Political Economy of Growth: Modeling Barriers to Economic Growth

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Taking Stock

- Lecture 1:
  - Institutions matter.
  - Social conflict view, a useful perspective on understanding the choice of institutions
  - Inefficient institutions may be preferable for the politically powerful.
- This lecture:
  - Compare the incentives of the elite to block development.
  - Historical example: Iceland, 16^{th}-19^{th} century.
  - Conclusion: Motive of factor price manipulation more deleterious to development than rent extraction.
- Leading up to the next lecture: Compare inefficiencies in Oligarchy and Democracy.

Key Question

- Why would societies choose policies that do not encourage growth? Actively create barriers against growth?
- Part of the answer: Social Conflict.
  - Growth does not benefit those with political power.
- But not enough.
  - Why not encourage growth, increase the size of the national pie and then redistribute?
- General answer: growth and distribution of resources cannot be separated.
  - Limited fiscal instruments instruments.
  - Political power depends on existing structure of production.

Why Iceland Starved? The Problem

- Stagnant economy in 16^{th}-19^{th}.
- Typical pattern of underdevelopment.
  - Backward techniques of agriculture;
  - Famines of increasing frequency;
  - Declining average height of the population.

Why Iceland Starved? The Puzzle

- Eggertsson (2005, p. 102): "The central paradox in Iceland's economic history is Icelanders' failure to develop a specialized fishing industry and exploit on a large scale the country's famous fisheries."
- Key questions:
  - why did fisheries not develop?
  - why were resources inefficiently tied in to agriculture?

Why Iceland Starved? An Answer

- According to Eggertsson, the answer lies in social conflict, and the fact that the elite would be hurt by the development of the fisheries.
  - Landlords had political power and “realized that the development of a specialized fishing industry would draw farm workers away, substantially increasing labor costs.” (p. 111).
- Lessons:
  - modelling inefficient institutions;
  - investigate the particular channels through which the elite is hurt by development.

Modelling Approach

- Building on the seminal work by Arrow, Black, Hotelling.
- Agents have preferences over allocations and understand the mapping from economic institutions to allocations.
- Thus they have induced preferences over economic institutions (policies).
- They also understand the mapping from political institutions to economic institutions.
- Therefore, they also have induced preferences over political institutions.
- Consistent with the tradition of work in social choice, those preferences are not always aligned.
- Key concept in mediating preferences: political power.

Modelling Approach (continued)

- Build a simple model to understand preferences over policies.
- Some groups are going to prefer "inefficient" policies (here policies that retard economic growth and cause stagnation).
  - "Inefficient" therefore does not necessarily mean Pareto inefficient.
- These inefficient policies in turn leading to blocking of development and a process of underdevelopment.
- Ultimately building up to understanding of equilibrium political institutions.

Economic Model: Overview

- Three groups: workers, elite producers and "middle-class producers".
- Economic and hence political conflict between all three groups.
- The elite are in power and will choose policies/economic institutions in order to transfer resources from the two other groups to themselves.
- Two central economic mechanisms:
  - Revenue extraction
  - Factor price manipulation
- Political mechanism: the elite will also try to manipulate economic allocations in order to protect their political power.

Economic Model: Preferences

- All agents have preferences at time $t = 0$:

$$U_0^j = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t c_t^j. \tag{1}$$

- Mass of workers equal to 1, set of elite agents S^e with mass θ^e, and set of middle-class agents S^m with mass θ^m.

- Elite and middle-class producers have access to technology:

$$y_t^j = \frac{1}{1-\alpha}(A_t^j)^{\alpha}(k_t^j)^{1-\alpha}(l_t^j)^{\alpha}, \tag{2}$$

  where k denotes capital and l labor. Capital depreciates fully after use.

- Key difference between the two groups is their productivity.
  - A^m for the middle class and A^e for the elite.

Economic Model: Policies

- Activity-specific tax rates on production, $\tau^e \geq 0$ and $\tau^m \geq 0$.
- Important: no other fiscal instruments
  - In particular, no lump-sum non-distortionary taxes.
- Lump-sum transfers targeted towards each group, $T^w \geq 0$, $T^m \geq 0$ and $T^e \geq 0$.
- Return from natural resources R.
- Parameter $\phi \in [0, 1]$, related to "state capacity," measures how much of the tax revenue can be redistributed.
- Government budget constraint is therefore:

$$T_t^w + \theta^m T_t^m + \theta^e T_t^e \leq \text{Revenue}_t \equiv \phi \int_{j \in S^e \cup S^m} \tau_t^j y_t^j dj + R. \quad (3)$$

The Labor Market

- Only workers work, so market clearing implies

$$\int_{j \in S^e \cup S^m} l_t^j dj \leq 1, \tag{4}$$

- Key condition for excess supply:

$$\theta^e + \theta^m \leq \frac{1}{\lambda}, \tag{ES}$$

- If this condition is not satisfied, then there will be or full employment.

- Also assume for simplification that

$$\theta^e \leq \frac{1}{\lambda} \text{ and } \theta^m \leq \frac{1}{\lambda}, \tag{A1}$$

Economic Equilibrium

- An economic equilibrium is defined as a sequence of wages $\{w_t\}_{t=0,1,\ldots,\infty}$, and investment levels and employment levels for all producers, $\{[k_t^j, l_t^j]_{j \in S^e \cup S^m}\}_{t=0,1,\ldots,\infty}$ such that given $\{\tau_t^e, \tau_t^m\}_{t=0,1,\ldots,\infty}$ and $\{w_t\}_{t=0,1,\ldots,\infty}$, all producers choose their investment and employment optimally and the labor market clears.

Equilibrium: Preliminaries

- Firm-maximization:

$$\max_{k_t^j, l_t^j} \frac{1-\tau_t^j}{1-\alpha}(A^j)^\alpha (k_t^j)^{1-\alpha}(l_t^j)^\alpha - w_t l_t^j - k_t^j,$$

which yields

$$k_t^j = (1-\tau_t^j)^{1/\alpha} A^j l_t^j, \tag{5}$$

and

$$l_t^j \begin{cases} = 0 & \text{if } w_t > \frac{\alpha}{1-\alpha}(1-\tau_t^j)^{1/\alpha} A^j \\ \in [0,\lambda] & \text{if } w_t = \frac{\alpha}{1-\alpha}(1-\tau_t^j)^{1/\alpha} A^j \\ = \lambda & \text{if } w_t < \frac{\alpha}{1-\alpha}(1-\tau_t^j)^{1/\alpha} A^j \end{cases}. \tag{6}$$

Equilibrium Wages

- Combining (6) with (4), equilibrium wages are obtained as follows:

  1. If Condition (ES) holds, there is excess supply of labor and $w_t = 0$.
  2. If Condition (ES) does not hold, then there is "excess demand" for labor and the equilibrium wage is

$$w_t = \min\left\langle \frac{\alpha}{1-\alpha}(1-\tau_t^e)^{1/\alpha} A^e, \frac{\alpha}{1-\alpha}(1-\tau_t^m)^{1/\alpha} A^m \right\rangle. \quad (7)$$

- Whichever group has lower marginal product (given policies) determines the equilibrium price of labor.

- This opens the way for factor price manipulation.

Inefficient Policies

- Suppose there is an upper bound on taxation, so that

$$\tau_t^m \leq \bar{\tau} \text{ and } \tau_t^e \leq \bar{\tau},$$

- The timing of events within each period is as follows:
  - *first*, taxes are set;
  - *then*, investments are made.
- This implies no holdup.
- Also to start with, focus on Markov Perfect Equilibria (MPE).

Revenue Extraction

- Let us start with pure revenue extraction.
- This means shutting off the factor price interactions, i.e., assume that (ES) is satisfied.
- The elite would like to tax the middle class up to the peak of the Laffer curve.

Proposition 1 Suppose Assumption (A1) and Condition (ES) hold and $\phi > 0$, then the unique political equilibrium features $\tau_t^m = \tau^{RE} \equiv \min\{\alpha, \bar{\tau}\}$ for all t.

Factor Price Manipulation

- Let us next turn to pure factor price manipulation.
- For this reason, assume that ϕ =0.

Proposition 2 Suppose Assumption (A1) holds, Condition (ES) does not hold, and $\phi = 0$, then the unique political equilibrium features $\tau_t^m = \tau^{FPM} \equiv \bar{\tau}$ for all t.

Revenue Extraction and Factor Price Manipulation Combined

- Now let us allow both effects to operate.
- Clearly, this implies that (ES) should not be satisfied so that the FPM motive is active. Then the elite solve:

$$\max_{\tau_t^m} \left[\frac{\alpha}{1-\alpha} A^e - w_t\right] l_t^e + \frac{1}{\theta^e}\left[\frac{\phi}{1-\alpha}\tau_t^m (1-\tau_t^m)^{(1-\alpha)/\alpha} A^m l_t^m \theta^m + R\right], \tag{8}$$

subject to (7) and

$$\theta^e l_t^e + \theta^m l_t^m = 1 \tag{9}$$

and

$$l_t^m = \lambda \text{ if } \quad (1-\tau_t^m)^{1/\alpha} A^m \geq A^e. \tag{10}$$

Revenue Extraction and Factor Price (continued)

- Solution depends on whether the elite want to be "producers".
- Rather than provide a full taxonomy, let us impose:

$$A^e \geq \phi(1-\alpha)^{(1-\alpha)/\alpha} A^m \frac{\theta^m}{\theta^e}, \qquad \text{(A2)}$$

- When (A2) holds, we have $w_t = \alpha(1-\tau_t^m)^{1/\alpha} A^m \, \tau_t^m / (1-\alpha)$.

Revenue Extraction and Factor Price (continued)

- Therefore, the elite's problem is simply to choose τ_t^m to maximize
$$\frac{1}{\theta^e}[\frac{\phi}{1-\alpha}\tau_t^m(1-\tau_t^m)^{(1-\alpha)/\alpha}A^m l^m \theta^m + R] - \frac{\alpha}{1-\alpha}(1-\tau_t^m)^{1/\alpha}A^m\lambda,$$
- Maximization of this expression gives
$$\tau_t^m = \tau^{COM} \equiv \min\{\frac{\kappa(\lambda,\theta^e,\alpha,\phi)}{1+\kappa(\lambda,\theta^e,\alpha,\phi)},\bar{\tau}\}. \qquad (11)$$

Proposition 3 Suppose Assumptions (A1) and (A2) hold, Condition (ES) does not hold, and $\phi > 0$. Then the unique political equilibrium features $\tau_t^m = \tau^{COM}$ as given by (11) for all t. Equilibrium taxes are increasing in θ^e and α and decreasing in ϕ.

- Important comparative statics.

Political Consolidation

- Another motive: is preservation of political power.
- The elite enjoy revenues and profits because of their political power, thus likely to take actions to preserve and consolidate their political power.
- Suppose, in a reduced-form way, that the elite can lose political power to the middle-class, and when the middle class is richer, this is more likely to happen. Then:

  Proposition 4 *Consider the economy with political replacement. Suppose also that Assumption (A1) and Condition (ES) hold and $\phi > 0$, then the political equilibrium features $\tau_t^m = \tau^{PC} > \tau^{RE}$ for all t. This tax rate is increasing in R and ϕ.*

- Interesting comparative statics with respect to R and ϕ, different from before.

Subgame Perfect Equilibria versus MPE

- Does the restriction to MPE matter?
- Given the timing of events, the answer is no.

Proposition 5 The MPEs characterized in Propositions 1-4 are the unique SPEs.

- Why? Because there is no commitment problem.

Holdup

- Inefficiencies become more serious when there is an issue of holdup.
- More explicitly, we say that there is holdup if in the timing of events the elite set taxes after the middle class choose investments.
- Let us now focus on MPE.

  Proposition 6 With holdup, there is a unique political equilibrium with $\tau_t^m = \tau^{HP} \equiv \bar{\tau}$ for all t.

- Therefore, with holdup there is excessive taxation even from the viewpoint of the elite.

Subgame Perfect Equilibria versus MPE Again

- With holdup, there is over-taxation, so MPE and SPE are no longer identical.

  Proposition 7 Consider the holdup game, and suppose that Assumption (A1) and Condition (ES) hold and $\bar{\tau} = 1$. Then for $\beta \geq 1 - \alpha$, there exists a subgame perfect equilibrium where $\tau_t^m = \alpha$ for all t.

- Implicit commitment to low taxes using trigger strategies if parties are sufficiently patients.
- Potential alternative to “good institutions”, but imperfect.

Technology Adoption

- Let us now consider technology adoption, whereby producers (in particular the middle class) choose their technology, A^m) at Time $t = 0$ at some cost $\Gamma(A^m)$.
- Similar to hold up, but worse because there is only one time investment.
- When the objective of the elite is factor price manipulation, this doesn't matter.

Proposition 8 Consider the game with technology adoption and suppose that Assumption (A1) holds, Condition (ES) does not hold, and $\phi = 0$, then the unique political equilibrium features $\tau_t^m = \tau^{FPM} \equiv \bar{\tau}$ for all t. Moreover, if the elite could commit to a tax sequence at time $t = 0$, then they would still choose $\tau_t^m = \tau^{FPM} \equiv \bar{\tau}$.

Technology Adoption (continued)

- However, when there is at least some element of revenue extraction, lack of commitment introduced by technology adoption at the beginning is harmful to all groups.

  Proposition 9 Consider the game with technology adoption, and suppose that Assumption (A1) and Condition (ES) hold and $\phi > 0$, then the unique political equilibrium (either SPE or MPE) features $\tau_t^m = \tau^{RE} \equiv \min\{\alpha, \bar{\tau}\}$ for all t. If the elite could commit to a tax policy at time $t = 0$, they would prefer to commit to $\tau^{TA} < \tau^{RE}$.

- Note that SPE does not help.
- Because punishment strategies not possible (only one-time investment).
- What can be done? Economic institutions...

Inefficient Economic Institutions

- We now start thinking about economic institutions.
- Since we know preferences over policies, we can derive induced preferences over economic institutions.
- In particular, let us consider two stylized institutions.
  - security of property rights, modeled as limits on taxes.
  - regulation of technology, modeled as barriers to technology adoption by the middle class.

Security of Property Rights

- General principle: in the absence of holdup issues, the elite have no interest to grant further property rights to other groups (even if they can).
- This conclusion is modified in the presence of technology adoption or holdup.
- Simple model: imagine that the elite can commit (somehow credibly) to some maximum tax rate $\bar{\tau}$ instead of some higher-level $\bar{\tau}^H$.

Proposition 10 Without holdup and technology adoption, the elite prefer $\bar{\tau} = \bar{\tau}^H$.

Security of Property Rights (continued)

- The picture changes with holdup or technology adoption.

  Proposition 11 Consider the game with holdup and suppose Assumptions (A1) and (A2) hold, Condition (ES) does not hold, and $\phi > 0$, then as long as τ^{COM} given by (11) is less than $\bar{\tau}^{H}$, the elite prefer $\bar{\tau} = \tau^{COM}$.

  Proposition 12 Consider the game with holdup and technology adoption, and suppose that Assumption (A1) and Condition (ES) hold and $\phi > 0$, then as long as $\tau^{TA} < \bar{\tau}^{H}$, the elite prefer $\bar{\tau} = \tau^{TA}$.

- General principle: factor price manipulation and political consolidation effects potentially much more damaging to economic efficiency.

Regulation of Technology

- Would the elite like the middle class to be productive?
- The answer depends on the economic mechanism at work.
  - Yes, if they want to extract revenues.
  - No, if they want to manipulate factor prices or preserve their political power.
- Suppose that government policy $g \in \{0, 1\}$ influences the productivity of middle class producers, with $A^m(g = 1) > A^m(g = 0)$.
- Thus $g = 0$ like blocking of technological progress.

Proposition 13 Suppose Assumption (A1) and Condition (ES) hold and $\phi > 0$, then $w = 0$ and the the elite always choose $g = 1$.

Regulation of Technology (continued)

- Different conclusions when factor price manipulation or political replacement effects are in play.

  Proposition 14 Suppose Assumption (A1) holds, Condition (ES) does not hold, $\phi = 0$, and $\bar{\tau} < 1$, then the elite choose $g = 0$.

  Proposition 15 Consider the economy with political replacement. Suppose also that Assumption (A1) and Condition (ES) hold and $\phi = 0$, then the elite prefer $g = 0$.

- Same general principle: blocking of technology is a major problem when issues of factor price manipulation and/or political consolidation are present.

Why Iceland Starved? Taking Stock

- Development was blocked in Iceland because factor price manipulation was the dominant motivation for the elite.
  - Eggertsson: "The farm community was conscious of latent upward pressures on labor costs and fought those pressures. When the pull of the fisheries was relatively strong, courts reaffirmed the regulations in the labor market, and authorities tightened enforcement."
- This took the form of blocking innovations in the fishing industry:
  - Eggertsson: "New incentive schemes for the fishermen were seen as a threat to the system and forbidden. ... The farming community also saw improvements in fishing gear and the resulting increase in labor productivity as upsetting the balance."

Inefficient Political Institutions

- The model showed inefficiencies of dictatorship of the elite... is it any better than dictatorship of the middle class, or democracy?
- In general, there is no guarantee that one system is better than another.
- But more important, there are no natural mechanisms for the more efficient system to emerge in any case.

Comparison of Political Systems

- Assume

$$\theta^m = \theta^e < \frac{1}{2}, \tag{A3}$$

and

$$A^m \geq \phi(1-\alpha)^{(1-\alpha)/\alpha} A^e \frac{\theta^e}{\theta^m}. \tag{A4}$$

Proposition 16 Suppose Assumptions (A1) and (A3) hold, Condition (ES) does not hold, and $\phi > 0$, then the unique political equilibrium with middle class control features $\tau_t^e = \tilde{\tau}^{COM}$ as given by (11) for all t.

Comparison of Political Systems (continued)

- Democracy, on the other hand, will redistribute away from both the middle class and elite producers to the workers.
- Efficiency of democracy depends on whether there is excess supply or not.
- With excess supply, democracy taxes both the middle class and the elite, so it is more inefficient than the dictatorship of either of these two groups.
- Without excess supply, democracy is much less redistributive because the median voter understands that high taxes and reduce equilibrium wages.

Dynamic Differences in Political Regimes

- Model so far suggests that different political regimes will create different types of distortions, depending on who has political power.
- Can we say whether one type of political regime is better for economic growth than another?
- Oligarchy versus democracy?
- Are short-run and long-run trade-offs the same?

Oligarchy Versus Democracy: Basic Differences

- Entry in democracy, sclerosis in oligarchy.
- Lower investment in democracy.
- Worse allocation of talent in oligarchy.
- Democracy more equal, oligarchy more unequal (lower wages higher profits).
- Oligarchy gets worse over time as the comparative advantage of incumbents gets worse.
- Potential cycles in oligarchy.

Rise and Decline of Nations

- What explains the rise and decline of nations?
  - Olson, Kennedy
  - But the mechanism not always clear.
- Example: the Caribbean Plantation societies in the 17th and 18th centuries initially prosperous, but then falling behind Northeastern United States.
- Mechanism:
  - oligarchy less harmful initially, even encouraging investment;
  - but harmful as comparative advantage of oligarchs disappears, especially because of new technological opportunities.

Model

- Infinite horizon economy, with the unique non-storable good, y.
- Preferences

$$U_0^j = E_0 \sum_{t=0}^{\infty} \beta^t c_t^j, \tag{12}$$

- Assume each agent dies with a small probability ε, consider the limit of this economy with $\varepsilon \to 0$.

Model (continued)

- Choice between entrepreneurship and production work.
- Entrepreneurial talent $a_t^j \in \{A^L, A^H\}$ with $A^L < A^H$.
- Either already own an active firm, or set it up (costly when there are entry barriers).
- Each agent starts period t with entrepreneurial talent $a_t^j \in \{A^H, A^L\}$, and $s_t^j \in \{0, 1\}$ which denotes the individual possesses an active firm.
- Agent with $s_t^j = 1$ member of the elite.
- Each agent takes the following decisions: c_t^j, $e_t^j \in \{0, 1\}$.
- If $e_t^j = 1$, then he also makes investment, employment, and hiding decisions, k_t^j, l_t^j and h_t^j, where h_t^j denotes whether he decides to hide his output in order to avoid taxation.

Model (continued)

- Three policy choices: a tax rate τ_t on firms, lump-sum transfer, T_t, and a cost B_t to set up a new firm (pure waste).
- Production function for talent a_t^j:

$$\frac{1}{1-\alpha}(a_t^j)^\alpha (k_t^j)^{1-\alpha}(l_t^j)^\alpha,$$

- To simplify assume that $l_t^j = \lambda$, and that entrepreneur himself can work in his firm as one of the workers.
- Denote: $b_t \equiv B_t/\lambda$.

Model (continued)

- Denote the wage rate by $w_t \geq 0$.
- Profit function (without hiding):

$$\pi\left(\tau_t, k_t^j, a_t^j, w_t\right) = \frac{1-\tau_t}{1-\alpha}(a_t^j)^\alpha (k_t^j)^{1-\alpha}(l_t^j)^\alpha - w_t l_t^j - k_t^j, \quad (13)$$

- With hiding:

$$\tilde{\pi}\left(\tau_t, k_t^j, a_t^j, w_t\right) = \frac{1-\delta}{1-\alpha}(a_t^j)^\alpha (k_t^j)^{1-\alpha}(l_t^j)^\alpha - w_t l_t^j - k_t^j \lambda.$$

- Thus

$$\tau_t \leq \delta,$$

- Labor market clearing: $\int_0^1 e_t^j \lambda dj = \int_{j \in S_t^E} \lambda dj \leq 1$, where S_t^E is the set of entrepreneurs at time t.
- For agents with $s_t^j = 0$, setting up a new firm may entail an additional cost B_t because of entry barriers.

Model (continued)

- Law of motion of individual states:

$$s_{t+1}^{j} = i_{t}^{j}, \tag{14}$$

$$a_{t+1}^{j} = \begin{cases} A^H & \text{with probability } \sigma_H & \text{if } a_t^j = A^H \\ A^H & \text{with probability } \sigma_L & \text{if } a_t^j = A^L \\ A^L & \text{with probability } 1-\sigma_H & \text{if } a_t^j = A^H \\ A^L & \text{with probability } 1-\sigma_L & \text{if } a_t^j = A^L \end{cases}, \tag{15}$$

- Stationary distribution fraction of high-productivity agents:

$$M \equiv \frac{\sigma_L}{1-\sigma_H+\sigma_L}.$$

- Assume

$$M\lambda > 1,$$

Analysis

- Timing of events:
  1. Entrepreneurial talents, $\left[a_t^j\right]$, are realized.
  2. The entry barrier for new entrepreneurs B_t is set.
  3. Agents make occupational choices, $\left[e_t^j\right]$.
  4. Entrepreneurs make investment decisions k_t^j.
  5. The labor market clearing wage rate, w_t, is determined.
  6. The tax rate on entrepreneurs, τ_t, is set.
  7. Entrepreneurs make hiding decisions, $\left[h_t^j\right]$.
- where $\left[a_t^j\right]$ shorthand for the mapping $\mathbf{a}_t : [0, 1] \to \left\{A^L, A^H\right\}$, etc.

Analysis (continued)

- Economic equilibrium: subgame perfect equilibrium given a policy sequence $\{b_t, \tau_t\}_{t=0,1,\ldots}$.
- Equilibrium investments:

$$k_t^j = (1 - \tau_t)^{1/\alpha} a_t^j \lambda. \tag{16}$$

$$\Pi\left(\tau_t, w_t \mid s_t^j, a_t^j\right) = \frac{\alpha}{1-\alpha}(1 - \tau_t)^{1/\alpha} a_t^j \lambda - w_t \lambda. \tag{17}$$

- Tax revenues:

$$T_t = \tau_t \frac{(1 - \tau_t)}{1-\alpha}^{\frac{1-\alpha}{\alpha}} \lambda \sum_{j \in S_t^E} a_t^j, \tag{18}$$

Analysis (continued)

- Who will become an entrepreneur?
  1. Entry equilibrium: where all entrepreneurs have $a_t^j = A^H$.
  2. Sclerotic equilibrium: where agents with $s_t^j = 1$ become entrepreneurs irrespective of their productivity.
- An entry equilibrium will emerge only if the net gain to a high-skill non-entrepreneur of incurring the entry cost and setting up a firm (at a given wage) is positive.
- This net gain takes into account the future benefit of becoming an elite protected from competition (as a function of future entry barriers etc.).
- Determined by simple dynamic programming taking equilibrium policies as given.

Analysis (continued)

- Let the value function of a worker of type z as a function of the sequence of future policies and equilibrium wages, $(\mathbf{p}^t,\mathbf{w}^t)$:

$$W^z\left(\mathbf{p}^t,\mathbf{w}^t\right) = w_t + T_t + \beta CW^z\left(\mathbf{p}^{t+1},\mathbf{w}^{t+1}\right), \tag{19}$$

where the continuation values from time $t+1$ onwards are:

$$\begin{aligned} & CW^z\left(\mathbf{p}^{t+1},\mathbf{w}^{t+1}\right) = \\ & \sigma^z \max\left\{W^H\left(\mathbf{p}^{t+1},\mathbf{w}^{t+1}\right), V^H\left(\mathbf{p}^{t+1},\mathbf{w}^{t+1}\right) - \lambda b_{t+1}\right\} \\ & +\left(1-\sigma^z\right)\max\left\{W^L\left(\mathbf{p}^{t+1},\mathbf{w}^{t+1}\right), V^L\left(\mathbf{p}^{t+1},\mathbf{w}^{t+1}\right) - \lambda b_{t+1}\right\}. \end{aligned} \tag{20}$$

- These incorporate optimal occupational choice from time $t+1$ onwards.

- Similarly, for a current entrepreneur

$$V^z\left(\mathbf{p}^t,\mathbf{w}^t\right) = w_t + T_t + \Pi^z\left(\tau_t, w_t\right) + \beta CV^z\left(\mathbf{p}^{t+1},\mathbf{w}^{t+1}\right), \tag{21}$$

Analysis (continued)

- Define the net value of entrepreneurship as a function of an individual's skill a and ownership status, s,

$$NV\left(\mathbf{p}^t,\mathbf{w}^t \mid A^z,s\right)=V^z\left(\mathbf{p}^t,\mathbf{w}^t\right)-W^z\left(\mathbf{p}^t,\mathbf{w}^t\right)-(1-s)\,\lambda b_t,$$

where the last term is the entry cost for agents with $s=0$.

$$NV\left(\mathbf{p}^t,\mathbf{w}^t \mid A^H,s_t^j=1\right)\geq NV\left(\mathbf{p}^t,\mathbf{w}^t \mid a_t^j,s\right)$$

and

$$NV\left(\mathbf{p}^t,\mathbf{w}^t \mid a_t^j,s\right)\geq NV\left(\mathbf{p}^t,\mathbf{w}^t \mid A^L,s_t^j=0\right).$$

- Therefore, high-skill incumbents remain entrepreneurs and low-productivity workers never become entrepreneurs.
- Whether low-productivity incumbents remain entrepreneurs depends on taxes, wages and entry barriers.

Analysis (continued)

- Define entry equilibrium wage such that $NV\left(\mathbf{p}^t, \left[w_t^H, \mathbf{w}^{t+1}\right] \mid a_t^j = A^H, s_t^j = 0\right) = 0$. So that

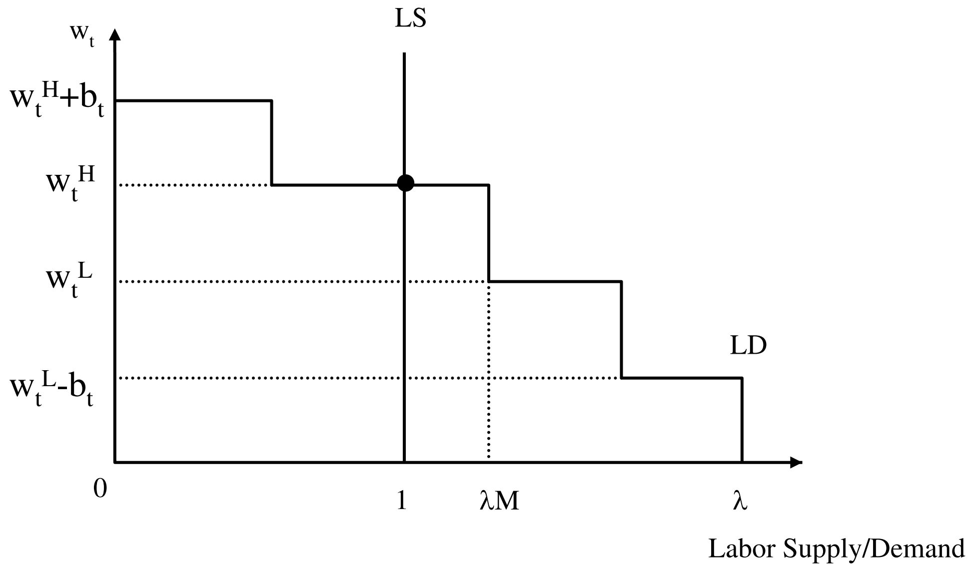
$$\begin{aligned} w_t^H &\equiv \frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha} A^H - b_t \\ &+ \frac{\beta\left(CV^H\left(\mathbf{p}^{t+1},\mathbf{w}^{t+1}\right) - CW^H\left(\mathbf{p}^{t+1},\mathbf{w}^{t+1}\right)\right)}{\lambda}, \end{aligned}$$

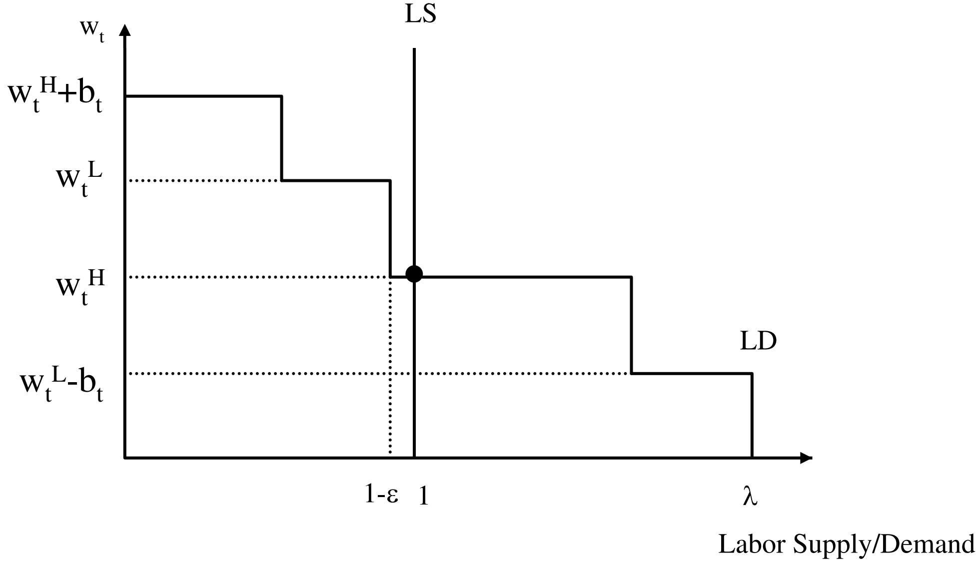
- Similarly, sclerotic wage is

$$\begin{aligned} w_t^L &\equiv \frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha} A^L \\ &+ \frac{\beta\left(CV^L\left(\mathbf{p}^{t+1},\mathbf{w}^{t+1}\right) - CW^L\left(\mathbf{p}^{t+1},\mathbf{w}^{t+1}\right)\right)}{\lambda}. \end{aligned}$$

- An entry equilibrium only when

$$w_t^H \geq w_t^L. \tag{22}$$


LS
w_t
w_t^H+b_t
w_t^H
w_t^L
LD
w_t^L-b_t
0
1
λM
λ
Labor Supply/Demand



w_t
LS
$w_t^H+b_t$
w_t^L
w_t^H
LD
$w_t^L-b_t$
1-ε
1
λ
Labor Supply/Demand

Analysis (continued)

- Therefore, in equilibrium $w_t^e = w_t^H$.
- Define fraction of high-productivity entrepreneurs:

$$\mu_t = \Pr\left(a_t^j = A^H \mid e_t^j = 1\right) = \Pr\left(a_t^j = A^H \mid j \in S_t^E\right)$$

- Since no entry barriers initially, $\mu_0 = 1$.
- Law of motion of μ_t:

$$\mu_t = \begin{cases} \sigma_H \mu_{t-1} + \sigma_L (1 - \mu_{t-1}) & \text{if (22) does not hold} \\ 1 & \text{if (22) holds} \end{cases} . \tag{23}$$

Political Equilibrium

- Consider two simple extreme political regimes:
    1. Democracy: the policies b_t and τ_t are determined by majoritarian voting, with each agent having one vote.
    2. Oligarchy (elite control): the policies b_t and τ_t are determined by majoritarian voting among the elite at time t.
- Focus on Markov perfect equilibria.

Democracy

- Non-elites in the majority.
- Majoritarian voting: taxes will be chosen to maximize per capita transfers,

$$T_t(b_t, \tau_t) = \begin{cases} \tau_t \frac{(1-\hat{\tau}_t)}{1-\alpha}^{\frac{1-\alpha}{\alpha}} \lambda \sum_{j \in S_t^E} a_t^j & \text{if } \tau_t \leq \delta \\ 0 & \text{if } \tau_t > \delta \end{cases}, \qquad (24)$$

  where $\hat{\tau}_t$ is the tax rate expected by the entrepreneurs and τ_t is the actual tax rate set by voters.

- Since 0 profits, entry barriers will be chosen to maximize equilibrium wages, thus $b_t = 0$.
- Intuitively, entry barriers reduce labor demand and depress wages.

Democracy (continued)

Proposition 17 A democratic equilibrium always features $\tau_t = \delta$ and $b_t = 0$, and $e_t^j = 1$ if and only if $a_t^j = A^H$, and $\mu_t = 1$. The equilibrium wage rate is given by

$$w_t^D = \frac{\alpha}{1-\alpha}(1-\delta)^{1/\alpha} A^H,$$

and the aggregate output is

$$Y_t^D = Y^D \equiv \frac{1}{1-\alpha}(1-\delta)^{\frac{1-\alpha}{\alpha}} A^H. \tag{25}$$

- Perfect equality.

Oligarchy

- Policies determined by majoritarian voting among the elite.
- To simplify this talk, assume

$$\lambda \geq \frac{1}{2}\frac{A^H}{A^L} + \frac{1}{2}, \tag{26}$$

which ensures that low and high-skill elites prefer low taxes.

- Otherwise, low-skill elites side with the workers to tax the high-skilled elites.

Oligarchy (continued)

- Then entry barriers will be set to prevent entry:

$$b_t \geq b_t^E \equiv \frac{\alpha A^H}{1-\alpha} + \beta \left(\frac{CV^H\left(\mathbf{p}^{t+1}, \mathbf{w}^{t+1}\right) - CW^H\left(\mathbf{p}^{t+1}, \mathbf{w}^{t+1}\right)}{\lambda} \right). \tag{27}$$

- Imposing $w_{t+n}^e = 0$ for all $n \geq 0$,

$$\tilde{V}^L = \frac{1}{1-\beta} \left[\frac{\alpha\lambda}{1-\alpha} \frac{\left(1-\beta\sigma^H\right) A^L + \beta\sigma^L A^H}{\left(1-\beta\left(\sigma^H - \sigma^L\right)\right)} \right], \tag{28}$$

$$\tilde{V}^H = \frac{1}{1-\beta} \left[\frac{\alpha\lambda}{1-\alpha} \frac{\left(1-\beta\left(1-\sigma^L\right)\right) A^H + \beta\left(1-\sigma^H\right) A^L}{\left(1-\beta\left(\sigma^H - \sigma^L\right)\right)} \right]. \tag{29}$$

Oligarchy (continued)

- Using these equilibrium relationships,

$$b_t = b^E \equiv \frac{1}{1-\beta}\left[\frac{\alpha\lambda}{1-\alpha}\frac{\left(1-\beta\left(1-\sigma^L\right)\right)A^H + \beta\left(1-\sigma^H\right)A^L}{\left(1-\beta\left(\sigma^H-\sigma^L\right)\right)}\right]. \tag{30}$$

- Wages are zero and aggregate output is

$$Y_t^E = \mu_t \frac{1}{1-\alpha}A^H + (1-\mu_t)\frac{1}{1-\alpha}A^L \tag{31}$$

where

$$\mu_t = \sigma_H \mu_{t-1} + \sigma_L(1-\mu_{t-1})$$

with

$$\lim_{t\to\infty} Y_t^E = Y_\infty^E \equiv \frac{1}{1-\alpha}\left(A^L + M(A^H - A^L)\right). \tag{32}$$

Oligarchy (continued)

Proposition 18 Suppose that condition (26) holds. Then an oligarchic equilibrium features $\tau_t = 0$ and $b_t = b^E$ as given by (30), and the equilibrium is sclerotic, with equilibrium wages $w_t^e = 0$, and fraction of high-skill entrepreneurs $\mu_t = \sigma^H \mu_{t-1} + \sigma^L (1 - \mu_{t-1})$ starting with $\mu_0 = 1$. Aggregate output is given by (31) and decreases over time starting at $Y_0^E = \frac{1}{1-\alpha} A^H$ with $\lim_{t \to \infty} Y_t^E = Y_\infty^E$ as given by (32).

Comparison of Oligarchy and Democracy

- We always have that initially:

$$\frac{1}{1-\alpha}(1-\delta)^{\frac{1-\alpha}{\alpha}}A^H < Y_0^E = \frac{1}{1-\alpha}A^H.$$

- Will oligarchy fall behind democracy?
  - If (1) democratic taxes are low and not very distortionary; (2) selection of entrepreneurs is difficult, and (3) comparative advantage in entrepreneurship is important, then oligarchy ultimately worse than democracy:
  - Condition for this:

$$(1-\delta)^{\frac{1-\alpha}{\alpha}} > \frac{A^L}{A^H} + M\left(1-\frac{A^L}{A^H}\right). \tag{33}$$

Comparison of Oligarchy and Democracy (continued)

- Workers always worse off in oligarchy than in democracy.
- What about entrepreneurs?
- High-skill entrepreneurs always better off. But

  Proposition 19 If

  $$\alpha\lambda\frac{\left(1-\beta\sigma^{H}\right)A^{L}/A^{H}+\beta\sigma^{L}}{\left(1-\beta\left(\sigma^{H}-\sigma^{L}\right)\right)}<\left(\left(\alpha+\left(1-\delta\right)\delta\right)\left(1-\delta\right)^{(1-\alpha)/\alpha}\right), \quad (34)$$

  then low-skill elites would be better off in democracy.
- Low-skill entrepreneurs still willing to remain in entrepreneurship, however, taking equilibrium prices and future policies as given.

New Technologies

- At $t' > 0$ a new technology arrives.
- Productivity with new technology:

$$\frac{1}{1-\alpha}(\psi \hat{a}_t^j)^{\alpha}(k_t^j)^{1-\alpha}(l_t^j)^{\alpha},$$

where $\psi > 1$

- Law of motion of $\hat{a}_t^j$ orthogonal to a_t^j, and given by

$$\hat{a}_{t+1}^j = \begin{cases} A^H & \text{with probability } \sigma_H & \text{if } \hat{a}_t^j = A^H \\ A^H & \text{with probability } \sigma_L & \text{if } \hat{a}_t^j = A^L \\ A^L & \text{with probability } 1-\sigma_H & \text{if } \hat{a}_t^j = A^H \\ A^L & \text{with probability } 1-\sigma_L & \text{if } \hat{a}_t^j = A^L \end{cases}, \quad (35)$$

New Technologies (continued)

- In democracy, aggregate output jumps from Y^D to

$$\hat{Y}^D \equiv \frac{1}{1-\alpha}(1-\delta)^{\frac{1-\alpha}{\alpha}}\psi A^H.$$

- In oligarchy, elites will stay in entrepreneurship despite their worse comparative advantage

- For example, if $\psi A^L > A^H$, then aggregate output jumps to and remains at

$$\hat{Y}^E \equiv \frac{1}{1-\alpha}\left(\psi A^L + M(\psi A^H - \psi A^L)\right),$$

- Potential explanation for why oligarchic societies don't adjust well to new opportunities/technologies.

Summary

- Elites may block development, depending on their motivations.
  - Three different motives for inefficient policies; revenue extraction, factor price manipulation and political consolation.
  - Factor price manipulation (and political consultation) more deleterious than revenue extraction.
- Different political regimes produce different results.
  - Oligarchy or democracy may be more conducive to economic growth
  - However, oligarchies are more likely to get trapped in growth-blocking equilibria
  - Also oligarchies less adaptive to dealing with new technologies.

Further Issues

- Understand why to know between groups benefiting from growth and those losing their rents from growth.
- Understand why regimes that block growth can survive.
- What is the relationship between political institutions and economic institutions?
- Topics for next lecture.