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POLITICAL LABOR MARKET, GOVERNMENT POLICY,
AND STABILITY OF A NON-DEMOCRATIC REGIME[*]

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An important source of stability of a hierarchical non-democratic political regime, such as that of the Soviet Union in the past or China today, is the rulers' ability to buy the services and political support of activists recruited from the working population in the monopsonistic political labor market. Implicit contracts that underlie this exchange require retirement of incumbents to allow for deferred promotion of activists into rent-paying positions. An analysis of optimal promotion contracts shows that regime stability is consistent with a high income gap between the rulers and the working population, strengthened when government pursues an active investment policy, and not affected positively by government spending on public goods. Predictions of the promotion contract model are tested using Soviet data for the period 1956 to 1968.

JEL codes: D70, J45, P26

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I. Introduction

Non-democracy has been the prevalent form of political organization throughout history. Despite the advancement of democracy during the last two centuries, the majority of the world's population still lives under various sorts of dictatorial and autocratic regimes. Why is non-democracy so persistent? The coercive power of the state applied from the top down is not sufficient to explain decades of peaceful existence of a non-democratic regime. Another source of stability – support from the bottom up by the potential entrants to the ruling elite – is the focus of this study. This paper proposes a model of implicit contract between the rent-maximizing rulers and rent-seeking activists under a hierarchical regime, analyzes the equilibrium in the political labor market that rests upon this implicit contract and facilitates the regime stability, and tests the model using an original dataset.

Economic models of non-democracy typically assume a segregated society where the dictator – a single person or homogeneous ruling elite – is set against the disfranchised population. One strand of the literature proposes models in which the dictator maximizes his political power or the probability of staying in power (e.g., Grossman and Noh 1994, Wintrobe 1998). Another strand is based on the assumption that the dictator maximizes the *returns* to power – income or utility of income (e.g., McGuire and Olson 1996, Egorov and Sonin 2005, Overland et al. 2005, Acemoglu and Robinson 2006). Both types of models implicitly or explicitly produce similar predictions. Rulers who value power per se should transform themselves, in the long run, into welfare-maximizing "benevolent dictators," who buy the loyalty of the population by producing public goods. Income-maximizing rulers may choose to transfer a fraction of their income to the population to avoid losing everything in a violent revolution. In particular, additional political support can be obtained at the expense of the rulers' per capita income: by extending the franchise to the middle class (Acemoglu and Robinson 2006) or co-opting some potential rivals into the ranks of the ruling elite (Gershenson and Grossman 2001, Bertocchi and Spagat 2001). Dictatorship in a segregated society with a high income gap

between the rulers and the ruled (inter-group inequality) can be sustained only by brutal force, while a stable non-democracy is possible only when the inequality is relatively low.

The major tendency over the past hundred years, however, has been the rise of hierarchical regimes, which do not yield easily to the models developed for segregated non-democracies. Under a hierarchical regime, the ruling elite is the collective owner of the economy's productive assets. This population group is not segregated from the rest of society but open for entry by the members of the subordinate stratum of the society. Positions within such a ruling elite are not hereditary. One-party polities (socialist and nationalist), military dictatorships, and theocracies are realizations of a hierarchical regime. In the twentieth century, regimes of this type came to dominance in the world scene for shorter or longer periods of time (Nazi Germany and Soviet Union, respectively). A significant number of regimes of this type (Cuba, China, Iran, and many other non-dynastic regimes in Asia and Africa) continue to exist in the twenty-first century, and their ranks can be potentially increased by reversals in some countries that seem to have established themselves as democracies (e.g. Venezuela).

A hierarchical regime with collective ownership differs from a conventional dictatorship in a segregated society in that it commands an additional important resource: the voluntary support of the potential entrants into the ranks of the ruling elite. As a monopsonist in the market for administrative and managerial jobs, it can raise support by admitting volunteers to the lowest rank of its power hierarchy with a possibility of subsequent promotion to higher-paid positions. [1] The support obtained in exchange for the promise of deferred promotion requires no payment on the spot, unlike transfers,

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[1] Constitution of the Communist Party of China gives a fair characterization of this system, however oxymoronic it sounds: "people's democratic dictatorship". It is a dictatorship in that public officials are not subject to the voters' control, but there are no barriers to entry to the ruling stratum, hence "people's". (*Constitution of the Communist Party of China amended and adopted at the 16th CPC National Congress on November 14, 2002.* http://www.china.org.cn/english/features/45461.htm)

public goods or co-option. To the contrary, this "promotion machine" produces additional rents for the incumbent rulers. The prospect of promotion creates an incentive for aspirants to rent-paying positions to expend extra effort in a capacity as informant, voluntary supervisor in the workplace, or a member of paramilitary. These types of service increase the rulers' rents. Mature hierarchical regimes seem to value supervisory services. The current Constitution of the Communist Party of China, for example, establishes that "party members must… lead the masses to work hard to bring about economic development and social progress; and play an exemplary, vanguard role in production… and social life"; "cadres who have made exceptional achievements" are selected for promotion.[2] Similarly, the Soviet propaganda in the past emphasized that joining the party essentially meant more effort and additional duties, including supervision over fellow workers, while promotion to a position in the party bureaucracy or industrial management could follow in the future.[3] Any successful career is preceded

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[2] Voluntary supervisory agents may seem redundant under the contemporary market arrangements in the Chinese economy. Biographical sketches of the delegates of the last congress of CPC (see above) do emphasize that this is not true. Even in a private foreign-owned enterprise, party activists are supposed to do what the party constitution requires: work in the best interest of the enterprise and encourage coworkers to do the same. The reasoning behind this must be that the government will benefit from better performance by every tax-paying unit.

[3] A Soviet sociological review purports: "Once you become a communist, you assume voluntarily an additional heavy duty to lead the others." A characteristic career path of a new working-class party recruit is described in the following manner: foreman – student in an engineering school – head of the planning department in a large enterprise. The next step would be further up the ladder of industrial management or to an entry-level position in the party bureaucracy. Eighty percent of the Soviet party bureaucrats of the 1970s followed this career path (*Rabochii klass SSSR. 1966-1970.* 1979. Nauka, Moskva [*Working class of the USSR in 1966-70.* pp. 225-234]). Biographies of the current generation of Chinese party leaders (available at http://www.china.org.cn/english/features/44526.htm) seem to suggest a somewhat different career trajectory: education first, the beginning of party career is close in time to the beginning of the professional career.

by, and possibly overlaps with, a period of activist service in the workplace or wherever the party calls for it, which makes it a necessary (but not sufficient) condition for future promotion.

It is convenient to model hierarchy as being composed of two layers. The first layer, "bosses", consists of the holders of governing positions such as state and party bureaucracy, military command, etc. The second larger layer, "activists," consists of the aspirants to the governing positions.[4] The bosses' salaries and benefits greatly exceed the wages of ordinary workers by far, while the activists retain ordinary low-paid jobs. The activists are required to "pay dues", which may include but are not limited to a monetary component (Belova and Lazarev 2007). More importantly, these dues include additional services, in particular, supervisory services, performed for the bosses' benefit. The bosses enter an implicit contract with activists, according to which the activists pay "dues" in exchange for the prospect of promotion. As long as the activist is on a career track, he has an incentive to support the regime. If the regime changes, the investment in activist service is lost. The promotion contract therefore creates a nexus between the economic incentives and the political stability of the regime. In contrast, simple cash transfers to a group of the population or on the spot purchase of the activists' services do not assume any investment into the future stability of the regime.[5]

In the short run, the costs of this arrangement are borne by the activists. Formal admittance to the hierarchy (party, army, etc.) does not immediately make them better off. To the contrary, their

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[4] Formal attributes of the two groups vary across political systems and can change over time. For example, in the early period of the Soviet regime, the distinction between "party candidates" – new recruits on probation – and the "full" party members drew the formal line. As the party was growing, the class of actual activists came to include part of rank-and-file full party members. However, the relative positions of the two groups did not change over time.

[5] This line of reasoning does not necessarily exclude ideology from consideration. To the contrary, an ideology, such as shared beliefs in the "better communist future", can be instrumental in maintaining the implicit contract between the bosses and the activists. However, the ideology per se is not considered a primary motivating factor for the activist choice in the context of present study.

positions yield lower utility than that of an ordinary worker. In the long run, the bosses bear their share of costs by retiring and thus creating vacancies to be filled by promoted activists. Incentives for the incumbents to enter the promotion contract are determined by the costs and benefits of the activists' services: the extra rents produced by the activists versus the rents forgone by the bosses due to retirement in compliance with the contract. Without the promotion contract, the bosses expect to receive rents longer, possibly indefinitely if they are hereditary autocrats or private proprietors, but lose the extra rents produced by the activists. A regime without a promotion contract – a competitive regime based on private property rights – is an outside option for the bosses. Under certain conditions in the political labor market, such outside option may potentially yield greater net benefits than the existing hierarchical regime, prompting rational bosses to initiate a regime change. At the same time, the presence of an outside option (e.g., shadow economy or emigration) may divert potential activists from the political labor market. This would further reduce the extra rents produced by the activists, thus prompting a regime change.

The effectiveness of the loyal-service-for-promotion exchange depends on the extent to which the rulers are capable of controlling the sources of income and, by the same token, the paths of upward job mobility. All dictatorships seek to control access to high-income positions via appointments in the public sector, licensing businesses, and regulating access to higher education, to name a few examples. Communist states of the twentieth century created the most favorable conditions for such control by establishing a near monopoly on the ownership of productive capital. In the Soviet Union, for example, the *nomenklatura* system of job assignment, run by the ruling party, provided an institutional mechanism for awarding "promotion tickets" in exchange for loyal service. The *nomenklatura* was practically the only way up for a contender.[6] The absolute monopsony in the political labor market, as

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6 Voslenskii (1984) popularized the use of the term *nomenklatura* as a synonym to the Soviet ruling bureaucracy itself. Here this term is used in a narrower sense of appointment control, which is more accurate historically.

in the case of the Soviet Union, simplifies empirical analyses. Moreover, relevant data from the Soviet Union, including formerly top-secret materials from the Communist party archives, are now available to researchers. For these reasons, the proposed model is tested using data from the former Soviet Union for the period from 1956 to 1968.

Explaining the dynamics of modern dictatorships and democratic transitions, including the outstanding phenomenon of the rapid and peaceful demise of the Soviet Union, calls for a deeper research in the operation of political-economic hierarchies. While the long-run dynamics a hierarchical regime is discussed in Lazarev (2005), this paper focuses on the equilibrium in the political labor market where services and political support of activists are "borrowed" in exchange for deferred promotion into the ruling stratum. The model developed in this paper rests on the notion of implicit promotion contract between the incumbents and contenders and implies that the stability of a hierarchical regime – contrary to a segregated non-democracy – is consistent with large income gaps between the rulers and the rest of the population. It is also consistent with active government investment in state-managed productive assets.

Empirical analysis produces results that are consistent with the theoretical predictions by the implicit-promotion contract model. The supply of activists, expressed as the number of party candidates, is positively affected by the size of the income gap between the party bureaucracy and workers. Investment in physical capital, which increases the return on activists' services, also positively affects the equilibrium number of activists and therefore increases the regime's stability. Indicators of the provision of public goods have either no or negative effect on the support for the regime. These findings are in agreement with earlier empirical studies of conventional dictatorships (Feng and Zak, 1999; Barro, 1999), which suggests that the model underlying this study could be applicable to a broader class of non-democratic regimes.

The rest of the paper is organized as follows. Section II introduces a model of implicit contract between the incumbent rent-maximizing rulers and rent-seeking activists, analyzes the characteristics

of the equilibrium in the political labor market and establishes the limits of a regime's sustainability. The empirical data used in this study are described in Section III. Tests of the proposed model using data from several former Soviet states are presented in Section IV. Section V concludes.

II. Promotion Contract: A Theoretical Model

2.1. Model Setup

Let us consider a population with size normalized to unity that consists of two groups: bosses and workers. The bosses' incomes are political rents. Individual rents are identical and equal R. The rest of the population, comprised of the workers and the retired bosses, earn a uniform wage, W, which is substantially lower than the political rent: $W << R$. A part of the working population, the activists, provide additional services that benefit the bosses by increasing their rents: $R = f(N_a) > R_0 > 0$, where $f(N_a)$ is the activists' "rent-production function" such that $f'(N_a) \geq 0$ and $f''(N_a) \leq 0$; and R_0 is the basic rent – the bosses' potential per capita rent in the absence of activists[7]. N_a is the number of activists as a share of the working population. Both R_0 and W are positive and assumed exogenous.[8] The bosses and

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[7] R_0 measures the rulers' own productivity in rent-collection. R_0 is generally greater than zero, since a rational worker will *not* fight corruption or resist predatory taxation as long as his losses do not exceed the perceived cost of enforcing the rule of law.

[8] A singular monopsonistic boss/dictator, who combines political and economic power, could endogenize the wage. However, the division of responsibility within a sizeable ruling elite makes it virtually impossible to align the contract design by political leaders with wage setting decisions by production managers. Even in the highly centralized Soviet command economy of the 1930s, the government was unable to fully eliminate the managerial discretion (Belova and Gregory 2002). Moreover, the government itself may find it beneficial to increase wages occasionally to stimulate higher worker productivity (Gregory 2005).

the activists comprise small fractions of the total population: $N_b \ll 1$, $N_a \ll 1$.[9] No specific

assumptions are made with respect to the ratio of the numbers of bosses and activists.

Activist service requires extra effort on the part of the workers who choose to enlist as

activists. No immediate compensation is offered for their service. Activists are homogeneous in the

extra effort they exert, but the workers in general are heterogeneous in their idiosyncratic distaste for

activist service, ω_i (disutility of the extra effort). It is distributed within the population with c.d.f.,

$Z(\omega)$: $Z(0) = 0$. The population is homogeneous with respect to all other behavioral parameters. In

particular, all agents are risk-neutral and discount the future exponentially at the rate r.

The implicit contract between the bosses and the activists offers the participating activists a

possibility of promotion into a boss position after T_a years of service and limits the bosses' tenures to

T_b years in order to facilitate promotion. The probability of promotion is π. Activists who do not obtain

promotion rejoin the ranks of ordinary workers.[10] There is no outside option for a worker: the only way

to achieve a level of income exceeding W lies on the activist- boss career track. T_b is not bounded from

above explicitly, but T_b exceeding the life expectancy is essentially equivalent to the elite becoming

hereditary. The promotion contract cannot be sustained in this range of boss tenures.

Similar to the dictator in the model of economic growth under dictatorship (Overland et al.

2005), bosses are assumed to maximize the present value of their lifetime income (rents). We extend

the same approach to model activists, taking into account the negative value (disutility) of the activist

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[9] Realistic values of N_a and N_b are of the order $10^{-2} \div 10^{-3}$ (a share of one percent to a few percent of the

total population). See Section III for a discussion.

[10] Promotion does not have to be random. Rational bosses are likely to resort to a sort of rank-order

wage tournament (Lazear and Rosen 1981) to elicit more activist effort and select the most able

activists. In the present context, however, it is sufficient to assume that promotion is random for a

beginner activist perspective. In fact, keeping the rules secret can help eliciting extra effort from the

agents and maximize accumulation of political rents (Lazarev and Gregory 2003, Harrison 2004).

service. The contract satisfies the participation constraints as long as (a) the activist's disutility is compensated by the expected rent after the end of service and (b) extra rents due to activist services compensate incumbent bosses for the loss of rents after retirement. In the absence of contract-based exchange between the bosses and the working population, the bosses never retire (T_b is infinite) and acquire the basic rent, R_0, forever, while the workers earn W forever.

In setting the terms of the contract, the bosses behave as a single entity – the representative boss. The contract designed by the incumbent representative boss is offered to every worker who is not yet (and has never been) an activist. Although the boss dictates the terms of the contract to the activists, he cannot force a worker to enlist as an activist and has to choose the contract terms in anticipation of known voluntary response from the workers, given the chosen values of T_a, T_b, and π, and the exogenous wage, W. The optimal contract is therefore a subgame-perfect equilibrium in the boss-activists strategic interaction where the boss is the prime mover. The contract is life-long; once written, it is supposed to be non-renegotiable. However, the terms of contracts offered to successive cohorts of activists may differ.

2.2. Equilibrium in the Political Labor Market

The choice problem facing an individual worker involves a comparison of returns to strategies. The first one is to stay in the ordinary-worker position permanently and receive certain income. The second consists of the period of costly activist service of duration T_a, uncertain promotion to the higher-income boss position thereafter, and retirement after T_b years in office if promoted. Worker i makes the choice to become an activist if the expected lifetime income along the activist career path exceeds the income as an ordinary worker:[11]

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[11] Post-retirement income flows are not included in the expression, since they are identical, by assumption, for all agents. R should be interpreted here as an exogenously determined activists' expectation of future rents, which does not have to satisfy $R = f(N_a)$.

$$(1) \quad \int_0^{T_a} (W - \omega_i)e^{-rt}dt + \pi \int_{T_a}^{T_a+T_b} Re^{-rt}dt + (1-\pi)\int_{T_a}^{T_a+T_b} We^{-rt}dt \ge \int_0^{T_a+T_b} We^{-rt}dt$$

Inequality (1) yields the threshold disutility of service $\omega*$ that determines activist participation:

$$(2) \quad \omega^* = \pi(R-W)\frac{1-e^{-rT_b}}{e^{rT_a}-1}.$$

The supply of activists – the number of workers for whom $\omega_i < \omega^*$ holds under a given contract – is then the left tail of the distribution of the disutility from the activist service:

$$(3) \quad N_a^s = Z(\omega^*).$$

Without the loss of generality, we can use the first-order approximation of (3): $N_a^s = \zeta\omega^*$, where ζ is a constant. This is additionally justified by a relatively narrow range of variation in the values of N_a (see Footnote 9).

Let us measure time in units of the term of activist service, T_a, so that $T_a \equiv 1$.[12] Then the supply of activists is expressed as:

$$(4) \quad N_a^s = \pi\kappa(R-W)(1-e^{-rT_b}),$$

where $\kappa = \zeta/(e^{-r}-1)$.

It can be easily verified that the supply of activists increases in the boss rent, tenure, and the probability of promotion, and decreases in the workers' wage:

$$(5) \quad \frac{\partial N_a^s}{\partial R} > 0, \ \frac{\partial N_a^s}{\partial T_b} > 0, \ \frac{\partial N_a^s}{\partial \pi} > 0, \ \frac{\partial N_a^s}{\partial W} < 0.$$

This result is hardly surprising. It tells us that the willingness to become an activist is positively affected by the expected rent, which is the product of boss rent, tenure, and the probability of

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[12] This substitution that reduces the dimensionality of the problem is justified on the ground that activist service is typically institutionalized (for example, as a probationary period for a new party member or the length of military service for a recruit) and its duration is fixed, at least in the short run, while the tenures are seldom explicitly regulated, and their actual lengths fluctuate as a result of policy changes or political perturbations. Note that a change in the term of activist service *ceteris paribus* translates, by rescaling the time axis, into an increase in the rate of future discounting and a decrease in the duration of tenure in an equal proportion.

promotion. It is negatively affected by the value of the alternative to the activist-boss career track represented by the worker's wage.

At the core of the representative boss's choice problem is the tradeoff between additional rents provided by the activists and the limitation of tenure that the provision of incentives for the activists implies. By entering the contract with the activists, the bosses seek to maximize the present value of the residual lifetime rent:

(6) $$\overline{R} = \int_0^{T_b} f(N_a) e^{-rt} dt$$

To achieve this goal, they choose the probability of promotion, π, and the length of tenure, T_b, taking into account the workers' response expressed in the form of the supply of activists (4). An additional *stationarity constraint* to their problem results from the necessity to balance the inflow of promoted activists and retiring bosses:

(7) $$\pi N_a = \frac{N_b}{T_b} .$$

To simplify further analysis, let us combine the two constraints, by plugging (7) into (4) and rearranging the terms:

(8) $$N_a = \left[\kappa N_b \Delta R \frac{(1 - e^{-rT_b})}{T_b} \right]^{\frac{1}{2}} ,$$

where $\Delta R = R - W$ is the boss premium. In essence, (8) is the general form of the *activists participation constraint* that takes into account that the parameters of a sustainable promotion contract are not independent but are subject to the stationarity constraint (7). The representative boss's problem is then:

(9) $$\max_{T_b} \int_0^{T_b} f(N_a) e^{-rt} dt$$

subject to (8).

The bosses' objective function (6) can be characterized by the lines of equal levels of residual lifetime rents in the (T_b, N_a) plane – *isorents*:

$$(10) \qquad N_a = f^{-1}\left(\frac{rC}{1-e^{-rT_b}}\right),$$

where C is an arbitrary constant. The isorent (10) is a downward-sloping and convex curve. The activists participation constraint is also a downward-sloping convex curve originating at $N_a^{max} = \sqrt{\kappa N_b r \Delta R}$. Its curvature is systematically lower than that of an isorent and the point of tangency of the two curves represents the location of the unique optimal contract (Figure 1).[13]

The final constraint to the problem is determined by the outside option that is available to the bosses. An alternative to a regime with collective ownership and rotation of the ruling elite is one that is based on private property rights and lacks the support of activists. Rational bosses choose to enter into a promotion contract with the workers at a moment $T = 0$ if the present value of rents accumulated over the period of tenure, T_b, are expected to exceed those in the absence of activists' support (R_0 per period of time forever):

$$(11) \qquad \int_0^{T_b} f(N_a)e^{-rt}dt \geq \int_0^{\infty} R_0 e^{-rt}dt.$$

Integrating, taking logs, and rearranging terms yields the bosses' contract participation constraint:

$$(12) \qquad N_a \geq f^{-1}\left(R_0\frac{1-e^{-rT_m}}{rT_b}\right),$$

which is a hyperbolic curve.

Expression (12) determines the lower boundary of a region in the (T_b, N_a) plane, where the contracts acceptable for the bosses are located (Figure 1). A hierarchical regime described by the present model cannot exist in the region to the left of the bosses participation constraint curve. If (12) is binding, the bosses are indifferent between maintaining the contract and the regime change. The location of the boundary optimal contract is determined by the productivity of activists captured by the parameters of the function, $f()$.

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[13] Formal analysis is given in Mathematical Appendix (A).

To analyze the comparative statics of the equilibrium in the political labor market, let us note that the first-order condition to problem (9) can be represented in the following form:

(13) $$\frac{N_a f'(N_a)}{f(N_a)} = \frac{2rT_b}{e^{rT_b} - 1 - rT_b}$$

If we denote the left-hand side of (13), which is essentially the elasticity of the activists' production function, $X(N_a)$ and the right-hand side $Y(N_a) \equiv Y(T_b(N_a))$, where $T_b(N_a)$ is the inverse of (8), then the solution to (9) is the point of intersection of the two curves $X(N_a)$ and $Y(N_a)$. The position of $X(N_a)$ depends exclusively on the properties of the activists' rent-production function, $f(N_a)$, while $Y(N_a)$ depends on the same contract parameters as the supply of activists (4). It can be shown that $Y(N_a)$ is an upward-sloping curve with a vertical asymptote at $N_a^{max} = \sqrt{\kappa N_b r \Delta R}$. This implies that the equilibrium number of activists increases in the number of bosses, N_b, and the boss premium, $\Delta R = R - W$.

These results can be summarized as follows:

Proposition 1. *If the bosses' contract participation constraint (12) does not bind, then there exists a unique solution to problem (9), which defines the optimal contract between the bosses and activists. The number of activists N_a under optimal contract is increasing in the bosses' rent, R, and the number of bosses, N_b, and decreasing in wage, W.*

$$\frac{\partial N_a^*}{\partial R} > 0, \ \frac{\partial N_a^*}{\partial W} < 0, \ \frac{\partial N_a^*}{\partial N_b} > 0.\ {}^{14}$$

This means that higher inter-group inequality, represented in the model by the boss premium, produces greater support for the regime (a larger number of activists). We should bear in mind that this result is obtained under the assumptions of the promotion contract model and is conditional on the

[14] See proof in Mathematical Appendix (B).

bosses' ability to design the optimal contract and commit to its terms by retiring and promoting the activists.[15] The three derivatives above should therefore be jointly interpreted as a positive effect of the expected rent on the equilibrium number of activists under a stationary hierarchical regime. In this context, high and rising inequality is consistent with the regime stability. Persistent, substantial, and apparent income gap between the ruling elite and the working population in Stalin's Soviet Union and in China today seem to support this conclusion.

Proposition 1 also implies that increased spending on public goods or transfers affects the equilibrium number of activists negatively by increasing W and is therefore not conducive to the stability of a hierarchical non-democracy. Although we denoted W as wage, it does not have to be limited to nominal worker's earnings but should be interpreted more broadly as real consumption. This interpretation is particularly important when the state replaces a number of final consumer goods markets with administrative allocation[16] of publicly provided substitutes, as was the case with housing, health care, etc. Wage, W, should therefore be interpreted as a sum of private earnings plus per capita public consumption and transfers. Each of these components should have the same effect on the equilibrium number of activists as W.

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[15] A discussion of the causes and consequences of deviations from the optimal contract as it applies to the dynamic of the Soviet Communist party can be found in Lazarev (2005).

[16] It is well known that Soviet type economies extend centralized administrative allocation far beyond the healthcare, housing and other markets where democratic governments also tend to intervene (see Gregory and Harrison (2005) for a survey of allocation in the Stalinist economy). The governmental control of consumer markets complements the control over appointments. Both types of control served primarily political purposes. Lazarev and Gregory (2003), for example, show in the Soviet Union of the 1930s, political motives lied behind the patterns of administrative allocation of cars.

2.3. An Extension: Production with Activists-supervisors and Economic Policy

The analysis above produces certain important comparative statics results without making any restrictive assumptions about the activists' rent-production function, $f(N_a)$. The model as it has been developed so far has therefore broad applicability but limited explanatory power. While the validity of Proposition 1 does not depend on the properties of the activists rent-production function[17], further analysis of the effects of economic policy on the political labor market requires specifying a functional relationship between $f(N_a)$ and the economic output. Activists-supervisors, whose function is to elicit a higher level of effort from fellow workers, can be considered as a sort of labor-augmenting technology. The activists rent-production function can then be represented as:

(14) $f(N_a) = F\{K, (1+aN_a)L\}$,

where K is capital, L is labor, a is a productivity parameter, $F(K,L)$ is the production function of the economy with the standard properties: $F_K > 0$, $F_L > 0$, $F_{KK} < 0$, $F_{LL} < 0$, $F_{KL} > 0$.

Under these conditions, the left-hand side of (13) becomes:

(15) $X(N_a) = aN_a F_L L/F$.

The position of $X(N_a)$ depends on the elasticity of output with respect to labor input $F_L L/F$. If the production technology has unitary elasticity of substitution between labor and capital, $\rho = 1$, then $X(N_a) = aN_a (1 - \alpha)/(1+ aN_a)$, where α is the capital share, and $F_L L/F$ does not depend on factor proportions. If $\rho < 1$, then $F_L L/F$ increases (and $X(N_a)$ curves in Figure 2 fan out) as the capital-labor ratio increases. The reverse is true when $\rho > 1$. The case of a less-than-unitary elasticity of substitution is of particular interest in the context of this study. Numerous empirical studies show that the elasticity of substitution between labor and capital is typically less than one for most modern economies. In

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[17] The direction of change in the optimal number of activists N_a^* resulting from changes in wages, bosses' rents, or the number of bosses does not depend on the shape of $X(N_a)$ (See Mathematical Appendix and Figure 2).

particular, this applies to the Soviet economy. Weitzman (1970) and Easterly and Fisher (1995) show that Soviet economic growth is consistent with a CES production function with an elasticity of substitution significantly below one.[18] We can therefore formulate the following:

Proposition 2. *In an economy with a less than unitary elasticity of substitution between labor and capital, the number of activists under optimal contract is increasing in the capital and decreasing in labor employed in the national economy:* $\dfrac{\partial N_a^*}{\partial K} > 0, \ \dfrac{\partial N_a^*}{\partial L} < 0$.[19]

An important implication is that government investment in capital calls for increasing numbers of activists. The intuition behind this result is that with a substantial degree of complementarity between effective labor input and capital, more activists-supervisors have to be hired to elicit additional effort from workers to match an increase in capital. The opposite is true with respect to an increase in the labor force, since activists-supervisors are technically substitutes for crude labor input by assumption. Note also that the marginal effect of an increase in the capital-labor ratio on the magnitude of $F_L\,L/F$, and consequently on the position of $X(N_a)$ curves, diminishes as the capital-labor ratio increases. This means that the link between investment policy and the recruitment of activists is going to weaken with the accumulation of capital in the economy.

These theoretical statements can be illustrated by the history of the Soviet Union. As Lazarev (2005) shows, the period of forced industrialization, 1928-1940, with its low but rapidly growing

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[18] Both studies yield the elasticity of substitution around 0.4. Although some authors (see Desai, 1987) find that Soviet postwar economic growth is consistent with unitary elasticity of substitution, elasticity below unity seems to be typical for developing economies. It has been identified, for example, for the South Korean economy (Yuhn, 1992) and many others. Duffy and Papageorgiou (2000) find that less developed economies, as a group, are characterized by less-than-unitary elasticity of substitution.

[19] See proof in Mathematical Appendix (C).

capital-labor ratios, was characterized by record high numbers of activists (new party members). It was the time when the Stalinist hierarchical regime consolidated. By contrast, the "aging" Soviet regime in the 1970s and 1980s that presided over the economy characterized by overinvestment and diminishing returns to capital (see for example Easterly and Fisher 1995), saw a steady decline in the numbers of activists.

The empirical analysis in the remainder of this paper focuses on the determinants of equilibrium under a stable hierarchical regime. The post-Stalin Soviet Union provides an appropriate testing ground for the proposed model.

III. Data

The dataset used to test the model is a panel of nine states-republics of the former Soviet Union (no reliable data is available for the remaining six). The data cover the period of 1956-1968, roughly coinciding with the leadership of Nikita Khrushchev. There were no significant political and economic shocks during this period, and the institutional setting remained largely unchanged.

3.1. Institutional setting

Hierarchy. The Soviet Communist party hierarchy nearly mirrored the hierarchy of administrative (territorial) units of the Soviet Union. The major layers in the hierarchy included (from top to bottom): union, republic, oblast, district/independent city/urban district, primary party organization (PPO). The heads of party committees of all levels except the PPO were paid party bureaucrats (bosses in terms of the model). PPOs were typically associated with industrial enterprises. Secretaries of PPOs were paid only in the largest enterprises. The number of bosses and average boss salaries were largely determined by the size of the constituency and the number of subordinate units (if any). Changes in the administrative (territorial) structure translated typically into the creation and destruction of party bodies and, consequently, into changes in the number of paid positions for party

17

officials. Territorial structure was subject to frequent reshuffling, creating substantial cross-sectional and intertemporal variation in the number of paid positions and salaries.

Party membership. The rules of the Soviet Communist party (similar to other communist countries) specified a probation period for new members. During this time, new party recruits were titled *candidates*. Upon passing the candidate review successfully, they became *full* party members. Although the probability of promotion into full membership exceeded 90%, only a small share of the new full members actually remained on party career tracks and was able to reach a position in the party bureaucracy. Bureaucracy accounted for around one percent of the total party membership so that the a priori probability of promotion into the "bosses" (in terms of the model developed in this paper) was of the order of 0.01. The proportion of candidates in the total party membership gradually declined in all republics from about eight to five percent over the period of 1956-69. There was, however, a substantial cross-sectional variation in the rate and even the direction of change in the ratio of party candidates to the total labor force (Figure 3).

Benefits of party membership. Party membership was normally a prerequisite for appointment to a top managerial position in all spheres of the economy or for pursuing a career in government: civil administration, economic control, or party. A position of a "leading party worker" (party bureaucrat) was of the utmost importance. While rank-and-file party members enjoyed only minor non-pecuniary benefits of membership (such as softer punishment in case of criminal prosecution, preferential right to occupy certain types of jobs, etc.), party bureaucracy received substantial rents in the form of high salaries and fringe benefits. A major part of the party expenditure, according to national party budgets, was geared to provide benefits to paid party officials, the remainder being used to cover operational expenses and to finance propaganda campaigns (Belova and Lazarev 2007). Salaries of paid party officials constituted only a minor portion of their rents. Fringe benefits (health and child care subsidies, relocation packages, etc.) and non-monetary rewards, such as free housing financed from party budgets, constituted a significant part of their real incomes. Anecdotal evidence suggests a strong

correlation between fringe benefits and salaries. This makes salary an accurate indicator of the total party official's remuneration.

3.2. Available data

Numbers of candidates and full members are available on the national level for the whole period of the existence of the Soviet communist party. Republic level data are available for 1956-1968.[20] Significant lacunae in the time series restrict the dataset to nine republics: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Latvia, Tajikistan, Turkmenistan, and Uzbekistan. In the post-Stalin years, the candidate probation period was close to one year, so the number of candidates for a given year equals approximately the number of new activists. There is a significant variation in the rates of recruitment across the republics, although the end of the period is marked with convergence, probably due to increasing pressure from the central party leadership.

Communist Party budgets, deposited in the formerly secret party archives,[21] record total expenditures of the Central Committee and territorial organizations. The latter are the aggregate numbers for all administrative units below the national level. Breakdowns by republic are available only for the years 1950, 1962, and 1964. However, as mentioned earlier, the territorial structure of a republic (numbers of units in each level) determines the variation in the party payroll and in the average salaries by republics. Regression analysis shows that territorial composition indicators explain

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[20] John Scherer, ed. *USSR Facts and Figures Annual*. Various issues: 1977-1980. Academic International Press. *Ezhegodnik BSE,* 1971-1990. Sovetskaia entsiklopediia, Moskva. [*Great Soviet Encyclopedia; Annual Appendices*]

[21] Russian State Archive of Socio-Political Information (RGASPI). Fond 17 (Central Committee of the Communist Party of the Soviet Union): Opis 7 (Statistical department), Opis 75 (Finance department). Hoover/Chadwick-Healey. Soviet State and Party Archives Microfilm Series.

more than 99 percent of variation in party salaries across republics. These relationships are used to impute missing salary data.[22]

Demographic and economic data are available from published sources for 1956-1968 (as well as later years) for every republic in the sample.[23] Series of interest include employment,[24] nominal wages, retail sales, various indicators of public consumption, indices of industrial output, and annual investment in the economy. Primary capital stock data are not available, while existing estimates do not cover the whole period of this study and are therefore not used. All nine republics in the sample are relatively small and internally homogenous. The largest republics are Uzbekistan and Belarus (population around 8 million each, in 1959); the smallest republic is Estonia (just below 1 million).

Reliability of the data pertaining to the Communist party is virtually unquestionable since they were collected by the central party administration, were not published (with the exception of bare party membership) or even intended for publication, and were used only by the Central Committee accountants. Reliability of the published Soviet economic data has been often questioned but the dominating position is that the official Soviet statistics was not deliberately distorted, but suffered from the use of idiosyncratic concepts, omissions, and warped presentation – obstacles that are overcome through careful analysis. The data used in this study as they appear in *Narodnoe khoziaistvo* – in absolute levels – were clearly meant to demonstrate the ever-improving living standards of the population of all Soviet republics. However, simple transformations (first-differenced per capita indicators) produce the panel data that exhibit substantial variation both over time and across republics.

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[22] Details are available from the author upon request.

[23] *Narodnoe khoziaistvo SSSR.* Statistika, Moskva. [*National economy of the USSR.* Various issues, 1956-1969.]

[24] The Soviet policy of full employment makes labor force practically equivalent to the total employment in industry and state farms. Reported labor force does not include employment in collective farms, around one fifth of the total working-age population in the period of this study.

(See Table 3) This suggests that the available data had not been purposefully manipulated before publication.

IV. Empirical implementation and estimation results

4.1. Empirical specification

The following assumptions need to be made to relate the available data series to the model variables. The number of party candidates is equivalent to the number of activists, N_a. The boss premium, ΔR, is the gap between the rent, R, and the workers' real wage. R is approximated by the average salaries of the party officials. Several variables are used as the indicators of the real wages. Because of involuntary savings resulting from pervasive shortages in consumer markets, typical for the Soviet economy, nominal wage data are of little use. Retail sales, RS, per worker is a more accurate measure of consumption expenditure per wage earner. RS should have a negative effect on the number of activists. Three indicators of public consumption – enrollment in higher education institutions, ST, new public housing construction in square meters, NH, and physicians per capita, PH – should also have a non-positive effect (negative if provision of public goods is correlated with wages and zero otherwise). In addition, enrollment in institutions of higher education serves as a proxy for the availability of the "outside option" for potential activists: non-party professional careers.[25] Therefore, enrollment is likely to have a strictly negative effect on the number of activists. Finally, investment measures, investment per worker and the change in investment rate, used here as correlates of the changes in the capital-labor ratio, should have positive effect of less-than-unitary magnitude.

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[25] Total enrollment is equivalent to the number of "promotion tickets" available to the population outside of the party promotion machine. Although party membership was a plus for a college applicant, it was not a prerequisite for admission and higher education is therefore a distinct alternative to activist service.

It can be shown (see Mathematical Appendix (D) for details) that in an economy with the elasticity of substitution below unity, the equilibrium number of activists in the short run is determined approximately by:

(16) $\qquad \ln(N_a) = \beta_0 + \beta_1 \ln(N_b) + \beta_2 \ln(\Delta R) + \beta_3 \ln(K/L)$, where $\beta_1 > 0, \beta_2 > 0, 0 < \beta_3 < 1$.

The model variables in (16) need to be replaced with actual data series as described earlier in this section. Since N_a and N_b are shares (ratios of absolute numbers of activists and bosses respectively and total labor, L), (16) needs to be rewritten in terms of absolute numbers with all the terms for labor collected together to avoid spurious correlation. In addition, it is desirable to use first-order log differences in order to exclude the time trend and fixed effects.

The complete empirical specification is given by:

(17) $\qquad \Delta \ln(A_{it}) = \beta_0 + \beta_1 \Delta \ln(B_{it}) + \beta_2 \Delta \ln(R_{it}) + \beta_3 \Delta \ln(RS_{it}) + \beta_4 \Delta \ln(L_{it})$

$\qquad\qquad\qquad + \beta_5 I_{it} + \beta_6 \Delta \ln(ST_{it}) + \beta_7 \Delta \ln(PH_{it}) + \beta_8 \Delta \ln(NH_{it}) + \varepsilon_{it}$

In the expression above, A_{it} is the absolute number of activists and B_{it} is the absolute number of bosses. I_{it} replaces K/L in the prototype specification (16) and is alternatively log of investment per worker, $\ln(I/L)$, or the change in investment rate, $\Delta \ln(I/Y)$.

Labor force, L_{it}, is present in (17) as the denominator for the other variables (except for investment, I_{it}, and physicians per capita, PH_{it}, which comes originally in per capita terms). The theoretical model deals with the numbers of activists and bosses as shares of labor force, and the wage (retail sales divided by labor). Enrollment and housing also should be measured with respect to the total labor force. Therefore, the net effect of the labor force is given by:

(18) $\qquad \beta_{NL} = \beta_1 + \beta_3 + \beta_4 + \beta_6 + \beta_8 - 1.$

This net effect should equal zero if the linearized model (16) is sufficiently accurate and the proxies for the change in capital-labor ratio are adequate. Predictions of the promotion contract model with respect to the empirical specification (17) are summarized in Table 1.

4.2. Estimation results

The model (17) is estimated using the feasible GLS method with three error term specifications: random effects, cross-sectional heteroskedasticity, and cross-sectional correlation. Both proxies for the change in capital-labor ratio produce similar results (reported in Table 2), with the exception of the effect of investment itself, which has higher significance if log change in investment rate is used (columns (4-6) in Table 2). All these estimates are robust with respect to sample composition. In particular, truncation of the time period on either or both sides or removal of one to four cross-sections at random does not affect the sign and the order of magnitude of any parameter estimate. Experimenting with various subperiod dummies shows that an additional constant for the years after 1961 improves the results most significantly. Only estimates with the *After_1961* dummy are reported in Table 2.

The signs and magnitudes of the parameter estimates are consistent with the promotion contract model. The number of bosses, N_b, has a positive coefficient as expected. The boss rent (party salaries), *R,* also has a positive effect, although its significance is low. Signs and magnitudes of both investment indicators are consistent with the production technology with low elasticity of substitution between labor and capital. Net effects of labor force, insignificantly different from zero, suggests that linearized model (17) is appropriate. The variables that measure public consumption – enrollment in higher education institutions, *ST*, new public housing construction, *NH*, and physicians per capita, *PH*, – also have expected signs or are insignificant (*NH*). These effects provide additional support for the theoretical result that the real wages of the working population (broadly conceived) should have a destimulating effect on the supply of activists. Enrollment, *ST*, can be also interpreted as an indicator of the availability of alternative opportunities for vertical income mobility which was not introduced explicitly in the theoretical model. The negative effect of this variable is in agreement with this interpretation. It can be argued, however, that the rulers value an educated 'cadre' and, therefore, a higher educational attainment increases the chances of promotion and/or is a reward for extra effort.

This contradicts the alternative-opportunity function of higher education. The low significance of *ST* in most specifications can be, therefore, considered as resulting from the counteraction of the two effects of the higher education on the incentives to join the ranks of activists. Finally, significant negative estimates of the *After_1961* dummy can be explained by the elevated expectations of promotion on the part of the activists due to the temporary increase in the rate of turnover within the Soviet party bureaucracy in 1956-61, when Stalin's cohort of bosses was largely forced to retire.

A distinctive feature of the results is the higher significance of variables that correspond to the negative stimuli to become an activist (retail sales, enrollment in higher education, etc.) versus low significance of positive ones (the number of bosses and their average salary). The contribution of the latter into the explained variation is one order of magnitude lower than that of the former. Although the proxy for the boss rent used here – salary – accounts for only a portion of the total remuneration of the bureaucrats, there might be a more general explanation for the relative strength of the "push" of low wages versus the "pull" of expected rents. The variables that determine the latter are far from perfectly observable by a worker considering the choice to become an activist. The information on the number of positions in the bureaucracy and the bosses' salaries and benefits is hardly public domain under any non-democratic regime. The information can only be acquired indirectly and is easily distorted in transmission. It is not surprising therefore that the supply of activists is more elastic with respect to the workers' consumption than the boss rent. This implies that future empirical research on hierarchical regimes is unlikely to be significantly hampered by the lack of access to the data that pertain to the opaque higher tiers of the ruling bureaucracies, as long as relevant economic variables can be observed.

In part, these results reconfirm earlier findings by Schnytzer and Sustersic (1998) for the former Yugoslavia. The essence of their findings is that the lower wages and employment, the higher the supply of activists, as revealed in the party recruitment rates. The negative treatment effect of the post-1961 period, however, indirectly contradicts the positive effect of repression on the support for the regime identified by these authors, since it was the period of 1956-61 that was characterized by more

liberal policies in the Soviet Union. Results in this paper are also in general agreement with the results of the cross-country studies by Feng and Zak (1999) and Barro (1999), although it is hard to compare the findings directly due to the differences in the composition of the datasets. Both studies reveal a positive correlation between low inequality and a high level of education with the probability of democratic transitions (the former) or propensity for democracy (the latter). These results are consistent with our assumption of the rent-maximizing rulers and the rational population, responsive to promotion incentives. The analysis in this paper, however, indicates that both sides of the political labor market influence the observed outcomes significantly. Economic incentives for both incumbent bureaucrats and activists determine the equilibrium number of party candidates under a hierarchical regime.

V. Conclusion

Collective control rights over the economy, as opposed to private property rights, create the possibilities for the rulers in a political hierarchy to "borrow" support and rent-augmenting services of the activists in exchange for promises of deferred promotion. Institutional forms that facilitate the political-economic exchange of this type vary historically and across countries. What they all have in common is the turnover within the hierarchical ruling stratum and implicit promotion contracts that provide participation incentives for both the workers and the rulers. Efficiency of this exchange is a function of the income gap between workers and rulers. The more thorough the governmental control over the paths of upward income mobility in society, the closer its position is to the monopsony in the political labor market, the more rents the rulers can capture. The efficiency depends also on production technology. Activists' supervisory service is essentially a labor-augmenting technology. In an economy with low elasticity of substitution between labor and capital, this produces a positive correlation between the rulers' demand for activists and public investment.

The two groups of factors affecting the supply of activists and the rulers' demand for activist services are responsible for the emergence of hierarchical regimes. Most such regimes were established in the twentieth century in low-income countries that were facing developmental challenges. Similar factors can be responsible for the reverse movement – endogenous democratic transitions. The regime analyzed empirically in this paper, USSR in the 1950s-60s, seems to be an example of a stable hierarchical regime. However, the observed effects of the economic parameters of the promotion contract on the political variables suggest the ways in which economic development can bring the equilibrium of such a regime to the limit. On the one hand, as an economy on the modern growth path becomes more complex, the rulers gradually lose control over the workers' earnings. If the rates of economic growth are relatively low, then the boss premium will decrease. If the rates are high, the expectations of sustained growth are likely to make certain earnings of ordinary workers preferable to the lottery of activist service. In either case the supply of activists is affected adversely. On the other hand, the demand effect of investment policy fades away with the accumulation of capital in an economy with a low elasticity of capital-labor substitution. Adoption of modern labor-substituting technologies reverses this effect. Again, in either case the economic foundation of a hierarchical regime is bound to decay. A scenario of this kind should have led to democratic transitions in the former Soviet Union and Central and Eastern Europe. Simultaneous analysis of political variables and economic parameters of the promotion contract could shed a light on the prospects of contemporary non-democratic regimes such as the ones that exist in China and other countries.

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Mathematical Appendix

A. Properties of the isorent and the activists participation constraint

The inverse of the rent-production function $f^{-1}()$ is an increasing and convex function since $f()$ is an increasing and concave function by assumption. The isorent $N_a = f^{-1}\left(\dfrac{rC}{1-e^{-rT_b}}\right)$ as a function of boss tenure, T_b, is a superposition of $f^{-1}()$ and the function in brackets, which is decreasing and convex. The isorent is therefore a decreasing and convex function of T_b. It is easy to observe that the isorent has a horizontal asymptote, $N_a = f^{-1}(rC)$. At the other end of the range, in the vicinity of $T_b = 0$, $N_a \cong f^{-1}(C/T_b)$, that is, it behaves approximately as a hyperbolic curve $T_b^{-\alpha}$ with $\alpha \geq 1$.

The derivative of the activists participation constraint (8) with respect to the boss tenure is:

$$\frac{dN_a}{dT_b} = \tfrac{1}{2}\sqrt{\kappa N_b \Delta R}\left[-T_b^{-3/2}\left(1-e^{-rT_b}\right)^{1/2} + T_b^{-1/2}\left(1-e^{-rT_b}\right)^{-1/2} re^{-rT_b}\right]$$

Rearranging terms and substituting (8) into the expression above obtains:

(19) $$\frac{dN_a}{dT_b} = \frac{N_a}{2}\left(-T_b^{-1} + r\left(e^{rT_b}-1\right)^{-1}\right).$$

This derivative is always negative. To show this, we need to show that the term in brackets is negative: $-T_b^{-1} + r\left(e^{rT_b}-1\right)^{-1} < 0$. Indeed, rearranging and denoting $z = rT_b$, yields $z+1 < e^z$, which obviously holds for any z. Therefore, the activists participation constraint is a downward-sloping curve in the (T_b, N_a) plane.

Additionally, it follows immediately from (8) that, at $T_b = 0$, N_a reaches its maximum value, (A1.2)

$$N_a^{\max} = \sqrt{\kappa N_b r \Delta R},$$

while $N_a \sim T_b^{-1/2}$ when $T_b \gg 1$, i.e., the activists participation constraint approaches the horizontal axis asymptotically. The absolute value of the derivative (A1.1) decreases monotonically from its maximum of $r/2$ reached at $T_b = 0$ to zero.

It follows immediately from the juxtaposition of the properties of the isorent and the activists participation constraint that there exists only one C such that $0 < f^{-1}(rC) < N_a^{\max}$ that produces an isorent tangent to a given activists participation constraint. The point of tangency is the locus of the optimal contract that solves problem (9).

B. Proof of Proposition 1.

It follows from the properties of the activists participation constraint discussed (see Appendix A) that its inverse, $T(N_a)$, has the following properties:

(B1a) $\qquad$ $T'(N_a) < 0,$

(B1b) $\qquad$ $T''(N_a) > 0,$

(B1c) $\qquad$ $T(N_a) \to \infty$ as $N_a \to 0,$

(B1d) $\qquad$ $T\left(\sqrt{\kappa N_b r \Delta R}\right) = 0.$

Let us show that $Y(T)$ has the following properties:

(B2a) $\qquad$ $Y(T) \to \infty$ as $T \to 0,$

(B2b) $\qquad$ $Y(T) \to 0$ as $T \to \infty,$

(B2c) $\qquad$ $Y'(T) < 0,$

(B2d) $\qquad$ $Y''(T) > 0,$

Since $Y(T) = \dfrac{2rT}{e^{rT} - 1 - rt}$ has an exponent in the denominator, it approaches zero as T approaches infinity and vice versa. At $T = 0$, $Y(T) \to \infty$,by the L'Hôpital rule.

The derivative of $Y(T)$ is:

$$Y'(T) = \frac{2r\left(e^{rT} - 1 - rT\right) - 2rT\left(re^{rT} - r\right)}{\left(e^{rT} - 1 - rt\right)^2} = \frac{2r\left(e^{rT} - 1 - rTe^{rT}\right)}{\left(e^{rT} - 1 - rt\right)^2}$$

We need to show that the numerator in the last expression is negative. Rearranging the terms in $e^{rT} - 1 - rTe^{rT} < 0$ obtains $1 - rT < e^{-rT}$, which is true for any positive T.

Finally, (B2d) follows immediately from properties (B2a-B2c).

Since $Y(N_a) \equiv Y(T(N_a))$ is a superposition of two convex, monotonically decreasing functions, $Y(N_a)$ is a convex and monotonically increasing function:

$$Y'(N_a) > 0,$$

$$Y''(N_a) > 0.$$

In addition, it follows from (B2b) and (B1c) that $Y(0) = 0$ and it follows from (B2a) and (B1d) that $Y(N_a)$ has a vertical asymptote at $N_a^{\max} = \sqrt{\kappa N_b r \Delta R}$.

The properties of $Y(N_a)$ imply that an increase in N_b or ΔR shift the asymptote and therefore the point of intersection of $Y(N_a)$ and $X(N_a)$ to the right. This in its turn means that the equilibrium number of activists increases. Therefore, $\dfrac{\partial N_a^*}{\partial R} > 0, \ \dfrac{\partial N_a^*}{\partial W} < 0, \ \dfrac{\partial N_a^*}{\partial N_b} > 0.$ ∎

C. *Proof of Proposition 2.*

It can be easily observed that $X(N_a) = a N_a F_L L/F > 0$, when $N_a > 0$, and $X(0) = 0$.

The derivative of $X(N_a)$ with respect to the number of activists equals:

(C1)
$$\frac{dX}{dN_a} = \frac{aL}{F^2}\left[\left(F_L + aLN_a F_{LL}\right)F - aLN_a \left(F_L\right)^2\right] = \frac{aL}{F^2}\left[F_L + aLN_a \left(F_{LL} - \frac{\left(F_L\right)^2}{F}\right)\right].$$

At $N_a = 0$, (C1) collapses into aLF_L/F^2 and therefore $X'(N_a) > 0$ at low levels of N_a (in the neighborhood of zero). Since the factor in round brackets is negative and the second term increases in absolute value with an increase in N_a, $X''(N_a) < 0$. The second term may exceed F_L to the right of some point $N^\wedge$. In that region, $X(N_a)$ bends down. Alternatively, $X'(N_a)$ may remain positive as $N_a \to \infty$. Therefore, $X(N_a)$ reaches the maximum at a certain point, which may or may not lie within the range of admissible values of N_a, to the left of $\min(1, \sqrt{\kappa N_b r \Delta R})$. In either case, $X(N_a)$ is concave.

If the production technology has less than unitary elasticity of substitution between labor and capital, then $F_L L/F$ and, therefore, $X(N_a)$ by (15) increases in capital-labor ratio, K/L. Since $Y'(N_a) > 0$, the point of intersection of the curves $X(N_a)$ and $Y(N_a)$ shifts to the right. Therefore, the optimal number of activists increases in the capital-labor ratio or: $\dfrac{\partial N_a^*}{\partial K} > 0, \ \dfrac{\partial N_a^*}{\partial L} < 0$ ∎

D. *Approximation for an economy with the elasticity of substitution below unity.*

31

Following the discussion in Section 2.4, the generic specification of the activists rent-production function can be replaced with a specification that is based on a CES production function with the elasticity of substitution between capital and labor below unity:

(20) $$f(N_a) = [K^\rho + ((1 + aN_a)L)^\rho]^{\varepsilon/\rho}, \quad \varepsilon \leq 1, \rho < 0.$$

Accordingly, following the analysis in Section 2, one of the two functions that determine the parameters of optimal contract, $X(N_a)$, takes the form of:

(21) $$X(N_a) = \varepsilon a N_a^\rho [(K/L)^\rho + (1 + aN_a)^\rho]^{-1}.$$

Since reasonable numbers of activists are small ($N_a \sim 10^{-2}$), (21) can be approximated for negative values of ρ by:

(22) $$X(N_a) = akN_a^\alpha (K/L)^\beta, \quad \text{where } k > 0, 0 < \alpha < 1, 0 < \beta < 1.$$

Similarly, it can be shown that in the range of N_a and N_b that is considered here and for reasonable values of parameters ($r \ll 1$, $T_b \gg 1$, $K/L \sim 1$)

(23) $$Y(N_a) \cong bN_a^\gamma (\kappa N_b r \Delta R)^\delta, \quad \text{where } \gamma > 1, \delta < 0.$$

Exponents in D3 and D4 only parameterize the approximation of $X(N_a)$ and are in no meaningful way related to the parameters of production function.

Combining (22) and (23), taking logs, rearranging terms, and relabeling coefficients obtains the reduced form equation:

$$\ln(N_a) = \beta_0 + \beta_1 \ln(N_b) + \beta_2 \ln(\Delta R) + \beta_3 \ln(K/L),$$

where $\beta_1 > 0$, $\beta_2 > 0$, $0 < \beta_3 < 1$, as follows from (22) and (23).

Tables

Table 1. Expected effects in the empirical model.

Variable	Expected effect
Number of bosses	> 0
Average boss salary	> 0
Retail sales	< 0
Students	< 0
Physicians per capita	≤ 0
New housing	≤ 0
Investment	0 ÷1
Labor force, net effect	0

Table 2. Estimation results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	0.0280 (0.0613)	− 0.0175 (0.0456)	0.0372 (0.0654)	0.0684 (0.0521)	0.0382 (0.0372)	0.0801 (0.0568)	0.1196** (0.0532)	0.1274*** (0.0490)	0.1220** (0.0587)
After 1961							− 0.1004*** (0.0361)	− 0.1257*** (0.0478)	− 0.0904** (0.0404)
Number of bosses	0.5774*** (0.2227)	0.3239 (0.2049)	0.5606** (0.2457)	0.4589** (0.2214)	0.2632 (0.1940)	0.4664* (0.2401)	0.6692*** (0.2212)	0.4328** (0.1859)	0.6431*** (0.2479)
Average boss salary	0.4252 (0.4278)	0.2998 (0.3318)	0.3848 (0.4711)	0.4752 (0.4368)	0.2223 (0.2951)	0.4558 (0.4613)	0.8327* (0.4260)	0.4386 (0.2704)	0.7239 (0.4670)
Retail sales	− 1.4120*** (0.4587)	− 0.4808 (0.3541)	− 1.4476*** (0.4940)	− 1.3328*** (0.4464)	− 0.5925* (0.3201)	− 1.4012*** (0.4851)	− 0.7922* (0.4769)	− 0.3916 (0.3078)	− 0.8910* (0.5267)
New housing	− 0.0143 (0.1040)	0.0278 (0.0559)	0.0056 (0.1177)	− 0.0117 (0.1038)	− 0.0105 (0.0569)	− 0.0001 (0.1140)	− 0.1447 (0.1066)	− 0.1016* (0.0577)	− 0.1083 (0.1216)
Physicians per capita	− 1.1415** (0.5540)	− 0.4954 (0.3209)	− 1.0911* (0.6109)	− 0.8666 (0.5452)	− 0.6055** (0.3094)	− 0.8351 (0.5678)	− 1.1092** (0.5191)	− 0.7823*** (0.2990)	− 0.9642* (0.5586)
Students	− 0.6093** (0.2865)	− 0.4236** (0.1835)	− 0.5329* (0.3149)	− 0.6835** (0.2734)	− 0.5730*** (0.1628)	− 0.6104** (0.3033)	− 0.3384 (0.3025)	− 0.3270** (0.1595)	− 0.2858 (0.3304)
Investment	0.0888* (0.0484)	0.0682* (0.0409)	0.0788 (0.0524)	0.3629** (0.1483)	0.2621*** (0.0706)	0.3469** (0.1564)	0.3442** (0.1410)	0.2441*** (0.0639)	0.3352** (0.1531)
Labor force	2.6532*** (0.5922)	1.7546*** (0.3219)	2.4696*** (0.6364)	2.5069*** (0.5986)	1.7100*** (0.3002)	2.2844*** (0.6377)	1.8242*** (0.6313)	1.3426*** (0.2988)	1.6451** (0.6865)
Labor force, net effect	0.1950 (0.7277)	0.2019 (0.4503)	0.0554 (0.7985)	0.0623 (0.7245)	0.2027 (0.4077)	0.2609 (0.7885)	0.2181 (0.7054)	− 0.0448 (0.4198)	0.0031 (0.7805)
R^2	0.283	0.237	0.285	0.303	0.267	0.305	0.339	0.314	0.342

Notes:
1) Standard errors in parentheses.
2) Error term specifications: (1, 2, 4, 5, 7, 8) – cross-sectional heteroskedasticity; (2, 5, 8) – cross-sectional correlation; (3, 6, 9) – random effects..
3) Investment: (1-3) – log (I/L); (4-9) – $\Delta \ln(I/Y)$.
4) Significance: * – 10%, ** – 5%, *** – 1%.

Table 3. Summary Statistics.

	1956-1961			1962-1968		
	Mean	Standard deviation		Mean	Standard deviation	
		Between	Within		Between	Within
Number of bosses	-0.1252	0.0259	0.0570	-0.0571	0.0114	0.0576
Average boss salary	0.0213	0.0057	0.0329	0.0095	0.0046	0.0220
Retail sales	0.0154	0.0132	0.0499	0.0339	0.0100	0.0261
New housing	0.0912	0.0328	0.1694	-0.0119	0.0262	0.0966
Physicians per capita	0.0248	0.0185	0.0264	0.0228	0.0129	0.0169
Students	-0.0126	0.0311	0.0414	0.0416	0.0176	0.0300
Investment	0.0796	0.0231	0.0570	0.0481	0.0181	0.0448

Figures

Figure 1. Optimal promotion contract.
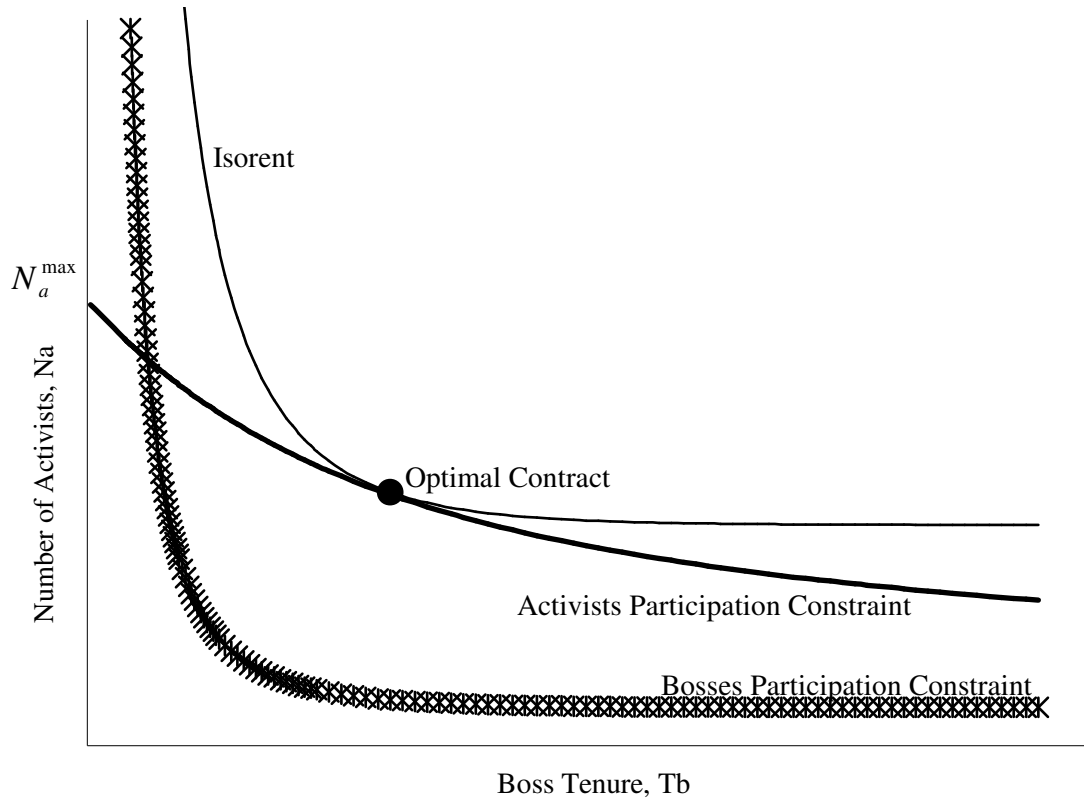
Figure 2. Configuration of $X(N_a)$ and $Y(N_a)$ and the equilibrium number of activists.

$Y(T(N_a))$

$X(N_a) = aN_aF_L\,L/F$

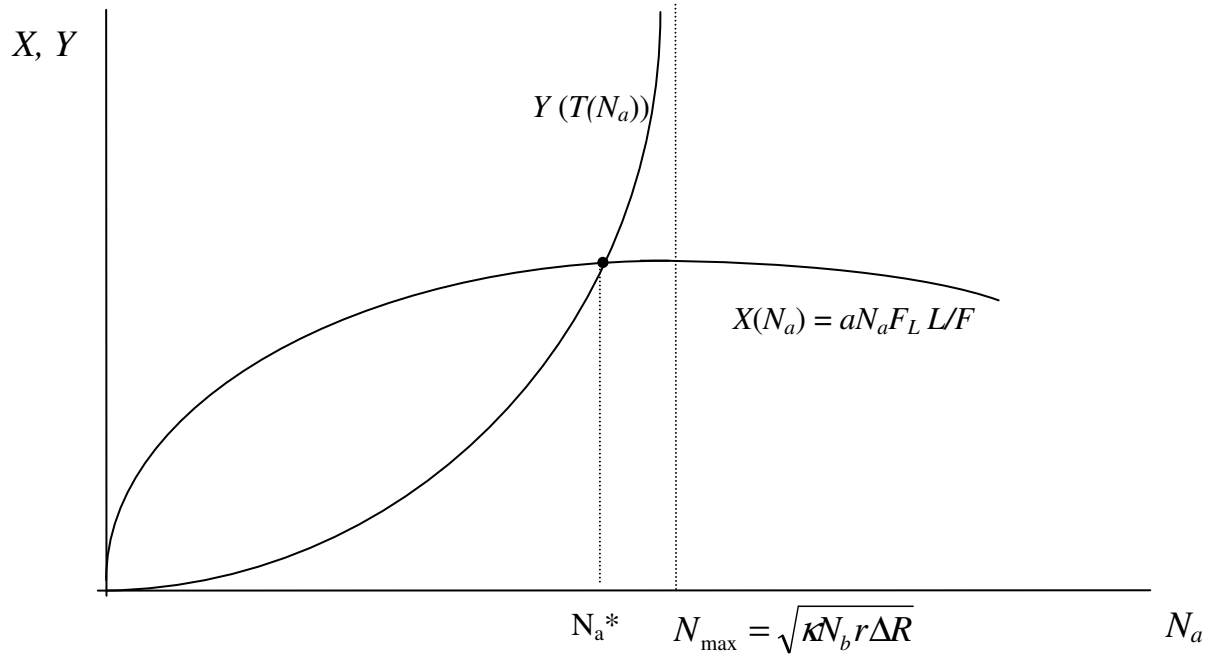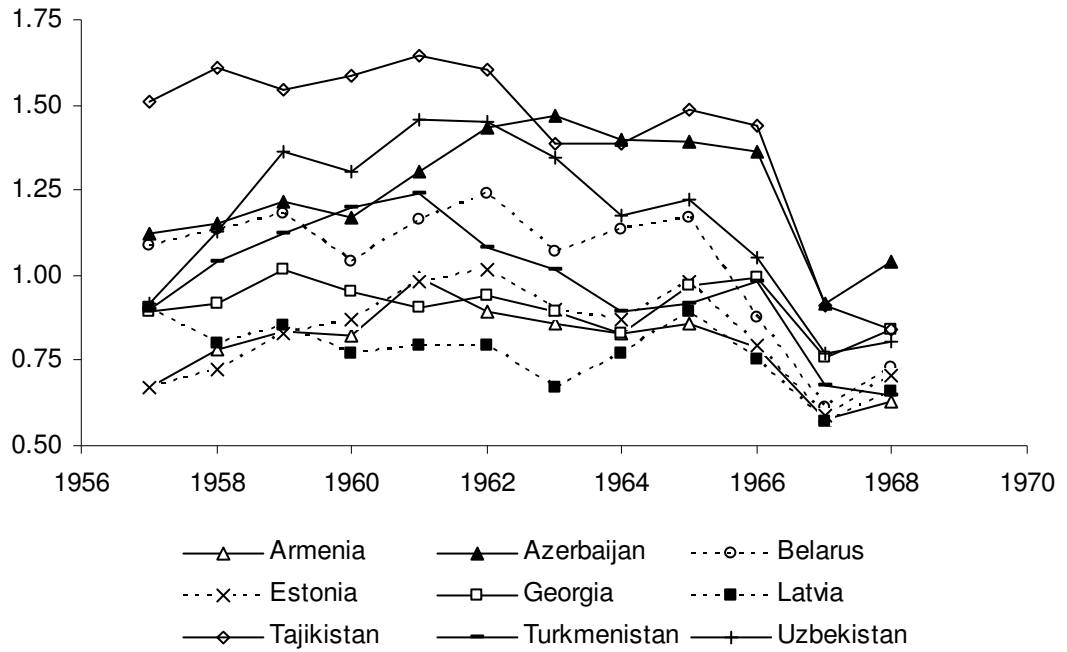N_a* $N_{max} = \sqrt{\kappa N_b r \Delta R}$ N_a

Figure 3. Party candidates as percentage of labor force by state, 1957-1968.

Sources: Party membership: *UFFA*. Labor force: *Narodnoe khoziaistvo*.