14.770: Introduction to Political Economy
Lectures 8 and 9: Political Agency

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Introduction

- So far the models and conceptual ideas we have discussed lacked the key feature of representative democracies — delegation of policies to elected politicians.

- But then How to ensure that politicians implement policies consistent with voter preferences?

- Barro-Ferejohn model: elections as a politician control device.

- Voters vote politicians who do not "perform" out of office.

- Loosely speaking, politicians as "agents" and voters as "principals".

Control of Politicians: Overview

- Model of politicians moral hazard
- Current leader has power today, so can decide the allocation of resources (limited ability of citizens to control that in a representative democracy).
- But citizens can kick this politician out in the next election.
- This is the model considered by Barro (1973) and Ferejohn (1986).
- Main idea: provide just enough rents to the politician so that the threat of being kicked out, he/she doesn't misbehave too badly.

Model

- Infinite horizon, $t = 0, 1, 2, \ldots$
- Continuum of citizens, one politician per period.
- Discount factor (same for everybody for now) δ.

Timing of Events

- Output y produced.
- Incumbent politician decides how much output to devote to public goods g, how much to consume.
  Citizens' payoff:

$$g$$

  Politician payoff:

$$y - g + R$$

  where R is exogenous office rent, and $r = y - g$ is endogenous rent, corresponding to resources siphoned off or used for pet projects by the politician.
- Citizens decide whether to re-elect incumbent for next period, or choose identical new leader (from infinite pool).

Upper Bound on Citizens' Payoff

- Incumbent can always grab entire output today and then (at the worst) get fired. This guarantees payoff of

$$R + y$$

- Given that this much rent must be left to politician, an upper bound on citizens' payoff is

$$\frac{1}{1-\delta}\left(R+y\right) - \left(R+y\right)$$
$$= \frac{\delta}{1-\delta}\left(R+y\right)$$

- Another upper bound is total output $\frac{1}{1-\delta}y$.

- So overall upper bound on citizens' payoffs is

$$\frac{1}{1-\delta}\min\left\{\delta\left(R+y\right), y\right\}$$

Best Equilibrium

- There is a simple equilibrium that always gives citizens their best possible payoff (a best SPE):
- Politician is required to provide public goods at least $g^* = \min\{\delta(R+y), y\}$. (Reelected iff he/she does this).
- Politician provides exactly this much.
- In stationary equilibrium of this form, politician IC constraint is:

$$\frac{1}{1-\delta}(R + y - g^*) \geq R + y$$

or equivalently

$$g^* \leq \delta(R+y),$$

which is satisfied, and thus we have characterized a best SPE for the citizens, with their utility given by

$$\frac{1}{1-\delta}\min\{\delta(R+y), y\}.$$

- The IC constraint ensures that politicians receives enough rents.

Discussion

- Comparative statics: in this best equilibrium, citizen utility $\uparrow$ in δ, R, y. Is this intuitive?

- In this case, no gains from nonstationary strategies. Why?

- Still, there are other SPEs. How do we ensure that this one arises?

- Are there simple strategies that voters could use to implement this SPE?

    - Consider retrospective voting strategies, where citizens kick out the politician if they fall below a reservation utility.
    - Then choose the reservation utility as $\min\{\delta(R + y), y\}$.

- But problem: suppose there is cost ε of replacing the politician. What happens?

Incomplete Information

- Monitoring politicians becomes harder if they have private information about economic or other conditions affecting the feasibility or the cost of providing public goods.
- Suppose cost of providing unit of public goods is now stochastic, $\theta \sim F$ iid.
- Suppose cost observed only by politician.
- Citizens only see how many goods provided — this implies that citizens cannot tell apart whether low public goods are due excessive rent grabbing by the politician or because things are going badly in the economy.

Stationary Equilibrium

- Restrict attention to stationary equilibria: politician reelected iff g is above some g^*.
- Note, however, that nonstationary strategies may do better now.
- Letting V be politician's continuation value, politician will provide exactly g^* units of public good if

$$\theta g^* \leq \delta V,$$

  and will steal all output otherwise (and get fired).
- Politician provides public good iff

$$\theta \leq \theta^* = \frac{\delta V}{g^*}$$

- g^* too low $\implies$ few public goods even when they're provided.
- g^* too high $\implies$ politician rarely provides public goods.

Politician's Continuation Value

- Expected cost of public goods when they're provided is

$$\hat{\theta} = E\left[\theta | \theta \le \theta^*\right]$$

$\implies$ politician's continuation value is

$$
\begin{aligned}
V &= F\left(\theta^*\right)\left[R + y - \hat{\theta}g^* + \delta V\right] \\
&\quad + \left(1 - F\left(\theta^*\right)\right)\left[R + y\right]
\end{aligned}
$$

or equivalently

$$V = \frac{1}{1 - \delta F\left(\theta^*\right)}\left[R + y - F\left(\theta^*\right)\hat{\theta}g^*\right]$$

- Comparative statics: $V \uparrow$ in $\delta, R, y, \downarrow$ in g^*.

Optimal Stationary Equilibrium

- Politician's incentive constraint is

$$\theta^* g^* = \delta V$$

- Solution $\theta^* \uparrow$ in δ, R, y, $\downarrow$ in g^*.
- Citizen utility is $g^* F(\theta^*)$.
- Therefore, maximum citizen utility is

$$\max_{g^*} g^* F(\theta^*(g^*)),$$

and thus trades off the level of public good and the frequency of provision.
- Maximum citizen utility $\uparrow$ in δ, R, y.

Non-Stationary Equilibria

- Ferejohn only considers stationary equilibria, but non-stationary equilibria could be better.

- This is for two reasons:

1. **Productive efficiency:** efficient to provide more public goods when θ lower.

   - For example, society can expect the politician to deliver high public goods in some periods, but then lower levels at some future date.

2. **Backloading:** efficient to give politicians rents tomorrow rather than today, as this relaxes his incentive constraint in **both** periods.

- We will see how backloading works in the context of optimal nonstationary equilibria next.

Nonstationary Equilibria in a Production Economy

- Consider Acemoglu, Golosov and Tsyvinski (2008), which adds **endogenous production** and **concave utility** (risk aversion).
- But no incomplete information for simplicity.
- Each period, citizens decide how much output y to produce, at cost $h(y)$.
- Citizen utility:

$$u(g) - h(y)$$

- Politician utility:

$$v(y - g)$$

Optimal Equilibrium

- Best subgame perfect equilibrium (SPE) for citizens solves:

$$\max_{(y_t, g_t)_{t=0}^{\infty}} \sum_{t=0}^{\infty} \delta^t \left[u\left(g_t\right) - h\left(y_t\right) \right]$$

subject to (for all t)

$$u\left(g_t\right) \geq h\left(y_t\right) \qquad \text{(citizen IC)}$$

$$w_t \equiv \sum_{s=0}^{\infty} \delta^s v\left(y_{t+s} - g_{t+s}\right) \geq v\left(y_t\right) \qquad \text{(politician IC)}$$

- What are the implications of the politicians IC?

Short-Run and Long-Run Distortions

- We can think of the equilibrium being decentralize via a labor tax τ defined by:

$$u'\left((1-\tau)\,y\right) = h'\left(y\right)$$

- Why should we have $\tau > 0$?
  distort output down $\implies$ less for politician to steal
  $\implies$ relax politician incentive constraint.

- But, it is also efficient to give politician incentives through future consumption, or **backloading.**

- Intuitively, future promises relax politician IC both in the future and today.

- But once giving large share of output to politician, there is no longer a reason to distort output. So what happens to distortions in the long run?

Main Result

Theorem

In the optimal equilibrium, output is distorted downward in period 0 (that is, $\tau_0 > 0$).

The continuation values promised to the politician (w_t) are non-decreasing and converge to some w^*.

Also, distortions disappear in the long run, i.e., $\tau_t \to 0$ as $t \to \infty$.

- Because future payments to the politician relax the IC constraint, it's better to give late rewards than earlier rewards.
- This leads to backloading.
- Why not give everything very late? Because of concave utility.
- So rewards buildup slowly over time, until the IC constraint becomes slack.

Proof: Recursive Formulation

- The easiest way of proving this result is via the recursive formulation of the problem.
- What's best payoff for citizens consistent with politican getting payoff w?

$$V(w) = \max_{y,g,w^+} u(g) - h(y) + \delta V(w^+)$$

subject to

$$w = v(y - g) + \delta w^+ \qquad \text{(PK, } \gamma)$$
$$v(y - g) + \delta w^+ \geq v(y) \qquad \text{(IC, } \psi)$$

First-Order Conditions

- FOC_{w^+}:

$$V'\left(w^+\right) = -\gamma - \psi = V'\left(w\right) - \psi$$

where γ is the multiplier the promise keeping constrained and ψ is the multiplier on the politician IC constraint.

- $FOC_{y,g}$:

$$u'\left(g\right) - h'\left(y\right) = \psi v'\left(y\right)$$

- This clarifies that ψ is related to distortions. If $\psi = 0$, then $u'\left(g\right) - h'\left(y\right) = 0$ or equivalently, $\tau = 0$. (Why do distortions depend on $v'(y)$?)

- Now observed that by FOC_{w^+}, as $t \to \infty$,

$$\psi \to 0$$

- But then $u'\left(g\right) - h'\left(y\right) \to 0$ and thus $\tau \to 0$.

Converse Result

- Does this imply that distortions will always go down to zero?
- Not if the politician is more impatient than citizens (because he will be replaced for other reasons for example).

Theorem

Suppose the discount factor of the politician $\beta < \delta$. Then in the optimal equilibrium, output is distorted downward in period 0 (that is, $\tau_0 > 0$). Distortions do not disappear in the long run.

- Intuition: now costly to delay payments too much.

Electoral Controls with Career Concerns

- A major shortcoming of the previous models is that if replacing politicians is costly, then these equilibria might unravel.
- Why?
- This is partly because voters do not think that they are replacing the current politician with a better one.
- One way of overcoming this problem is to look at a different type of agency models, inspired by Holmstrom's career concerns model.
- The main idea is that there is a feature of the politician, like ability, that voters care about, which also affects outcomes.
- Then, forward-looking voters look at past performance to estimate the ability—and thus the electability—of the politician.

Career Concerns

- Let us illustrate the main issues using a two-period model here.
- The welfare of the voters is again

$$U_t = g_t.$$

- Let us modify the technology for public goods as follows:

$$g_t = \eta(y - r_t),$$

where η is the "ability" of the politician, which is fixed in both periods.

- Let us assume that η is drawn uniformly from the interval

$$\left[1 - \frac{1}{2\xi}, 1 + \frac{1}{2\xi}\right].$$

- We assume, for reasons that will become clear soon, that $r_t \leq \bar{r} < y$.

Career Concerns (continued)

- The important simplifying assumption of the Holmstrom model, which we adopt here, is that there is symmetric information, so the politician is also uncertain about η with the same prior.
- The utility of the politician is

$$v_I = r_1 + p_I \beta (R + r_2),$$

  with $0 < \beta < 1$ again as the discount factor, p_I is the endogenous probability of remaining in power, and now R is interpreted as non-pecuniary rents from being in power.
- The exact timing of events is as follows:
  - Nature determines η.
  - The politician chooses r_1.
  - Observing g_1 (but not r_1), voters decide whether to keep the politician. If they elect a new politician, he is drawn randomly from the same distribution.
  - The politician in power chooses g_2.

Career Concerns (continued)

- Given this structure, the equilibrium is straightforward to determine by backward induction.
- In the second period, there is no control over the politician, so

$$r_2 = \bar{r},$$

and public goods will be

$$g_2 = \eta(y - \bar{r})$$

- If they appoint a new politician, he will have $\mathbb{E}(\eta) = 1$, so the expected utility of appointing a new politician for the voters is

$$U_2^N = (y - \bar{r})$$

- What about the utility of keeping the incumbent? This would be

$$U_2^I = \tilde{\eta}(y - \bar{r})$$

where $\tilde{\eta}$ is their posterior about the incumbent's ability.

Career Concerns (continued)

- Now suppose that voters know that the politician will choose $\tilde{r}_1$ amounts of rents for himself.
- Then they can estimate

$$\tilde{\eta} = \frac{g_1}{y - \tilde{r}_1}$$

and their optimal reelection decision is

$$\tilde{p}_I = \begin{cases} 1 & \text{iff } \tilde{\eta} \geq \mathbb{E}(\eta) = 1 \\ 0 & \text{otherwise.} \end{cases}$$

- The problem is that $\tilde{r}_1$ is an equilibrium choice by the politician.
- He will try to make this choice in a way that affects the beliefs of citizens and his probability of remaining in power, for example, by providing more public goods.
- This is why this class of models are sometimes called "signal jamming" models.

Career Concerns (continued)

- To make more progress, let us first look at the probability that he keeps power.
- This is

$$
\begin{aligned}
p_I &= \text{Prob}\left[\tilde{p}_I = 1\right] = \text{Prob}\left[\tilde{\eta} \geq 1\right] \\
&= \text{Prob}\left[\frac{g_1}{y - \tilde{r}_1} \geq 1\right] = \text{Prob}\left[\frac{\eta(y - r_1)}{y - \tilde{r}_1} \geq 1\right] \\
&= \frac{1}{2} + \xi\left[1 - \frac{y - r_1}{y - \tilde{r}_1}\right]
\end{aligned}
$$

where the last equality exploits the uniform assumption for η.

- Now the incumbent will choose r_1 to maximize $v_I = r_1 + p_I \beta(R + r_2)$, which we can write as:

$$
\max_{r_1} v_I = r_1 + \left[\frac{1}{2} + \xi\left(1 - \frac{y - r_1}{y - \tilde{r}_1}\right)\right]\beta(R + \bar{r})
$$

Career Concerns (continued)

- The first-order condition of this maximization problems gives

$$1 - \frac{\xi(y - \tilde{r}_1)}{(y - r_1)^2}\beta(R + \bar{r}) = 0 \qquad (1)$$

- This defines a best-response $r_1(\tilde{r}_1)$ by the incumbent. When voters expect them to play $\tilde{r}_1$, he would play $r_1(\tilde{r}_1)$.
- Clearly, the equilibrium has to be a fixed point, $r_1(\tilde{r}_1) = \tilde{r}_1$.
- Substituting this into (1), we obtain

$$r_1 = y - \xi\beta(R + \bar{r})$$

and the politician keeps power with probability $p_I = \frac{1}{2}$, since in equilibrium nobody's fooled, and with probability $1/2$ the politician is worse than average.

Career Concerns (continued)

- This is therefore a more satisfactory model of deriving results in which elections appear as a method of controlling politicians.
- We can again express the equilibrium behavior of voters as electing the incumbent if

$$g_1 = \xi\beta(R + \tilde{r})\eta \geq \xi\beta(R + \bar{r})$$

- Nevertheless, it is important to emphasize that such decision rules are no longer "retrospective" or pre-determined punishment rules; instead they are derived from the forward-looking optimal behavior of the voters. This, in particular, implies that even if there were costs of replacing the current politician, with sufficiently small costs, the same equilibrium with the rise.

Evidence

- Several pieces of evidence in the literature point to the existence of political agency type considerations.
- In particular, politicians behave differently depending on how much rents they expect from remaining in office, and voters to kick out politicians who (badly) misbehave.
- Let us now go over a few papers illustrating this.

Electoral Accountability and Policy Choices

- Besley and Case (1995) provide differences-in-differences estimates from US governors. Term-limited governors raise taxes and spending, and this is driven by Democrats.

TABLE IV
THE IMPACT OF TERM LIMITS ON TAXES, SPENDING, AND MANDATES,[a] 1950–1986
(t-STATISTICS IN PARENTHESES)

	Dep var: sales taxes	Dep var: income taxes[b]	Dep var: corporate taxes	Dep var: total taxes	Dep var: state expenditure per cap	Dep var: state minimum wage[c]	Dep var: maximum weekly benefits[d]
Incumbent cannot stand for reelection	7.86 (2.58)	8.74 (2.54)	0.57 (0.67)	6.71 (1.56)	14.38 (2.10)	−0.14 (2.57)	2.25 (0.83)
State income per capita (1000s)	17.46 (4.58)	9.96 (2.52)	6.60 (5.27)	25.46 (4.87)	3.52 (0.46)	−0.04 (0.88)	8.64 (3.92)
Proportion state population elderly	980.78 (5.38)	20.68 (0.08)	8.36 (0.13)	695.14 (2.74)	−1143.34 (2.21)	−9.22 (3.69)	−1358.73 (6.65)
Proportion state population young	229.57 (2.08)	1564.84 (9.39)	221.38 (5.92)	1590.94 (9.95)	1293.53 (4.00)	0.18 (0.10)	646.86 (6.67)
State population (millions)	−0.99 (1.04)	7.68 (5.02)	2.61 (8.39)	−1.41 (0.62)	−16.70 (4.07)	−0.05 (4.39)	−7.74 (5.90)
R^2	0.8938	0.8721	0.8253	0.9170	0.9397	0.7619	0.7462
Number of observations	1728	1327	1364	1728	1728	1721	1604

a. See notes to Table III for sample information.
   All taxes and income are per capita in 1982 dollars.
   All regressions include year and state effects. Huber standard errors were used in calculating t-statistics.
b. Income tax regressions are restricted to states that have an income tax. Corporate taxes are treated analogously.

Term Length and Legislative Effort

- Dal Bo and Rossi (2011) exploit natural experiments from the Argentine Congress where term lengths were assigned essentially randomly.
- They find lower effort by legislators who face shorter terms.
- In 1983, 254 House members in Argentina were randomly assigned either a two-year or a four-year term.
- in 2001, a constitutional reform led to a similar variation for Senators. Out of 71 senators, some were given a two-year, some four-year and some others six-year terms.
- They measure effort with attendance, committee participation, number of times a legislator speaks on the floor, number of bills introduced, and number of bills approved. The authors construct an index from these six variables.

Term Length and Legislative Effort: Results

TABLE 5
The effects of term length on legislative effort

| | Index of legislative effort | | |
	(1)	(2)	(3)
Four-year term	0·212***	0·195***	0·193***
	(0·062)	(0·063)	(0·064)
Age		0·001	0·001
		(0·003)	(0·003)
Male		0·104	0·018
		(0·165)	(0·135)
Freshman		0·097	0·137
		(0·185)	(0·177)
Lawyer		0·035	0·058
		(0·076)	(0·075)
University degree		0·119*	0·119
		(0·071)	(0·076)
Leader		0·215*	0·225*
		(0·113)	(0·115)
Slackness		−0·024	−0·027
		(0·059)	(0·061)
Majority party		0·145**	0·139**
		(0·066)	(0·066)
Small block		0·176	0·186
		(0·161)	(0·154)
Distance		−0·007	
		(0·005)	
Province dummies	No	No	Yes

Notes: Standard errors clustered at the legislator level are in parentheses. All models include a time dummy and are estimated by ordinary least squares (OLS). The number of observations is 492. *Significant at the 10% level; **Significant at the 5% level; ***Significant at the 1% level.

Term Length and Legislative Effort (continued)

TABLE 6
The effects of term length on legislative effort by outcome

	Floor attendance		Committee attendance		Committee bills	
	(1)	(2)	(3)	(4)	(5)	(6)
Four-year term	2·513**	2·548***	5·635**	6·259**	0·133	0·175
	(1·076)	(0·956)	(2·764)	(2·498)	(0·100)	(0·108)
Change	3%	3%	11%	12%	14%	19%
Controls	No	Yes	No	Yes	No	Yes
Method	OLS	OLS	OLS	OLS	Neg. Bin.	Neg. Bin.
	Floor speeches		Bills introduced		Bills ratified	
	(7)	(8)	(9)	(10)	(11)	(12)
Four-year term	0·264	0·122	0·133	0·184	0·753***	0·669***
	(0·198)	(0·172)	(0·184)	(0·135)	(0·256)	(0·249)
Change	30%	13%	14%	20%	112%	95%
Controls	No	Yes	No	Yes	No	Yes
Method	Neg. Bin.	Neg. Bin.	Neg. Bin.	Neg. Bin.	Neg. Bin.	Neg. Bin.

Notes: Standard errors clustered at the legislator level are in parentheses. For OLS models, Change is calculated as $100 \times$ Estimate/mean of the respective output for legislators in a two year track. For Neg. Bin. (negative binomial) models, Change is calculated as $100 \times$ [exp(Estimate)-1]. All models include a time dummy. Controls include *Age, Male, Freshman, Lawyer, University degree, Leader, Slackness, Majority party, Small block,* and the set of province dummies. The number of observations is 492. *Significant at the 10% level; **Significant at the 5% level; ***Significant at the 1% level.

Audits and Elections

- A very creative paper by Ferraz and Finan (2008) studies the effects of random audits of mayors in Brazil.

- They compare mayors revealed to be corrupt right before and right after elections.

- Those revealed to be corrupt right after elections are very similar, but voters don't have this information (except through other channels such as performance).

- The question is whether information revealed from audits affects elections relative to the elections of similarly corrupt mayors whose information is not been revealed.

- They estimate differential effects indicating that this is the case.

- Also, the effects are stronger when there are more media channels (radio stations) likely publicizing this information to voters.

Audits and Elections: Main Effects

TABLE III
THE EFFECTS OF THE RELEASE OF THE AUDITS ON REELECTION RATES BY THE LEVEL OF REPORTED CORRUPTION

	Linear		Quadratic	Semiparametric	Corruption ≤ 5	Corruption ≤ 4
	(1)	(2)	(3)	(4)	(5)	(6)
Preelection audit	0.029	0.030	0.126	0.084	0.068	0.086
	[0.083]	[0.082]	[0.101]	[0.104]	[0.087]	[0.088]
Preelection audit × number of corrupt violations	−0.038	−0.038	−0.200		−0.070	−0.088
	[0.035]	[0.035]	[0.090]*		[0.041]+	[0.043]*
Preelection audit × number of corrupt violations^2			0.034			
			[0.017]*			
Preelection audit × corruption = 0				0.010		0.003
				[0.156]		[0.036]
Preelection audit × corruption = 2				−0.253		
				[0.148]+		
Preelection audit × corruption = 3				−0.321		
				[0.192]+		
Preelection audit × corruption = 4+				−0.159		
				[0.168]		
Number of corrupt violations	−0.013	−0.012	0.037		0.012	0.003
	[0.026]	[0.027]	[0.066]		[0.033]	[0.036]
Number of corrupt violations^2			−0.009			
			[0.011]			

Audits and Elections: Differential Effects by Media

TABLE VI

THE EFFECTS OF THE RELEASE OF THE AUDITS ON REELECTION RATES BY CORRUPTION LEVELS AND LOCAL RADIO

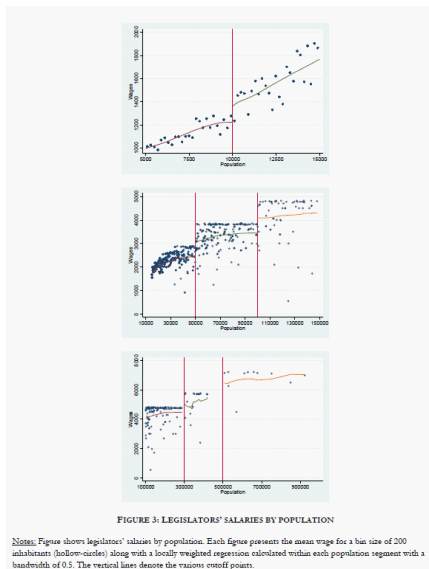| Dependent variable: Pr(reelection)	Full sample (1)	Corruption ≤ 5 (2)	Demographic interactions (3)	Demographic and institutional interactions (4)	Households w/ radio (5)
Preelection audit	−0.059	−0.033	0.296	0.208	−0.954
	[0.091]	[0.096]	[1.121]	[1.247]	[0.629]
Number of corrupt violations	−0.034	−0.013	−0.13	−0.069	−0.161
	[0.029]	[0.035]	[0.224]	[0.288]	[0.194]
Number of radio stations	−0.131	−0.150	−0.216	−0.253	
	[0.064]*	[0.063]*	[0.073]**	[0.083]**	
Preelection audit × number of radio stations	0.229	0.271	0.356	0.449	
	[0.099]*	[0.104]**	[0.115]**	[0.129]**	
Preelection audit × number of corrupt violations	0.007	−0.018	−0.236	−0.412	0.458
	[0.038]	[0.044]	[0.402]	[0.430]	[0.229]*
Number of corrupt violations × number of radio stations	0.050	0.058	0.082	0.09	
	[0.026]+	[0.025]*	[0.025]**	[0.028]**	
Preelection audit × corrupt violations × radio stations	−0.118	−0.157	−0.185	−0.238	
	[0.045]**	[0.067]*	[0.051]**	[0.064]**	

Selection

- In the literature on worker incentives, it is known that higher pay (or pay more sensitive to performance) not only affects effort but also changes the selection of workers (through differential hiring or selective retention).

- For example, a famous paper by Lazear studies the introduction of performance pay (in the form of piece rates) in a large auto glass installer.

- Lazear's evidence shows that when this particular company went from fixed salaries to piece rates productivity rose by 35% because of greater effort by the employees (the increase in average wages was 12%), but a large part of this response was due to selection — the composition of employees changed significantly.

- The same considerations are important in political economy.

- Different institutional arrangements (different rents) not only affect incentives, but may also change the composition of political candidates and elected officeholders.

A Study in Selection

- Another interesting paper by Ferraz and Finan (2011) uses discontinuous changes in legislator salaries as a function of municipality population to study these issues.

- In particular, the maximum salaries of legislatures in Brazil are constitutionally linked to municipality population, with this continuous changes at 10,000, 50,000, 100,000, 300,000 and 500,000 inhabitants — first stage shows that these discontinuous maxima translate into changes in actual salaries.

- Their main results show significant improvement in performance due to higher salaries, and there is an effect on "effort". But also there is a large effect on the composition of who runs and thus becomes a legislator.

Discontinuous Changes in Salaries

FIGURE 3: LEGISLATORS' SALARIES BY POPULATION

Notes: Figure shows legislators' salaries by population. Each figure presents the mean wage 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.

Effects on Performance

Table 8: The Effects of Wages on Provision of Public Goods

Dependent variable:	Education				Health		
	Change in number of schools	Change in share of schools with a science lab	Change in share of schools with a computer lab	Change in share of teachers with a college degree	Number of health clinics per capita (x1000)	Number of doctors per capita (x1000)	Change in the average number of doctor visits
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: IV estimates							
Log Wages	2.186	0.039	0.106	0.027	0.175	0.642	0.522
	[1.100]**	[0.020]**	[0.049]**	[0.050]	[0.052]***	[0.278]**	[0.236]**
F-test (exc. instruments)	26.21	26.21	26.21	24.52	27.31	28.59	30.23
Panel B: OLS estimates							
Log Wages	0.11	0.003	0.021	0.019	0.01	0.013	0.04
	[0.209]	[0.004]	[0.009]**	[0.009]**	[0.009]	[0.051]	[0.040]
R-squared	0.07	0.00	0.03	0.01	0.06	0.31	0.01
Municipal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4542	4542	4542	3814	4015	4859	4875

Notes: The table reports the IV estimates for the effects of wages on provision of public goods. The dependent variables in columns 1-4 and 7 refer to the change from 2004-2006. The dependent variables in columns 5 and 6 are the levels in 2006. All regressions control for the number of hours the legislature functions per week and assistants per legislator. The Log wages refer to legislators' wages from the 2005 Brazilian Legislative Census (Censo do Legislativo). Municipal Characteristics include Log household income per capita, % urban population, Gini coefficient, % households with energy, % literate population, log average wage in private and public sector in municipality, and a linear spline in population. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. Robust standard errors are reported in brackets. The instruments used are the indicators for the cutoffs at 1{x>10,000}, 1{x>50,000}, 1{x>100,000}, 1{x>300,000} and 1{x>500,000}. The reported F-test refers to these excluded instruments.

Effects on Effort

Table 7. The Effects of Politicians' Wages on Legislative Productivity

Dependent variable:	Log Number of Bill Submitted		Log Number of Bill Approved		Share of Bills Approved		Functioning Commission	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: IV estimates								
Log Wages	0.466	0.436	0.495	0.506	0.275	0.297	0.208	0.206
	[0.254]*	[0.251]*	[0.263]*	[0.264]*	[0.096]***	[0.099]***	[0.097]**	[0.098]**
F-test	27.18	26.63	25.29	24.51	20.62	19.91	29.83	29.72
(exc. instruments)								
Panel B: OLS estimates								
Log Wages	0.531	0.502	0.438	0.411	-0.022	-0.023	0.101	0.09
	[0.044]***	[0.041]***	[0.035]***	[0.035]***	[0.011]**	[0.011]**	[0.011]***	[0.012]***
R-squared	0.18	0.24	0.15	0.18	0.03	0.05	0.02	0.03
Municipal characteristics	No	Yes	No	Yes	No	Yes	No	Yes
Observations	4471	4471	4216	4216	3392	3392	4894	4894

Notes: The table reports the IV and OLS estimates for the effects of wages on legislative productivity. The dependent variable in columns 1 and 2 is the log of one plus the number of bills submitted. The dependent variable in columns 3-4 is the log of one plus the number of bills approved. All regressions control for the number of hours the legislature functions per week and assistants per legislator. The Log wages refer to legislators' wages from the 2005 Brazilian Legislative Census (Censo do Legislativo). Municipal Characteristics include Log household income per capita, % urban population, Gini coefficient, % households with energy, % literate population, log average wage in private and public sector in municipality, and a linear spline in population. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. Robust standard errors are reported in brackets. The instruments used are the indicators for the cutoffs at 1{x>10,000}, 1{x>50,000}, 1{x>100,000}, 1{x>300,000} and 1{x>500,000}. The reported F-test refers to these excluded instruments.

Effects on Selection

Table 5. The Effects of Politicians' Wages on Candidate Entry – TSLS

Dependent variable:	Total Number of Candidates per Seat		Average Years of Schooling		Share of candidates with less than a high school education		Share of candidates with at least a high school education		Share of male candidates		Average Age	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Log wages	1.463	1.334	0.619	0.625	-0.064	-0.069	0.066	0.072	-0.027	-0.029	-0.988	-1.015
	[0.598]**	[0.547]**	[0.352]*	[0.318]**	[0.037]*	[0.035]**	[0.037]*	[0.035]**	[0.017]	[0.017]*	[0.601]	[0.586]*
F-test (exc. instruments)	29.66	29.56	29.44	29.35	29.66	29.56	29.66	29.56	29.66	29.56	29.44	29.35
Municipal characteristics	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	4891	4891	4889	4889	4891	4891	4891	4891	4891	4891	4889	4889

Notes: The table reports the IV estimates for the effects of wages on the characteristics of those that ran for legislature in the 2004 elections. All regressions control for the number of hours the legislature functions per week and assistants per legislator. The Log wages refer to legislators' wages from the 2005 Brazilian Legislative Census (Censo do Legislativo). Municipal Characteristics include Log household income per capita, % urban population, Gini coefficient, % households with energy, % literate population, log average wage in private and public sector in municipality, and a linear spline in population. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. Robust standard errors are reported in brackets. The instruments used are the indicators for the cutoffs at 1{x>10,000}, 1{x>50,000}, 1{x>100,000}, 1{x>300,000} and 1{x>500,000}. The reported F-test refers to these excluded instruments.

Conclusion

- The empirical literature provides some evidence that politician behavior and effort respond to the election incentives and that voters, deliberately or otherwise, provide such incentives.
- But this evidence does not imply that incentives work well.
- In the next lecture we will see that under some conditions they work very badly.