

Democracy, Autocracy, and Bureaucracy *

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Abstract

Democratic and autocratic rulers alike must use a bureaucracy to implement policy. In each case the optimal policy is a second-best solution to this agency problem, giving the bureaucrat some economic rent for information revelation and effort incentive. This paper argues that autocrats are less willing to sacrifice rents, and therefore accept a worse second-best (here less of a public good) than democrats. It also finds a synergistic matching between a democratic ruler and an altruistic bureaucrat who internalizes the citizens' welfare. This synergy is absent for autocrats, but they can gain by extorting from highly altruistic agencies like NGOs.

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1 Introduction

Whether a democratic regime or an authoritarian one is better for economic development has been much discussed and researched. Most western observers and analysts intuitively favor democracy, and indeed their position finds substantial theoretical and empirical support. But others offer counterarguments and evidence favoring authoritarianism at least in some phases of development. Some of this conflicting literature is summarized in the next section.

Most of this research views economic policymaking in democracies as an electoral or legislative process, and regards decisions in an authoritarian regime as made by a dictator. In reality, except in states of trivial size, rulers do not implement their decisions directly, but must rely on several intermediate layers of administration. Most models of democracy as well as dictatorship, by ignoring this aspect, implicitly assume that the policy chosen at the top level will be implemented efficiently by a Weberian bureaucracy. In reality there are numerous problems and constraints at the stage of policy implementation, and the top-level decision-makers should look ahead and take these into account when designing their policies.

Our understanding of government and public policy stands to gain much by studying in greater detail the internal structure of the organization that makes and implements public policies. This “opening the black box of policy administration” is analogous to what occurred in the theory of the firm. Our view of the firm has changed for the better, from a mechanical maximizer of profit (or some other objective in cases of managerial or labor-managed firms) taking technology and factor prices as given, to an organization that must tackle manifold problems of internal governance and incentives. Analysis of the process of policy implementation promises similar progress.

In this paper I use such an organizational perspective to examine a new bureaucracy-based reason for difference between democracy and authoritarianism. This is offered as an additional or complementary idea, not an alternative to the findings of previous research based on differences in the nature of the top rulers per se.

In democracies and in autocracies, bureaucrats are agents of the top-level policymakers. This brings the usual moral hazard and adverse selection problems. We know from the general theory of agency that the principal’s constrained optimum requires giving the agent some rent to induce him to take a desired but unobservable action, and to reveal truthfully his private information. Giving up rent is costly in terms of the policymaker’s objective; therefore he has to trade off economic efficiency of the outcome against the loss of rent to the agent, and accept a second-best outcome. Democratic and autocratic regimes have

different objectives (either inherently in the preferences of the policymakers, or because of the differences in the constraints imposed on them by the citizens). Specifically, democrats may not wish to, or in any event are not permitted to, extract much from the economy for themselves. They give rent to the bureaucrats by transferring it from the citizens; this is costly only to the extent that transfers involve a dead-weight loss. Autocrats who want to extract rent from the economy for their own benefit must give rent out of their own pockets to bureaucrats. Therefore rent loss is more costly to autocratic rulers, and they must correspondingly accept a more inefficient second-best, than democratic rulers.

To highlight the difference with the least mathematical complexity, I will model and compare two extreme pure or ideal types: a democratic ruler who cannot extract any rent at all, and an autocrat who wants to and can maximize his own extraction, in each case subject to the information constraints of the bureaucratic agency relationship. In the real world, democratic rulers do extract some rent, and some autocratic rulers do care about the welfare of their populations. But my qualitative results comparing democracies and autocracies hold so long as the constraint on extracting rents is tighter for democrats than autocrats.

Just as governments can have different objectives, explicitly or implicitly, ranging from social welfare maximization to maximizing the ruling elite's private extraction from the economy, bureaucrats may have varying degrees of innate concern about the citizens' welfare. This raises the possibility of a positive associative matching between types of governments and bureaucrats, where social welfare maximizing governments selectively hire concerned bureaucrats, and kleptocratic governments hire selfish bureaucrats. This can provide another reason for superior performance of democracies. The results of the model in this paper show some such synergies in equilibrium.

There is empirical evidence of such matching. The World Bank's Governance Indicators Project (see <http://info.worldbank.org/governance/wgi/index.asp>) constructs six indicators. One of them, Voice and Accountability, captures "perceptions of the extent to which a country's citizens are able to participate in selecting their government," and therefore spans the spectrum between an ideal democracy and an autocratic regime. Another, Government Effectiveness, captures "perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation"; this relates to the quality of bureaucracy. The two measures are highly correlated; in 2008 across 212 countries, the correlation coefficient between them was 0.735. This should not be taken too literally. Each of the measures has

potential problems of its own that the constructors acknowledge; see Kaufmann and Kraay (2008). The democracy/autocracy distinction is only imperfectly related to the distinction between objectives of the ruler that is the true basis for the analysis in this paper. And the quality of bureaucracy is a mixture of the efficiency and concern aspects considered here. But the high correlation does suggest a fact that calls for explanation, and the model of this paper contributes to that, even though it is unlikely to be the sole or a complete explanation.

Another measure comes from Evans and Rauch (1999): the “Weberianness” of the bureaucracy. This measure, using data for 35 countries for 1993-6, based on meritocratic selection and career prospects, is a mixture of the efficiency and concern aspects considered here. Evans and Rauch find that the measure is significant in a regression for economic growth in a cross-section of countries, controlling for initial GDP per capita and human capital. However, they do not examine the interaction with the type of regime. Polity III data from ICPSR based at the University of Michigan gives ratings of countries for two regime types, Autocratic and Democratic. (These two measures are almost but not exactly the opposite of each other). I correlated these ratings for 1994 for the set of countries in the Evans-Rauch study. Weberianness has a correlation coefficient of 0.19 with the Democracy measure and -0.24 with the Autocracy measure. These are consistent with the tendency toward synergy between democratic rulers and altruistic bureaucrats in my model, but the correlations are not significant even at the 10% level so the evidence is not conclusive. My model can claim to explain at best only a part of the interaction between rulers and bureaucrats.

How such synergistic matching affects outcomes for public goods depends on the type of ruler and the extent of the bureaucrat’s altruism, but one case is worth highlighting here. If the bureaucrat is highly altruistic, as is the case with many NGOs delivering services in LDCs, the model predicts that a predatory autocratic ruler will extract rent from the NGOs even more profitably than from his own citizens. A dramatic example of this was reported by *The Economist*: after the May 2008 cyclone hit Myanmar, the military junta imposed high import duties on the emergency relief supplies that NGOs brought into the country.¹

After the literature review, I outline a model in which each of these points can be made in the simplest possible way. Then I describe the modifications and extensions of the model, and suggestions for future research, to analyze various further aspects of reality.

¹“Myanmar’s Misery,” *The Economist*, May 8, 2008.

2 An Overview of the Literature

Many general reasons or mechanisms have been advanced to claim superiority of democracy in delivering economic outcomes; here is a small sample.

One of the best known arguments concerns commitment. In this theory, inefficiencies arise because those currently in power are unable to make the commitments needed to elicit efficient economic and political actions from the citizens. Democracies must follow established procedures to change policies, whereas autocrats can change them arbitrarily; therefore democracies suffer less from the commitment problem. Acemoglu (2003) and Acemoglu and Robinson (2006) focus on this aspect. Besley, Persson, and Strum (2005) using data from the United States argue that political competition is a key to better economic policies and outcomes. Besley and Burgess (2002) using panel data from India find that an informed and active electorate leads to effective incentives for governments to respond to economic problems, and that mass media play an important part in this process. In other words, democracy succeeds by facilitating voice and participation. Bardhan (2005, ch. 1) also stresses the importance of democratic participation in a generalized interpretation of the “rule of law.” Rodrik (2000) emphasizes the importance of local knowledge in the process of successful institution-building, and argues that participatory democracy is meta-institution that facilitates such use of local knowledge and thereby enables higher-quality growth.

But an equally impressive emerging literature makes a serious case for authoritarian governments and institutions when it comes to starting growth and development. Glaeser et al. (2004) argue that less-developed countries that achieve economic success do so by pursuing good policies, often under dictatorships, and only then do they democratize. Giavazzi and Tabellini (2005) find a positive feedback between economic and political reform, but they also find that the sequence of reforms matters, and countries that implement economic liberalization first and then democratize do much better in most dimensions than those that follow the opposite route.

Lake and Baum (2001) and Deacon (2003) find that democrats provide significantly more public goods – public schools, roads, safe water and sanitation, and pollution control – than do autocrats, after controlling for several other relevant factors. However, Mulligan, Gil and Sala i Martin (2004) do not find any significant differences in either direction.

At an anecdotal level, Taiwan and South Korea in the 1960s and 1970s, and China in the last two decades, are striking examples of authoritarian regimes that deliver economic success; there are numerous examples of democratic economic successes and failures; and

Japan and Singapore can be thought to be mixed cases in their economic policymaking. But more systematic empirical work, consisting of cross-country regressions, yields mixed results on the comparison of democratic or authoritarian governments in this regard. For example, Barro (1999, p. 61) found a relatively poor fit and an inverse U-shaped relationship. He suggested that “more democracy raises growth when political freedoms are weak, but depresses growth when a moderate amount of freedom is already established.” Persson (2005), using cross-sectional as well as panel data, finds that the crude distinction between democratic and non-democratic forms of government is not enough; the precise form of democracy matters for policy design and economic outcomes. “Reforms of authoritarian regimes into parliamentary, proportional, and permanent democracies seem to foster the adoption of more growth-promoting structural policies, whereas reforms into presidential, majoritarian, and temporary democracy do not.” However, Keefer (2004 a), after surveying a wide-ranging literature on electoral rules and legislative organizations, concludes that they affect policies but are not a crucial determinant of success: “electoral rules almost surely do not explain why some countries grow and others do not,” and “the mere fact that developing countries are more likely to have presidential forms of government is unlikely to be a key factor to explain slow development.”

In a famous paper, Olson (1993) contrasted democracy, dictatorship with a short time horizon (a “roving bandit”) and one with a long time horizon (a “stationary bandit”). He argued that while a roving bandit would do nothing to promote economic growth, a stationary bandit would do something in the interests of his own take from the economy in the long run. But economic performance under a stationary bandit would still fall short of that under a democracy: because the bandit’s optimal tax rate must be less than 100% (as with the Laffer curve), he gets less than 100% of the social marginal product of any investment, and therefore invests less than what is socially optimal. However, Olson’s result is driven by his ad hoc assumption that the bandit robs the economy using proportional (and therefore distortionary) taxation. An optimal nonlinear tax will enable him to satisfy the marginal conditions for Pareto efficiency, while getting his rent extraction in an inframarginal way without distortion. It is in the bandit’s own interest to rob the economy in a Pareto efficient manner.

A similar argument applies to the theory of Bueno de Mesquita et al. (2003). They distinguish two subsets of the population, the selectorate S , consisting of those entitled to participate in the policymaking process (all adult citizens in a democracy, smaller groups

in other systems), the winning coalition W , this being the minimum size of group that is sufficient to choose and sustain a leader in office (the majority in a democracy, an elite corps of officers in a military regime, etc.), and the leader (or leadership group) who makes the actual decisions. If the ratio W/S is large, e.g. more than half in a democracy, current members of the winning coalition have a good chance of being included in another, therefore they constrain the leader better. This is conducive to good economic policy. In an authoritarian regime, W/S is small, and a current member of the winning coalition is afraid to rebel because he is unlikely to be included in another. Therefore the leader enjoys more arbitrary power, and will use it to enjoy private goods and neglect productive investment in the economy. However, if the leader has a long time horizon, his private consumption over his whole lifetime may be maximized by making public investment that yields more private goods in the future. In other words, the leader will pursue the most efficient available means of extracting private benefits. Thus we must look elsewhere for constraints that force Olson's bandit or a de Mesquita's leader to depart from Pareto efficiency, and as so often in modern political economics these come from considerations of information and agency.

Another related branch of the literature considers delegation in the context of policymaking, focusing largely on the efficiency reasons for using this mode. For example, Gilligan and Krehbiel (1987) and Epstein and O'Halloran (1999) examine the legislature's delegation of specified powers to committees or the executive branch. The motive is to allow the delegate to acquire expertise and information that enables better *design* of policy. Agency problems in the *implementation* of policy are not considered. Similarly, in the literature on delegating monetary policy to a suitably conservative central banker (e.g. Rogoff 1985), the agent is assumed to have the desired preferences and to carry out the assignments perfectly. Thus possible agency problems in implementation are not an issue.

In any non-trivial economy, policy implementation requires a bureaucracy, usually with many departments and hierarchies. The bureaucrats have their own personal and social objectives distinct from those of the rulers, have private information about the policies, and can take actions that are difficult for their superiors or rulers to observe. Therefore agency problems are inherent in the implementation of economic policy. These issues have of course been analyzed extensively in the literature, but mostly within the context of a social-welfare maximizing top level. This includes most three-tier models of corruption, e.g. Becker and Stigler (1974), Tirole (1986), Banerjee (1997) and Guriev (2004), which consider how far a benevolent ruler can control corruption and collusion among middle-level

bureaucrats. It also includes most Ramsey-Boiteaux type models of regulation, extensively reviewed and discussed in Laffont and Tirole (1993), where the top tier has the “socially correct” objective function, with different specifics of who is supposed to do what and who has what information.

Laffont (2000) regards politicians as selfish and corruptible; his top-level principal is the constitution designer who lays down the rules, constraints, incentive schemes, and checks and balances for politicians, to maximize the fully benevolent objective of maximizing total social surplus, subject to the constraints on instruments arising from various information asymmetries. However, the assumption of benevolence at the top level seems unrealistic for weak or failing states, and perhaps also for many other states. Many states have a grand-sounding or even well-intentioned constitution, but it is merely a façade behind which the actual top-level rulers make policy at will. Sometimes they can even change the constitution to suit their needs or whims. Therefore the case of a predatory top level is worth more attention in the agency context. Shleifer and Vishny (1998) recognize that governments are not benevolent, and that much of the malfeasance they discuss takes place at the level of the bureaucracy, but they generally regard the government as a single entity and do not analyze the agency problems that arise in multi-tiered governments. Excellent descriptive and qualitative analyses of bureaucracy and its agency relationships do exist, Wilson (1990) being one of the best, but these offer only isolated remarks about different kinds of rulers and bureaucrats and do not conduct any formal modeling or comparisons. More generally, organization theory has as one of its central concerns the issue of governance – agency and incentives – in bureaucratic organizations, but it is less concerned with comparing organizations with different political conflicts and different objectives at the top levels. Historical studies of administration and bureaucracy in dictatorships exist, for example Gregory and Harrison (2005). Greif (2007) studies in a historical perspective the larger question of whether and how bureaucrats can act as constraints on rulers. But no formal modeling for comparisons with democracies have been attempted to my knowledge.

Thus a systematic comparison of economic outcomes under different top-level rulers when each must operate through bureaucratic agencies remains to be done, and this paper aims to start such study.

3 The Model

The model has three participants: the citizen, the bureaucrat, and the ruler. The ruler is the principal and the bureaucrat is his agent. Of course in reality there are numerous citizens and many bureaucrats. Some aspects of this multiplicity are easy to accommodate within my model; thus the costs and evaluation criteria with many citizens and bureaucrats can be handled by suitably scaling the relevant parameters like γ and α or introducing new parameters in the production function below. The citizen should be thought of as a representative of his class, but that precludes consideration of distributive issues. The bureaucrat may likewise be a representative, although the simultaneous existence of several agents creates opportunities for the ruler in the form of relative performance schemes that are briefly discussed in the concluding section and form part of the agenda for future research.

The technology and the first best

The role of the bureaucrat agent is modeled as the provision of a public good. This is a very basic role of the government. Indeed some political scientists judge success or failure of a state in these terms; see Rotberg ed. (2004), Bueno de Mesquita et al. (2003). Let K measure the provision of the public good; this could be its quantity or quality. The cost is $\frac{1}{2} \gamma K^2$; in one case of the agency problem studied here, γ will be the bureaucrat's private information. The citizen then supplies a private input, which can be labor or anything else. It is labeled L , and its cost is $\frac{1}{2} L^2$. These functional forms are chosen for algebraic simplicity in deriving the results, but the insights they yield are perfectly general.

The resulting final output Q is given by

$$Q = \min(K, L). \tag{1}$$

This captures the idea that public and private inputs are complements, so the government's failure to provide adequate public goods will lead to general economic failure. The total social surplus is

$$S = Q - \frac{1}{2} \gamma K^2 - \frac{1}{2} L^2. \tag{2}$$

It is easy to see that the social welfare maximizing ideal first-best policy for public good provision, constrained only by resources and technology and not by affected by the top ruler's personal objectives or by any agency problems, is given by

$$Q^{FB} = L^{FB} = K^{FB} = \frac{1}{1 + \gamma}. \tag{3}$$

The labels FB of course indicate the idealized first-best. In the various constrained or suboptimal outcomes below, the expression for K will be similar but will have added factors or terms in the denominator. In each case, the private sector will then choose $L = K$ and the resulting output will be $Q = K$ also; I will not state this repeatedly.

Financial flows and surpluses

The bureaucrat will also collect some financial transfer F from the citizen and remit R to the ruler. There may be dead-weight losses involved in these transfers. I assume that for the bureaucrats to receive F , the citizen must give up $(1 + \lambda_C) F$, and for the ruler to receive R , the bureaucrats must give up $(1 + \lambda_B) R$.² The standard motivation for $\lambda_C > 0$ in the literature is that it is the shadow cost of public funds, stemming from some (here unspecified) Mirrlees-type model of informational limitations in taxation. The motivation for $\lambda_B > 0$ is more complex; it may be the cost of hiding side-transfers through gifts or perks, or psychic costs of illegal or unethical behavior. In a thoroughgoing kleptocracy the ruler and the bureaucracy may face no such costs and λ_B may be close to zero. However, a kleptocratic ruler may have to maintain a special army or praetorian guard to protect himself and his wealth, and the costs of this may be captured in λ_B . I will allow the special cases where λ_B and λ_C are zero, but the more general formulation helps me compare the results better with those of previous literature on agency theory which has similar assumptions, for example Baron and Myerson (1982) and Laffont and Tirole (1993), and also to Olson (1993).

With this notation, the citizen's surplus is

$$S_C = Q - \frac{1}{2} L^2 - (1 + \lambda_C) F. \quad (4)$$

The bureaucrats are also citizens and partake in this surplus in that capacity, but they receive additional surplus

$$S_B = F - (1 + \lambda_B) R - \frac{1}{2} \gamma K^2. \quad (5)$$

Finally, the ruler's surplus or private rent extraction from the economy is simply

$$S_R = R. \quad (6)$$

²Throughout this paper I will maintain the assumption that F and R must be non-negative. Some super-benevolent rulers and bureaucrats may wish to make transfers to the citizens and may have outside resources to do so. Such transfers may also involve dead-weight losses. This creates cases of "kink" optima at $F = 0$ and $R = 0$, which makes the analysis complicated without generating useful new insights; hence the assumption ruling them out. Dixit (2006) considers some of these cases.

Objective functions

What is the top-level ruler's objective function? Whether democratic or authoritarian, a ruler may be concerned only with his own surplus S_R , perhaps in combination with some ego-rent derived from being in power, or may be benevolent and directly wish to maximize social welfare, or in this context the sum of the three surpluses. However, much of the literature in modern political science regards pure benevolence as less likely. It assumes that all rulers are driven by private objectives, and only the constraints arising from the need to stay in power induce them to care indirectly about social welfare. Perhaps the clearest statement and application of this point of view can be found in Bueno de Mesquita et al. (2003). This approach can be captured by supposing that the ruler wants to maximize S_R subject to a participation constraint stating that the citizen must receive at least a specified minimum level of surplus, $S_C \geq S_C^0$ say. (The citizen's participation constraint can be interpreted either as survival or non-rebellion.) Write the Lagrangian for this problem as $S_R + \zeta S_C$ where ζ is the Lagrange multiplier. If the constraint is very tight, ζ will be large and the ruler's implicit objective (the Lagrangian) will be close to the citizens' welfare. If the constraint is not so tight, ζ will be small and the ruler can come close to maximizing his direct private objective.

Constraints on rulers are more likely to be tight in democracies than in dictatorships, and I assume this here. In fact for ease of contrast I consider only two extreme pure conceptual cases. Thus I regard a democracy as maximizing social welfare, and an authoritarian regime as maximizing S_R subject to a participation constraint on S_C . Of course the alignment is not perfect and we can all think of exceptions – kleptocratoc rulers who were democratically elected and benevolent dictators.³ But the correlation is evident on a priori as well as empirical grounds, and analysis in terms of the two pure conceptual categories is easier to follow and remember. Dixit (2006) considers a more general model where the ruler's objective is a parametric combination of the citizen's, the bureaucrat's and the ruler's own surpluses, but the results become complex and taxonomic.

Both types of top rulers (principals) have to meet the bureaucrats' participation constraint, that is, give them enough surplus, say $S_B \geq S_B^0$, to induce them to take on these

³All of the results below for democracies can be interpreted as valid for the case of a benevolent despot, and all of the results for autocracies can be interpreted as valid for a democracy where the ruler happens to enjoy kleptocratic powers.

duties. Of course S_B^0 may equal zero or even be negative if being a bureaucrat brings some intangible benefits.

Thus the democratic ruler's policy design problem is

$$\text{maximize } U_D \equiv S_C + S_B + S_R \quad \text{subject to } S_B \geq S_B^0, \quad (7)$$

The citizen's participation constraint is ignored because it will not be binding in a nontrivial problem of this kind. The autocratic ruler's problem is

$$\text{maximize } S_R \quad \text{subject to } S_C \geq S_C^0, S_B \geq S_B^0. \quad (8)$$

In Dixit (2006) I consider a more general problem with an objective function that gives parametric weights to the three surpluses.

It would be natural to give the bureaucrat a selfish objective, namely his own surplus S_B . However, he may to some extent internalize the citizen's welfare, either because, like many agents observed in recent research on behavioral economics and evolutionary games he has other-regarding preferences, or because bureaucrats' education and professional training successfully instills a spirit of public service in them (e.g. "Princeton (and its Woodrow Wilson School) in the nation's service" !). This can be captured by giving the bureaucrat a utility function

$$U_B = S_B + \alpha (S_C - S_C^0) \quad (9)$$

where $\alpha > 0$ measures the extent of the bureaucrat's altruism. Assuming that the bureaucrat's outside opportunities do not involve such a rewarding public service, the caring bureaucrat's participation constraint becomes $U_B \geq S_B^0$.

This raises another information asymmetry: the parameter α may be the bureaucrat's private information, and the ruler may want to elicit this information and exploit it for his own advantage. I will consider information problems one at a time: when considering information asymmetry about the productivity parameter γ , I will assume that $\alpha = 0$ and this is common knowledge, whereas when I consider information asymmetry about α , I will assume that γ is common knowledge. In the concluding section I mention the possibility of asymmetric information about both α and γ as a part of the ideas for future research.

4 Selfish Bureaucrat

Here the bureaucrat is concerned only with his own surplus (5) and this is common knowledge. But he may have private information about the cost parameter γ , and his actions may not be observable to the ruler.

4.1 Full Information

First consider, for purpose of later comparisons, the full-information problem, where the top ruler (principal) need consider only the participation constraints. Relatively simple but tedious algebra, relegated to Appendix A, shows that democratic and autocratic rulers implement the same policy with regard to the public good, and it is given by

$$K^{FI} = \frac{1}{1 + \gamma(1 + \lambda_C)}. \quad (10)$$

The label FI is for full information. Comparing this with the first best K^{FB} in (3) above, we see that the two differ only if $\lambda_C > 0$, in which case the second best constrained by the dead-weight loss in transfer but not by an information or agency considerations entails a smaller provision of the public good than the first best. If $\lambda_C = 0$ the two coincide.

This is the point made in connection with the discussion of Olson (1993) above. Even if the top ruler wants to maximize his own private extraction, it is in his own interest to do this as efficiently as possible; this is analogous to the Coase Theorem. Olson builds in an unavoidable distortion by assuming that taxation must be linear (proportional). In my model the corresponding ad hoc assumption is $\lambda_C > 0$.

Even though the two types of rulers choose the same K , they choose very different financial flows F and R . The democratic ruler chooses his own receipt $R = 0$, and F just high enough to meet the bureaucrat's participation constraint with equality, giving all surplus to the citizen. The autocratic ruler meets the participation constraints of both the citizen and the bureaucrat with equality, collecting all the surplus for himself.

4.2 Private Information and Agency Problems

The agency problems facing the ruler may involve both moral hazard (some or all of the bureaucrat's actions are unobservable) and adverse selection (bureaucrat has private information about the productivity γ and his own caring α). I examine various possibilities, focusing on one problem at a time.

4.2.1 Productivity Private Information, Actions Observable

In this section I allow the cost parameter γ to be the bureaucrat's private information. As in Laffont (2000, pp. 23-27) and Laffont and Tirole (1993, pp. 55-63), I assume that there are two possible values of the cost parameter, $\gamma_L < \gamma_H$, with probabilities θ_L and θ_H .

Correspondingly I speak of two types of bureaucrat, L and H . But here I abstract from moral hazard problems, so the ruler can observe, for each type $i = L, H$ bureaucrat, the choice K_i of the level of the public good K_i , the fee F_i that he extracts from the citizen, and of course his remittance R_i to the ruler. By the revelation principle, the ruler's policy can then be formally characterized as a direct truthful mechanism,⁴ where he asks the bureaucrat to report his type, and specifies actions (K_j, F_j, R_j) contingent on the reported type j . The ruler chooses this to maximize his objective, subject to the bureaucrat's incentive compatibility constraints which require truthful reporting to be optimal, and of course all participation constraints.

Recall that the cost parameter can have two values, $\gamma_L < \gamma_H$. Suppose for a moment that the ruler tries to implement a policy similar to the full-information case above, giving each type of bureaucrat just enough to meet his participation constraint with equality. Then the bureaucrat has the temptation to pretend that the cost parameter is high even when it is low, because then the ruler will give him a larger transfer to meet his participation constraint. The ruler must design his policy subject to an incentive-compatibility constraint that offsets this temptation, that is, give the bureaucrat some rent in exchange for revealing low cost.

The algebraic derivations of this constrained optimization problem are in Appendix B; the solution is as follows. Both types of rulers implement the same public good policy when the bureaucrat reports low cost, and this policy

$$K_L = \frac{1}{1 + \gamma_L(1 + \lambda_C)} \quad (11)$$

is the same as it would be if the ruler knew himself that the cost was low (calculated from (10) with $\gamma = \gamma_L$). But if the cost report is high, the two types of rulers implement different policies:

$$\text{Democratic Ruler's } K_H = \frac{1}{1 + \gamma_H(1 + \lambda_C) + \frac{\theta_L}{\theta_H}(\gamma_H - \gamma_L)\lambda_C} \quad (12)$$

⁴For any readers not familiar with such direct or revelation mechanisms, I should emphasize that this need not be the way in which the ruler's policy is actually implemented. There may be various complex games between the ruler and the bureaucrat, involving stages of communication, instructions, menus of contracts, and incentives (carrots and/or sticks). But the revelation principle says that the equilibrium outcome of any such process can be characterized as if it arose from the direct mechanism here studied. See Myerson (1982) for details and proofs of this general theory of mechanism design.

$$\text{Autocratic Ruler's } K_H = \frac{1}{1 + \gamma_H (1 + \lambda_C) + \frac{\theta_L}{\theta_H} (\gamma_H - \gamma_L) (1 + \lambda_C)} \quad (13)$$

Each of these is smaller than the full-information level of K_H the ruler would implement if he knew himself that the cost was high.

The intuition for these results is well known from agency theory, e.g. Baron and Myerson (1982), Laffont and Tirole (1993). If the low-cost bureaucrat pretends to be high-cost, he will be asked to supply K_H of the public good, and be compensated as if his cost were high, but will therefore make an extra profit $\frac{1}{2} (\gamma_H - \gamma_L) (K_H)^2$. He must be given at least this much rent to overcome this temptation and achieve truthful revelation. The ruler then finds it optimal to accept some inefficiency to reduce this rent loss; that is, he chooses a lower K_H . The formulas (12) and (13) are result of such optimal trade-offs between rent loss and efficiency loss for the two types of rulers. In both cases, the participation constraint of the “bad” or high cost type is met with equality; report that $\gamma = \gamma_H$ gets the bureaucrat no rent. Thus we have the standard property: “no rent for the worst (high cost) type, no distortion for the best (low cost) type.” More detailed features of the formulas, for example way the cost difference $(\gamma_H - \gamma_L)$ and the relative proportions of the two types (θ_L/θ_H) figure in it, is also familiar from standard theory, e.g. Laffont and Tirole (1993 pp. 58-59).

The key new thing is the comparison between the two types of rulers. The denominator in the formula (13) for the autocratic ruler exceeds that in the formula (12) for the democratic ruler. Thus the autocrat distorts K_H downward by more than the democrat. This is because for the democrat the cost of the rent transfer from the citizen to the bureaucrat is purely the dead-weight loss λ_C (if this is indeed positive), whereas for the autocrat this is the full 1 that he might otherwise have extracted from the citizen for his own benefit *plus* the dead-weight loss. The standard figure for dead-weight losses in income taxation are typically taken to be around 0.25, therefore the distortion for the autocrat is about 5 times that for the democrat ($1 + \lambda_C = 1.25$ versus $\lambda_C = 0.25$). Thus we should expect the efficiency difference between democracy and autocracy to be quite substantial for the reason under focus here, namely the fact that both have to operate through bureaucrat agents.

The qualitative result is not surprising: a ruler who sets out to maximize social welfare should achieve an outcome closer to the first best than another with a different objective. But the model shows that the difference is likely to be quantitatively substantial, and therefore worthy of serious attention in future research.

4.2.2 Bureaucrat's Actions Not Observable

Next consider the moral hazard problem where one or both of the bureaucrat's actions K and F may or may not be observable to the ruler. I assume that the ruler can observe his own receipts R .⁵ I also assume that the ruler can observe whether the citizen survives or whether there is a rebellion, therefore the bureaucrat must choose his actions subject to the citizen's participation constraint.

First suppose the bureaucrat's choice of K cannot be observed by the ruler but the financial flow F can be observed. Appendix C shows that both types of rulers will achieve the full-information level of the public good, but the democratic ruler will (somewhat reluctantly) leave the benefits with the bureaucrat, and the autocratic ruler will get them for himself. Thus the latter achieves the same outcome when K is not observable as when it is. The same will be true even with private information about γ . The intuition is that the ruler's choice of F will force the bureaucrat to choose enough K to ensure fulfillment of the citizen's participation constraint. This is as if the citizen can observe K (even though the ruler cannot), so the citizen becomes an indirect enforcer of the ruler's desired policy.

This works well for the autocratic ruler, but not so well for the democratic ruler, who does not want to keep the citizen on the participation constraint. The only way such a ruler can do better under moral hazard is by hiring a super-altruistic bureaucrat (with $\alpha > 1/(1+\lambda_C)$) when K is unobservable. Whether and how he can do so is considered in the next section.

5 Altruistic Bureaucrat

Here I consider the other type of information asymmetry mentioned above. The bureaucrat may care about the citizen's welfare. I will refer to such a bureaucrat as altruistic, whether because he has other-regarding preferences or because he has been professionally trained to care. An altruistic bureaucrat's objective function was defined in (9) above. Substituting for the two surpluses, it becomes

$$\begin{aligned}
 U_B &= S_B + \alpha(S_C - S_C^0) \\
 &= F - (1 + \lambda_B)R - \frac{1}{2}\gamma K^2 + \alpha [K - \frac{1}{2}K^2 - (1 + \lambda_C)F - S_C^0] \\
 &= [1 - \alpha(1 + \lambda_C)]F - (1 + \lambda_B)R + \alpha K - \frac{1}{2}(\alpha + \gamma)K^2 - \alpha S_C^0. \quad (14)
 \end{aligned}$$

⁵As the nursery rhyme says, "The king was in the counting-house, counting out his money."

If $(1 + \lambda_C)\alpha > 1$, the bureaucrat is super-altruistic; he does not want to receive any transfer from the citizen, and prefers to bear the cost of the public good out of his own resources. This may be the case if the bureaucracy is actually an NGO that has an outside source of funds.⁶ Otherwise we should expect to see $(1 + \lambda_C)\alpha < 1$. I will consider the two cases of “normal” altruism and super-altruism separately below.

I will assume that there are just two types of bureaucrats, a purely selfish type, and an altruistic type whose altruism parameter $\alpha > 0$ is a known (common knowledge) number. Let ω_S and ω_A be the probabilities that a randomly selected bureaucrat is of the two types. To focus on one issue at a time, in this section I ignore the possibility of different cost parameters γ and asymmetric information about them.

The ruler can try to exploit a bureaucrat’s altruism: the participation constraint $S_B + \alpha(S_C - S_C^0) \geq S_B^0$ can be met with a smaller transfer F_A or a larger remittance R_A than can $S_B \geq k_B$. Then an altruistic bureaucrat may have the temptation to pretend to be selfish, because that earns him a higher transfer F_S . When α is the bureaucrat’s private information, the ruler’s mechanism must concede the altruistic type some rent if he wants to achieve truthful revelation. To set the stage for this, begin without private information.

Various cases arise depending on whether the ruler is democratic or autocratic, and the bureaucrat a normal altruist or a super-altruist. The details are in appendixes D-F. The results are as follows.

The case of the autocratic ruler is in Appendix D. He wants to extract as much as he can from the economy. If the bureaucrat is a normal altruist, the ruler finds it optimal to extract from the citizen. Then the citizen’s participation constraint is binding. But when $S_C = S_C^0$, the bureaucrat’s utility is just his surplus, $U_B = S_B$, regardless of his altruism parameter (within the normal range). The ruler implements the same solution as in the case of the selfish bureaucrat. Even if he does not know the bureaucrat’s type, he does not care and will not expend any rent on revelation.

An autocratic ruler facing a super-altruistic bureaucrat finds the bureaucrat a better source of extraction than the citizen. He can make the altruistic bureaucrat happier by lowering the fee F_A down to zero, and then extract this surplus from the bureaucrat by

⁶Such an organization may wish to make a reverse transfer to the citizen. Of course the citizen will not receive $(1 + \lambda_C)\alpha > 1$ when the organization gives up 1; we do not expect a reverse transfer to reverse the dead-weight losses. In fact there may be dead-weight losses in the other direction, too. This can generate solutions at a kink, with zero transfers. These involve tedious calculations and do not generate enough useful intuition; therefore I do not go into their analysis. Dixit (2006) considers some of these issues.

raising R_A . When this is done, the optimal K is the same as the choice the bureaucrat would have made if the ruler could not observe it; there is no moral hazard problem! Thus the autocratic ruler can let in a super-caring bureaucrat, who is willing to reveal his type for this purpose, extracting from him a high entry price R , and let him do what he wants. We do indeed see many kind-hearted NGOs that work in despotic and kleptocratic regimes in just such a way. They accept the conditions and pay the price imposed by regimes they thoroughly dislike, because they cannot bear to see the populations in these countries suffer. The introduction cited the example of the military junta in Myanmar extracting import duties from foreign NGO on the emergency relief supplies they were bringing.⁷

The citizens do benefit in this process; they do not pay any fee for the services they receive from the NGO ($F_A = 0$), and their participation constraint is slack ($S_C > S_C^0$). But this is an incidental by-product, and not the ruler's direct intention; he simply finds it more profitable to extract from the NGO than from the citizens.

Next consider a democratic ruler. If there is full information and the altruist bureaucrat has normal altruism, the ruler wants to implement the same full information K as he would facing a selfish bureaucrat. But so long as the resulting total surplus exceeds the sum of the citizen's and the bureaucrat's opportunity utilities, the ruler wants to leave the altruistic bureaucrat with a lower fee F than the selfish type. Therefore the altruist does have the temptation to pretend to be selfish, and the ruler faces a revelation problem in the absence of full information. The details are in Appendix E.1.

Revelation of the altruistic bureaucrat's type can sometimes be achieved using financial transfers alone, without the need to distort the public good levels below the full information optimum. This is done by raising the remittance R_S from the selfish type (and correspondingly the fee F_S the selfish type must receive to satisfy his participation constraint), so high that the resulting decrease in the citizen's surplus makes it unattractive for the altruistic type to pretend to be selfish. However, this comes at the cost of the citizen's surplus if the bureaucrat's type is actually selfish; therefore this approach is desirable only if the probability of the selfish type is sufficiently small. Also, if the altruism parameter is near the upper end of the normal range, this approach cannot be used without driving the fee that the altruistic bureaucrat collects from the citizen down to its lower limit of zero; if that

⁷Figures for the amounts involved are hard to find, but a quick search of web sites for several aid agencies and international organization suggests that the total amount of aid ran to tens of millions of dollars, so even a 10% tax on that would be significant for this one episode.

happens, only a constrained (third-best) optimum is achievable. Details of all of this are in Appendix F.1.

There is also a practical problem about implementing this solution. If there is any doubt about the motives of the democratic ruler, his claim that he is extracting an R_S from the selfish type bureaucrat solely to achieve truthful revelation of the altruistic type bureaucrat will sound highly suspicious. Therefore a constrained optimum assuming zero remittances may be more appropriate. I consider this in Appendix F.2.

The optimal second-best for this case conforms to the standard property: “no rent for the worst (here selfish) type, no distortion for the best (here altruistic) type.” The participation constraint for the selfish type of bureaucrat is kept binding, and the altruist is given just enough rent to induce him to reveal his type truthfully. To avoid losing too much rent, the action of the selfish type is distorted. But the way this happens in this specific context turns out to depend on the proportion ω_S of selfish types in the population. If this is below a certain threshold, the solution is as described, and it is optimal to drive the level of the public good to be supplied by the selfish type, K_S , down as low as is compatible with his participation constraint. But if ω_S exceeds this threshold, the social cost of the distortion is too high, and the ruler finds it optimal to abandon attempts to separate the types. Instead he has both types implementing the full-information K^{FI} and taking the same fee from the citizen, with the result that the altruist type simply retains all the externality he enjoys from the citizen’s surplus.

A democratic ruler facing a super-altruist bureaucrat would, under full information, want to implement the first best K^{FB} , and set $F = 0$. If the bureaucrat’s super-altruism is so great that $\alpha > 1$, then his own ideal K is even higher. Then he clearly would not want to pretend to be selfish; that would lead to K^{FI} , which is $< K^{FB}$ and therefore even farther from the bureaucrat’s ideal, and he would be asked to extract some F from the citizen, which he does not like. But a bureaucrat with $1 > \alpha > 1/(1 + \lambda_C)$ faces a trade-off: pretending to be selfish may lead to a K closer to his ideal if α is close to its lower bound, but the positive F is undesirable. However, we should not expect this case to arise much in reality, because the realistic values of λ_C are quite low and therefore this range is quite small. Therefore the case does not seem worth the further taxonomic analysis of pinning down the precise conditions for incentive compatibility. The details of this case are in Appendix E.2.

To sum up, on the whole a democratic top ruler and an altruistic bureaucrat interact well. The ruler can to a certain extent exploit the bureaucrat’s altruism and can in some

cases reduce or even eliminate the need to distort the levels of the public good downward. If the probability of the bureaucrat being the selfish type is sufficiently small, then the ruler can make it undesirable for the altruistic type to pretend to be selfish by requiring that the selfish type should remit enough money to the ruler to drive the citizen down to his participation constraint; if such remittances are ruled out, then distorting the level of the public good supplied by the selfish type downward achieves separation. If the probability of the selfish type is large, then the ruler abandons the attempt to achieve separation, and lets the altruistic type keep the extra payoff he gets from the citizen's well-being, again without distorting the level of the public good downward.

6 Extensions and Suggestions for Future Research

The basic model sketched above already yields some interesting results about the difference between democracies and authoritarian regimes as regards their policy design and bureaucratic implementation. The difference mostly favors democracies – the greater reluctance of autocrats to lose their own rent leads them to tolerate greater inefficiency in operating via bureaucrat agents, specifically to provide a smaller quantity or quality of public goods. Results of the model show that the difference is of substantial magnitude, and casual empiricism supports that finding.

But the model needs to be extended and enriched in many directions before this conclusion can be thought robust. The program of research tasks outlined below consists of several such extensions; more will no doubt emerge as the research proceeds.

[1] The most important extension is to incorporate the possibility that an autocrat underprovides public goods because that would make it more likely that the bureaucrats (especially the military) and/or the citizens would rebel. The classic example of this is the advice that the Mobutu Sese Seko, for many years dictator of Zaire (Congo) supposedly gave to a fellow dictator: “Never to build any roads; that will only make it easier for your enemies to reach the capital and overthrow you.” (Quoted in Robinson, 2001.) This is one manifestation of the general issue of commitment emphasized by Acemoglu (2003) and Acemoglu and Robinson (2006): the ruler will engage in predation by inefficient policies if his power would be put at risk by economically efficient ones. In the linear-quadratic framework of this model, a simple way to handle this is to change the right hand side of the bureaucrat's and the citizen's participation constraints to make them increasing functions of K , so they are harder

to fulfill when K is larger. Suppose the constraints are now

$$S_B \geq \delta_B K, \quad S_C \geq \delta_C K.$$

Then in the solutions, every K for the autocratic ruler gets multiplied by $(1 - \delta_B - \delta_C)$, while that for the democrat is multiplied by only $(1 - \delta_B)$. The reason is that the democrat's optimum keeps the citizen's participation constraint slack. (If $\delta_B \geq 1$ both rulers' K 's have a corner optimum at 0; if $\delta_B + \delta_C \geq 1 > \delta_B$, only the autocrat's does.) Thus the Mobutu argument provides another reason for superiority of democracy. While the extension is easy to incorporate in this model, Robinson (2001) constructs a more complex and richer model to focus on this specific aspect.

[2] I considered separately two types of private information the bureaucrat may have: one about the cost of producing the public good and the other about his own degree of concern for the citizen. In reality the two can exist together. Such higher-dimensional private information problems can be quite difficult and the results are often hard to obtain and interpret. But the two aspects in this case can be correlated, producing one-dimensional problems. Most interesting is the possibility that the agent who has greater concern for the citizen is also less efficient at producing the public good; think of a kind-hearted but impractical NGO or similar organization. In such a case, which kind of agent will the ruler find more desirable, and will the two types of rulers differ in this regard? What will this imply for the matching of ruler type with bureaucrat type, and for the outcome? The answers will of course depend on the relative sizes of the caring parameter α and the cost difference $(\gamma_H - \gamma_L)$; the task of the modelling is to find the precise relationship.

[3] In reality there are many public goods, with different degrees of substitution or complementarity between them, and different errors in observing the outcome of the bureaucrats' actions. This can create problems of bias, where the bureaucrat devotes more effort to the goods whose provision is more accurately observable by the ruler, and the ruler's attempt to cope with the problem of bias may force him to attenuate the strength of incentives he offers the bureaucrat for all goods (Holmström and Milgrom, 1991). This effect will exist regardless of the ruler's intention; the question in the current context is whether it is stronger for a democratic ruler than for an autocrat. However, there are some obvious differences. If a democratic ruler hires a bureaucrat with genuine direct concern for the citizen's welfare, the objectives of the two will be better aligned. This will ease the ruler's multitask incentive problem, and provide another reason for the associative matching between a democratic ruler

and a caring bureaucrat. Moreover, an autocrat may have specific preferences over multiple public goods; for example, Stalin's and his Soviet successors' priorities were for investment, military, and big projects like the Moscow Metro and space exploration, not for basic transport and utility infrastructure outside the main cities. Then their agents in specific regions or industries are unlikely to share these multidimensional preferences, thereby aggravating the multitask incentive problem. Such possibilities merit rigorous analysis in the context of the model.

[4] In reality there is not just one bureaucrat but a whole bureaucracy. This creates both problems and opportunities for the ruler. If there are several bureaucrats engaged in doing similar things and subject to correlated shocks, then the ruler can use relative performance schemes to improve the outcome according to his own objectives, whether they be predatory or benevolent. Analysis similar to that of Laffont and N'Guessan (1999) in the context of a benevolent social planner can be done for the case of a kleptocratic dictator and the outcomes compared. However, if each bureaucrat is responsible for providing a different public good, and these public goods are complementary inputs to the production of the final consumption good, we have new problems of moral hazard in teams. Or suppose two different bureaucrats are responsible for providing the public good and for collecting taxes from the citizen. Not only may one bureaucrat be unconcerned about making matters harder for the other, but each may not internalize the effects of his actions on the other bureaucrat's and the citizen's participation constraints. Then the ruler may have to give additional incentives to ensure his own survival in power in the Nash (non-cooperative) equilibrium of such a bureaucracy.

[5] Governments in most countries have many parallel units whose rulers have considerable top-level powers over their own jurisdictions, for example state and local governments. Therefore even within a country, democratic constraints may be more effective in preventing some officeholders from extracting rents while others can run their offices as predatory fiefdoms. Then the model suggests that public good provision will be closer to efficiency in the former than the latter. This is empirically testable, but actually designing and carrying out such a test requires another paper by itself.

[6] The basic model had the ruler dealing with just one abstract bureaucrat. In reality the ruler chooses his bureaucrat from a number of candidates, and can use this ex ante stage of competition to reduce the rent given to the agent. That can in turn reduce the need to tolerate inefficiency. As an artificial but conceptually clarifying device, suppose the ruler sells

the position of the bureaucrat by auction. Each bureaucrat's altruism parameter α being his private information corresponds to a private value situation, whereas the technological cost parameter γ being known imperfectly to all bureaucrats but not at all to the ruler corresponds to a common value situation. By analogy with simple models of such private value auctions, if there are n bidders, the ruler need give away rent only of order $(1/n)$. In the context of cost information γ , this can help both types of rulers. But when it comes to the altruism information α , ex ante competition helps only the democratic ruler because the autocrat is not interested in screening for this attribute anyway as we saw above. This can be an added reason favoring outcomes under a democracy.

[7] I assumed the information structure to be exogenous (although I considered alternative possibilities). In reality, rulers go to considerable efforts to improve their information; for example they monitor and audit the performance of their agents. However, they have to use other agents to obtain and communicate this information. There is also a vertical hierarchy in the bureaucracy, where higher levels monitor the work of the lower levels. Such layers and functions of bureaucracy raise issues of collusion and the need for the ruler to devise his incentive schemes to reduce the incentives to collude (e.g. Laffont and Tirole, 1993, chapter 12, Laffont, 2000, chapter 2). Collusion-proof mechanisms generally use less powerful incentive schemes to reduce the two agents' potential aggregate benefit of collusion. A less powerful incentive scheme in turn implies a less efficient outcome. Once again, it remains to be seen how this effect differs between the two types of rulers.

[8] The top level ruler may actually be a coalition. If this coalition can conclude in advance a bargain that resolves or compromises the differences among its members, and present a united objective, the analysis with a single ruler stands. Otherwise policymaking at the top level becomes a multi-principal (common agency) problem, and this may cause a further and substantial deterioration in the power of incentives (Dixit, 1997). It remains to be seen how this effect operates differently when members of the coalition are mostly predatory and when they are mostly benevolent but each is more concerned about his own constituency of citizens. We also have the intriguing possibility that the weakness of incentives caused by the common agency leads to deteriorating economic outcomes, which further worsens the conflict among the multiple principals, leading to a downward spiral, or a process by which state weakness turns into state failure and eventually into state collapse.

[9] In many hierarchical organizations including (especially?) administrative civil service, career concerns can be more effective incentives than immediate monetary payments. Again

the situation differs between democracies and dictatorships. In democracies, all civil servants except a few political appointees are professional career appointees, with expected time horizon in service longer than that of the top-level rulers. In dictatorships, many civil servants may share the fate of the ruler if he is deposed. Therefore we should expect the structures of incentives and resulting outcomes to differ between the two types of regimes. This merits theoretical study.

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Appendix

The derivations of the results presented in the text are collected here.

A. Full-Information Agency Problem

With full information, rulers can directly contract on, and thereby effectively dictate, the choice of policy subject only to the bureaucrat's participation constraint.

The democratic ruler's objective function $U_D \equiv S_C + S_B + S_R$ is expressed as a function of the policy variables K , F and R by summing the component surpluses in (4), (5) and (6), and using $Q = L = K$.

$$U_D = K - \frac{1}{2}(1 + \gamma) K^2 - \lambda_C F - \lambda_B R. \quad (\text{a.1})$$

This is to be maximized subject to the bureaucrat's participation constraint

$$S_B \equiv F - (1 + \lambda_C) R - \frac{1}{2} \gamma K^2 \geq S_B^0. \quad (\text{a.2})$$

It is obviously optimal to set $R = 0$: a positive R cannot help the objective function and only worsens the constraint. So long as $\lambda_C > 0$, it is optimal to set F as low as possible. If $\lambda_C = 0$, the choice of F is arbitrary (the distribution of the total surplus between the citizen and the bureaucrat is a matter of indifference to the ruler), but keeping F low and the participation constraint binding remains optimal, and I will do so. Similarly, in all that follows, I will break the indifference created by the possibilities of $\lambda_C = 0$ and $\lambda_B = 0$ in favor of the citizen.

Then (a.2) can be solved for F and substituted into (a.1) to express the objective function in terms of K alone:

$$U_D = K - \frac{1}{2} [1 + \gamma (1 + \lambda_C)] K^2.$$

Maximizing this yields the formula (10) in the text for the optimal full-information choice of the public good, K^{FI} .

The autocratic ruler maximizes $S_R = R$ subject to (a.2) and the citizen's participation constraint

$$S_C \equiv K - \frac{1}{2} K^2 - F \geq S_C^0. \quad (\text{a.3})$$

Obviously the ruler will raise F as high as possible to extract from the citizen and then R as high as possible to extract from the bureaucrat. Solving the binding constraints, we find

$$R = \frac{1}{1 + \lambda_B} \left[\frac{1}{1 + \lambda_C} \left(K - \frac{1}{2} K^2 - S_C^0 \right) - \frac{1}{2} \gamma K^2 - S_B^0 \right].$$

Maximizing this with respect to K yields (10) again.

B. Productivity Private Information, Actions Observable

Both types of rulers face the same participation and incentive-compatibility constraints with regard to the bureaucrat. The participation constraints for the two types are

$$F_i - (1 + \lambda_B) R_i - \frac{1}{2} \gamma_i (K_i)^2 \geq S_B^0, \quad \text{for } i = L, H.$$

and the incentive compatibility constraints are

$$F_i - (1 + \lambda_B) R_i - \frac{1}{2} \gamma_i (K_i)^2 \geq F_j - (1 + \lambda_B) R_j - \frac{1}{2} \gamma_i (K_j)^2 \quad \text{for } i, = L, H, j \neq i.$$

It proves convenient to define the bureaucrat's net financial receipts

$$N = F - (1 + \lambda_B) R,$$

with the type subscripts $i = L, H$ as needed. Rewrite the constraints and label them BPC_i and BIC_i , standing for type- i bureaucrat's participation (resp. incentive compatibility) constraints:

$$BPC_H : \quad N_H - \frac{1}{2} \gamma_H (K_H)^2 \geq S_B^0 \tag{a.4}$$

$$BPC_L : \quad N_L - \frac{1}{2} \gamma_L (K_L)^2 \geq S_B^0 \tag{a.5}$$

$$BIC_H : \quad N_H - \frac{1}{2} \gamma_H (K_H)^2 \geq N_L - \frac{1}{2} \gamma_H (K_L)^2 \tag{a.6}$$

$$BIC_L : \quad N_L - \frac{1}{2} \gamma_L (K_L)^2 \geq N_H - \frac{1}{2} \gamma_L (K_H)^2 \tag{a.7}$$

Standard arguments work toward the “no rent for the worst type, no distortion for the best type” property. There are three intermediate results:

[1] Adding the two incentive constraints and collecting terms yields

$$\frac{1}{2} (\gamma_H - \gamma_L) \left[(K_L)^2 - (K_H)^2 \right] \geq 0,$$

therefore $K_L \geq K_H$.

[2] If BIC_L is binding and $K_L \geq K_H$, then BIC_H holds. To see this, note that

$$\begin{aligned} N_H - \frac{1}{2} \gamma_H (K_H)^2 &= N_H - \frac{1}{2} \gamma_L (K_H)^2 - \frac{1}{2} (\gamma_H - \gamma_L) (K_H)^2 \\ &= N_L - \frac{1}{2} \gamma_L (K_L)^2 - \frac{1}{2} (\gamma_H - \gamma_L) (K_H)^2 \quad \text{using } BIC_L \text{ with } = \\ &= N_L - \frac{1}{2} \gamma_H (K_L)^2 + \frac{1}{2} (\gamma_H - \gamma_L) (K_L)^2 - \frac{1}{2} (\gamma_H - \gamma_L) (K_H)^2 \\ &= N_L - \frac{1}{2} \gamma_H (K_L)^2 + \frac{1}{2} (\gamma_H - \gamma_L) \left[(K_L)^2 - (K_H)^2 \right] \\ &\geq N_L - \frac{1}{2} \gamma_H (K_L)^2 \quad \text{using } K_L \geq K_H \end{aligned}$$

[3] If BIC_L and BPC_H hold, then so does BPC_L . To see this, note that

$$\begin{aligned}
N_L - \frac{1}{2} \gamma_L (K_L)^2 &\geq N_H - \frac{1}{2} \gamma_L (K_H)^2 && \text{using } BIC_L \\
&= N_H - \frac{1}{2} \gamma_H (K_H)^2 + \frac{1}{2} (\gamma_H - \gamma_L) (K_H)^2 \\
&\geq S_B^0 && \text{using } BPC_H \text{ and } \gamma_H > \gamma_L, K_H \geq 0
\end{aligned}$$

Therefore we solve a less constrained or “relaxed” optimization problem imposing only BIC_L and BPC_H , and verify that in the solution BIC_L is binding and $K_L \geq K_H$. (In fact it will also be true that BPC_H is also binding, which is the “no rent for the worst type” property.) This ensures that all four of the original constraints hold. The solution of the relaxed problem remains feasible for the original more-constrained problem; therefore it must be optimal for the latter, too.

Consider the democratic ruler first. Using the new variable, his objective function is

$$\begin{aligned}
U^D &= K - \frac{1}{2} (1 + \gamma) K^2 - \lambda_C [N + (1 + \lambda_B) R] - \lambda_B R \\
&= K - \frac{1}{2} (1 + \gamma) K^2 - \lambda_C N - [(1 + \lambda_B) (1 + \lambda_C) - 1] R
\end{aligned}$$

The expected value of this is

$$E[U^D] = \sum_{i=L,H} \theta_i [K_i - \frac{1}{2} (1 + \gamma_i) (K_i)^2 - \lambda_C N_i - [(1 + \lambda_B) (1 + \lambda_C) - 1] R_i].$$

This is to be maximized subject to

$$\begin{aligned}
BPC_H : \quad N_H - \frac{1}{2} \gamma_H (K_H)^2 &\geq S_B^0 \\
BIC_L : \quad N_L - \frac{1}{2} \gamma_L (K_L)^2 &\geq N_H - \frac{1}{2} \gamma_L (K_H)^2
\end{aligned}$$

So long as one of λ_B and λ_C is even slightly positive, it is optimal to keep both $R_i = 0$, and I am using the same as a tie-break even when both λ_B and λ_C are zero. Next, it is optimal to keep N_H as low as possible, so BPC_H should be binding. And given this, it is also optimal to make N_L as low as possible, so BIC_L should be binding. Thus

$$\begin{aligned}
BPC_H : \quad N_H &= \frac{1}{2} \gamma_H (K_H)^2 + S_B^0; \\
BIC_L : \quad N_L &= \frac{1}{2} \gamma_L (K_L)^2 + N_H - \frac{1}{2} \gamma_L (K_H)^2 \\
&= \frac{1}{2} \gamma_L (K_L)^2 - \frac{1}{2} \gamma_L (K_H)^2 + \frac{1}{2} \gamma_H (K_H)^2 + S_B^0 \\
&= \frac{1}{2} \gamma_L (K_L)^2 - \frac{1}{2} (\gamma_L - \gamma_H) (K_H)^2 + S_B^0.
\end{aligned}$$

Substituting,

$$\begin{aligned} E[U^D] &= \theta_H [K_H - \frac{1}{2} (1 + \gamma_H) (K_H)^2 - \lambda_C [\gamma_H (K_H)^2 + S_B^0] \\ &\quad + \theta_L [K_L - \frac{1}{2} (1 + \gamma_L) (K_L)^2 - \lambda_C [\frac{1}{2} \gamma_L (K_L)^2 - \frac{1}{2} (\gamma_L - \gamma_H) (K_H)^2 + S_B^0]]. \end{aligned}$$

Therefore the first-order condition for K_L is

$$\begin{aligned} \frac{\partial E[U^D]}{\partial K_L} &= \theta_L [1 - (1 + \gamma_L) K_L - \lambda_C \gamma_L K_L] \\ &= \theta_L \{ 1 - [1 + \gamma_L (1 + \lambda_C)] K_L \} = 0, \end{aligned}$$

which yields (11) in the text. The first-order condition for K_H is

$$\begin{aligned} \frac{\partial E[U^D]}{\partial K_H} &= \theta_H [1 - (1 + \gamma_H) K_H - \lambda_C \gamma_H K_H] - \theta_L \lambda_C (\gamma_L - \gamma_H) K_H \\ &= \theta_H \left[1 - [1 + \gamma_H (1 + \lambda_C)] K_H - \frac{\theta_L}{\theta_H} (\gamma_L - \gamma_H) \lambda_C K_H \right] = 0, \end{aligned}$$

which yields (12) in the text. The second order condition, and the requirements for the relaxed problem to be feasible for the full problem, namely that BIC_L be binding and $K_L \geq K_H$, are easily verified.

C. Agent's Actions Not Observable

First suppose only K is not observable. Given the F and R chosen by the ruler, the agent will choose K as low as compatible with $S_C \geq S_C^0$. Using (4) and $Q = K = L$, this implies

$$K - \frac{1}{2} K^2 - (1 + \lambda_C) F = S_C^0.$$

Figure 1 shows how this works. Only (K, F) combinations on or below the inverse-U-shaped curve are feasible with respect to the citizen's participation constraint. By setting F between its lowest and the highest possible values, $-S_C^0/(1+\lambda_C)$ and $[1-2S_C^0]/[2(1+\lambda_C)]$ respectively, the ruler can force the bureaucrat to choose K at the value between \widehat{K} and 1 along the left hand branch of this curve. Thus we can regard the ruler as effectively choosing K in the range $[0, 1]$, with F satisfying the citizen's participation constraint with equality.

Then for the democratic ruler,

$$U_D = K - \frac{1}{2} (1 + \gamma) K^2 - \frac{\lambda_C}{1 + \lambda_C} \left(K - \frac{1}{2} K^2 - S_C^0 \right) - \lambda_B R.$$

The optimum R still equals zero, and the optimum K satisfies

$$1 - (1 + \gamma) K - \frac{\lambda_C}{1 + \lambda_C} (1 - K) = 0,$$

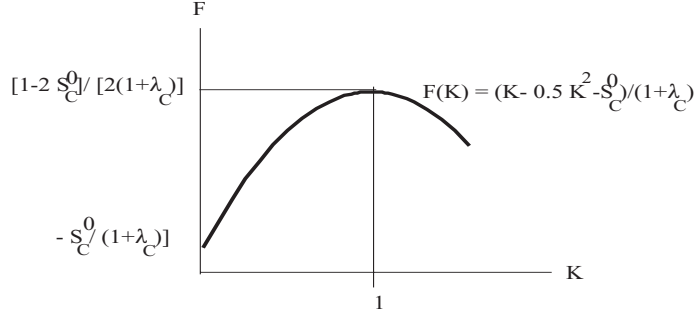


Figure 1: Forcing Choice of K via F

which simplifies to the same expression as K^{FI} in (10).

For the autocratic ruler, who wants to drive the citizen down to his participation constraint anyway, the problem is the same as that under full information. In fact the problem with private information is also unchanged and this ruler can obtain the same outcome when K is not observable as when it is.

D. Altruistic Bureaucrat, Autocratic Ruler

Begin by assuming full information (the ruler knows the bureaucrat's type). When the bureaucrat has a known positive altruism parameter α , the ruler solves the problem

$$\text{Max } R$$

subject to the citizen's participation constraint (*CPC*)

$$K - \frac{1}{2} K^2 - (1 + \lambda_C) F \geq S_C^0,$$

or

$$F \leq \frac{1}{1 + \lambda_C} [K - \frac{1}{2} K^2 - S_C^0]; \quad (\text{a.8})$$

and the bureaucrat's participation constraint (*BPC*)

$$[F - \frac{1}{2} \gamma K^2 - (1 + \lambda_B) R] + \alpha [K - \frac{1}{2} K^2 - (1 + \lambda_C) F \geq S_C^0] \geq S_B^0,$$

or

$$R \leq \frac{1}{1 + \lambda_B} \left\{ [1 - \alpha(1 + \lambda_C)] F + \alpha K - \frac{1}{2} (\alpha + \gamma) K^2 - \alpha S_C^0 - S_B^0 \right\}. \quad (\text{a.9})$$

In case of normal altruism, Figure 2 shows the line in (F, R) space where the bureaucrat's participation condition is binding, that is, (a.9) holds with equality. The line is upward-sloping, and points on or below it are feasible. The citizen's participation constraint is

binding along the vertical line CPC; points on or to its left are feasible. Therefore the points feasible with respect to both constraints constitute the shaded region.

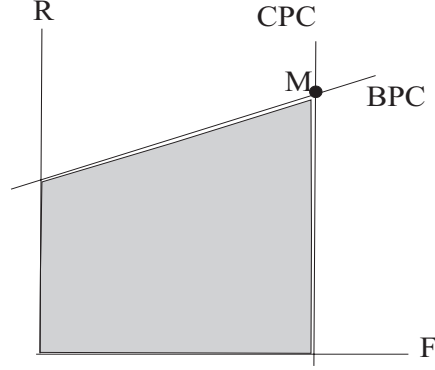


Figure 2: Feasible region - normal altruism

For any given K , it is evident from the figure that the ruler's choice of (F, R) to maximize R occurs at the point M , where both constraints are binding. Using the expressions for F and R given by equalities in (a.8) and (a.9), we have

$$\begin{aligned} \frac{dR}{dK} &= \frac{1}{1 + \lambda_B} \left\{ [1 - \alpha(1 + \lambda_C)] \frac{dF}{dK} + \alpha - (\alpha + \gamma) K \right\} \\ &= \frac{1}{1 + \lambda_B} \left\{ [1 - \alpha(1 + \lambda_C)] \frac{1}{1 + \lambda_C} (1 - K) + \alpha - (\alpha + \gamma) K \right\} \\ &= \frac{1}{(1 + \lambda_B)(1 + \lambda_C)} \left\{ 1 - [1 + \gamma(1 + \lambda_C)] K \right\} \end{aligned}$$

Therefore the ruler's optimal choice of K is the same full-information K^{FI} given by (10) as in the case of the selfish bureaucrat (with $\alpha = 0$).

The intuition is that the autocratic ruler wants to drive the citizen down to his participation constraint; therefore the bureaucrat does not get any indirect benefit from the citizen's surplus regardless of his degree of (normal) altruism.

A consequence is that the autocratic ruler does not care whether the bureaucrat is selfish or altruistic (to a normal extent). Even if he lacks direct knowledge of the bureaucrat's type, he will not expend any rent to achieve revelation.

In case of super-altruism, $1 - \alpha(1 + \lambda_C) < 0$; therefore (a.9) shows that in Figure 3 the boundary BPC of the bureaucrat's participation region is downward-sloping. Then, for any given K , the choice (point M) of (F, R) that maximizes R will set $F = 0$ and keep the bureaucrat's participation constraint binding.

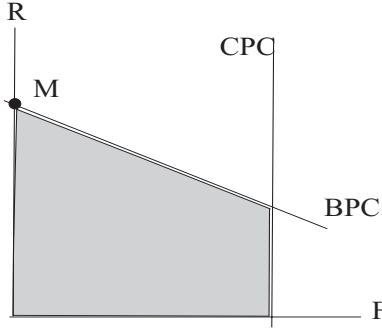


Figure 3: Feasible region - super-altruism

With $F = 0$ and BPC binding, we have

$$R = \frac{1}{1 + \lambda_B} \left\{ \alpha K - \frac{1}{2} (\alpha + \gamma) K^2 - \alpha S_C^0 - S_B^0 \right\}.$$

To maximize this, the ruler will choose

$$K = \frac{\alpha}{\alpha + \gamma}. \quad (\text{a.10})$$

This has some interesting properties. First, the autocratic ruler's interest is best served by exploiting the kind-hearted super-altruistic bureaucrat and incidentally benefiting the citizen! Second, the bureaucrat is on his participation constraint and gets utility S_B^0 ; he would get the same utility if he pretended successfully to be selfish ($\alpha = 0$). So he has no positive incentive to falsify his type. There is no adverse selection problem of agency in this case, and the ruler need not expend any rent for truthful revelation. Second, given the ruler's choice of F (here 0) and R , the bureaucrat will maximize his own utility (14) by choosing the same K as the ruler's optimum given by (a.10). Therefore the ruler does not face a moral hazard problem even if he cannot observe the agent's action!

E. Altruistic Bureaucrat, Democratic Ruler, Full Information

The ruler solves the problem

$$\text{Max } U_D = K - \frac{1}{2} (1 + \gamma) K^2 - \lambda_C F - \lambda_B R$$

subject participation constraints: the citizen's (CPC)

$$K - \frac{1}{2} K^2 - (1 + \lambda_C) F \geq S_C^0, \quad (\text{a.11})$$

and the bureaucrat's (*BPC*)

$$[1 - \alpha(1 + \lambda_C)] F - (1 + \lambda_B) R + \alpha K - \frac{1}{2}(\alpha + \gamma) K^2 - \alpha S_C^0 \geq S_B^0. \quad (\text{a.12})$$

Obviously $R = 0$ is optimal; a positive R would only make it harder to meet *BPC* without helping (actually hurting when $\lambda_B > 0$) the objective.

CPC gives an upper bound on F . Whether the *BPC* gives a lower or an upper bound on F depends on whether the bureaucrat's altruism is normal or super.

E.1: Normal Altruism

Here the coefficient of F in (a.12) is positive; therefore *BPC* places a lower bound on F . A lower F raises the objective U_D . Therefore so long as the feasible region is non-empty, the ruler wants F as low as possible, that is, he keeps *BPC* binding and *CPC* slack. Therefore

$$F = \frac{1}{1 - \alpha(1 + \lambda_C)} \left\{ -\alpha K + \frac{1}{2}(\alpha + \gamma) K^2 + \alpha S_C^0 + S_B^0 \right\}.$$

Using this,

$$\begin{aligned} \frac{dU_D}{dK} &= 1 - (1 + \gamma) K - \frac{\lambda_C}{1 - \alpha(1 + \lambda_C)} \left\{ -\alpha + (\alpha + \gamma) K \right\} \\ &= \frac{1 - \alpha}{1 - \alpha(1 + \lambda_C)} \left\{ 1 - [1 + \gamma(1 + \lambda_C)] K \right\} \end{aligned}$$

after some simplification. Note that $\alpha < 1/(1 + \lambda_C) \leq 1$, so the fraction on the right hand side is positive. Therefore the ruler's optimal choice is the same K^{FI} in (10) as in the case where the bureaucrat is purely selfish ($\alpha = 0$). However, F is different, and that affects the bureaucrat's incentive to reveal his altruism.

If an altruistic bureaucrat successfully pretended to be selfish, the ruler would set the same $K = K^{FI}$, but

$$F = \frac{1}{2}\gamma K^2 + S_B^0.$$

Compare the bureaucrat's utility U_B given by (14) with his true α . Since K is the same in the two cases, the pretense of selfishness benefits the altruistic bureaucrat if it leads to a larger F , that is, if

$$\frac{1}{2}\gamma K^2 + S_B^0 > \frac{1}{1 - \alpha(1 + \lambda_C)} \left\{ -\alpha K + \frac{1}{2}(\alpha + \gamma) K^2 + \alpha S_C^0 + S_B^0 \right\}.$$

This simplifies to

$$K - \frac{1}{2}[1 + \gamma(1 + \lambda_C)] K^2 > S_C^0 + (1 + \lambda_C) S_B^0.$$

or

$$U_D = K - \frac{1}{2}(1 + \gamma)K^2 - \lambda_C F > S_C^0 + S_B^0, \quad (\text{a.13})$$

that is, the total social surplus should exceed the sum of the outside opportunities $S_C^0 + S_B^0$. This is a reasonable requirement for an interesting context of provision of public goods; therefore I will assume this condition holds, and examine the ruler's mechanism design problem in Section F below.

E.2. Super-altruism

If $\alpha > 1/(1 + \lambda_C)$, the coefficient of F in (a.12) is negative; therefore *BPC* places an upper bound on F . So does *CPC*. Therefore when the feasible region is non-empty it is optimal for the democratic ruler to set $F = 0$, and both participation constraints are non-binding. With $R = 0$ as before, the ruler's objective function becomes

$$U_D = K - \frac{1}{2}(1 + \gamma)K^2.$$

Then the optimal K is the first-best K^{FB} given by (3). The citizen gets surplus

$$S_C = \frac{1}{2}(K^{FB})^2,$$

and the bureaucrat gets the utility

$$\begin{aligned} U_B &= -\frac{1}{2}\gamma(K^{FB})^2 + \alpha[K^{FB} - \frac{1}{2}(K^{FB})^2 - S_C^0] \\ &= \alpha K^{FB} - \frac{1}{2}(\alpha + \gamma)(K^{FB})^2 - \alpha S_C^0. \end{aligned}$$

If such a super-altruistic bureaucrat successfully pretended to be selfish, the democratic ruler would set $K = K^{FI}$ and F to keep a selfish bureaucrat on the participation constraint, that is,

$$F = \frac{1}{2}\gamma(K^{FI})^2 + S_B^0.$$

And of course $R = 0$. Using these values in his true objective function, the super-altruistic bureaucrat would get utility

$$\begin{aligned} U_B &= [F - \frac{1}{2}\gamma K^2 - (1 + \lambda_B)R] + \alpha[K - \frac{1}{2}K^2 - (1 + \lambda_C)F \geq S_C^0] \\ &= [1 - \alpha(1 + \lambda_C)] [\frac{1}{2}\gamma(K^{FI})^2 + S_B^0] + \alpha K^{FI} - \frac{1}{2}(\alpha + \gamma)(K^{FI})^2 - \alpha S_C^0. \end{aligned}$$

Let us examine whether the super-altruistic bureaucrat's utility is higher when he reveals α truthfully, that is, whether the full-information optimum is naturally incentive-compatible. We want

$$\begin{aligned} \alpha K^{FB} - \frac{1}{2}(\alpha + \gamma)(K^{FB})^2 - \alpha S_C^0 \\ \geq [1 - \alpha(1 + \lambda_C)] [\frac{1}{2}\gamma(K^{FI})^2 + S_B^0] + \alpha K^{FI} - \frac{1}{2}(\alpha + \gamma)(K^{FI})^2 - \alpha S_C^0. \end{aligned}$$

For the super-altruistic bureaucrat, $1 - \alpha(1 + \lambda_C) < 0$. Therefore, so long as $S_B^0 \geq 0$, for example this is an NGO with useful roles elsewhere,

$$[1 - \alpha(1 + \lambda_C)] [\frac{1}{2} \gamma (K^{FI})^2 + S_B^0] < 0.$$

Therefore a sufficient condition for the desired inequality is

$$\alpha K^{FB} - \frac{1}{2} (\alpha + \gamma) (K^{FB})^2 > \alpha K^{FI} - \frac{1}{2} (\alpha + \gamma) (K^{FI})^2.$$

To see when it holds, consider the function

$$\alpha K - \frac{1}{2} (\alpha + \gamma) K^2$$

This is single-peaked, and is maximized at the bureaucrat's most-preferred K , namely

$$K^B = \frac{\alpha}{\alpha + \gamma} = \frac{1}{1 + \gamma/\alpha}.$$

If $\alpha > 1$, then

$$\frac{1}{1 + \gamma(1 + \lambda_C)} < \frac{1}{1 + \gamma} < \frac{1}{1 + \gamma/\alpha},$$

or

$$K^{FI} < K^{FB} < K^B.$$

Over the range $[0, \alpha/(\alpha + \gamma)]$ the function we are considering is increasing, therefore

$$\alpha K^{FI} - \frac{1}{2} (\alpha + \gamma) (K^{FI})^2 < \alpha K^{FB} - \frac{1}{2} (\alpha + \gamma) (K^{FB})^2,$$

which is the desired inequality. The intuition is as follows. A pretense of selfishness would lead to the selfish-bureaucrat-full-information $K = K^{FI}$ instead of the first-best $K = K^{FB}$, the middle expression. If the bureaucrat is so super-altruistic ($\alpha > 1$) that his privately optimal level of K exceeds the first-best, then the pretense leads to an even worse choice of K than truth-telling. The pretense also requires the super-altruistic bureaucrat to extract positive F from the citizen, which he does not want to do. Putting the two together, the bureaucrat clearly does not benefit by pretending selfishness.

However, if $1/(1 + \lambda_C) < \alpha < 1$, then the same argument leads to

$$K^{FI} < K^B < K^{FB},$$

and we cannot say whether the bureaucrat would prefer to reveal the truth and implement K^{FB} which is larger than he most prefers, or conceal and implement K^{FI} which is smaller.

F. Democratic Ruler, Bureaucrat's Normal Altruism Private Information

The bureaucrat may be selfish (type S) or normally altruistic (type A , with $\alpha(1 + \lambda_C) < 1$) with probabilities ω_S, ω_A respectively. The democratic ruler's problem is to design a direct mechanism where he asks the bureaucrat to announce his type, and a response i means implementing (K_i, F_i, R_i) for $i = S, A$. This is done to maximize expected social welfare, subject to the participation and incentive-compatibility (truthful revelation) constraints for each type. I ignore the citizen's participation constraints since the democratic ruler will leave them slack; however, this will have to be reconsidered briefly in the first subsection.

F.1. Revelation using remittances

The expected social welfare is

$$E[U_D] = \sum_{i=S,A} \omega_i [K_i - \frac{1}{2}(1 + \gamma)(K_i)^2 - \lambda_C F_i - \lambda_B R_i],$$

and the constraints are:

$$BPC_S : F_S - (1 + \lambda_B) R_S - \frac{1}{2} \gamma (K_S)^2 \geq S_B^0 \quad (\text{a.14})$$

$$\begin{aligned} BPC_A : [1 - \alpha(1 + \lambda_C)] F_A - (1 + \lambda_B) R_A + \alpha K_A - \frac{1}{2} (\alpha + \gamma) (K_A)^2 - \alpha S_C^0 \\ \geq S_B^0 \end{aligned} \quad (\text{a.15})$$

$$BIC_S : F_S - (1 + \lambda_B) R_S - \frac{1}{2} \gamma (K_S)^2 \geq F_A - (1 + \lambda_B) R_A - \frac{1}{2} \gamma (K_A)^2 \quad (\text{a.16})$$

$$\begin{aligned} BIC_A : [1 - \alpha(1 + \lambda_C)] F_A - (1 + \lambda_B) R_A + \alpha K_A - \frac{1}{2} (\alpha + \gamma) (K_A)^2 - \alpha S_C^0 \\ \geq [1 - \alpha(1 + \lambda_C)] F_S - (1 + \lambda_B) R_S + \alpha K_S - \frac{1}{2} (\alpha + \gamma) (K_S)^2 - \alpha S_C^0 \end{aligned} \quad (\text{a.17})$$

Begin with two intermediate results:

[1] If BIC_A binds, and $F_S \geq F_A, K_S \leq K_A \leq 1$, then BIC_S holds.

To prove this, add each side of (a.17) (the two are equal when it holds as an equation) to the corresponding side of (a.16). Canceling some terms, the latter is equivalent to

$$-\alpha(1 + \lambda_C) F_A + \alpha K_A - \frac{1}{2} \alpha (K_A)^2 \geq -\alpha(1 + \lambda_C) F_S + \alpha K_S - \frac{1}{2} \alpha (K_S)^2,$$

or

$$(1 + \lambda_C) (F_S - F_A) + \left\{ \left[K_A - \frac{1}{2} (K_A)^2 \right] - \left[K_S - \frac{1}{2} (K_S)^2 \right] \right\} \geq 0.$$

The function $K - \frac{1}{2} K^2$ is increasing in the interval $[0, 1]$; therefore the inequality holds under the stipulated conditions.

[2] If BIC_A and BPC_S hold, and the citizen's participation constraint is met, then BPC_A holds.

To prove this, write BIC_A as

$$\begin{aligned} & [1 - \alpha(1 + \lambda_C)] F_A - (1 + \lambda_B) R_A + \alpha K_A - \frac{1}{2} (\alpha + \gamma) (K_A)^2 - \alpha S_C^0 \\ & \geq [F_S - (1 + \lambda_B) R_S - \frac{1}{2} \gamma (K_S)^2] + \alpha [K_S - \frac{1}{2} (K_S)^2 - (1 + \lambda_C) F_S - S_C^0] \end{aligned}$$

The first bracketed term on the right hand side is $\geq S_B^0$ by BPC_S , and the second is ≥ 0 by the citizen's participation constraint. Therefore the left hand side is $\geq S_B^0$, which is exactly what we need for BPC_A .

Now we can solve a relaxed problem imposing only BPC_S and BIC_A , and verify that the other requirements are met. Then the solution will also be optimal for the full problem. The relaxed problem is to maximize

$$\begin{aligned} E[U_D] &= \omega_S [K_S - \frac{1}{2} (1 + \gamma) (K_S)^2 - \lambda_C F_S - \lambda_B R_S] \\ &\quad + \omega_A [K_A - \frac{1}{2} (1 + \gamma) (K_A)^2 - \lambda_C F_A - \lambda_B R_A] \end{aligned}$$

subject to the constraints written with a slight rearrangement of terms:

$$BPC_S : F_S \geq (1 + \lambda_B) R_S + \frac{1}{2} \gamma (K_S)^2 + S_B^0,$$

and

$$\begin{aligned} BIC_A : F_A &\geq F_S - \frac{1 + \lambda_B}{1 - \alpha(1 + \lambda_C)} R_S + \frac{1 + \lambda_B}{1 - \alpha(1 + \lambda_C)} R_A \\ &\quad - \frac{1}{1 - \alpha(1 + \lambda_C)} \left\{ [\alpha K_A - \frac{1}{2} (\alpha + \gamma) (K_A)^2] - [\alpha K_S - \frac{1}{2} (\alpha + \gamma) (K_S)^2] \right\}. \end{aligned}$$

First note that reducing R_A increases the objective and relaxes BIC_A ; therefore it is optimal to make $R_A = 0$. Next, reducing F_S also increases the objective and relaxes BIC_A , therefore it is optimal to make F_S as low as is compatible with BPC_S . And since $S_B^0 \geq 0$, even when BPC_S binds, F_S remains ≥ 0 . Therefore it is optimal to set

$$F_S = (1 + \lambda_B) R_S + \frac{1}{2} \gamma (K_S)^2 + S_B^0. \quad (\text{a.18})$$

Next, for given R_S (and therefore F_S), reducing F_A increases the objective, therefore it is optimal to keep F_A as low as possible. Substituting from (a.18), when BIC_A is binding

we have

$$F_A = F_S - \frac{1 + \lambda_B}{1 - \alpha(1 + \lambda_C)} R_S - \frac{1}{1 - \alpha(1 + \lambda_C)} \left\{ [\alpha K_A - \frac{1}{2}(\alpha + \gamma)(K_A)^2] - [\alpha K_S - \frac{1}{2}(\alpha + \gamma)(K_S)^2] \right\} \quad (\text{a.19})$$

$$= (1 + \lambda_B R_S) + \frac{1}{2} \gamma (K_S)^2 + S_B^0 - \frac{1 + \lambda_B}{1 - \alpha(1 + \lambda_C)} R_S - \frac{1}{1 - \alpha(1 + \lambda_C)} \left\{ [\alpha K_A - \frac{1}{2}(\alpha + \gamma)(K_A)^2] - [\alpha K_S - \frac{1}{2}(\alpha + \gamma)(K_S)^2] \right\} \quad (\text{a.20})$$

Recall that here we have normal altruism so $1 - \alpha(1 + \lambda_C) > 0$. The requirement $F_A \leq F_S$ will be verified below. However, $F_A \geq 0$ cannot be guaranteed if R_S is increased, and this becomes an issue in what follows. For the time being, assume the equality (a.20). Holding K_S and K_A constant but allowing F_S and F_A to vary with R_S as given by (a.18) and (a.20) above, we get

$$\begin{aligned} \frac{\partial E[U_D]}{\partial R_S} &= \omega_S [-\lambda_C (1 + \lambda_B) - \lambda_B] + \omega_A \lambda_C \frac{\alpha (1 + \lambda_B)(1 + \lambda_C)}{1 - \alpha (1 + \lambda_C)} \\ &= -\omega_S [\lambda_C + \lambda_B + \lambda_C \lambda_B] + \omega_A (1 + \lambda_B)(1 + \lambda_C) \frac{\alpha \lambda_C}{1 - \alpha (1 + \lambda_C)} \end{aligned}$$

The sign of this depends on whether

$$\frac{\omega_S}{\omega_A} > \frac{(1 + \lambda_C)(1 + \lambda_B)}{\lambda_C + \lambda_B + \lambda_C \lambda_B} \frac{\alpha \lambda_C}{1 - \alpha (1 + \lambda_C)} \equiv \rho_1 \quad (\text{a.21})$$

If this inequality holds, then $\partial E[U_D]/\partial R_S < 0$, so it is optimal to decrease R_S all the way down to zero. Then the analysis of subsection F.2 below applies. This critical ratio ρ_1 is bigger than a corresponding critical ratio ρ_2 in subsection F.2, so to anticipate, we are already in the case where ruler prefers not to try to achieve revelation of the altruistic types, implements the full-information K_S and K_A , and simply accepts the loss of rent to the altruistic type bureaucrat.

Observe that if λ_B is small, the right hand of (a.21) is large; then the case under analysis here holds for a large range of values of ω_S/ω_A . This makes intuitive sense; if remittances from the bureaucrat to the ruler do not cause much dead-weight loss, then they can be used more effectively for information revelation.

If the inequality in (a.21) does not hold, then $\partial E[U_D]/\partial R_S > 0$, so it is optimal to increase R_S . Then (a.20) shows that F_A must decrease. Suppose F_A is decreased until BPC_A is met with equality. Therefore we have three equality constraints, BPC_A , BPC_S and BIC_A ; only

BIC_S is slack. The three constraints can be solved for F_S , R_S and F_A in terms of K_S and K_A . We get

$$\begin{aligned}
F_S &= \frac{1}{(1 + \lambda_C)} [K_S - \frac{1}{2} (K_S)^2 - S_C^0] \\
R_S &= \frac{1}{1 + \lambda_B} [F_S - \frac{1}{2} \gamma (K_S)^2 - S_B^0] \\
&= \frac{1}{(1 + \lambda_B)(1 + \lambda_C)} \left\{ K_S - \frac{1}{2} [1 + \gamma(1 + \lambda_C)] (K_S)^2 - S_C^0 - (1 + \lambda_C) S_B^0 \right\} \text{(a.22)} \\
F_A &= \frac{1}{1 - \alpha(1 + \lambda_C)} [\alpha S_C^0 + S_B^0 - \alpha K_A + \frac{1}{2} (\alpha + \gamma) (K_A)^2] \quad \text{(a.23)}
\end{aligned}$$

Incidentally, note that the first of these equalities implies

$$K_S - \frac{1}{2} (K_S)^2 - (1 + \lambda_C) F_S = S_C^0.$$

Therefore the citizen's participation constraint is only just met when the bureaucrat is of the selfish type. This is the key aspect of making it unattractive for the altruistic type to pretend to be selfish.

Using these values of the financial transfers in the objective function, we get

$$\begin{aligned}
\frac{\partial E[U_D]}{\partial K_A} &= \omega_A \left\{ 1 - (1 + \gamma) K_A + \frac{\lambda_C}{1 - \alpha(1 + \lambda_C)} [\alpha - (\alpha + \gamma) K_A] \right\} \\
&= \omega_A \frac{1 - \alpha}{1 - \alpha(1 + \lambda_C)} \{ 1 - [1 + \gamma(1 + \lambda_C)] K_A \}
\end{aligned}$$

after some simplification. And

$$\begin{aligned}
\frac{\partial E[U_D]}{\partial K_S} &= \omega_S \left\{ 1 - (1 + \gamma) K_S - \lambda_C \frac{\partial F_S}{\partial K_S} - \lambda_B \frac{\partial R_S}{\partial K_S} \right\} \\
&= \omega_S \left\{ 1 - (1 + \gamma) K_S - \lambda_C \frac{\partial F_S}{\partial K_S} - \frac{\lambda_B}{1 + \lambda_B} \left[\frac{\partial F_S}{\partial K_S} - \gamma K_S \right] \right\} \\
&= \omega_S \left\{ 1 - (1 + \gamma) K_S - \lambda_C \frac{\partial F_S}{\partial K_S} - \frac{\lambda_B}{1 + \lambda_B} \left[\frac{\partial F_S}{\partial K_S} - \gamma K_S \right] \right\} \\
&= \omega_S \left\{ 1 - (1 + \gamma) K_S - \left[\lambda_C + \frac{\lambda_B}{1 + \lambda_B} \right] [1 - K_S - \gamma K_S] \right\} \\
&= \frac{1}{(1 + \lambda_B)(1 + \lambda_C)} \{ 1 - [1 + \gamma(1 + \lambda_C)] K_S \}
\end{aligned}$$

also after some simplification. Therefore $K_S = K_A = K^{FI}$, the full information optimal level of public goods.

It remains to verify that the various assumptions made so far are valid. The relaxed problem requires $K_A \geq K_S$ and $F_S \leq F_S$. The first is true since $K_A = K_S$. As for the second, note from the second expression for R_S , (a.22) above, that when $K_S = K^{FI}$, we have

$$R_S = \frac{1}{(1 + \lambda_B)(1 + \lambda_C)} \left\{ K^{FI} - \frac{1}{2} [1 + \gamma(1 + \lambda_C)] (K^{FI})^2 - S_C^0 - (1 + \lambda_C) S_B^0 \right\},$$

which is positive by the assumption that at the full information optimum, the total social surplus exceeds the sum of outside opportunities; see (a.13) above. With $R_S > 0$ and $K_S = K_A$, the expression for F_A in (a.19) shows that $F_A < F_S$.

However, $F_A \geq 0$ is not guaranteed. Its sign depends on where α is in its permissible range from 0 to $1/(1 + \lambda_C)$ of the normal altruism case. When $\alpha = 0$, we see from (a.23) that the sign of F_S is the same as the sign of:

$$S_B^0 + \frac{1}{2} \gamma (K_A)^2,$$

which is positive. But when $\alpha = 1/(1 + \lambda_C)$ the sign of F_A is the same as the sign of

$$S_C^0 + (1 + \lambda_C) S_B^0 - K_A + \frac{1}{2} [1 + \gamma(1 + \lambda_C)] (K_A)^2,$$

which is negative by the same condition on the total social surplus. Therefore the solution of information revelation using remittances works perfectly only over a range of small α , that is, low altruism.

The intuition is as follows. An increase in R_S and a decrease in F_A are both ways of reducing the temptation for a normally altruistic bureaucrat to pretend to be selfish. However, they differ in their deadweight loss implications. A increase in R_S increases the deadweight loss (because of λ_B), so this avenue should be used as little as possible. A decrease in F_A reduces the deadweight loss, so this should be used more if possible. But if α is large, more of the effect of a unit change in F_A on the altruistic bureaucrat's welfare is offset by the effect on the citizen's welfare. Therefore a bigger change in F_A is needed to achieve separation, and this can go so far as to hit the non-negativity constraint.

If the solution to the relaxed problem yields $F_A = 0$, we must solve a further constrained (third-best) problem setting $F_A = 0$. The results are not very enlightening, so I will omit them even from the appendix.

F.2. Constrained optimum with zero remittances

With the assumption $R_S = R_A = 0$, the expected social welfare is

$$E[U_D] = \sum_{i=S,A} \omega_i \left[K_i - \frac{1}{2} (1 + \gamma) (K_i)^2 - \lambda_C F_i \right]$$

The constraints, with the same labeling principle as with private information about γ in Section B are

$$BPC_S : F_S - \frac{1}{2} \gamma (K_S)^2 \geq S_B^0 \quad (\text{a.24})$$

$$BPC_A : [1 - \alpha(1 + \lambda_C)] F_A + \alpha K_A - \frac{1}{2} (\alpha + \gamma) (K_A)^2 - \alpha S_C^0 \geq S_B^0 \quad (\text{a.25})$$

$$BIC_S : F_S - \frac{1}{2} \gamma (K_S)^2 \geq F_A - \frac{1}{2} \gamma (K_A)^2 \quad (\text{a.26})$$

$$\begin{aligned} BIC_A : [1 - \alpha(1 + \lambda_C)] F_A + \alpha K_A - \frac{1}{2} (\alpha + \gamma) (K_A)^2 - \alpha S_C^0 \\ \geq [1 - \alpha(1 + \lambda_C)] F_S + \alpha K_S - \frac{1}{2} (\alpha + \gamma) (K_S)^2 - \alpha S_C^0 \end{aligned} \quad (\text{a.27})$$

Once again we begin with two intermediate results:

[1] If BIC_A binds, and $F_S \geq F_A$, $K_S \leq K_A \leq 1$, then BIC_S holds.

To prove this, add each side of (a.27) (the two are equal when it holds as an equation) to the corresponding side of (a.26). Canceling some terms, the latter is equivalent to

$$-\alpha(1 + \lambda_C) F_A + \alpha K_A - \frac{1}{2} \alpha (K_A)^2 \geq -\alpha(1 + \lambda_C) F_S + \alpha K_S - \frac{1}{2} \alpha (K_S)^2,$$

or

$$(1 + \lambda_C) (F_S - F_A) + \left\{ \left[K_A - \frac{1}{2} (K_A)^2 \right] - \left[K_S - \frac{1}{2} (K_S)^2 \right] \right\} \geq 0.$$

The function $K - \frac{1}{2} K^2$ is increasing in the interval $[0, 1]$; therefore the inequality holds under the stipulated conditions.

[2] If BIC_A and BPC_S hold, and the citizen's participation constraint is met, then BPC_A holds.

To prove this, write BIC_A as

$$\begin{aligned} [1 - \alpha(1 + \lambda_C)] F_A + \alpha K_A - \frac{1}{2} (\alpha + \gamma) (K_A)^2 - \alpha S_C^0 \\ \geq [F_S - \frac{1}{2} \gamma (K_S)^2] + \alpha [K_S - \frac{1}{2} (K_S)^2 - (1 + \lambda_C) F_S - S_C^0] \end{aligned}$$

The first bracketed term on the right hand side is $\geq S_B^0$ by BPC_S , and the second is ≥ 0 by the citizen's participation constraint. Therefore the left hand side is $\geq S_B^0$, which is exactly what we need for BPC_A .

Now we can solve a relaxed problem imposing only BPC_S and BIC_A , and verify that the other requirements are met. Then the solution will also be optimal for the full problem. To maximize

$$E[U_D] = \omega_i [K_S - \frac{1}{2} (1 + \gamma) (K_S)^2 - \lambda_C F_S] + \omega_i [K_S - \frac{1}{2} (1 + \gamma) (K_S)^2 - \lambda_C F_S]$$

subject to

$$BPC_S : \quad F_S - \frac{1}{2} (K_S)^2 \geq S_B^0$$

and

$$\begin{aligned} BIC_A : \quad & [1 - \alpha(1 + \lambda_C)] F_A + \alpha K_A - \frac{1}{2} (\alpha + \gamma) (K_A)^2 - \alpha S_C^0 \\ & \geq [1 - \alpha(1 + \lambda_C)] F_S + \alpha K_S - \frac{1}{2} (\alpha + \gamma) (K_S)^2 - \alpha S_C^0, \end{aligned}$$

it is obviously optimal to keep F_S as low as is compatible with BPC_S – that increases the objective function and also helps fulfillment of BIC_A . Once this is done, it is optimal to make F_A as low as is compatible with BIC_A to increase the objective function. Therefore both constraints will bind. Thus

$$F_S = \frac{1}{2} \gamma (K_S)^2 + S_B^0,$$

and

$$F_A = F_S - \frac{1}{1 - \alpha(1 + \lambda_C)} \left\{ \left[\alpha K_A - \frac{1}{2} (\alpha + \gamma) (K_A)^2 \right] - \left[\alpha K_S - \frac{1}{2} (\alpha + \gamma) (K_S)^2 \right] \right\}.$$

Using these, we have

$$\begin{aligned} \frac{\partial E[U_D]}{\partial K_A} &= \omega_A \left[1 - (1 + \gamma) K_A + \lambda_C \frac{\alpha - (\alpha + \gamma) K_A}{1 - \alpha(1 + \lambda_C)} \right] \\ &= \frac{\omega_A (1 - \alpha)}{1 - \alpha(1 + \lambda_C)} [1 - [1 + \gamma(1 + \lambda_C)] K_A]. \end{aligned}$$

Therefore $K_A = K^{FI}$, the previous full-information choice. This is the “no distortion for the best type” property.

As for the choice of K_S ,

$$\begin{aligned} \frac{\partial E[U_D]}{\partial K_S} &= \omega_S [1 - (1 + \gamma) K_S - \lambda_C \gamma K_S] - \omega_A \lambda_C \left[\gamma K_S + \frac{\alpha - (\alpha + \gamma) K_S}{1 - \alpha(1 + \lambda_C)} \right] \\ &= \frac{\omega_S (1 - \alpha) - \alpha \lambda_C}{1 - \alpha(1 + \lambda_C)} [1 - [1 + \gamma(1 + \lambda_C)] K_S] \end{aligned}$$

after some algebraic manipulation.

If $\omega_S (1 - \alpha) - \alpha \lambda_C > 0$, that is

$$\frac{\omega_S}{\omega_A} > \frac{\alpha \lambda_C}{1 - \alpha(1 + \lambda_C)} \equiv \rho_2, \quad (\text{a.28})$$

this yields $K_S = K^{FI}$, again with no distortion! If the proportion of the S types in the population is too large, then distorting their choices becomes too costly and the ruler prefers

not to try to achieve revelation of the altruistic types. Note that with normal altruism, $1 - \alpha(1 + \lambda_C) > 0$, therefore the critical ratio ρ_1 is positive, and the bound on ω_S is meaningful.

If $\omega_S(1 - \alpha) - \alpha\lambda_C < 0$, that is, $\omega_S/\omega_A < \rho_2$, then $\partial E[U_D]/\partial K_S < 0$ for all $K_S \leq K^{FI}$. Therefore it is optimal to distort K_S downward as far as is compatible with the participation constraints, perhaps all the way down to zero.