A Model for Anocracy

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In this article a dynasty model is developed with a non-benevolent planner who maximizes the welfare of a size-adjusted elite. Joining the elite is costly, as it provides access to financial intermediation for new entrants. Some of the incumbents collect payments, which are redistributed back based on their welfare status. Corrupt incumbents necessarily emerge and amplify negative externality towards the poor through collateral, which is required for loan market participation. The resulting model is useful to describe the evolution of incomplete democracies (*anocracies*). Elites alternate with each other, and successors discipline their predecessors with expropriation threats on collected rents should too many licenses for intermediation be sold, as that accelerates the wealth equalization process. This disciplinary mechanism, however, mitigates wealth differences, since it creates a burden on corruption, and the elite is expanded through intermediaries.

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Introduction

In this article we describe how a model economy with heterogeneous agents and certain institutional inefficiencies evolves over time. Our primary interest is to characterize the impact of these inefficiencies on wealth inequality and to provide detailed analysis on the main determinants for inequality dynamics. In order to model the impact of the ruling elite on resource allocation in an economy, we introduce financial markets, in which the members of the elite are professional participants; they open banks, connect net lenders to net borrowers, and charge commission fees for their service. As an alternative to financial intermediation, incumbent families (those who bequeathed their membership from the previous period) may choose rent seeking, exercised towards the new entrants, via selling licenses for financial intermediation.

In the model, political and economic power is concentrated in hands of the elite, and there is succession of elites over time. The leader[1] maximizes the welfare of the elite (the minority). Economic resources are allocated in favor of the minority (the

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elite), while the interest of the majority is essentially disregarded. Such economies are at the incomplete democracy stage, termed as *anocracy* and described by Monty G. Marshall and Benjamin R. Cole in their Global Reports[2]. Anocracy refers to the regimes that lie between the two polar regime states, democracy and autocracy; many countries sustain political regimes sharing some of the components of these two extremes. As Marshall and Cole (2011, p. **?????**) state, "Anocracy is characterized by institutions and political elites that are far less capable of performing fundamental tasks and ensuring their own continuity".

Anocracy itself assumes a transitional status; anocratic regimes end up sooner or later as either democratic or autocratic regimes. Our hypothesis is that the extent of equalizing power in the underlying technology of an economy's patterns will determine the long term path for that economy. It is definite that elites will invest in technology to align themselves in their favor, while the societal community will make efforts to countervail the pressure from the elite.

Many anocratic regimes take a gradual path towards democracy. The differences in social groups, which are central to collective-action problems, gradually decay, and civil society takes a more significant role in executive decision-making. When society becomes more homogeneous, in terms of having access to economic and political resources, it is more challenging for the elite to sustain and further reproduce the current *status quo*, the *status quo* bequeathed from, and somewhat deprived by, its predecessor.

Many central aspects of anocracy, such as power succession, the self-interest of certain groups of families, the existence of rent-seeking technologies, as well as confrontation between consecutive elites, are captured by our model. Wealth inequality is affected by these different dimensions, and the simulated example is able to quantify these effects. The complexity of the model provides a sound understanding of the underlying mechanism by which decision-making at the political stage translates into consequences in resource distribution.

First, we solve the baseline model, in which there is no punishment (disciplinary) mechanism. Inequality, measured in terms of the end-period wealth, is distorted by the non-benevolent planner's welfare objective. Corruption necessarily emerges, and, as time unfolds, rent-seekers become the vast majority in the elite. This is due to the fact that rent-seeking is free and contrary to intermediation; when equating marginal returns and splitting the pie among members, the same revenue generates more rent-seekers than intermediaries. As discipline is incorporated into the baseline model, rent-seeking becomes costly, via expropriation threats realized as collected bribes. As a result, excessive rent-seeking is eliminated, and the size of the elite is expanded with the help of intermediaries. Somewhat surprisingly, wealth differences are mitigated. While the threat was supposed to keep the predecessor from selling too many licenses for intermediation, it propagates an equalizing process and deprives the successor of an income source. Instead, effective substitution of rent-seekers by intermediaries results in even less inequality under discipline.

The rest of this article is organized as follows. A brief review of the relevant literature is provided in the next section. The following section, "The model", describes the model used in this article. The planner's problem is analyzed in the section so titled. The simulated model and related outcomes are in the section "Simulated model". Concluding remarks concerning the article are in the final section. In order to make the article reader-friendly, two topics, the underlying mechanism of the model and dynamic equilibrium analysis, as well as some of the tables, are relegated to the Appendix.

Related Literature

To our knowledge, this model is the first attempt to characterize the dynamics of wealth inequality in anocratic regimes. In most such countries[3] there is strong control of resources by factions, which destroys agents' incentives to invest in productive technologies and to create effectively extractive institutions. Decision-making by leaders from consecutive elite groups as well as the possible disciplinary mechanism are by no means uninteresting dimensions to model and analyze in terms of their impact on inequality.

Endogenous income inequality has been explored in the literature only recently, within the last decade. Mookerjee and Ray[4] have, however, consistently develop a unified theory for dynamic models with income distribution involved. In models with endogenous inequality, disequalizing power stems neither from stochastic shocks nor from a specific form of the production set, both factors being exogenous. Instead, endogenous inequality is present due to the endogenous nature of the technological frontier, as a consequence of economic agents' interaction in the value-creating process. Mookerjee and Ray contrast such models to those with identical convex technologies, in which there is inequality because of exogenous stochastic shocks (as found in Loury (1981), Becker and Tomes (1979), and Becker and Tomes (1986)), and to others, in which inequality may arise due to the non-convex nature of the technological set (as in Galor and Zeira (1993), Banerjee and Newman (1993), *etc*.). Mookherjee and Ray (2005) label the latter class of models as "neutral towards inequality", since income differences persist only for some parameter space and some specification of initial distribution.

Our model has features from two types of models: those with endogenous inequality as well as models that are "neutral towards inequality". In the transition path, the joint decision of agents matters and technology is endogenous; technology evolves over time, depending on the past and current optimal policies of agents. In the long run, however, the before-trade technology, (the "row"), is the only factor affecting wealth distribution. Convergence takes place in the infinite time horizon (gradually), and hence a detailed analysis of endogenous inequality along the transition path is important.

We have no irreversibility of occupational choices, as in Acemoglu (1995), but differences in families led by rent-seeking activities have lasting effects, until the point when loan markets are shut down due to fixed costs for launching intermediation. In Acemoglu (1995, p. **?????**), an economy starting with too many rent-seekers, "may be condemned to the steady state equilibrium with high rent-seeking unless shocked by an exogenous event". The corruption level in an economy has a historical dependence in Tirole (1996) as well, in the collective reputation framework. Our only historical dependence is given by the initial income distribution, but it is rather weak. In fact we do not observe historical dependence on the size of the elite or of the rent-seekers in earlier periods. The relative advantage of incumbents towards the new entrants decays over time, and all dynasties become identical, approaching the limit. That is, in our model, an occupational distribution does not have a permanent effect.

The model

There is a continuum of dynasties over [0, 1], ordered with respect to the capital stock that dynasties owned at time zero. In each period a dynasty is represented by a family, consisting of a parent and offspring. A single non-perishable good is produced in each period by all dynasties. All decisions in a given period are made by the parent of the family, and each individual lives in two periods (as a child in the first and as a parent in the second period). Dynasties exist forever, and the current mature individual derives utility from the current consumption (which is a family-involved activity) and from the bequest left to the child. Thus parents have a "warm-glow" type of preferences, inspired by Andreoni (1989), which is the least altruistic set of preferences, relative to the non-paternalistic dynastic preferences (perfect altruism) and preferences in which parents derive utility from the total wealth of children.

We assume logarithmic utilities, which makes our algebra easier and provides a closed-form policy function. The objective function of the mature individual at time t of the dynasty $i \in [0,1]$ takes the following form:

$$\max_{a_{t+1,i}} \log(F_t(a_{t,i}) - a_{t+1,i}) + \beta \log(a_{t+1,i}). \tag{1}$$

Given the production function F_t the mature individual of the dynasty i at time t has a well-specified, deterministic policy function. The first order condition with respect to $a_{t+1,i}$ yields the familiar optimal bequest policy,

$$a_{t+1,i} = \delta F_t(a_{t,i}), \tag{2}$$

where $\delta = \beta/(1+\beta)$.

Three types of business activities are feasible for families:

(i) Trade — i) all families run their own family-involved production, independent from what they are otherwise engaged in;[5]

(ii) Financial intermediation;

(iii) iii) Rent-seeking — some incumbent families may carry on rent-seeking activities, which is to sell licenses for intermediation.

Corrupt families are always assumed to be on the top of the wealth distribution, with the rationale being that the wealthiest families have the relevant political and social connections to afford illegal activities without punishment. Importantly, the same family cannot be involved in both legal and illegal activities in a given period.

The size of the elite is given by the continuum $[n_t, 1]$. If the elite is inflated in the current period, we observe $[n_{t-1}, 1] \subset [n_t, 1]$; if the elite is contracted, $[n_t, 1] \subset [n_{t-1}, 1] \Leftrightarrow 0 < n_{t-1} < n_t < 1$. Finally, the size of corrupt incumbents is $[z_t, 1]$, when the elite is expanded. When $[n_t, 1] \subset [n_{t-1}, 1]$, all incumbents are financial intermediaries; since there are no entrants and hence no room to raise rents, $z_t = 1$.

Each period families have access to the credit markets if they meet the minimum capital requirement, $c_t = C(z_t - n_t)$. The higher the number of financial intermediaries, the lower the level of required collateral, due to more intense competition among banks, $C'(.) < 0$.[6] The capital requirement for the trade is always satisfied given higher than required levels of capital holdings. If $a_{t,i} \in [0, c_t)$, then the dynasty i at time t cannot take part in the loan market, however, if $(a_{t,i} \geq c_t, \forall i)$ it trades. Families that trade in the market are in the region $[m_t, 1]$.

There is a capital requirement for financial intermediation. Before choosing an intermediation status, a family should find itself above the average level among all families who have the right of capital market participation. In the Appendix we describe the rule in detail, describing how decisions are made concerning intermediation status. Here we state the condition for the capital requirement, necessary to apply for intermediation:

$$a_{t,z_t} \geq \bar{a}_t(z_t) = \int_{[m_t,1]} a_{t,i} P(di), \tag{3}$$

where P is the cumulative distribution of assets, the z_t agent is the marginal (to be an insider), and $\bar{a}_t(z_t)$ is the average capital among traders. For credit market participants, having higher than the average capital stock prior to intermediation status is the condition for being "currently rich enough" to apply for intermediation. This can be interpreted as the capital requirement for opening a bank. In addition, for any two families, the richer one has priority to ask for intermediation, since higher capitalization allows it to control risks more effectively. From the technical viewpoint these restrictions provide a clear mechanism for how families acquire an intermediation status and how equilibrium is achieved within the period.

Rent-seeking and decision-making for incumbents concerning intermediation hinge on the no-arbitrage (henceforth, NA) condition (see Appendix for the derivation). When the elite group is expanded, then the following NA condition implied condition is derived:

$$Q_t = \frac{(1-z_t)-(n_{t-1}-n_t)}{n_{t-1}-n_t}\left[\frac{\Omega_t}{z_t-n_t}-d\right], \tag{4}$$

where Q_t and Ω_t are given by Equation A5 and Equation A6, respectively.

When $Q_t \geq 0$ and $n_{t-1}-n_t > 0$ (the elite is expanded), as well as when $\Omega_t/(z_t - n_t) \geq d$ (implied by the NA condition), the nominator of the coefficient in the left-hand side should be nonnegative as well:

$$1-z_t \geq n_{t-1}-n_t > 0, \tag{5}$$

$$1-n_t > 1-n_{t-1} \geq z_t-n_t > 0. \tag{6}$$

Inequality Equation 6 states that when the size of the elite is expanded, corrupt insiders emerge necessarily, since $1-n_t > z_t-n_t$. The number of financial intermediaries cannot, however, exceed the size of the previous period's elite. In particular, if in the previous period the elite has been so deflated that there were no rent-seekers at $t-1$, then, if the elite is currently expanded, the number of intermediaries cannot increase relative to the previous period. In these circumstances, if the size of the current elite is enlarged too much, then there will be too many rent-seekers, and from some point on the enlargement will be due only to additional rent-seekers. In addition, Inequality Equation 5 states that the number of corrupt incumbents is greater than the number of new intermediaries, and thus each new intermediary pays more than one corrupt insider.

Planner's problem

The planner's objective is to determine the size of the elite, that club of the richest members of the society, who are empowered with the optimal level of economic power. The principle is the same as in the social welfare function, but it respects only the interests of the richest class of society. We think of the 'planner' as a leader of the elite, and as a benchmark model we start with a situation in which there is no link between subsequent elites. Next, we incorporate the disciplinary mechanism and compare the two specifications.

The Appendix section of this article provides detailed analysis on decision-making for different classes of agents and enables immediately the writing of the planner's problem. When the current size of the elite is expanded, (*i.e.*, $n_t < n_{t-1}$), we have:

$$\max_{n_t, z_t, \chi_t} \int_{n_t}^{1} \omega_{t,i} [f(\bar{a}_t(z_t)) + f'(\bar{a}_t(z_t))(a_{t,i} - \bar{a}_t(z_t))] di + \int_{n_t}^{z_t} \omega_{t,i} \left[\frac{\Omega_t}{z_t - n_t} - d \right] di + \left[- \int_{n_t}^{n_{t-1}} \omega_{t,i} f'(\bar{a}_t(z_t)) \chi_t di \right] + \int_{z_t}^{1} \omega_{t,i} \frac{1}{1 - z_t} \left[\int_{n_t}^{n_{t-1}} \omega_{t,i} (f'(\bar{a}_t(z_t)) \chi_t) dj \right] di \quad (7)$$

subject to the NA condition in Equation A9 and

$$f'(\bar{a}_t(z_t))\chi_t = Q_t + \frac{\Omega_t}{z_t - n_t} - d, \quad (8)$$

where χ_t is the size of the rent. Equation 8 equates the marginal cost for entrants to the marginal return. The weights in the objective function $\{\omega_{t,i}\}$ are constructed, while taking into account the welfare status of the families in society; the richer the family, the higher the weight in the welfare function:

$$\omega_{t,i} = \frac{a_{t,i}}{\int_{n_t}^{1} a_{t,i} di}. \quad (9)$$

In Equation 7, the first term is general for all insiders; they trade in markets and do not pay commission fees to bankers. The second integral in Equation 7 concerns financial intermediaries and accounts for the collected commission fees, net of the fixed costs needed to launch a business, d. The third integral comprises the costs that the entrants incur to acquire the license for financial intermediation. Finally, the last term is the revenue for rent-seekers in the form of collected payments from the new insiders.

When the size of the elite contracts, *i.e.*, $[n_t, 1] \subset [n_{t-1}, 1]$, all incumbents take on financial intermediation, as there are no entrants and hence no rent-seeking opportunities. The only choice variable for the planner remains $n_t \in (n_{t-1}, 1)$, and the program takes the following form:

$$\max_{n_t \in (n_{t-1}, 1)} \int_{n_t}^{1} \omega_{t,i} [f(\bar{a}_t(z_t)) + f'(\bar{a}_t(z_t))(a_{t,i} - \bar{a}_t(z_t))] di + \left(\frac{\Omega_t}{1 - n_t} - d \right). \quad (10)$$

It is possible to write the objective function in the form of Equation 10, as the term in brackets is general for members. The first term involves the post trade technology for each insider, while the second term is the collected commission fees, split equally among intermediaries.

Whatever the elite's allocation is, dynasties preserve their income status in all subsequent periods *ad infimum*. That is, for any two dynasties, $i, j \in [0, 1]$, if

$a_{0,i} \geq a_{0,j}$, then $a_{t,i} \geq a_{t,j}$ for all $t = 1, 2, \ldots, \infty$. It is easy to see this point from the planner's program. Within any class of families (non-traders, outsider traders, intermediaries and rent seekers), heterogeneity in end-period incomes is owed to the post trade technology. Suppose the planner's allocation is $\{n_t, z_t, \chi_t\}$, given the beginning-of-period distribution P_t at time t. Then, for any two dynasties i and j, which are both insiders, although one an intermediary and the second a rent seeker, such that $a_{t,i} \leq a_{t,j}$, then $F(\bar{a}_t(z_t), a_{t,i}) \leq F(\bar{a}_t(z_t), a_{t,j})$, where

$$F(\bar{a}_t(z_t), a_{t,\tau}) \equiv f(\bar{a}_t(z_t)) + f'(\bar{a}_t z_t)(a_{t,\tau} - \bar{a}_t(z_t)), \tau \in [n_t, 1]; \tag{11}$$

and net revenues from their side activities are equalized by the NA condition. The second aspect is that the condition

$$\frac{\Omega_t}{z_t - n_t} \geq d \tag{12}$$

excludes situations in which the planner may increase the dynasties' welfare by continuing to have families keep taking losses from financial intermediation.

We will now also provide the definition for the model's equilibrium. Given the initial distribution P_0 for $\{a_{0,i}\}$ and (n_{-1}, z_{-1}, m_{-1}):

(i) Each period t, for $t = 0, 1, \ldots$, i) and taking as given the beginning-of-period bequest distribution, P_t, as well as $(n_{t-1}, z_{t-1}, m_{t-1})$, i) the planner's program pins down the end-period technology, jointly determined by $(n_t, z_t, m_t, \chi_t, R_t)$;

(ii) Each family $i \in [0, 1]$ inherits the bequest size, $a_{t,i}$, by the optimal policy rule of Equation 1, for $t = 1, 2 \ldots$;

(iii) A steady state is a stationary equilibrium, in which $(n_t, m_t, P_t) = (n, m, P)$.

The disciplinary mechanism

Anocratic regimes are not sustainable for a long period, and interdependence between subsequent powers is fairly strong.[7] The analyzed structure of the model cannot, however, take into account the impact of the leader's current actions on its future wealth status. In order to capture explicitly the inter-temporal link between powers, we expand the model to allow for a disciplinary policy by a forthcoming leader.

If there are too many intermediaries, the current leader will appropriate a huge share of profit opportunities, since competitiveness in the banking sector accelerates the wealth equalization process. In order to control for the predecessor's appetite, the successor threatens to expropriate a part of the illegal wealth raised by the predecessor. To make the link complete, we theorize that the leader who has used the punishment tool is more likely to be punished, since the forthcoming leader will feel little tension from the social community in taking a symmetrical approach towards a departed leader. The corresponding question will be 'how effectively can rent-seeking technologies be used, so that the forthcoming planner can be saturated as well as the probability of the expropriation of extracted rents by the future planner effectively controlled?'.

After plugging the constraints into the welfare function and eliminating payment for entrance, χ_t, the welfare function, when the elite is expanded, can be written as:

$$\begin{aligned} \max_{n_t, z_t} \int_{n_t}^{1} \omega_{t,i} F(\bar{a}_t(z_t), a_{t,i}) di + \omega_{[n_t, z_t]} \left[\frac{\Omega_t}{z_t - n_t} - d \right] \\ - \omega_{[n_t, n_{t-1}]} \left[Q_t + \frac{\Omega}{z_t - n_t} - d \right] + \omega_{[z_t, 1]} \frac{n_{t-1} - n_t}{1 - z_t} \left[Q_t + \frac{\Omega}{z_t - n_t} - d \right]. \end{aligned} \tag{13}$$

where the ω values are the corresponding sums of the weights within each class, $\omega_{[n_t,z_t]} = \int_{n_t}^{z_t} w_{t,i} di$, $\omega_{[n_t,n_{t-1}]} = \int_{n_t}^{n_{t-1}} w_{t,i} di$ and $\omega_{[z_t,1]} = \int_{z_t}^{1} w_{t,i} di$.

The forth component in the objective function refers to the collected rents. We denote the total sum of rents by

$$B_t \equiv (n_{t-1} - n_t) \left[Q_t + \frac{\Omega}{z_t - n_t} - d \right]. \tag{14}$$

As already noted, a higher number of intermediaries will accelerate the wealth equalizing process and will hurt the forthcoming leader. The function $\Phi(z_t - n_t) \in (0,1)$, with $\Phi'(.) > 0$, determines the probability of expropriation. In the simulated model we use the functional form, $\Phi(z_t - n_t) = \alpha(z_t - n_t)^e$, with some small positive α and e such that $e \in \{e_0, e_1\}$. The probability of expropriation is realized *ex post*, following the Bernoulli function, $f(\Phi; exp) = \Phi^{exp}(1-\Phi)^{1-exp}$, where exp being equal to one (1) is the expropriation state, and $(1 - exp)$ indicates no expropriation. Once expropriation action is taken by the leader, there is a high probability for there to be expropriation by the next leader, which is governed by the parameter $e = e_1$. Contrary to this, no expropriation, *ceterus paribus*, will decrease the probability to be expropriated, with $e = e_0$.

Incorporating these components into the welfare function, the final formula will be:

$$\begin{aligned} \max_{n_t, z_t} \int_{n_t}^{1} \omega_{t,i} F(\bar{a}_t(z_t), a_{t,i}) di + \omega_{[n_t, z_t]} \left[\frac{\Omega_t}{z_t - n_t} - d \right] \\ - \omega_{[n_t, n_{t-1}]} \left[Q_t + \frac{\Omega}{z_t - n_t} - d \right] + \omega_{[z_t, 1]} \frac{n_{t-1} - n_t}{1 - z_t} \left[Q_t + \frac{\Omega}{z_t - n_t} - d \right] \\ - \Phi(z_t - n_t) B_t. \end{aligned} \tag{15}$$

In case of the elite's contraction, the welfare function remains the same (Equation 10).

Simulated model

In the Appendix we study the long-run equilibrium in the model. At some point wealth inequality becomes so tight that there is no room for financial intermediation, and hence for a non-benevolent planner. That is, once the society becomes sufficiently equal, it gets rid of the elite and converges to perfect equality. The long-run equilibrium remains invariant to the modification of the model when incorporating a disciplinary mechanism.

Here, we turn to the transitional dynamics of the model. The model is too complex to characterize its transitional path analytically. To see how this process evolves, we simulate the discrete version of the model for some reasonable parameters. For the initial wealth distribution, P_0, we randomly draw 200 numbers from the normal distribution with a mean of 0.15 and a variance of 1.1, controlling for negative values.[8] The lists of variables and parameter values are shown in Tables 1 and 2, respectively.

Simulation results of the baseline model are provided in Tables 3 and 4. After a couple of periods, the elite is consistently inflated with an increasing number of corrupt incumbents. Then, in the ninth period, markets are shut down, as fixed costs are too high, and all families become outsiders. The time series of the mean and the variance explain this phenomenon perfectly. The mean consistently moves towards the steady state, accompanied by a strong decrease in variance, with the latter's converging to zero. The measure of the end-period wealth inequality is the Gini coefficient, which is also gradually converging to zero. We have the same pattern of dynamics for any other sensible specifications of initials. For instance, if we start with a value of n_0 that is too large, then the elite group is contracted in the first period, and the economy takes a path similar to the one discussed.

An interesting observation is the emergence of too many rent-seekers, as the elite is subsequently enlarged. This is one of the central results of this article. Rent-seeking activities are not costly, and, as families become less heterogeneous in income levels, gains from trade get smaller. This translates into fewer incumbents who take on intermediation; most of them become rent-seekers.

The other interesting observation is the immediate break-up of the elite; it consistently grows and then, in one period, crushes down to zero. Consistent increase in the number of insiders is possible due to rent-seeking activities, but the latter is possible only so long as there are financial markets available, in which the owners of banks gain positive profits, *i.e.*, fees collected for each intermediary exceed the amount of fixed costs. At some point this difference is no longer positive, and markets are shut down. As already noted, in this situation the social planner's objectives no longer make sense.

We observe that gradually improved equality is accompanied by an increase of the share of rent-seekers in the population during the transition period. This obser-

Table 1
Variables in the model

Minimum collateral requirement	$C(z_t - n_t)$
Payment for membership	χ_t
The size of the elite	$[n_t, 1]$
Continuum of intermediaries	$[n_t, z_t]$
Continuum of rent seekers	$[z_t, 1]$
Continuum of outsider traders	$[m_t, n_t]$
Continuum of outsider non-traders	$[0, m_t]$
Average capital among traders	$\bar{a}_t$

Table 2
Parameter values

Parameters		**Values**
The size of the economy	N	200
Average of wealth distribution at $t = 0$		0.1935
Variance of wealth distribution at $t = 0$		0.0186
Gini coefficient at $t = 0$		0.3926
The steady state value	a^*	0.196
Initial size of the elite	n_0	13
Fixed costs for interm.	$\bar{c}$	0.01
Savings rate	δ	0.6
Comssion fee	α	0.7
Production parameter	θ	0.8
Productivity	A	1.2
Prob. (no expropriation)	e_0	0.3
Prob. (expropriation)	e_1	0.8
Collateral parameter	γ	0.01
Collateral parameter	ε	2.4

vation suggests a formal hypothesis, where, in incompletely democratic regimes, corruption flourishes throughout the transition.

Simulating model with discipline

How is the transitional path affected when we allow for a disciplinary channel? Intermediation that is too intense, and so serves to increase the probability of wealth expropriation generated by rent-seekers, emerges necessarily as the elite is expanded. The optimal rule, by which the elite is split into intermediaries and rent-seekers, is somewhat displaced in favor of intermediaries, since side payments are subject to direct expropriation, while a higher number of intermediaries will increase only the probability of this threat. We do not derive the optimal rule analytically, but the rationale is that collecting bribes is now costly, and if the elite is expanded, then relatively few rent-seekers emerge. On the other hand, in a probabilistic sense, costs are increasing with the number of intermediaries, which is another channel to compress the size of the elite. The third factor is dependence

Table 3
Baseline model — First 6 periods

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Insiders	11	19	11	19	13	18
Intermed-s	11	9	11	9	13	11
Rent seekers	0	10	0	10	0	7
Min. cap. req	0.1634	0.2206	0.1634	0.2206	0.1214	0.1634
Mean	0.1920	0.1889	0.1863	0.1865	0.1866	0.1872
Variance	0.0133	0.0097	0.0067	0.0050	0.0035	0.0025
Gini coeff.	0.3381	0.2935	0.2471	0.2116	0.1765	0.1474

Table 4
Baseline model — Last 6 periods

	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12
Insiders	24	32	39	0	0	0
Intermed-s	10	9	8	0	0	0
Rent seekers	14	23	31	0	0	0
Min. cap. req	0.1900	0.2206	0.2546	0.4207	0.4207	0.4207
Mean	0.1883	0.1896	0.1898	0.1898	0.1901	0.1904
Variance	0.0018	0.0013	0.0010	0.0006	0.0003	0.0002
Gini coeff.	0.1232	0.1037	0.0745	0.0601	0.0484	0.0389

on past expropriation, which triggers the leader to stay away from raising bribes. Thus, if the elite is to be expanded, it should be through intermediaries, although the latter will increase the probability to be expropriated. The bribe factor tends to be dominant, that is, rent-seekers retreat at a higher rate than intermediaries do. As a consequence, wealth inequality always remains lower, when the discipline is feasible.

The evolution of an economy when a disciplinary mechanism is put into action is given in Tables 5 and 6.[9] The parameter configuration admits high probability for expropriation, which occurs twice out of three possibilities. For example, in the third period the leader finds it optimal to expand the elite, accompanied by three rent-seekers, and the resulting probability yields expropriation administered by the forthcoming leader. Then the latter, amplifying the probability for being expropriated in turn, avoids expanding the elite, which leads to an increase of intermediaries, as incumbent rent-seekers take on intermediation. This results in an even higher number of intermediaries under discipline relative to the baseline economy, while the size of the elite falls short. In the fourth period the difference between the two Gini coefficients increases by a factor of 1.83.

Table 7 and 8 provide the differences between the two models, by subtracting the corresponding variables of the expanded model from the baseline. The resulting central observation is that an economy with discipline has greater equality than the baseline economy. When the possibility of punishment is introduced, there is evi-

Table 5
Discipline incorporated — First 6 periods

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Insiders	11	11	13	13	13	16
Intermed-s	11	11	10	13	13	11
Rent seekers	0	0	3	0	0	5
Min. cap. req	0.1634	0.1634	0.1900	0.1214	0.1214	0.1634
Mean	0.1920	0.1874	0.1852	0.1849	0.1853	0.1862
Variance	0.0133	0.0091	0.0063	0.0045	0.0032	0.0023
Probability of exprop.	0	0	0.5986	0.6476	0.6476	0.6159
Exprop. status	0	0	1	0	0	1
Gini coeff.	0.3381	0.2879	0.2432	0.2045	0.1706	0.1424

Table 6
Discipline incorporated — Last 6 periods

	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12
Insiders	19	0	0	0	0	0
Intermed-s	10	0	0	0	0	0
Rent seekers	9	0	0	0	0	0
Min. cap. req	0.1900	0.4207	0.4207	0.4207	0.4207	0.4207
Mean	0.1873	0.1878	0.1884	0.1891	0.1898	0.1904
Variance	0.0016	0.0011	0.0007	0.0005	0.0003	0.0002
Probability of exprop.	0.5986	0	0	0	0	0
Exprop. status	0	0	0	0	0	0
Gini coeff.	0.1186	0.0960	0.0776	0.0625	0.0503	0.0405

dence of fewer rent-seekers, more intermediaries, a lower level of minimum capital requirement, a lower average and variance of capital stock, as well as lower Gini coefficients. At first this result is surprising, as one might expect higher inequality when discipline is introduced, as pressure by the forthcoming power triggers the current leader to sustain excessive inequality, in order to retain some profits for successors. The counter argument hinges on the fact that the expropriation threat is spread across the collected rents, raised by corrupt incumbents. Moreover, we have shown that expansion of the elite at later periods owes mainly to rent-seekers, depressing the number of intermediaries and hence sustaining high inequality. In the baseline economy, there is a cost for intermediation, while rent-seeking is not costly. When punishment is feasible, it creates (variable) costs on rent-seeking, and leaders account for these costs via limiting the number of rent-seekers and, when expanding the elite, they do so by selling more licenses for intermediation.

The last observation worth indicating is that in the model with discipline, the elite structure falls away earlier then in the other model. In this regime:

1. elites incur more costs;

2. excessive intermediaries nevertheless exhaust profit opportunities soon and

Table 7
Differences — First 6 periods

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Insiders	0	-8	2	-6	0	-2
Intermed-s	0	2	-1	4	0	0
Rent seekers	0	-10	3	-10	0	-2
Min. cap. req	0	-0.0572	0.0266	-0.0992	0.0000	0.0000
Mean	0	-0.0015	-0.0011	-0.0016	-0.0012	-0.0011
Variance	0	-0.0006	-0.0003	-0.0005	-0.0003	-0.0002
Gini coeff.	0.0000	-0.0056	-0.0039	-0.0071	-0.0058	-0.0050

Table 8
Differences — Last 6 periods

	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12
Insiders	-5	-30	-37	0	0	0
Intermed-s	0	-7	-6	0	0	0
Rent seekers	-5	-23	-31	0	0	0
Min. cap. req	0.0000	0.2001	0.1661	0.0000	0.0000	0.0000
Mean	-0.0010	-0.0018	-0.0014	-0.0007	-0.0003	0.0000
Variance	-0.0002	-0.0002	-0.0003	-0.0001	0.0000	0.0000
Gini coeff.	-0.0046	-0.0077	0.0031	0.0024	0.0019	0.0015

no room is left for the elite's survival. As a result, democracy arrives earlier.

We subtract the variables of the expanded model from the corresponding variables of the baseline model and offer difference tables, Tables 7 and 8.

Conclusion

In this article, we study a model economy distinguished by a non-democratic regime, which translates into an economic relationship in the form of monopoly power, exercised by a certain minority (the elite) toward the rest of the economy. Insufficient competition in banking keeps the financial participation rate low, creating a negative externality for dynasties at the bottom part of the wealth distribution. Corrupt incumbents necessarily emerge and serve to amplify the externality. At the later stage of transition there is too much corruption, since rent-seeking is free, contrary to intermediation. The income-equalizing process, owing to an underlying technology, is consistently distorted along the transition path. When incorporating a punishment mechanism into the model, suggesting a novelty for successions of anocratic regimes, excessive rent-seeking shrinks, and wealth differences are mitigated. As a result, the epoch of elites ends earlier, under discipline. It is important that punishment be exercised toward collected bribes, which makes rent-seeking costly for the elite.

The main findings of the model hinge on the income-equalizing power of the underlying technology. Financial intermediation in fact accelerates the equalizing process, while rent-seeking only hinders it. In our model, planners extract profits from the wealth diversity of economic agents, and they have strong incentives to punish their predecessors, if little inequality is left to exploit. Incentives are, however, constrained by the technologies given to planners. If they could choose among different technologies, such as increasing, decreasing and constant returns, then the optimal choice is likely to be increasing returns[10], as the latter preserves wealth inequality over time. Financial intermediaries then may provide educational loans, which will shift productivity of individual projects upward, but this will mitigate wealth differences only temporarily.

The model suggests the hypothesis: anocratic regimes with wealth equalizing technologies will converge to democracy. The question of how to establish and sustain such technologies opens room for policies implemented by a third party, say, the international community. There are several ways to increase the productivity of the poor, to help them catch up to the wealthier parts of society. These include providing access to business and educational loans, eliminating bureaucratic barriers for small- and medium-size entrepreneurs, as well as investing in infrastructure aimed at the mitigation of transaction costs and measurements. At the political stage, strong discipline by forthcoming leaders, such as pushing for fair elections, as well as legal expropriation threats on illegal revenues, will only accelerate the wealth-equalizing process, resulting in civil society formation and gradual movement towards democracy.

Appendix

No-arbitrage condition

In the model, credit markets are available for sufficiently rich families. The dynasty i with the bequeathed capital $a_{i,t} \in [m_t, 1]$ at time t, solves the following maximization problem:

$$\max_{\tilde{a}_{t,i} \geq 0} f(\tilde{a}_{t,i}) + R_t(a_{t,i} - \tilde{a}_{t,i}),$$

subject to

$$\int_{[m_t,1]} (\tilde{a}_{t,i} - a_{t,j}) P_t(dj) = 0 \tag{A1}$$

where $\tilde{a}_{t,i}$ is the capital stock after the trade, R_t is the price for unit of capital, and P_t is the current probability distribution of $\{a_{t,j}\}_{j \in [m_t,1]}$. When the technology f is concave, the First Order Condition (FOC), necessary and sufficient, yields

$$f'(\tilde{a}_{t,i}) = R_t \Rightarrow a_t^* = (f')^{-1}(R_t).$$

Plugging the unique capital stock a_t^* into the constraint in Equation A1, we obtain

$$\int_{j\in N_t^*}(a_t^*-a_{t,j})dP_t(d_j)=0\Rightarrow a_t^*=\int_{j\in[m_t,1]}a_{t,j}dP_t(d_j)=\bar{a}_t.$$

That is, each families' production size is $f(\bar{a}_t)$ and if its initial asset is higher than $\bar{a}_t$, the family is a lender, and if it has less than $\bar{a}_t$, a borrower. Capital is traded by the price R_t.

Although heterogeneity of physical capital invested in production technology is removed, households continue to be different in incomes from the overall technology, which includes the term $R(a_{t,i}-\bar{a}_t)$, a consequence of trade. *Ceteris paribus*, each trade participant family is better off, and unrestricted trade (no capital or income classes, within which only trade takes place) leads to a Pareto superior outcome. Contrary to other specifications of preferences, the "warm-glow" type of utility assumes a constant share that accrues to investment, and hence optimal bequest policies are not distracted by the fact that there are credit markets available in the economy.

If the bequest size falls short from the minimum capital requirement $(a_{t,i}<c_t)$, then $F_t(a_{t,i})=f(a_{t,i})$, where f is strictly concave, $f(0)=0$ and satisfies Inada conditions ($f'(0)=\infty$, $f'(\infty)=0$). If the dynasty trades in the market, but remains an outsider, the technology takes the form of

$$F_t(a_{t,i})=f(\bar{a}_t)+f'(\bar{a}_t)(a_{t,i}-\bar{a}_t)-\alpha(f(\bar{a}_t)+f'(\bar{a}_t)(a_{t,i}-\bar{a}_t)-f(a_{t,i})). \quad \text{(A2)}$$

where $\bar{a}_t=\int_{a_{t,i}\geq c_t}a_{t,i}dP_t(a_{t,i})$ and $\alpha\in(0,1)$. The first term is an outcome of interaction among families in the credit markets. For a given family, if inherited capital a_t is greater than $\bar{a}_t$, then the family is a lender and receives interest payments in the amount $R_t(a_t-\bar{a}_t)$, where $R_t=f'(\bar{a}_t)$ is the interest rate by which capital is traded. Alternatively, families with less capital than $\bar{a}_t$ are borrowers. Participants in trade pay commission fees, an α part of their net returns from trade.

In order to decide on the financial intermediation status, each dynasty compares $F_t(a_{t,i})$ in Equation A2 with the following:

$$\begin{aligned}\tilde{F}_t(a_{t,i})=&f(\bar{a}_t)+f'(\bar{a}_t)(a_{t,i}-\chi_t-\bar{a}_t)\\&+\frac{1}{z_t-n_t}\int_{m_t}^{n_t}\alpha(f(\bar{a}_t)+f'(\bar{a}_t)(a_{t,j}-\bar{a}_t)-f(a_{t,j}))dj-d,\end{aligned} \quad \text{(A3)}$$

where χ_t is the size of the bribe that a new insider should pay to a rent-seeker in order to get permission to open a bank, and d is the fixed cost needed to launch the business. The integrated sum is simply the amount that outsider traders pay to rent-seeker incumbents, and all insiders, irrespective of whether their income rank has an equal share from that sum. It is important to realize that $\bar{a}_t$ in Equation A2 is different from that in Equation A3. To be precise, we should use the notation

$\bar{a}_t(z_t^*)$ in Equation A2 and $\bar{a}_t(z_t)$ in Equation A3, where z_t^* stands for the size of the group of insiders with the marginal (${z_t}^{\text{th}}$) family excluded. To see this, let us write the condition for intermediation properly:

$$\begin{aligned} f'(\bar{a}_t(z_t))\chi_t \leq\ & f(\bar{a}_t(z_t)) + f'(\bar{a}_t(z_t))(a_{t,i} - \bar{a}_t(z_t)) \\ & - (1-\alpha)(f(\bar{a}_t(z_t^*)) + f'(\bar{a}_t(z_t^*))(a_{t,i} - \bar{a}_t(z_t^*))) - \alpha f(a_{t,i}) \\ & + \frac{1}{z_t - n_t}\int_{m_t}^{n_t} \alpha(f(\bar{a}_t(z_t)) + f'(\bar{a}_t(z_t))(a_{t,i} - \bar{a}_t(z_t)) - f(a_{t,i}))di - d. \end{aligned} \tag{A4}$$

For convenience, let us take the first two terms and the integral, denoted by:

$$\begin{aligned} Q_t \equiv\ & f(\bar{a}_t(z_t)) + f'(\bar{a}_t(z_t))(a_{t,i} - \bar{a}_t(z_t)) \\ & - (1-\alpha)(f(\bar{a}_t(z_t^*)) + f'(\bar{a}_t(z_t^*))(a_{t,i} - \bar{a}_t(z_t^*))) - \alpha f(a_{t,i}) \end{aligned} \tag{A5}$$

and

$$\Omega_t \equiv \int_{m_t}^{n_t} \alpha(f(\bar{a}_t) + f'(\bar{a}_t)(a_{t,i} - \bar{a}_t) - f(a_{t,i}))di, \tag{A6}$$

respectively. Recall that:

(i) for a family to apply for intermediation it needs to have more capital than the average and

(ii) a richer family has a priority to choose intermediation.

Suppose that any i^{th} family (not necessarily the richest one) is prompted by that decision. It takes the status if the constraint in Equation A4 is satisfied. The terms in the first two lines determine the benefit from the status change, net of revenues from the intermediation services (the third line). If the i^{th} family takes on intermediation, then, after $\bar{a}_t$ is contracted due to a decrease in c_t, Equation 3 guaranties that the difference between the first two terms is higher for richer families.

The integral is, however, also affected and decreases more if a richer family takes intermediation, since it is further from $\bar{a}_t$. To have a complete understanding about the constraint of new insiders, we write it in the following form for any family i with $a_{t,j} \geq c_t$:

$$\begin{aligned} f'(\bar{a}_t(z_t))\chi_t \leq\ & f(\bar{a}_t(z_t)) + f'(\bar{a}_t(z_t))(a_{t,i} - \bar{a}_t(z_t)) \\ & - (1-\alpha)(f(\bar{a}_t(z_t^*)) + f'(\bar{a}_t(z_t^*))(a_{t,i} - \bar{a}_t(z_t^*))) - \alpha f(a_{t,i}) \\ & + \frac{1}{z_t^* - n_t^*}\int_{m_t}^{n_t^*} \alpha(f(\bar{a}_t(z_t^*)) + f'(\bar{a}_t(z_t^*))(a_{t,i} - \bar{a}_t(z_t^*)) - f(a_{t,i}))di \\ & - \alpha(f(\bar{a}_t(z_t^*)) + f'(\bar{a}_t(z_t^*))(a_{t,i} - a_t(z_t^*)) - f(a_{t,i})), \end{aligned} \tag{A7}$$

where $[m_t, n_t^*]$ is the set of traders that the marginal i^{th} family excluded, and the integrated sum includes the i^{th} family's commission fees as an outsider. The last subtracted term represents the same commission fees, since that family will not pay them as an insider (the right-hand side is the net revenue, when the family is an insider). Note that $\bar{a}_t$ remains unchanged, when considering exactly which family with $a_{t,j} \geq c_t$ takes intermediation. That is, the integrated sum (together with the subtracted term), the way we have written it, is constant when comparing the right-hand side of Equation A7 for any two families.

Canceling the terms multiplied by α and droping the integral, we obtain

$$\begin{aligned} f'(\bar{a}_t(z_t)) \leq f(\bar{a}_t(z_t)) + f'(\bar{a}_t(z_t))(a_{t,i} - \bar{a}_t(z_t)) \\ - (f(\bar{a}_t(z_t^*)) + f'(\bar{a}_t(z_t^*))(a_{t,i} - \bar{a}_t(z_t^*))) \end{aligned} \tag{A8}$$

This difference is nonnegative, since new families take part in the trade, which only enriches the distribution mass in the bottom part of $P_t(a_i|a_i \geq c_t)$ and decreases $\bar{a}_t$: $\bar{a}_t(z_t) \leq \bar{a}_t(z_t^*)$.

In the model, insiders are split into two groups. One part of the previous insiders (incumbents) takes on rent-seeking activities, while the remaining part, including all new insiders, takes on intermediation. The rule that determines the sizes of these groups is simply a No-Arbitrage (NA) condition; agents are engaged in different activities in a way that marginal profits from these two activities are equated. In our case, marginal values and averages are equal and constant, and the NA condition takes the following form:

$$\frac{1}{z_t - n_t}\Omega_t - d = \frac{1}{1 - z_t}\int_{n_t}^{n_{t-1}} f'(\bar{a}_t(z_t))\chi_t di, \tag{A9}$$

where the left-hand side is the net revenue from the intermediation activities per family and the right-hand side is the revenue from the rent-seeking, when the rent is invested in physical technology. The latter can be written as:

$$\begin{aligned} \frac{1}{1 - z_t}\int_{n_t}^{n_{t-1}} f'(\bar{a}_t(z_t))\chi_t di &= \frac{n_{t-1} - n_t}{1 - z_t} f'(\bar{a}_t(z_t))\chi_t \\ &= \frac{n_{t-1} - n_t}{1 - z_t}\left[Q_t + \frac{\Omega_t}{z_t - n_t} - d\right]. \end{aligned} \tag{A10}$$

Plugging Equation A10 into A9, and using a little algebra, we obtain the following form for the NA condition:

$$Q_t = \frac{(1 - z_t) - (n_{t-1} - n_t)}{n_{t-1} - n_t}\left[\frac{\Omega_t}{z_t - n_t} - d\right].$$

Whether to involve new entrants depends on the increase in the integral, due to an increase in the number of families that take part in the loan market as well as payments to the rent-seekers, which should compensate for the commission fees that the potential entrants would pay if they continued to be outsiders. In addition to the left-hand side of Equation A4, $f'(\bar{a}_t(z_t))\chi_t$ is decreasing in $\bar{a}_t$, which means for each additional family that decides on intermediation, the amount to pay increases, expressed as income losses from the owned technology after trade and fixed costs. Suppose $\tilde{a}_t$ is the upper bound of the capital stock distribution at time t for outsiders, with some $P_t(\tilde{a}_t) > 0$. Then, the ïňĄrst rich family compares the two sums in Equations A2 and A3, on the supposition that it takes intermediation. Afterwards, the second rich family checks the condition. If the sum in Equation A3 is still larger, it buys the license.

Characterization of dynamics

We start from deriving a closed formula for next-period average capital among all traders, $[m_t, 1]$. We can write

$$\begin{aligned} E\left\{a_{t+1,i} | a_{t,i} \geq C(z_t)\right\} &= \delta E\left\{F(\bar{a}_t(z_t), a_{t,i}) | a_{t,i} \geq C(z_t)\right\} \\ &= \delta \int_{m_t}^{1} F(\bar{a}_t(z_t), a_{t,i}) P_{m_t}(di), \end{aligned} \tag{A11}$$

where P_{m_t} is the cumulative distribution function over $[m_t, 1]$. Then we decompose the integral in the right-hand side of Equation A11 into the corresponding classes with traders. These form outsiders, new insider intermediaries, incumbent intermediaries and rent seekers[11]. We shorten the notation denoting $E\left\{a_{t+1,i} | a_{t,i} \geq C(z_t)\right\} \equiv E_{m_t}(a_{t+1,i})$ and do the subsequent steps:

$$\begin{aligned} \frac{E_{m_t}(a_{t+1,i})}{\delta} = &\int_{m_t}^{n_t} [F(\bar{a}_t, a_{t,i}) - \alpha[F(\bar{a}_t, a_{t,i}) - (f(a_{t,i})]] P_{m_t}(di) + \int_{n_t}^{n_{t-1}} [F(\bar{a}_t, a_{t,i}) \\ &+ \frac{\Omega_t}{z_t - n_t} - f'(\bar{a}_t)\chi_t - d] P_{m_t}(di) + \int_{n_{t-1}}^{z_t} [F(\bar{a}_t, a_{t,i}) + \frac{\Omega_t}{z_t - n_t} - d] P_{m_t}(di) \\ &+ \int_{z_t}^{1} [F(\bar{a}_t, a_{t,i}) + \frac{1}{1 - z_t} \int_{n_t}^{n_{t-1}} f'(\bar{a}_t)\chi_t d_j] P_{m_t}(di), \end{aligned}$$

where Ω_t is the sum of all commission fees, collected from outsider traders and given by Equation A6. Since

$$\begin{aligned} \int_{m_t}^{n_t} \alpha(F(\bar{a}_t, a_{t,i}) - f(a_{t,i})) P_{m_t}(di) &= \frac{1}{1 - m_t} \int_{m_t}^{n_t} \alpha(F(\bar{a}_t, a_{t,i}) - f(a_{t,i})) di \\ &= \frac{1}{1 - m_t} \Omega_t, \end{aligned}$$

and

$$\int_{n_t}^{n_{t-1}} f'(\bar{a}_t)\chi_t P_{m_t}(di) = \frac{n_{t-1} - n_t}{1 - m_t} f'(\bar{a}_t)\chi_t,$$

we simplify the terms as follows:

$$
\begin{aligned}
fracE_{m_t}(a_{t+1,i})\delta = & \int_{m_t}^{n_t} F(\bar{a}_t, a_{t,i})P_{m_t}(di) - \frac{\Omega_t}{1-m_t} \\
& + \int_{n_t}^{n_{t-1}} [F(\bar{a}_t, a_{t,i})]P_{m_t}(di) - \frac{n_{t-1}-n_t}{1-m_t} f'(\bar{a}_t)\chi_t \\
& + \frac{n_{t-1}-n_t}{1-m_t}\left[\frac{\Omega_t}{z_t-n_t} - d\right] + \int_{n_{t-1}}^{z_t} F(\bar{a}_t, a_{t,i})P_{m_t}(di) \\
& + \frac{z_t-n_{t-1}}{1-m_t}\left[\frac{\Omega_t}{z_t-n_t} - d\right] + \int_{z_t}^{1} F(\bar{a}_t, a_{t,i})]P_{m_t}(di) \\
& + \frac{n_{t-1}-n_t}{1-m_t} f'(\bar{a}_t)\chi_t d_j
\end{aligned}
$$

which reduces to

$$
\begin{aligned}
E_{m_t}(a_{t+1,i}) &= \delta\left[\int_{m_t}^{n_t} [f(\bar{a}_t) + f'(\bar{a}_t)(\bar{a}_t - a_{t,i})]P_{m_t} + \frac{z_t-n_t}{1-m_t}d\right] \\
&= \delta\left[f(\bar{a}_t) + f'(\bar{a}_t)(\bar{a}_t - E_{m_t}(a_{t,i}) + \frac{z_t-n_t}{1-m_t}d\right].
\end{aligned}
$$

However, $\bar{a}_t = E_{m_t}(a_{t,i})$, and thus we have the optimal policy rule for the average capital among traders:

$$E_{m_t}(a_{t+1,i}) = \delta\left[f(\bar{a}_t) + \frac{z_t-n_t}{1-m_t}d\right]. \tag{A12}$$

When the current size of the elite is smaller than the previous one (*i.e.*, $[n_t, 1] \subset [n_{t-1}, 1]$), then we do not have classes of new intermediaries and rent seekers, and

$$E_{m_t}(a_{t+1,i}) = \delta f(\bar{a}_t). \tag{A13}$$

The expected value of next-period's average capital among traders is updated each time by the planner's allocation. That is, the end-period average capital differs from the beginning-of-period one by some value, L_t, which is a function of (z_t, P_t):

$$L_t = L(z_t, P_t), \tag{A14}$$

so that the expected value of the next end-period average capital, $E^*_{m_t}(a_{t+1,i})$, is defined as

$$E^*_{m_t}(a_{t+1,i}) = E_{m_t}(a_{t+1,i}) + L_t. \tag{A15}$$

Clearly, if $z_t = z_{t-1} = 1$ and $P_t = P_{t-1}$, then $L_t = 0$, which implies that at the steady state we have

$$E^*_{m_t}(a_{t+1,i}) = E_{m_t}(a_{t+1,i}) = \delta f(\bar{a}_t), \tag{A16}$$

and the steady state average capital among the traders, if there are some, satisfies

$$\bar{a} = \delta f(\bar{a}), \tag{A17}$$

Now, recalling that families preserve their social status in all subsequent periods (single-crossing property[12]), a fixed average capital among traders, as it is in the steady state, is possible if all traders hold the same stock of capital, such that $a_i = a_j, \forall i, j, \in [m, 1]$.

What about families that do not trade in the long run? Those families that at some time t do not satisfy the minimum collateral requirement follow the simple optimal-policy rule:

$$a_{t+1,i} = \delta f(a_{t,i}), \forall i \in [0, m_t]. \tag{A18}$$

If a family stays out of the trade region, then adhering to the optimal bequest policy rule of Equation A18, it converges to the steady state, $a^* = \delta f(a^*)$, at the infinite period. If, instead, a family passes to the trade region and follows the dynamics given by Equations A13 through A16, then it arrives at the steady state, according to Equation A17. As we have argued, however, the latter reduces to the same steady state, as the one for non-traders:

$$a^* = \delta f(a^*). \tag{A19}$$

It is easy to see that both the before-trade, concave technology and the transformed, after-trade, linear technology gradually equalize all families lying in the region $[0, n_t]$. As a consequence, for some future period, credit markets become non-profitable to hold, since collected commission fees are not sufficient to cover fixed costs. After some finite number of periods families become non-traders, and converge to the unique steady state given by Equation A19.

Notes

[1]*Leader* and *Planner* are used interchangeably throughout the article.

[2]For a detailed description of anocratic regimes, see Marshal and Cole (2011).

[3]Marshal and Cole (2011) suggest a polity index, by which countries in the world are classified as democratic, autocratic, or anocratic.

[4]See Mookherjee and Ray (2002), Mookherjee and Ray (2003), Mookherjee and Ray (2005), and Ray (2006).

[5]There is one factor (capital), time invariant production technology. We solve the model for a concave technology that satisfies Inada conditions.

[6]In the simulated model it takes the following form:

$$c_t = \frac{1}{(z_t - n_t) + \varepsilon} + \gamma,$$

with some constants $\varepsilon > 0$ and $\gamma \geq 0$.

[7]Marshal and Cole (2011, p. **?????**) stress the fragile nature of anocratic regimes:

> "... Research indicates that anocracies have been highly unstable and transitory regimes, with over ïňĄfty percent experiencing a major regime change within five years and over seventy percent within ten years. Anocracies have been much more vulnerable to new outbreaks of armed societal conflict; they have been about six times more likely than democracies and two and one-half times as likely as autocracies to experience new outbreaks of societal wars. Anocracies have also been about three times more susceptible to autocratic 'backsliding' than democracies; they are four times more likely than democracies to experience coup plots and about one and one-half times more vulnerable to coups than autocracies."

[8]We take the absolute values of randomly drawn numbers.

[9]We simulate both economies using the same parameters, and the only difference is the design for discipline in the expanded model.

[10]Clearly, the choice will eventually depend on an inter-temporal link between planners, among other things.

[11]As usual, first we solve the case $[n_t, 1] \supset [n_{t-1}, 1]$.

[12]This property tells that for any two families, i and j, if $W_{t,i} < W_{t,j}$ for some t, where W stands for the total income (net of depreciation) in the end of the period t, then, necessarily, $a_{t+\tau,i} \leq a_{t+\tau,j}$ for all $\tau \geq 1$.

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