Understanding the Foundations of Institutions: Moral Hazard in High Office

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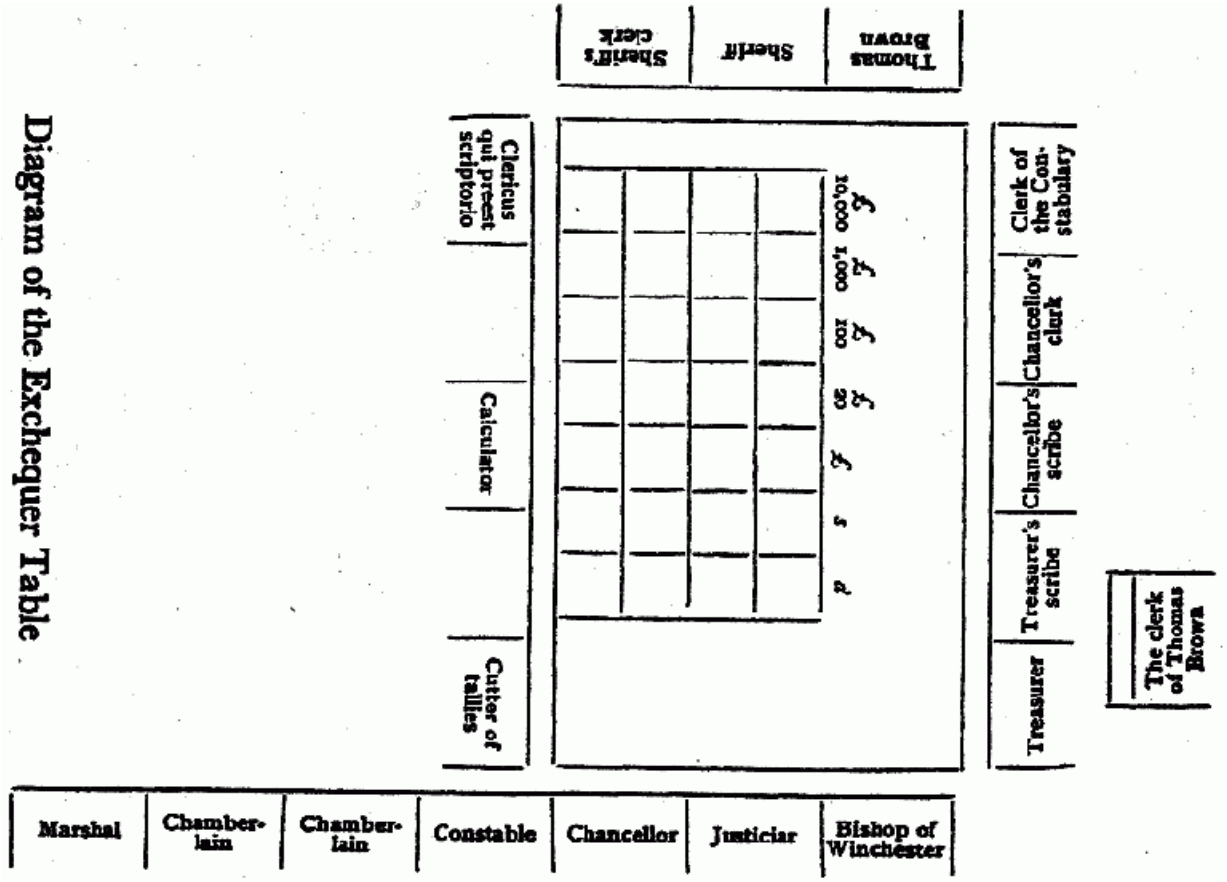
http://home.uchicago.edu/~rmyerson/research/es2009.pdf

Paper: "Leadership, trust, and power: dynamic moral hazard in high office,"
http://home.uchicago.edu/~rmyerson/research/power.pdf

Court of the Exchequer: vital institution of English government

Richard FitzNigel's <u>Dialogue of the Exchequer</u> (c. 1180):

Why is the Exchequer so called? ...Because the table resembles a checker board... Moreover, just as a battle between two sides takes place on a checker board, so here too a struggle takes place, and battle is joined chiefly between two persons, namely the Treasurer and the Sheriff who sits to render account, while the other officials sit by to watch and judge the proceedings.



Foundations of the state: efficiency wages and patronage

Moral-hazard problems are fundamental in any institution.
Motivating officials to enforce institutional rules is a moral-hazard problem.

Government is a network of agents with broad powers, imperfectly monitored.
Government agents (governors) could profit from abusing power,
and so they must expect greater long-run rewards from good service.
Candidates would be willing to pay for such highly rewarded offices.
(Becker-Stigler, *J Legal Studies* 1974.)

Agents' rewards depend on judgments of their superiors in the network, and so incentives ultimately depend on top leaders. (Alchian-Demsetz, *AER* 1972.)
Promises of back-loaded rewards become a debt owed by the state,
which leaders could be tempted to repudiate.
When a high official is dismissed, his valuable office can be re-sold.

So courtiers must monitor the distribution of offices and rewards.

Any organization must promise performance-contingent rewards to its agents, who must trust the organization to implement the terms of these debts appropriately.
Costs of maintaining this circle of trust may cause organizational officials to become an entrenched privileged elite.

An extension of the Becker-Stigler model of controlling a governor

[Ex: α=0.1, β=0.3, γ=1, D=5, δ=0.05, K=1, H=25]

At any time, governor can behave well, or misbehave, or rebel.

The prince cannot directly observe whether a governor is behaving or misbehaving.
But he can observe costly crises that occur in the province as a Poisson process with rate α when gov'r behaves well, rate β when gov'r misbehaves. $\beta > \alpha > 0$.
In misbehavior, governor takes corrupt hidden benefits worth γ per unit time.

Open rebellion gives the governor an expected net present value of D.
Each individual is risk neutral and has discount rate δ.
Candidates for governor have only some limited assets K. Have $0 \leq K < D$.

The prince could free himself of debts to a governor by sacking the governor, so let H be the upper bound on what prince can be trusted to owe a governor.

Governors cannot rebel during short visits to court, but they see crises first.
Crises and rebellions are very costly for prince, so he wants to always have a governor who behaves well, never rebels.
Goal: minimize prince's E(cost) of such incentives.

Discrete-time model, with ε = (length of time interval)$\to 0$.

1. In short visit to court, governor may be paid (εy), may be dismissed (prob'y q). If dismissed, then a new governor is appointed, paying K.
2. Governor chooses to behave well or to misbehave (take $\varepsilon\gamma$).
3. Observable crisis occurs with probability $\varepsilon\alpha$ if behave well, $\varepsilon\beta$ if misbehave.
4. Governor chooses to rebel (take D) or not.
   (Expected future credit, if not rebel: r if no crisis, $r-\pi$ if crisis.)

Given u = (governor's credit promised at end of last period),
prince chooses y, q, r, π.

Feasibility constraints:

(1)	$\varepsilon y + (1-q)[(1-\varepsilon\alpha)r + \varepsilon\alpha(r-\pi)] \geq (1+\varepsilon\delta)u$	(promise keeping),
(2)	$0 \leq q \leq 1,\ y \geq 0$	(nonnegativity),
(3)	$(1-\varepsilon\alpha)r + \varepsilon\alpha(r-\pi) \geq \varepsilon\gamma + (1-\varepsilon\beta)r + \varepsilon\beta(r-\pi)$	(no corruption),
(4)	$r - \pi \geq D$	(no rebellion),
(5)	$r \leq H$	(trust bound).

Let $\tau = \gamma/(\beta-\alpha)$. Constraint (3) is equivalent to $\pi \geq \tau$.

Let $G = D+\tau$. Constraints (3)-(5) require the parametric assumption $H \geq G$,
as we need $H \geq r \geq D+\tau = G$.

Discrete-time model, with ε = (length of time interval).

Given u = (governor's credit promised at end of last period), prince chooses

y = (current pay rate), q = Pr(dismissal), r = (future credit if no crisis), π = (crisis penalty).

Feasibility constraints:

(1) $\varepsilon y + (1-q)[(1-\varepsilon\alpha)r+\varepsilon\alpha(r-\pi)] \geq (1+\varepsilon\delta)u$ (promise keeping),

(2) $0 \leq q \leq 1,\ y \geq 0$ (nonnegativity),

(3) $(1-\varepsilon\alpha)r+\varepsilon\alpha(r-\pi) \geq \varepsilon\gamma + (1-\varepsilon\beta)r + \varepsilon\beta(r-\pi)$ (no corruption),

(4) $r-\pi \geq D$ (no rebellion),

(5) $r \leq H$ (trust bound).

Let $\tau = \gamma/(\beta-\alpha)$. Constraint (3) is equivalent to $\pi \geq \tau$.

Let $G = D+\tau$. Constraints (3)-(5) require the parametric assumption $H \geq G$.

Recursive optimality conditions:

$\forall u \in [D,H]$, let V(u) = (leader's minimal expected future costs when promise u).

$(1+\varepsilon\delta)V(u) = \min_{y,q,r,\pi}\ \varepsilon y+qv_0+(1-q)[(1-\varepsilon\alpha)V(r)+\varepsilon\alpha V(r-\pi)]$ subject to (1)-(5),

where $v_0 = \min_{y,r,\pi}\ \varepsilon y+(1-\varepsilon\alpha)V(r) + \varepsilon\alpha V(r-\pi) - K$ subject to (2)-(4).

Optimal solutions: Let $G_\varepsilon = (G-\varepsilon\alpha\tau)/(1+\varepsilon\delta) > D$, $H_\varepsilon = (H-\varepsilon\alpha\tau)/(1+\varepsilon\delta)$.

For v_0 (new gov'r): y=0, r=G, $\pi=\tau$. For $u \in [D,G_\varepsilon]$: y=0, $q = 1-u/G_\varepsilon$, r=G, $\pi=\tau$.

For $u \in [G_\varepsilon,H_\varepsilon]$: y=0, q=0, $\pi=\tau$, $r = u + \varepsilon(\delta u+\alpha\tau)$.

For $u \in [H_\varepsilon,H]$: q=0, r=H, $\pi=\tau$, $\varepsilon y = u+\varepsilon(\delta u+\alpha\tau)-H$.

Continuous time limit

Consider the limit as $\varepsilon \to 0$. The optimal policy is:
when $u<H$, pay rate is $y=0$ and credit growth rate between crises is $u' = \delta u + \alpha\tau$,
when $u=H$, pay rate is $y = \delta H + \alpha\tau$ and $u' = 0$,
crisis penalty is always $\pi = \tau = \gamma/(\beta - \alpha)$, new governors start at credit $r = G = D + \tau$,
when $u<G$, dismiss with probability $q = 1 - u/G$, reinstate at credit G with prob'y u/G.

The limiting ($\varepsilon \to 0$) value function is characterized by the conditions:
for $0 \le u \le G$: $V(u) = V(G) - (1 - u/G)K$,
for $G \le u \le H$: $V'(u) = [(\delta+\alpha)V(u) - \alpha V(u-\tau)]/(\delta u + \alpha\tau)$,
$V'(H) = [(\delta+\alpha)V(H) - \alpha V(H-\tau)]/(\delta H + \alpha\tau) = 1$.

Computing V(u): For $u \le G$, let $\Psi(u) = 1$.
For $u \ge G$, let $\Psi'(u) = [(\delta+\alpha)\Psi(u) - \Psi(u-\tau)]/(\delta u + \alpha\tau)$.
(So $\Psi(u)$ is increasing and strictly convex on $u \ge G$.)
Then $V(u) = (1 - K/G)\Psi(u)/\Psi'(H) + uK/G$ for $0 \le u \le H$.

Fact: Given the parameters, $V(u)$ is a strictly convex increasing function of u.
Increasing the parameter H strictly decreases the prince's ex-ante expected cost
$V(0) = V(G) - K = (1 - K/G)/\Psi'(H)$.

Back-loading pay to H, randomizing dismissals below G

The prince incurs a liability G for payment K<G when a new governor is appointed, so the optimal strategy should minimize expected net turnover costs G–K.
With high debt, suspending pay can be used as punishment instead of dismissal.
Expected turnover costs are minimized by deferring pay until debt reaches H.

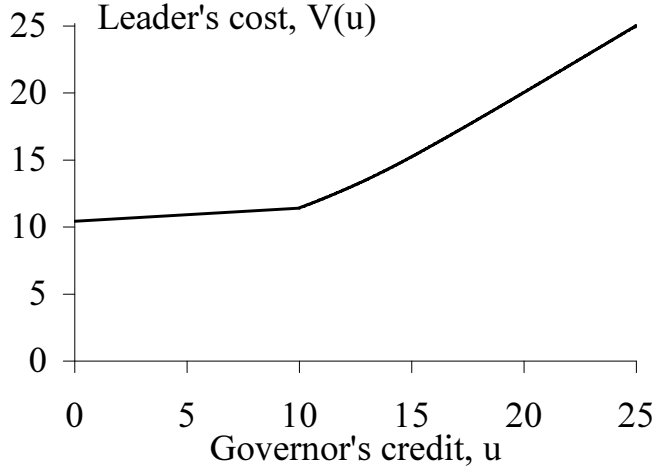
Even when the leader is secure in power and is as patient as his agents (same δ), agency costs give leader an incentive to accumulate large H-debts to governors.
Raising the trust bound H would strictly decrease expected net cost.

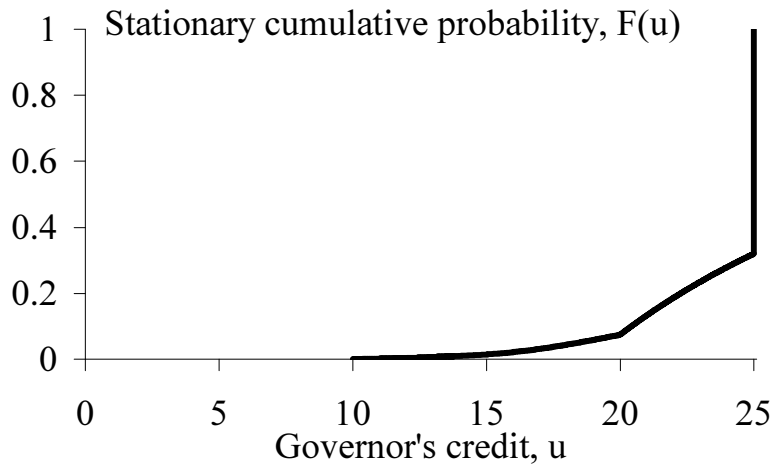
To deter rebellion and corruption, the prince must be trusted to $H \geq G = D+\tau$.
Randomization, to soften dismissal threats, is achieved by fair trial at leader's court.

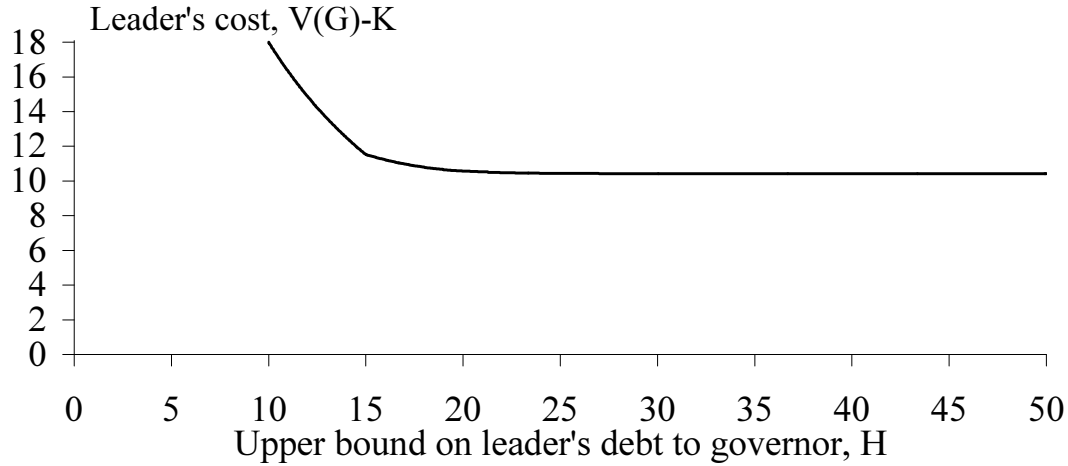
Severance pay would have greater expected cost: $u+V(G)-K > V(G)-(1-u/G)K$.
Unproductively punishing ex-governors would reduce expected income from K,
because governor's credit must be ≥D, so anticipated punishment would require greater probability of reinstating instead of reselling office after crises.

Fact. As $H\to\infty$, long-run steady state $\tilde{\mathbf{u}}$ has $P(\tilde{\mathbf{u}}=H)\to 1$, $E(\text{dismissal rate})\to 0$.
With high credit and low turnover, officials become an entrenched aristocracy.
Aristocracy here derived from assumption of equal abilities (commoners not better).
Large agency debts in long run may become a cause of dynastic decline.

Example: Let $\delta = 0.05$, $\alpha = 0.1$, $\beta = 0.3$, $\gamma = 1$, $D = 5$, $K = 1$, $H=25$.
Then $\tau = \gamma/(\beta-\alpha) = 5$, $G = D+\tau = 10$, Initial E(costs) = $V(G)-K = 10.44$,
Steady state: $P(u=H) = 0.68$, $E(\text{PayRate}) = 1.19$, $E(\text{DismissalRate}) = 0.00030$.







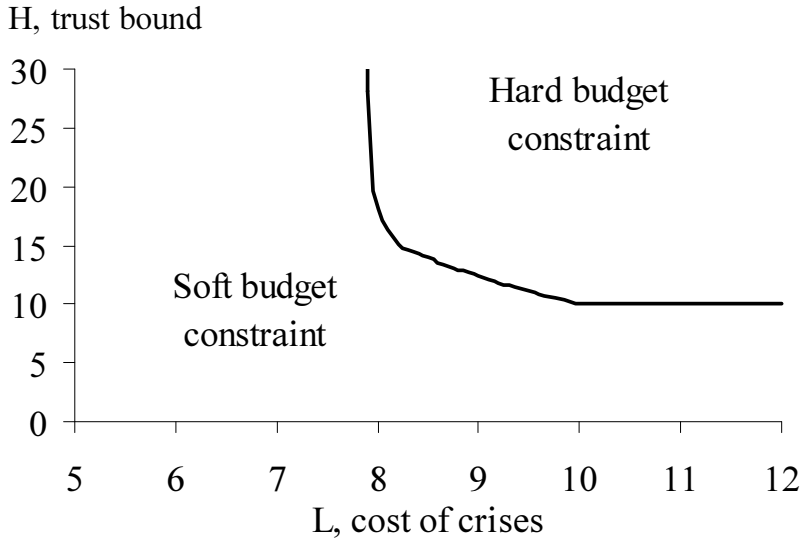
Increasing H from 10 to ∞ could reduce initial Ecosts $(V(G)-K)$ from 18 to 10.42.
With H=10=G, get pay $\delta G+\alpha\tau=1$, dismiss-rate $\alpha(1-(G-\tau)/G)=0.05$, $V(G)-K=18$.

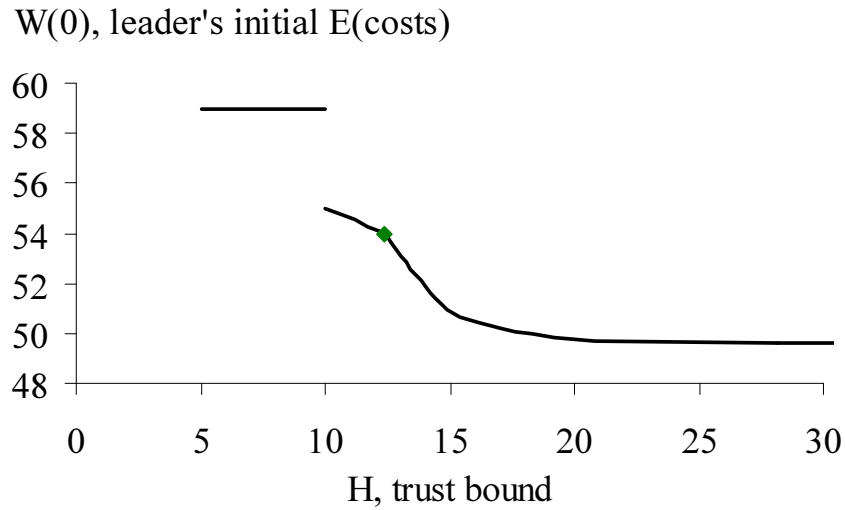
Tolerating corruption (retaining γ maintenance budget), but not rebellion:
Let L = (leader's cost of a crisis) $< \infty$. Assume $\alpha L+\gamma < \beta L$, $H \geq G$, $K = 0$.
When $V(0) \leq (\beta L - \alpha L - \gamma)/\delta$, solution is same (***hard***): may dismiss when credit $u<G$, no misbehavior, with crisis and maintenance costs $W(u) = V(u) + (\alpha L+\gamma)/\delta$.

With smaller L, solution has ***soft budget constraint***: new governor starts at credit D; when $u<G$: misbehavior is tolerated with **no dismissals**, no γ expense, and no crisis penalties until random promotion to credit G at Poisson rate $\delta u/(G-u)$; when $u \geq G$: demand good behavior as before, cover expense γ, have crisis penalty τ; $W(u) = u + (V(u)-u)(\beta L - \alpha L - \gamma)/(\delta V(D)) + (\alpha L+\gamma)/\delta$, $\forall u \geq D$.

With $\delta = 0.05$, $\alpha = 0.1$, $\beta = 0.3$, $\gamma = 1$, $D = 5$, $G = D+\tau = 10$, and $L = 9$, the optimal regime switches to the soft budget constraint when $H < 12.4$.

(with L=9)





Discrete model with L: L = (prince's cost of crisis). Assume $\alpha L+\gamma < \beta L$, K=0.

1. In short visit to court, governor can be paid (εy), may be dismissed (prob'y q), advised to shirk (prob'y p), or else told to work (getting $\varepsilon\gamma$ budget).
2. Governor chooses to work or shirk (=misbehave, taking $\varepsilon\gamma$ if told to work)
3. Observable crisis occurs with probability $\varepsilon\alpha$ if behave well, $\varepsilon\beta$ if misbehave.
4. Governor chooses to rebel (take D) or not. (Expected future credit if not rebel: s if told to shirk, r if told to work and no crisis, $r-\pi$ if told to work and crisis.)

Given u = (governor's credit promised at end of last period),
the prince chooses y, q, p, s, r, π.

Feasibility conditions:

(1)	$\varepsilon y + ps + (1-q-p)[(1-\varepsilon\alpha)r+\varepsilon\alpha(r-\pi)] \geq (1+\varepsilon\delta)u$	(promise keeping),
(2)	$q \geq 0,\ p \geq 0,\ p+q \leq 1,\ y \geq 0$	(nonnegativity),
(3)	$(1-\varepsilon\alpha)r + \varepsilon\alpha(r-\pi) \geq \varepsilon\gamma+(1-\varepsilon\beta)r + \varepsilon\beta(r-\pi),\ \pi \geq \tau$	(deter corruption),
(4)	$s \geq D,\ r-\pi \geq D$	(no rebellion),
(5)	$s \leq H,\ r \leq H$	(trust bound).

Discrete model with L: L = (prince's cost of crisis). Assume $\alpha L+\gamma < \beta L$, K=0.
Given u = (governor's credit promised from last period), the prince chooses
y=(current pay rate), q=Pr(dismissal), p=Pr(tolerate shirking), s=(future credit if tolerate),
r = (future credit if demand work & no crisis), π = (penalty if work & crisis),

Feasibility conditions:

(1) $\varepsilon y + ps + (1-q-p)[(1-\varepsilon\alpha)r+\varepsilon\alpha(r-\pi)] \geq (1+\varepsilon\delta)u$ (promise keeping),

(2) $q \geq 0,\ p \geq 0,\ p+q \leq 1,\ y \geq 0$ (nonnegativity),

(3) $(1-\varepsilon\alpha)r + \varepsilon\alpha(r-\pi) \geq \varepsilon\gamma+(1-\varepsilon\beta)r + \varepsilon\beta(r-\pi),\ \pi \geq \tau$ (deter corruption),

(4) $s \geq D,\ r-\pi \geq D$ (no rebellion),

(5) $s \leq H,\ r \leq H$ (trust bound).

Recursive optimality conditions: $\forall u\in[D,H]$: $(1+\varepsilon\delta)W(u) =$

$= \min_{y,q,p,s,r,\pi}\ \varepsilon y + qw_0 + p[W(s)+\varepsilon\beta L] + (1-q-p)[(1-\varepsilon\alpha)W(r)+\varepsilon\alpha W(r-\pi)+\varepsilon(\alpha L+\gamma)]$
subject to (1)-(5),

where $w_0 = \min_{y,p,s,r,\pi}\ \varepsilon y + p[W(s)+\varepsilon\beta L] + (1-p)[(1-\varepsilon\alpha)W(r)+\varepsilon\alpha W(r-\pi)+\varepsilon(\alpha L+\gamma)]$
subject to (2)-(5).

Optimal solutions: Apply HBC if $W(G_\varepsilon) \leq \beta L/\delta$, SBC if $W(G_\varepsilon) > \beta L/\delta$.

For $u\in[G_\varepsilon,H]$: $\varepsilon y=\max\{0, u+\varepsilon\delta u+\varepsilon\alpha\tau-H\}$, $p=q=0$, $\pi=\tau$, $r = \min\{u+\varepsilon\delta u+\varepsilon\alpha\tau, H\}$.

HBC for $u<G_\varepsilon$: $y=0$, $p=0$, $q = 1-u/G_\varepsilon$, $r=G$, $\pi=\tau$, $W(u) = V(u)+(\alpha L+\gamma)/\delta$.

SBC for $u<G_\varepsilon$: $y=0$, $q=0$, $p = 1-(u+\varepsilon\delta u-D)/(\tau-\varepsilon\alpha\tau)$, $s=D$, $r=G$, $\pi=\tau$,
so that $(1-p)(1-\varepsilon\alpha)G + [1-(1-p)(1-\varepsilon\alpha)]D = u+\varepsilon\delta u$.

Interpreting the solution

Like a banker, a leader's promises of future credit must be trusted and valued as rewards for current service. The leader must be a trusted debtor to his agents.
But these debts need enforcement, so an effective leader must create institutions that give his agents power to enforce these debts, to solve moral hazard at the top.

Officials must be dismissed sometimes, but only randomly, to not provoke rebellion.
In this randomization, the leader actually prefers to dismiss and resell the office.
So the trials must be monitored by people who can punish the leader for cheating.

In supreme political institutions of the state, who has such power to punish a leader?
The other high officials who sustain the state together have such power, if they share a sense of identity that would cause them all to lose trust if he cheated any one.
So in a leader's court, his reputation for reliably judging and rewarding his agents can be collectively guarded by his agents and courtiers. (Court of Exchequer.)
Feudal oath of *aid and counsel*: support lord in battle, attend his court.

Turnover losses (G–K) would vanish if commoners could trust the leader to protect deposits earning interest δ until they grow to G and can buy a governorship.
Key assumption: Commoners trust the leader less than high officials ($K<G<H$).
Many rulers have held power without much trust from common people, but no one can rule long without trust from high officials of his government.
So privileged aristocracy can be derived from a scarcity of trust.

Captains' trust of their leader

In a companion paper (APSR, 2008), I focused on a leader's need for supporters (captains) to help him compete for power and establish his state.

Initial supporters must be motivated by expectation of future rewards if they win.

But a leader's promises would be doubted if nothing could constrain him to fulfill past promises when his rivals have been defeated.

A strong competitive leader needs some institutional court where his promises to supporters can be credibly enforced.

Supporters can constitute such a court when they share group identity and norms so that, if he cheated any one of them, then he would lose the trust of all.

In negotiation-proof equilibria of sequential contests for power, a contender cannot recruit any supporters without a court where they can depose him (APSR, 2008).

The state's captains and governors are like a firm's investors and managers: all need some institutional protection for their promised future rewards.

Shared group identity can define organizational boundaries.

Development: from Moral Hazard to Adverse Selection

We have argued that moral-hazard problems are fundamental in any institution, and their solution requires networks of leadership and personal trust.

In post-conflict nation-building, systems of control are scarce, urgent priorities:
first military, then law-enforcement, local administration, and public finance
(James Dobbins, *Beginners Guide to Nation-Building*, 2007).
The first focus in development must be on building the state's administrative
capacity (Ashraf Ghani, *Fixing Failed States*, 2008).

Economic development may be seen as a process of moving from moral-hazard
problems to adverse-selection problems.
In poor countries, potentially valuable investment opportunities are everywhere,
but investments cannot be controlled or protected.
With development, investment opportunities become less common,
but still may be much claimed by entrepreneurs.

In development assistance, building infrastructure may be less important than
increasing the supply of people who can be trusted with public resources,
by distributing local responsibility with transparent local accountability.

Vulnerable Financial Institutions

I have emphasized the political system, but moral hazard is also an essential concern in a financial system that allocates vast amounts of other people's wealth.

Moral-hazard rents make trusted bankers a privileged elite, but in a regulatory framework where privileges depend on good performance.

Back-loaded moral-hazard rents: Trust-worthiness of agents today depends on expectation of their benefiting more from trust in future.

So trust is a coordination game with the future, and it must have arbitrary equilibria.

To justify nonmonetary aspects of Fisher's ('33) debt-deflation theory of depressions, Bernanke ('95) cited agency-theoretic requirements of collateral for transactions.

When deflation ruins debtors, the largest debtors are trusted financial intermediaries.

Their loss of functional status cuts others' ability to profitably invest, causing substitution of inefficient bureaucratic-governmental control of investments.

Macro multipliers from moral hazard in general equilibrium? Models are needed...

When we see lost reputations as key, how can we restore a system of trust?
Redistribute positions of financial power and privilege?
Reform the institutional system that regulates them?

Economic theory traditionally focused on impersonal prices and market aggregates, but trust is built on individual reputations and status under recognized rules.

These notes: http://home.uchicago.edu/~rmyerson/research/es2009.pdf

"Leadership, trust, and power: dynamic moral hazard in high office," http://home.uchicago.edu/~rmyerson/research/power.pdf

"The autocrat's credibility problem and foundations of the constitutional state," *American Political Science Review 102* (2008), 125-139.

"Fundamental theory of institutions: a lecture in honor of Leo Hurwicz," *Review of Economic Design 13* (2009), 59-75.

End note: Two new journals from the Econometric Society:

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