14.770: Corruption Lecture 24-27b

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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

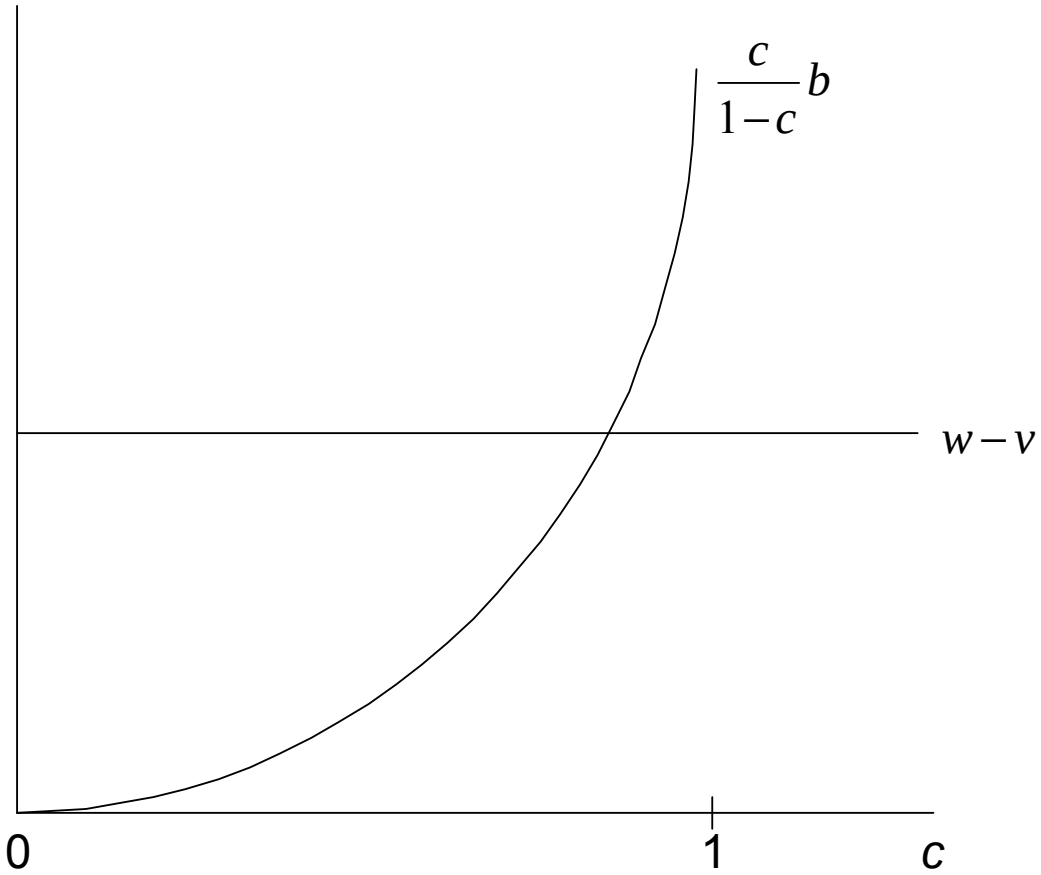
- Instead of endogenous wage, fix wage w, but suppose probability of detection p is endogenous and depends on how many other people are also corrupt
- Denote by c fraction of population that's corrupt
- Suppose $p(c) = 1 - c$
- Recall agent will steal if

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

- 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?
    - Selection or treatment?
  - 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

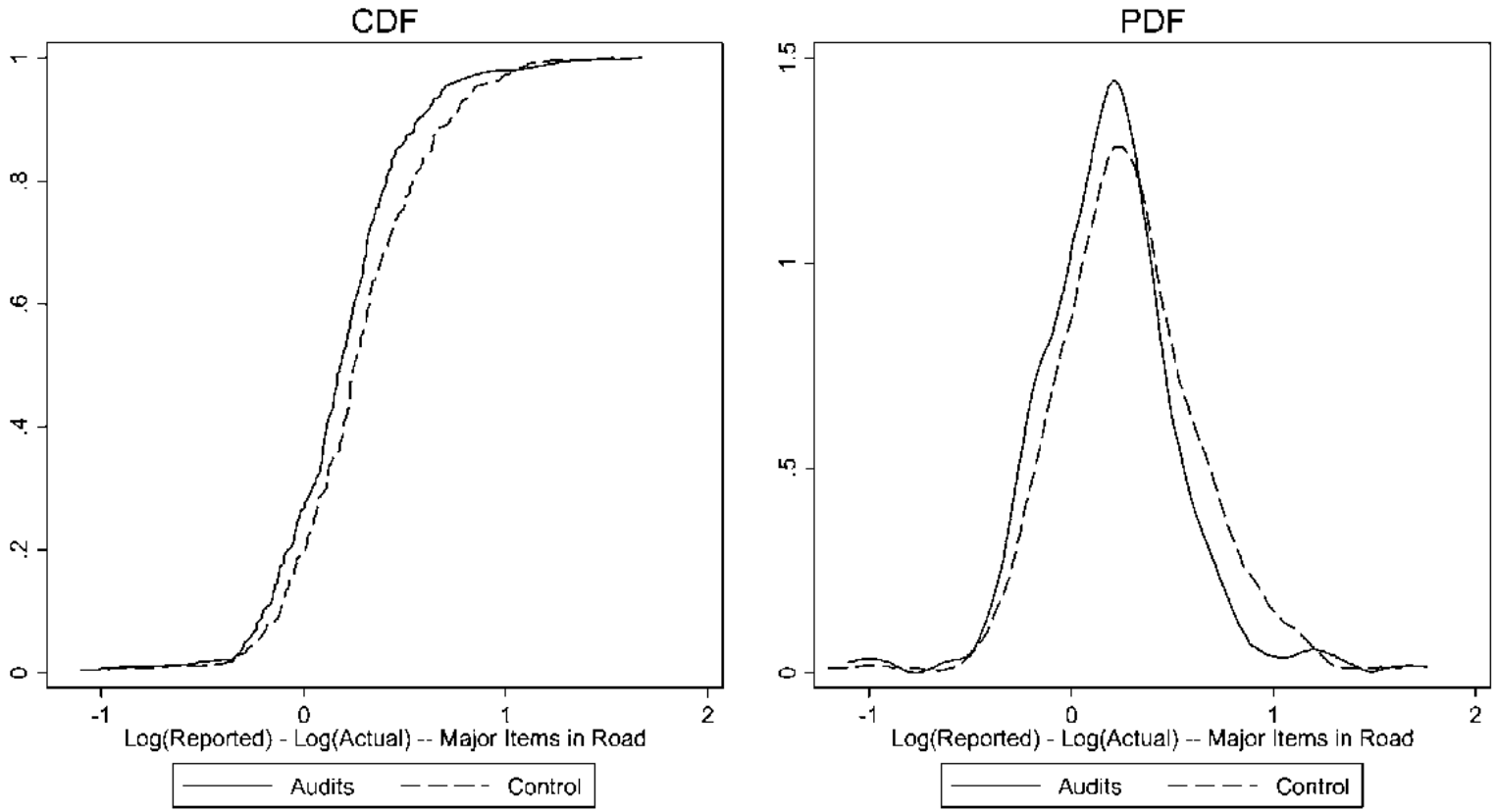


FIG. 1.—Empirical distribution of missing expenditures. The left-hand figure shows the empirical CDF of missing expenditures for the major items in a road project, separately for villages in the audit treatment group (solid line) and the control group (dashed line). The right-hand figure shows estimated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

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)	Stratum Fixed Effects: Audit Effect (7)	Stratum Fixed Effects: *p*-Value (8)
Major items in roads ($N = 477$)	.277	.192	−.085*	.058	−.076**	.039	−.048	.123
	(.033)	(.029)	(.044)		(.036)		(.031)	
Major items in roads and ancillary projects	.291	.199	−.091**	.034	−.086**	.022	−.090***	.008
($N = 538$)	(.030)	(.030)	(.043)		(.037)		(.034)	
Breakdown of roads:								
Materials	.240	.162	−.078	.143	−.063	.136	−.034	.372
	(.038)	(.036)	(.053)		(.042)		(.037)	
Unskilled labor	.312	.231	−.077	.477	−.090	.304	−.041	.567
	(.080)	(.072)	(.108)		(.087)		(.072)	

NOTE.—Audit effect, standard errors, and *p*-values are computed by estimating eq. (1), a regression of the dependent variable on a dummy for audit treatment, invitations treatment, and invitations plus comment forms treatments. Robust standard errors are in parentheses, allowing for clustering by subdistrict (to account for clustering of treatment by subdistrict). Each audit effect, standard error, and accompanying *p*-value is taken from a separate regression. Each row shows a different dependent variable, shown at left. All dependent variables are the log of the value reported by the village less the log of the estimated actual value, which is approximately equal to the percent missing. Villages are included in each row only if there was positive reported expenditures for the dependent variable listed in that row.

[a] Percent missing equals log reported value − log actual value.

* Significant at 10 percent.

** Significant at 5 percent.

*** Significant at 1 percent.

More results

- Prices vs. Quantities
  - Decompose corruption into price markups and quantity reductions
  - Find virtually all corruption and all change in corruption occurs on quantity dimension
  - Why might this be? Which is easier to detect?
- Reported vs. Actual Expenditures
  - Compare estimated reported and actual expenditures to initial (pre-randomization) budget
  - Results suggest reduction in corruption due to increases in actual expenditures
  - Why do we care? Efficiency implications.

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?

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

NOTE.—Robust standard errors are in parentheses, adjusted for clustering at subdistrict level. Auditor scores refer to the results from the final BPKP audits; engineering team scores refer to the results from the engineering team that was sent to estimate missing expenditures. The results from the engineering team were not shared with the BPKP audit team. All specifications include subdistrict fixed effects, which therefore hold constant both the BPKP audit teams and the engineering teams. For both physical and administrative scores, scores are normalized to have mean zero and standard deviation one.

* Significant at 10 percent.
** Significant at 5 percent.
*** Significant at 1 percent.

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%

NOTE.—Tabulations from BPKP final report submitted to the Government of Indonesia's KDP management team and to the World Bank on December 22, 2004. This report included all findings from the 283 villages that were audited as part of phase II of the audits. The percentage reported is the percentage of the 283 audited village for which BPKP reported finding the listed problem.

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:

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

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: Dynamic considerations

Niehaus and Sukhtankar 2008: Corruption Dynamics: The Golden Goose Effect

- Becker-Stigler implies that, all else equal, increasing future rents from staying in the job reduce corruption
  - Becker-Stigler model future rents as coming from wages
  - But future rents could also come from future opportunities for corruption
  - This paper tests the second idea
- Setting:
  - Labor redistribution program in India (NEGRA)
  - Corruption is putting fake people on the rolls
  - Piece rate and daily rate projects.
- Find that as one corruption on one type of project (daily rate) becomes more valuable, theft on piece rate projects decline

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

TABLE 1

The Effect of the Corruption Crackdown on Prices

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

TABLE 2

THE ROLE OF WAGES DURING THE CORRUPTION CRACKDOWN

Variables	(1)	(2)	(3)	(4)
Quantity	−.03714**	−.04775**	−.03697**	−.04766**
	(4.913)	(5.538)	(4.926)	(5.511)
Beds	.00920		.00868	
	(1.020)		(.987)	
Period 2	−.15532**	−.10420	−.15525**	.90829
	(5.546)	(1.484)	(5.545)	(1.170)
Period 3	−.10081**	.03165	−.10057**	1.41566*
	(3.631)	(.467)	(3.624)	(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

NOTE.—Dependent variable: log of unit price. Efficiency Wage is the difference between the log of the nominal wage and the log of the opportunity wage. Wage is the log of the nominal wage. Regressions (1)

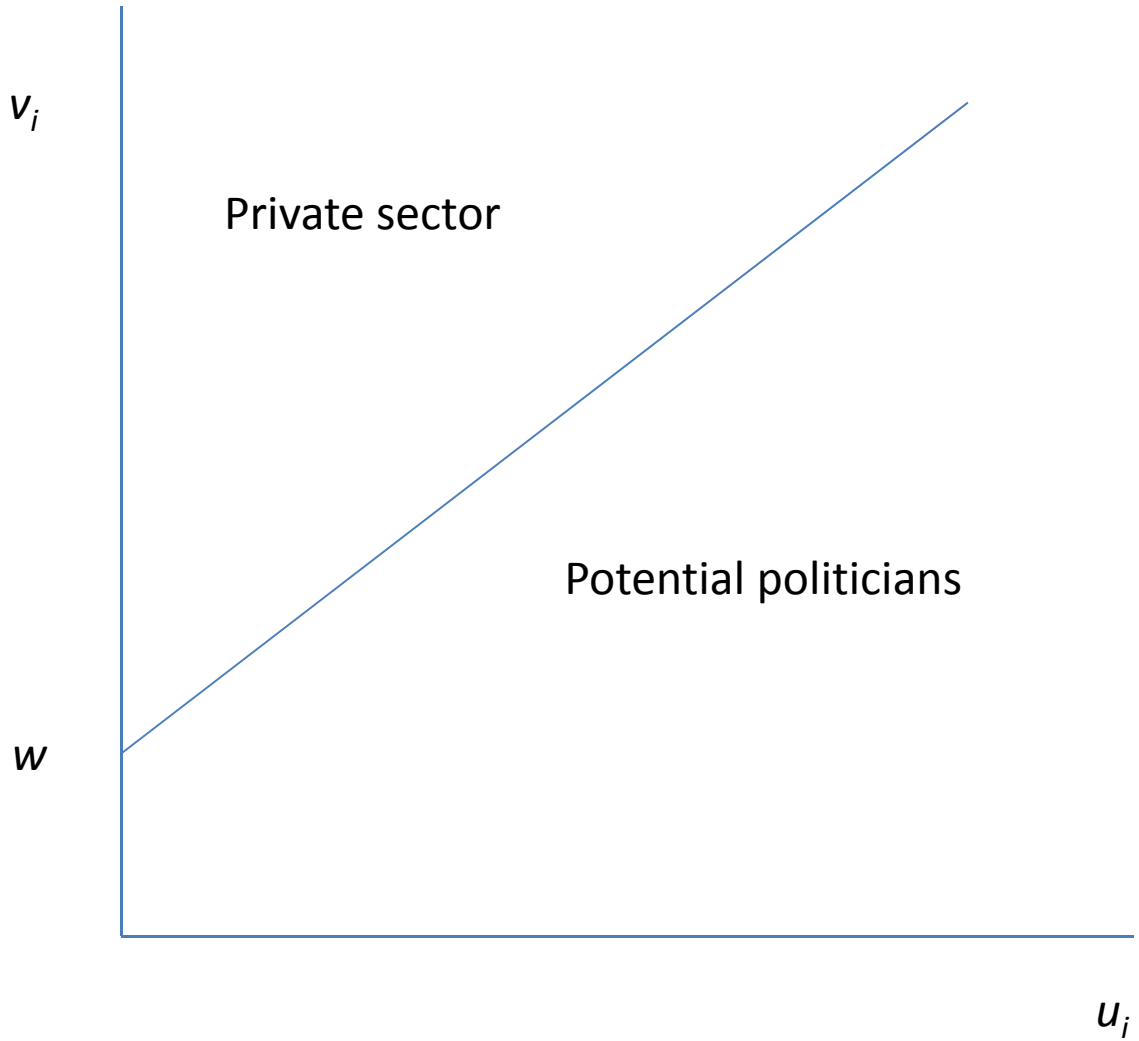
Wages and selection

- The other way that wages can matter is through selection
- Suppose that people in the population have an outside wage v_i and get utility rents from office u_i.
- They will choose to become politicians if

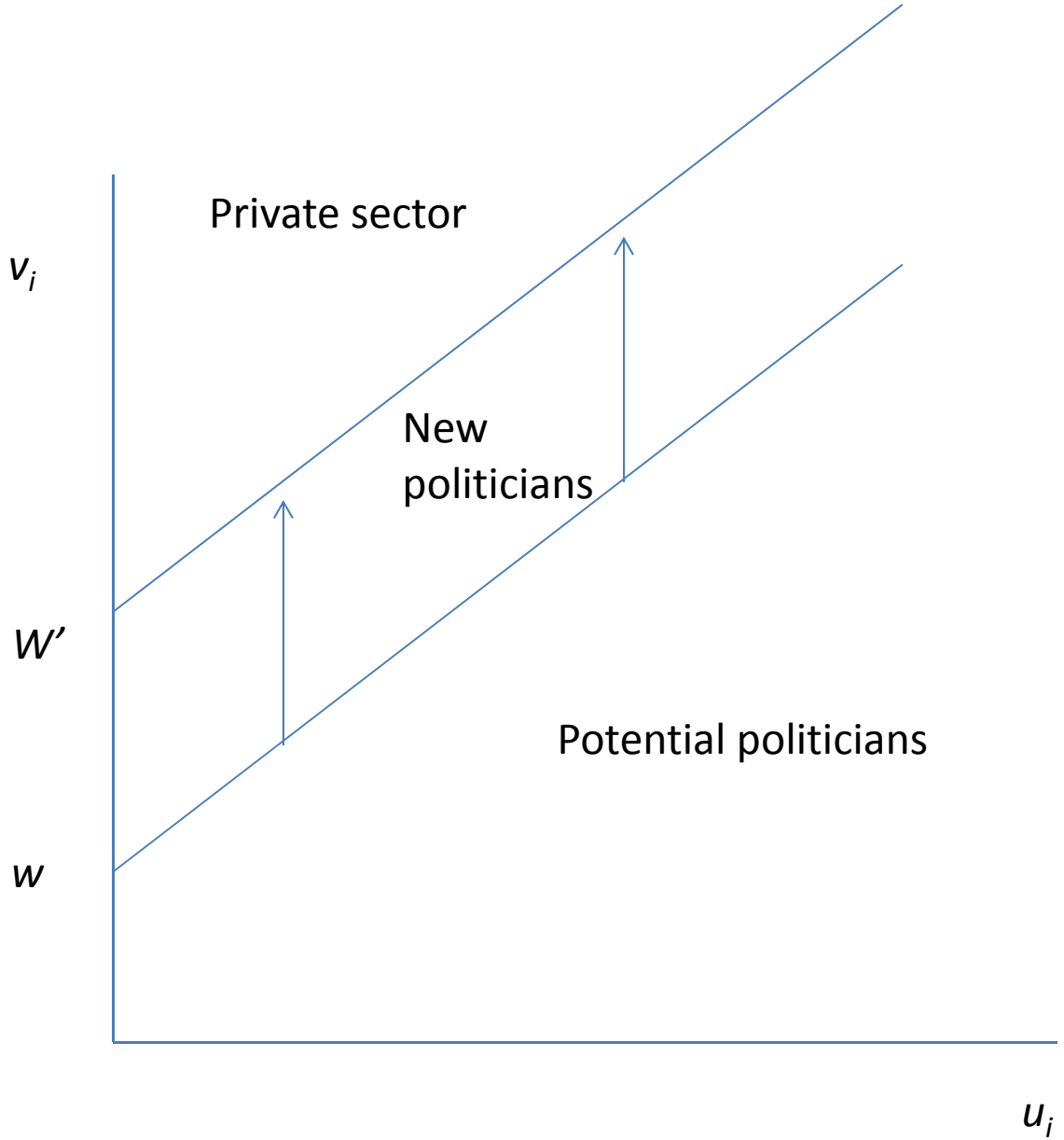
$$w > v_i - u_i$$

  and suppose that within this group that is interested, we randomly choose someone to be a politician
- Suppose that we care about some combination of v_i (correlated with competence) and u_i (correlated with idealism, public service)
- What happens if we increase w? Is this good or bad?
- Depends on the correlation of u_i and v_i.

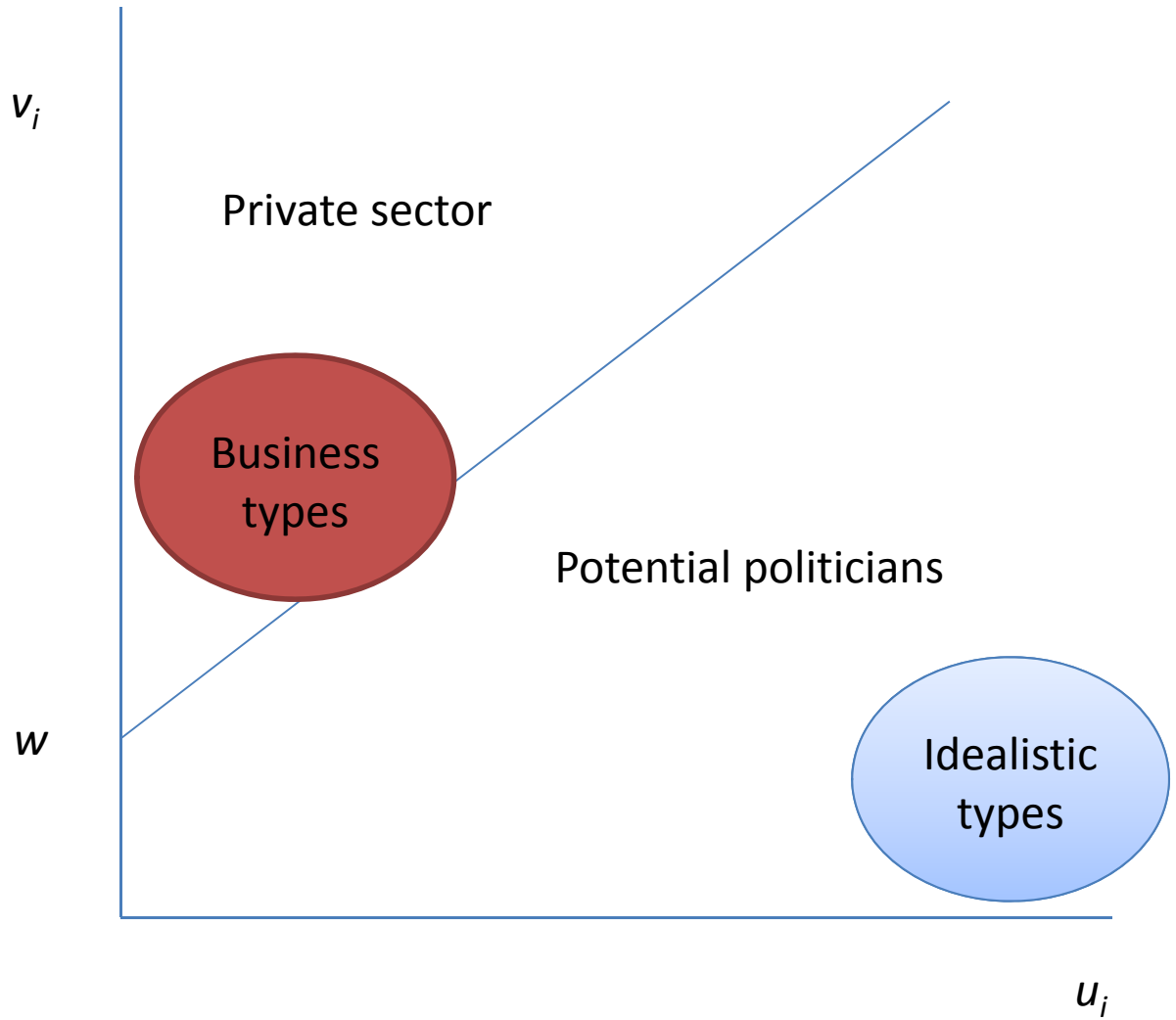
Wages and selection



Wages and selection



Wages and selection



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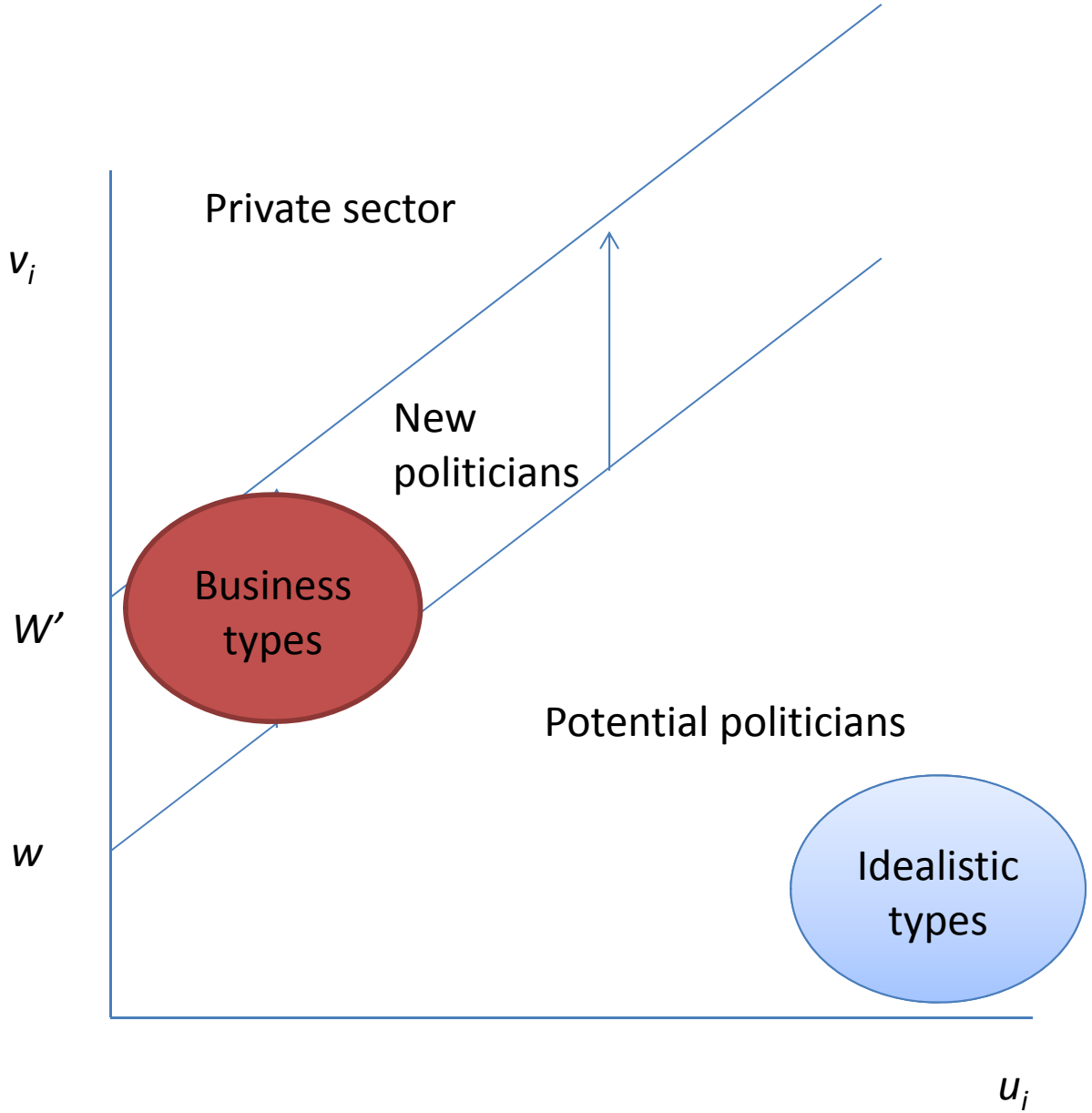

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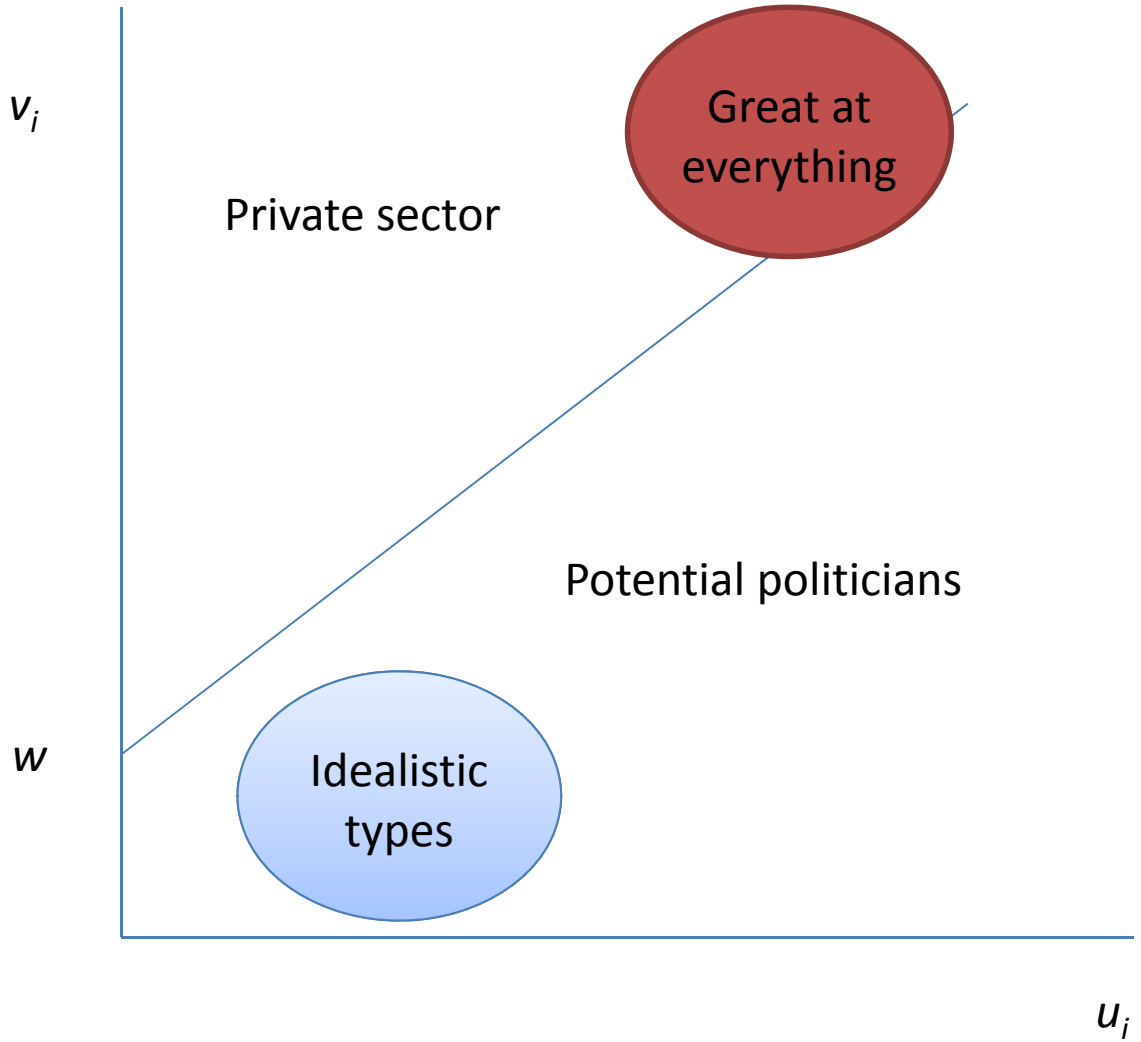

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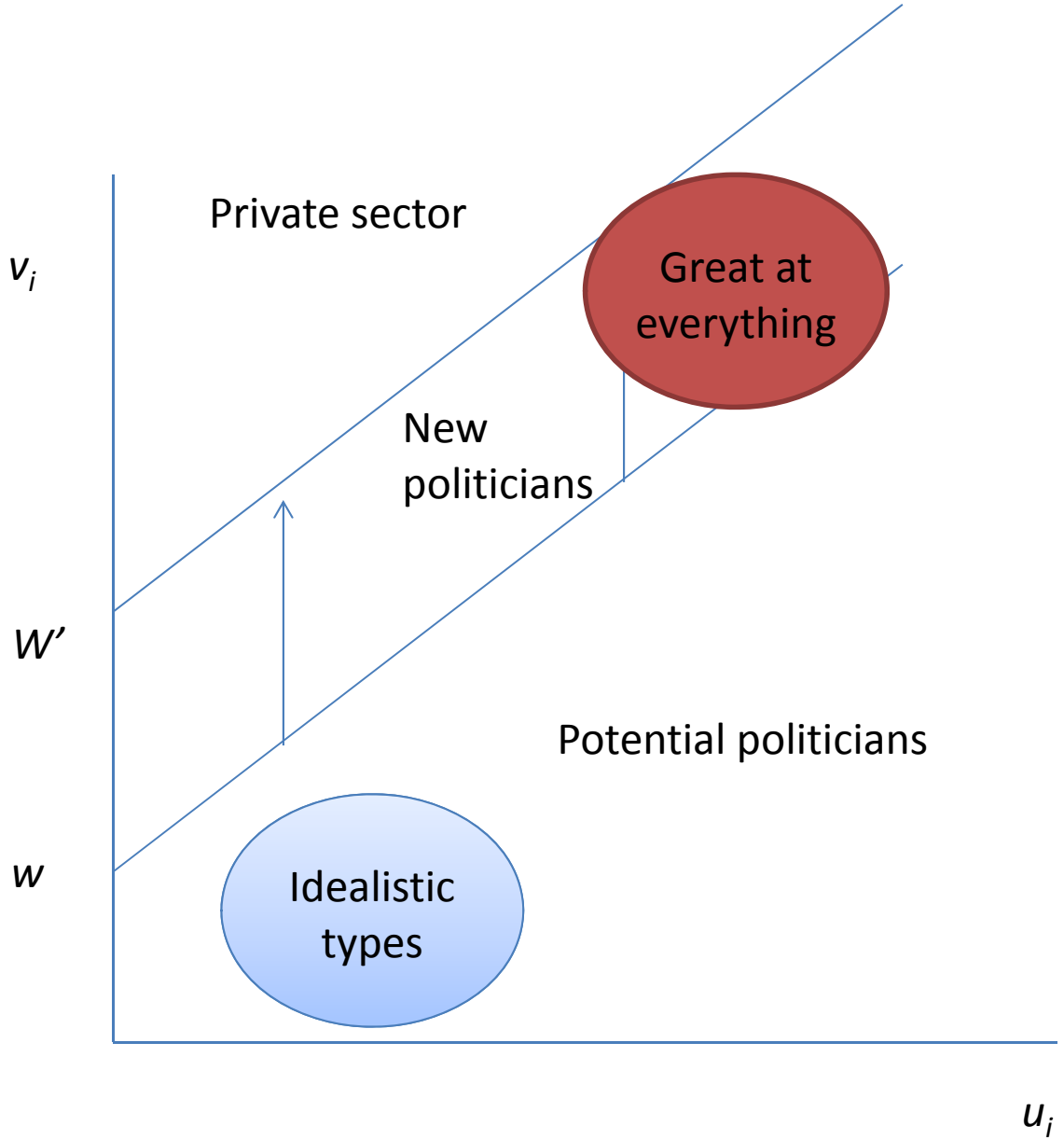


Empirical evidence

Ferraz and Finan 2011, Motivating Politicians: The Impacts of Monetary Incentives on Quality and Performance

- Why is estimating the relationship between salaries and performance hard?
  - Usual omitted variable problems
  - Plus politicians set their own salaries
  - So you need an instrument of some type
- Setting:
  - Municipal legislators in Brazil, 98% of whom are part time
  - Regression discontinuity design – salary caps are a function of municipal size
  - Use the cap as an instrument for salaries

The RD rule

Table 1. Constitutional Amendment No. 25, 2000

Population bracket	Cap on salary as a percentage of state legislators salary	Value of maximum allowed salary in 2004	Cap on legislative spending as a proportion of revenues	Average legislative spending as a proportion of revenues	Cap on salary spending as a proportion of legislative spending
0 to 10,000	20%	1927.1	8%	3.6%	75%
10,001 to 50,000	30%	2890.6	8%	3.0%	75%
50,001 to 100,000	40%	3854.2	8%	2.8%	75%
100,001 to 300,000	50%	4817.7	7%	2.6%	75%
300,001 to 500,000	60%	5781.2	6%	2.7%	75%
500,000 plus	75%	7226.6	5%	2.6%	75%

Notes: The population brackets and the caps on the salaries are defined by the Constitutional Amendment No. 25, 2000. The approximate salaries in 2004 are calculated based on the salary of Federal Deputies of R$ 12,847.2. The maximum legislative spending is defined as a proportion of revenues, defined as the sum of tax revenues and intergovernmental transfers in the previous year.

Looks like it binds...

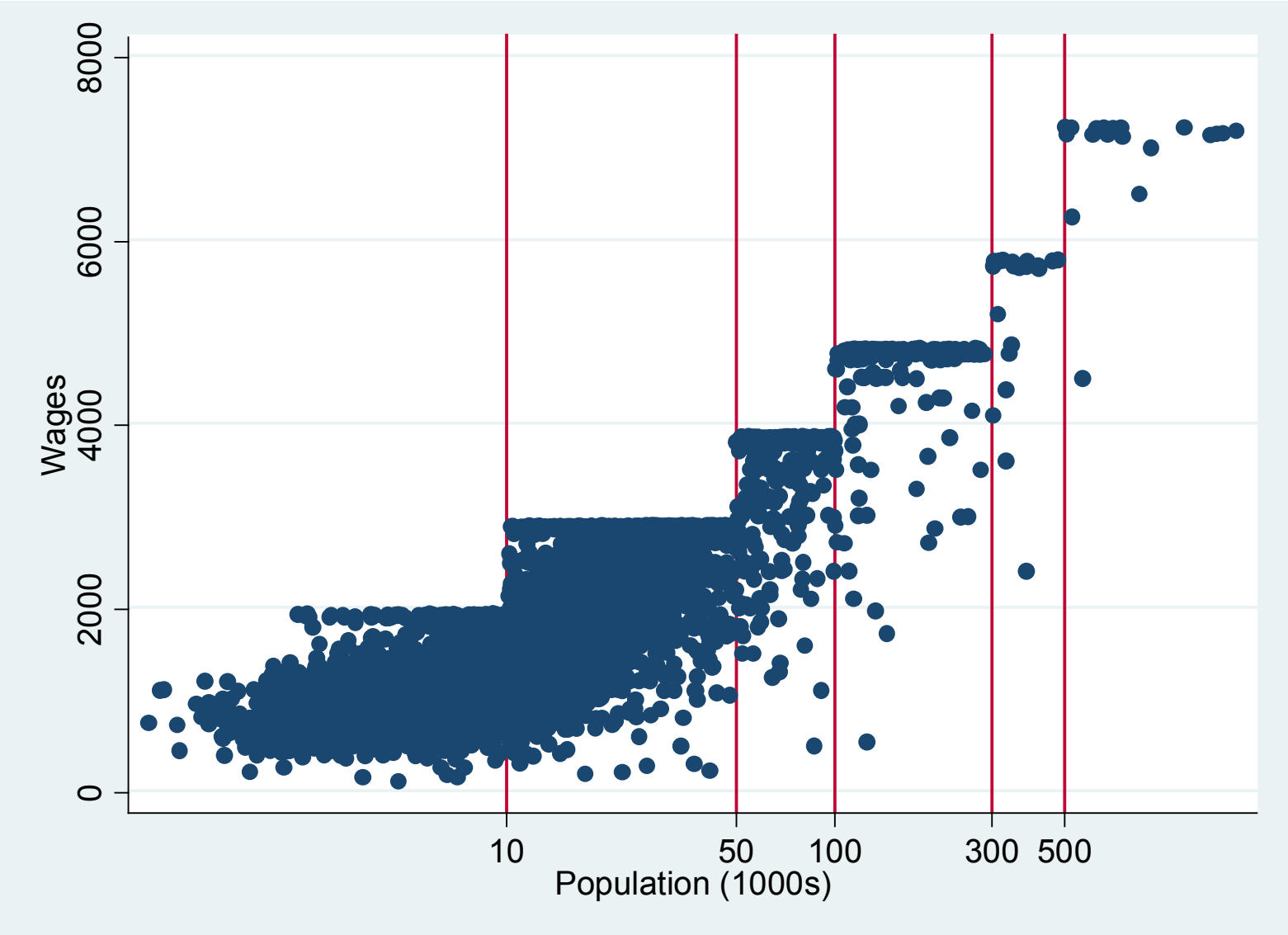
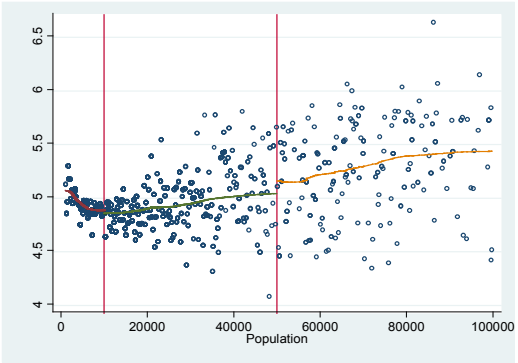


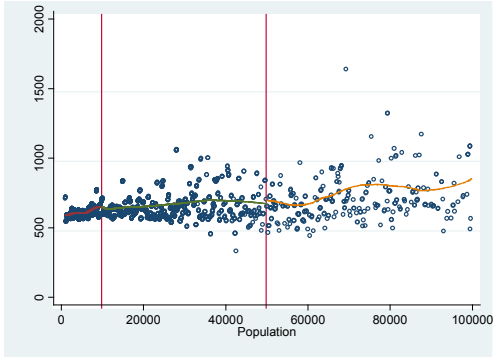
FIGURE 1: LEGISLATORS' SALARIES BY POPULATION

Courtesy of Claudio Ferraz and Frederico Finan. Used with permission.

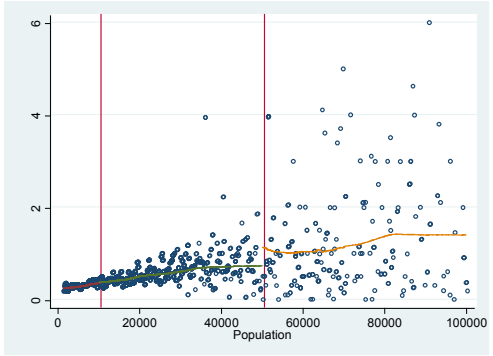
Other characteristics do not change at discontinuity



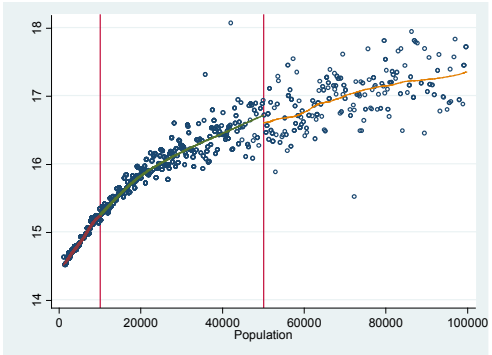
Income per capita (log)



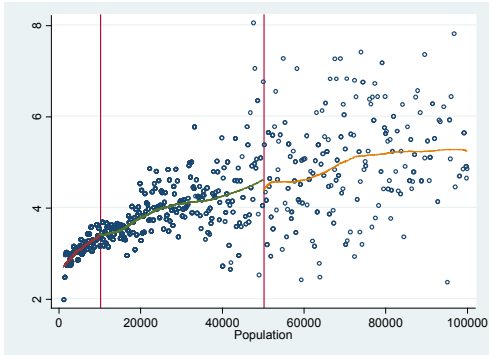
Private Sector Wages



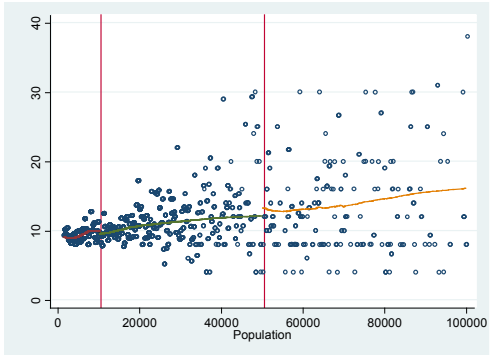
Assistants per legislators



Total Expenditure 2000



Effective Number of Political Parties in 1996 Elections



Hours in session

FIGURE 2: MUNICIPAL CHARACTERISTICS BY POPULATION

Notes: The figure shows municipal characteristics by population. Each figure presents the mean of the municipal characteristic for a bin size of 200 inhabitants (hollow-circles) along with a locally weighted regression calculated within each population segment with a bandwidth of 0.5. The vertical lines denote the various cutoff points.

Courtesy of Claudio Ferraz and Frederico Finan. Used with permission.

Estimation

- Define the salary cap function as the non-linear function of population shown in Figure 1:

$$\begin{aligned} f_i^{cap} &= 1927.1 \times 1\{P_i \leq 10,000\} + \\ &\quad 2890.6 \times 1\{P_i \in (10,000, 50,000]\} + \\ &\quad 3854.2 \times 1\{P_i \in (50,000, 100,000]\} + \\ &\quad 4817.7 \times 1\{P_i \in (100,000, 300,000]\} + ... \end{aligned}$$

  where P_i is population of municipality i.
- Estimate the following IV model:

$$\begin{aligned} y_i &= \beta_0 + \beta_1 w_i + g(P_i) + \varepsilon_i \\ w_i &= \alpha_0 + \alpha_1 f_i^{cap} + g(P_i) + \mu_i \end{aligned}$$

  controlling for flexible polynomial in P_i
- This approach requires a constant coefficient α_1 and the (known) functional form for f. But maybe some cutoffs are more binding than others. What do to?

First stage

Table 4. First-Stage Results

Dependent variable	Wages				
	(1)	(2)	(3)	(4)	(5)
1{x>10,000}	300.221	351.656			
	[24.984]***	[24.126]***			
1{x>50,000}	714.156	181.299			
	[44.255]***	[77.649]**			
1{x>100,000}	562.203	527.580			
	[72.648]***	[135.854]***			
1{x>300,000}	478.769	313.848			
	[191.212]**	[273.066]			
1{x>500,000}	1205.685	991.549			
	[228.879]***	[408.177]**			
Salary caps			0.360	0.655	0.561
			[0.026]***	[0.038]***	[0.035]***
Log income per capita	-127.398	-130.167	-130.963	-113.574	-141.676
	[30.620]***	[30.067]***	[30.190]***	[32.091]***	[30.120]***
% urban population	137.510	123.008	127.164	256.883	131.523
	[32.908]***	[31.988]***	[32.075]***	[35.209]***	[32.015]***
Gini	1151.751	1172.443	1182.932	1442.734	1125.511
	[129.011]***	[127.289]***	[127.460]***	[136.035]***	[127.013]***
% households with energy	142.595	143.488	142.351	102.902	141.835
	[52.751]***	[50.908]***	[51.057]***	[55.623]*	[50.587]***
% literate	174.494	114.378	106.562	96.972	200.438
	[120.447]	[117.034]	[116.857]	[127.397]	[116.409]*
Average wages in the municipality	359.909	317.249	327.173	355.260	331.962
	[43.119]***	[44.496]***	[44.513]***	[46.582]***	[44.882]***
Hours functioning legislature	5.535	5.144	5.134	6.055	5.510
	[1.043]***	[1.021]***	[1.029]***	[1.137]***	[1.022]***
Assistants per legislator	44.818	35.768	35.142	69.312	45.031
	[12.916]***	[12.411]***	[12.738]***	[16.011]***	[12.804]***
Functional form assumption on population	Log	Linear spline	Linear spline	3rd-order polynomial with quadratic on first cutoff	3rd-order polynomial with quadratic on first two cutoffs
Observations	5093	5093	5093	5093	5093
R-squared	0.76	0.80	0.80	0.80	0.80
F-test on cutoff indicators	133.11	47.10			
(P-values)	[0.00]	[0.00]			

Notes: This table reports the OLS estimate of the effects of the population cutoffs and salary caps on wages. The running variable x refers to the population in 2003. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. Robust standard errors are reported in brackets. The reported F-test refers to the cut-off indicators.

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Impact on legislative effort

Table 5: The Effects of Wages on Legislative Performance

Dependent variable:	Number of Bills Submitted		Number of Bills Approved		Functioning Commission		Public events	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: IV estimates								
Wages	0.807	0.672	0.584	0.515	0.065	0.062	0.074	0.06
	[0.238]***	[0.230]***	[0.125]***	[0.122]***	[0.025]***	[0.026]**	[0.033]**	[0.034]*
Panel B: Reduced-form estimates								
Salary caps	0.72	0.621	0.487	0.429	0.043	0.04	0.034	0.026
	[0.220]***	[0.211]***	[0.109]***	[0.105]***	[0.020]**	[0.021]*	[0.029]	[0.029]
R-squared	0.18	0.2	0.15	0.17	0.02	0.03	0.03	0.04
Municipal characteristics	No	Yes	No	Yes	No	Yes	No	Yes
Observations	3544	3544	3544	3544	5093	5093	5093	5093

Notes: The table reports the TSLS and reduced-form estimates for the effects of wages on legislative performance for the 2005/2008 legislature. Municipal Characteristics include Log household income per capita, % urban population, Gini coefficient, % households with energy, % literate population, average wage in private and public sector in municipality, the number of hours the legislature functions per week and assistants per legislator. All regressions include a 3rd order polynomial in population along with a quadratic spline on the first cutoff. Wages and salary caps have been divided by 1000. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. Robust standard errors are reported in brackets. The excluded instrument is the salary caps.

Impact on public good provision

Table 6. The Effects of Wages on Legislative Performance: Public Goods Provision

	Education			Health			Sanitation
Dependent variable:	Number of schools per school aged child (x1000)	Some schools have science lab	Some schools have computer lab	Health Clinic	Number of doctors per capita (x1000)	Average number of doctor visits per household per year	Share of population with sanitation connections
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: IV estimates							
Wages	0.328	0.185	0.134	0.153	0.355	0.214	0.017
	[0.174]*	[0.031]***	[0.026]***	[0.033]***	[0.089]***	[0.050]***	[0.014]
Panel B: Reduced-form estimates							
Salary caps	0.217	0.121	0.088	0.102	0.233	0.074	0.012
	[0.113]*	[0.020]***	[0.017]***	[0.022]***	[0.057]***	[0.021]***	[0.010]
Municipal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5004	5004	5004	4200	5059	5094	4155

Notes: The table reports the TSLS and reduced-form estimates for the effects of wages on legislative performance for the 2005/2008 legislature. Municipal Characteristics include Log household income per capita, % urban population, Gini coefficient, % households with energy, % literate population, average wage in private and public sector in municipality, the number of hours the legislature functions per week and assistants per legislator. All regressions include a 3rd order polynomial in population along with a quadratic spline on the first cutoff. Wages and salary caps have been divided by 1000. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. Robust standard errors are reported in brackets. The excluded instrument is the salary caps.

Evidence of positive selection

Table 7. The Effects of Wages on Political Selection

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Dependent variable	Years of schooling	No formal schooling	Some primary school	Primary school	Some high school	High school	Some college	College	High skilled occupation
Wages	0.495 [0.155]***	-0.023 [0.008]***	-0.016 [0.015]	-0.014 [0.012]	0.009 [0.008]	0.004 [0.016]	0.021 [0.007]***	0.017 [0.013]	0.043 [0.018]**
Observations	5091	5093	5093	5093	5093	5093	5093	5093	5093
Panel B: Dependent variable	Average terms of experience	1 term of experience	2 terms of experience	3 terms of experience	4 terms of experience	5 terms of experience	6 terms of experience	7 terms of experience	Male
Wages	0.154 [0.056]***	-0.047 [0.019]**	-0.007 [0.015]	0.03 [0.012]**	0.021 [0.008]**	0.005 [0.005]	0.003 [0.002]	0.000 [0.003]	-0.005 [0.010]
Observations	5093	5092	5092	5093	5092	5093	5093	5093	5093
Municipal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the TSLS estimates of the effects of wages on political selection of 2005/2008 legislature. Municipal Characteristics include Log household income per capita, % urban population, Gini coefficient, % households with energy, % literate population, average wage in private and public sector in municipality, the number of hours the legislature functions per week and assistants per legislator. All regressions include a 3rd order polynomial in population along with a quadratic spline on the first cutoff. Wages have been divided by 1000. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. Robust standard errors are reported in brackets. The excluded instrument is the salary caps.

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Does selection affect the results? Controlling for selection

Table 8. The Effects of Wages on Legislative Productivity: Incentives versus selection

Dependent variable:	Number of Bills Submitted	Number of Bills Approved	Functioning Commission	Public events	Number of schools per school aged child (x1000)	Some schools have science lab	Some schools have computer lab	Health Clinic	Number of doctors per capita (x1000)	Average number of doctor visits per household per year	Share of population with sanitation connections
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A:											
Wages	0.662	0.482	0.064	0.055	0.286	0.176	0.132	0.158	0.31	0.106	0.017
	[0.243]***	[0.132]***	[0.027]**	[0.035]	[0.178]	[0.032]***	[0.027]***	[0.034]***	[0.092]***	[0.033]***	[0.015]
Male	0.448	0.289	0.004	-0.086	-0.309	-0.068	-0.008	-0.011	0.319	-0.034	-0.032
	[0.229]*	[0.177]	[0.046]	[0.055]	[0.358]	[0.057]	[0.039]	[0.064]	[0.129]**	[0.059]	[0.026]
Years of schooling	0.024	0.026	0.002	0.009	-0.024	0.013	0.002	-0.004	0.05	0.011	0.006
	[0.020]	[0.010]***	[0.003]	[0.004]**	[0.023]	[0.004]***	[0.003]	[0.004]	[0.009]***	[0.004]***	[0.002]***
Terms of experience	0.006	0.049	-0.014	0.012	0.136	0.000	0.007	-0.012	0.076	-0.001	0.001
	[0.080]	[0.060]	[0.008]*	[0.010]	[0.084]	[0.011]	[0.008]	[0.012]	[0.028]***	[0.010]	[0.004]
High skilled occupation	-0.069	-0.185	-0.017	-0.024	0.652	-0.012	-0.007	-0.012	0.112	0.021	-0.019
	[0.185]	[0.110]*	[0.028]	[0.035]	[0.201]***	[0.035]	[0.025]	[0.040]	[0.082]	[0.035]	[0.016]
Panel B: Controlling for reelection rates											
Wages	0.653	0.471	0.067	0.054	0.322	0.171	0.136	0.157	0.316	0.101	0.027
	[0.240]***	[0.132]***	[0.027]**	[0.035]	[0.181]*	[0.033]***	[0.027]***	[0.035]***	[0.091]***	[0.032]***	[0.018]
Male	0.449	0.304	0.004	-0.084	-0.351	-0.062	-0.012	-0.012	0.303	-0.034	-0.032
	[0.230]*	[0.178]*	[0.046]	[0.055]	[0.358]	[0.057]	[0.039]	[0.064]	[0.130]**	[0.059]	[0.026]
Years of schooling	0.024	0.026	0.002	0.009	-0.019	0.013	0.003	-0.005	0.052	0.011	0.006
	[0.020]	[0.010]**	[0.003]	[0.004]**	[0.023]	[0.004]***	[0.003]	[0.004]	[0.009]***	[0.004]***	[0.002]***
Terms of experience	0.007	0.075	-0.016	0.015	0.056	0.011	-0.001	-0.009	0.045	0.001	0.001
	[0.093]	[0.066]	[0.009]*	[0.011]	[0.088]	[0.012]	[0.008]	[0.013]	[0.030]	[0.010]	[0.004]
High skilled occupation	-0.067	-0.17	-0.018	-0.022	0.59	-0.004	-0.013	-0.009	0.09	0.023	-0.02
	[0.183]	[0.110]	[0.028]	[0.035]	[0.199]***	[0.035]	[0.025]	[0.040]	[0.082]	[0.035]	[0.016]
Municipal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3544	3544	5092	5092	5002	5002	5002	4199	5057	5092	4153

Notes: The table reports the TSLS estimates of the effects of wages on political performance of 2005/2008 legislature. Municipal Characteristics include Log household income per capita, % urban population, Gini coefficient, % households with energy, % literate population, average wage in private and public sector in municipality, the number of hours the legislature functions per week and assistants per legislator. The regressions in Panel B all include a 3rd order polynomial in the share of incumbents from 2001-2004 legislature that was re-elected in 2004. All regressions include a 3rd order polynomial in population along with a quadratic spline on the first cutoff. Wages have been divided by 1000. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. Robust standard errors are reported in brackets. The excluded instrument is the salary caps.

Courtesy of Claudio Ferraz and Frederico Finan. Used with permission.

More on wages and selection

Dal Bo, Finan, and Rossi (2013): Strengthening State Capabilities: The Role of Financial Incentives in the Call to Public Service

- RCT in Mexico which varied the wage at which people are recruited
- Key question: estimate impact of wages on both market-valued skills and public orientedness

Experimental design

- Jobs are for facilitators for a Mexican rural works program. Does this matter?
- Job postings sent out to 133 schools and 106 localities. Provided general description of job, toll-free number, and email address. But not wage.Does this matter? How do you think about this?
- When you call or email in, they register your name and address. Depending on locality where you saw the add, they tell you the wage. Wage thus randomized by locality. Why? Would you do it this way or no? What about sorting?
- Wage randomized to either 3,750 pesos per month ($350) or 5,000 ($500) pesos per month. Corresponds to 65th and 80th percentiles of wage distribution. Does this seem right? What would Becker and Stigler theory tell you?

Results

TABLE III

EFFECTS ON FINANCIAL INCENTIVES ON APPLICANT POOL: PRODUCTIVE ATTRIBUTES

	Observations (1)	Control (2)	Treatment effect (3)	Randomization inference p-value (4)	FDR q-value (5)
Number of applicants	106	18.093	4.714 [4.430]	.36	n/a
Panel A: Market skills					
Wage in previous job	1,572	3479.667	819.154 [174.703]***	.00	0.00
Previous job was white collar	1,170	0.243	0.069 [0.029]***	.01	0.02
Currently employed	2,225	0.104	0.053 [0.019]***	.01	0.02
Has work experience	2,212	0.459	0.167 [0.048]***	.00	0.00
Years of experience in past 3 spells	2,212	1.185	0.284 [0.171]	.08	0.06
IQ (Raven test)	2,229	8.488	0.506 [0.223]**	.01	0.02
Raven score ≥ 9	2,229	0.572	0.091 [0.039]**	.01	0.02
Chose dominated risk option	2,213	0.431	−0.064 [0.025]**	.01	0.02
Years of schooling	2,198	14.552	0.091 [0.308]	.40	0.14

Results

TABLE III
(CONTINUED)

	Observations (1)	Control (2)	Treatment effect (3)	Randomization inference p-value (4)	FDR q-value (5)
Panel B: Personality traits					
Extraversion	2,189	3.674	0.013 [0.036]	.37	0.14
Agreeableness	2,167	4.107	0.004 [0.022]	.44	0.15
Conscientiousness	2,191	4.235	0.063 [0.030]**	.03	0.04
Neuroticism	2,168	2.254	−0.099 [0.033]***	.01	0.02
Openness	2,168	3.910	0.042 [0.028]	.08	0.06
Big 5 index	2,099	0.000	0.087 [0.049]*	.07	0.06
Integrity: direct	2,223	0.067	−0.009 [0.013]	.73	0.26
Integrity: indirect	2,099	44.424	0.602 [1.232]	.33	0.14

Results

TABLE IV

EFFECTS ON FINANCIAL INCENTIVES ON THE APPLICANT POOL: MOTIVATION PROFILE

	Observations (1)	Control (2)	Treatment effect (3)	Randomization inference p-value (4)	FDR q-value (5)
Panel A: PSM traits					
PSM index	2,074	0.000	0.092 [0.046]**	.05	0.09
Attractiveness	2,217	2.803	0.070 [0.041]*	.05	0.14
Commitment	2,170	3.316	0.045 [0.035]	.15	0.18
Social justice	2,180	3.646	0.075 [0.026]***	.01	0.04
Civic duty	2,158	3.924	0.027 [0.033]	.25	0.22
Compassion	2,168	3.001	0.066 [0.031]**	.04	0.14
Self-sacrifice	2,168	3.687	0.039 [0.034]	.15	0.18
Panel B: Prosocial behavior					
Altruism	2,199	23.491	0.039 [0.291]	.53	0.29
Negative reciprocity	2,206	0.508	0.075 [0.023]***	.00	0.00
Cooperation	2,157	26.174	0.675 [0.404]*	.08	0.16
Did charity work in the past year	2,223	0.605	−0.096 [0.041]**	.01	0.05
Volunteered in the past year	2,224	0.710	−0.006 [0.027]	.38	0.34
Importance of wealth	2,025	3.159	0.107 [0.087]	.14	0.18
Belongs to a political party	2,225	0.113	−0.026 [0.014]*	.07	0.16
Voted	2,225	0.758	0.019 [0.035]	.33	0.26

(5) reports the q-value associated with the false discovery rate test which accounts for the multiple testing. See the Appendix for more details on the procedure. Statistically significant at the 10%

Discussion

- What do you make of this?
- What else might you want to see?

Do corrupt people select into public service?

Hanna and Wang (2013): Dishonesty and Selection into Public Service

- Use dice-game from Fischbacher and Follmi-Heusi to measure dishonesty:
  - Ask respondent to privately roll a standard die 42 times
  - Respondent reports the list of what they roll
  - Respondent is paid based on the sum of the dice roll
  - Allows researcher to test for dishonestly statistically, while not identifiying it for each individual (unless they do something really stupid)
- They then ask two questions:
  - For students in Indian universities, are more dishonest students (measured by dice) more likely to express a preference to become civil servants
  - For nurses in Indian public health centers, are more dishonest nurses (measured by dice) more likely to be absent from work?

Table 3A: Does Dishonesty in the Dice Task Predict Job Preferences and Worker Attendance?

	Student Sample		Nurse Sample	
	Wants Government Job		Attendance	
	(1)	(2)	(3)	(4)
Dice Points	0.002^{***}		-0.002^{*}	
	(0.001)		(0.001)	
High Dice Score		0.063^{*}		-0.075^{**}
		(0.037)		(0.038)

Courtesy of Rema Hanna and Shin-Yi Wang. Used with permission.

$p < .01$

Another approach: incentives

- A totally different approach is to pay for performance
- In the aligned case, with little multi-tasking, economics are straightforward. Issue is whether incentives are actually enforced:
  - Duflo, Hanna, and Ryan (2012) show that paying teachers based on attendence increases attendence and test scores
  - but, Banerjee et al (2008) show that paying nurses based on attendence worked initially, but over time was undone as nurses exploted loopholes in the system (excused absences)
- But other cases may be harder

Tax Farming

Khan, Khwaja, and Olken (2014): Tax Farming Redux: Experimental Evidence on Performance Pay for Tax Collectors

- Randomized experiment on incentives for property tax collectors in Pakistan
  - Tax officers in treatment group (team of three staff) receive 20-40% of all revenue collected above a historical benchmark (On average each person faces a 10% incentive on the margin)
  - Many staff get close to doubling their base wages
- What do you expect will happen?

Model

- Nash bargaining (assume equal weights) between Taxpayer (P) and Tax Collector (C) to collude and reduce official tax liability
- τ^*: true amount of tax, same for everyone. Can instead negotiate to pay bribe (b) and report less tax τ ($\leq \tau^*$).
- Taxpayer's utility:

$$u_p(\tau, b) = -\tau - \alpha(\tau^* - \tau) - b$$

  where $\alpha(\tau^* - \tau)$ is cost of under-paying: α is heterogeneous among taxpayers
- Tax collector's utility:

$$r\tau - \beta(\tau^* - \tau) + b$$

  r: proportional incentive,$\beta(\tau^* - \tau)$ is cost of under-taxing
- Possibility of getting caught/penalty embedded in $\alpha(\tau^* - \tau)$ and $\beta(\tau^* - \tau)$.

Model

- Nash bargaining: Maximize (net of outside options) joint surplus from agreement

$$[-\tau - \alpha(\tau^* - \tau) - b + \tau^*] + [r\tau - \beta(\tau^* - \tau) + b - r\tau^*]$$

Rewrite as:

$$-\tau(1 - r - \alpha - \beta) + (1 - r - \alpha - \beta)\tau^*$$

- Solving yields (corner solutions; γ is bargaining weight of taxpayer):

$$(\tau, b) = \begin{cases} (0, [(1-\gamma)(\beta + r) + \gamma(1-\alpha)]\tau^* & \text{if } r + \alpha + \beta < 1 \\ (\tau^*, 0) & o/w \end{cases}$$

Model

- Comparative statics: As r increases (performance pay introduced) - two effects:
  - Equilibrium Selection: LESS likely to get collusive equilibrium
    - Recall Need: $r + \alpha + \beta < 1$ for collusion
    - Intuition: "Outside" option (fully collect taxes) of collector has gone up
  - Equilibrium Bribe Amount:
    - Recall (conditional on collusion) bribe $= [(1 - \gamma)(\beta + r) + \gamma(1 - \alpha)]\tau^*$
    - Intuition: Increased outside option of collector means he requires larger bribe
- Overall:
  - total amount of tax collected increases.
  - total amount of bribe can either increase or decrease (depends on distribution of α).
  - total amount of money paid by the taxpayers (tax + bribe) increases.

Results

Revenue

Table 3: Impacts on Revenue Collected

	Year 1			Year 2		
	(1) Total	(2) Current	(3) Arrears	(4) Total	(5) Current	(6) Arrears
Panel A: Main Treatment						
Any treatment	0.090***	0.073***	0.152**	0.093***	0.091***	0.113
	(0.028)	(0.027)	(0.069)	(0.031)	(0.032)	(0.083)
Panel B: Subtreatments						
Revenue	0.117***	0.109***	0.134	0.128***	0.152***	0.005
	(0.035)	(0.034)	(0.099)	(0.044)	(0.044)	(0.133)
Revenue Plus	0.080	0.086*	0.072	0.092**	0.081*	0.175
	(0.053)	(0.052)	(0.110)	(0.045)	(0.049)	(0.114)
Flexible Bonus	0.070*	0.024	0.243**	0.056	0.035	0.148
	(0.038)	(0.035)	(0.098)	(0.041)	(0.042)	(0.108)
N	481	481	481	482	482	479
Mean of control group	15.672	15.379	14.030	15.745	15.518	13.915
Rev. vs. Multitasking p.	0.322	0.193	0.830	0.237	0.049	0.262
Objective vs. Subjective p.	0.530	0.090	0.212	0.222	0.084	0.634
Equality of Schemes	0.561	0.143	0.433	0.363	0.086	0.527
Joint significance	0.004	0.010	0.073	0.014	0.005	0.305

Table 6: Impacts on Reassessments

Panel A

	(1) Total Number of Section 9 Properties Added to Tax Rolls in Treatment Period	(2) Number of New Properties Added to Tax Rolls in Treatment Period	(3) Number of Reassessed Properties Added to Tax Rolls in Treatment Period
Treatment	83.0*	74.0**	9.0
	(45.27)	(34.39)	(22.35)
N	234	234	234
Mean of control group	96.7	36.7	60.0

Panel B

				Components of GARV						
	(1) GARV	(2) Number of floors	(3) Last renovation was $\leq$ 2 years ago	(4) Land area (sq. feet)	(5) Total covered area (sq. feet)	(6) Main Road	(7) Tax Category	(8) Percent of property commercial	(9) Percent of property commercial and rented	(10) Tax Liability
Re-assess * Treatment	20674.778	0.002	-0.005	-271.548	869.811	-0.002	-0.220***	0.018	0.075**	4118.466
	(16481.084)	(0.050)	(0.020)	(746.256)	(769.903)	(0.048)	(0.084)	(0.037)	(0.029)	(3601.334)
Re-assess	24878.797***	0.078***	0.095***	334.908	-202.510	0.064***	0.204***	0.217***	0.176***	5517.176***
	(7786.877)	(0.026)	(0.011)	(514.958)	(376.675)	(0.024)	(0.041)	(0.019)	(0.015)	(1718.354)
N	15489	16352	16128	16352	16346	16352	15489	16226	16227	15489
Mean of control group in gen. pop. sample	35986.47	1.57	0.02	2703.99	2803.92	0.46	3.76	0.35	0.17	6483.80

Panel C

	(1) Approximate age of owner	(2) Owner's level of education	(3) Per-capita wages	(4) Predicted expenditure given assets	(5) Connected to Politician	(6) Connected to Politician/ Government/ Police
Re-assess * Treatment	-0.348	-0.523*	-821.749	111.044	0.021*	0.005
	(0.794)	(0.317)	(1078.070)	(213.404)	(0.012)	(0.027)
Re-assess	-0.656*	0.303*	13.126	-94.557	-0.013**	0.005
	(0.398)	(0.157)	(510.004)	(122.394)	(0.006)	(0.014)
N	13406	16254	13765	13954	16354	16354
Mean of control group in gen. pop. sample	50.70	9.19	16281.55	6291.64	0.05	0.36

Notes: This table examines whether the performance pay treatments affected the number of properties that were reassessed (Panel A), and how reassessed properties (Panel B) and property owners (Panel C) differed from the average property. The unit of observation is a circle, as defined at the time of the survey (Quarter 2 of FY 2012-2013). Panel A presents instrumental variables regressions, where treatment status is instrumented with randomization results. The sample consists of circles that were surveyed in the second phase of the survey (see Appendix B). Specification includes stratum fixed effects and controls for number of new and reassessed properties added in the pre-treatment (FY 2011) fiscal year. Panels B and C present instrumental variables regressions, where treatment status is instrumented with randomization results. Specifications follow Equation 5.6 of the main text, and includes a control for whether the response came from the short version of the questionnaire. The characteristics in Panel B labelled Components of GARV are those that directly enter into the formula used to calculate GARV (see Appendix B for more information). Tax Category (Panel B, Column 7) is 7-tiered categorical variable with 7 being the most expensive tax bracket and 1 being the least expensive. Per-capita wages (Panel C, Column 3) is self-reported household expenditures divided by the total number of working household members. Predicted expenditure given assets (Panel C, Column 4) is the predicted value of a regression of household expenditure on series of dummy variables indicating various household assets. The Information treatment is included in the control group in all panels. Standard errors in all panels are clustered by the robust partition of circles (a partition of circles such that all circles that merged or split with [illegible] in the same group in the robust partition. * p<0.10, ** p<0.05, *** p<0.01

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Results

Tax Gap

Courtesy of Adnan Q. Khan, Asim I. Khwaja, Benjamin A. Olken. Used with permission.

Table 7: Impacts on Tax Payments and Corruption, by Reassessed Status

	(1) Self-reported Tax Payment	(2) Bribe Payment	(3) Frequency of Bribe Payment	(4) Perception of Corruption
Panel A: General Population Sample				
Treatment	-126.9	594.1*	.2021**	.0113
	(310.5)	(333)	(.0951)	(.0254)
N	9632	5993	4802	6050
Mean of control group	4919.067	1874.542	0.683	0.644
Panel B: Re-assessed				
Re-assessed * Treatment	2248*	-557.4	-.1592*	-.0031
	(1311)	(367.1)	(.0934)	(.0221)
Re-assessed	3430***	-66.38	.0137	-.0191*
	(688.5)	(177.3)	(.0403)	(.0107)
N	13693	8207	6993	8268
Sample	Full	Phase 1	Phase 1	Phase 1
Mean of control group in gen. pop. sample	4713.484	1874.542	0.683	0.644

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
  - Incentives can also increase bargaining power of officials, so potentially a two-edged sword

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