INSTITUTIONS, INSTITUTIONAL CHANGE, AND THE DISTRIBUTION OF WEALTH[1]

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Abstract

What drives the difference in institutional quality across countries? We explain the survival of institutional inefficiency by investigating the relationship between wealth inequality and institutions. We present a model of regulated entry where entrepreneurs form coalitions of potentially varying size to bribe the regulator. Small coalitions run short of resources, while large coalitions suffer more severe free-rider problems. The prevalence and intensity of corruption is thus determined by the distribution of wealth: when wealth is more concentrated, both cash constraints and free-rider problems are less restrictive, equilibrium coalitions are smaller, corruption is prevalent, and barriers to entry are high.

A dynamic analysis supports the persistence of inefficiencies in the long run. Depending on initial conditions, the economy may be either on a path towards institutional change where investment increases and inequality eventually vanishes; or, it may be on a path towards institutional sclerosis, which exhibits a polarization of society into two classes with a wealthy elite dominating the increasingly impoverished masses who do not have access to profitable opportunities. The predictions of the model are consistent with a number of observed facts, which indicate an apparent close relationship between institutions and inequality.

1 Introduction

What explains the persistence of institutions that are harmful to investment and growth? A major puzzle faced by economists is the observed differences in economic development between countries. These observed differences seem to be attributable to differences in institutions. While assessing the causality between institutional environments and economic performance, La Porta, Lopez-de-Silanes, Shleifer and Vishny [1998, 1999] and Acemoglu, Johnson and Robinson [2001] find that present institutions, largely inherited from the past, are significant determinants of current economic outcomes. Moreover, there is evidence that changes in institutions, once implemented, can have real effects on subsequent economic performance. Besley [1995], as well as Banerjee, Gertler and Ghatak [2002] find that improved land rights have a significant impact in Ghana and West Bengal, respectively, increasing agricultural productivity and investment.

This raises a key question: if some arrangements seem so detrimental to economic development, why don't governments implement institutions that foster investment and promote growth? This paper suggests one answer to this question. We analyze a political economy model where the distribution of wealth determines the quality of governance. Regulation introduces the possibility of imperfect competition in the product market, creating rents. Entrepreneurs may thus engage in rent-seeking activity, which in our model takes the form of restrictions on entry. A coalition of entrepreneurs - the insiders - forms and offers bribes to a bureaucrat in order to limit entry from other entrepreneurs - the outsiders. Hence, insiders enjoy higher market power. The inefficiency of regulation is measured by the extent of underinvestment, and is determined by the distribution of wealth among entrepreneurs. A larger coalition of insiders is subject to more severe free-riding problems, while a smaller coalition lacks resources. When wealth is concentrated in the hands of few people, collusion is easier so that both the free-riding and budget constraints are less stringent; insiders form small coalitions, corruption is prevalent and entry is severely limited. Conversely, more equally distributed wealth inhibits such collusive behavior and thus, regulation is more efficient. In a dynamic framework, initial conditions determine the trajectory the economy follows. On a path towards positive institutional change, the wealth distribution becomes more equal and regulation improves over time. Conversely, institutional sclerosis is characterized by a widening gap between insiders and outsiders, and a society polarized around two classes: a rich and small entrepreneurial elite that dominates the increasingly impoverished masses.

This model offers one specific channel relating inequality and performance, contributing to a large literature on inequality and economic development. While Alesina and Rodrik [1994] and Persson and Tabellini [1994] examine mechanisms where inequality creates larger distortions through increased redistribution, another class of models explores the dynamics of wealth distribution and economic performance when credit markets are imperfect. In the presence of borrowing constraints, inequality maps into the extent of unfulfilled investment opportunities. Such economies exhibit either underinvestment in physical capital (Aghion and Bolton [1997]; Piketty [1997]) or human capital (Loury [1981]; Banerjee and Newman [1993]; Galor and Zeira [1993]). More recently, emphasis is put on the role of institutions and the interplay between inequality and the design of institutions. Engerman and Sokoloff [1997] adopt the view that exogenous factors such as geography determined initial differences in wealth distribution across countries. Unequal societies were then more likely to adopt inefficient institutions, as members of the elite opposed institutional change to protect their rents, leading to persistence. A subsequent literature illustrated by Acemoglu, Aghion and Zilibotti [2002] and Glaeser, Scheinkman and Shleifer [2002] also follows this approach by analyzing how inequality might be driving institutional choices. Within this framework, we present a model where the interaction between inequality and institutions works through a mechanism of rent dissipation: competition among elites makes them less effective at extracting rents. In that respect, this paper relates to Krueger [1974] and Becker [1983]. While some previous works argue that persistence of institutional inefficiencies stems from the cost of changing institutions [North, 1990], the present analysis explains institutional sclerosis in a political economy model, emphasizing the commitment problem as in Fernandez and Rodrik [1991], or in Acemoglu and Robinson [2001] or more specifically the free-rider problem; it thus relates to Olson [1965].

The paper is organized as follows: the next section presents empirical motivation. Section 3 lays out the model in its simplest static form, without corruption: we refer to this situation as the benchmark case. In section 4 we relax the corruption-free assumption and analyze the economy when coalitions are exogenous. Section 5 characterizes the equilibrium of the endogenous coalition formation game. The dynamic analysis is presented in section 6 while section 7 relates the predictions of the model to empirical findings. Section 8 concludes.

2 Empirical Motivation

Large differences in levels of economic and institutional development can be observed throughout the world. Exogenous factors such as geographical conditions or ethnic composition of a population cannot alone explain such differences. Figure 1 below plots, for a sample of East-Asian countries, the level of economic development against an index of corruption.[1] Note that the same pattern is observed using other indexes of governance as well. This suggests a close relationship between economic development and institutional environments.

INSERT FIGURE 1 HERE

[1] Economic development is measured by the level of Gross Domestic Product (GDP) per capita in 1995, while the corruption index is the "assessment of the corruption in government. Lower scores indicate that 'high government officials are likely to demand special payments [and] illegal payments are generally expected throughout lower levels of government [in the form of] bribes connected with import and export licenses'[...]" [La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1998, p. 1124].

Figure 2 reports the findings of Claessens, Djankov and Lang [1998] for the same set of countries: concentration of family control, as percentage of total market capitalization owned by the top 15 families in a given country, is strongly and negatively correlated with the quality of governance.[2] The authors suggest that the "concentration of corporate control is a major determinant in the evolution of the legal system, i.e. relationships exist between ownership structure of the whole corporate sector and the level of institutional development."[3] This statement suggests a theory of regulatory capture (cf. Stigler [1971]) supported by De Soto [1989] and later by Djankov, La Porta, Lopez-de-Silanes and Shleifer [2000]. These studies both claim that regulation benefits politicians, bureaucrats and incumbents more than economic development as a whole. Licensing policy in post-independence India illustrates the point. While licensing was in part aimed at breaking the domination of monopolies, Hazari [1967] noted in his *Final Report* to the Planning Commission: "[There is] the presumption that multiple applications for the same product and for a wide, very wide indeed variety of products are meant to foreclose lincensable (sic) capacity".[4]

INSERT FIGURE 2 HERE

History also provides many other examples of barriers to positive change. Parente and Prescott [2000] detail evidence of barriers to efficiency and argue that such barriers are the main determinants of cross-country differences in economic development. Looking at the textile industry across countries and through time, the authors conclude that vested interests played a significant role in cases of failure to adopt new technologies and new forms of organizations, which explains "the differences in the percentage increase in labor productivity in the cotton mills in India and Japan between 1920 and 1938. In this period, Japanese labor productivity increased by more than 120 percent, while Indian productivity increased by only 40 percent."[5] They argue further that barriers to technology adoption are key to understanding why England experienced modern economic growth before continental Europe, as well as why China did not exhibit sustained growth before 1950.

Similarly, Rajan and Zingales [2001] argue that the development of financial markets during the 20^{th} century was partly driven by private interests. Incumbents opposed the development of financial institutions in order to prevent the emergence of competition and influenced the design of policies in the aftermath of the Great Depression. "Thus, Japan, for example, moved from an economy with a flourishing financial market, and a competitive banking system, to an economy with small financial markets and a concentrated banking system."[6]

[2] The authors find a Pearson correlation coefficient equal to -0.8.

[3] [Claessens, Djankov and Lang, 1998, p.24]

[4] [Hazari, 1967, p. 7]

[5] [Parente and Prescott, 2000, p. 93]

[6] [Rajan and Zingales, 2001, p. 32]

The rise and fall of mercantilism in Western Europe provides an interesting illustration of the issue addressed in this paper. Ekelund and Tollison [1981] view "the historical record of the mercantilist era as an expression of individual rent-seeking behavior in a variety of institutional settings".[7] Competition among entrepreneurs to obtain monopoly rights from regulators and competition among political organizations (namely the Crown and the Parliament) for the authority to grant those rights is the main thread of the comparative analysis of mercantilism in England and France. Thus, the rise of the Parliament is associated with the fall of mercantilism in England while the strengthening central power in France in the same period is seen as a source of intensification of mercantilism under Colbert (1661 - 1683).

The evidence presented suggests that regulation is not necessarily driven by public interests but is often captured by a small elite at the expense of society as a whole. The rest of the paper describes a mechanism where the pursuit of monopoly rents governs the relationship between regulation and wealth distribution.

3 Static Model: The Benchmark Case

Consider a population of N individuals and one bureaucrat. There are two goods in the economy, a production good and a consumption good. We will call production goods *capital* and consumption goods *wealth*. Individuals are each endowed with an initial amount of wealth and one unit of labor. The time horizon consists of three dates. At time $T = 0$, individuals interact with a bureaucrat who issues licenses. At time $T = 1$, individuals choose their occupation: those receiving a license may undertake a project; the remaining are subsistence workers earning a fixed wage w. Licensed entrepreneurs compete in a Cournot game in which they choose the level of capital they supply. Finally at time $T = 2$, a production industry buys capital to produce wealth. Projects are then liquidated, profits are realized, consumption takes place and agents die. A storage technology is available to all entrepreneurs with no depreciation.

INSERT FIGURE 3 HERE

We start with a crucial assumption to our model:

Assumption (A0) There is no credit market.

[7] [Ekelund and Tollison, 1981, p. 17]

3.1 Entrepreneurs

The set $\Im$ of entrepreneurs has size N.[8] Entrepreneurs are indexed by $i \in \Im$, and each of them is endowed with one unit of labor and an initial level of wealth a_i. The wealth distribution is characterized by a cumulative distribution function $F(.)$. As most results do not depend on N, we can normalize population size to 1.

Entrepreneurs are risk-neutral and maximize consumption at time $T = 2$.

3.2 Licensing, Cournot game and Production

- Licensing

  One bureaucrat issues licenses at time $T = 0$. Licenses are necessary for entrepreneurs who want to undertake a project. Licensing will be discussed in detail below.

- Cournot game

  At time $T = 1$, licensed entrepreneurs have access to a continuous investment technology. Entrepreneurs non-cooperatively choose the level V of capital they wish to supply. V is produced at no cost but is bounded above by some $\bar{V}$.[9] Capital is then sold to the production sector at uniform price r, wealth being the numeraire.

- Production

  Entrepreneurs at time $T = 1$ face a demand for capital from an industry which operates at time $T = 2$. This industry buys the total amount of capital K supplied by entrepreneurs at price r and produces $\pi(K)$ units of wealth. $\pi(.)$ is assumed to have the standard regularity properties.[10]

3.3 Equilibrium Outcome

In order to provide a benchmark for the rest of the analysis, we solve for the equilibrium of the economy in this simple framework. A natural equilibrium concept to adopt is Subgame Perfection. We therefore solve the model by backward induction.

3.3.1 Time $T = 2$: Final Production

Facing a rental price r, producers choose a demand level to equalize price and marginal product of capital. This defines the demand function faced by entrepreneurs at the end of Time $T = 1 : \forall K \geq$

[8] The assumption that the set of entrepreneurs is finite is crucial here. A finite population size ensures that the free-rider problem at the Cournot stage is bounded.

[9] The capacity constraint merely simplifies algebra and interpretation. Though relaxing this assumption complicates the interpretation of the results, the same conclusions nevertheless hold.

[10] The regularity properties are formally stated in the Appendix.

0,

$$r = \pi'(K).$$

3.3.2 Time $T = 1$: Cournot game and supply decision

Entrepreneurs in subgames starting at date $T = 1$ are characterized by whether they were issued a license at the end of time $T = 0$ or not. We will denote $\Gamma \in P(\Im)$, the set of licensees.[11]

In this game, licensed entrepreneurs compete à la Cournot. They non-cooperatively set levels of supply. Non-cooperative behavior is assumed and can be justified by transaction costs or inability to make binding commitments. To simplify notations, let's denote $V_{-i} \equiv \sum_{j \in \Gamma \setminus \{i\}} V_j$. Each insider $i \in \Gamma$ solves the following program:

$$V_i = \arg\max_{v \leq \bar{V}} \pi'(V_{-i} + v)\, v.$$

Entrepreneurs' supply choices equalize the marginal benefit of an additional unit of capital produced and the marginal cost due to a decrease in price. When project capacities are small, entrepreneurs will be "at the corner" and produce at full capacity.

Lemma 1 *For low capacities $\bar{V}$, all entrepreneurs who undertake a project choose to supply $\bar{V}$ units of capital.*[12]

Henceforth, to simplify notation we will normalize the investment cap to 1.

Assumption (A1) Investment cap normalization:

$$\bar{V} \equiv 1.$$

When the subsistence wage level is low, all licensed entrepreneurs prefer to undertake a project rather than work.

Assumption (A2) Alternative occupation condition:

$$w < \pi'(1).$$

Corollary 2 *Under assumptions (A0) to (A2), all licensed entrepreneurs undertake a project and choose to supply $\bar{V} = 1$ unit of capital.*

[11] $P(\Im)$ is the set of all subsets of $\Im$.

[12] The result of this lemma is standard and the proof is omitted here. As individual supply is decreasing in the number of suppliers (under some implicitly assumed regularity assumptions about $\pi(.)$), setting $\bar{V}$ below the individual production when all N entrepreneurs enter the market is sufficient to induce capacity constraints to always bind. For more details, see e.g. Tirole [1995]

3.3.3 Time $T = 0$: Licensing

Under these conditions, a licensed entrepreneur undertakes a project and produces at full capacity. We describe as the benchmark case, an economy in which the bureaucrat issues a license at not cost to anyone who requests one. This implies that every entrepreneur asks for a license and supplies 1 unit of capital.

Lemma 3 *In the benchmark case, and under assumptions (A1) and (A2), every entrepreneur is granted a license and supplies* 1 *unit of capital, so that the equilibrium price of capital is given by*

$$r = \pi' (1) ,$$

and aggregate output achieves the highest possible level equal to

$$\pi (1) .$$

When transfers between entrepreneurs and the bureaucrat are possible, a coalition of entrepreneurs may form and bribe the bureaucrat to limit the total number of licenses issued. This results in a higher price of capital for insiders, at the expense of outsiders who are barred from entry. We now turn to an economy where regulatory capture is possible.

4 The Bribing Game: A First Example

To focus on the value of license restrictions and the free-rider problem, we begin by assuming that entrepreneurs are *exogenously* divided into two groups: insiders (or incumbents) and outsiders (or entrants). We analyze the behavior of each of the parties vis-à-vis the bureaucrat, when incumbents face threats of entry.

4.1 Outline of the game

The bureaucrat may now enter into contracts with entrepreneurs. We assume that the bureaucrat has developed a reputation for honoring agreements made with entrepreneurs. Bribes are paid at the end of time $T = 0$.

Incumbents are members of $\Gamma \in P(\Im)$, while entrants belong to the complementary set, $E \equiv \Im \setminus \Gamma$. Γ is exogenously given.

1. Entrepreneurs offer $(s_i)_{i \in \Im}$ to the bureaucrat: incumbents bid to prevent entry, while entrants bid for entry.

2. The bureaucrat decides whether to grant a license to all or no entrants. Payments are made accordingly.

3. Players move to time $T = 1$ subgame: licensees choose a level of supply, and then move to time $T = 2$ subgames.

INSERT FIGURE 4 HERE

4.1.1 Strategies

Entrepreneurs' strategies are denoted $(s_i)_{i \in \Im}$. Without credit markets, no coalition of entrepreneurs (either incumbents or entrants) can offer more than its aggregate wealth as a bribe to the bureaucrat. Agents are however allowed to pool resources, so wealth constraints may potentially bind at the aggregate rather than individual level. In this specific setting, the game is equivalent to a first-price auction with two bidders: the coalition of incumbents versus the coalition of entrants.

4.1.2 Payoffs

We first introduce a convenient notation.

Notation 4 *For any subset $J \in P(\Im)$,*

$$\eta^J \equiv \sum_{i \in \Im} 1_{i \in J},$$

where 1_X is the indicator function which takes value 1 if X is true and 0 otherwise, so that η^J is the size of coalition J measured by the fraction of the population present in J.

Whereas entrants bid to have access to the productive investment technology, incumbents bid to bar entry and enjoy more market power. Entry depreciates the price of capital by increasing supply. Thus, for any incumbent $i \in \Gamma$ who bids s_i,

$$U_i(s_i) = \begin{cases} \pi'(1) + a_i & \text{if entry occurs} \\ \pi'(\eta^\Gamma) + a_i - s_i & \text{otherwise} \end{cases}.$$

Conversely, entrants enjoy the benefits of the project if and only if they are granted entry. We thus have for any entrant $i \in E$ who bids s_i,

$$U_i(s_i) = \begin{cases} \pi'(1) + a_i - s_i & \text{if entry occurs} \\ a_i + w & \text{otherwise} \end{cases}.$$

4.2 Equilibrium Outcome

4.2.1 Offers and Payments

Players' willingness to pay is the amount that makes them indifferent between the two alternatives: entry or no entry. Thus, incumbent $i's$ willingness to pay is given by

(1) $$v_i = \pi' \left(\eta^{\Gamma}\right) - \pi' \left(1\right),$$

while entrant $i's$ willingness to pay is equal to

(2) $$v_i = \pi' \left(1\right) - w.$$

In this setting, the coalitions of incumbents and entrants behave like two buyers in an auction of licenses. The valuation of a given coalition is the sum of members' valuations while the budget limit is the aggregate wealth of each coalition. Hence entry is precluded if and only if incumbents value eviction more than entrants value entry, provided that wealth constraints do not bind; the result is summarized in inequality (3) :

(3) $$\min \left[\eta^{\Gamma} \left[\pi' \left(\eta^{\Gamma}\right) - \pi' \left(1\right)\right], \sum_{i \in \Gamma} a_i\right] \geq \min \left[\eta^{E} \left[\pi' \left(1\right) - w\right], \sum_{i \in E} a_i\right].$$

4.2.2 Group size and the free-rider problem

Equations (1) and (3) determine the impact of group size on the outcome of the game. When the size of the group of entrants is small, a Taylor approximation of (1) gives: $\forall i \in \Gamma$,

(4) $$v_i \approx -\pi'' \left(\eta^{\Gamma}\right) \times \eta^{E}.$$

Equation (4) deserves particular attention as it synthesizes the underlying forces of the model. The first term, $-\pi'' \left(\eta^{\Gamma}\right)$, is the marginal increase in price when aggregate output falls by one unit; the second term of the equality, η^{E}, is the shortfall in investment following the eviction of all entrants. The product $-\pi'' \left(\eta^{\Gamma}\right) \times \eta^{E}$ is then the total price increase when entrants are deterred from entry, which is also the marginal benefit for entrant i as she supplies 1 unit of capital.

Thus the coalition will be willing to bid in order to deter entry if and only if

(5) $$-\pi'' \left(\eta^{\Gamma}\right) \times \eta^{E} \geq \frac{1}{\eta^{\Gamma}} \min \left[\sum_{i \in E} a_i, \eta^{E} \left[\pi' \left(1\right) - w\right]\right].$$

Each incumbent trades-off the benefit from entry deterrence, $-\pi'' \left(\eta^{\Gamma}\right) \times \eta^{E}$, and the per incumbent cost of eviction, $\frac{1}{\eta^{\Gamma}} \min \left[\eta^{E} \left[\pi' \left(\eta^{\Gamma} + \eta^{E}\right) - w\right], \sum_{i \in E} a_i\right]$.

The outcome of the bribing game is driven by the free-rider problem that characterizes Cournot competition. Free-riding at the Cournot stage, by increasing the ex-post level of capital supply, mechanically decreases incumbents' gains from eviction at the corruption stage. In other words, *ex-post competition undermines ex-ante incentives for entry deterrence.*

While aggregate willingness to bribe decreases with group size, the aggregate budget constraint is loosened as the group becomes larger; incumbents face the well-known group size paradox. Figure 6 illustrates the different outcomes of the game.

INSERT FIGURE 6 HERE

When entrants' bids are low, entry is deterred (bottom quadrant of the figure). For higher bids, entry occurs either because a small coalition faces cash constraints (left quadrant) or because a large coalition suffers from free-riding (right quadrant), or both (top quadrant).

5 Coalition Formation : The General Case

In the previous example, we studied the impact of group size on incumbents' incentives to deter entry. However, we assumed that incumbents were chosen exogenously. In this section, we relax this assumption and study how, given an initial population of entrepreneurs, a coalition will form in order to preclude its complementary set from entering. We no longer refer to incumbents and entrants, as entrepreneurs are not characterized by any time precedence; we instead refer to insiders and outsiders.

A complete analysis of such coalition formation game is somewhat involved as precise notation is cumbersome. We will therefore, in this section, describe briefly the game and present the major results without proof. A formal analysis is provided in the appendix.

5.1 Outline

Entrepreneurs play a bribing game at time $T = 0$. There is a set $\Im$ of players and one auctioneer, the bureaucrat. Individuals interact in a multi-stage game, with the following timing:

- Stage 1: Coalition announcements
  Entrepreneurs sequentially announce a coalition to which they want to belong. The order of announcements is determined randomly. A coalition emerges when all players named in a given coalition agree: this procedure therefore follows a uninamity rule.

- Stage 2: Bureaucrat's choice
  Among all coalitions formed, the bureaucrat chooses one. Members of this coalition are called insiders while outsiders are members of the complementary set.

- Stage 3: Bargaining over contributions and Licensing
  Insiders and outsiders play two distinct multilateral bargaining games where they determine contribution levels. The bargaining game is structured such that all players in a given coalition contribute the same amount. If insiders provide a higher aggregate contribution, then licenses are not given to outsiders. Otherwise outsiders receive licenses. Losers contributions are refunded.

INSERT FIGURE 5 HERE

5.2 Properties of the equilibrium outcome

We now describe some properties of the equilibrium outcome, again adopting a subgame-perfection solution concept.

5.2.1 Stage 3: Bargaining over Contributions and Licensing

Insiders bid against outsiders. In each coalition, a multilateral bargaining game is played within each coalition. In equilibrium, contributions are efficient (the coalition with highest aggregate willingness/ability to pay wins the auction) and members of each coalition contribute the same amount. We can then state the *feasibility condition,* identical to condition (3):

Claim 5 (feasibility) *For any subset $\varphi \in P(\Im)$ chosen by the bureaucrat to be the coalition of insiders, eviction takes place if and only if*

$$\min\left[\sum_{i\in\varphi} a_i; \eta^{\varphi}\left[\pi'\left(\eta^{\varphi}\right)-\pi'\left(1\right)\right]\right] \geq \min\left[\sum_{i\notin\varphi} a_i; \left(1-\eta^{\varphi}\right)\left[\pi'\left(1\right)-w\right]\right].$$

5.2.2 Stage 2: Bureaucrat's choice

At this stage, the bureaucrat picks the coalition that offers the highest bribe. If insiders outbid outsiders, then outsiders are barred from entry. Otherwise, entry is allowed. Under weak restrictions on feasible coalitions, the winning coalition is uniquely determined by the distribution of wealth and the shape of the profits function. We call this the *uniqueness property*:

Proposition 6 (uniqueness) *Assuming that agents do not announce losing coalitions in Stage 1, any coalition structure that forms in equilibrium contains one and only one winning coalition.*

5.2.3 Stage 1: Coalition formation

When players are restricted to feasible coalition announcements, players face a trade-off: the gain from a high price when the group of outsiders barred from entry is large, but so is the per-capita cost of the bribe as it is bourne by fewer people. Besides any winning coalition will always be made of richest entrepreneurs: a richer insider contributes more, while a richer outsider makes the cost of bribe higher. The game is thus a game in which the richest entrepreneur chooses the members of the winning coalition, trading off ex-post market power gains and ex-ante contribution levels. This leads to the central result of the paper:

Theorem 7 *The equilibrium coalition chosen by the bureaucrat in stage 2 has the form:*

$$\varphi^* = \{i \in \Im, a_i \geq a^*\},$$

so that the coalition size is

$$\eta^{\varphi^*} = 1 - F(a^*),$$

where a^* is the solution to

$$(6) \qquad a^* \in \arg\max_a \left\{ \pi' [1 - F(a)] - \frac{1}{1 - F(a)} \min \left[\int_0^a \tilde{a} dF(\tilde{a}), F(a) \left[\pi'(1) - w \right] \right] \right\},$$

subject to the feasibility condition:

$$\min \left[\int_0^a \tilde{a} dF(\tilde{a}), F(a) \left[\pi'(1) - w \right] \right] \leq \min \left[\int_a^{+\infty} \tilde{a} dF(\tilde{a}), [1 - F(a)] \left[\pi' [1 - F(a)] - \pi'(1) \right] \right].$$[13]

The result is fairly intuitive. The "strongest" coalition maximizes its constituents' payoffs $\pi' [1 - F(a)]$, net of corruption costs given by $\min \left[\int_0^a \tilde{a} dF(\tilde{a}), F(a) [\pi'(1) - w] \right]$, which is equal to the outsiders bid. Such costs are split equally among members of the coalition of size $1 - F(a)$. Such optimization is subject to the feasibility condition. The winning coalition is "connected" and the economy is partitioned into richer insiders (whose wealth is above a^*) and poorer outsiders (whose wealth is below a^*).

5.3 Comparative Statics

To understand the determinants of the equilibrium coalition, it is necessary to look at the first-order condition implied by program (6).

[13] To account for the discreteness of the population while maintaining consistent notations, let the integral $\int_0^a dF(a')$ be a sum in which the upper bound a is not included, while $\int_a^{+\infty} dF(a')$ does include a.

Lemma 8 (first-order conditions) *Let $\lambda \geq 0$ be the Lagrange multiplier of the feasibility constraint in program* (6)*. When aggregate budget constraints are binding around a^*, a^* satisfies*

$$-\pi'' \{[1 - F(a^*)]\} = \frac{1}{1 - F(a^*)} \left[a^* + \frac{1}{1 - F(a^*)} \int_0^{a^*} adF(a) + 2\lambda a^* \right]. \tag{7}$$

Equation (7) summarizes the trade-off faced by insiders. As in the exogenous coalition case, the left-hand side of the equality is a single insider's marginal benefit when one additional entrepreneur is evicted, which consists of the marginal price increase. The right-hand side of (7) is the per insider marginal cost of evicting an additional entrepreneur. The term $\frac{1}{1-F(a^*)}$ divides total cost between all members of the coalition. This total cost is the sum of three elements. The first term is the additional amount to pay to exclude the marginal entrepreneur. Since the budget constraint is assumed to be binding, the cost is the marginal outsider's wealth. Up to this point, the analysis is identical to the case in which the coalition was exogenously determined.[14] When coalitions are formed endogenously, an additional factor comes into play: the opportunity cost of evicting an additional insider. Such cost is twofold: first, insiders lose $\frac{1}{1-F(a^*)} \int_0^{a^*} adF(a)$, which is the contribution of the marginal outsider, were she to be admitted into the coalition; second, when the aggregate budget constraint is binding, the Lagrange multiplier λ is positive and therefore evicting an additional entrepreneur has a double effect as it decreases the ability to pay and increases the cost of eviction by the same amount. This last statement explains why equilibrium coalitions are connected with respect to wealth; richer entrepreneurs have higher shadow values so that coalitions made of richest entrepreneurs prevail.

We now investigate the importance of these effects. Looking at the components of equation (7), one sees that the equilibrium outcome is determined by the behavior of $\pi(.)$, and more precisely its first derivative $\pi'(.)$, and by the characteristics of the distribution function $F(.)$.

5.3.1 Returns to corruption

A first determinant of the intensity of regulatory capture is the elasticity of the demand function entrepreneurs face. Insiders have an incentive to bribe the bureaucrat as long as the eviction of one entrepreneur has a significant impact (increase) on the price of capital. When prices are more sensitive to output, incentives to evict more entrepreneurs become higher. Thus, in order to make corruption profitable, only small coalitions can be sustained in equilibrium. But, this implies that the budget constraints for these small groups are likely to bind, so that capture may no longer be feasible. The next proposition formally states this result, while the proof is provided in the appendix.

Proposition 9 *If the production technology $\pi(.)$ exhibits a larger elasticity of demand for capital with respect to price, then regulatory capture is less severe.*

[14] See equation (5).

5.3.2 Wealth concentration

The central prediction of our model relates to the comparative statics arising from changes in the distribution of wealth. When wealth is concentrated in the hands of a small elite, both budget and free-riding constraints are looser. This allows small coalitions to capture regulation and deter entry. When wealth is more evenly distributed, large coalitions are necessary to satisfy the feasibility condition. But the free-rider problem will make such coalitions unstable or ineffective. One straightforward corollary of the previous statement is the impact of a redistribution of wealth on the extent of regulatory capture.

Any exogenous shock that changes the distribution of wealth is likely to have an impact on the subsequent regulatory environment. Consider redistributions that are a progressive transfer from wealthy to poor individuals, which preserves the mean wealth of the economy as well as the ranking of individuals.[15] As insiders happen to be the wealthiest class in the economy, redistribution weakens insiders while it strengthens outsiders. This implies that the equilibrium coalition needs to be larger after redistribution.

Corollary 10 *An economy suffers less regulatory capture after redistribution.*

Another determinant of regulatory capture is the degree of openness to trade of the economy. Openness to trade creates an increased competition for each entrepreneur in the domestic market. This is then equivalent to bringing additional entrepreneurs (foreign entrepreneurs) to the game. Then, by increasing ex-post competition, trade openness decreases the ex-ante incentives to create barriers to entry.

Corollary 11 *An economy more opened to trade is less subject to regulatory capture.*

However, as analyzed theoretically by Grossman and Helpman [1994] and tested by Goldberg and Maggi [1999], the decision to open to trade is likely to be itself endogenous as policy makers are subject to capture as well.[16]

[15] Formally, we define a redistribution as follows: $\rho(.)$ is a redistribution function of the economy, if $\rho(.)$ is a decreasing function such that

$$\sum_{i \in \Im} \rho(a_i) = 0$$

and $\forall i, j \in \Im$,

$$a_i \leq a_j \quad \Rightarrow \quad a_i + \rho(a_i) \leq a_j + \rho(a_j)$$

[16] Grossman and Helpman [1994] provide a theoretical framework to analyze the impact of lobbying on trade policy. In their model, the better-organized coalition will capture regulation. While Grossman and Helpman consider the coalition structure of the economy as exogenous and credit markets as perfect, we relax these assumptions by making endogenous the composition of each coalition, relying on an imperfect credit market assumption to drive the equilibrium coalition structure.

6 Dynamics

The previous sections were devoted to understanding one channel through which the distribution of wealth affects the efficiency of regulation. However, institutions also have a direct impact on investment and wealth as they are aimed at raising investment capacities. Hence, differential access to government services has direct consequences on inequality of wealth throughout the economy in the subsequent period.

6.1 Dynamic Setting

We now extend the model to analyze the behavior of the economy in a dynamic framework. Each generation $t = 1, ...$ plays the static game studied in the previous sections. Each memer of generation t has one offspring to whom she leaves a bequest. The distribution of wealth at $t = 1$ is given exogenously.
For simplicity, assume each entrepreneur has a Cobb-Douglass utility function: $\forall i \in \Im$,

$$U_i (c_i, b_i) = c_i^{1-\beta} b_i^{\beta},$$

where c_i is individual $i's$ consumption at period $T = 2$, and b_i is the bequest individual i leaves her offspring at the end of period $T = 2$, before she retires and dies. A straightforward implication of this specification is that each individual will, within each generation, maximize period $T = 2$ wealth and then consume exactly a fraction $(1 - \beta)$ of that final wealth, passing on the remainder. Thus, the static results derived in the previous sections remain unchanged. Under this specification, the wealth distribution follows a Markov process.

For any lineage $i \in \Im$, indexing by t variables on the equilibrium path for generation t, the transition is given by :

$$a_i^{t+1} = \begin{cases} \beta \left[\pi' \left(\eta^{\Gamma^t} \right) + a_i^t - s_i^t \right] & if\ i \in \Gamma^t \\ \beta \left[a_i^t + w \right] & otherwise \end{cases},$$

where Γ^t is the (unique) equilibrium winning coalition formed at date t, and s_i^t the corresponding bribe level.
Generically, the process is not stationary as the transition is itself endogenous, since it is determined by the entire distribution of wealth through Γ^t.

6.2 Convergence

6.2.1 Convergence without corruption

When no transfers are allowed, every entrepreneur receives a license at no cost. All entrepreneurs invest and for any $t \geq 1$:

$$\Gamma^t = \Im \ and\ r^t = \pi' (1).$$

And wealth follows a Markov process with stationary transitions: $\forall t \geq 1$,

$$a_i^{t+1} = \beta \left[\pi'(1) + a_i^t \right].$$

In the limit, all entrepreneurs end up with the same level of wealth equal to

$$a^{\infty}(1) = \frac{\beta}{1-\beta} \pi'(1),$$

where we define

$$a^{\infty}(\eta) \equiv \frac{\beta}{1-\beta} \left[\pi'(\eta) - \frac{1-\eta}{\eta} \frac{\beta}{1-\beta} w \right].$$

The dynamics of the wealth distribution is described in figure 7.

INSERT FIGURE 7 HERE

6.2.2 Steady state: general case

In the general case, there exist steady states where licenses become hereditary. A dynasty which starts as an outsider remains so in all subsequent periods, for a small enough β (proofs are provided in appendix).

(A4) We suppose that the saving rate β is such that:

$$\beta \leq \frac{1}{2}.$$

Proposition 12 (steady states) *When the outside opportunity pays a low wage w, there exists two threshold values η^* and η^{**} such that*

$$0 \leq \eta^* < \eta^{**} \leq 1$$

and any feasible value

$$\eta \in [0, \eta^*] \cup [\eta^{**}, 1],$$

defines a steady state with a population divided into two classes:[17]

1. *An elite of size η with wealth*

$$a^{\infty}(\eta) = \frac{\beta}{1-\beta} \left[\pi'(\eta) - \frac{1-\eta}{\eta} \frac{\beta}{1-\beta} w \right].$$

[17] η is said to be feasible if and only if ηN is an integer smaller than N.

2. A wage labor class of size $(1-\eta)$ *with wealth*

$$a^{\infty} = \frac{\beta}{1-\beta} w.$$

For low values of η, $\eta \leq \eta^*$, *the economy is said to be in an oligopolistic steady state. We will refer to cases of higher values of* η, $\eta \geq \eta^{**}$, *as competitive steady states.*

Each steady state is determined by two forces: free-riding and eviction costs. In the oligopolistic steady state, insiders' wealth is high, thus further evictions are too costly to undertake and the economy is stable. In competitive steady states, the number of wealthy individuals is large, so that small coalitions cannot form and the free-rider problem is exacerbated; this ensures stability. Similarly, when the outside opportunity pays high wages, only large coalitions can potentially win. However, this induces the free-rider problem to undermine the incentives to bribe, making oligopolistic distributions unstable.

Corollary 13 *For large values of* w, *the only steady states are competitive.*

6.2.3 Local Convergence and Stability

Though we can characterize the set of steady states, little can be said about convergence. We can nevertheless provide two properties of convergence and local stability.

Proposition 14 (basin of attraction) *Consider the threshold* $\hat{\eta}$ *defined by*

$$\pi'(\hat{\eta}) = \frac{1}{1-\beta} \pi'(1).$$

For low values of w, *any equilibrium coalition with a size smaller or equal to* $\hat{\eta}$ *shrinks over time and the economy converges to an oligopolistic steady state.*

Symmetrically, when the economy is in the domain of competitive outcomes, we can derive some stability properties. The grand coalition, i.e. the coalition including all entrepreneurs, is dynamically stable. Once the economy has reached the efficient outcome in some generation $t \geq 1$, it will converge to the efficient limiting distribution of wealth described by (7).

Proposition 15 (dynamic stability) *The grand coalition* $\Im$ *is dynamically stable.*

Convergence results cannot be derived explicitly as we are dealing with non-linear Markov processes.[18] We thus rely on a numerical analysis to have a sense of the dynamic behavior of the economy.

[18] For examples of non-linear Markov processes in similar situations, see Banerjee and Newman [1991], Aghion and Bolton [1997] or Piketty [1997].

6.2.4 Convergence: Simulation

We consider four cases with identical parameter values but varying levels of initial inequality. The distribution of wealth is generated as follows. Each individual in the population can initially be either poor or rich. A poor individual starts with wealth a^L while a rich individual starts with wealth a^H, with $a^H > a^L$. The four economies we consider differ by the proportion of poor people in the population: the two extreme cases exhibit either very high or very low levels of inequality, while the two other cases are intermediate. The results of the simulation are shown in figure 8:[19]

INSERT FIGURE 8 HERE

While the horizontal axis measures generations, the vertical axis measures the size of the winning coalition, denoted earlier Γ^t. Thus, 100 percent entry means that the grand coalition is the unique equilibrium coalition, while 1 percent is the case in which one lone monopolist blocks all other entry. We next comment on the dynamics of the wealth distribution.

6.2.5 The dynamics of the wealth distribution: a theory of class formation

In a given generation, we define the middle-class as the group of entrepreneurs who are either richest among outsiders or poorest among insiders. The middle-class is pivotal to the trajectory followed by the economy: when a small and relatively poor middle-class is evicted, the economy converges to an oligopolistic steady state. On the contrary, a large and relatively wealthy middle-class can resist eviction from the upper-class while undermining incentives for corruption by increasing the free-rider problem. The economy is then potentially able to converge to a competitive steady state, in which the poorest individuals have access to profitable opportunities. Wealth differences eventually vanish.

On the path towards institutional sclerosis, the gap between insiders and outsiders widens. As the lower-class (poorest entrepreneurs) grows poorer, the cost of eviction becomes smaller. Thus, it decreases the strength of the middle-class: members of the middle-class are now threatened with eviction (medium-low and medium-high-initial-inequality curve in figure 8). The phenomenon

[19] We use a sample of 100 individuals divided into two groups: poor individuals have wealth a_L, while rich individuals have wealth a_H. The "low initial inequality" curve is generated from an economy in which 5 percent of the population are initially poor, while the three other curves have respectively 10, 15 and 40 percent poor entrepreneurs.

The demand function is specified according to:

$$\pi(K) = A\left(1 - \frac{1}{K^{\alpha}}\right)$$

and parameter values are $a_L = .5,\ a_H = 10,\ \bar{V} = .5,\ A = 1000,\ \alpha = .3,\ \beta = .4,\ w = .2.$

The scale (above 10 percent) has been modified to emphasize the behavior of the economy around the threshold 10 percent.

accelerates as both cash constraints and free-riding are less and less severe for an upper-class that ends up dominating the economy in an oligopolistic steady state: access to profitable opportunities is restricted to a minority (high-initial-inequality curve in figure 8).

In the opposite case, an economy characterized by positive institutional change, the size and wealth of the middle-class increases continuously. The bargaining power of the upper-class diminishes as wealth levels equalize. The equilibrium coalition must therefore be larger and the free-riding problem is exacerbated. Eventually, the equilibrium coalition is the grand coalition. The economy converges towards a competitive steady state: all individuals can access the profitable investment opportunity and inequality vanishes (low-initial-inequality curve in figure 8).

Figure 9 summarizes the dynamics of the wealth distribution.

INSERT FIGURE 9 HERE

On a path toward institutional change (left arrow), barriers to entry fall so more entrepreneurs may access productive occupations. Aggregate output mechanically increases and the wealth distribution converges to the degenerate case of strict equality. On the other hand, on a path toward institutional sclerosis (right arrow), barriers to entry increase so that the circle of privileged entrepreneurs shrinks. Inequality becomes more severe and output drops. In the limit, a small elite owns the means of production while a large mass works in the subsistence sector.

7 More Empirical Evidence

7.1 From Political Institutions to Licenses

The model we have presented and analyzed encompasses a large number of institutional environments. Licensing is a convenient formalization, but the model provides insights into the mechanics of other phenomena. Just as entrepreneurs compete for licenses, so may bureaucrats compete for the right to issue licenses. We have until now taken the bureaucratic structure as given. However, political struggles were major determinants of the institutional environments in many countries. The next example illustrates this point.

7.1.1 The comparative development of Mexico versus Brazil, and Japan versus China.

The comparative development of the financial sectors of Mexico and Brazil provide an interesting illustration of the mechanism we describe. The overthrow of the Brazilian monarchy in 1889 provides an example of an exogenous redistribution of political power, while the persistence of the *Díaz* dictatorship (1877-1911) in Mexico constitutes a convenient control to assess the impact of redistribution on subsequent economic outcomes. Haber [1991] argues that Mexico and Brazil were characterized by the same level of financial underdevelopment at the end of the 19^{th} century. Important among the causes of such backwardness, was the perverse regulatory environment preventing the development of banks: the Mexican government privileged the nation's largest bank by granting the institution special rights and simultaneously creating barriers to entry for competitors. While the author acknowledges this protection provided a needed stable source of financing, there is no denying that executives of the Banco Naciónàl de México were close to the Díaz regime and used their political advantage to restrict market entry. While a similar situation prevailed in Brazil, the First Republic proclaimed in 1889 resulted in a deregulation of the financial sector. With access to a competitive credit market, Brazilian entrepreneurs were able to enter into a thriving textile industry. In Mexico on the other hand, the textile industry languished.

A similar story accounts for the comparative development of China and Japan at the end of the 19^{th} century. As Olson [1982] suggested, when Japan underwent the Meiji restoration (1867), guilds lost their influence, while their counterparts in China maintained strict control of the economy. One cause of this decline, although not the only one, may have been the forced openness to trade of the Japanese economy under Western pressure. Olson also argues that the persistence of guilds and their preserved influence on the regulatory environment constituted a major obstacle to Chinese industrialization at the end of the 19^{th} century.

Those two stories illustrate the impact of a redistribution of political power. In a world where wealth is power, the histories of Brazil and Japan are consistent with the prediction of our model when wealth redistribution or opening to trade are undertaken.

7.1.2 The deregulation of the banking industry in the United States in the 1970s

Krozner and Strahan [1999] look at the elimination of restrictions on bank branching since the 1970s in the United States. Their main finding supports a theory of interest-group regulation as developed in this paper. Observing that deregulation of restrictions on geographical expansions in the banking industry did not take effect the same year across states, Krozner and Strahan look for determinants of such difference. Looking at the strength of small banks, they find that "[a] one-standard-deviation increase in the small bank share results in a 30 percent increase in the time until deregulation, or about 4.7 years".[20] Taking the channel described in the present paper seriously, small banks and larger banks can be seen as respectively, insiders and outsiders. When insiders are strong enough to preclude entry, deregulation occurs later, while with weaker small banks, coalitions are unstable, leading to earlier deregulation. The mechanics of deregulation are thus well described by figure 6. Indeed, as the value of local banking declined over time, entry of larger banks could not be prevented, given the increasing demand for finance. Consistent also with the theory developed so far, there is support for the view that the timing of deregulation, which started in the early 1970s,

[20] [Krozner and Strahan, 1999, p. 1453]

corresponds to shocks to the balance of power between insiders and outsiders. "[T]echnological, economic, and legal shocks generated conditions that changed the long-standing balance favoring the antibranching forces. The marginal value of lobbying to repeal branching restrictions increased just as the relative value to the small banks of maintaining branching restrictions was declining".[21] This story is consistent with the dynamics of our model.

7.2 Initial Conditions and Persistence

The dynamic analysis provides an explanation for the persistence of intense regulatory capture. Countries may fall into an institutional trap, in which the elite does not face any opposition from the rest of the population, and can maintain a regime, which protects its members' personal interests. Initial conditions or historical shocks matter in determining the subsequent growth paths countries follow.

7.2.1 "How Latin America fell behind?"

Engerman and Sokoloff [1997] argue that geographical conditions largely determined initial levels of inequality and the corresponding institutional environment in the early history of colonization. The countries of Latin America "possessed climates and soils that were well-suited for the production of sugar and other highly valued crops characterized by extensive scale economies associated with the use of slaves", whereas North American colonies "were not endowed with substantial populations of natives able to provide labor, nor with climates and soils that gave them comparative advantage in the production of crops characterized by major economies in using slave labor."[22]

The extent of initial inequality then determined the level of investment in schooling and the pattern of diffusion of universal male suffrage across New World countries. In unequal societies, elites seek to restrict access to political rights and schooling to protect their privileges, hence impeding long-term growth. Such a conjecture is consistent with the predictions delivered by our model.

7.2.2 On legal origins

To conclude this section, we compare our analysis to Glaeser and Shleifer [2001, 2002] and argue that the two descriptions of institutional environment are complementary. Glaeser and Shleifer explain how the choice of the legal structure (civil versus common law) or the regulatory environment (regulation versus litigation) was governed by the trade-off between distortion and subversion. Just as a common law system is considered to be more efficient than a civil law system, litigation is less distortionary than regulation. However, when bureaucratic capture is a potential threat to the

[21] [Ibid, p. 1462]

[22] Engerman, Haber and Sokoloff (2000), p.117-8

well-functioning of institutions, Glaeser and Shleifer argue that civil law was adopted in France because it was less subject to capture. Whereas in England juries could be protected against bribery and violence by a strong central power, the French king found it preferable to hire and protect judges. Similarly, under the influence of the Progressive movement at the beginning of the 20^{th} century, regulation was preferred to litigation because it was less prone to subversion. Their analysis relies on the claim that "Courts are more vulnerable to subversion than regulators, especially in an environment of significant inequality of wealth and political power."[23]. Evidence supporting this theory is provided by Djankov, La Porta, Lopez-de-Silanes, and Shleifer [2002]. In recent work, Glaeser, Scheinkman and Shleifer [2002] go one step further and relate the choice of institutions to an exogenous distribution of political power. The model presented in this paper provides a rationale for a difference of vulnerability to subversion across societies and time, and points out to a mechanism that relates economic and political power.

8 Conclusion

This paper has described and analyzed a model of institutional choice and dynamics in which the distribution of wealth is the key variable. The contribution of this paper is twofold: (1) it provides a theoretical framework to evaluate the impact of inequality on the design of institutions, and on the persistence of inefficiencies in the long-run; (2) it highlights a mechanism which helps understand why countries experience such different growth paths.

We emphasized that free-riding and credit constraints are the main forces underlying our results. When coalitions form to extract rents, inequality determines the optimal coalition size; the more unequal a society, the smaller the equilibrium coalition, and the more regulation is captured. Inefficient institutions create a feedback effect whereby unequal access to investment opportunities exacerbates inequality.

The model provides a view on political transitions complementary to Acemoglu and Robinson [2000]. While Acemoglu and Robinson build their theory on the threat of revolution coming from the masses, emphasis is put on the balance of power between the classes and especially the pivotal role of the middle-class. The paper thus parallels the view of Engels and Marx [1848] in which class relationships were the key determinant of the shape of societies in the modern world.

While we present historical evidence that is consistent with our analysis, a rigorous empirical test of the model is warranted.

[23] [Glaeser and Shleifer, 2001]

9 Appendix 1: Proofs

9.1 Proof or Proposition 12 (steady states)

To prove the proposition, we specify regularity assumptions so far implicitly assumed.

(AA1) $\pi(.)$ is increasing concave and $\pi'(K) = O(K)$.

(AA2) $\varepsilon(K) = -K\frac{\pi''(K)}{\pi'(K)}$ is decreasing for all $K \geq 0$.

For a given value of η, insiders pay a price of zero for corruption. Their wealth thus remains equal to $a^{\infty}(\eta)$. However, the stability of the coalition requires that no sub-coalition has an incentive to evict any member. The feasibility condition for the whole coalition is always satisfied as outsiders have little wealth (w is small). The optimization program then yields the following solution:

$$(8) \qquad 1 = \arg\max_{\lambda} V(\lambda) \equiv \pi'(\lambda\eta) - \frac{1}{\lambda\eta}\left\{(1-\lambda)\eta\min\left[a^{\infty}(\eta), \pi'(1) - w\right] + (1-\eta)\frac{\beta}{1-\beta}w\right\},$$

subject to the feasibility condition:

$$(1-\lambda)\eta\min\left[a^{\infty}(\eta), \pi'(1) - w\right] + (1-\eta)\frac{\beta}{1-\beta}w \leq \lambda\eta\min\left[a^{\infty}(\eta), \pi'(\lambda\eta) - \pi'(1)\right].$$

For large values of λ, the feasibility condition always holds and the unconstrained first-order derivative is:

$$V'(\lambda) = \eta\pi''(\lambda\eta) + \frac{1}{\lambda^2}\left\{\min\left[a^{\infty}(\eta), \pi'(1) - w\right] + \frac{1-\eta}{\eta}\frac{\beta}{1-\beta}w\right\}.$$

Under assumptions (AA1) and (AA2), for $\lambda = 1$ to be the solution to program (8), a necessary and sufficient condition is

$$V'(1) \geq 0,$$

which translates into:

$$(9) \qquad -\eta\pi''(\eta) - \frac{1-\eta}{\eta}\frac{\beta}{1-\beta}w \leq \min\left[a^{\infty}(\eta), \pi'(1) - w\right].$$

We can first assume that the constraint is not binding ($\pi'(1)$ is high enough) so that the condition becomes

$$(10) \qquad -\frac{1-\beta}{\beta}\eta\pi''(\eta) - \frac{1-\eta}{\eta}\frac{1-2\beta}{1-\beta}w \leq \pi'(\eta).$$

Let's denote $R(\eta)$ and $L(\eta)$ the right-hand side and left-hand side of (10) respectively. While $R(\eta)$ is always decreasing, $L(\eta)$ is increasing for low values of η and decreasing for large values of η. As β may be thought of as a scaling factor, the following graphs illustrate possible values of $R(\eta)$ and $L(\eta)$.

INSERT FIGURE 10 HERE

Relaxing the assumption that $\pi'(1)$ is large does not qualitatively change the results. We now define

$$\Theta \equiv \left\{ \eta \in [0,1] \ / \ -\eta\pi''(\eta) - \frac{1-\eta}{\eta}\frac{\beta}{1-\beta}w \leq \min\left[a^{\infty}(\eta), \pi'(1) - w\right] \right\}.$$

For low values of β, every coalition size can be sustained in a steady state (provided that the feasibility constraint holds); for high values of β, only small coalitions will be observed in the long run, and for intermediate values of β, the set of steady states has the form:

$$\Theta = [0, \eta^*] \cup [\eta^{**}, 1].$$

Q.E.D.

9.2 Proof of Proposition 14 (basin of attraction)

In period t, the equilibrium coalition Γ^t is a solution to program (6) under the feasibility constraint. Suppose that $\eta^{\Gamma^t} \leq \hat{\eta}$ and consider the transition function:

$$a_i^{t+1} = \begin{cases} \beta\left[\pi'\left(\eta^{\Gamma^t}\right) + a_i^t - s_i^t\right] & \text{if } i \in \Gamma^t \\ \beta\left[a_i^t + w\right] & \text{otherwise} \end{cases}.$$

This implies the following dynamics, for low enough values of w :

$$\begin{aligned} \min\left[\sum_{i \notin \Gamma^t} a_i^{t+1}, \sum_{i \notin \Gamma^t} \pi'(1) - w\right] &\leq \min\left[\sum_{i \notin \Gamma^t} a_i^t, \sum_{i \notin \Gamma^t} \pi'(1) - w\right], \\ \min\left[\sum_{i \in \Gamma^t} a_i^{t+1}, \sum_{i \in \Gamma^t} \pi'\left(\eta^{\Gamma^t}\right) - \pi'(1)\right] &\geq \min\left[\sum_{i \in \Gamma^t} a_i^t, \sum_{i \in \Gamma^t} \pi'\left(\eta^{\Gamma^t}\right) - \pi'(1)\right]. \end{aligned}$$

Hence, in period $t+1$, the feasibility constraint is looser and the cost of eviction is lower and thus

$$\eta^{\Gamma^t} \geq \eta^{\Gamma^{t+1}}.$$

The sequence $\left(\eta^{\Gamma^t}\right)_{t \geq 1}$ is non-increasing and bounded below: it thus converges to a parameter η^{∞}. Stability then implies that $\eta^{\infty} \leq \eta^*$

Q.E.D.

9.3 Proof of Proposition 15 (dynamic stability)

Suppose that for some time $T \geq 0$, the grand coalition is the equilibrium outcome of the static game. For values of $\pi'(1)$ large enough, such that an entrepreneur who undertakes a project bequeaths to her offspring more than what she started with, the transition function implies that if

$$\Im = \arg\max_{\gamma} \pi'(\eta^{\gamma}) - \min\left[\sum_{i \notin \gamma} a_i^t, \sum_{i \notin \gamma} \pi'(1) - w\right],$$

subject to the feasibility condition, then in the following period, the feasibility condition is stricter and the cost function is uniformly steeper. For any $\gamma \in P(\Im)$

$$\pi'(\eta^{\gamma}) - \min\left[\sum_{i \notin \gamma} a_i^t, \sum_{i \notin \gamma} \pi'(1) - w\right] \leq \pi'(\eta^{\gamma}) - \min\left[\sum_{i \notin \gamma} a_i^{t+1}, \sum_{i \notin \gamma} \pi'(1) - w\right],$$

with strict inequality if $\gamma \neq \emptyset$. The same property holds for the feasibility constraint:

$$\begin{aligned} &\min\left[\sum_{i \in \gamma} a_i^{t+1}, \sum_{i \in \gamma} \pi'(\eta^{\gamma}) - \pi'(1)\right] - \min\left[\sum_{i \notin \gamma} a_i^{t+1}, \sum_{i \notin \gamma} \pi'(1) - w\right], \\ \leq\ &\min\left[\sum_{i \in \gamma} a_i^{t}, \sum_{i \in \gamma} \pi'(\eta^{\gamma}) - \pi'(1)\right] \min\left[\sum_{i \notin \gamma} a_i^{t}, \sum_{i \notin \gamma} \pi'(1) - w\right]. \end{aligned}$$

The set of feasible coalitions shrinks so that the optimal solution at date $t+1$ is still the grand coalition:

$$\Im = \arg\max_{\gamma} \pi'(\eta^{\gamma}) - \min\left[\sum_{i \notin \gamma} a_i^{t+1}, \sum_{i \notin \gamma} \pi'(1) - w\right],$$

subject to

$$\min\left[\sum_{i \in \gamma} a_i^{t+1}, \sum_{i \in \gamma} \pi'(\eta^{\gamma}) - \pi'(1)\right] \geq \min\left[\sum_{i \notin \gamma} a_i^{t+1}, \sum_{i \notin \gamma} \pi'(1) - w\right].$$

Q.E.D.

10 Appendix 2: Coalition Formation Game

In this section, we formally describe and solve the game described in the paper. In order to make this section self-contained, some notation be redundant. The set of players consists of the population $\Im$ of entrepreneurs of size N and the bureaucrat. Entrepreneurs have an initial endowment of wealth $(a_i)_{i \in \Im}$

We first introduce (or recall) the following notations:

- Complementary set: $\forall \varphi \in P(\Im)$,
$$\bar{\varphi} \equiv \Im \setminus \varphi,$$
so that we may equivalently write $i \in \bar{\varphi}$ or $i \notin \varphi$

- Cardinality of a set: $\forall \varphi \in P(\Im)$,
$$\eta^{\varphi} \equiv \sum_{i \in \Im} 1_{i \in \varphi}.$$

Entrepreneurs and the bureaucrat interact in a multi-stage game with observed actions. The game consists of three stages:

- **Stage 1: Coalition announcements**
Entrepreneurs sequentially announce a coalition to which they want to belong. The order of announcements is determined randomly. A coalition structure emerges.

- **Stage 2: Bureaucrat's choice**
Among all the coalitions that were formed, the bureaucrat chooses one. Members become insiders while outsiders are members of the complementary set.

- **Stage 3: Bargaining over contributions and Licensing**
Insiders and outsiders play two distinct multilateral bargaining games where contributions are determined. If insiders provide a higher aggregate contribution, then licenses are not given to outsiders and insiders pay their contribution to the bureaucrat. Otherwise, outsiders receive licenses and pay their contribution to the bureaucrat.

10.1 Timing and Action spaces

10.1.1 Stage 1: Coalition announcements

Nature moves and picks p among all permutations of the set $\Im$. Each entrepreneur $i \in \Im$ receives an order number $p(i)$. The set of all permutations of $\Im$ is denoted $p(\Im)$.

For $k = 1$ to $k = N$, individual i such that $p(i) = k$, observes previous moves and makes an announcement γ_i which consists of a list of entrepreneurs in $\Im$.

Definition 16 *An* ***announcement*** *for individual i is a subset $\gamma_i \in P(\Im)$ such that $i \in \gamma_i$*

The outcome of the announcement game is a coalition structure; entrepreneurs are divided into coalitions according to the *unanimity rule*:

Definition 17 *A coalition $\varphi \in P(\Im)$* ***forms subsequently to the announcement profile*** *$(\gamma_i)_{i \in \Im}$, if $\forall i \in \varphi$,*
$$\varphi = \{i\}$$

or

$$\gamma_i = \varphi.$$

In other words, subsequent to announcements made during stage 1, entrepreneurs are divided into coalitions. An entrepreneur is either alone (the coalition is a singleton) or is in a coalition with other entrepreneurs. In order for a coalition to form, all members must agree to be in that same coalition, which implies that they must have made the same announcement in stage 1. For example, if entrepreneur i announces γ_i and one individual in γ_i does not announce that same coalition, then i ends up being alone in $\{i\}$. Note that at the end of stage 1, the announcement profile $(\gamma_i)_{i\in\Im}$ defines a partition of $\Im$.

10.1.2 Stage 2: Bureaucrat's choice

The bureaucrat's action consists of the choice of a coalition to be considered the coalition of insiders, the complementary set being the set of outsiders.

Definition 18 *The bureaucrat's* ***decision*** *is a subset of* $\varphi \in P(\Im)$.

10.1.3 Stage 3: Bargaining over contributions

At this stage, and for a given decision $\varphi \in P(\Im)$ made by the bureaucrat in stage 2, entrepreneurs submit bids to the bureaucrat. Insiders are individuals listed in φ while outsiders are in $\bar{\varphi}$. Insiders bid for eviction of outsiders, while outsiders bid for entry.

Each group of entrepreneurs plays a two-stage bargaining game. Denote Φ the set that can either be φ or $\bar{\varphi}$.

Stage 3.1: First offer

Nature determines randomly a permutation $p_1 \in p(\Phi)$. Player i such that $p_1(i) = 1$ makes an offer. An offer consists of a contribution profile $\sigma_i^1 = (s_j)_{j\in\Phi}$. Following the order defined by p_1, other members of Φ either accept (A) or reject (R) the offer made by i. The game ends if and only if no member plays R and the aggregate contribution is then given by $\sum_{j\in\Phi} s_j$. Otherwise the game moves to Stage 3.2

Stage 3.2: Final offer

Nature determines randomly a permutation $p_2 \in p(\Phi)$. Player i such that $p_2(i) = 1$ makes an offer. An offer consists of a contribution profile $\sigma_i^2 = (s_j)_{j\in\Phi}$. Following the order defined by p_2, other members of Φ either accept (A) or reject (R) the offer made by i. If no member plays R then the aggregate contribution is given by $\sum_{j\in\Phi} s_j$. Otherwise the aggregate contribution is given by 0.

In case of delay (games where nodes corresponding to Stage 3.2 are reached), all members of Φ incur a cost of delay in the form of a discount $\delta < 1$ on their final wealth level.

Actions relevant to stage 3 consist of moves of nature, p_1 and p_2 in $p(\Phi)$ and offers and responses made by players:

$$\sigma_i^k \in \begin{cases} R^{\Phi} & if\ p_k(i) = 1 \\ \{A, R\} & otherwise \end{cases} \quad for\ k = 1, 2.$$

10.1.4 Licensing and Payoffs

In the game we began describing above, the set of players is a set

$$\Omega = \Im \cup \{bureaucrat\} \cup \{Nature\}.$$

The description of the timing and the action spaces determines a set H of sequences (of histories) and a mapping h that assigns to each non-terminal history a player in Ω. For simplicity, we will omit explicitly definition of the set H and the function h.

We now define the finite extensive form game that we are analyzing by:

$$G = \left\{\Omega, H, h, U_b, (U_i)_{i \in \Im}\right\},$$

where U_b and $(U_i)_{i \in \Im}$ are payoffs of players at the end of the game and are defined below.

To determine terminal histories, let us denote by $\gamma^* = (\gamma_i^*)_{i \in \Im}$ announcements made in stage 1 by entrepreneurs, by φ^*, the bureaucrat's decision made in stage 2, and $s^* = (s_i^*)_{i \in \Im}$ the contribution profile obtained at the end of stage 3. Finally, for the bargaining game played between players in φ^* (respectively $\bar{\varphi}^*$), we will write $t^* = 1$ (respectively $\bar{t}^* = 1$) when the node corresponding to Step 3.2 of the negotiation is reached and $t^* = 0$ (respectively $\bar{t}^* = 0$) otherwise . In the latter case, we will say that agreement has been reached with no delay.

10.1.5 Bureaucrat's payoff

The bureaucrat chooses a coalition φ^* to be insiders, and his payoffs are given by:

$$U_b(\varphi^*, \gamma^*, s^*, t^*, \bar{t}^*) = \begin{cases} \max\left\{\sum_{i \in \varphi} s_i^*, \sum_{i \in \bar{\varphi}} s_i^*\right\} & if\ \varphi^* \text{ formed subsequently to } \gamma^* \\ 0 & otherwise \end{cases}.$$

The bureaucrat derives utility from bribes only if he picks a subset in the coalition structure which emerged from the announcements made in stage 1.

10.1.6 Entrepreneurs' payoffs

Entrepreneurs have access to supply of capital when they are granted a license. Using standard notation, we can write their payoffs as:

If φ^* is realized subsequently to γ^*, then

$\forall i \in \varphi^*$,

$$U_i\left(\varphi^*, \gamma^*, s^*, t^*, \bar{t}^*\right) = \begin{cases} \delta^{t^*}\left[\pi'\left(\eta^{\varphi^*}\right) - s_i^* + a_i\right] & if\ \sum_{j\in\varphi} s_j^* \geq \sum_{j\in\bar{\varphi}} s_j^* \\ \delta^{t^*}\left[\pi'\left(1\right) + a_i\right] & otherwise \end{cases},$$

and $\forall i \in \bar{\varphi}^*$,

$$U_i\left(\varphi^*, \gamma^*, s^*, t^*, \bar{t}^*\right) = \begin{cases} \delta^{\bar{t}^*}\left[a_i + w\right] & if\ \sum_{j\in\varphi} s_j^* \geq \sum_{j\in\bar{\varphi}} s_j^* \\ \delta^{\bar{t}^*}\left[\pi'\left(1\right) - s_i^* + a_i\right] & otherwise \end{cases}.$$

Otherwise, if φ^* is not realized subsequently to the announcement profile γ^*, $\forall i \in \Im$,

$$U_i\left(\varphi^*, \gamma^*, s^*, t^*, \bar{t}^*\right) = \pi'\left(1\right) + a_i.$$

10.2 Strategies and Equilibrium concept

In this multi-stage game with observed actions, strategies are simply defined. A strategy for player i when it is her turn to play is a mapping from the set of possible histories to the set of actions available to i. Abusing notation, we will assimilate strategies and actions, and will omit references to histories when no ambiguity is possible.

A natural equilibrium concept is Subgame Perfection. We thus solve the equilibrium outcome of the game G using a backward induction argument.

10.2.1 Stage 3: Bargaining over Contributions

In this paragraph, we take as given the bureaucrat's decision φ^* that we suppose realized subsequently to the announcement profile γ^* (if φ^* is not realized subsequently to the announcement profile γ^*, actions are payoff-irrelevant).

To start with, we are making an assumption on the set of possible strategies at this stage.

(AB1) Members of the same coalition can borrow from one another at an interest rate of 1.

Lemma 19 *For any subset $\varphi \in P(\Im)$, individuals' willingness to pay is given by:*

$$\mu_i^{\varphi} = \begin{cases} \pi'\left(\eta^{\varphi}\right) - \pi'\left(1\right) & if\ i \in \varphi \\ \pi'\left(1\right) - w & otherwise \end{cases}.$$

Proof. *Omitted.* ■

Notation 20 *For any subset* $\varphi \in P(\Im)$, *we denote by* Δ^{φ} *the aggregate surplus of insiders in the auction they play against outsiders:*

$$\Delta^{\varphi}_{ins} \equiv \min\left[\sum_{i\in\varphi}\mu_i^{\varphi};\sum_{i\in\varphi}a_i\right],$$

$$\Delta^{\varphi}_{out} \equiv \min\left[\sum_{i\in\bar{\varphi}}\mu_i^{\varphi};\sum_{i\in\bar{\varphi}}a_i\right],$$

$$\Delta^{\varphi} \equiv \Delta^{\varphi}_{ins} - \Delta^{\varphi}_{out}.$$

The structure of the game delivers the following outcome: insiders win if and only if $\Delta^{\varphi} \geq 0$. If $\Delta^{\varphi} \geq 0$, then each member of winning coalition contribute the same amount equal to $\Delta^{\varphi}_{out}/\eta^{\varphi}$. The following claim formalizes this point without a proof.

Claim 21 *Insiders win the auction if and only if*

$$\Delta^{\varphi} \geq 0. \tag{11}$$

If (11) *holds then* $\forall i \in \varphi$,

$$s_i = \frac{\Delta^{\varphi}_{out}}{\eta^{\varphi}},$$

so that

$$\sum_{i\in\varphi} s_i = \Delta^{\varphi}_{out}.$$

10.2.2 Stage 2: Bureaucrat's decision

In stage 2, the bureaucrat maximizes the sum of transfers made to him at the end of stage 3. In case of indifference, we assume that the bureaucrat picks a coalition, realized subsequently to the announcement profile γ^*. Thus as transfers are nonnegative, the bureaucrat always picks a coalition φ^*, realized subsequently to γ^*.

Notice that the set of realized coalitions defines a partition of $\Im$.

We first put some restrictions on parameters of the model:

(AB2)

$$\pi'(0) - \pi'(1) \leq \pi'(1) - w.$$

Lemma 22 *Under assumption (AB2), and for any announcement profile* γ^*, *there exists at most one coalition realized subsequently to* γ^*, *where insiders bid more than outsiders do.*

Proof. *Suppose there exists one such coalition* φ^* *realized subsequently to* γ^*. *The result presented in the previous paragraph implies that* $\Delta^{\varphi^*} \geq 0$. *As the set of realized coalitions defines a* *partition of* $\Im$, *any other coalition different from* φ^* *is included in* $\bar{\varphi}^*$. *Assumption (AB1) induces the following implication:* $\forall\varphi \in P(\Im)$

$$\Delta^{\varphi} \geq 0 \Rightarrow \Delta^{\bar{\varphi}} < 0. \tag{12}$$

Furthermore, the operator Δ *is characterized by the following property:* $\forall\varphi, \varphi' \in P(\Im)$,

$$\varphi \subseteq \varphi' \Rightarrow \Delta^{\varphi} \leq \Delta^{\varphi'}. \tag{13}$$

Implications (12) *and* (13) *imply that there does not exist two disjoint winning coalitions.* ■

10.2.3 Stage 1: Coalition Announcements

We start this section by assuming the following restriction on feasible announcements:

(AB3) $\forall i \in \Im$,

$$\Delta^{\gamma_i} \geq 0.$$

Assumption (AB3) deletes weakly dominated strategies. Insiders in a losing coalition do not benefit nor lose from the auction as losing bids are refunded. Thus, we assume that entrepreneurs prefer to name the grand coalition $\Im$ rather than a coalition which does not have the ability to outbid outsiders.

In this section, we will determine necessary and sufficient conditions for existence and uniqueness of an equilibrium of game G. The proof is organized as follows: we will first summarize the results proved so far in order to define a reduced-form game played in stage 1. We will then determine the outcome of the game G. Finally, we will prove that the equilibrium outcome is characterized by Theorem 7.

10.2.4 Summary of results

Consider the choice γ_i of entrepreneur $i \in \Im$. Suppose that the bureaucrat's decision φ^* is such that $\Delta^{\varphi^*} \geq 0$. Then we have the following:

$$U_i(\gamma_i) = \begin{cases} \pi'(\eta^{\gamma_i}) + a_i - \mu_i^{\gamma_i} + \frac{1}{\eta^{\gamma_i}}\Delta^{\gamma_i} & if\ \varphi^* = \gamma_i \\ a_i + w & otherwise \end{cases}.$$

10.2.5 Individual optimal coalition

We first characterize the optimal coalition for each entrepreneur $i \in \Im$.

Each entrepreneur's "preferred coalition" is given by:

$$\gamma_i^m = \arg\max_{\gamma} \left[\pi'(\eta^{\gamma}) - \mu_i^{\gamma} + \frac{1}{\eta^{\gamma}}\Delta^{\gamma}\right],$$

subject to

$$\begin{cases} i \in \gamma \\ \Delta^{\gamma} \geq 0 \end{cases}.$$

Lemma 23 (Convexity) *For all $i \in \Im$, γ_i^m can be written*

$$\gamma_i^m = \{i\} \cup \Gamma_i^m$$

where $\forall j, k \in \Im$

$$\left[j \in \Gamma_i^m \text{ and } a_j < a_k < \pi'(1) - w\right] \Rightarrow \left[k \in \Gamma_i^m\right] \tag{14}$$

Proof. *Suppose that $\exists i, j, k \in \Im$*

$$j \in \Gamma_i^m \text{and } a_j < a_k < \pi'(1) - w \text{ and } k \notin \Gamma_i^m.$$

Then consider the coalition

$$\hat{\gamma}_i^m = \gamma_i^m \cup \{k\} \setminus \{j\}.$$

We thus have

$$\begin{aligned} i &\in \hat{\gamma}_i^m, \\ \Delta^{\hat{\gamma}_i^m} &> \Delta^{\gamma_i^m}. \end{aligned}$$

As

$$\eta^{\hat{\gamma}_i^m} = \eta^{\gamma_i^m},$$

we have

$$\mu_i^{\gamma_i^m} = \mu_i^{\hat{\gamma}_i^m}.$$

And thus

$$\pi'\left(\eta^{\gamma_i^m}\right) + a_i - \mu_i^{\gamma_i^m} + \frac{1}{\eta^{\gamma_i^m}}\Delta^{\gamma_i^m} < \pi'\left(\eta^{\hat{\gamma}_i^m}\right) + a_i - \mu_i^{\hat{\gamma}_i^m} + \frac{1}{\eta^{\hat{\gamma}_i^m}}\Delta^{\hat{\gamma}_i^m},$$

which contradicts the optimality condition for γ_i^m. ■

10.2.6 Equilibrium Outcome

Let's index by $i = 1$ the richest individual in the economy. Consider the following assumption on the price elasticity (previously made in AA1):

(AA1) The function $\pi'(.)$ is concave

Proposition 24 *Under assumption (AA1), the unique equilibrium coalition is given by γ_1^m*

$$\gamma_1^m = \arg\max_{\gamma}\left[\pi'(\eta^{\gamma}) - \mu_1^{\gamma} + \frac{1}{\eta^{\gamma}}\Delta^{\gamma}\right],$$

subject to

$$\Delta^{\gamma} \geq 0.$$

Proof. *Consider a draw of nature and members of γ_1^m. All members of γ_1^m also have γ_1^m as their preferred coalition. Consider the subgame with the following characteristics:*

- *The last member of γ_1^m, i say, is making an announcement*
- *All previous members of γ_1^m have announced γ_1^m*

Then as

$$\gamma_1^m = \arg\max_{\gamma} \left[\pi' \left(\eta^{\gamma} \right) - \mu_i^{\gamma} + \frac{1}{\eta^{\gamma}} \Delta^{\gamma} \right],$$

subject to

$$\Delta^{\gamma} \geq 0.$$

and under assumption (AA1), the optimum is unique. Then individual i is announcing:

$$\gamma_i = \gamma_i^m = \gamma_1^m.$$

A backward induction argument proves that all members of γ_1^m are announcing γ_1^m as well so that γ_1^m is formed subsequently to the equilibrium announcement profile $(\gamma_i^*)_{i \in \Im}$. Under assumption (AB2), the bureaucrat's equilibrium choice is uniquely given by γ_1^m. ■

We have proved that the optimal coalition for the richest entrepreneur is always chosen in equilibrium, regardless of the order of moves in the first stage. This result is equivalent to a Coalition-Proofness property developed by Bernheim, Peleg and Whinston [1987].

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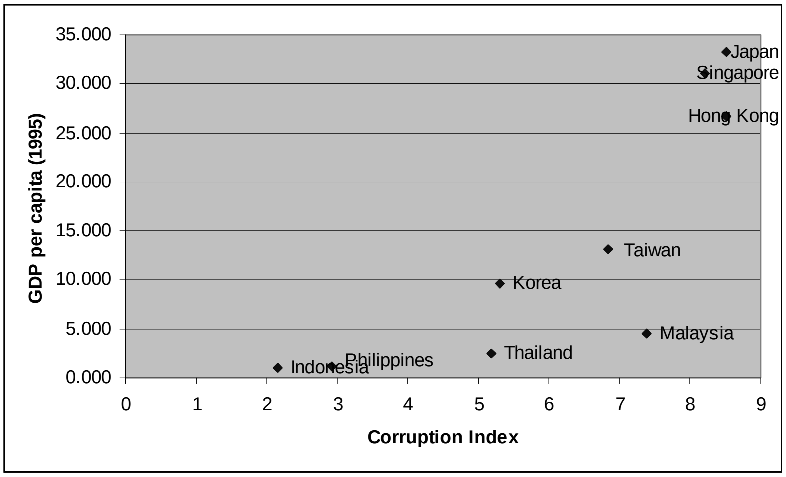

Figure 1: Corruption Index and GDP

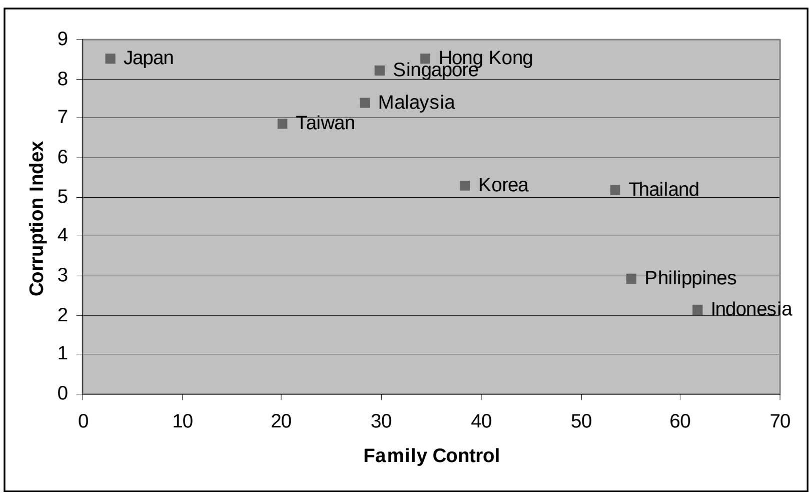

Figure 2: Wealth Concentration and Corruption Index

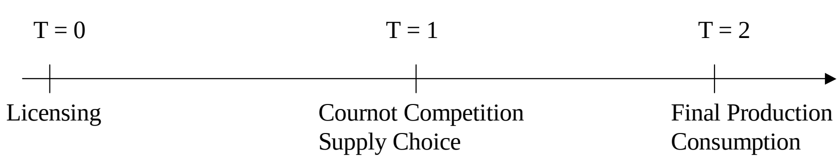

Figure 3: Timeline Benchmark Case

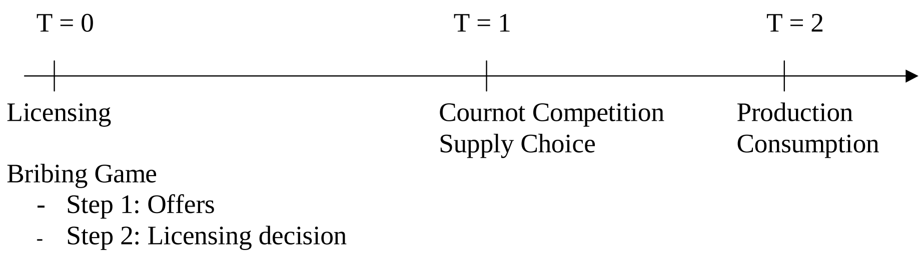

Figure 4: Timeline Bribing Game

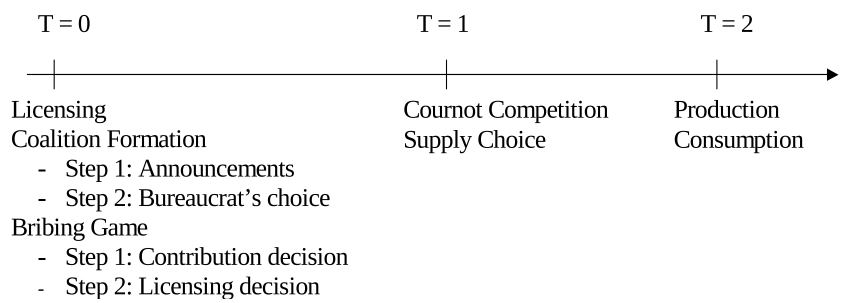

Figure 5: Timeline Coalition Formation Game

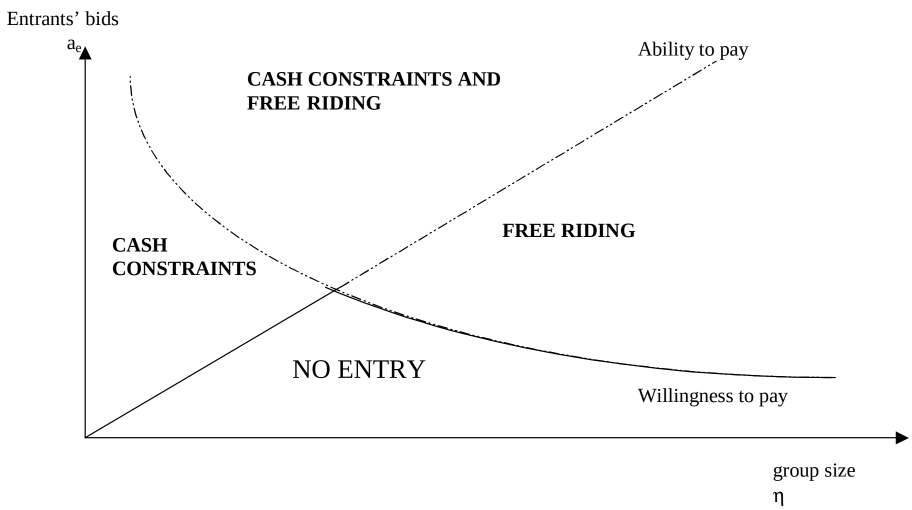

Figure 6: Ex-ante wealth constraints versus ex-post competition.

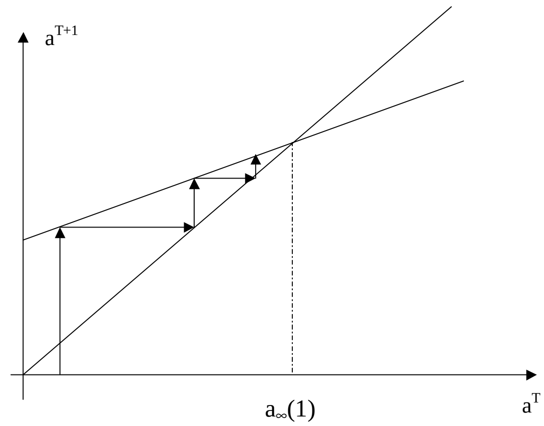

Figure 7: Dynamics - Benchmark case

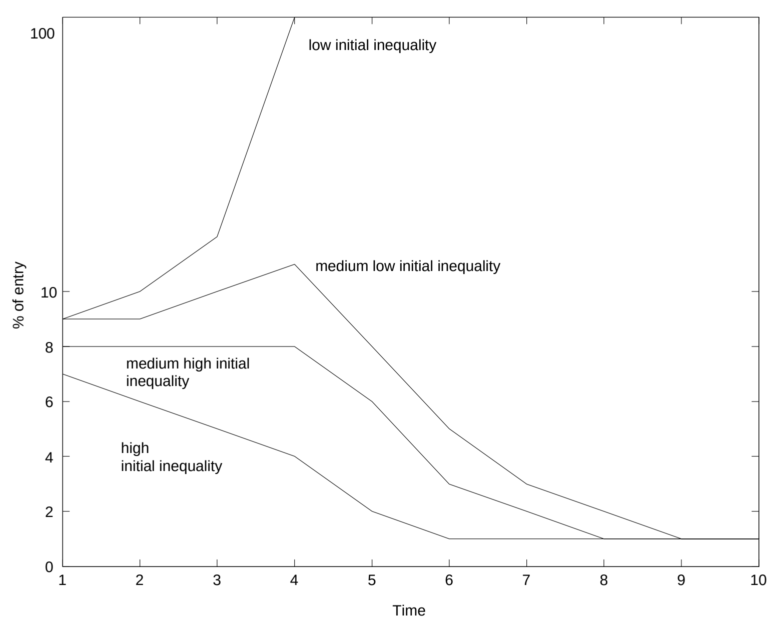

Figure 8: Dynamics - Simulation

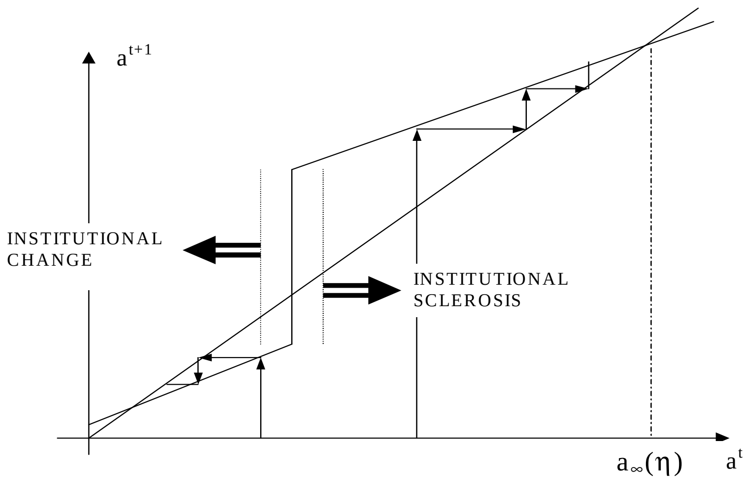

Figure 9: Institutional Change and Institutional Sclerosis

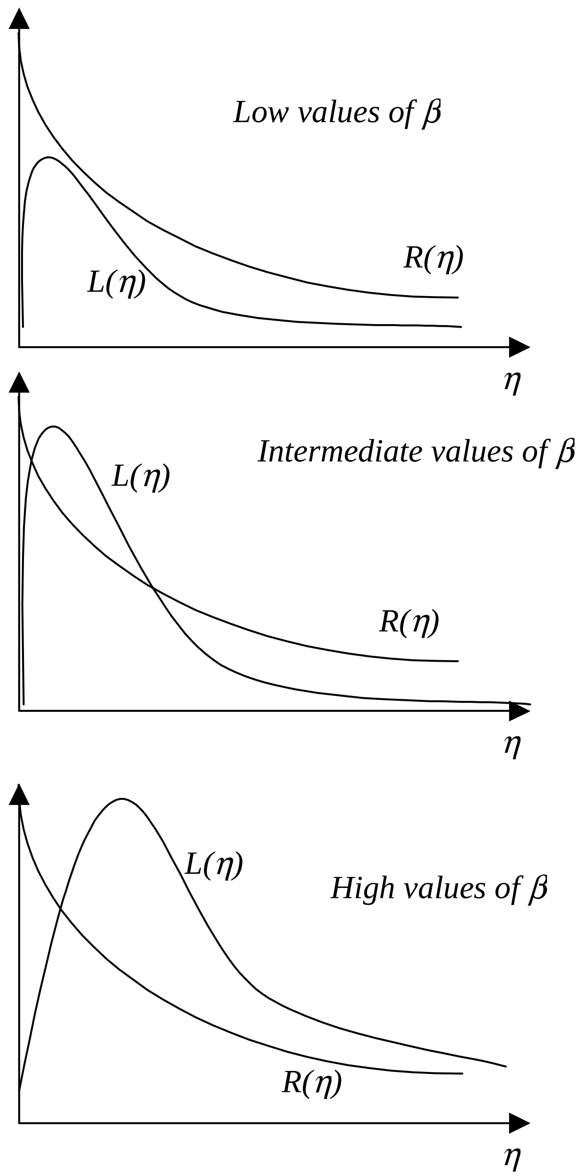

Figure 10: Steady States Analysis