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Evidence from Public Goods Experiments

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Abstract: In this paper, I test the effects of religious norms on the provision of public goods. My evidence is drawn from public goods experiments that I ran with regional bureaucrats in Tomsk and Novosibirsk, Russia. I introduce three treatments, which I define as degrees of Eastern Orthodox collectivist enforcement: 1. Solidarity, 2. Obedience, and 3. Universal discipline. I argue for the existence of an *Eastern Orthodox hierarchy* in the Russian bureaucracy that facilitates the delivery of public goods under conditions of universal discipline and the principal's overfulfillment. Eastern Orthodox hierarchy is enforced through universal disciplinary monitoring, which induces collective punishment when the public good is not delivered. Contrary to conventional wisdom about freeriding in administrative institutions, higher ranks in Russian bureaucracies are associated with less freeriding.

Keywords: Public goods experiments, bureaucracy, enforcement, Russia, religion, incomplete information, hierarchy

JEL: C91, C92, D72, D73, P21, P26, P32, P51, Z12

I. Introduction

In this paper, I argue that religion matters for the provision of public goods in Russia. My evidence is drawn from public goods experiments that I ran with regional bureaucrats in the oblast administrations of Tomsk and Novosibirsk, Russia. The core principles of Eastern Orthodox monastic organization are solidarity, obedience and universal discipline. I model them into strategic games and then transform them into treatments in a series of public goods experiment. Moreover, I establish the Soviet system of bureaucratic incentives as the institutional bridge between post-Soviet Russian bureaucracies and Eastern Orthodox monasteries.

In post-Soviet Russia there have been two critical and contradictory dimensions in the study of the bureaucracy. On the one hand, bureaucrats have been treated as one of the main factors for the country's economic stagnation and institutional backwardness. Extensive

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corruption, lack of technical skills, hoarding of state resources both under socialism and post-socialism have been only a few of the negative aspects of the Soviet and Russian civil service. On the other hand, regional bureaucracies have been essential for tracing the pathways of policy implementation. Despite their financial constraints and deficiencies in vocational training, they perform a series of duties and services that link the federal government with businesses - domestic and multinational - aid organizations, and the lower half of the population's income distribution. This is why regional bureaucracies form the ideal venue for the study of economic collectivism in the Russian Federation. Regional bureaucrats are components of the hierarchical monitoring structure, originating in the Kremlin and ending in municipalities and city districts. A public goods experiment that measures their degree of adherence to principles of Eastern Orthodox administrative organization can provide solid evidence on whether Eastern Orthodoxy has been an inherent part of Russian state culture and challenge the conventional wisdom of Soviet atheism.

Following the line of Stark, Iannaccone, and Finke, I do not treat religion and political economy as antithetical (1996); on the contrary, I am convinced that religion can explain political and social phenomena away from the conventional labels of fundamentalism and irrationality. Different religions generate different types of distributive hierarchies. Second, I enrich the existing literature on religion and political economy by offering a political theory that refutes the basic premises of secularism and its proposed dichotomies between sacred and profane institutions.

In this paper, my theoretical and experimental results on the effects of solidarity, obedience and universal discipline on the provision of public goods are not identical. The derived equilibrium solutions suggest that under solidarity the public good is not delivered, whereas under obedience and universal discipline is delivered. In all three cases, they are Nash equilibria in mixed strategies. In the OLS estimations of the experimental data, universal discipline induces higher contributions toward the public good at group and rank levels. This implies that - contrary to theoretical findings - obedience as an Eastern Orthodox principle does not have policy implications for the delivery of public goods by Russian bureaucracies. Furthermore, universal discipline leads to higher levels of private rewards both at group and rank levels. This set of observations leads to the definition of an Eastern Orthodox hierarchy that advances individual welfare only when the collective minimum is reached. The threat of collective punishment and the

ensuing learning process as a result of its imposition induce self-investment in the provision of public goods.

I also find that the principal contributes more toward the public good than bureaucrats of rank 2 and 3. This suggests that the efficient preservation of an Eastern Orthodox hierarchy requires a higher sacrifice from the leadership rather than lower administrative ranks. Thus, post-Soviet authoritarianism, which is so often observed in countries with an Eastern Orthodox majority, is likely to endure, only if the political, administrative and economic elites are inclined to provide public goods above the citizenry's overfulfillment threshold and relatively more than the lower ranks of the bureaucracy. In Eastern Orthodox hierarchies, the normative prerequisite for an efficient contribution increases discontinuously with rank.

The paper is structured as follows. In section 2, I provide an overview of the literature and in section 3 I discuss the relationship between Eastern Orthodoxy and the provision of public goods in Russia. In section 4, I setup and solve a public goods game in its static and dynamic forms as they correspond to solidarity, obedience and universal discipline. The results of the model are tested empirically in section 5 which presents the experimental design. Results are reported and discussed in section 6. In section 7, I provide the conclusions.

II. Literature

Modern social science has defined religion in the form of institutional entities that complement or substitute state functions in the provision of social welfare. It has also treated religiosity as verbal adherence to the existence of God or membership to a religious community. Huber and Stanig argue that state provision of social services through local churches puts the religious and secular poor in competition against each other in democracies, because it favors the former at the expense of the latter (2011). Scheve and Stasavage propose that social insurance and religiosity are substitute mechanisms with respect to life's adverse events and therefore shape people's demands for welfare state provisions in opposite directions; more religious people are inclined to be less dependent on social insurance (2006). Based on World Values Survey data from 1995-97 Torgler argues that different proxies of religiosity induce higher tax morale and that this

finding justifies the use of non-economic factors in the study of economic behavior (2006). Gill and Lundsgaarde treat the welfare state as a substitute to social services provided by the local churches (2004: 399). They suggest that a strong welfare state is conducive to higher levels of secularization and thus modernization (2004).

The historical variables of control, respect and obedience, which are invoked by Tabellini in his effort to explain regional variation in economic performance across Europe, offer an interesting, yet limited set of analytical conclusions (2010). Tabellini stresses the significance of culture for economic behavior and suggests that personal independence and social capital are crucial factors for economic development (2010). At the same time, the cultural division of labor constitutes a necessary, but not sufficient condition for class struggle; as long as a nondemocratic government is able to maintain the welfare of stratified workers at an acceptable minimum, the probability of revolution or loss of legitimacy of the incumbent government is definitely low (Hechter, 1978: 315-316).

Public goods experiments usually take place in the form of classroom games; people sit in the same room, but do not have direct eye contact with each other. They also record their contributions per round on special earnings or payoff sheets (Holt and Laury, 1997). As Marwell and Ames indicate, while the weak free-rider hypothesis holds, the overall private contributions by experiment participants undermine the formal validity of that theory (1981). People may still contribute toward a public good, even if they consider the possibility that another group member will contribute less while hoping to free-ride on the rest of the society (Marwell and Ames, 1981). Ironically, only economists, when participating in the Marwell and Ames experiments, seem to validate by approximation the free-rider hypothesis (1981).

Fehr and Gächter propose that cooperators prefer to impose punishments on free-riders, even when they are costly for them; they suggest that the presence of a punishment condition induces full cooperation among subjects that otherwise defect when there is a no-punishment condition (2000). Their theory of costly punishment finds particular application under Stranger-treatment – when random group composition in each period occurs – rather than under Partner-treatment – when group composition remains the same across periods (Fehr and Gächter, 2000). The confirmation of the weak free-rider hypothesis can also be explained by conditional

cooperation; with the use of a contribution table, 50 percent of the subjects stated their intention to contribute more toward the public good if their co-players contribute more (Fischbacher, Gächter and Fehr, 2001). This observation – backed up by additional evidence from public goods games - adds a third category to cooperators and free-riders; reciprocators (Burlando, 2005). This is why a theory of heterogeneous agents and endogenous group formation can be particularly useful when there is no hierarchical relationship between experimental subjects (Burlando, 2005).

As Palfrey and Prisbrey point out, experienced players are more stable and less altruistic in their contributions across periods, the more experience they accumulate (1997). They also show that not only the threshold level of the public good but also the marginal value of the private good influence each player's contribution decision per round and per experimental session (Palfrey and Prisbrey, 1997). In his seminal article on public goods experiments, Andreoni proposes that strategic behavior or learning alone cannot account for decay in public goods experiments (1988). Partners contribute more to the public good than Strangers, and this may be due to the fact that Partners adjust their priors faster than Strangers to the collected sum in round n-1 of an n round experiment (Andreoni, 1988).

This learning process becomes more effective when there is a concrete threshold to be achieved. The reason is that there is a binary dilemma imposed on experiment participants; to over- or under-contribute toward collective welfare. This is in line with Andreoni, who argues about the significance of social norms with respect to levels of cooperation (1988). Social norms may sustain a high level of cooperation in repetitive public goods games with a finite horizon, and thus induce learning *ex-ante* rather than *ex-post*. In my experiments, I make use of Partner-treatment only and allow for hierarchical differentiation across group members. Eastern Orthodoxy is the singular common ground that can explain the existence of rigid yet collectivist hierarchies in the Russian bureaucracy.

III. Eastern Orthodoxy and the Provision of Public Goods in Russia

Hierarchy, solidarity and universal discipline are central in Eastern Orthodox theology and organization. If the core of the Orthodox tradition - according to St. John the Chrysostom - is the idea that the state should imitate the norms and organization of the church in order to achieve its optimal form, then it is seems appropriate to test this idea with Russian bureaucrats at the subnational level. In his work on Russian intellectual history and the relationship between the individual and the collective, Kharkhordin draws the fascinating analogy between Soviet collectives and Orthodox congregations (2005: 51-56). His contribution lies primarily on political theory and the linkage between Byzantine patristics and Russian ecclesiastical thought as well as the influence of the former on religious practices and state structures in Russia from Kievan Rus to the Soviet Union.[1] More specifically, he proposes that the Eastern Orthodox collective (on the basis of the Russian Orthodox Monastery and Soviet civil society) is bounded by the following principles: 1. Hierarchy, 2. Collective surveillance, and 3. Mutual assistance at the community level (2005: 51-56). Instead of focusing on the analogy between Soviet collectives and Orthodox congregations, I draw a much longer historical line between late Byzantium and post-Soviet Russia. Moreover, I trace the roots of Eastern Orthodox collectivism in Russia in the influence of Byzantium's Hesychast movement on Russia's ecclesiastical thought and more importantly administrative structures.

Joseph Volotsky, the abbot of Volokolamsk Monastery, has been one of the most influential figures in the definition of monastic organization in Russian Orthodoxy; his Brief and Extended Rules suggest a series of principles on what constitutes a monastic community, its core, boundaries and limitations (Goldfrank, 1975). In his approach of coenobitic life, he argues in the Extended Rule that mercy and charity are critical for the self-preservation of the monastery and its ability to fulfill its social welfare obligations, i.e. meeting the needs of the poor (Goldfrank, 1975). Moreover, he suggests that the monastery is a worldly institution and thus it is also defined by material needs and principles that may define also other forms of communal organization; contrary to Goldfrank

[1] The core of his argument can be also found in Kharkhordin Oleg V. *The Collective and the Individual in Russia: A Study of Practices*, University of California Press, 1999.

(1975), who understands the monastery as a reflection of Muscovy's political and economic structures, I argue that the monastery itself perpetuates political and economic structures that have been far more ancient than Muscovy.

The key distinction between Joseph Volotsky and Nil Sorsky, the Athonite monk who was Volotsky's contemporary and equally influential in the Russian Orthodox Church, is the following: while Sorsky prioritized hermitage and Hesychast asceticism, Volotsky treated monasticism as a worldly elite institution. Penitence, material detachment and emotional indifference are some of the prerequisites of the Hesychast ideal of stillness, which lies in the core of Sorsky's Byzantine Orthodox thought in early modern Russia (Goldfrank, 1975).

This very idea of abstinence from property is central in the theological thought of St. John the Chrysostom, where the *koinonia* of resources is essential for the unity and utility of the church (Petrou, 1996). Nevertheless, *koinonia* is not only material; it also has a direct personal dimension, because property is only complementary to personal communication and human salvation through the community of persons. Hence, mysticism is not in opposition to asceticism; the Hesychast tradition suggests that the former should rather be seen as an extension of the latter (Buss, 1989). The end is *Kaini Ktisi*, the creation of a new world on the basis of Eastern Orthodox principles; the Church as an institution is a necessary prerequisite in that respect (Nissiotis, 1961). Thus, the Church in the Orthodox tradition becomes the paradigmatic structure for the state. The monastic community lies in the core of this administrative system. The mainstream position of the Hesychast tradition in Orthodox Christianity, within the boundaries of Byzantine Empire and beyond, and the willingness of the Emperor John VI Kantakouzenos to support the Hesychast cause confirm its key role in the development of the Orthodox commonwealth (Meyendorff, 1988).

Marcuse, in his explanation of the new rationality emerged in the Soviet Union in the 1920s, proposes that transition from capitalism to communism was conditioned by social processes, reinforcement of the state apparatus, elimination of competitive ideologies, achievement of a subsistence minimum, industrialization and agricultural collectivization (Marcuse, 1961: 63-64). The formation of vertical and centralized administrative structures that proclaim to eradicate individual interests vis-à-vis collective welfare in many instances was more rhetorical than real.

Nevertheless, the Soviet synthesis of common interest is elaborated in Marcuse as a negation of individual freedom and inequality (Marcuse, 1961: 100-103).

This is why I treat orthodoxy and central planning as a continuum in terms of bureaucratic organization. They constitute the two leading cultural paradigms in Russian history since the 10th century, when the principality of Kievan Rus' adopted Orthodox Christianity from Constantinople in 988 AD; they have both defined Russian identity in stark contrast with the West, whose main cultural elements have been capitalism and any of the two leading versions of Western Christianity, Catholicism or Protestantism (Makrides and Uffelmann, 2003). The imperial heritage of Byzantium constitutes a key component of Russia's national self-consciousness (Papanikolaou, 2003). Since the Byzantine emperor was seen as the representative of God and the Empire itself the depiction of the Divine Kingdom on Earth, Russia's lack of democratic culture may be linked to its Eastern Orthodox tradition (Papanikolaou, 2003). Rational individualism is the cornerstone of Western Christianity and capitalism, as well as of capitalism's political outgrowth: democracy. Rather than making an argument about the incompatibility of orthodoxy with democratic values and economic development, I define Eastern Orthodox collectivism as a form of political and economic organization, alternative to market economy and democracy, with distinctive microfoundations and bureaucratic characteristics.

This abstinence of the Russian administrative state from the Weberian ideal type is linked to a strong commitment to communitarianism and the creation of relational rather than professional policy networks (Brym and Gimpelson, 2004). The size of the Russian civil service is considered to be inefficient and its education substandard by Western criteria; nevertheless, it fulfills multidimensional social functions (Brym and Gimpelson, 2004). Although it is not accurate to define Russia as collectivist and the West as individualist in an exclusive way, it is certainly the case that the Russian administrative state has determined the concept of economic and political community in a radically different way than its Western counterparts (Stoeckl, 2007: 6-12). The government is not just the collective representation of citizens' individual interests. It serves broader social functions that transcend the boundaries between what we perceive as public and private; education, healthcare, energy regulation and transportation are critical policy areas, where the state does not function as a profit-maximizing entrepreneur or a mere coordinator of public

activities. On the contrary, it has the absolute authority in defining public interest, since it controls all governance structures in the Russian society, both vertical and horizontal.

The ability of the Russian executive to enforce collaborative rather than competitive structures in the provision of public goods is due to a mix of repressive technology and transactional efficiency. Thus, the Russian administration becomes the embodiment of family and community values at the macro-level. Selective resonance to contract enforcement and judicial institutions does not mean that resource allocation occurs without the existence of functioning institutions (Hendley, Ryterman and Murrell, 1999).[2] The Russian administrative state is a complex organization of overlapping hierarchies, subject to scrutiny and control by immediate supervisors; this is why any trace of administrative justice in Russia is certainly not a victory of citizens against local or federal arbitrariness (Solomon, 2004: 574-575).

The political economy of democratic reform in the 1990s has been severely criticized for its intent to destroy the collectivist core in Russia's political and economic system and substitute it with a privatized version of the state, which would have no distributive obligations toward the citizens (Guriev and Rachinsky, 2005). This is why the democratic experiment failed in Russia: because instead of becoming the principled polity of the middle class, democracy was treated as equivalent to an arbitrary form of government, run by privatized state elites. The icon of the state, perpetuating the Byzantine political tradition of the Emperor, constitutes a solid ideological stronghold, which is defined by the divide-and-rule principle vis-à-vis the citizens, and constrains any major form of civic organization. Civicness and trust as alternative foundations of governance are seen as threats to community cohesion, because they limit the role of the state as supplier of public goods and social services. This multiplicity of organizational forms facilitates high levels of administrative corruption, mainly targeted at small and medium enterprises (SMEs), which play by default a minor role in generating public goods for the government and hence contributing to regime legitimacy (Safavian, 2001).

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[2] See also Clarks Simon and Vadim Borisov, "New forms of labor contract and labor flexibility in Russia", *Economics of Transition* 7 (3): 593-614.

Unity rather than diversity, and the perception of a super state that embodies collective interests and has messianic traits are in the core of both Marxian and Byzantine political traditions (Rothbard, 1990). Unlike Protestant bureaucracies, where *ex-ante* enforcement mechanisms form the basis of state-society relations and social trust, in post-communist Russia the minimization of exogenous risk, and thus the maintenance of a rational hierarchy forms the basis of administrative decision-making and public goods distribution (Rubin, 1994). Treating communism as Russia's civil religion and orthodoxy as the primary form of theological expression in Russian history may provide the cultural foundations of bureaucracy and regime formation in post-Soviet Russia, both under Yeltsin and Putin (Dinello, 2003).

IV. The Model

How can these arguments be formally developed? Modeling the Russian bureaucracy as a hierarchical organization that operates on the basis of obedience, solidarity and universal discipline provides a baseline for the experimental results that I am presenting in subsequent section of this paper.

Standard Form with Rank Differentiation

I assume an administrative agency with three different administrative ranks: $n_1 = 1$ and $n_1 < n_2 < n_3$, which means that the principal of the administrative agency is singular, and the lower the administrative rank the higher the number of the agents. I assume a linear utility for all three ranks, which has the following structure:

$$U_i = \chi_i - \theta_i + \beta_i Z_i(\theta_i)$$

where χ_i is the initial endowment of any bureaucrat i where i=1, 2, or 3, θ_i is his monetary contribution toward the public good, Z_i his private rewards from the delivery of the public good, which is monotonically decreasing in θ_i, β_i is a parameter between 0 and 1, which denotes the degree of hierarchical accountability for the provision of public goods, such that $\beta_1 > \beta_2 > \beta_3$.

Each bureaucrat does not know if the other one will provide adequate contribution toward the public good. There are four possible events:

1. Bureaucrat i overfulfills and bureaucrats –i underfulfill s.t. $\theta_i \geq \hat{\theta}_i$ and $\theta_{-i} < \hat{\theta}_{-i}$
2. Bureaucrat i underfulfills and bureaucrats –i overfulfill s.t. $\theta_i < \hat{\theta}_i$ and $\theta_{-i} \geq \hat{\theta}_{-i}$
3. All types of bureaucrats overfulfill s.t. $\theta_i \geq \hat{\theta}_i$ and $\theta_{-i} \geq \hat{\theta}_{-i}$
4. All types of bureaucrats underfulfill s.t. $\theta_i < \hat{\theta}_i$ and $\theta_{-i} < \hat{\theta}_{-i}$.[3]

where $\hat{\theta}_i$ is the exogenous threshold for overfulfillment. If all types of bureaucrats overfulfill, the public good is certainly delivered. If all types of bureaucrats underfulfill, the public good is certainly not delivered. If bureaucrat i underfulfills and bureaucrats –i overfulfill, then both outcomes are likely. The same holds, when bureaucrat i overfulfills and bureaucrats –i underfulfill. The probability of overfulfillment is denoted as $p(\theta_i \geq \hat{\theta}_i) = p(\overline{\theta}_i)$ and the probability of under-fulfillment is $1 - p(\theta_i \geq \hat{\theta}_i) = p(\underline{\theta}_i)$. Moreover, because the public good is delivered if and only if t is reached, there is a discontinuity in the payoffs around threshold t. I assume that private rewards from non-delivery have the form $Z_i^{t>\sigma} = Z_i^{t\leq\sigma} - C_i$, where σ is the sum of contributions provided by all bureaucrats and C_i is the cost of free-riding, which is monotonically decreasing in θ_i. Therefore, I rewrite the utility payoffs as follows:

$$U_i(\theta_i) = \begin{cases} p_i(t \leq \sigma)[\chi_i - \theta_i + \beta_i Z_i^{t\leq\sigma}(\theta_i)] + p_i(t > \sigma)[\chi_i - \theta_i + \beta_i Z_i^{t\leq\sigma}(\theta_i) - \beta_i C_i(\theta_i)], \text{if } \theta_i \geq \hat{\theta}_i \text{ and } \theta_{-i} < \hat{\theta}_{-i} \\ \lambda_i(t \leq \sigma)[\chi_i - \theta_i + \beta_i Z_i^{t\leq\sigma}(\theta_i)] + \lambda_i(t > \sigma)[\chi_i - \theta_i + \beta_i Z_i^{t\leq\sigma}(\theta_i) - \beta_i C_i(\theta_i)], \text{if } \theta_i < \hat{\theta}_i \text{ and } \theta_{-i} \geq \hat{\theta}_{-i} \\ \chi_i - \theta_i + \beta_i Z_i^{t\leq\sigma}(\theta_i), \text{if } \theta_i \geq \hat{\theta}_i \text{ and } \theta_{-i} \geq \hat{\theta}_{-i} \\ \chi_i - \theta_i + \beta_i Z_i^{t\leq\sigma}(\theta_i) - \beta_i C_i(\theta_i), \text{if } \theta_i < \hat{\theta}_i \text{ and } \theta_{-i} < \hat{\theta}_{-i} \end{cases}$$

It is important to mention here that $p_i(t \leq \sigma)$ is the probability of threshold fulfillment if bureaucrat i overfulfills and bureaucrats –i underfulfill, and $\lambda_i(t \leq \sigma)$ is the probability of

[3] See also Arnott Richard and Joseph E. Stiglitz. "Moral Hazard and Nonmarket Institutions: Dysfunctional Crowding Out of Peer Monitoring?" *American Economic Review*, Vol. 81, No. 1, March 1991: 179-190.

threshold fulfillment if bureaucrat i underfulfills and bureaucrats –i overfulfill. Based on the proposed income differentiation across bureaucratic ranks, the following inequalities hold:

$$p_1(t \le \sigma) \ge p_2(t \le \sigma) \ge p_3(t \le \sigma)$$
$$\lambda_1(t \le \sigma) \le \lambda_2(t \le \sigma) \le \lambda_3(t \le \sigma)$$
$$p_1(t \le \sigma) \ge \lambda_1(t \le \sigma)$$
$$p_2(t \le \sigma) \le \lambda_2(t \le \sigma)$$
$$p_3(t \le \sigma) \le \lambda_3(t \le \sigma)$$

The first-order conditions have the following form:

$$\max_{\theta_i} U_i(\theta_i) = L_i(\theta_i) = \begin{cases} \beta_i \dfrac{\partial Z_i^{t \le \sigma}}{\partial \theta_i} - p_i(t > \sigma)\beta_i \dfrac{\partial C_i}{\partial \theta_i} - 1, \text{if } \theta_i \ge \hat{\theta}_i \text{ and } \theta_{-i} < \hat{\theta}_{-i} \\ \beta_i \dfrac{\partial Z_i^{t \le \sigma}}{\partial \theta_i} - \lambda_i(t > \sigma)\beta_i \dfrac{\partial C_i}{\partial \theta_i} - 1, \text{if } \theta_i < \hat{\theta}_i \text{ and } \theta_{-i} \ge \hat{\theta}_{-i} \\ \beta_i \dfrac{\partial Z_i^{t \le \sigma}}{\partial \theta_i} - 1, \text{if } \theta_i \ge \hat{\theta}_i \text{ and } \theta_{-i} \ge \hat{\theta}_{-i} \\ \beta_i \dfrac{\partial Z_i^{t \le \sigma}}{\partial \theta_i} - \beta_i \dfrac{\partial C_i}{\partial \theta_i} - 1, \text{if } \theta_i < \hat{\theta}_i \text{ and } \theta_{-i} < \hat{\theta}_{-i} \end{cases}$$

By the implicit function theorem I define $\theta_i = q_i(\theta_{-i})$. Therefore, the second-order conditions for the principal have the following form:

$$D_{\theta_{-1}} L_1 = \begin{cases} \dfrac{\partial q_1}{\partial \theta_{-1}} = -\left(\dfrac{\partial^2 Z_1}{\partial \theta_1 \partial \theta_{-1}} - p_1(t > \sigma) \dfrac{\partial^2 C_1}{\partial \theta_1 \partial \theta_{-1}} \right) \left(\dfrac{\partial^2 Z_1}{\partial \theta_1^2} - p_1(t > \sigma) \dfrac{\partial^2 C_1}{\partial \theta_1^2} \right)^{=1}, \text{if } \theta_1 \ge \hat{\theta}_1 \text{ and } \theta_{-1} < \hat{\theta}_{-1} \\ \dfrac{\partial q_1}{\partial \theta_{-1}} = -\left(\dfrac{\partial^2 Z_1}{\partial \theta_1 \partial \theta_{-1}} - \lambda_1(t > \sigma) \dfrac{\partial^2 C_1}{\partial \theta_1 \partial \theta_{-1}} \right) \left(\dfrac{\partial^2 Z_1}{\partial \theta_1^2} - \lambda_1(t > \sigma) \dfrac{\partial^2 C_1}{\partial \theta_1^2} \right)^{=1}, \text{if } \theta_1 < \hat{\theta}_1 \text{ and } \theta_{-1} \ge \hat{\theta}_{-1} \\ \dfrac{\partial q_1}{\partial \theta_{-1}} = -\dfrac{\partial^2 Z_1}{\partial \theta_1 \partial \theta_{-1}} \left(\dfrac{\partial^2 Z_1}{\partial \theta_1^2} \right)^{-1}, \text{if } \theta_1 \ge \hat{\theta}_1 \text{ and } \theta_{-1} \ge \hat{\theta}_{-1} \\ \dfrac{\partial q_1}{\partial \theta_{-1}} = -\left(\dfrac{\partial^2 Z_1}{\partial \theta_1 \partial \theta_{-1}} - \dfrac{\partial^2 C_1}{\partial \theta_1 \partial \theta_{-1}} \right) \left(\dfrac{\partial^2 Z_1}{\partial \theta_1^2} - \dfrac{\partial^2 C_1}{\partial \theta_1^2} \right)^{=1}, \text{if } \theta_1 < \hat{\theta}_1 \text{ and } \theta_{-1} < \hat{\theta}_{-1} \end{cases}$$

Similarly, for bureaucrats of rank 2 and 3:

$$D_{\theta_{-2}}L_2=\begin{cases}\dfrac{\partial q_2}{\partial\theta_{-2}}=-\left(\dfrac{\partial^2 Z_2}{\partial\theta_2\partial\theta_{-2}}-p_2(t>\sigma)\dfrac{\partial^2 C_2}{\partial\theta_2\partial\theta_{-2}}\right)\left(\dfrac{\partial^2 Z_2}{\partial\theta_2^2}-p_2(t>\sigma)\dfrac{\partial^2 C_2}{\partial\theta_2^2}\right)^{=1}, \text{if } \theta_2\geq\hat{\theta}_2 \text{ and } \theta_{-2}<\hat{\theta}_{-2}\\ \dfrac{\partial q_2}{\partial\theta_{-2}}=-\left(\dfrac{\partial^2 Z_2}{\partial\theta_2\partial\theta_{-2}}-\lambda_2(t>\sigma)\dfrac{\partial^2 C_2}{\partial\theta_2\partial\theta_{-2}}\right)\left(\dfrac{\partial^2 Z_2}{\partial\theta_2^2}-\lambda_2(t>\sigma)\dfrac{\partial^2 C_2}{\partial\theta_2^2}\right)^{=1}, \text{if } \theta_2<\hat{\theta}_2 \text{ and } \theta_{-2}\geq\hat{\theta}_{-2}\\ \dfrac{\partial q_2}{\partial\theta_{-2}}=-\dfrac{\partial^2 Z_2}{\partial\theta_2\partial\theta_{-2}}\left(\dfrac{\partial^2 Z_2}{\partial\theta_2^2}\right)^{-1}, \text{if } \theta_2\geq\hat{\theta}_2 \text{ and } \theta_{-2}\geq\hat{\theta}_{-2}\\ \dfrac{\partial q_2}{\partial\theta_{-2}}=-\left(\dfrac{\partial^2 Z_2}{\partial\theta_2\partial\theta_{-2}}-\dfrac{\partial^2 C_2}{\partial\theta_2\partial\theta_{-2}}\right)\left(\dfrac{\partial^2 Z_2}{\partial\theta_2^2}-\dfrac{\partial^2 C_2}{\partial\theta_2^2}\right)^{=1}, \text{if } \theta_2<\hat{\theta}_2 \text{ and } \theta_{-2}<\hat{\theta}_{-2}\end{cases}$$

$$D_{\theta_{-3}}L_3=\begin{cases}\dfrac{\partial q_3}{\partial\theta_{-3}}=-\left(\dfrac{\partial^2 Z_3}{\partial\theta_3\partial\theta_{-3}}-p_3(t>\sigma)\dfrac{\partial^2 C_3}{\partial\theta_3\partial\theta_{-3}}\right)\left(\dfrac{\partial^2 Z_3}{\partial\theta_3^2}-p_3(t>\sigma)\dfrac{\partial^2 C_3}{\partial\theta_3^2}\right)^{=1}, \text{if } \theta_3\geq\hat{\theta}_3 \text{ and } \theta_{-3}<\hat{\theta}_{-3}\\ \dfrac{\partial q_3}{\partial\theta_{-3}}=-\left(\dfrac{\partial^2 Z_3}{\partial\theta_3\partial\theta_{-3}}-\lambda_3(t>\sigma)\dfrac{\partial^2 C_3}{\partial\theta_3\partial\theta_{-3}}\right)\left(\dfrac{\partial^2 Z_3}{\partial\theta_3^2}-\lambda_3(t>\sigma)\dfrac{\partial^2 C_3}{\partial\theta_3^2}\right)^{=1}, \text{if } \theta_3<\hat{\theta}_3 \text{ and } \theta_{-3}\geq\hat{\theta}_{-3}\\ \dfrac{\partial q_3}{\partial\theta_{-3}}=-\dfrac{\partial^2 Z_3}{\partial\theta_3\partial\theta_{-3}}\left(\dfrac{\partial^2 Z_3}{\partial\theta_3^2}\right)^{-1}, \text{if } \theta_3\geq\hat{\theta}_3 \text{ and } \theta_{-3}\geq\hat{\theta}_{-3}\\ \dfrac{\partial q_3}{\partial\theta_{-3}}=-\left(\dfrac{\partial^2 Z_3}{\partial\theta_3\partial\theta_{-3}}-\dfrac{\partial^2 C_3}{\partial\theta_3\partial\theta_{-3}}\right)\left(\dfrac{\partial^2 Z_3}{\partial\theta_3^2}-\dfrac{\partial^2 C_3}{\partial\theta_3^2}\right)^{=1}, \text{if } \theta_3<\hat{\theta}_3 \text{ and } \theta_{-3}<\hat{\theta}_{-3}\end{cases}$$

Following the standard public goods game, the players' actions are *strategic substitutes* such that $\frac{\partial q_1}{\partial\theta_2}<0,\ \frac{\partial q_1}{\partial\theta_3}<0,\ \frac{\partial q_2}{\partial\theta_1}<0,\ \frac{\partial q_2}{\partial\theta_3}<0,\ \frac{\partial q_3}{\partial\theta_1}<0,\ \frac{\partial q_3}{\partial\theta_2}<0.$ The same assumption holds also for the extension I present here. This means that the higher the contributions of bureaucrats of rank 2 and 3, the lesser the contribution of the principal. The same holds symmetrically for bureaucrats of rank 2 and 3. There is no reason for him to contribute more, if he can achieve the same public good payoff by contributing the least to it. The standard public goods game with linear payoffs identifies two types of Nash equilibria (Cadsby and Maynes, 1999). The first one is a Nash equilibrium in pure strategies where everybody bids zero *such that* $\theta_1=\theta_2=\theta_3=0.$ The second one is also a Nash equilibrium in pure strategies where everybody bids the same monetary contribution such that $\theta_i=\frac{t}{N}$, where N is the total number of players.

In my propositions below, I provide the Nash equilibria derived from my extension to the standard form with differentiated ranks.

Proposition 1:

If $\frac{\partial^2 C_1}{\partial\theta_1\partial\theta_{-1}} \geq \frac{\partial^2 Z_1}{\partial\theta_1\partial\theta_{-1}}$ *and* $p_1(t>\sigma) < \lambda_1(t>\sigma)$, *then the principal sets the threshold* t *such that* $\lim_{\theta_1\to\hat{\theta}_1} t = m$, *and his contribution such that* $\lim_{\theta_2,\theta_3\to 0,0}\inf\{\theta_1 : \theta_1 \geq \hat{\theta}_1\} = \hat{\theta}_1$. *This is a Nash equilibrium in mixed strategies and a weakly dominant strategy as it implies the existence of a continuum of Nash equilibria.*

Corollary 1a:

If $\frac{\partial^2 C_2}{\partial\theta_2\partial\theta_{-2}} \geq \frac{\partial^2 Z_2}{\partial\theta_2\partial\theta_{-2}}, \frac{\partial^2 C_3}{\partial\theta_3\partial\theta_{-3}} \geq \frac{\partial^2 Z_3}{\partial\theta_3\partial\theta_{-3}}$, $p_2(t>\sigma) > \lambda_2(t>\sigma)$ *and* $p_3(t>\sigma) > \lambda_3(t>\sigma)$, *then bureaucrats of rank 2 and 3 set their contributions such that* $\lim_{\theta_1\to\hat{\theta}_1} p_2(t>\sigma) = 0$, $\lim_{\theta_1\to\hat{\theta}_1} p_3(t>\sigma) = 0$ *and* $\lim_{\theta_1,\theta_3\to\hat{\theta}_1,0}\inf\{\theta_2 : \theta_2 < \hat{\theta}_2\} = 0$ and $\lim_{\theta_1,\theta_2\to\hat{\theta}_1,0}\inf\{\theta_3 : \theta_3 < \hat{\theta}_3\} = 0$. *This is a Nash equilibrium in mixed strategies and a weakly dominant strategy as it implies the existence of a continuum of Nash equilibria.*

Proof of Proposition 1

As indicated in the second-order conditions matrices of the principal, if $\frac{\partial^2 C_1}{\partial\theta_1\partial\theta_{-1}} \geq \frac{\partial^2 Z_1}{\partial\theta_1\partial\theta_{-1}}$ and $p_1(t>\sigma) < \lambda_1(t>\sigma)$, then the principal has an incentive to overfulfill at the minimum level $\hat{\theta}_1$. More specifically, if his individual cost of non-delivery is higher than the individual welfare from delivery and if the probability of non-delivery for the public good is lower when he overfulfills than when he underfulfills, then the principal has an incentive to set the threshold equal to the minimum level m, assuming that the contributions of bureaucrats of ranks 2 and 3 tend to zero.

Proof of Corollary 1a

As indicated in the second-order conditions matrices of bureaucrats of ranks 2 and 3, if $\frac{\partial^2 C_2}{\partial\theta_2\partial\theta_{-2}} \geq \frac{\partial^2 Z_2}{\partial\theta_2\partial\theta_{-2}}, \frac{\partial^2 C_3}{\partial\theta_3\partial\theta_{-3}} \geq \frac{\partial^2 Z_3}{\partial\theta_3\partial\theta_{-3}}$, $p_2(t>\sigma) > \lambda_2(t>\sigma)$ and $p_3(t>\sigma) > \lambda_3(t>\sigma)$, then bureaucrats of ranks 2 and 3 have an incentive to underfulfill, assuming that the principal is better off by over- rather than underfulfilling when they freeride. The principal has an incentive to set

$t = m$, so that his own contribution has a limit in $\hat{\theta}_1$, as the contributions of bureaucrats of ranks 2 and 3 approximate zero if and only if $p_1(t < \sigma) > \lambda_2(t < \sigma) > \lambda_3(t < \sigma)$

In a public goods game with hierarchical differentiation, the principal contributes the infimum of his overfulfillment space, whereas bureaucrats of ranks 2 and 3 contribute the infimum of their respective underfulfillment spaces. Both the principal and lower-level bureaucrats have an interest in the delivery of the public good; the comparative income advantage of the principal makes his own contribution critical for this outcome. Therefore, without his overfulfillment the public good is not going to be delivered, as the principal anticipates that bureaucrats of ranks 2 and 3 have an incentive to freeride. At the same time, bureaucrats of ranks 2 and 3 decide to freeride, as they expect that the principal is better off by offering a contribution. The equilibrium set has the following form:

$$\{\lim_{\theta_2,\theta_3 \to 0,0} \inf \{\theta_1 : \theta_1 \geq \hat{\theta}_1\}, \lim_{\theta_1,\theta_3 \to \hat{\theta}_1,0} \inf \{\theta_2 : \theta_2 < \hat{\theta}_2\}, \lim_{\theta_1,\theta_2 \to \hat{\theta}_1,0} \inf \{\theta_3 : \theta_3 < \hat{\theta}_3\}\} \Rightarrow \{\hat{\theta}_1, 0, 0\}.$$

Thus, the public good is not delivered in the standard form as $\hat{\theta}_1 < m$.

Solidarity

I now assume that the bureaucrats decide about whether to deliver a social good. This is not for the general public, including themselves, but it addresses the needs of poorer and more disadvantaged members of the society. The differences from the standard form model are the following:

1. The private rewards payoff from solidarity is lower than the private rewards payoff from the delivery of the public good, such that $\frac{\partial Y_i^{t_1 \leq \sigma}}{\partial \theta_i} < \frac{\partial Z_i^{t_1 \leq \sigma}}{\partial \theta_i}$ and $\gamma_i < \beta_i$, where $Y_i^{t_1 \leq \sigma}$ denotes the private rewards from solidarity derived by the bureaucrat.
2. The private rewards payoff from solidarity is divided by $\tau_p \lambda$, where λ is the total population, and τ_p is the percentage of poor people in any society. The utility payoffs have the following form:

$$J_i(\theta_i)=\begin{cases} p_i(t\le\sigma)[\chi_i-\theta_i+\frac{\gamma_i}{\tau_p\lambda}Y_i^{t\le\sigma}(\theta_i)]+p_i(t>\sigma)[\chi_i-\theta_i+\frac{\gamma_i}{\tau_p\lambda}Y_i^{t\le\sigma}(\theta_i)-\frac{\gamma_i}{\tau_p\lambda}C_i(\theta_i)], \text{if } \theta_i\ge\hat{\theta}_i \text{ and } \theta_{-i}<\hat{\theta}_{-i} \\ \lambda_i(t\le\sigma)[\chi_i-\theta_i+\frac{\gamma_i}{\tau_p\lambda}Y_i^{t\le\sigma}(\theta_i)]+\lambda_i(t>\sigma)[\chi_i-\theta_i+\frac{\gamma_i}{\tau_p\lambda}Y_i^{t\le\sigma}(\theta_i)-\frac{\gamma_i}{\tau_p\lambda}C_i(\theta_i)], \text{if } \theta_i<\hat{\theta}_i \text{ and } \theta_{-i}\ge\hat{\theta}_{-i} \\ \chi_i-\theta_i+\frac{\gamma_i}{\tau_p\lambda}Y_i^{t\le\sigma}(\theta_i), \text{if } \theta_i\ge\hat{\theta}_i \text{ and } \theta_{-i}\ge\hat{\theta}_{-i} \\ \chi_i-\theta_i+\frac{\gamma_i}{\tau_p\lambda}Y_i^{t\le\sigma}(\theta_i)-\frac{\gamma_i}{\tau_p\lambda}C_i(\theta_i), \text{if } \theta_i<\hat{\theta}_i \text{ and } \theta_{-i}<\hat{\theta}_{-i} \end{cases}$$

The players' actions in this game are also *strategic substitutes* such that $\frac{\partial q_1}{\partial\theta_2}<0$, $\frac{\partial q_1}{\partial\theta_3}<0$, $\frac{\partial q_2}{\partial\theta_1}<0$, $\frac{\partial q_2}{\partial\theta_3}<0$, $\frac{\partial q_3}{\partial\theta_1}<0$, $\frac{\partial q_3}{\partial\theta_2}<0$.

Proposition 2:

If $\frac{\partial^2 C_1}{\partial\theta_1\partial\theta_{-1}}\ge\frac{\partial^2 Y_1}{\partial\theta_1\partial\theta_{-1}}$ *and* $p_1(t>\sigma)<\lambda_1(t>\sigma)$, *then the principal sets the threshold* t *such that* $\lim_{\theta_1\to\hat{\theta}_1-\varepsilon} t=k$, *and his contribution such that* $\limsup_{\theta_2,\theta_3\to 0,0}\{\theta_1:\theta_1<\hat{\theta}_1\}=\hat{\theta}_1-\varepsilon$, *where* ε *is the difference between* $\frac{\partial^2 Y_1}{\partial\theta_1\partial\theta_{-1}}$ and $\frac{\partial^2 Z_1}{\partial\theta_1\partial\theta_{-1}}$. *This is a Nash equilibrium in mixed strategies and a weakly dominant strategy as it implies the existence of a continuum of Nash equilibria.*

Corollary 2a: *If* $\tau_p\to+\infty$, *then there is no incentive for any player to contribute toward the social good such that* $\theta_1=\theta_2=\theta_3=0$. *Solidarity is more likely to be observed in societies with less rather than more inequality.*

Proof of Proposition 2

The principal is even less incentivized to contribute toward the social good, and thus he underfulfills. This is why his contribution is now located in the upper bound of his underfulfillment space. Solidarity does not make bureaucrats of rank 2 and 3 improve their contribution: they are expected to freeride here as well, as per proposition 1.

Thus, the equilibrium has the following form:

$$\{\lim\sup_{\theta_2,\theta_3\to 0,0}\{\theta_1:\theta_1<\hat{\theta}_1\},\ \lim\inf_{\theta_1,\theta_3\to\hat{\theta}_1-\varepsilon,0}\{\theta_2:\theta_2<\hat{\theta}_2\},\ \lim\inf_{\theta_1,\theta_2\to\hat{\theta}_1-\varepsilon,0}\{\theta_3:\theta_3<\hat{\theta}_3\}\}\Rightarrow\{\hat{\theta}_1-\varepsilon,0,0\}.$$

Proof of Corollary 2b

It is defined that as τ_p increases, Y_i monotonically decreases. Thus, if τ_p approximates infinity, then Y_i approximates zero and hence there is no incentive of contribution toward the social good by any bureaucrat such that $\lim_{\tau_p\to+\infty} Y_i = 0$.

Obedience

I now assume that bureaucrats of rank 2 and 3 are monitored by their respective immediate supervisors (the principal and bureaucrats of rank 2). It is possible to set up a dynamic game with two periods:

1. In period 1, the process is the same as in the standard form. After period 1 is completed, the principal and bureaucrats of rank 2 learn the contributions of their respective supervisees.
2. In period 2, immediate supervisors punish their supervisees by freeriding under two conditions:
   a. The public good was not delivered in period 1, and
   b. Their contribution was below the overfulfillment threshold $\hat{\theta}_{-1}$.

Immediate supervisors have a binary choice: 1. To repeat the standard form game in two periods (*ex-ante* monitoring), or 2. To learn the outcome and contributions of their immediate supervisees and then freeride or not (*ex-post* or Bayesian monitoring). Thus, the *ex-ante* monitoring payoff for all three types of players is the following:[4]

[4] The logic of my model follows the two-period gradualism model in Roland Gérard. *Transition and Economics: Politics, Markets and Firms*, MIT Press, 2000: 31-42.

$$W_{12}(\theta_1) = (1-\delta)W_{11}(\theta_1) + \delta \max W_{11}(\theta_1)$$
$$W_{22}(\theta_2) = (1-\delta)W_{21}(\theta_2) + \delta \max W_{21}(\theta_2)$$
$$W_{32}(\theta_3) = (1-\delta)W_{31}(\theta_3) + \delta \max W_{31}(\theta_3)$$

Under Bayesian monitoring, the principal has learned the performance of bureaucrats of rank 2, and bureaucrats of rank 2 have learned the performance of bureaucrats of rank 3. The contributions of bureaucrats of rank 2 form a signal for the principal that can influence his own contribution in round n+1. The same holds for bureaucrats of rank 2 with respect to the contributions of bureaucrats of rank 3. The less a supervisee contributes in period 1, the more likely it is that he will be punished with non-delivery also in period 2. The immediate supervisor makes him pay the cost of non-delivery by deciding to freeride. The continuation payoffs in that case can be written in the following form:

$$W_{12}(\mathrm{S}_{n_2}) = (1-\delta)W_{11}(\theta_1|\mathrm{S}_{n_2}) + \delta \max W_{11}(\theta_1|\mathrm{S}_{n_2})$$
$$W_{22}(\mathrm{S}_{n_3}) = (1-\delta)W_{21}(\theta_2|\mathrm{S}_{n_3}) + \delta \max W_{21}(\theta_2|\mathrm{S}_{n_3})$$
$$W_{32}(\theta_3) = (1-\delta)W_{31}(\theta_3) + \delta \max W_{31}(\theta_3)$$

Bureaucrats of rank 2 know in advance that the principal will check on their performance after period 1 is over, and bureaucrats of rank 3 know in advance that bureaucrats of rank 2 will check on their performance after period 1 is over. Thus, freeriding may not be the most efficient strategy in this game, because information revelation can create freeriding incentives for immediate supervisors and thus prevent delivery of the public good. The introduction of two competing modes of efficiency with distinctive religious characteristics is prevalent here. The *ex-ante* continuation payoff does not consider the respective contributions of bureaucrats of ranks 2 and 3 in period 1. It is a dynamic form of the standard public goods game. Under *ex-ante* efficiency, there is no opportunity of benevolent performance for bureaucrats of ranks 2 and 3.

I suggest that dynamic freeriding embodies a Protestant worldview on state-society relations and class stratification. Bureaucrats care about the delivery of the public good to the extent that it does not diminish their private rewards from delivery. This rule that has dominated the political economy of collective action is only partially true and refers mainly to Protestant societies with a small state and a disciplinary version of bureaucratic rationality. This is what I define as *ex-ante (or synchronic) monitoring*.

On the contrary, the introduction of obedience in the form of strategic adjustment to the perceived expectations of immediate supervisors allows bureaucrats of rank 2 and 3 to show the degree of their distributive commitment in period 1. This monitoring structure has two unique elements: 1. It has a learning effect on the contributions of immediate supervisors in period n+1, and 2. It creates a hierarchical accountability dilemma for hierarchically-inferior bureaucrats in period 1. Bureaucrats of rank 2 both learn the performance of rank 3 bureaucrats and are hierarchically accountable to the principal for their own performance in period n. Hence, obedience corresponds to a non-individualist worldview on public goods provision.

Hierarchically lower bureaucrats become aware that there is a smaller probability that the public good will be provided in round n+1 if they freeride in period n, and immediate supervisors are enforced to think beyond their private endowment and preserve their hierarchical authority. This is the Orthodox worldview in bureaucratic organization and the public sector. Rather than performing cross-rank equalization to the bottom, the Orthodox-minded bureaucrat takes into account his own hierarchical position, which defines the degree of his distributive commitment, while accounting for the contributions of others. Under conditions of obedience or hierarchical accountability, everybody is given the opportunity to strategically adjust its strategy so that there is a better opportunity for the provision of the public good. Individual repentance rather than individual punishment lies in the core of Eastern Orthodox theology and is reflected in what I define as *Bayesian monitoring*.

If hierarchy preservation lies in the core of an efficient Orthodox bureaucrat, then the system of linear payoffs for all ranks has the following form:

$$H_{12}(\mathrm{S}_{\mathrm{n}_2}) = (1-\delta)W_{11}(\theta_1|\mathrm{S}_{\mathrm{n}_2}) + \delta W_{11}(\theta_1|\mathrm{S}_{\mathrm{n}_2}, t \le \sigma, \theta_2 \ge \hat{\theta}_2) + \delta W_{11}(\theta_1|\mathrm{S}_{\mathrm{n}_2}, t \le \sigma, \theta_2 < \hat{\theta}_2) +$$
$$\delta W_{11}(\theta_1|\mathrm{S}_{\mathrm{n}_2}, t > \sigma, \theta_2 \ge \hat{\theta}_2) + \delta W_{11}(\theta_1|\mathrm{S}_{\mathrm{n}_2}, t > \sigma, \theta_2 < \hat{\theta}_2)$$

Similarly, for bureaucrats of rank 2:

$$H_{22}(\mathrm{S}_{\mathrm{n}_3}) = (1-\delta)W_{21}(\theta_2|\mathrm{S}_{\mathrm{n}_3}) + \delta W_{21}(\theta_2|\mathrm{S}_{\mathrm{n}_3}, t \le \sigma, \theta_3 \ge \hat{\theta}_3) + \delta W_{21}(\theta_2|\mathrm{S}_{\mathrm{n}_3}, t \le \sigma, \theta_3 < \hat{\theta}_3)$$
$$+\delta W_{21}(\theta_2|\mathrm{S}_{\mathrm{n}_3}, t > \sigma, \theta_3 \ge \hat{\theta}_3) + \delta W_{21}(\theta_2|\mathrm{S}_{\mathrm{n}_3}, t > \sigma, \theta_3 < \hat{\theta}_3)$$
$$\text{s.t. } \mu_2(\theta_2 - \hat{\theta}_2) \ge 0$$

which is the hierarchical budget constraint imposed on bureaucrats of rank 2 who are both monitored by the principal and monitor bureaucrats of rank 3, and μ_2 is a parameter.

Similarly, for bureaucrats of rank 3, who are just monitored by bureaucrats of rank 2:

$$H_{32} = (1-\delta)W_{31}(\theta_3) + \delta W_{31}(\theta_3|t \le \sigma) + \delta W_{31}(\theta_3|t > \sigma)$$
$$\text{s.t. } \mu_3(\theta_3 - \hat{\theta}_3) \ge 0$$

Proposition 3: *Obedience is more likely than ex-ante efficiency to lead to public goods provision.*

Corollary 3a: *Bayesian monitoring weakly dominates ex-ante (synchronic) monitoring such that* $H_{ik}(S_{n_{i-1}}) \ge W_{ik}$ *and* $n_2\hat{\theta}_2 + n_3\hat{\theta}_3 + \pi \ge t$, *where* $\lim_{\theta_2,\theta_3 \to \hat{\theta}_2,\hat{\theta}_3} \theta_1 = \pi < \hat{\theta}_1 - \varepsilon.$

Proof of Proposition 3

To show that obedience is more likely to lead to public goods provision than *ex-ante* efficiency, I show that Bayesian monitoring weakly dominates ex-ante (synchronic) monitoring. The ex-ante monitoring payoff for bureaucrats of rank 2 is $W_{22}(\theta_2) = (1-\delta)W_{21}(\theta_2) + \delta \max W_{21}(\theta_2)$ and their Bayesian monitoring payoff is:

$$H_{22}(\mathrm{S}_{n_3}) = (1-\delta)W_{21}(\theta_2|\mathrm{S}_{n_3}) + \delta W_{21}(\theta_2|\mathrm{S}_{n_3}, t \le \sigma, \theta_3 \ge \hat{\theta}_3) + \delta W_{21}(\theta_2|\mathrm{S}_{n_3}, t > \sigma, \theta_3 < \hat{\theta}_3) +$$
$$\delta W_{21}(\theta_2|\mathrm{S}_{n_3}, t \le \sigma, \theta_3 \ge \hat{\theta}_3) + \delta W_{21}(\theta_2|\mathrm{S}_{n_3}, t > \sigma, \theta_3 < \hat{\theta}_3) - \lambda\mu_2(\theta_2 - \hat{\theta}_2) \Rightarrow$$
$$\max W_{21}(\theta_2) \le W_{21}(\theta_2|\mathrm{S}_{n_3}, t \le \sigma, \theta_3 \ge \hat{\theta}_3) + W_{21}(\theta_2|\mathrm{S}_{n_3}, t > \sigma, \theta_3 \ge \hat{\theta}_3) +$$
$$W_{21}(\theta_2|\mathrm{S}_{n_3}, t \le \sigma, \theta_3 < \hat{\theta}_3) + W_{21}(\theta_2|\mathrm{S}_{n_3}, t > \sigma, \theta_3 < \hat{\theta}_3) - \lambda\mu_2(\theta_2 - \hat{\theta}_2),$$

where $W_{21}(\theta_2)$ is a payoff function, discontinuous at t, and it is possible for bureaucrats of rank 2 either to contribute below or above $\hat{\theta}_2$. However, they are incentivized to contribute at least $\hat{\theta}_2$ under obedience (right-hand side payoff), because the principal can find out whether they freeride and reduce his own contribution toward the public good to such an extent that the public good is not delivered. In that case, freeriding does not make them better off. For a bureaucrat of rank 2, the principal's threat for free-riding in case he contributes below $\hat{\theta}_2$ is relatively more credible than an underfufillment signal of any bureaucrat of rank 3. Thus, given their dual function in this type of game, bureaucrats of rank 2 have higher incentives to contribute rather than freeride at the expense of the collective, even when their supervisees of rank 3 do so. Bureaucrats of rank 3 contribute less consistently above $\hat{\theta}_3$, because they do not have any immediate supervisees and thus they do not know how much the other members of the collective contribute. The principal enforces rather than tolerates obedience. Nevertheless, he is also more likely to increase his contribution under obedience such that $\pi > 0$ because his contribution is not to be manipulated by his supervisees. Obedience sacrifices the middle-level

bureaucrats (rank 2) for the benefit of the principal and low-level bureaucrats (rank 3). Thus, the equilibrium has the following form:

$$\{\lim_{\theta_2,\theta_3\to\hat{\theta}_2,\hat{\theta}_3-\varepsilon}\inf\{\theta_1:\theta_1<\hat{\theta}_1\}_1,\ \lim_{\theta_1,\theta_3\to\hat{\theta}_1-\pi,\hat{\theta}_3-\varepsilon}\inf\{\theta_2:\theta_2\geq\hat{\theta}_2\},\ \lim_{\theta_1,\theta_2\to\hat{\theta}_1-\pi,\hat{\theta}_2}\inf\{\theta_3:\theta_3<\hat{\theta}_3\}\}\Rightarrow\{\hat{\theta}_1-\pi,\hat{\theta}_2,\ \hat{\theta}_3-\varepsilon\}.$$

It becomes obvious, that while the principal free-rides, bureaucrats of ranks 2 and 3 do not. The public good is delivered under the conditions that $t\leq n_2\hat{\theta}_2+n_3\hat{\theta}_3+\hat{\theta}_1-\pi$ and $\hat{\theta}_1\geq\pi$.

Proof of Corollary 3a

It follows from the proof of proposition 3.

If Protestantism and Eastern Orthodoxy are the individualist and collectivist corners of Christianity, then synchronic and Bayesian monitoring are their equivalent structures in administrative organization and policy enforcement. The Protestant immediate supervisor assumes that there is no need for learning in period 1 about the performance of the bureaucrats that he supervises. On the contrary, he treats private consumption as more important than the delivery of the public good. The Eastern Orthodox immediate supervisor treats public goods delivery as a strictly dominant strategy over private consumption. The existence of the tradeoff between *ex-ante* efficiency and obedience provides useful insights about the religious origins of public goods distribution by administrative agencies.

Universal Discipline

I now assume that the principal can punish bureaucrats of rank 2 and 3 in period 2, if the public good is not delivered in period 1. The model is set up as follows:

1. In period 1, I assume that the public good is not delivered such that $n_2\theta_2+n_3\theta_3+\theta_1<t.$
2. In period 2, the principal enforces a planned contribution on all bureaucrats of rank 2 and rank 3 such that $n_2\theta_2^p+n_3\theta_3^p+\theta_1=t.$
3. In period 3, bureaucrats of rank 2 and rank 3 are allowed to contribute freely toward the public good. The idea is that they will contribute in the interval $\theta_{-1}\in[\hat{\theta}_{-1},\chi_{-1}]$, as a result of the previously enforced discipline. The discipline is defined as universal because it does not distinguish between bureaucrats that did free-riding and those who did not. Contrary to obedience, where freeriding is punished in the form of

counter-freeriding by the immediate supervisor, here the principal enforces horizontal and rank-differentiated penalties on his supervisees in round n+1.

The principal's payoff has the following form:

$$D_{13}(\mathrm{S}_{n_2},\mathrm{S}_{n_3}) = (1-\delta)W_{11}(\theta_1|\mathrm{S}_{n_2}\mathrm{S}_{n_3},\mathrm{t}>\sigma) + \delta W_{11}(\theta_1|\mathrm{S}_{n_2},\mathrm{S}_{n_3},\mathrm{t}=\sigma) +$$
$$\delta^2 W_{11}(\theta_1|\mathrm{S}_{n_2},\mathrm{S}_{n_3},\mathrm{t}\le\sigma) + \delta^2 W_{11}(\theta_1|\mathrm{S}_{n_2},\mathrm{S}_{n_3},\mathrm{t}>\sigma)$$

Similarly for bureaucrats of rank 2 and 3,

$$D_{23} = (1-\delta)D_{21}(\theta_2|\mathrm{t}>\sigma) + \delta D_{21}(\theta_2^p) + \delta^2 D_{21}(\theta_2|\mathrm{t}\le\sigma) + \delta^2 D_{21}(\theta_2|\mathrm{t}>\sigma)$$

$$D_{33} = (1-\delta)D_{31}(\theta_3|\mathrm{t}>\sigma) + \delta D_{31}(\theta_3^p) + \delta^2 D_{31}(\theta_3|\mathrm{t}\le\sigma) + \delta^2 D_{31}(\theta_3|\mathrm{t}>\sigma)$$

Just like under obedience, the principal expects the other bureaucrats to abide at least by the minimum standard $\hat{\theta}_{-1}$. The difference is that now he has the ability to directly enforce it. The effects of this principle are traced in period 3 when bureaucrats of rank 2 and 3 are free again to choose independently their contribution to the public good.

Proposition 4: *Under universal discipline, the principal sets* $\hat{\theta}_2^p$ *and* $\hat{\theta}_3^p$ *such that* $\theta_1 = 0$ *and* $n_2\theta_2^p + n_3\theta_3^p \ge t$.

Corollary 4a: *In period 3 the principal contributes* $\theta_1 = 0$, *such that* $\lim_{\theta_2^p \to \chi_2} \theta_2 = \hat{\theta}_2$, *and* $\lim_{\theta_3^p \to \chi_3} \theta_3 = \hat{\theta}_3$. *This is a weakly dominant strategy and a Nash equilibrium in mixed strategies, as* $\theta_2 \in (\hat{\theta}_2, \chi_2)$ *and* $\theta_3 \in (\hat{\theta}_3, \chi_3)$.

Universal discipline can also be defined as disciplinary monitoring. Therefore, the following proposition holds:

Proposition 5: *Disciplinary monitoring weakly dominates Bayesian monitoring such that* $D_{ik}(S_{n_{i-1}}) \ge H_{ik}(S_{n_{i-1}})$.

Corollary 5a: *The public good is more likely to be delivered under disciplinary monitoring rather than under Bayesian monitoring.*

Proof of proposition 4

Because the principal can enforce rank-differentiated penalties on his supervisees, he has the incentive to transfer the total cost of public good delivery onto them and free-ride at their expense.

Proof of corollary 4a

Because in period 2 (universal discipline) the principal almost confiscates the initial endowment of bureaucrats of ranks 2 and 3 such that θ_2^p is in the neighborhood of χ_2 and θ_3^p in the neighborhood of χ_3, in period 3 bureaucrats of ranks 2 and 3 contribute more than the hierarchically defined minimum $\hat{\theta}_{-1}$ and less than their initial endowment χ_{-1}. They have the incentive to be at least as worse off as under period 2, because that way they will ensure that no further punishment by the principal occurs in any of the following rounds. Therefore, their contribution set lies in the open interval $(\hat{\theta}_{-1}, \chi_{-1})$. In this case, the principal also bids zero, because the threshold he set is reached anyway.

Proof of proposition 5

I prove the proposition for bureaucrats of rank 2. It is necessary to prove that:

$$(1-\delta)D_{21}(\theta_2|\mathrm{t} > \sigma) + \delta D_{21}(\theta_2^p) + \delta^2 D_{21}(\theta_2|\mathrm{t} \le \sigma) + \delta^2 D_{21}(\theta_2|\mathrm{t} > \sigma) \ge$$
$$(1-\delta)W_{21}(\theta_2|\mathrm{S}_{n_3}) + \delta W_{21}(\theta_2|\mathrm{S}_{n_3}, t \le \sigma, \theta_3 \ge \hat{\theta}_3) + \delta W_{21}(\theta_2|\mathrm{S}_{n_3}, t > \sigma, \theta_3 < \hat{\theta}_3) +$$
$$\delta W_{21}(\theta_2|\mathrm{S}_{n_3}, t \le \sigma, \theta_3 \ge \hat{\theta}_3) + \delta W_{21}(\theta_2|\mathrm{S}_{n_3}, t > \sigma, \theta_3 < \hat{\theta}_3) - \lambda\mu_2(\theta_2 - \hat{\theta}_2) \Rightarrow$$

$$D_{21}(\theta_2^p) + \delta D_{21}(\theta_2|\mathrm{t} \le \sigma) + \delta D_{21}(\theta_2|\mathrm{t} > \sigma) \ge W_{21}(\theta_2|\mathrm{S}_{n_3}, t \le \sigma, \theta_3 \ge \hat{\theta}_3) + W_{21}(\theta_2|\mathrm{S}_{n_3}, t > \sigma, \theta_3 \ge \hat{\theta}_3) +$$
$$W_{21}(\theta_2|\mathrm{S}_{n_3}, t \le \sigma, \theta_3 < \hat{\theta}_3) + W_{21}(\theta_2|\mathrm{S}_{n_3}, t > \sigma, \theta_3 < \hat{\theta}_3)$$

because θ_2^p is in the neighborhood of χ_2 and therefore the public good is definitely delivered, whereas the only case where the same certainty holds under obedience is when $W_{21}(\theta_2|\mathrm{S}_{n_3}, t \le \sigma, \theta_3 \ge \hat{\theta}_3)$. Moreover, θ_2 lies in the open interval $(\hat{\theta}_2, \chi_2)$, and therefore bureaucrats of rank 2 will always contribute more in period 3 of universal discipline rather than in period 2 of obedience. Hence, the public good is more likely to be delivered that way as well. The same holds for the principal and bureaucrats of rank 3. The marginal utility from private rewards of the public good delivery will always be higher for any bureaucrat under universal discipline rather than under obedience.

Proof of corollary 5a

It follows from the proof of proposition 5.

Thus, the equilibrium has the following form:

$$\{\lim_{\theta_2, \theta_3 \to \hat{\theta}_2 + \varepsilon, \hat{\theta}_3 + \varepsilon} \inf \{\theta_1 : \theta_1 < \hat{\theta}_1\}, \lim_{\theta_1, \theta_3 \to 0, \hat{\theta}_3 + \varepsilon} \inf \{\theta_2 : \theta_2 \ge \hat{\theta}_2\}, \lim_{\theta_1, \theta_2 \to 0, \hat{\theta}_2 + \varepsilon} \inf \{\theta_3 : \theta_3 \ge \hat{\theta}_3\}\} \Rightarrow \{0, \hat{\theta}_2 + \varepsilon, \hat{\theta}_3 + \varepsilon\}.$$

The public good is delivered under the condition that $t \le n_2(\hat{\theta}_2 + \varepsilon) + n_3(\hat{\theta}_3 + \varepsilon)$.

Universal discipline is the most effective mechanism for the provision of public goods in an Eastern Orthodox bureaucracy. The imposition of planned contributions in period 2 induces alignment of hierarchically lower bureaucrats with the expectations of the principal for the purpose of collective welfare. There is a progressive increase of contributions across principles such that obedience and universal discipline can form a continuum of *degrees in Eastern Orthodox collectivist enforcement,* which can also be observed with different variations in Islamic and Catholic economic systems.

V. Experimental Design

The public goods experiment, which I ran, involved bureaucrats in the multifunctional centers for the provision of state and municipal services as well as the regional administration headquarters in the cities of Tomsk and Novosibirsk. Bureaucrats have the professional duty to deliver public goods. I tested the extent to which the principles that defined both Soviet collectives and Orthodox monasteries hold when it comes to the contemporary Russian bureaucracy.

I selected 8 bureaucrats based on their availability during their lunch break. I made sure that they understand the rules of the experiment and were willing to participate into it. They sat in the same room, but they had no eye contact with each other. I assigned them randomly to three groups of different administrative rank. Each rank corresponded to a different income level: 15,000 RUB for the principal, 10,000 RUB for bureaucrats of rank 2 and 7,000 RUB for bureaucrats of rank 3. These monetary rewards were nominal due to financial constraints and current political restrictions.

Rank 1 had 1 member, rank 2 had 3 members and rank 3 had 4 members. The threshold of the public good was set by the principal (rank 1) given the constraint that 15,000 RUB < Threshold Public Good < 73,000 RUB (Cadsby and Maynes, 1999). When the public good was not reached, all of them lost L = 5,000 RUB. If the public good was reached, they gained M = 2,500 RUB so that M < L. I repeated the experiment on ten different days with multiple combinations of bureaucrats and administrative ranks. It was possible that a bureaucrat participated in more than one experiment, but never in the principal position more than once and never in rank 2 or 3 more than twice.

I applied the following treatments to find whether the principles of Eastern Orthodox monasticism are reflected on Russia's current administrative structures and the provision of public goods:

Treatment 1 (Standard Form with Rank Differentiation and Thresholds): *No information exchanged among the experiment subjects. This is the standard public goods experiment.*

Treatment 2 (Solidarity): *It was announced to the subjects that they were now contributing toward a social good such as the construction of a house for disabled or elderly people or a kindergarten.*

Treatment 3 (Obedience): *Each bureaucrat was obliged to report her contribution to her immediate supervisor after each round has been completed.*

Treatment 4 (Universal Discipline): *Each bureaucrat was obliged to report the contribution that the highest bureaucrat in the group hierarchy decides for her in round n+1, if the public good was not delivered in round n. The principal enforced such penalties on bureaucrats of rank 2 and 3, so that the public good is delivered.*

As it has been aforementioned, treatments 2-4 are defined as *degrees of Eastern Orthodox collectivism* or rather *degrees of Eastern Orthodox collectivist enforcement*. Each experiment is run for fifteen rounds per treatment. I ran a total of ten experimental sessions. The hypotheses I tested are the following:

Hypothesis 1: *The public good is more likely to be delivered under treatment 4 rather than under any other treatment.*

Corollary 1a: *Bureaucrats of all ranks are likely to contribute more toward the public good under treatment 4 rather than under any other treatment.*

This hypothesis is the first application of my theory on the degrees of Eastern Orthodox collectivist enforcement. Universal discipline is treated as the most effective form of enforcement in an administrative agency that imitates the organizational principles and structures of the Eastern Orthodox monastery. This hypothesis is a behavioral extension of the equilibrium solutions proposed in the formal part of this paper, where the abrogation of the bureaucrat's attachment to private benefits is more likely to lead to the fulfillment of the defined threshold value. Patriarchal social structures, collectivist perceptions of property and welfare, and surveillance incentives render more likely the fulfillment of collective welfare under a quasi-planned administrative system, where every bureaucrat has to abide by the authority of the principal in public goods provision.

Hypothesis 2: *The principal is likely to freeride more than bureaucrats of rank 2 and 3 under treatment 4 rather than under any other treatment.*

This hypothesis is a second-order condition of the first one. Now, instead of looking at the fulfillment of the threshold value, I look at the cross-round and cross-treatment contributions of the principal. Universal discipline allows him to freeride much more than under obedience, solidarity or the standard form, because in that case he has the information monopoly and this does not reduce the probability of public goods delivery.

It is important to note that the mirror hypothesis here is that bureaucrats of rank 2 and 3 will freeride progressively less across these four treatments. My expected outcome is the inverse of the previous hypothesis: universal discipline rather than hierarchy or solidarity motivates agents to abide by the rules of the administrative collective.

Hypothesis 3: *Average group profit is likely to be higher under treatment 4 rather than under any other treatment.*

Corollary 3a: *Average rank profit is likely to be higher under treatment 1 rather than under any other treatment.*

The logic here is straightforward. The higher the degree of Eastern Orthodox collectivist enforcement the higher the average group profit due to the delivery of the public good. The opposite holds for the rank level: the higher the degree of Eastern Orthodox collectivist enforcement the lower the average rank profit because the delivery of the public good occurs at the expense of bureaucrats of ranks 2 and 3.

VI. Results

I ran 10 experiments with all 4 treatments and one experiment only with treatments 1 and 4. The experiments run in Tomsk I code as *TM* and the experiments run in Novosibirsk as *NK*. The first number denotes the experiment and the second the treatment. Thus, TM11 denotes the first treatment of the first experiment in Tomsk. To present cross-treatment and cross-session effects, I summarize the results by breaking the results both by experiment and by treatment. Thus, I provide the following set of experiments in Tables 1-4: TM11-TM14, TM21-TM24, TM31-TM34, TM41-TM44, TM51-TM54, TM61-TM64, NK71-NK74, NK-81-NK84, NK91-NK94, NK101-NK104, TM31A and TM34A. Table 1 summarizes average group contributions

toward the public good in three-period intervals. Because each experiment has fifteen rounds, there are five three-round periods per experiment. Tables 2-4 cluster for rank: they summarize average rank contribution for ranks 1, 2 and 3. Per Cadsby and Maynes, I count both the times that the threshold public good is achieved in the last three periods and the times it is achieved overall (1999).

Tables 1-4 (see below Appendix B) summarize the experimental data per group (Table 1) and rank (Tables 2-4). In times that the public good is provided under treatment 4, the times where the principal-planner enforces provisions are not counted. The logic is to see how many times group cooperation occurs as a learning result of universal discipline rather than to add times of public good delivery that did not occur as an outcome of voluntary cooperation. The same assumption holds for the other three treatments, but without excluding instances of threshold achievement. This is why average group and rank contributions as well as times of public good delivery are measured both in their overall means and in periodic intervals. Table 1 provides a very interesting overview of the cross-treatment levels of average group contribution. Under treatment 2 (solidarity), average group contribution is lower than under treatment 1 (standard game). Moreover, under treatment 3, experiment participants contribute more than under treatment 1 or 2, while treatment 4 induces the highest levels of average group contribution so that $AGC_{T_4} > AGC_{T_3} > AGC_{T_2} > AGC_{T_1}$. This means that solidarity may not constitute a degree of Orthodox collectivist enforcement. The perspective of contributing to the provision of a social good for the more disadvantaged members of the society are going discouraged Siberian bureaucrats from contributing a higher percentage of resources out of their initial endowment. Nevertheless, obedience and universal discipline seem to persist as enforcement mechanisms in Russian subnational institutions.

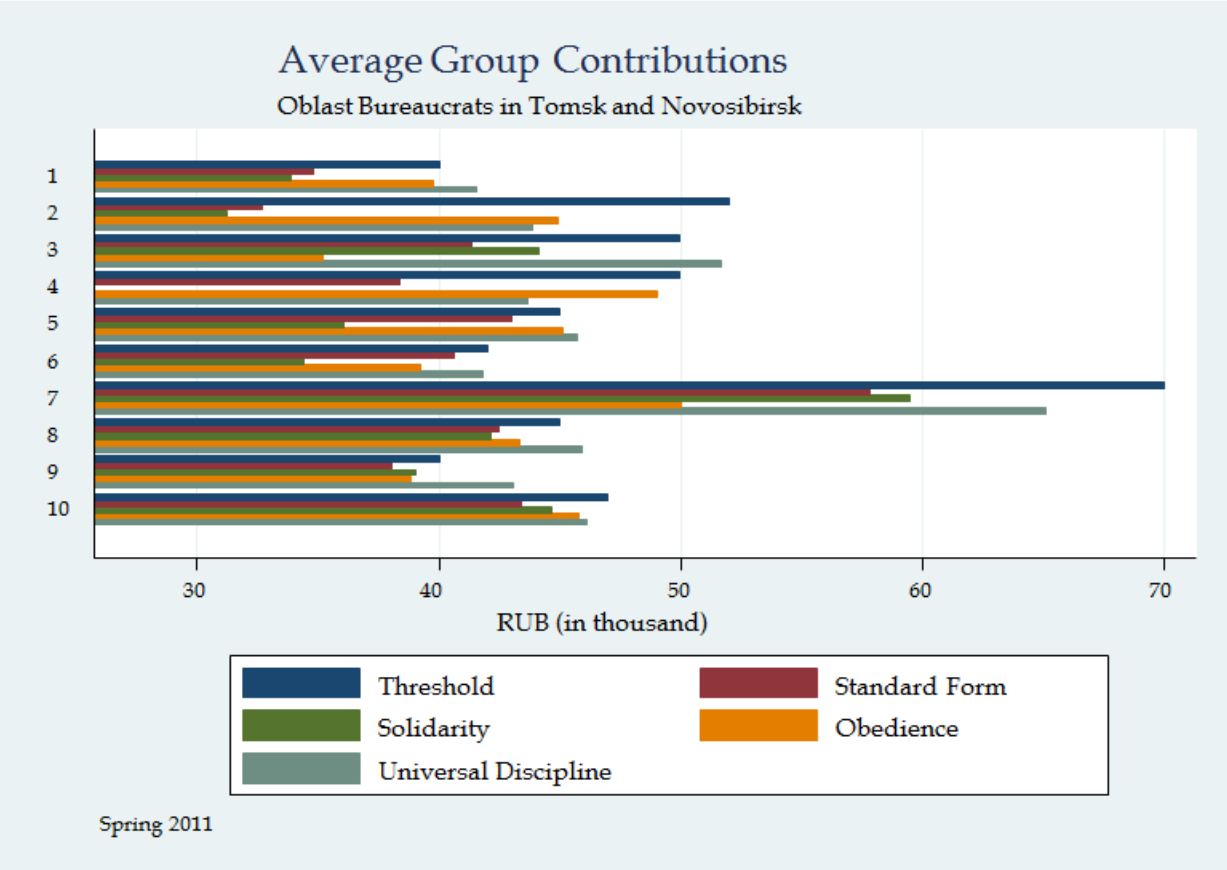
In tables 2-4, average contributions are summarized per rank. The distribution of experiment participants into three ranks with a single principal-planner allows the identification of treatment effects per rank and thus provides some useful findings about the provision of incentives at different hierarchical levels of an administrative agency. The strategies of the principal and bureaucrats of rank 2 and 3 become clear at this point. The principal, whose contributions are presented per treatment in table 2, not only does not freeride, but he also makes the highest contributions toward the public good. What the descriptive data shows in tables 2 and 3 is that bureaucrats of rank 3 may be the least likely to make a significant

contribution in order to deliver the public good in terms of initial endowment percentage (their initial endowment is 7,000 RUB). Similarly, there is a considerable contribution gap between the principal and bureaucrats of rank 2, whose initial endowment is 10,000 RUB. These preliminary observations are tested in conjunction with the aforementioned H1-3.

Tables 5 and 6 provide OLS estimations where standardized average group and rank contributions – both at aggregate and last three-period levels – as well as standardized average group and rank profits are regressed on treatment and – where applicable – rank dummies (fixed effects).

In figure 1 (see below), average group contributions under all three treatments are plotted jointly across experiments - TM1, TM2, TM3, TM3A, TM4, TM5, TM6, NK7, NK8, NK9, TM10. The average distance between the threshold and the average group contribution line per experiment is progressively smaller in treatments 3 and 4 compared to treatment 1, whereas the biggest average distance per experiment is observed for treatment 2. This confirms the initial observations drawn from tables 1-4. Average group contributions under treatment 4 approximate the threshold line in each experiment more than any other treatment. Treatment 3 line offers a second-best approximation, while treatment 2 increases the average distance of bureaucratic contributions from the set threshold. Delivery of the public good is more likely to be observed only under conditions of Bayesian and collectivist disciplinary monitoring. Russian bureaucrats of ranks 2 and 3 are more inclined to abide by the institutional principles of Eastern Orthodox rather than Protestant bureaucracies.

Figure 1



In table 5 (see below), I present the OLS estimations of my data at the group level. Average group contribution overall, average group contribution in the last three periods and average group profit are standardized with respect to the threshold and used interchangeably as dependent variables. I run the model with treatment dummies and use treatment 1 (standard form game) as a reference variable. Treatment 4 is positively significant at the 5 and 1 percent levels, when the dependent variable is average group contribution at the aggregate level and average group profit respectively. Treatment 2 is negatively significant at the 5 percent level in my second model, when the dependent variable is average group contribution in the last three periods of the experiment. Thus, H1 and H3 are not rejected.

What we learn from the group level results is that:

1. Treatment 4 has a positive effect both on average group contribution at the aggregate level and on average group profit. Thus, universal discipline does not suggest that collective welfare and individual profit are orthogonal in the decision-making processes

of the Siberian bureaucracy. This observation underpins the concept of an Eastern Orthodox hierarchy, where hierarchical provision of public goods does not occur at the expense of efficiency.

2. Treatment 2 has a negative effect on average group contribution in the last three periods. The more the participants adjust to the rules of the experiment the less willing they become to contribute toward a social good that is directed only to disadvantaged members of society. Solidarity with the poor is confirmed not to be a degree of Orthodox collectivist enforcement, but it is more likely to be observed in market- rather than plan-based religions. It requires an efficient horizontal network of public goods provision rather than an efficient centralizing hierarchy.

Table 5

OLS Results

	Average Group Contribution	Average Group Contribution (Last Three Periods)	Average Group Profit
Treatment 2	Yes	-0.11 (-2.32)**	Yes
Treatment 3	Yes	Yes	Yes
Treatment 4	0.12 (2.33)**	Yes	0.28 (3.32)***
Intercept	0.86 (25.06)***	0.94 (29.37)***	0.34 (5.74)***
Adjusted R-squared	0.17	0.14	0.25
No of observations	40	40	40

Note: Significance levels: * 0.05 < p < 0.10, ** 0.01 < p < 0.05, *** p < 0.01.
T-statistics are in parentheses. Treatment 1 is a reference for Treatments 2, 3 and 4.

Table 6 (see below) reports the OLS estimations at the rank level. The dependent variables are now the standardized average rank contributions overall and in the last three periods as well as the standardized average rank profit – all with respect to initial endowment per rank. Treatment 4 is positively significant at the 1 percent level in the average group profit model; bureaucrats of all ranks gain more on average when treatment 4 is implemented. Thus, C3a is rejected. Moreover, in my sample I have not traced a causal relationship between treatment dummies and average rank contribution at the aggregate and three-last-period levels. On the contrary, bureaucrats of ranks 2 and 3 freeride consistently more than the principal. Rank 2 and 3 dummies are positively significant at the 1 percent level in all three models. When the dependent variable is average rank contribution at aggregate and three-last-period levels,

the sign of the coefficients is negative. When the dependent variable is average rank profit, the sign of the coefficients is positive.

What we can infer from the OLS results of table 6 is the following:

1. Treatment 4 makes all bureaucrats better off, as it increases the probability of public good delivery, when the punishment period is over. This finding introduces the idea of an efficient hierarchy that treats collective and individual welfare as complements rather than as substitutes. The fact that treatment 4 works for the experimental group of Siberian bureaucrats may explain why unitary organizations, central planning and vertical planning have had such endurance in Russian administrative organization and economic policy.
2. Bureaucrats of ranks 2 and 3 are freeriding at the expense of the principal. This is a finding contrary to the conventional wisdom about post-communist bureaucracies. The supervisees are inclined to be relatively more corrupt than the supervisor. This is the case both in terms of contributions and in terms of accumulated profit. Repression is a very singular way to explain corruption and authoritarian success in the Eastern Orthodox - and possibly Muslim - lands of the former Soviet Union. The leader needs to contribute a minimum toward the common pool that has to be higher than the relative contributions of his citizens. What I infer for political regimes holds also for ministries and administrative agencies.

Table 6

OLS Results

	Average Rank Contribution	**Average Rank Contribution (Last Three Periods)**	**Average Rank Profit**
Treatment 2	Yes	Yes	Yes
Treatment 3	Yes	Yes	Yes
Treatment 4	Yes	Yes	0.18 (5.82)***
Rank 2	-0.12 (-2.63)***	-0.17 (-4.98)***	0.08 (3.14)***
Rank 3	-0.14 (-2.98)***	-0.18 (-5.36)***	0.08 (3.11)***
Intercept	0.64 (13.89)***	0.75 (22.04)***	0.14 (5.30)***
Adjusted R-squared	0.05	0.22	0.32
No of observations	120	120	120

Significance levels: * 0.05 < p < 0.10, ** 0.01 < p < 0.05, *** p < 0.01. T-statistics are in parentheses. Treatment 1 is a reference for Treatments 2, 3 and 4. Level 1 is a reference for Levels 2 and 3.

VII. Conclusions

In this paper I analyze Eastern Orthodoxy as an administrative culture. With a regional focus on Russia, I argue that there is a continuity of administrative norms in the organization of Eastern Orthodox monasteries and post-Soviet bureaucracies. The principal – the abbot-equivalent of the Byzantine and Russian monastery – cares about the enforcement of the public good threshold decided by him. This is why under *disciplinary monitoring* he threatens bureaucrats of rank 2 and 3 with confiscation of their total income if they contribute less than a minimum threshold $\hat{\theta}_{-1}$, which is different for ranks 2 and 3. This explains why universal discipline weakly dominates the standard *ex-ante monitoring*. For similar reasons, *Bayesian monitoring* is preferred to *ex-ante monitoring*. Under *Bayesian monitoring*, the principal learns the actual contribution of his immediate supervisee in period n and strategically adjusts in period n+1. The same holds for bureaucrats of rank 2, after they have observed the contributions of bureaucrats of rank 3.

The experiments I ran with bureaucrats in the oblast administrations of Tomsk and Novosibirsk suggest the existence of an *Eastern Orthodox hierarchy* that defines distributive efficiency in post-Soviet Russian bureaucracies. The principal contributes the most toward the public good, while bureaucrats of rank 2 and 3 contribute progressively less. Universal discipline induces both higher levels of contribution and higher profit at the group and rank levels. There is an interesting conclusion to be drawn here about collectivism and the nature of post-Soviet Russian bureaucracy. Unlike in Protestant societies, freeriding is more likely to occur at lower rather than at higher hierarchical levels. Russian administrative principals are more public-minded than their supervisees, because they continue the line of Soviet bureaucrats and the latters' Orthodox institutional vocation. Universal discipline in the form of treatment 4 is necessary to preserve administrative hierarchies and facilitate public goods provision at a minimum threshold. Eastern Orthodoxy has strong political and economic implications. The ideal-type of the Orthodox administrative state is defined by disciplinary enforcement and self-investment of its leadership in the provision of public goods.

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Appendix A

Experimental Instructions

This is an experiment on group decision-making. You are randomly assigned into one out of three groups: 1, 2 or 3. Each group corresponds to a different administrative rank, with 1 being the highest rank. The session will last for fifteen periods per method. In each session you will have to decide how much of your initial private endowment you will contribute to the threshold public good. The value of the threshold public good is defined by the highest-ranked group - group 1 - given the constraint 15.000 RUB < Threshold Public Good < Total Private Endowment.

Method 1:

You have fifteen information sheets in front of you. On each of these you will write date and time, your assigned group, the value of the threshold public good and the value of your contribution. If you belong to group 3, your initial individual income is 7000 RUB, if you belong to group 2, your initial individual income is 10000 RUB, and if you belong to group 1, your initial individual income is 15000 RUB.

You will be asked to record the number of cards that you contribute to the public good privately on your information sheet within three minutes. Then raise your hand, and I will come to collect your information sheet. When all of you are finished I will sum up your contributions to the public good and will announce if the threshold is met. In case it is met, all of you earn M = 2.500 RUB. In case it is not met, all of you lose L = 5.000 RUB. Then, you may calculate your net payment on your net payment sheet. For example the income of a group 3 member is 7.000 RUB and his contribution 3.000 RUB; if the threshold public good is not reached, then his net payment is 7000 – 3000 – 5000 = - 1000 RUB ~ 0 RUB, which becomes zero for the purposes of our experiment, and if the threshold public good is reached, then 7000-3000+2500= 6500 RUB. Your initial income in the beginning of each round is unaffected by your net payments in the previous round. In the end of the experiment I will collect your net payment sheets. Examples of a public good can be a bridge, a park or a public hospital. You are definitely going to use it during your lifetime.

Method 2:

This procedure is the same as above. The only difference is that this is a threshold social good, i.e. not for all citizens, but only for concrete social groups, such as children, elderly people, and

disabled people. Examples of a social good can be a kindergarten, an elderly care house or a community house for disabled people. You may or may not use it during your lifetime.

Method 3:

This procedure is the same as above. The only difference is that in the end of each round, I will report your contribution to your immediate supervisor only (the contributions of group 3 members to group 2 members and the contributions of group 2 members to the group 1 person).

Method 4:

The procedure is the same. The only difference is that if the threshold value is not reached in the end of any round, groups 2 and 3 will have to make the contribution that group 1 person decides for each of them in the subsequent round so that the threshold public good is reached.

Appendix B

Table 1 *Summary of Experimental Results*

	Average Group Contribution						Times Public Good Provided		
	Periods 1-3	**Periods 4-6**	**Periods 7-9**	**Periods 10-12**	**Periods 13-15**	**Overall**	**Periods 13-15**	**Overall**	**Threshold**
Treatment 1: Standard Form									
TM11	30,967	34,833	34,433	39,067	34,500	34,760	0	3	40,000
TM21	25,367	25,067	34,733	32,100	46,200	32,693	0	0	52,000
TM31	36,667	35,667	37,833	51,333	45,167	41,333	1	2	50,000
TM41	34,833	26,167	38,767	47,500	44,500	38,353	1	3	50,000
TM51	42,033	40,867	44,367	42,867	44,867	43,000	1	5	45,000
TM61	41,833	38,000	36,133	46,233	41,000	40,640	1	7	42,000
NK71	47,333	52,333	57,667	63,000	68,833	57,833	2	2	70,000
NK81	42,833	46,033	41,000	39,833	42,700	42,480	1	6	45,000
NK91	33,933	40,433	41,167	37,833	36,667	38,007	0	4	40,000
TM101	41,167	44,167	40,833	45,667	45,167	43,400	2	4	47,000
Treatment 2: Solidarity									
TM12	31,667	31,433	32,200	35,733	38,333	33,873	1	1	40,000
TM22	23,767	38,167	27,767	23,100	43,433	31,247	0	0	52,000
TM32	47,000	46,167	45,333	44,167	38,000	44,133	0	2	50,000
TM42	26,433	26,100	21,933	26,267	27,933	25,733	0	0	50,000
TM52	35,667	34,333	36,000	36,467	37,867	36,067	0	0	45,000
TM62	39,167	31,333	38,000	28,333	35,333	34,433	0	3	42,000
NK72	60,833	61,333	62,567	57,333	55,461	59,506	0	0	70,000
NK82	44,000	43,667	43,433	42,567	37,000	42,133	0	4	45,000
NK92	41,000	37,167	36,700	41,000	39,333	39,040	2	5	40,000
TM102	33,833	46,833	48,333	47,633	46,500	44,627	1	8	47,000

Treatment 3: Obedience									
TM13	35,967	40,600	39,833	41,833	40,500	39,747	2	7	40,000
TM23	39,100	41,900	45,500	49,000	49,000	44,900	1	2	52,000
TM33	40,333	35,070	31,500	32,333	36,500	35,147	0	0	50,000
TM43	47,500	48,000	49,667	50,000	49,667	48,967	1	7	50,000
TM53	44,867	47,633	44,600	44,333	44,400	45,167	1	9	45,000
TM63	40,333	34,833	34,000	44,333	42,533	39,207	1	7	42,000
NK73	52,817	46,433	49,333	50,783	50,866	50,047	0	0	70,000
NK83	42,333	40,667	43,833	44,133	45,767	43,347	1	6	45,000
NK93	36,533	37,833	37,017	40,000	42,700	38,817	2	4	40,000
TM103	45,000	46,500	44,833	51,333	41,167	45,767	0	8	47,000
Treatment 4: Universal discipline									
TM14	42,667	41,500	44,000	40,367	38,933	41,493	0	8	40,000
TM24	41,367	49,233	42,367	47,533	38,833	43,867	0	2	52,000
TM34	51,667	50,333	54,167	57,333	45,000	51,700	0	4	50,000
TM44	44,167	48,000	39,000	46,000	41,333	43,700	0	0	50,000
TM54	45,253	45,633	45,100	46,800	45,763	45,710	1	5	45,000
TM64	36,667	42,167	42,333	40,667	47,167	41,800	2	3	42,000
NK74	57,667	69,333	65,667	69,600	63,067	65,067	0	0	70,000
NK84	46,000	44,100	44,800	46,000	48,500	45,880	3	7	45,000
NK94	37,833	48,667	41,700	46,500	40,517	43,043	2	8	40,000
TM104	41,667	47,833	47,767	45,067	48,117	46,090	0	7	47,000

Table 2 *Summary of Experimental Results*

	Average Rank Contribution: Rank 1						Times Public Good Provided		
	Periods 1-3	**Periods 4-6**	**Periods 7-9**	**Periods 10-12**	**Periods 13-15**	**Overall**	**Periods 13-15**	**Overall**	**Threshold**
Treatment 1: Standard Form									
TM11	8,333	9,500	9,533	9,833	10,667	9,573	0	3	40,000
TM21	6,000	6,333	9,667	7,333	12,833	8,433	0	0	52,000
TM31	10,000	10,000	10,000	13,333	10,000	10,667	1	2	50,000
TM41	12,667	13,000	11,000	14,000	14,000	12,933	1	3	50,000
TM51	8,000	7,667	9,333	8,667	9,333	8,600	1	5	45,000
TM61	12,333	10,333	9,667	12,333	11,333	11,200	1	7	42,000
NK71	15,000	15,000	15,000	15,000	15,000	15,000	2	2	70,000
NK81	6,333	9,000	7,667	9,000	10,000	8,400	1	6	45,000
NK91	12,667	9,333	12,000	12,667	13,000	11,933	0	4	40,000
TM101	7,333	8,333	9,333	10,000	10,000	9,000	2	4	47,000
Treatment 2: Solidarity									
TM12	10,667	12,333	11,667	13,333	14,000	12,400	1	1	40,000
TM22	3,667	7,667	5,333	3,167	8,500	5,667	0	0	52,000
TM32	15,000	15,000	15,000	15,000	10,000	14,000	0	2	50,000
TM42	13,000	13,000	13,000	13,000	13,000	13,000	0	0	50,000
TM52	7,000	7,667	7,333	6,667	8,667	7,467	0	0	45,000
TM62	10,000	11,167	7,000	7,000	7,667	8,567	0	3	42,000
NK72	13,833	14,833	14,900	15,000	15,000	14,713	0	0	70,000
NK82	10,000	11,000	11,000	9,000	9,000	10,000	0	4	45,000
NK92	11,667	8,000	8,000	11,000	14,000	10,533	2	5	40,000
TM102	8,667	9,000	9,000	8,333	9,667	8,933	1	8	47,000
Treatment 3: Obedience									
TM13	10,667	8,667	11,000	12,000	12,000	10,867	2	7	40,000

TM23	7,667	12,000	12,333	11,333	13,333	11,333	1	2	52,000
TM33	13,333	10,000	10,000	10,000	10,000	10,667	0	0	50,000
TM43	13,000	13,000	13,000	13,000	13,000	13,000	1	7	50,000
TM53	9,000	10,000	10,000	10,000	10,000	9,800	1	9	45,000
TM63	10,000	6,000	11,000	10,667	9,000	9,333	1	7	42,000
NK73	14,767	14,700	14,867	15,000	14,933	14,853	0	0	70,000
NK83	6,000	5,000	7,333	9,333	8,333	7,200	1	6	45,000
NK93	12,667	12,000	8,000	11,000	13,333	11,400	2	4	40,000
TM103	9,000	8,667	10,000	10,000	10,000	9,533	0	8	47,000
Treatment 4: Universal discipline									
TM14	12,000	12,000	13,000	12,400	12,133	12,307	0	8	40,000
TM24	10,000	7,500	9,667	7,167	8,667	8,600	0	2	52,000
TM34	15,000	15,000	15,000	15,000	11,667	14,333	0	4	50,000
TM44	10,333	9,000	9,000	11,000	12,000	10,267	0	0	50,000
TM54	10,000	10,000	10,000	10,000	10,000	10,000	1	5	45,000
TM64	9,667	9,667	9,000	9,000	8,000	9,067	2	3	42,000
NK74	14,333	15,000	15,000	15,000	15,000	14,867	0	0	70,000
NK84	10,000	5,333	5,000	7,333	7,000	6,933	3	7	45,000
NK94	10,333	8,667	7,333	8,000	8,000	8,467	2	8	40,000
TM104	10,000	11,333	11,333	11,000	11,667	11,067	0	7	47,000

Table 3 *Summary of Experimental Results*

	Average Rank Contribution: Rank 2						Times Public Good Provided		
	Periods 1-3	**Periods 4-6**	**Periods 7-9**	**Periods 10-12**	**Periods 13-15**	**Overall**	**Periods 13-15**	**Overall**	**Threshold**
Treatment 1: Standard Form									
TM11	3,500	5,444	5,278	6,278	4,667	5,033	0	3	40,000
TM21	3,333	3,889	4,556	4,222	5,444	4,289	0	0	52,000
TM31	4,722	4,722	5,222	7,778	6,611	5,811	1	2	50,000
TM41	4,000	2,889	5,833	5,944	5,389	4,811	1	3	50,000
TM51	6,400	5,844	5,622	5,956	5,511	5,867	1	5	45,000
TM61	5,333	5,444	4,778	6,444	5,444	5,489	1	7	42,000
NK71	4,444	6,000	7,667	9,222	9,667	7,400	2	2	70,000
NK81	5,222	5,111	3,833	3,611	3,778	4,311	1	6	45,000
NK91	4,278	6,444	4,667	5,556	5,611	5,311	0	4	40,000
TM101	5,333	5,111	4,833	4,500	4,444	4,844	2	4	47,000
Treatment 2: Solidarity									
TM12	4,056	3,211	4,889	4,444	4,111	4,142	1	1	40,000
TM22	3,444	6,222	3,333	2,778	7,556	4,667	0	0	52,000
TM32	6,611	6,278	4,667	3,333	4,333	5,044	0	2	50,000
TM42	2,111	2,333	1,778	2,667	3,889	2,556	0	0	50,000
TM52	6,000	6,000	6,000	5,822	5,733	5,911	0	0	45,000
TM62	5,111	2,333	5,000	3,222	4,778	4,089	0	3	42,000
NK72	9,222	9,389	9,278	8,556	7,889	8,867	0	0	70,000
NK82	4,667	4,333	4,778	4,833	3,833	4,489	0	4	45,000
NK92	5,778	5,722	6,167	6,556	5,000	5,844	2	5	40,000
TM102	3,444	5,000	5,889	6,211	5,278	5,164	1	8	47,000
Treatment 3: Obedience									
TM13	4,944	6,611	5,778	6,556	5,833	5,944	2	7	40,000

TM23	5,722	4,667	4,889	6,889	5,889	5,611	1	2	52,000
TM33	4,722	4,167	3,333	4,056	3,944	4,044	0	0	50,000
TM43	6,778	6,556	7,000	6,444	6,778	6,711	1	7	50,000
TM53	6,178	6,822	6,700	6,667	6,522	6,578	1	9	45,000
TM63	5,000	4,889	3,444	7,556	7,556	5,689	1	7	42,000
NK73	7,000	4,778	5,544	6,700	6,033	6,011	0	0	70,000
NK83	4,611	4,333	4,722	4,889	4,833	4,678	1	6	45,000
NK93	4,667	5,333	5,667	7,000	6,389	5,811	2	4	40,000
TM103	5,222	6,500	5,167	7,278	4,333	5,700	0	8	47,000
Treatment 4: Universal discipline									
TM14	6,667	6,278	6,333	6,044	5,600	6,184	0	8	40,000
TM24	5,778	7,278	5,278	7,056	4,111	5,900	0	2	52,000
TM34	6,278	5,889	6,333	7,333	4,667	6,100	0	4	50,000
TM44	6,333	7,000	5,333	6,444	5,333	6,089	0	0	50,000
TM54	6,467	6,711	6,700	6,711	6,756	6,669	1	5	45,000
TM64	3,556	5,778	6,111	6,111	7,222	5,756	2	3	42,000
NK74	7,667	9,389	8,444	9,733	9,167	8,880	0	0	70,000
NK84	5,500	5,444	5,111	6,444	6,444	5,789	3	7	45,000
NK94	4,778	7,222	6,333	6,000	5,500	5,967	2	8	40,000
TM104	5,000	5,889	6,167	5,722	5,944	5,744	0	7	47,000

Table 4 *Summary of Experimental Results*

	Average Rank Contribution: Rank 3						Times Public Good Provided		
	Periods 1-3	**Periods 4-6**	**Periods 7-9**	**Periods 10-12**	**Periods 13-15**	**Overall**	**Periods 13-15**	**Overall**	**Threshold**
Treatment 1: Standard Form									
TM11	3,033	2,250	2,267	2,600	2,458	2,522	0	3	40,000
TM21	2,342	1,767	2,850	3,025	4,258	2,848	0	0	52,000
TM31	3,125	2,875	3,042	3,667	3,833	3,308	1	2	50,000
TM41	2,542	1,125	2,567	3,917	3,583	2,747	1	3	50,000
TM51	3,708	3,917	4,542	4,083	4,750	4,200	1	5	45,000
TM61	3,375	2,833	3,033	3,642	3,333	3,243	1	7	42,000
NK71	4,750	4,833	4,917	5,083	6,208	5,158	2	2	70,000
NK81	5,208	5,425	5,458	5,000	5,342	5,287	1	6	45,000
NK91	2,108	2,942	3,792	2,125	1,708	2,535	0	4	40,000
TM101	4,458	5,125	4,250	5,542	5,458	4,967	2	4	47,000
Treatment 2: Solidarity									
TM12	2,208	2,367	1,467	2,267	3,000	2,262	1	1	40,000
TM22	2,442	2,958	3,108	2,900	3,067	2,895	0	0	52,000
TM32	3,042	3,083	4,083	4,792	3,750	3,750	0	2	50,000
TM42	1,775	1,525	900	1,317	817	1,267	0	0	50,000
TM52	2,667	2,167	2,667	3,083	3,000	2,717	0	0	45,000
TM62	3,458	3,292	4,000	2,917	3,333	3,400	0	3	42,000
NK72	4,833	4,583	4,958	4,167	4,199	4,548	0	0	70,000
NK82	5,000	4,917	4,525	4,767	4,125	4,667	0	4	45,000
NK92	3,000	3,000	2,550	2,583	2,583	2,743	2	5	40,000
TM102	3,708	5,708	5,417	5,167	5,250	5,050	1	8	47,000
Treatment 3: Obedience									

TM13	2,617	3,025	2,875	2,542	2,750	2,762	2	7	40,000
TM23	3,567	3,975	4,625	4,250	4,500	4,183	1	2	52,000
TM33	3,208	3,143	2,875	2,542	3,667	3,087	0	0	50,000
TM43	3,542	3,833	3,917	4,417	4,083	3,958	1	7	50,000
TM53	4,333	4,292	3,625	3,583	3,708	3,908	1	9	45,000
TM63	3,833	3,542	3,167	2,750	2,717	3,202	1	7	42,000
NK73	4,263	4,350	4,458	3,921	4,458	4,290	0	0	70,000
NK83	5,625	5,667	5,583	5,033	5,733	5,528	1	6	45,000
NK93	2,467	2,458	3,004	2,000	2,550	2,496	2	4	40,000
TM103	5,083	4,583	4,833	4,875	4,833	4,842	0	8	47,000
Treatment 4: Universal discipline									
TM14	2,667	2,667	3,000	2,458	2,500	2,658	0	8	40,000
TM24	3,508	4,975	4,217	4,800	4,458	4,392	0	2	52,000
TM34	4,458	4,417	5,042	5,083	4,833	4,767	0	4	50,000
TM44	3,708	4,500	3,500	3,917	3,333	3,792	0	0	50,000
TM54	3,963	3,875	3,750	4,167	3,874	3,926	1	5	45,000
TM64	4,083	3,792	3,750	3,333	4,375	3,867	2	3	42,000
NK74	5,083	6,542	6,333	6,350	5,142	5,890	0	0	70,000
NK84	4,875	5,608	6,117	4,833	5,542	5,395	3	7	45,000
NK94	3,292	4,583	3,842	5,125	4,004	4,169	2	8	40,000
TM104	4,167	4,708	4,483	4,225	4,654	4,448	0	7	47,000

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