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George Egorov and Konstantin Sonin

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George Egorov, CEFIR, Moscow
Konstantin Sonin, CEFIR, Moscow, New Economic School, Moscow and CEPR

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Centre for Economic Policy Research
90–98 Goswell Rd, London EC1V 7RR, UK
Tel: (44 20) 7878 2900, Fax: (44 20) 7878 2999
Email: cepr@cepr.org, Website: www.cepr.org

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ABSTRACT

Dictators and Their Viziers: Agency Problems in Dictatorships*

The possibility of treason by a close associate has been a nightmare of most dictators throughout history. Better informed viziers are also better able to discriminate among potential plotters, and this makes them more risky subordinates for the dictator. To avoid this, dictators – especially those which are weak and vulnerable – sacrifice the competence of their agents, hiring mediocre but loyal subordinates. One reason why democracies generally witness more talented people in the government is the dictator's inability to commit to the optimal (less than the capital) punishment for those who unsuccessfully plotted to remove him from power. Furthermore, any use of incentive schemes by a dictator is limited by the fact that rewards are conditional on dictator's own willingness to keep his promises, while punishments are conditional on dictator's own survival. We model a principal-agent game between a dictator and his (probably, few) viziers both in static and dynamic perspectives. The dynamic model allows us to focus on the succession problem the insecure dictators face.

JEL Classification: D72 and P16
Keywords: dictatorship, formal political theory and principal agent

George Egorov
CEFIR/New Economic School
47 Nakhimovsky prosp.
Moscow, 117418
RUSSIA
Tel: (7 095) 105 5002
Email: gegorov@cefir.ru

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Konstantin Sonin
Institute for Advanced Study
Einstein Dr.
Princeton, NJ 08540
USA
Tel: (1 609) 734 8364
Email: ksonin@nes.ru

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1 Introduction

Dictatorship is one of the oldest forms of government. Human history is replete with examples of unconstrained rulers, most exhibiting poor governance. Despite the enormous successes of democracies on every count, there is no sure sign that dictatorship is vanishing as a form of governance today. While the number of democratic countries increased significantly during the last decades of the 20th century, there is also a significant number of emerging dictatorships, especially in countries of the former Soviet Union. If in countries like Cuba, Burma, Egypt, Libya, North Korea, Zimbabwe the regimes have already reached some sort of maturity, the situation is very different in the newly emerging dictatorships in the countries of the former Soviet Union such as Uzbekistan, Turkmenistan, or Belorussia.

In this paper, we do not study why dictatorships emerge.[1] Instead, we focus on the internal structure of dictatorships. When a dictator faces threats from both inside and outside his country, one limit on his power is the incompetence of his ministers and advisors. While incompetent ministers are not completely unusual in democratic countries, most historians and political scientists would agree that dictatorships are especially marred by incompetence. Most recently, Saddam Hussein's failure to maintain a reasonable pre-war strategy and defense (even taking into account overwhelming American military power) seems in particular to be due to the incompetence of his closest advisors. The infamous Iraqi information minister Muhammed al-Sahhad (dubbed 'Comical Ali') is only one manifestation of this pattern. Furthermore, even the best of dictators have lost the most competent of their advisors while acquiring more and more power. Napoleon's Marshal Jean-Batist Bernadotte – in Napoleon's opinion, one of the two marshals with a war talent equal to that of the Emperor himself – left Napoleon not out of fear of ultimate defeat, but at the zenith of Napoleon's power in 1811. In his most unfortunate military undertaking, the 1812 Russian campaign, Napoleon was surrounded by his most loyal marshals, rather than his most competent ones.

[1] For an excellent overview of the state of the arts in the dictatorship literature see Wintrobe (1998) and Bueno de Mesquita *et al* (2004). Watchekon (2000) argues that dictatorships are more likely to emerge in countries which are rich in natural resources. Acemoglu (2003) and Acemoglu, Robinson and Verdier (2004) suggest a dynamic framework for studying modern disctatorships. Domínguez (2002) lists traits that are likely to be exposed by a politically effective military dictatorships.

Stalin, a dictator of a very different kind, was notable for having exclusively mediocrities in his inner circle (Gregory, 2004).

Yet the main problem for a dictator might be not the incompetence, but a possible treachery of a vizier. As early as in 1965 BCE, i.e. almost four thousand years ago, King Sesostris of Egypt warned future kings in his Instruction: 'Be on your guard against all subordinates, because you cannot be sure who is plotting against you' (Rindova and Starbuck, 1997). Han Fei Tzu, a Chinese philosopher of the 3th century BCE, advised rulers to distrust subordinates and inspire fear in them. Wintrobe (2000) notes that 'the dictator has every reason to suspect that there are plots against him' and lists some dictators that have been consumed by paranoia, 'the most likely personality characteristics possessed by dictators': the Roman Emperors, Nero and Tiberius, and modern dictators Stalin and Mao Zedong. Often, dictators' long tenures witness executions or at least long imprisonments of their closest subordinates. For example, the history of European monarchies contains a long list of brilliant first ministers executed (for various formal reasons) by their sovereigns: Thomas More by Henry VII of England, Angerran de Maringhi by Philippe IV of France, Thomas Wentworth (Strafford) by Charles I of England, etc. Modern examples include executions and imprisonment of close associates of Mao Zedong, Fidel Castro, and Saddam Hussein, not to mention the 'great purges' of the Stalin era.

The principal-agent theory, coupled with an appropriate selection model, helps us to explain simultaneously the incompetence and the treason phenomenon.[2] One driving force is that a more competent advisor is more prone to treason: he might be more easily bribed into a plot, etc. The reason is that a cunning first minister acts as a discriminating monopolist (for possible enemies of the crown), while an uninformed first minister acts as a normal monopolist. As Bueno de Mesquita *et al* (2004) put it, 'The incentive to defect from the incumbent to a challenger depends on the prospects of being included into the challenger's winning coalition if he should replace the incumbent'. Assuming that the willingness of the first minister to accept a bribe is increasing both in the size of the bribe and the probability

[2]Proper acknowledgement of the principal-agent theory insights that influenced this work would have amounted to a small survey, which is hardly appropriate here. Still, it would certainly include the works of Myerson, Milgrom, Maskin, Tirole, and Holmstrom on theoretical issues; Aghion, Bolton, and Oliver Hart on contracts; Coase and Oliver Williamson on transaction costs; Shleifer on corporate governance.

of success of the plot (or a foreign invasion), the dictator trades off the loyalty of his first minister (less willingness to accept a bribe) and his competence (higher willingness to accept bribes for treason). Napoleon once explained that it is this trade-off that made him willing to keep both Talleyrand (a cunning foreign minister) and Savari (a loyal, but less cunning interior minister).

Though definitely adhering to the main paradigm of the principal-agent theory, we deliberately abstain from using some standard contract theory approaches to principal-agent issues. The main differences between this model and a standard one are that the dictator has a very limited power on determining the payoffs for the agent, both for the case where the agent is to be rewarded and where he is to be punished; and all information is *ex post* observable by the dictator. Indeed, it might be taken as a definition of a dictatorship that, once all the power is allocated to a single authority, all promises are subject to future reevaluation by this authority.[3]

With a dictator understanding that a better informed advisor is more likely to misinform him, the incentive for a competent politician to accept a high position in a dictatorial regime diminishes. In this case it is the threat of execution for treason or another severe punishment that might deter the most competent people from pursuing their careers. If the dictator is able to commit to some mild level of punishment (in the presence of the information-vs.-bribe trade-off that the advisor faces, capital punishment should be always suboptimal), then this problem can be resolved. However, in the subgame where the dictator believes that the advisor is a traitor, he has no incentive not to apply capital punishment. This is one place where democracy has an advantage over dictatorship: a commitment problem of this kind might be easier to resolve with democratic institutions in place. The dictator's inability to commit to the optimal level of punishment is a particular case of a more general phenomenon: any use of incentives schemes by a dictator is limited by the fact that rewards and punishments are necessarily conditional upon dictator's own survival. Acemoglu and Robinson (2001, and other works), building on the pioneering insights of North and Weingast

[3]Many modern dictatorships, have been democracies by constitution and held regular, if non-competitive, elections (e.g., the Philippines under Marcos, Paraguay under Stressner, and almost all socialist states). So, delineation of democracies and dictatorships, though often obvious, is to a large extent a matter of judgement on the researcher's part.

(1989), emphasize the role of democratization and delegation of authority as commitment devices.[4]

An important class of situations in which the choice of a close associate is very important to a dictator is when the dictator faces the succession problem. Historically, dictators with a plebeian origin were very rarely able to create a dynasty of their own.[5] Herz (1952) argues that of the dictators of the first half of the 20th century, only few succeeded in controlling their succession, one such example being the Turkish leader Kemal Ataturk's transfer of power to the designated successor.[6] Securing succession of their choice, dictators face the same problem that they face while selecting a vizier. The more capable a potential successor is, the more he is able to overthrow the dictator. This might be the reason that many undisputed leaders have been mute on potential succession. To study problems of succession, we investigate our formal model in a dynamic perspective, where the current choice of the dictator is affected not only by his own survival prospects, but by those of his successors as well.

When considering dictatorships, the role of case studies of particular regimes cannot be exaggerated. An excellent study of the structure of Stalin's regime was carried out by Gregory (2003). This study is particularly valuable because it used archives that became available only recently, including protocols of the Politburo meetings. A number of studies on particular regimes were carried out by Lewis. Considering the rule of Salazar, the Portugal dictator in 1932–1968, Lewis (1978) identifies the self-selection of subordinates problem: '[Salazar] was... intolerant of those who did not share [his own views] to the last degree. That discouraged many talented young men from entering the government service.' With Salazar's power being increasingly secure, 'the patterns of recruitment show the regime evolving from its military and semi-fascist beginnings in the direction of a modern technocratic state'

[4] North and Weingast (1989) and Shepsle (1991) made the commitment issue central in political science, demonstrating, in particular, that the interest rate for a constitutionally restrained monarch (William III) might be lower than for a powerful one (Sturts from James I to James II). The same historical context seems to support our message as well: a constrained ruler is more likely to have better ministers.

[5] Well-known examples include Oliver Cromwell and Napoleon.

[6] Twenty years after the Herz's article was completed, the last of the European dictators that came into power in 1930s, general Franco of Spain, succesfully transferred power to a designated successor.

(Lewis, 1978). In a search for a 'perfect dictatorship', Domínguez (2002) studies the most successful dictatorships of the 20th century: Mexico, Brazil, Chile and South Korea. He argues that all of them employed talented people, at least at the early years of the regime. However, with regimes maturing, personalist and institutionalized dictatorships diverged with respect to the political competence. In a personalist dictatorship such as South Korea under Park Chung Hee rule, competent people have been driven out of the government with the establishment of the loyalty-based Yushin system in 1971. Brazil and Mexico, with their institutionalized succession within an authoritarian regime, have had significantly less of these problems.

Probably, the most prominent modern theory highlighting advantages of dictatorship is Mancur Olson's 'stationary bandit' paradigm (Olson, 1993).[7] However, as Wintrobe (2000) rightly observes, 'the problem with Olson's analysis is that, comparing dictatorships, the worst regimes in human history appear to be precisely those such as Nazi Germany, Soviet Russia, or Cambodia which appear to have been the most encompassing.' The agency theory of dictatorships suggests an explanation why, despite a large encompassing interest, even a benevolent dictator may fail to implement a socially desirable policy. The 'loyalty vs. competence' trade-off, which is much more severe when commitment mechanisms are weak, is in a sense an indispensable feature of any dictatorship. Even if a dictator reads this paper, and understands the logic, it gives no help to him if he is insistent on keeping his power unrestricted. Until he opts for a sustainable delegation of power to other political institutions, he will have no opportunity to improve the quality of ministers.

Wintrobe (1990) classifies dictatorial regimes basing on the goal dictators pursue. However, while investigating the internal structure of dictatorial regimes, this study describes only general trends and relationships between different groups in the society. Wantchekon (2002) investigates the rise of democratic and dictatorial institutions out of anarchy. He argues that 'democratization is less likely when the factions depend heavily on foreign aid or natural resource wealth,' again raising the question of connection between factor endow-

[7] The idea of a stationary bandit can of course be traced back to Hobbes, who appraised monarchy as a system where public affairs are run perfectly because they are actually private. A formal model can be found, e.g., in McGuire and Olson (1996).

ments and institutions. De Long and Shleifer (1993) find that ‘a region ruled by an absolutist prince saw its total urban population shrink by one hundred thousand people per century relative to a region without absolutist government.’ Providing solid micro foundations for this general picture is one of the tasks our model seeks to accomplish.

The agency theory of dictatorships need not be applied exclusively to the problem of hiring a prime minister.[8] The main trade-off that we investigate might not be entirely new in the corporate governance literature, where the principal-agent conflict was studied in the first place. The commitment problem innate to dictatorships is not so extreme in the corporate world; there are contracts and courts that enforce them. Still, a top-manager of firm, which is concerned with the possibility of ‘betrayal’ by a hired agent, might be willing to hire a mediocrity rather than a high-ability or a low-ability agent. It is of course never the question of life and death, and calling ‘betrayal’ actions that make your supervisor feeling less happier is a bit of exaggeration, but still a subordinate who possesses superior ability to foresee business development might be a danger for anyone who hires her. Friebel and Raith (2004) (see also Prendergast and Topel, 1996) explore the way this danger affects the hierarchical structure of a firm. Glazer (2001) demonstrates that when an agent with a high ability to run a firm also possesses superior skills in internal rent-seeking, the owner might be willing to hire a low-ability one. In contrast, this model highlights that it might not be that the same person has two complimentary qualities, but the very quality for which the agent is hired (competence) might be the source of potential disutility to his principal. Prendergast (1993) (see also Morris, 2003) demonstrates that if subordinate’s activity is rewarded basing on subjective performance evaluation, high-powered incentives, while inducing the subordinate to work harder, make him conform to the opinion of his principals. Though some of the features are similar to that of our model (e.g. that relevant information possessed by the agent is lost for the principal in equilibrium), the approaches are very different. First, we do not make use of subjective performance evaluation: if the plot fails, the dictator gets all the relevant information. Second, the vizier has no need to

[8]For the same reason, many of ancient and medieval rulers hired foreign bodyguards, who were less able to take power themselves than the local military. In his The Twelve Caesars, Suetonius (this edition, 1979) mentions foreign body-guards protecting Caligula, the foremost example of an unconstrained ruler fearing betrayal.

conform to the dictator's opinion, which he knows for sure. Burkart, Panunzi, and Shleifer (2003) investigate the trade-off between competence of a hired manager and the loyalty of a family member, generally lacking that competence. In our model, loyalty and competence are two sides of the same token.

The rest of the paper is organized as follows. Section 2 presents the formal analysis. Section 3 derives and discusses implication of the formal model, while Section 4 is focused on the dynamic perspective. Section 5 concludes. All formal proofs are relegated to the Appendix.

2 The Formal Theory

2.1 The Setup

There are two players in the basic model, a dictator and an agent.[9] The dictator faces a threat of a plot and has to decide whether to take costly precautionary measures. If the dictator does not undertake extra measures, the plot succeeds if the enemy is strong (enemy's type is $t = Strong$), and fails if the enemy is weak ($t = Weak$). *Ex ante,* the probability that the enemy is strong is $\mathbf{P}(t = Strong) = q$. If the dictator survives, he gets the utility of Y. If extra measures, which cost C, $0 < C < Y$, to the dictator, are undertaken, the enemy has no chance to take over. The dictator is unable to judge the seriousness of the plot, so he hires an agent which is more able to deal with the problem. However, the agent himself is imperfectly informed. Let agent's signal about the enemy's type be denoted by s. Agents of type θ are characterized by

$$\mathbf{P}(s = Weak \mid t = Weak) = \theta,$$

while $\mathbf{P}(s = Strong \mid t = Strong) = 1$. Parameter θ reflects the degree of competence of the agent. Thus, the dictator hires a person of type θ and assigns him a policy to act upon.

[9] Our basic setup allows to capture not only single agent acting as a first minister, but also collective advisory bodies. Evidently, in this case the values of parameters may be different, and one may think that the main effect is that probabilities of mistakes are less. However, collective bodies are subject to correlated signals and information cascades, which makes the increase in efficiency much less significant. We consider the case of two agents explicitly further in the paper.

This policy π_D is a mapping from the set of possible signals, $\{Strong, Weak\}$, to the set of actions, $\{H, L\}$, where H and L stand for high and low level of agent's efforts, respectively.

An agent hired by the dictator might behave opportunistically, i.e. betray the dictator. We view betrayal as an action such that $a \neq \pi_D(s)$. In the case of betrayal, the vizier expects to receive a reward of $R + \overline{R}$ if the plot is successful. We assume that $\overline{R}$ is fixed and parametrizes enemy's strength and, perhaps more importantly, the ability to commit to pay the reward after the plot, while R is stochastic from the dictator's viewpoint and is distributed on (0,∞) with c.d.f. $G(x)$ and p.d.f. $g(x)$ such that $g'(x) < 0$.

If the agent had betrayed, but the plot did not succeed, the information about the plot is revealed to the dictator who punishes the agent with a disutility of F. There is also a premium received by the agent in the case the dictator survives the plot and learns that the agent did not betray him. (We assume that $W > \overline{R}$.) Formally, the agent decides on $a \in \{H, L\}$, i.e. the level of defense efforts (high or low), conditional on the dictator's order, so he chooses a strategy from the set of all mappings $\{(\pi_D, s, R)\} \longrightarrow \{H, L\}$.The timing of the one-shot game is as follows.

Timing

1. Dictator chooses an agent characterized by θ from the pool of candidates with competence that ranges from 0 to 1 and prescribes a policy π_D to him.

2. The agent gets a noisy signal about the enemy's strength and learns R, the stochastic component of his pay-off if the plot is successful. Basing on this information, the agent chooses the level of efforts $a \in \{H, L\}$. Effectively, the agent decides whether or not to betray the dictator.

3. The plot unfolds, and the outcome is determined. The dictator gets his pay-off. The agent is rewarded or punished.

We are focusing our analysis on the sub-game perfect equilibria of the above game. (In the dynamic game analyzed in Section 4, the relevant concept is the Markov perfect equilibrium.) For simplicity, we always assume that if the agent is indifferent between betrayal and remaining loyal, he remains loyal.

2.2 Agent's Behavior

To solve for a sub-game perfect equilibrium, we proceed by backward induction, i.e. by studying the behavior of an agent of a fixed type θ who has received policy prescription π_D and information about the potential reward guaranteed by the dictator's enemies, $R + \overline{R}$.

Proposition 1 *(i) If $s = Weak$, the agent will not betray the dictator. If $s = Strong$ and $\pi_D\,(Strong) = L$, the agent will not betray either. The only case where the agent opts to betray is $s = Strong$, $\pi_D\,(Strong) = H$ and*

$$\left(R + \overline{R}\right) \mathbf{P}\,(t = Strong \mid s = Strong) - F\mathbf{P}\,(t = Weak \mid s = Strong) > W. \tag{1}$$

(ii) The probability that the agent of a fixed type θ, having received a strong signal, obeys the orders of the dictator, increases with the reward W, the level of punishment for treason F, and decreases with the ex-ante probability of a serious plot, q, and his affinity with the opposition, $\overline{R}$. Moreover, the same probability of betrayal of a more competent agent can be achieved only by a higher level of reward/punishment.

The straightforward intuition behind condition (1) is that the agent betrays as long as he knows that his expected utility from betrayal exceeds that in the case of no betrayal. Both probabilities are conditional on the agent's signal s and thus are functions of the agent's competence θ. To calculate them, the agent uses the Bayes formula:

$$\mathbf{P}\,(t = Strong \mid s = Strong) = \frac{q}{q + (1-\theta)(1-q)}.$$

If $s = Strong$ and $\pi_D\,(Strong) = H$, then the probability that the agent of type θ does not betray (from the standpoint of an outside observer, e.g. the dictator) is

$$G\left(W + (1-\theta)\frac{1-q}{q}(W+F) - \overline{R}\right) \equiv G\,(R^*) \equiv G.$$

It increases with W, the premium the agent receives if the dictator survives, F, the level of punishment if the agent is caught, and decreases with $\theta, \overline{R}, q$. Indeed, both a higher reward for remaining loyal and a higher punishment for the opposite increase the agent's incentives to be loyal. A similar intuition applies to $\overline{R}$, the fixed part of the reward for betrayal. An increase in q leads to an increase of the probability that the enemy is strong, as perceived by the agent. This, in turn, decreases agent's fear to be punished, and makes him more likely to betray. Finally, a smarter agent receives a strong signal less frequently than a less competent one does, but once he has received a strong signal, he is more sure that the enemy is really strong, which also decreases his fear of punishment.

The above formula, though straightforward mathematically, deserves additional discussion. A more competent advisor (the one with a high θ) can betray the principal for a higher level of utility he secures if the dictator survives, since he can afford gambling on a lower level of reward by the enemy. In other words, the dictator has to pay a smarter agent a higher wage if he wants him to be as loyal as a less competent one. Therefore, if the dictator is free to choose the level of agent's compensation as it is standard in the corporate governance literature, he is able to mitigate the loyalty-vs.-competence trade-off. However, the dictator has a very limited power on determining the payoffs for the agent, both for the case where the agent is to be rewarded and when he is to be punished. From the *ex ante* perspective, the reward is not what the dictator promises, but what the agent believes about the dictator's promises. A track record of promises being kept is a thing worth having for a dictator, but once his power is challenged, he drowns into a spiral where his fear of viziers' disloyalty makes them feeling more unsafe and, therefore, less loyal.

2.3 Dictator's Choice

Once we know what each agent does in any state of the world, we can proceed with the dictator's problem. In any subgame perfect equilibrium, the dictator assigns $\pi_D\left(Weak\right) = L$, $\pi_D\left(Strong\right) = H$. Indeed, there is no reason to order the agent to take extra measures if the enemy is weak, because the agent will necessarily obey the order. On the other hand, if the signal is strong, it is better if the agent exerts high efforts, with the exception of the case of an agent who is so incompetent that spares too much resources against a weak enemy wrongly perceived as strong. Since the dictator can hire an agent of his choice, this never happens in equilibrium.

The dictator's utility equals

$$U_D(\theta) = \left(1-q\right)Y + \left(q\left(Y-C\right) - \left(1-\theta\right)\left(1-q\right)C\right)G. \tag{2}$$

The first-order condition for the dictator's problem of choosing the best agent is as follows:

$$\frac{\partial U_D(\theta)}{\partial \theta} = (1-q)\,CG - (q\,(Y-C) - (1-\theta)(1-q)\,C)\,\frac{1-q}{q}\,(W+F)\,G' = 0. \quad (3)$$

This formula highlights the trade-off the dictator faces. He wants to balance the benefit of competence (associated with less money spent on defense if it is unnecessary) and its cost (because of possibility of betrayal):

$$(1-q)\,CG = (q\,(Y-C) - (1-\theta)(1-q)\,C)\,\frac{1-q}{q}\,(W+F)\,G'.$$

The left-hand side is the marginal benefit of hiring a more competent agent. A marginal increase in θ saves the amount of C with probability $(1-q)\,G$ times this marginal increase, i.e. if the enemy is weak but the agent receives a strong signal and chooses not to betray. The right part is the expected loss because of betrayal, taking into account potential economy of resources if the agent betrays. In the Appendix, we show that the dictator's utility function $U_D(\theta)$ under standard policy prescription is single-peaked. Moreover, if $\theta^* \in [0,1]$ is its global maximum, then it is strictly concave on $[\theta^*, 1]$. The following Proposition summarizes the above discussion.

Proposition 2 *There exists a unique sub-game perfect equilibrium in the game, characterized by θ^* and R^*. In the equilibrium, $\pi_D(S) = H$ and $\pi_D(W) = L$, the dictator hires an agent of type θ^*, and the agent betrays if and only if $s = H$ and $R + \overline{R} > R^*$.*

Proposition 2 establishes the uniqueness of the equilibrium and allows us to study how the equilibrium choice of the agent's competence,

$$\theta^* = \arg\max_{\theta\in[0,1]} U_D(\theta),$$

depends on the parameters of the model. Without loss of generality, we assume that the maximum is interior.

Proposition 3 *The optimal agent is more able ($\theta^* = \arg\max U_D$ is high) when either*

(i) the dictator is strong (q is low);

(ii) the stakes are low for the dictator (Y is low);

(iii) the affinity between the vizier and the enemy is weak ($\overline{R}$ is low);

(iv) the measures that have to be taken are more costly (C is high).

Proposition 3 asserts that a less able agent is more likely to be chosen when either the dictator is weak, or he faces greater threat, or he values his power more (plans to leave a successor), or the enemy values the power more (when stakes are high), or can commit to rewards. (The parameter $\overline{R}$ is interpreted as a degree to which the plotter can commit to rewarding the agent if the plot is successful.) One can expect that general problems with commitment in a weakly-institutionalized environment mean, on average, less rewards, and this induces the advisor to remain loyal to the dictator. On the other hand, these problems might prevent enemies from overthrowing the dictator, since they are too unable to make credible promises. When are the plotters able to commit to reward the traitor? One such situation might be that the agent has his own political base, be it a certain ethnic or military faction. Thus, a dictator who thinks of bringing a local warlord to the central government, might be interested in increasing the vizier's loyalty parameter, e.g. by taking a family member as hostage as it was practiced in the 13th-century Horezm.

One occurrence where the above analysis is especially relevant is international negotiations. Modern dictators rarely negotiate on their own, and the choice of a negotiator involves the trade-off we explore: the dictator has to choose a negotiator who is competent enough to bring agreement on favorable terms, yet too much competence might make the negotiator more sensitive to personal alternatives provided by the other side. The political science literature on negotiations and informative signalling has been growing intensively in the recent time. Kydd (2002) argues that a biased mediator might be more effective in conveying message to a party in negotiations. His argument relies on the consideration that only a mediator biased towards the recipient of the signal can deliver credible threats, for he would not forge the threat if there were none. Dictators, however, often treat suggestions to negotiate as a treason, and this may be fatal for subordinates who offer to negotiate.[10] With loyal mediocrities being dictator's only trusted negotiators, it is not surprising that negotiations with dictators often lead to nowhere (literally, these envoys are often unable

[10] Since Kydd (2002) considers a mediator as an exogenously given third party, this problem does not arise in his work.

to see advantages and disadvantages of certain proposals). Saddam Hussein, Hitler, even Napoleon, the smartest of all dictators, have allowed their capitals to be occupied (and in the extreme case of Hitler, almost fully destroyed) by the enemy forces, refusing for months to have serious negotiations.

3 Commitment to Punishment and Adverse Selection

Political scientists (e.g., Lewis, 1978) have been long aware that the dictatorial rule averts able people from joining high-level politics. In his memoirs, Albert Speer, once a second-ranked official in the Third Reich and a Hitler confidant, uses the words 'negative selection' about the Hitler's court, discussing at length ignorance and incompetence of Hitler's closest subordinates (Speer, 1970).[11] This is a particular case of the Akerlof adverse selection problem: the more severely the dictator punishes (if survives the betrayal) those who betrayed him, the less the ability of agents applying for the job. Hence, the dictator faces a trade-off between high incentives for agents already on the job provided by a harsh punishment for betrayal, and low incentives to apply for the job. Indeed, the harsher the punishment for betrayal is, the lower is the expected utility of a competent advisor. Since it is the agent's competence that allows him to discriminate among potential plotters, he would never need to use his competence when the price of betrayal is infinite disutility.

Thus, a dictator has incentives to commit to the optimal punishment which is less than capital. However, the very nature of dictatorships precludes such commitment. Here democracies might have an advantage, since in democracies it is easier to commit to a mild punishment. In a democracy, though a punishment for a political betrayal might be politically severe, it rarely brings significant personal harm. Clearly, a U.S. President is bound by laws not to kill a cabinet member who pursues his own presidential ambitions as Secretary Chase was doing in the Lincoln's first cabinet (e.g., Dudley, 1932), or Attorney General Robert Kennedy in the first cabinet of President Johnson.[12] Betraying a brutal dictator such as

[11] Apparently, Speer does consider himself a counterexample that only proves the rule.

[12] In a small note, Edwards (2001) points to the same loyalty-vs.-competence trade-off in recent low-level presidential appointment in the U.S.

Saddam Hussein or Fidel Castro might have been more costly for their ministers.[13] Here we suggest a formal description of this phenomenon.

Proposition 4 *(i) Assume $R^* g(R^*)$ is a decreasing function of R^*. There exists a level of punishment F_0 such that for all $F \geq F_0$, the optimal advisor becomes more competent ($\theta^*(F)$ is increasing) with F. However, $\theta^*(F) < 1$ for any $F \geq F_0$.*

(ii) Let $\overline{\theta} < 1$ be the most competent type of advisor available, such that the dictator is still better off if he sets standard policy prescription. For any $u > 0$, there exists some $F_0 = F_0(u)$ such that for all $F > F_0$ and all $\theta \in \left[0, \overline{\theta}\right]$, the agent's utility does not exceed $|u_A(\theta, F)| < u$ and $\left|\frac{\partial u_A(\theta,F)}{\partial \theta}\right| < u$.

(iii) If reservation utility of an agent of type θ, $H(\theta)$, is a continuously differentiable function of θ and $H'(\theta) > 0$, then for a sufficiently high punishment only relatively incompetent advisors will be self-selected.

The first part of the above proposition shows that a higher level of punishment makes a more competent advisor desirable for the dictator. The second and the third parts assert that with a higher level of punishment, high-skilled agents gain less from their ability to discriminate potential plotters. Thus, when able agents face higher opportunity costs than agents with low ability, they have fewer incentives to apply for the job when the punishment is high. Part (iii) is proved given the least restrictive assumption regarding outside opportunities of skilled agents. We assume that a more skilled agent has better outside prospects than a less able one, but the difference (the slope) might be really small.

[13] In January 1984, the honorary title of 'Hero of the Cuban Republic' was conferred upon Gen. Arnaldo Ochoa in recognition of his extraordinary contributions to the insurrection against Batista, to the consolidation of the nation's defense, and for his service in international missions. In June 1989, MINFAR Minister Raul Castro explained that Gen. Ochoa 'was no longer the rebel soldier, the invader of Camilo's column, the internationalist in Venezuela, the commander of our troops in Ethiopia.' In July 1989, the prosecutor's closing remarks stated that "it became evident that we were confronted with a crime of treason committed against the fatherland, against the people, against his superiors, and against the very idea of what a revolutionary, a military chief, and a Cuban internationalist fighter really is. In accordance with the 'sentence dictated by the Special Military Court, Case No. 1 of 1989' Gen. Arnaldo Ochoa and three others had faced a firing squad in July 1989. (Alfonso, 1989 and sources cited therein.)

The key point in our analysis is that both a democratic leader and a violent dictator have a limited ability to change F, though the reasons are profoundly different. A democratic leader is bound by laws, and he may even not be the one who determines the size of punishment. It is of course only natural to expect the level of punishment to be greater in the case of a dictatorial rule. Consequently, in a democracy, leaders are more prone to political treason, but the pool of applicants to the agent's position is likely to be better. Conversely, the bloodiest dictator may feel himself relatively safe from betrayal, but the agents he will have to choose from will be extremely incompetent.

One potential counter argument is that the dictator could enter the private labor market and selectively depress rewards for competence, say, by threatening the family members of potential agents if the agent refuses to enter his service. While this argument certainly does have merit when applied to a single agent, this approach seems impossible on a large scale. Mass emigration is a most clear indication of unfavorable circumstances for talented people. In the first five years of the Mussolini regime, one and half million people left Italy (Cannistraro and Rosoli, 1979). For the political and intellectual elite, which is a tiny fraction of any country's population, its exile might not be easily detected by crude statistical data. For example, the departure of Albert Einstein, Joseph Schumpeter, Thomas Mann, and John von Neumann preceded mass emigration of intellectual elite from Europe, but might have still made profound impact on intellectual, and by implication, political life in their home countries. Thus, even for individual geniuses, providing the incentives to work in a certain political environment, might be a complicated task for the dictator. In much less frightening circumstances of the last decades of the Soviet rule, but without a possibility to emigrate, talented young Russians chose mathematics and natural science, generally avoiding politics (and, e.g., political science) as an occupation. One result, besides flourishing science, was that political positions were occupied by profound mediocrities.

4 Succession

Once an absence of ordered continuance was considered a major drawback of dictatorship as a form of government (Herz, 1952, Spearman, 1939, Olson, 1993). However, in the first half of the 20th century a number of once-dictatorial regimes survived the death of their founding fathers (e.g., Lenin in Russia, and Kemal Ataturk in Turkey). Nowadays, the technology of succession appears to be advanced enough to produce successful transition in such diverse countries as Syria in 2000, North Korea in 1994, China in 1989 and Kongo in 2003. Our model predicts that a ruler with a longer time horizon, e.g., resulting from the assurance of a desired succession, has more incentives to hire the most able agents. The last years of kings of the largest European monarchies, England, France, and Russia, executed by the revolutionaries might give additional support to this result. All these monarchs at the time they lost the crown had very young heirs, incapable of grasping the power if their fathers were dead. And the last years of each of these rulers were marred by colossal incompetence of their prime ministers.

To introduce a dynamic perspective, we make the following extension to our basic setup.[14] Now we assume that each dictator is succeeded by another ruler, and that ruler's utility may also be an object of dictator's concern. Specifically, the successor may be either desirable for the dictator or not. In the first case, the successor's utility is added to that of the dictator with a discount factor $\beta < 1$. In the latter case, the dictator does not care about his successor's utility at all. We may interpret β as a measure of affinity between the dictator and his successor. It is natural to think that β is high in the case of monarchy, but low in the case of army colonels succeeding one another.

Each dictator is characterized by his ability to ensure succession to the desirable heir in the case he does not survive the plot. The succession is either secure (S) or insecure (I). In the first case, the heir is desirable, and the hier's type is now either S with probability P_S, or I with probability P_I, so $P_S + P_I = 1$. In the latter case, the heir is desirable and secure himself (has type S) with probability Q_S, and desirable and insecure (heir's type is I) with probability Q_I. However, $Q_S + Q_I < 1$, so there is a non-trivial chance that the successor will not be desired. His type in this case is irrelevant from the dictator's standpoint. If the dictator wins, he is able to ensure that the successor is desired and has type S. One may rationalize this case as the one where the dictator succeeds himself.

[14] Acemoglu and Robinson (2001) introduced a broad class of dynamic models for comparative political economy. (See also Acemoglu, 2003, and Acemoglu, Robinson, and Verdier, 2004.)

For each dictator, the probability that the dictator loses equals $q(1-G)$, where G is the probability that the agent obeys even having received a strong signal. Denote

$$Y^* = (1-q)Y + (q(Y-C) - (1-\theta)(1-q)C)G.$$

The agent is concerned with his one-period utility (for the sake of simplicity, he serves the dictator for one period only). The dictator faces the following utility maximization problems.

$$\begin{aligned}
U_S &= \max_{\theta}\left(Y^* + \beta(1-q(1-G))U_S + \beta q(1-G)(P_S U_S + P_I U_I)\right). \\
U_I &= \max_{\theta}\left(Y^* + \beta(1-q(1-G))U_S + \beta q(1-G)(Q_S U_S + Q_I U_I)\right).
\end{aligned}$$

We search for perfect Markov equilibria in this game.

Proposition 5 *(i) There exists a unique perfect Markov equilibrium. In this equilibrium, $U_S > U_I$, and the competence of the agent is less in the state I than in the state S.*

(ii) For smaller β, U_S, U_I and $U_S - U_I$ are smaller. Consequently, the competence of the agent is higher if the dictator cares less about his successors.

Part (i) shows that a less sure succession leads to less competent agents. This result may be used to explain poor governance of monarchs whose immediate heirs are small children, or have other contenders for the throne (i.e., relatives they do not like). Part (ii) demonstrates that less desired succession leads to better agents. It may also help to explain the difference between 'party-machine' dictatorships such as Mexico in 1940-90, where members of a non-representative selectorate succeed each other as leaders of the country, but have neither desire nor possibility to pass this post to their children, and monarchies, where rulers would like to do it. The model predicts that a personalist dictatorship is less likely to witness competent advisors than an institutionalized dictatorship. Domínguez (2002) reaffirms that 'the most successful authoritarian regimes, namely, historical bureaucratic empires, had means of succession from one monarch to the next and featured bureaucratic organizations for the sharing and exercise of power.' Not coincidentally, Mexico, probably the most successful of 20th century dictatorships, had a well-institutionalized procedure for succession for almost six decades.

5 Courtiers

Appointing a council instead of a single advisor, the dictator might enjoy two kinds of benefits. First, with a council, more information can be aggregated, especially if members' signals are uncorrelated. Second, the members of the council face the coordination problem with respect to treason, and dictators usually took advantage of it. While the latter advantage has been already well understood by Machiavelli, the former is much less so. We allow for the possibility of a second agent in the model to investigate when the dictator is better suited to enjoy the information-aggregation advantages of a court.

Assume that the dictator has to hire two agents of type θ.[15] We consider the following modification of our basic setup. Suppose that each agent gets the same (correct!) information about potential reward $R + \overline{R}$, but the signals s_1 and s_2 are independent conditional on t. (This implies that information can indeed be aggregated.) Both agents can exert either high or low efforts; they choose their actions simultaneously and independently. As before, the dictator is safe if the enemy is weak. If the enemy is strong, the dictator is absolutely secure if both agents have chosen high defense, and absolutely insecure if none has. If only one agent has exerted high efforts and the enemy is strong, the enemy wins with probability α. Each half of defense costs $\frac{C}{2}$. As for the agents' payoff, they are rewarded or punished independently, i.e. participation of another agent in a coup does not undermine the potential benefits of any agent. Finally, assume for simplicity that policy prescription is fixed at $\pi_D\,(Strong) = H$, $\pi_D\,(Weak) = L$ for both agents.[16]

As before, we proceed with backward induction. It is easy to establish that if agent i receives signal $s_i = Weak$, then he obeys the dictator (and chooses low defense level). The intuition is practically the same: the agent knows that whatever his colleague does, the dictator will survive, and this makes him willing to avoid punishment.

Now consider the case where $s_i = S$. Having received such signal, the agent cares whether

[15] Alternatively, we could consider the case where agents may have distinct types θ_1 and θ_2. However, this would at some point lead to unnecessary complications that would shade the coordination effect we want to depict.

[16] In particular, this is done to avoid the potential situation where one half of defense is almost sufficient to protect the dictator, so he tells one agent to choose low defense all the time in order to save resources.

the enemy is strong. Bayes formula yields

$$\mathbf{P}\left(t=S \mid s_i=S\right)=\frac{q}{q+\left(1-\theta_i\right)(1-q)}.$$

If the enemy is strong, he knows that his colleague has also received $s_{-i}=S$, i.e.

$$\mathbf{P}\left(s_{-i}=S \mid t=S,\ s_i=S\right)=1.$$

If, however, the enemy is weak, agent i does not care about his colleague's signal, because he knows that in that case he would be punished anyway if he attempts to betray.

To summarize, agent i knows that if the enemy is strong, his fellow agent also receives signal $s_{-i}=S$. Moreover, he knows what information about R his colleague received, since they both receive correct information. We want to find out agent i's best reaction to his colleague's strategy. Denote by $d_i(R)$ the level of defense that agent i chooses if his signal is strong and the potential reward equals R. Function d_i is assumed to be measurable, and its value set is $\{H, L\}$. We aim at searching what d_i's will be the case at equilibria.

Suppose that agent i has received a strong signal and that the potential reward equals R. If $d_{-i}(R)=L$, i.e. another agent will betray if his signal is also strong, then the agent will betray if and only if

$$\left(R+\overline{R}\right)\frac{q}{q+(1-\theta)(1-q)}-F\left(1-\frac{q}{q+(1-\theta)(1-q)}\right)>W\left(1-\frac{\alpha q}{q+(1-\theta)(1-q)}\right),$$

which is equivalent to

$$R>(W+F)\left(1+(1-\theta)\frac{1-q}{q}\right)-F-\overline{R}-\alpha W\equiv R_L.$$

Similarly, if $d_{-i}(R)=H$, i.e. another agent will not betray for such R, the agent will betray if and only if

$$\left(R+\overline{R}\right)\frac{\alpha q}{q+(1-\theta)(1-q)}-F\left(1-\frac{\alpha q}{q+(1-\theta)(1-q)}\right)>W,$$

which is equivalent to

$$R>\frac{1}{\alpha}(W+F)\left(1+(1-\theta)\frac{1-q}{q}\right)-F-\overline{R}\equiv R_H.$$

This result is quite intuitive. The agent has stronger incentives to betray if the potential reward is high. Note that $R_L<R_H$, which simply means that the threshold reward is lower if another agent chooses to betray.

Now we can summarize these results and find agent i's best reaction on another agent's strategy which is given by d_{-i}. We obtain

$$BR_i(d_{-i})(R) = \begin{cases} H, & R \leq R_L; \\ d_{-i}, & R_L < R \leq R_H; \\ L, & R_H < R. \end{cases}$$

Having this result, we can prove the following proposition about pure strategy equilibria in the subgame played by agents. The difference between these equilibria is in the set of R's between R_L and R_H where agents betray. All equilibria are symmetric.

Proposition 6 *There exist an infinite number of equilibria. In any of them, agents who received a weak signal obey the dictator. If agent i receives a strong signal, his behavior is given by function d_i, such that $d_i(R) = H$ if $R \leq R_L$, $d_i(R) = L$ if $R_H < R$, and for R's such that $R_L < R \leq R_H$, $d_1(R) = d_2(R)$.*

To proceed further, we use equilibria refinement to study equilibria that appear to be the most reasonable ones only. Namely, we confine ourselves to monotonic equilibria, i.e. those where there exists some $\tilde{R} \in [R_L, R_H]$ such that $d_i(R) = H \iff R \leq \tilde{R}$. Our rationale is that in the one-agent setup, the agent was more likely to betray for larger R's. We consider it reasonable to retain this property in the two-agent case. In that case, $\tilde{R}$ parametrizes all such equilibria.

It is easy to see that both agents are better off if they play an equilibrium given by a smaller $\tilde{R}$. However, it is not always possible for people to negotiate on the equilibrium they will play.[17] Let τ be such that $\tilde{R} = \tau R_L + (1-\tau) R_H$. We believe that τ reflects trust between the agents. The dictator's utility if agents play equilibrium characterized by $\tilde{R}$ is given by the following formula:

$$U_D^{\tilde{R}}(\theta) = (1-q)Y + (q(Y-C) - (1-\theta)(1-q)C)\,G\left(\tilde{R}\right).$$

This helps us establish the following proposition.

[17] Myerson argues that equilibria people play depend on their cultural differences.

Proposition 7 *(i) Suppose that the dictator has to hire two agents of a fixed type θ. He would prefer to hire those whose degree of trust τ is as small as possible.*

(ii) For every τ, there exists a unique equilibrium in the game, characterized by θ^{τ}, dictator's optimal choice. Let θ^* be the dictator's choice in the one-agent setup. Then, if $\tau = 1$, $\theta^{\tau} \leq \theta^*$, i.e. the concordance between agents leads to less competent advisors as compared to the case of one agent. Moreover, θ^{τ} is decreasing as a function of τ, provided that τ is close to 1.

This fact may be interpreted as one of implementations of the 'Divide-and-Rule' policy. Actually, what the dictator wants is lack of trust between his subordinates, which would prevent coordinated betrayal. The dictator may be better off if he has an advisor who is unlikely to cooperate with other ones. For instance, Saddam Hussein might have kept Tarik Aziz, a Christian, in a predominantly Sunni government for this very reason: he would not betray Saddam because other Saddam's associates would gladly get rid of him should they notice any signal of disloyalty. Aziz was even his representative abroad. The logic might be as follows: should Aziz betray Saddam Hussein, his family in Iraq may suffer greatly. Conversely, if a member of a powerful clan betrayed Saddam, the clan may protect the family, and this makes betrayal more likely. This may also explain why Saddam executed his son-in-law (and why the latter had betrayed Saddam, if he really had). Another example of keeping an advisor who is opposed by the rest of the dictator's associates is Mazarin, whose Italian origin prevented him from cooperating with French nobles in the time of the Fronda.

In part (ii) of Proposition 7 we focus on equilibria of the whole game, namely, on the dictator's choice of θ. The fact that agents with different θ may play different equilibria in the subgame makes this problem too complex. To proceed, we assume that agents are committed to a certain level of trust τ, and the dictator chooses θ taking this level of trust as given. In other words, apparently good relations between the agents may force the dictator to hire less competent advisors. Also, if the dictator is able to hire advisors that can hardly deal with each other, he can afford more competent ones. We stress that our emphasis is not on the coordination problem per se. The observation that the success of a plot against a dictator is conditional upon courtiers' ability to coordinate on treason is well-established in political science literature (e.g., see Kydd, 2004, for a formal treatment). We show that the trust between advisors prevents the dictator from enjoying fruits of information aggregation, which is the single most important reason to have a council at all. This proposition may also help to explain the observation that many dictators often get rid of early supporters. We believe that it may be the case because early supporters had a long history of working with each other, and if they assisted the dictator in coming to power, they might even have a history of struggle for a common cause. This might have increased the level of trust between them, thus making them dangerous to the dictator. In particular, it makes sense for the dictator to replace people with new ones from time to time.

6 Conclusion

In a recent inquiry into dynamic nature of most dictatorship, Acemoglu, Robinson, and Verdier (2004) suggest that 'while the academic study of strongly-institutionalized polities is well advanced, there are few studies, and less of a consensus, on the nature of weakly-institutionalized polities.' The poor governance in mature dictatorships, as well as their degeneration, allow for a number of plausible explanations. These include greediness and selfishness of the dictator, as well as his personal incompetence and inability to listen and follow advice. We use the formal apparatus of economic theory to investigate agency problems in dictatorships as compared to democracies. We demonstrate that it is the unwillingness and inability of the dictator, fearing of opportunistic behavior of the agent and in the worst case his or her betrayal, to surround himself with competent associates that causes poor performance of dictatorships in the long run. The resulting incompetence will sooner or later have an adverse effect on the policies carried out and consequently on economic performance and social welfare. Moreover, an overwhelming presence of mediocrities among the authorities, combined with immature election mechanisms which impedes the rotation of people at power, may effectively create a caste of people who are vitally interested in sustaining the regime, for any change will drive them away from power.

Our model allows to get insights in a number of situations, ranging from the one where the dictator who survived the plot is still uncertain whether or not he was betrayed, to the situation, when the dictator chooses to appoint a council instead of an advisor. However, we do not model explicitly the situation where the agent betrayed, the plot turned nevertheless unsuccessful, but the dictator does not automatically learn that his agent is a traitor. In real-life situations, he may very well be uncertain whether or not the agent's inaction prior to the plot was betrayal or just lack of competence. Contrary to predictions of our analysis, there is a strand in the literature on dictatorships that argues that the dictators have an advantage in choosing most able man for government positions, while in democracies the first-best choice may be impossible. Though there is a certain merit to this point, the circumstances in which a dictator has this advantage are limited. One such situation appear when a new dictator emerge after years of political stagnation or political turmoil, bringing a whole class of politically young and able people with him. However, though emergence of new faces in politics or government may coincide with an accession of a dictator, it might be the same political wave that removed the former elite that made both a new dictator and extended opportunities of other talented individuals possible. Famous Napoleon's marshals, a group of brilliant military officers with plebeian origin who pursued their army careers to the point previously reserved to people of noble origin only, might be an example. Though their military glory came in full under the Napoleon's command in early 1800s, it was the French revolution of the earlier decade that made a dramatic break in their careers possible. And of course even mature and powerful dictators are constrained by political considerations, and their need of political alliances might actually be higher than that of democratic leaders.

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Appendix

Proof of Proposition 1. (i) If $s = Weak$, then $t = Weak$, and the agent knows that the dictator will survive for sure. The dictator will also survive if $s = Strong$, but $\pi_D(S) = L$ and the agent betrays. Therefore, in these cases the agent will obey in order to avoid punishment. If, however, $s = Weak$, but $\pi_D(S) = H$, then the agent has the following options. If he obeys and builds high defense, he will get W for sure. If he betrays, he gets $R + \overline{R}$ if $t = Strong$ and $-F$ if $t = Weak$. Therefore, he betrays if and only if

$$\left(R + \overline{R}\right) \frac{q}{q + (1-\theta)(1-q)} - F \frac{(1-\theta)(1-q)}{q + (1-\theta)(1-q)} > W.$$

(ii) This probability equals

$$\mathbf{P}\left(R \leq W + (1-\theta)\frac{1-q}{q}(W+F) - \overline{R}\right) = G\left(W + (1-\theta)\frac{1-q}{q}(W+F) - \overline{R}\right).$$

The last expression increases with W, F and decreases with $\theta, q, \overline{R}$. To keep this probability the same if θ increases, the dictator needs larger W or F. ■

Proof of Proposition 2. First, we consider the dictator's choice. If $s = W$, then the agent will obey, and it is best for the dictator to choose $\pi_D(W) = L$. If $\pi_D(W) = \pi_D(S) = L$, then the dictator's expected utility equals $(1-q)Y$, since no defense will be ever built. However, the dictator will be better off if he chooses $\pi_D(W) = L$, $\pi_D(S) = H$ and $\theta = 1$, because in that case defense will be built with a non-zero probability and only if $t = S$. This completes the first part of the proof.

Now let us prove that there are no interior minima. For brevity, denote $X \equiv q(Y-C) - (1-\theta)(1-q)C$. Differentiate (3) with respect to θ:

$$\frac{\partial^2 U_D(\theta)}{\partial \theta^2} = -2(1-q)C\frac{1-q}{q}(W+F)G' + X\left(\frac{1-q}{q}(W+F)\right)^2 G''. \tag{4}$$

From (3) we conclude that if $\frac{\partial U_D(\theta)}{\partial \theta} \leq 0$, which is of course true at a local interior minimum, then $X > 0$, and thus (4) implies $\frac{\partial^2 U_D(\theta)}{\partial \theta^2} < 0$, since $G'' < 0$. Evidently, this violates the necessary second-order condition. Therefore, this function has exactly one local maximum, i.e. it is single-peaked. Also note that if θ^* is a local maximum of $U_D(\theta)$ which does not equal to 1, then $\frac{\partial U_D(\theta)}{\partial \theta} \leq 0$, and $X > 0$ at θ^* as well as at all points to the right of θ^*, since

X increases with θ^*. Therefore, $\frac{\partial^2 U_D(\theta)}{\partial \theta^2} < 0$ on $[\theta^*, 1]$. Therefore, π_D is determined uniquely, and θ^* is also unique. This completes the proof. ■

Proof of Propositon 3. We are of course interested only in the case of an interior maximum, in the sense that $\frac{\partial U_D(\theta)}{\partial \theta} = 0$ at this point. Differentiating the implicit function $\theta^* = \theta^*(x)$, where x is any of the parameters, we find that it the dependence is positive if and only if the cross-derivative of $U_D(\theta)$ by θ and x is positive at θ^*. Now compute the cross-derivatives (since we need to do it only at points where $\frac{\partial U_D(\theta)}{\partial \theta} = 0$, we may assume $X > 0$).

$$\frac{\partial^2 U_D(\theta)}{\partial \theta \partial q} = -\frac{\frac{\partial U_D(\theta)}{\partial \theta}}{1-q} - \frac{1-q}{q^2}\left(2C(1-\theta)(W+F)G' + X\frac{1-q}{q}(W+F)G''\right)$$

$$\left.\frac{\partial^2 U_D(\theta)}{\partial \theta \partial q}\right|_{\frac{\partial U_D(\theta)}{\partial \theta}=0} = -\frac{1-q}{q^2}(W+F)\left(2C(1-\theta)G' + X\frac{1-q}{q}G''\right) < 0$$

$$\frac{\partial^2 U_D(\theta)}{\partial \theta \partial Y} = -(1-q)(W+F)G' < 0$$

$$\left.\frac{\partial^2 U_D(\theta)}{\partial \theta \partial \overline{R}}\right|_{\theta=\theta^*} = -(1-q)CG' - X\frac{1-q}{q}(W+F)G'' < 0$$

$$\frac{\partial^2 U_D(\theta)}{\partial \theta \partial C} = (1-q)G + (q + (1-\theta)(1-q))\frac{1-q}{q}(W+F)G' > 0.$$

This completes the proof. ■

Proof of Proposition 4. Compute the following cross-derivative.

$$\frac{\partial^2 U_D(\theta)}{\partial \theta \partial F} = ((1-q)(1-\theta)C - X)\frac{1-q}{q}G' - X\frac{1-q}{q}(W+F)(1-\theta)\frac{1-q}{q}G''.$$

If $(1-q)(1-\theta)C - X \geq 0$, then $\frac{\partial^2 U_D(\theta)}{\partial \theta \partial F}$ is positive for obvious reasons. Otherwise, observe that since $R^* G'(R^*)$ is decreasing by R^*, then $R^* G'' + G' < 0$, and we can substitute G' to get

$$\frac{\partial^2 U_D(\theta)}{\partial \theta \partial F} > \left[-((1-q)(1-\theta)C - X)\left(W - \overline{R}\right) - (1-q)(1-\theta)^2 C\frac{1-q}{q}(W+F)\right]\frac{1-q}{q}G''.$$

The expression in brackets is negative for large F because it is linear with respect to F. Therefore, $\frac{\partial^2 U_D(\theta)}{\partial \theta \partial F} > 0$ for large F. At the same time,

$$\left.\frac{\partial U_D(\theta)}{\partial \theta}\right|_{\theta=1} = (1-q)\, CG\left(W-\overline{R}\right) - (Y-C)(1-q)(W+F)\, G'\left(W-\overline{R}\right).$$

This expression is linear by F and is decreasing. Therefore, it is negative for sufficiently large F.

Now consider the agent's utility. In the equilibrium, agent's utility function is given by

$$U_A(\theta) = q\left(WG + \int_{R^*}^{\infty} RG'dR\right) + (1-\theta)(1-q)(WG - F(1-G)) + \theta(1-q)W.$$

Its derivative with respect to θ equals

$$\frac{\partial U_A(\theta)}{\partial \theta} = (1-q)(W+F)(1-G).$$

It is easy to see that on $\left[0,\overline{\theta}\right]$ both $U_A(\theta)$ and $\frac{\partial U_A(\theta)}{\partial\theta}$ uniformly tend to zero as $F \to \infty$. Since $\frac{\partial H(\theta)}{\partial\theta}$ is continuous, it is uniformly separated from 0, and hence $\frac{\partial U_A(\theta)}{\partial\theta} < \frac{\partial H(\theta)}{\partial\theta}$ for large F. Therefore, the set of agents for whom $U_A(\theta) \geq H(\theta)$ is a non-empty (because it contains 0) segment $[0, \theta_0]$. In other words, for large F only relatively incompetent agents are selected. ■

Proof of Proposition 5. (i) Basically, the equations (**??**) and (**??**) can be rewritten as

$$\begin{aligned} U_S &= \max_\theta f(U_S, U_I); \\ U_I &= \max_\theta g(U_S, U_I). \end{aligned}$$

The right-hand side defines a mapping from the plane (U_S, U_I) to itself. Let us establish that this mapping is contracting in metric C_∞, i.e. where the distance is the maximum of distances between corresponding coordinates. Let $\tau = \frac{1+\beta}{2}$. We show that the distance between images does not exceed τ times the distance between arguments. First, let us show that if one argument is fixed at (U_S^0, U_I^0), then this holds if the other argument (U_S, U_I) is in some small vicinity of (U_S^0, U_I^0). Evidently, by using Lagrange's formula $\Delta \max_\theta f(U_S, U_I) = \frac{\partial f}{\partial U_S}(\cdot)\,\Delta U_S + \frac{\partial f}{\partial U_I}(\cdot)\,\Delta U_I$. Note that partial derivatives are calculated at some points, both coordinates of which are between those of (U_S^0, U_I^0) and (U_S, U_I). Therefore, by contracting the vicinity, we can make the partial derivatives at these points as close as possible to those at (U_S^0, U_I^0). To compute the latter, we do not need to differentiate with respect to θ by the envelope's theorem. Therefore,

$$\left.\frac{\partial f}{\partial U_S}\right|_{\left(U_S^0, U_I^0\right)} = \beta\left(\left(1 - q\left(1 - G\right)\right) + q\left(1 - G\right) P_S\right)$$

and

$$\left.\frac{\partial f}{\partial U_I}\right|_{\left(U_S^0, U_I^0\right)} = \beta q\left(1 - G\right) P_I.$$

Therefore, in some vicinity of $\left(U_P^0, U_Q^0\right)$ we have

$$\Delta \max_\theta f\left(U_S, U_I\right) < K \max\left(\Delta U_S, \Delta U_I\right) \leq \tau \max\left(\Delta U_S, \Delta U_I\right),$$

where $K = \beta\left(\left(1 - q\left(1 - G\right)\right) + q\left(1 - G\right) P_S\right) + \beta q\left(1 - G\right) P_I + \frac{1-\beta}{2}$, and the term $\frac{1-\beta}{2}$ is chosen to majorate any inaccuracies in computation of partial derivatives that come from substituting an arbitrary point in the vicinity to point (U_S^0, U_I^0). Similar reasoning yields $\Delta \max_\theta g\left(U_S, U_I\right) < \tau \max\left(\Delta U_S, \Delta U_I\right)$. Therefore, the same holds for the maximum of the increments.

Now consider two arbitrary points on the plane and connect them with a segment. Each point on the segment yields a vicinity with the property defined (it contracts to its center). Taking a finite subset of these vicinities that covers the segment, we can add the inequalities obtained to get that $\Delta \max_\theta g\left(U_S, U_I\right) < \tau \max\left(\Delta U_S, \Delta U_I\right)$ holds for any points. This proves that the mapping is contracting, and the equations have a unique solution (U_S, U_I).

To prove that at this solution, both U_S and U_I are positive, note that any iteration process converges to (U_S, U_I). If we take some point with positive coordinates, we observe that its image preserves that property. Therefore U_S and U_I are at least non-negative. But none of them can be zero because neither $\max_\theta f\left(U_S, U_I\right)$ nor $\max_\theta g\left(U_S, U_I\right)$ may equal zero if U_S and U_I are nonnegative. Furthermore, the double inequality $U_S \geq U_I \geq 0$ is also preserved, because if g reaches its maximum at θ_0, then the value of f at θ_0 not less than that of g, and the maximum value of f can be even greater. $U_S = U_I$ may not be the case, hence, $U_S > U_I$. The coefficients at G are for the two states are $X + \beta q\left(1 - P_S\right)\left(U_S - U_I\right)$ and $X + \beta q\left(\left(1 - Q_S\right)\left(U_S - U_I\right) + \left(1 - Q_S - Q_I\right) U_I\right)$, respectively, and the latter is obviously greater. Therefore, θ is not less in the state S than in the state I.

(ii) Suppose that for β_0, (U_S^0, U_I^0), where $U_S^0 > U_I^0$, is the stable point. We need to study the signs of the derivatives $\frac{dU_S}{\partial\beta}, \frac{dU_I}{\partial\beta}$ and $\frac{dU_S - dU_I}{\partial\beta}$ at point β_0. Just as before, we do not need to differentiate with respect to θ. Therefore, the signs are the same as in the case of mapping

$$\begin{aligned} U_S^1 &= f(U_S, U_I); \\ U_I^1 &= g(U_S, U_I), \end{aligned}$$

where θ is fixed. This mapping is linear. Obviously, if $U_S^0 \geq U_S \geq U_I \geq 0$, then $U_S^0 \geq U_S^1 \geq U_I^1 \geq 0$. Suppose that $\beta < \beta_0$. To prove that this implication is still the case, we notice that,

$$\begin{aligned} U_S^1 - U_I^1 &= \beta q (1-G)\left((P_S - Q_S) U_S + (P_I - Q_I) U_I\right) \\ &= \beta q (1-G)\left((P_S - Q_S)(U_S - U_I) + (P_S - Q_S + P_I - Q_I) U_I\right). \end{aligned}$$

Since $P_S - Q_S + P_I - Q_I > 0$, the middle inequality is also preserved, and for the other two the statement is evident. Therefore, for β, the stable point lies in the area where $U_S < U_S^0$ and $U_S - U_I < U_S^0 - U_I^0$ (it is easy to see that β has a non-trivial effect on these values and inequalities are strict). Also, the inequality $U_I^0 > U_I$ is preserved, and thus the second coordinate of the stable point also decreases. This leads to a higher competence of agents if β is smaller (in both cases), since coefficients at G become less in both states. ■

Proof of Proposition 6. Obviously, if $s = W$, then $t = W$, and thus the agent will obey. Consider the case where agent i received $s_i = S$. From the best response formula it is easy to see that if $R \leq R_L$, then obeying the dictator is best for the agent regardless of his counterpart's strategy. Similarly, if $R > R_H$, it is optimal for him to betray the dictator. For intermediate values of R, i.e. if $R_L < R \leq R_H$, it is optimal to behave exactly the same way as the other agent does. Evidently, any functions d_1 and d_2 satisfying these properties constitute a Nash equilibrium. ■

Proof of Proposition 7. (i) The dictator's utility equals

$$U_D^{\tilde{R}}(\theta) = (1-q)Y + (q(Y-C) - (1-\theta)(1-q)C)\, G\left(\tilde{R}\right),$$

which is increasing with $\tilde{R}$, which is in turn decreasing with τ. Consequently, for any fixed θ the dictator will choose a pair of agents with as little τ as possible.■

(ii) As in the proof of proposition 2, we can differentiate $U_D^{\tilde{R}}(\theta)$, where $\tilde{R}$ is a function of both θ and τ, twice to see that it is single-peaked. Therefore, the equilibrium is unique. Notice that for $\tau = 1$, $U_D^{\tilde{R}}(\theta)$ becomes single-agent $U_D(\theta)$ if we set $\alpha = 0$ instead of some positive value. Therefore, since

$$\left.\frac{\partial^2 U_D^{\tilde{R}}(\theta)}{\partial\theta\partial\alpha}\right|_{\tau=1} < 0,$$

the advisors chosen by the dictator are worse if the trust between them is perfect than in the case of a single agent. Furthermore, for τ close to 1, it is easy to see that

$$\frac{\partial^2 U_D^{\tilde{R}}(\theta)}{\partial\theta\partial\tau} < 0.$$

Consequently, the quality of agents optimal for the dictator deteriorates as trust between them increases. This observation completes the proof.■