A Model of Equilibrium Institutions

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- Important in explaining disparities in income across the globe.
- Institutions may serve the interest of elites...but why does this gives rise to large economic inefficiencies?
- Why is there no "political" Coase Theorem in general?
- Under what conditions will elite control of institutions lead to economic distortions?
- This paper builds a model to address these questions.

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▸ Related literature

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  - Rebellions destroy existing institutions, making way for new ones.
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- In the absence of a rebellion, the rules laid down by the institutions are followed.
  - Institutions might be able to establish credible rules.
  - So a political Coase Theorem might emerge.
- However, once institutions have been destroyed, new ones are not constrained by any past rules or deals.
  - Rebellions cannot commit to establishing particular institutions.
  - Who would enforce such deals?

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- In equilibrium, power and rents are closely related:
  - Endogenous limits on the set of possible transfers.
  - Political Coase theorem breaks down.
- Not enough power sharing (elites are too small) $\Longrightarrow$ Too little investment.

Plan

1. Basic model
2. Benchmark case of public good provision
3. Private investment and capital taxation

Environment

Measure one of ex-ante identical and self-interested individuals.

- Institutions do not depend on benevolence, competence or factional affiliation of those in power.
- As in Orwell's *Animal Farm*, the "men" and the "pigs" are the same.
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No uncertainty:

- No rebellions in equilibrium.

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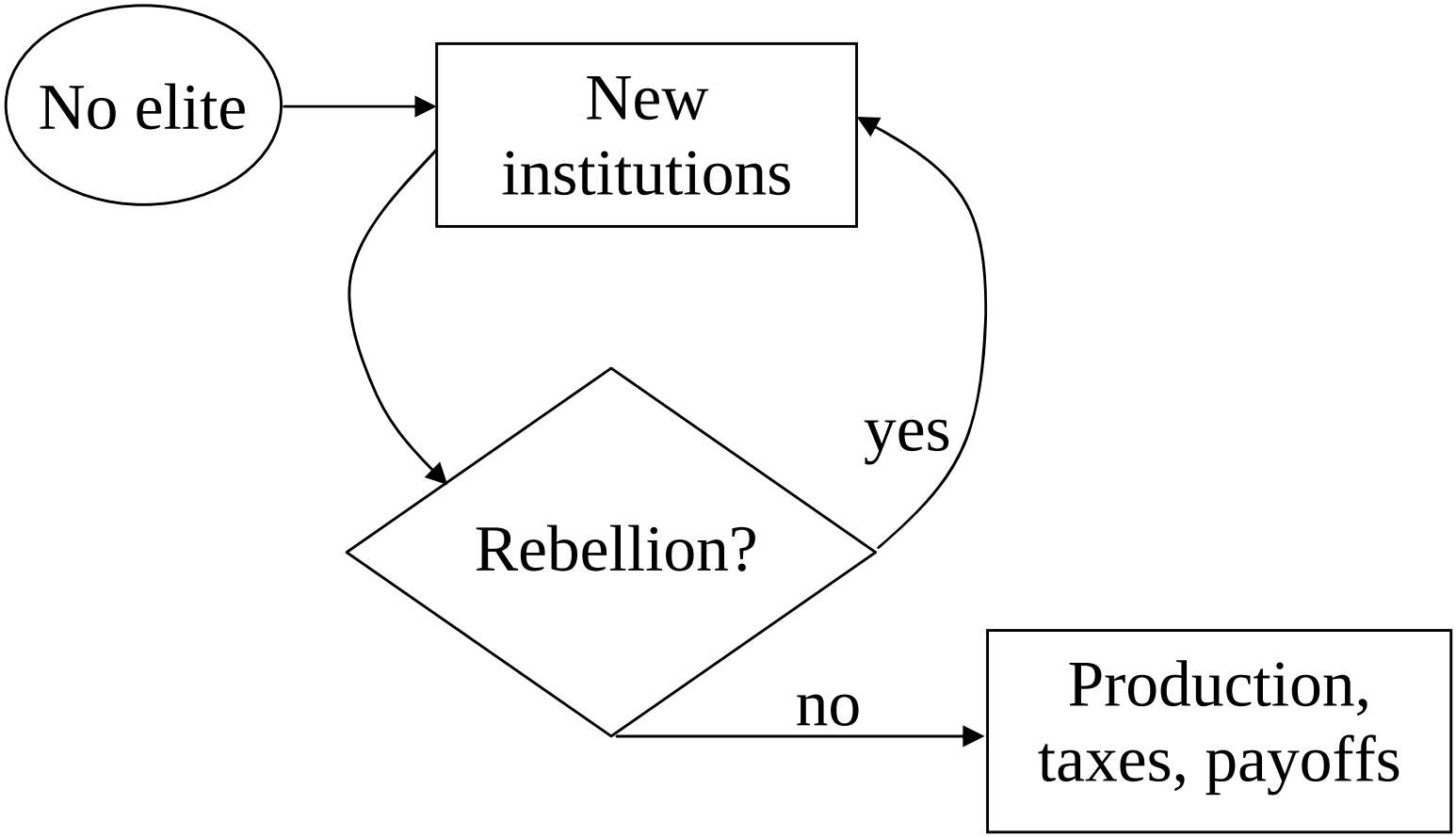
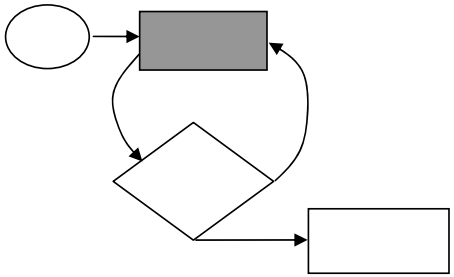
What individuals do:

- Producers receive q units of a homogeneous good.
- Members of the elite can defend their institutions.
- They can all take part in rebellions.

Sequence of events



Establishing institutions



Who is in power:

- Size of the elite *a* maximizes the average utility of its members:
  - No incentive to draft or expel any members.
  - Distribution of power reflects the interest of the elite power, not the welfare of society.

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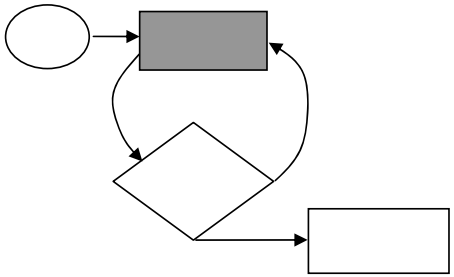

Who is in power:

- Size of the elite *a* maximizes the average utility of its members:
  - No incentive to draft or expel any members.
  - Distribution of power reflects the interest of the elite power, not the welfare of society.
- Given size *a*, the composition of the elite is determined by a predetermined ordering, set by the previous rebellion (or "nature" in the first round).

Establishing institutions

Allocation of resources:

- The elite chooses:
  - $\tau(\cdot)$: distribution of (lump-sum) taxes on producers;
  - $C_{\mathrm{a}}(\cdot)$: distribution consumption among elite members;
- to maximize the average utility of its members.
- Once institutions are established, each individual gets to know his $C_{\mathrm{a}}(\imath)$ or $\tau(\imath)$.

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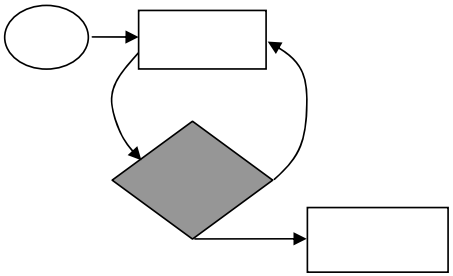
The maximization problem for choosing institutions is forward looking.

Rebellion



- Maximum fighting effort individual i is willing to exert if he expects to have a place in the subsequent elite:

$$F(i) = U'_{\mathrm{a}} - U(i)$$

  - U'_{a}: belief about the average utility of members of the subsequent elite;
  - $U(i)$: utility of individual i under the current institutions.
- Incentives for rebellion will also depend on:
  - a': belief about the size of the subsequent elite.

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- Incumbent army ($\mathcal{A} \backslash \mathcal{R}$): set of size $a - d$ comprising members of the elite not in the rebel army:
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  - $a =$ size of elite,
  - $d =$ measure of elite members in the rebel army.
- The rebellion is profitable if

$$\int_{\mathcal{R}} F(\imath) d\imath > \delta(a - d)$$

  where δ is an (exogenous) power parameter of the incumbent army.
- $\delta(a - d)$ is the cost the incumbent army imposes on the rebels.

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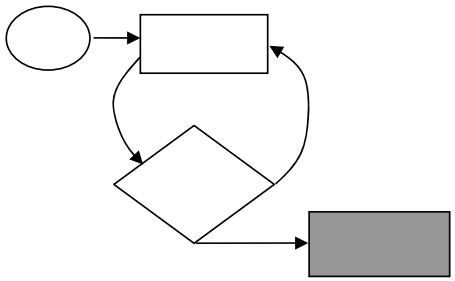
Rationale: it is much easier for armies to provide incentives to fight for those who will be in power if they win.

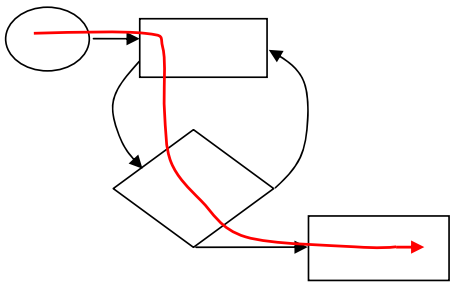
- Armies could deny a place in the elite to those who did not exert enough effort.
- Other forms of punishment would be costly.

Production, taxation, payoffs



- Producers make q units of goods (exogenous).
- The "rules of the game" laid down by the prevailing institutions are followed:
  - Taxes are collected and distributed among members of the elite.
- Payoffs are received:
  - Utility function: $u(C)$, with $U' > 0$ and $U'' \leq 0$.

Equilibrium



Equilibrium institutions are those that maximize

$$\frac{1}{a}\int_{\mathcal{A}} U_{\mathrm{a}}(\imath)d\imath$$

subject to

$$\int_{\mathcal{R}} \left(U'_{\mathrm{a}} - U(\imath)\right) d\imath \leq \delta(a-d)$$

for all sets $\mathcal{R}$ such that $\mathbb{P}(\mathcal{R}) = a'$; with $d = \mathbb{P}(\mathcal{R} \cap \mathcal{A})$.

- Solution depends on beliefs U'_{a} and a'.

The post-rebellion institutions

How are U'_{a} and a' determined?

- Once a rebellion occurs, the new institutions are determined through an identical maximization problem.
  - After each potential rebellion, history is payoff irrelevant — the cost of conflict is sunk.
- No fundamental reason why elites would make different choices.
- Natural to focus on Markovian equilibria.

Markovian equilibrium

Definition of a Markovian equilibrium:

- a, $\tau(\cdot)$ and $U_{\mathrm{a}}(\cdot)$ maximize the average payoff of those in the elite;
- $a = a'$;
- Same distribution of taxes over producers;
- Same distribution of payoffs in the elite.

Markovian equilibrium

Proposition

Any Markovian equilibrium must have the following properties:

1. *Equalization of producers' payoffs:* $U_{\mathrm{p}}(\imath) = U_{\mathrm{p}}, \forall \imath$
2. *Sharing power implies sharing rents:* $U_{\mathrm{a}}(\imath) = U_{\mathrm{a}}, \forall \imath$
3. *The no-rebellion constraint can be written as:*

$$U_{\mathrm{p}} \geq U_{\mathrm{a}'} - \delta \frac{a}{a'}$$

4. *Power determines rents:* $U_{\mathrm{a}} - U_{\mathrm{p}} = \delta$

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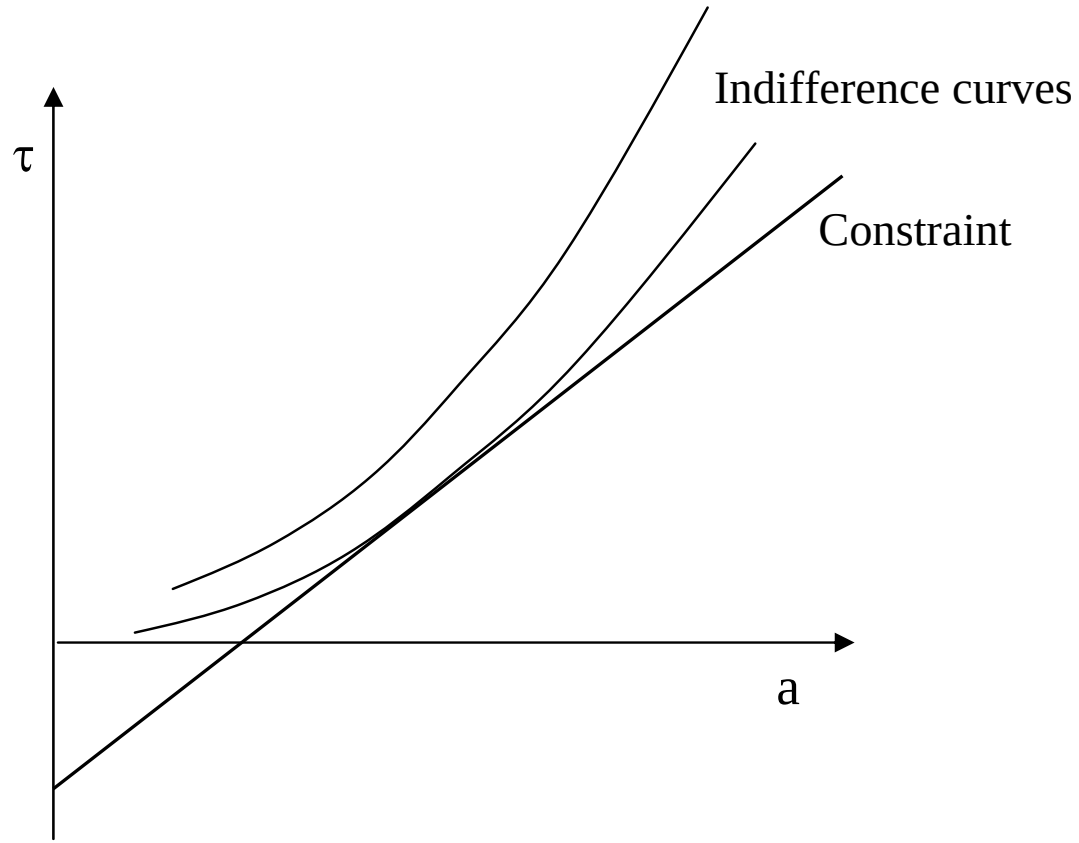
In a simple endowment economy, equalization of producers' payoffs entails tax equalization ($\tau(\imath) = \tau$).

Graphical representation

Tradeoff: Higher tax τ requires a larger elite size a.



▸ Linear utility case ▸ Log utility case

The provision of public goods

Benchmark case of provision of public goods:

- Technology that converts units of output into public goods.
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Does a political Coase theorem arise in this setting?

The provision of public goods

- Institutions determine a, τ and g.
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- Individuals take g into account when deciding whether to rebel.
- Consumption of a producer:

$$C_{\mathrm{p}} = q - \tau + f(g)$$

- Consumption of a member of the elite:

$$C_{\mathrm{a}} = \frac{(1-a)\tau - g}{a} + f(g)$$

The choice of institutions

The equilibrium institutions are the solution of:

$$\max_{a,\tau,g} U\left(\frac{(1-a)\tau - g}{a} + f(g)\right)$$

subject to

$$U'_{\mathrm{a}} - \delta\frac{a}{a'} \leq u(q + f(g) - \tau) \text{ with } a = a' \text{ , } \tau = \tau' \text{ and } g = g'.$$

First-order condition with respect to g:

$$f'(g^*) = 1$$

Equilibrium

- The public good is efficiently provided.
  - Even though the elite is purely self-interested, it acts as a meaningful government in its provision of public goods.
  - Similar result has been found in other models — a benchmark case.
- Individuals take the public good provision as well as taxes into account when deciding whether to rebel:
  - provision of public goods slackens the no-rebellion constraint;
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- Individuals take the public good provision as well as taxes into account when deciding whether to rebel:
  - provision of public goods slackens the no-rebellion constraint;
  - taxes raised to finance them tighten the constraint.
- Result is consistent with a political Coase Theorem:
  - setting down rules analogous to contracting;
  - threat of rebellion: there is a price attached to policy actions;
  - efficient outcome, transfers ensure constraints are respected.

Private investment

Extension of the model:

- Producers can exert effort to raise output in the future,
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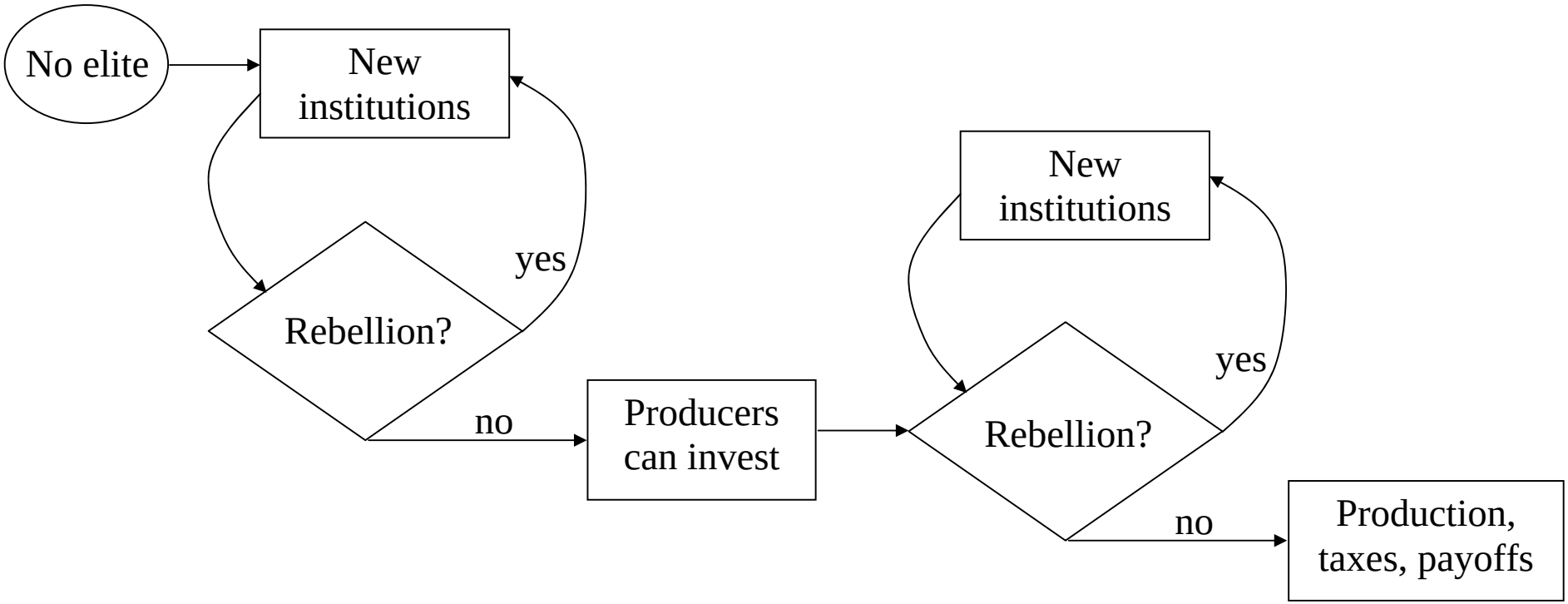
Investment proceeds changes incentives for rebellion, and thus affects the choice of institutions.

- What are the equilibrium institutions?
- Are they consistent with a political Coase Theorem?

Investment


No elite
New institutions
Rebellion?
yes
no
Producers can invest
New institutions
Rebellion?
yes
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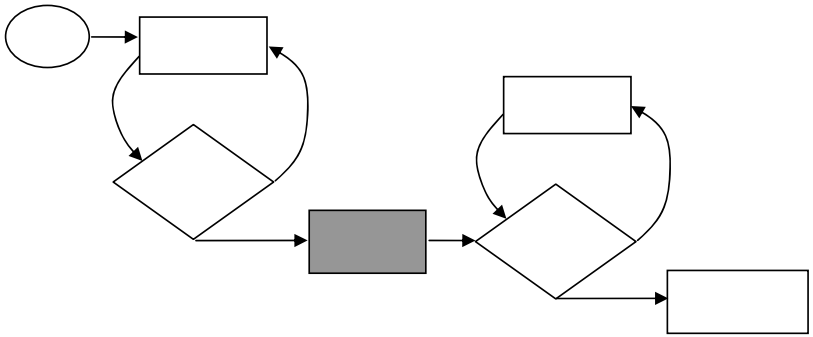
Investment



- Each producer gets to know his own (idiosyncratic) effort requirement, ϵ : Uniform$[\epsilon_L, \epsilon_H]$.
  - Assumption: parameters are such that some producers will choose not to invest.
- Those who make the effort receive κ units of output ("capital") at the production stage.
- Capital is observable, effort is not.

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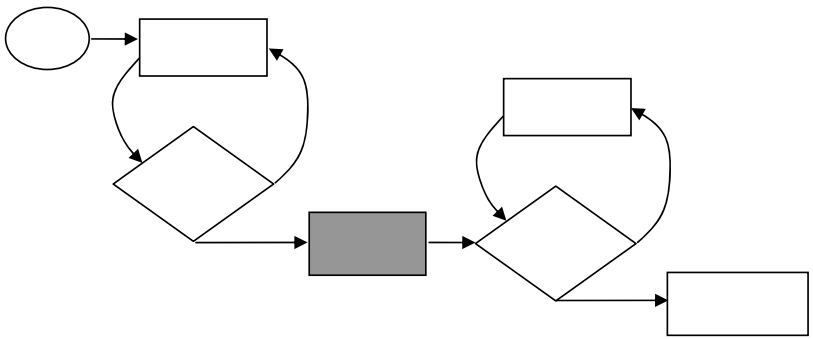

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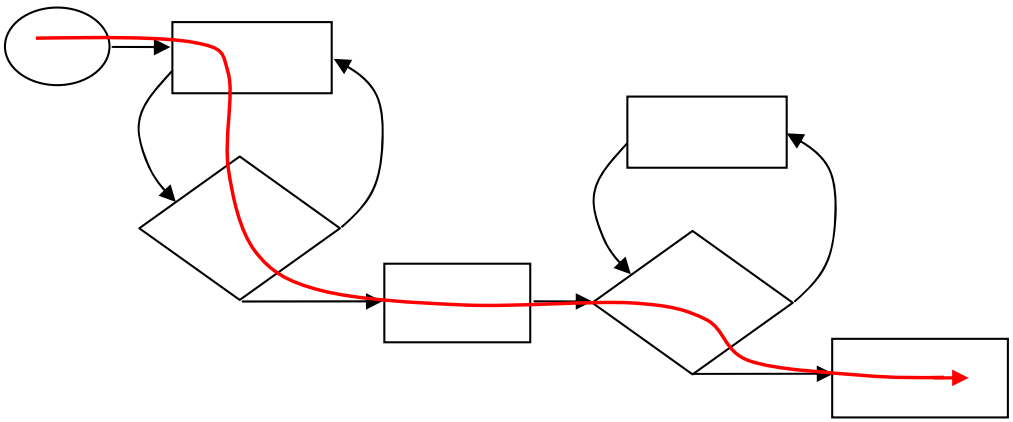
For tractability, $U(C) = C$.

Equilibrium

Equilibrium institutions survive rebellion at all points.



To characterize the equilibrium:

1. We start by analysing the possibility of a rebellion at the post-investment stage.
2. Then we determine the institutions chosen at the pre-investment stage.

A rebellion at the post-investment stage: Expropriation

Suppose a rebellion succeeds.

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Result: the elite chooses capital tax = 100%:

- Optimal for the elite to have all producers receive the same utility U_{p}.
- Having payoffs independent of individual capital stock requires full expropriation.
- Sunk investment cost does not influence decisions about rebelling.

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- Sunk investment cost does not influence decisions about rebelling.
- Total capital K is confiscated and equally distributed among all individuals (both inside and outside the elite).
- The new elite size is independent of the capital stock.

Equilibrium institutions (from pre-investment stage)

The institutions specify:

- The size of the elite a;
- A lump-sum tax on all producers τ_q;
- A tax on capital τ_K:

Chosen to maximize the payoff of those in the elite, subject to no rebellions.

No-rebellion constraints

Three no-rebellion constraints.

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By source and timing of rebellion:

- Producers at pre-investment stage
- Producers (with no capital) at post-investment stage
- Elite at post-investment stage

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In a Markovian equilibrium with some investment:

- The post-investment stage constraints for both producers (with no capital) and the elite are binding
- The pre-investment stage constraint is slack.

Equilibrium institutions (from pre-investment stage)

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- If the return on investment is sufficiently high then equilibrium capital taxes will be less than 100%, and some producers will invest.
- When some producers will invest, the equilibrium elite size will be larger than when there is no investment.

Intuition for protection of property rights

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Some producers invest $\Longleftrightarrow$ elite is larger than its equilibrium size after a rebellion at the post-investment stage.

- Discouraging rebellion by producers (with no capital) requires either a larger elite or *lower* taxes.
- Discouraging rebellion by members of the elite requires either a larger elite or *higher* taxes.

Intuition for protection of property rights

If the pre-investment stage elite is larger than its equilibrium size after a rebellion at the post-investment stage then changing institutions is costly for the elite:

- There would not be enough places in the subsequent elite for all those in the current elite.
- Those who would lose power fight against rebellions changing the institutions.

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The extra members of the elite have no special function:

- They simply deter rebellions that would dislodge them from power.

Intuition for protection of property rights

Two key assumptions:

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   - In principle, elites can create institutions that tie their hands.
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Two key assumptions:

1. Institutions cannot be modified without a rebellion.
   - In principle, elites can create institutions that tie their hands.
   - Institutions survive everything — except the collapse of the whole system.
2. Were a rebellion to occur, there can be no enforcement of deals made prior to the rebellion.
   - Optimization along *all* institutional variables.
   - No "meta-institutions" to enforce deals concerning the choice of institutions themselves.

Efficiency?

- Elites can choose institutions that allow for a credible commitment to a capital tax less than 100%.
- Will they set the capital tax rate efficiently?

The efficient choice of capital taxes

Efficiency benchmark:

- Suppose a benevolent agent can impose a particular level of capital taxes on all elites.
- The elite chooses all other institutional variables in its own interests (subject to no rebellions) taking capital taxes as given.
- The benevolent agent chooses capital taxes to maximize the average utility of all individuals, taking elite control of other institutional variables as given.

There are two distortions

First distortion: too little power sharing.

- Protection of property rights requires a larger elite.
- The extra elite members must be paid more than producers.
  - Sharing power requires sharing rents.
- The elite are reluctant to share rents by increasing their size.

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Second distortion: investor surplus cannot be fully extracted by the elite.

- Individual investment effort is unobservable.
- The extent to which individual investors' no-rebellion constraints are slack is unknown.

A political Coase Theorem breaks down

- Inseparability of power and rents puts an endogenous limit on the set of possible transfers.
  - It is not feasible to add individuals to the elite to ensure stable institutions, but only pay these individuals the same as a producer.
  - The low-paid members of the elite would rebel.
- Unobservability of investors' surplus.

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- Parliaments represent those who elected them...
- ... but so do democratically elected presidents.
- Power sharing ensures institutions are more stable by making it costly for a some members of the elite to try to change them.
- "The princes who have wanted to make themselves despotic have always begun by uniting in their person all the magistracies" — Montesquieu, *The Spirit of the Laws*.

Related historical examples: Glorious Revolution

- The Glorious Revolution, England, 1688: power sharing between King and Parliament.
- North and Weingast (1989): that led to secure property rights and the elimination of confiscatory government.
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- earlier kings fought hard against sharing power:
  - Sharing power requires sharing rents.

⏩ Skip other examples

Related historical examples: Roman Empire

- Malmendier (2009): Rome's societas publicanorum were the earliest predecessors of modern corporations.
- Their demise coincided with transition from the Roman Republic to the Roman Empire.
- Possible reason: while power was decentralized (Roman Republic), it was possible to have rules that guarantee property rights.
- But once power is centralized (Roman Empire), protection against expropriation was not possible any longer.

Related historical examples: Podesteria

- Greif (1994, 2006): Podesteria in Genoa.
- Many medieval Italian cities employed a podestà.
- Podestà: a leader coming from another city with military power that would rule the city for one year.
- Generously paid.
- Having the podestà allowed for inter-clan cooperation and investment.
- The podestà had to be sufficiently strong relative to the powerful clans in the city.
- In the language of the model, the elite (the total group of people with power) had to be large enough.

Investment and expropriation

- Empirical evidence: government expropriation of property is an important issue.
  - Acemoglu and Johnson (2005) suggest "property rights" institutions are more important than "contracting institutions".
- Model: protection against government expropriation is not optimally provided (capital taxes are too high):
  - Institutions credibly committed to low capital taxes are feasible...
  - but require the elite to share power...
  - which requires sharing rents.

1 Samuel 8:10-20

And Samuel told all the words of the Lord unto the people that asked of him a king.
And he said, This will be the manner of the king that shall reign over you: He will take your sons, and appoint *them* for himself, for his chariots, and *to be* his horsemen; and *some* shall run before his chariots. . . .
And he will take your daughters *to be* confectionaries, and *to be* cooks, and *to be* bakers. . . .
He will take the tenth of your sheep: and ye shall be his servants.
And ye shall cry out in that day because of your king which ye shall have chosen you; and the Lord will not hear you in that day.

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And ye shall cry out in that day because of your king which ye shall have chosen you; and the Lord will not hear you in that day.
Nevertheless the people refused to obey the voice of Samuel; and they said, Nay; but we will have a king over us;
That we also may be like all the nations; and that our king may judge us, and go out before us, and fight our battles.

Concluding remarks

- Sharing power allows for commitment to rules that would otherwise be time-inconsistent.

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- As sharing power requires sharing rents, capital taxes are too high, there is too little protection of investment.
- Possible extensions:
  - Which factors influence power sharing (and investment);
  - Other sources of inefficiency in this framework;
  - Heterogeneity, uncertainty...

Related literature

- Downs (1957): governments composed of self-interested agents.
  - A vast literature on political economy has developed.
  - Much of that focuses on elections, assuming an environment with well-functioning institutions.
- Work with similar motivation has been done by:
  - Acemoglu and Robinson (2006, 2008),
  - Besley and Persson (2009, 2010),
  - Greif (1994, 2006).

Related literature

- Coalition formation (Ray (2007)).
  - Non-cooperative process to establish rules, that are implemented by assumption.
  - Modelling of rebellions related to blocking in coalitions.
  - Distinguishing feature: the "rebellion technology".
- Myerson (2009) application of Schelling (1960).
  - Institutions as the *focal point* that determines allocation of resources once production has taken place.
- Conflict (Grossman and Kim (1995), Hirshleifer (1995)).
  - Here, people fight to establish the rules, not over what has been produced.
  - They fight in groups, not as isolated individuals.

Back

The model with linear utility

- $U(C) = C$.
- Problem:

$$\max_{a,\tau} \frac{1-a}{a}\tau \text{ s.t. } C'_{\mathrm{a}} - \delta\frac{a}{a'} \leq q - \tau$$

How we solve it

$$\max_{a,\tau} \frac{1-a}{a}\tau \text{ s.t. } C'_{\mathrm{a}} - \delta\frac{a}{a'} \leq q - \tau$$

- Contraint yields an expression for τ.
- We substitute it into the objective function.
- First order condition with respect to a.
- Impose equilibrium ($a = a'$, $C_{\mathrm{a}} = C'_{\mathrm{a}}$)

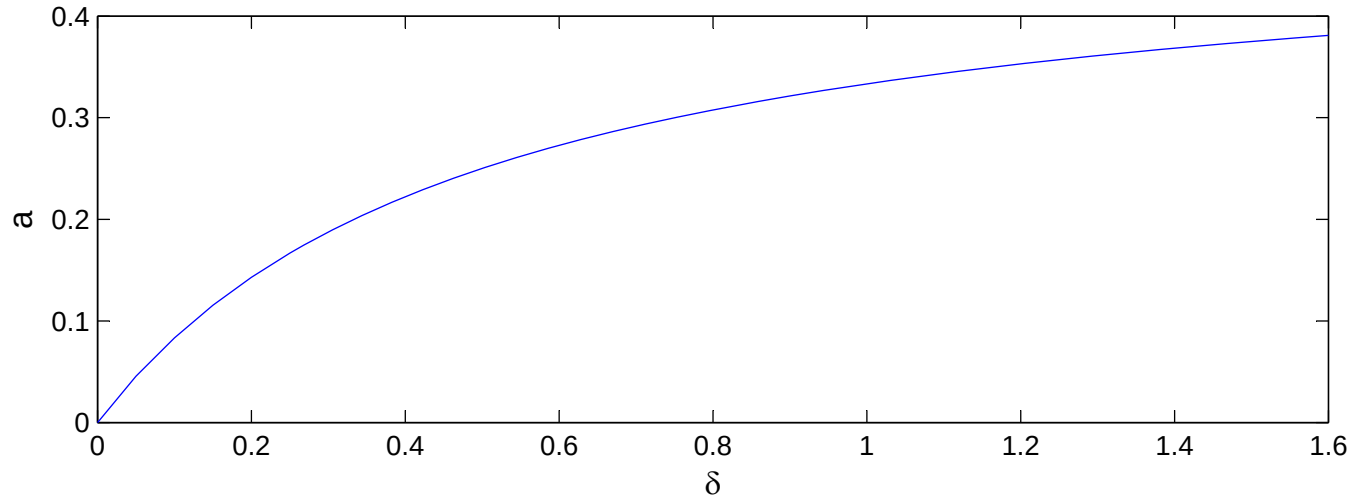
Solution

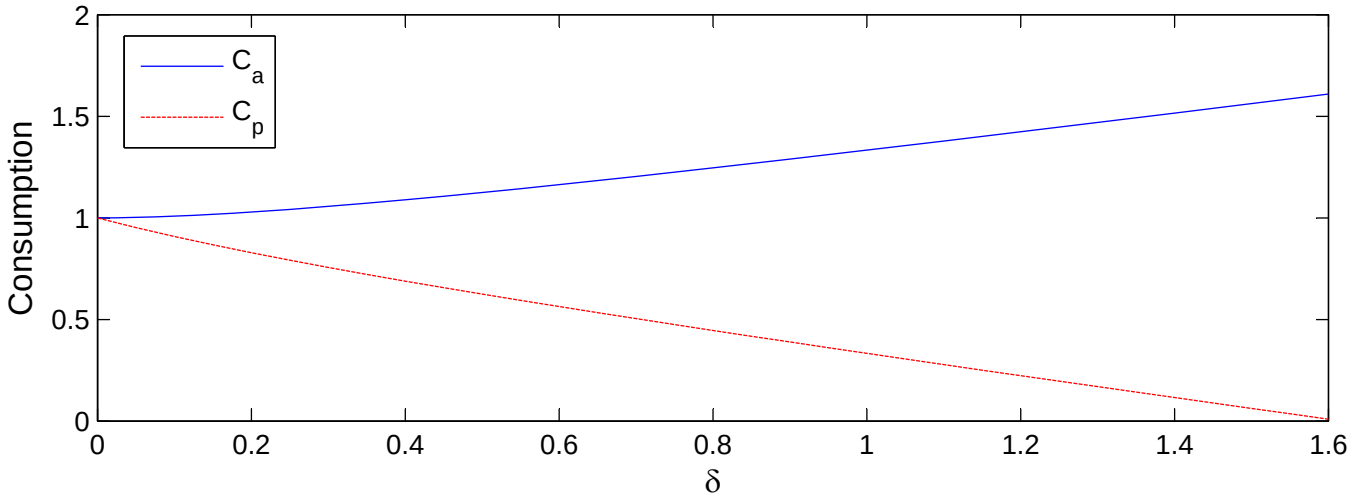
$$a^* = \frac{\delta}{q + 2\delta}$$

$$C_{\mathrm{a}} = \frac{(q+\delta)^2}{q+2\delta} \ , \ C_{\mathrm{p}} = \frac{(q+\delta)^2}{q+2\delta} - \delta$$

- In equilibrium, $C_{\mathrm{a}} - C_{\mathrm{p}} = \delta$.
- Results for $\delta/q < (1+\sqrt{5})/2$ (otherwise consumption of producers is 0).

The model with linear utility





The model with log utility

- $U(C) = log(C)$.
- Problem:

$$\max_{a,\tau} \log\left(\frac{1-a}{a}\tau\right) \text{ s.t. } \log\left(C'_{\mathrm{a}}\right) - \delta\frac{a}{a'} \leq \log(q-\tau)$$

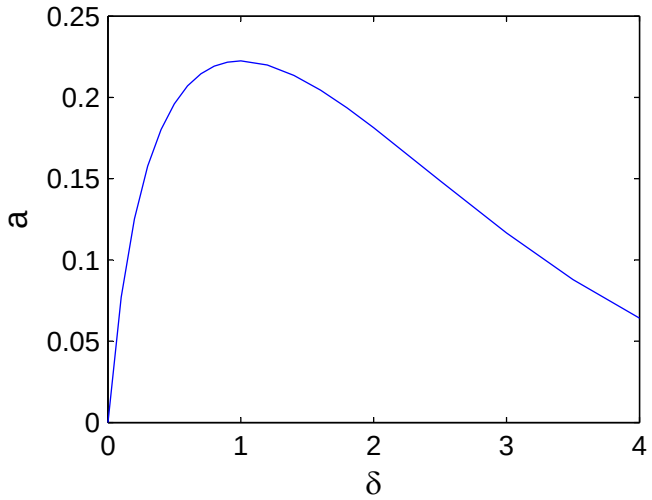
Solution

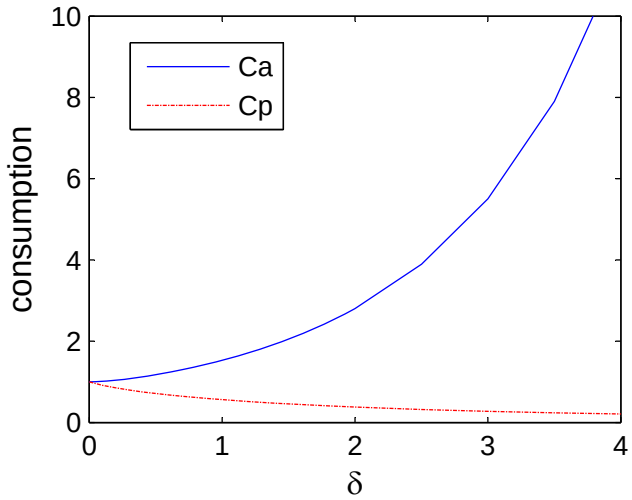
$$a = \frac{2\delta e^{-\delta}}{1 + 2\delta e^{-\delta} + \sqrt{1 + 4\delta e^{-\delta}}}$$

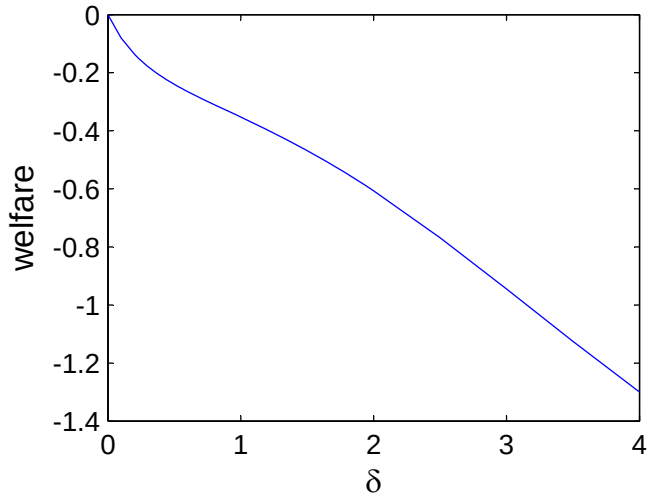
$$C_{\mathrm{a}} = \frac{(1-a)q}{a + (1-a)e^{-\delta}} \ , \ C_{\mathrm{p}} = \frac{e^{-\delta}(1-a)q}{a + (1-a)e^{-\delta}}$$

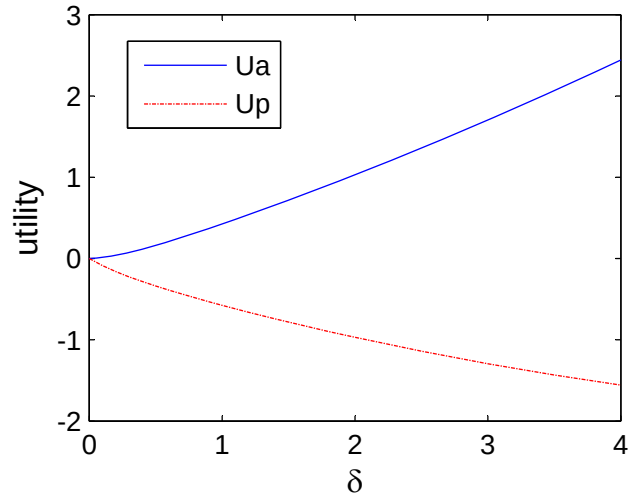
- a^* is independent of q.
  - Log utility: cost of conflict is proportional to q.

The model with log utility









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