed Effects: p-Value (4)	Engineer Fixed Effects: Audit Effect (5)	Engineer Fixed Effects: p-Value (6)
Major items in roads ($N = 477$)	.277	.192	−.085*	.058	−.076**	.039
	(.033)	(.029)	(.044)		(.036)	
Major items in roads and ancillary projects	.291	.199	−.091**	.034	−.086**	.022
($N = 538$)	(.030)	(.030)	(.043)		(.037)	
Breakdown of roads:						
Materials	.240	.162	−.078	.143	−.063	.136
	(.038)	(.036)	(.053)		(.042)	
Unskilled labor	.312	.231	−.077	.477	−.090	.304
	(.080)	(.072)	(.108)		(.087)	

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**	−.067	.024
	(.043)	(.071)	(.033)
Auditor administrative score	.007	.272**	−.055**
	(.049)	(.133)	(.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:

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

Results

Nepotism

TABLE 8
NEPOTISM

	(1)	(2)	(3)	(4)
Audit	−.011	.004	−.017	−.038
	(.023)	(.021)	(.032)	(.032)
Village government family member	−.020	.016	.016	−.014
	(.024)	(.017)	(.017)	(.023)
Project head family member	.051	−.015	.051	−.004
	(.032)	(.047)	(.032)	(.047)
Social activities	.017***	.017***	.013*	.014**
	(.006)	(.006)	(.006)	(.006)
Audit × village government family member	.079**			.064*
	(.034)			(.034)
Audit × project head family member		.138**		.115*
		(.060)		(.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

Summary

- 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

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

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

First stage and efficiency wages

Images removed due to copyright restrictions. See: Di Tella, Rafael, and Ernesto Schargrodsky. "The Role of Wages and Auditing During a Crackdown on Corruption in the City of Buenos Aires." *Journal of Law and Economics* (2003).
Table 1: The Effect of the Corruption Crackdown on Prices
Table 2: The Role of Wages During the Corruption Crackdown

Another approach: incentives

Duflo, Hanna, and Ryan (2007): "Monitoring Works: Getting Teachers to Come to School"

- Setting: para-teachers in India
- Experiment:
  - Teacher's daily attendance was verified through photographs with time and date stamps.
  - Salary was made a non-linear function of his attendance
- Paper:
  - Estimates average effects of incentive scheme from a randomized experiment
  - Uses non-linearity in incentives to show that they respond to incentives
  - Estimate a structural model from treatment group, which allows them to simulate counterfactuals

Incentive scheme

- Incentive scheme:
  - Teacher in Intervention school were provided with a camera with non-temperable time and date stamp
  - Instructed to take a picture of themselves and the children every day (morning and afternoon). A valid pairs of picture has:
    - Two pictures taken the same day, separated by at least 5 hours each.
    - At least 8 children per picture
  - Payment is calculated each month and is a non-linear function of attendance:
    - Up to 10 days: Rs 500.
    - Each day above 10 days: Rs 50.
  - In non-intervention schools, teachers receive Rs 1000, and are reminded by attending at least 20 days is compulsory.

Results

Attendance

Images removed due to copyright restrictions. See: Duflo, Esther, and Rema Hanna. "Monitoring Works: Getting Teachers to Come to School." NBER Working Paper No. 11880 (2005).
Table 2
Table 9
Figure 3
Table 3

Monitoring vs. incentives?

- Question: Are teachers sensitive to increased monitoring or to incentives?
- Empirical idea: When teachers switch from the last day of the month to the first day of the month:
  - A teacher who has attended 9 days or less in the rest of the month faces no incentive at the end of month t and faces incentives again at the end of month $t+1$.
  - A teacher who has attended more than 10 days in the rest of the month faces a Rs 50 incentives at the end of month t and slightly smaller at the beginning of the next month
- Regression:

$$W_{itm} = \alpha + \beta 1_m(d > 10) + \gamma F + \lambda 1_m(d > 10) \times F + v_i + \epsilon_{itm}$$

- What would this tell us?

But a cautionary note...

Banerjee, Duflo, and Glennerster (2008): "Putting a Band-Aid on a Corpse: Incentives for Nurses in the Indian Public Health Care System,"

- Setting: Nurses in Indian public health care centers, with high absenteeism
- Experiment:
  - NGO used automated time clocks to monitor nurse attendance
  - Government used time clock information combined with fines and punishments
- So, sounds very similar to cameras

Results

- What happened?
- Initially worked well
  - First 6 months had dramatic improvement in attendance – as much as 24 percentage points more likely to be present
- But subsequently, health administration undermined incentive system
  - System allows "excused" absences for government-mandated meetings, surveys, or other health work, or if machine malfunctions
  - So nurses started reporting many more excused absences, with no response from district administration
  - By 16 months after intervention started, treatment and comparison was essentially the same
- Why? Conclusions?

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?

14.75 Political Economy and Economic Development

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