Fundamental Theory of Social Institutions:
a lecture in honor of Nancy Schwartz and Leo Hurwicz

Introduction:
from old debates about socialism to incentive compatibility, & back...

Formalizing Hayek's arguments against socialism:
Comparing simple models of managerial moral hazard and adverse selection.

Capitalism as decentralization of power:
A model of moral hazard at the center and capitalist liberalization.

Who will guard the guardians at the foundations of our social institutions?
A dynamic moral-hazard model of powerful officials.

"The economic problem of society is not merely a problem of how to allocate 'given' resources... It is rather a problem of how to secure the best use of resources known to any of the members of society, for ends whose relative importance only these individuals know. ...it is a problem of the utilization of knowledge not given to anyone in its totality."

"This character of the fundamental problem has, I am afraid, been rather obscured than illuminated by many of the recent refinements of economic theory, particularly by many of the uses made of mathematics."

F. A. Hayek, "The use of knowledge in society," AER 35:519-530 (1945).

Inconclusiveness of old **debates about socialism vs. capitalism** (Barone, Lange; Mises, Hayek) showed limits of price theory for evaluating other institutions.
Hayek (1945): To answer such questions about fundamental institutions,
we must recognize that markets are mechanisms for communication.

Hurwicz took up this challenge: to show how mathematical economic models can provide a general framework for analyzing different economic institutions.
Extending Samuelson's (1954) remark on misrepresentation of public-good benefits, Hurwicz (1972) found incentives to misrepresent values in private-good markets too, and so he introduced the general concept of incentive compatibility.

When Hurwicz defined **incentive compatibility**, "the issue of incentives surfaced forcefully, as if a pair of blinders had been removed" (Makowski-Ostroy, 1993).
Before, economists could model resource constraints, but not incentive constraints.
Hayek's arguments showed an awareness of incentive problems, but with no formal models of incentives, these arguments were rhetoric without tight logical support.

But now we can analyze incentive problems in any resource-allocation system.
If Mises and Hayek's arguments against socialism were right, as empirical observations suggest, can we now formulate them in the incentivist framework?

Mises saw the essential problem arising in socialist allocation of capital,
because state ownership of means of production implies lack of any capital market.
Questions about mechanisms for allocating capital are a topic of corporate finance.
Tirole's Theory of Corporate Finance (2006) is full of models applying mechanism design to corporate finance, but these are generally based on two simple models:
one of moral hazard (Section 3.2), one of adverse selection (Section 6.2).
Each model describes a simple world which we can transform by socialist reforms, and we can see how the efficiency of capital allocation is affected.
The result may tell us something about what is truly fundamental in our models.

Hayek (1945) said the essential problem is in the communication of information that is privately known by different individuals, as in the adverse-selection model.

The **basic adverse-selection model** of Tirole (2006, section 6.2):

I = (capital investment cost required for new project) = 100,

A = (value of assets that manager can pledge to forfeit if project fails) < I

R = (returns from project if it succeeds) = 240, 0 = (project's returns if it fails),

p_H = (probability of success if manager is high type) = 1/2,

p_L = (probability of success if manager is low type) = 1/4,

η = (probability of manager being high type).

Only the manager knows his type, and he can lie.

We have $p_H R > I > p_L R$, so the project is worthwhile only if the manager is high.

Under socialism, there is no problem getting the manager to reveal type honestly: just pay him 0 (above his standard wage) no matter what he says.

With any A>0, could pay $\varepsilon(R-I)$ if project succeeds, $-\varepsilon I$ if it fails, where $\varepsilon < A/I$.

This example is interesting for Tirole only because he assumes that competitive investors must get E(NetProfit)=0 given their beliefs about the manager, and so low types who imitate high types could get their favorable terms of credit. But under socialism, the monopolistic state lender can fully exploit the high type.

The **basic moral-hazard model** of Tirole (2006, section 3.2):

I = (capital investment cost required for new project) = 100,

A = (value of assets that manager can pledge to forfeit if project fails) < I

R = (returns from project if it succeeds) = 240, 0 = (project's returns if it fails),

p_H = (probability of success if manager behaves appropriately) = 1/2,

p_L = (probability of success if manager misbehaves) = 1/4,

B = (manager's private benefits from misbehaving) = 30.

Here $p_H R = 120 > I > p_L R + B = 90$, so project is worthwhile only if manager behaves.
As individual wealth is modest under socialism, suppose $A < Bp_H/(p_H - p_L) = 60$.

Social investment plan with w = (net wage if success), $-A$ = (net wage if failure),
must satisfy: $p_H w - (1-p_H)A \geq 0$ [participation],

$p_H w - (1-p_H)A \geq B + p_L w - (1-p_L)A$ [moral-hazard].

Expected social profit, to be maximized, is $Y = p_H(R-w) + (1-p_H)A - I$.

The constraints imply $w \geq \max\{A/p_H - A, B/(p_H-p_L) - A\} = B/(p_H-p_L) - A = 120 - A$.
Manager must get an expected moral-hazard rent worth $p_H B/(p_H-p_L) - A = 60 - A$,
and expected social profit is $Y = p_H R - I + A - Bp_H/(p_H-p_L) = A - 40$.
The ideal $Y = p_H R - I = 20$ is feasible only if rich agents have $A \geq Bp_H/(p_H-p_L) = 60$,
because then $w = A(1-p_H)/p_H$ satisfies moral hazard with participation binding.

If managers can be punished, let x = (punishment cost on manager if fail).
Then a feasible mechanism (w,x) must satisfy

$p_H w - (1-p_H)(A+x) \geq 0$ [participation],

$p_H w - (1-p_H)(A+x) \geq B + p_L w - (1-p_L)(A+x)$ [moral-hazard],

but expected social profit is still $Y = p_H(R-w) + (1-p_H)A - I$.

The constraints now imply $w \geq (A+x)(1/p_H - 1)$, $w \geq B/(p_H-p_L) - (A+x)$.
With modest endowments $A < Bp_H/(p_H-p_L) = 60$,
the wage cost is minimized by the punishment $x = Bp_H/(p_H-p_L) - A = 60-A$,
which allows the wage $w = B(1-p_H)/(p_H-p_L) = 60$,
and so yields the expected social profit

$$Y = p_H R - I + (1-p_H)[A - Bp_H/(p_H-p_L)] = 0.5A-10$$
$$< p_H R - I = 20.$$

Punishing failures can improve social profit, but increasing collateral A still helps.
Society still can't profit from such project if A<20.

Without the participation constraint, w=0, x≥120 motivates high effort, yields Y=20, even with A=0.

There are two **ways to achieve full efficiency** ($Y=p_H R-I$) with such moral hazard:
(1) allow some individuals to hold more wealth, up to $Bp_H/(p_H-p_L)$
(perhaps favoring heroes of the Socialist Revolution, or of the Norman Conquest);
(2) drop the participation constraint, force people to become managers without compensation for punishment risks (perhaps prisoners or enemies of the state).
Either way, socialism looks rather less appealing from the perspective of this model!

As a source of insights into the flaws of Soviet communism, this simple moral-hazard model does well, capturing the implicit logic in some of Hayek's intuitive arguments:
"To assume that it is possible to create conditions of full competition without making those who are responsible for the decisions pay for their mistakes seems to be pure illusion." (1935, p. 237)

Comparison of these models suggests, in the foundations of social institutions, moral-hazard problems seem more fundamental than adverse-selection problems.

Moral hazard can explain why efficient institutions give individuals property rights.
But property rights give people different vested interests, which can make it more difficult to motivate them to share their private information with each other.
Collectivizing property can ameliorate adverse-selection problems,
but it can exacerbate moral-hazard problems.
Thus, adverse selection might not be so problematic if there were no moral hazard.

Socialism differs from capitalism in allowing less property rights for individuals,
but moral hazard provides a fundamental economic rationale for some property rights that must apply even under socialism.
So adverse-selection problems can also be important under socialism.

In the basic moral-hazard model with no punishment (x=0), add a small probability that the manager is a bad type who can't do better than the p_L probability of success.
With modest A, such bad types would imitate good types to get moral-hazard rents.

Moral hazard at the center of government

Proponents of the free-market system do not advocate it merely as an excuse for abandoning egalitarianism. It distributes power widely: "capitalism & freedom."

To formalize such arguments, costs of unrestrained central power should be analyzed in models of moral hazard at the center of government.

To encourage investments that increase his tax base, even an autocratic ruler may prefer to create political guarantees of private property rights,
even when such liberalization entails a risk of his losing power.

Incentives for such liberalization may depend on natural resources.

$Y(k)$ = (output flow if k invested) = $(k+n)^{\alpha}$ (where capital k is durable & mobile),
given $\alpha = 0.5$, n = (natural resources) = 12,
δ = (investors' discount rate) = 0.05, ρ = (basic political-risk rate) = 0.05,
ψ = (additional risk per liberalization from pseudo-expropriation scandals) = 0.05.

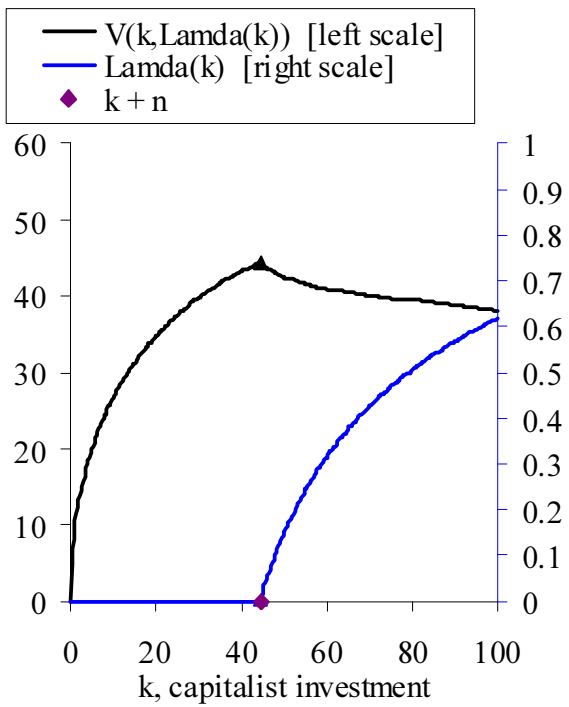
Choose k = (capitalist investment) ≥ 0 and λ = (liberalization) $\in [0,1]$ to
maximize the ruler's expected value $V = (Y(k) - \delta k)/(\delta+\rho+\psi\lambda)$
subject to $V \geq (1-\lambda)[k + Y(0)/(\delta+\rho)]$. [no incentive to expropriate]

With n=12, ruler's optimal regime is: $\lambda = 0.504$, $k = 52.4$. ($\lambda=0 \Rightarrow k=0$.)

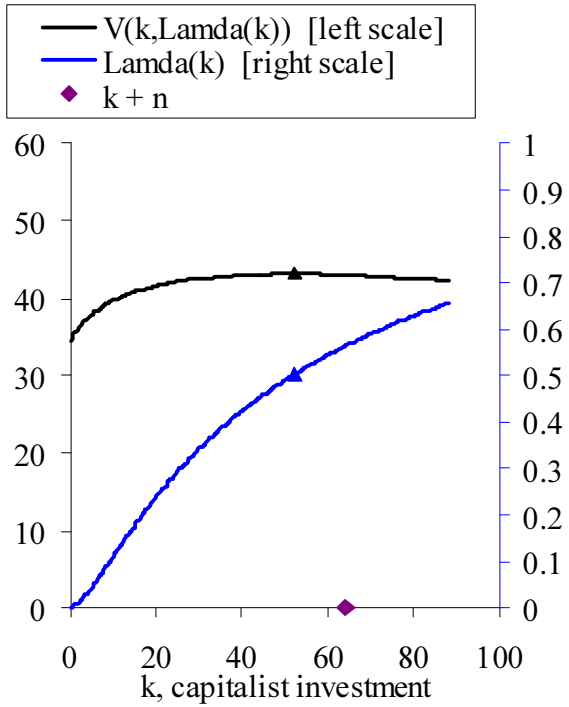
With n=0, optimal regime becomes $\lambda = 0$, $k = 44.4$.

With n=25, optimal regime becomes $\lambda=0$, $k=0$. [*No moral hazard* => $n+K^{*}=100$.]

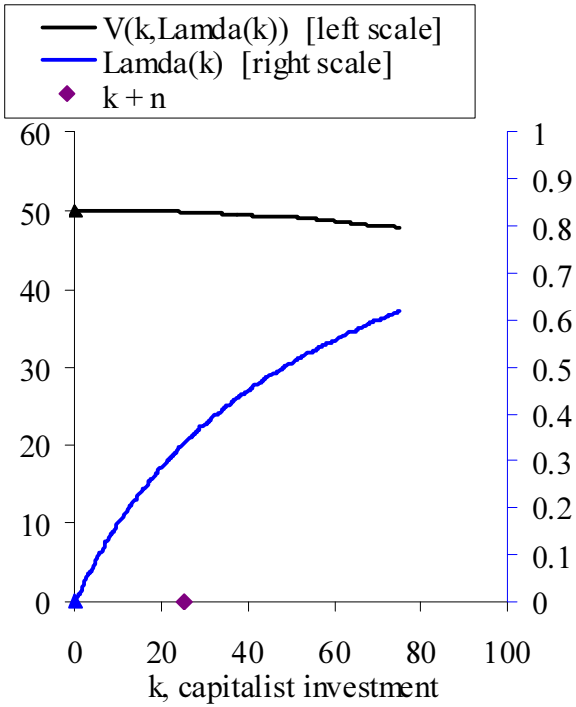
Natural resources curse? Example with $Y(k) = (k+n)^{0.5}$, $\delta = 0.05 = \rho = \psi$.



n=0



n=12



n=25

Hurwicz (1998, 2007) has moved to focus more on questions of how the rules of basic social institutions, like the US constitution, are enforced in "true" game of life. The constitution must arrange its officials into a circle of "guardians," so that each is guarded (constrained to act constitutionally) by another.

Institutional rules are enforced by officials, who prosecute others' violations. **Motivating officials to enforce institutional rules is a moral-hazard problem.** Becker Stigler (1974) showed that such officials must be motivated by expectation of back-loaded rewards and privileges for fulfilling their institutional responsibilities. The expectation of privileges by such officials is an essential part of the institution. Everything depends on top leaders' reputations for distributing such privileges appropriately to their network of agents and supporters (Alchian Demsetz 1972). ***Institutions are established by leaders with patronage networks.*** (Xenophon's Cyrus: individual reputations at foundations of state.)

To fully characterize the US constitution as a self-enforcing dynamic system, one must specify not only (1) a set of political offices;
(2) the powers, privileges, and responsibilities of these offices; and
(3) the procedures for selecting future holders of these offices; but also
(4) the individuals who hold these offices and leadership positions at initial time.
(The faces of the Founding Fathers may be part of our constitution.)

Consider an **extension of the Becker-Stigler model** of controlling a governor:
At any time, governor can behave well, or misbehave, or rebel.

Let D=5 denote the expected payoff value for a governor who rebels.
Candidates for governor have only some limited assets A=1. Have $0 \leq A < D$.

The leader 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=0.1 when gov'r behaves well, rate β=0.3 when gov'r misbehaves, $\beta > \alpha > 0$.
Misbehavior also gives governor additional hidden benefits worth γ=1 per unit time.

Each individual is risk neutral and has discount rate δ=0.05.

The leader could free himself of debts to a governor by sacking the governor,
so let H=25 be the upper bound on what the leader can be trusted to owe a governor.
This parameter H is our representation of moral hazard at the top.

Crises and rebellions are very costly for the leader,
so he wants his governors always to behave well, never rebel.
Objective: minimize leader's E(costs) of such incentives.

[Rebellion payoff $D=5$, crisis rates $\alpha=0.1 < \beta=0.3$, misbehavior benefit $\gamma=1$, discount rate $\delta=0.05$, candidates' assets $A=1$, leader's trust bound $H=25$.]

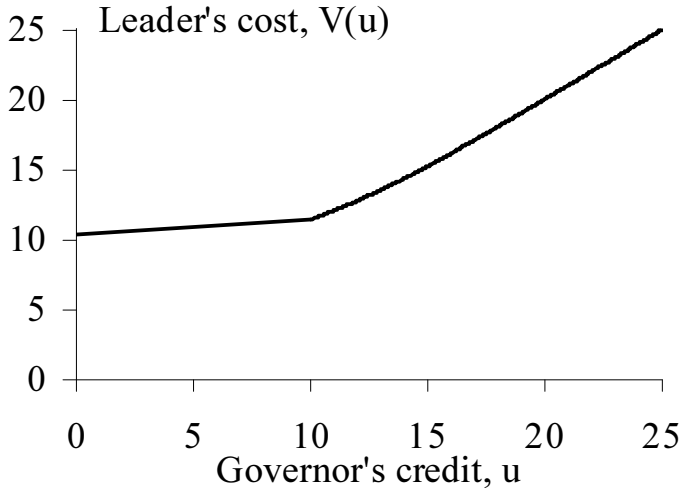
Optimal solution, to minimize the leader's expected costs of paying governors subject to incentive constraints of good behavior and no rebellion:
Dynamic state is the governor's credit, $U(t)$ = (expected present value of future pay).
To deter misbehavior, must expect credit to drop by $\tau = \gamma/(\beta-\alpha) = 5$ after any crisis.
To avoid rebellion, need $U(t)-\tau \geq D$ after crisis, so need $U(t) \geq D+\tau = 10$ before.
A new governor gets initial credit $U(0) = G = D+\tau$, after paying A for promotion.

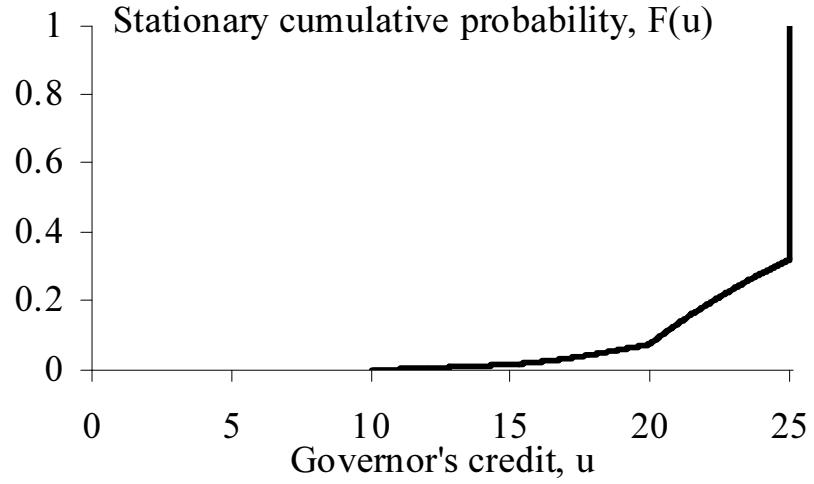
If $U(t)-\tau < G$ then, after a crisis, the governor must be called to court for trial, to be reinstated at credit G with probability $(U(t)-\tau)/G$ or else dismissed to 0.

Back-loading pay is better whenever possible.
When credit $U(t) < H$, governor gets no pay, credit grows at rate $U'(t) = \delta U(t)+\alpha\tau$.
When $U(t)=H$, the governor is paid at rate $\delta H+\alpha\tau$, with $U'(t)=0$ until the next crisis.

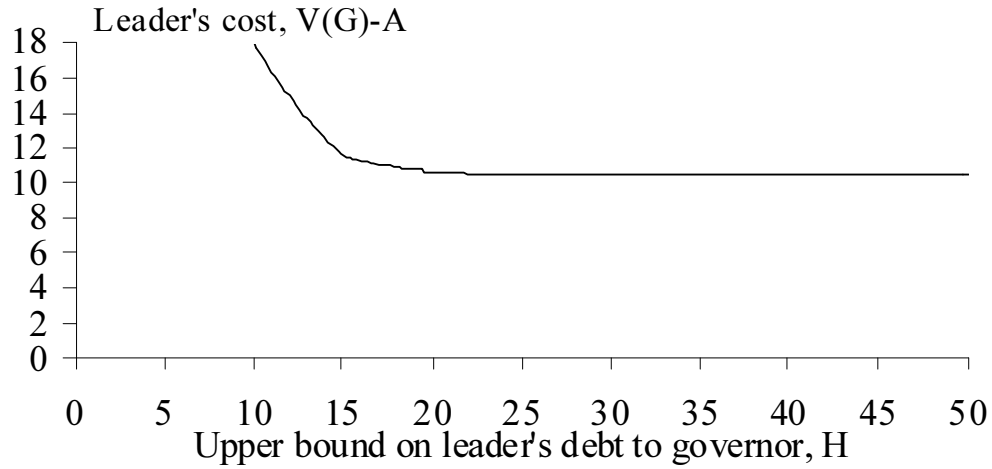
So the leader's credit bound H is regularly binding in the optimal solution.
Increasing H strictly decreases the leader's expected discounted costs ex ante.
But ex post, the leader incurs large debts to his high officials.

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





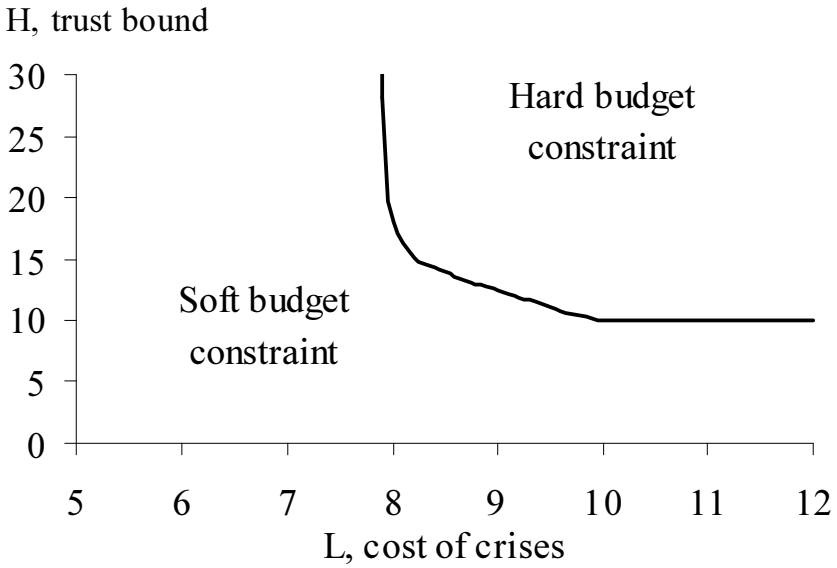
Increasing H from 10 to ∞ could reduce initial Ecosts $(V(G)-A)$ from 18 to 10.42.

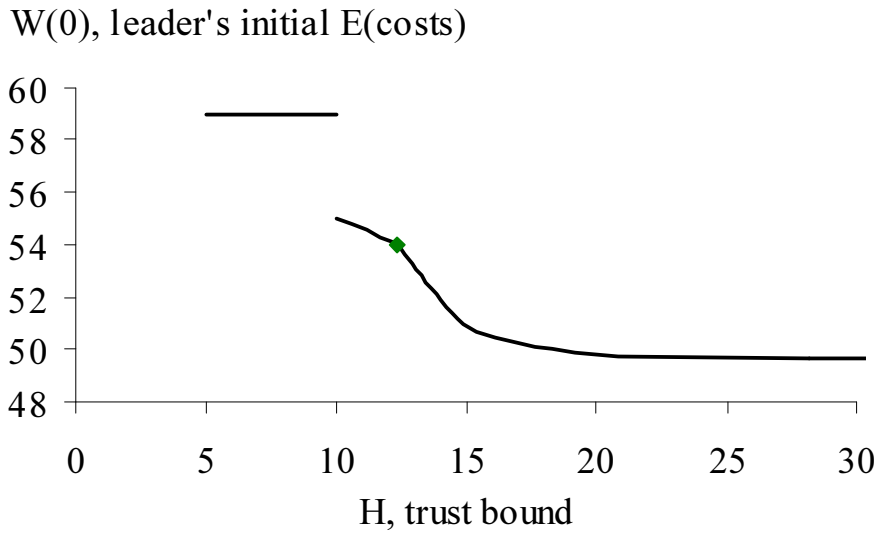


With $H=10=G$, get pay $\delta G+\alpha\tau=1$, dismiss-rate $\alpha(1-(G-\tau)/G)=0.05$, $V(G)-A=18$.

Tolerating corruption (misappropriating maintenance expense γ), but not rebellion.
Let L = (leader's cost of a crisis) = 9. We have $\alpha L+\gamma < \beta L$. Let A=0.
When L is large and $H \geq G$, the optimal solution is same, no misbehavior.
With moderate L, optimal solution may be a ***soft-budget-constraint*** regime where new governor starts at credit D. When $U(t)<G$: misbehavior tolerated, no expense γ, no crisis penalties, credit grows at rate $U'(t)=\delta U(t)$. Governor is never dismissed.
(When $U(t) \geq G$: good behavior demanded, expense γ paid, crisis penalty τ imposed.)

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 $H < 12.4$.





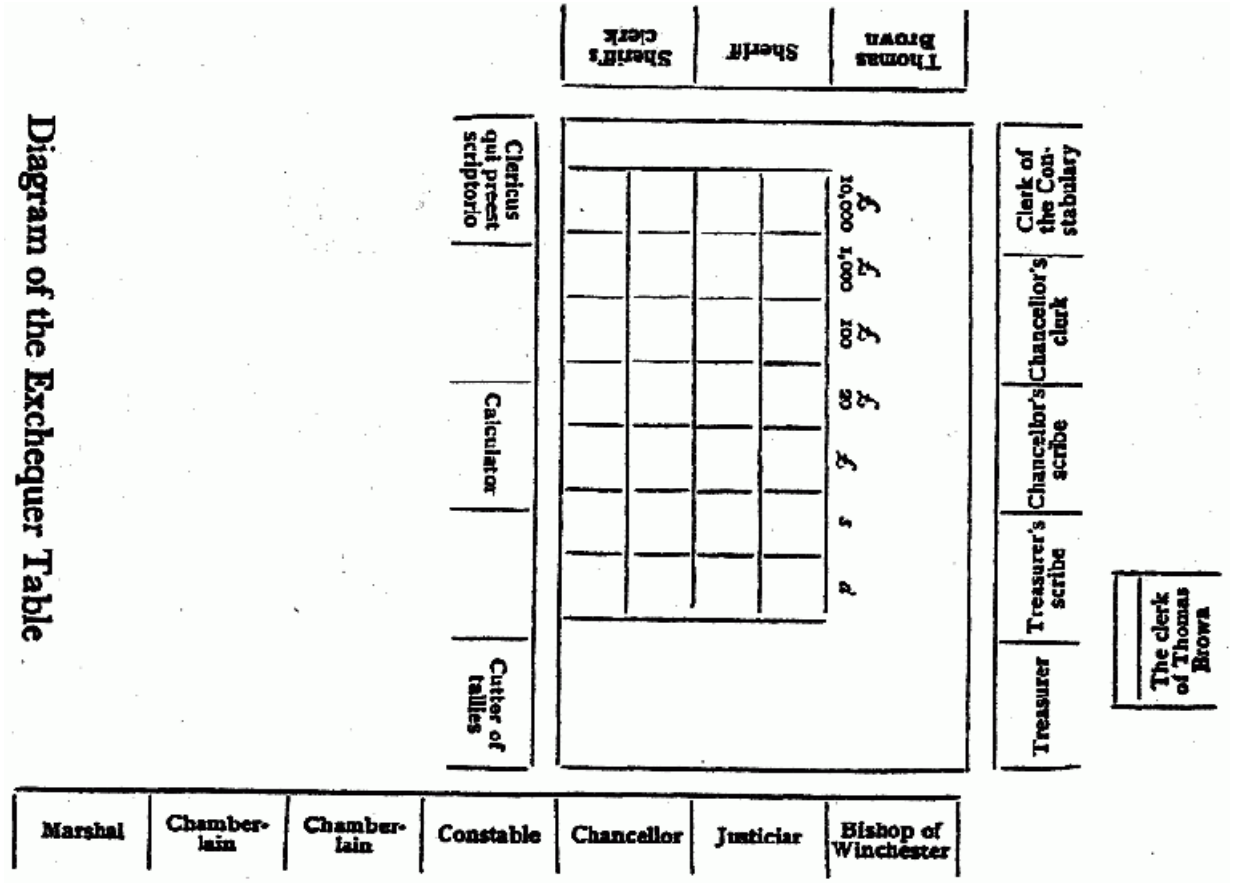
(Costs here include costs of crises and good-behavior maintenance expenses.)

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 some 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 would prefer 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 one of them.
So in a leader's court, his reputation for reliably judging and rewarding his agents can be collectively guarded by his agents and courtiers, closing Hurwicz's circle.
(Vassals' oath of "aid and counsel.")
A relationship of trust with such agents is the crucial asset that defines a leader.

Like the 19th-century socialists, we may dream of great social reforms.
But we should understand that the institutions of any such brave new world would be built on narrower factional foundations, organized by political leaders whose first imperative is to maintain their reputation for rewarding loyal supporters.



*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.
Richard FitzNigel, Dialogue of the Exchequer (c. 1180).

Online references:

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

"Perspectives on mechanism design in economic theory"
http://home.uchicago.edu/~rmyerson/research/nobel.pdf

"A model of capitalist liberalization"
http://home.uchicago.edu/~rmyerson/research/caplib.pdf

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

Computational model:
http://home.uchicago.edu/~rmyerson/research/schwartz.xls

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