CONTROL IN SOCIAL ECONOMIC SYSTEMS

Analysis of Collectivism and Egoism Phenomena within the Context of Social Welfare

P. Yu. Chebotarev, A. K. Loginov, Ya. Yu. Tsodikova, Z. M. Lezina, and V. I. Borzenko

Trapeznikov Institute of Control Sciences, Russian Academy of Sciences, Moscow, Russia

Received March 11, 2008

Abstract—Comparative benefits provided by basic social strategies, i.e., collectivism and egoism, are investigated within the framework of democratic collective decisions.

DOI: 10.1134/S0005117910060202

1. INTRODUCTION TO A PROBLEM

Egoism of a voter means supporting the proposals that meet his individual interests. On the other hand, collectivism is to protect the interests of a certain group associated with the voter in question. The egoist’s problem lies in the fact that, having a single vote, he is often unable to protect personal interests. A group has more chances to succeed through solidary voting; however, a member of the group still faces a problem. In particular, the larger (more powerful) is the group, the greater can be the differences between the interests of the group and the individual ones of its members. Therefore, the question “What is more beneficial for a person, i.e., playing for himself or protecting interests of the group that may not coincide with individual ones?” is nontrivial and has no universal answer. Similar problems arise for political parties and movements; they should choose possible candidates for making unions and alliances, as well as evaluate opportunities for autonomous participation in the political process.

In the case of a small group uniting participants with similar interests, collectivism of the members gets close to egoism. Contrariwise, in a large group that approximates the size of a society, collectivism turns out to be a version of altruism; in fact, every participant protects the interests common for the society.

Problems of relating egoism, altruism and rationality have been studied in [1–3]; voting as a method to make decisions regarding distribution of social benefits via income taxation and implementation of social programs has been considered in [4–7]. Democratic decisions made by egoistic voters are easily manipulated by means of formulation of proposals; this fact has been demonstrated in the theory of voting. In this context we should mention investigations performed, first, by A.V. Malishevskii (1970) of the Institute of Control Sciences [8, pp. 92–95] and, second, by R. McKelvey (1976) of the California Institute of Technology [9]; in addition, the reader is referred to [10].

For instance, the result of a sequence of decisions made by overwhelming majority may be disadvantageous for all voters without exception. Such manipulation is impossible with respect to collectivists seeking to maximize the benefits of large groups. Hence, the following type of social dynamics is an attractive area of research. Some participants form a group in order to protect their common interests. Assume they succeed in solving this task; i.e., the average group member gets more benefits than an egoist. Since the group is open for new members, the group size increases.
If the group remains successful under the growth, then there is no obstacle to further expansion, up to the size of the community; during the growth, the egoism of the group approaches altruism. As Arthur Koestler states, “The egoism of the group feeds on the altruism of its members;” some years earlier, the same idea was expressed by Reinhold Niebuhr. The phenomenon under study is an instance of the inverse transformation.

We have analyzed the corresponding effects using mathematical models in several papers. In particular, it has been shown in [11–13] that, for large domains in the parameter space of the model under consideration, the group can successfully (in terms of the utility of its members) compete with individual participants. This fact points to the practicability of the growing “snowball” of cooperation, the type of social dynamics mentioned above. At the same time, under certain conditions, the group loses, and it is more profitable to behave individually.

In order to further investigate the benefits and effective mechanisms of cooperative behavior, one should consider the case where the group competes not only with individual participants, but also with other groups (“parties”). The subject of the present paper is to analyze the case of two rival groups.

2. MODEL AND STATEMENT OF THE PROBLEM

A model suitable for the study of the collectivist and egoist strategies should possess the following features. It should be sufficiently rich to describe the basic elements of reality being modeled and sufficiently simple to allow the use of analytical methods.

The framework of the model should allow to formalize the following key notions: the interests of participants, cooperation, the interests of groups, profitability, variable environment, social opportunities and challenges, making and implementing collective decisions.

The basic assumptions of the model we propose are as follows.

(1) The current state of every participant is characterized by a quantitative indicator that may be viewed as the level of welfare, capital, utility, social role, satisfaction, success, etc. For brevity, we use a capital-like interpretation of this indicator in the sequel. The indicator may have both positive and negative values. The model allows to specify the initial values of the indicator for all the participants.

(2) An egoistic participant is interested in maximizing his capital.

(3) Participants may form groups.

(4) The success of a group is described by nondecreasing functions in the capitals of the members.

(5) The social dynamics under study is determined by collective decisions made through voting involving all participants.

(6) To make decisions, the \( \alpha \)-majority procedure is used; the parameter \( \alpha \) determines the number of votes necessary and sufficient to accept a proposal. E.g., \( \alpha = 0.5 \) describes the procedure of simple majority vote. If a proposal is rejected, \( \text{status quo} \) is preserved, i.e., the capitals of the participants remain the same.

(7) While voting, every egoistic participant supports precisely the proposals increasing his capital (this item makes item (2) more exact).

(8) The members of each group vote together. We consider several group criteria of supporting proposals, \( \text{viz.}, (a) \) the criterion of \( \alpha \)-majority (with a threshold \( \alpha_1 \) that may differ from the general vote threshold) and \( (b) \) a sufficiently high level of the average capital increment for the members of the group (e.g., exceeding 0).

(9) Proposal is modeled by the vector of capital increments of all the participants.

(10) As a generator of proposals we consider realizations of a random vector with independent identically distributed components. The proposals are interpreted as opportunities produced by a stochastic environment, which can be favorable, neutral or unfavorable.
As the distribution of a capital increment we use Gaussian distribution $N(\mu, \sigma^2)$. Parameters $\mu$ and $\sigma$ characterize the environment, i.e., $\mu > 0$, $\mu = 0$ and $\mu < 0$ correspond to a favorable, neutral and unfavorable environment, respectively; $\sigma$ stands for the variability of the environment.

Various modifications of the model are analyzed. They differ in the conditions of joining and leaving groups, as well as in the conditions of leaving the game for those participants who went bankrupt (have negative capital accounts), possible influence of the capital value on the capital increment, etc. In addition, other voting rules and principles to generate and support proposals are considered.

The main subject of investigation is social dynamics defined by collective decisions under the assumptions listed above. In particular, we analyze

- comparative benefits of different social strategies including egoism and collectivism with respect to both the participants and the whole society;
- relations between the results and the parameters of the model, including the levels of favor and variation in the environment, voting thresholds, supporting principles for the proposals, the ratio of participants with different strategies, and so on.

Special attention is paid to the interpretation of the results in social terms.

This paper is mostly dedicated to the case where participants are divided into three categories, namely, egoists and the members of two groups (“parties”).

3. “SNOWBALL” OF COOPERATION

One of the major problems of social reality can be formulated as follows. Egoistic behavior of social agents often leads to rather regrettable results. Falling into trouble or having a need of support, a pure egoist gets no assistance. In addition, faced with the slightest bit organized opposition, the egoist usually turns out to be powerless. Generally speaking, altruistic behavior is more profitable for the society until it is typical for the absolute majority of participants. Otherwise, altruists only have a sense of moral right while the remaining dividends are distributed among less noble members. In other words, altruism provides a beneficial equilibrium which is extremely unstable. In modern society, one can observe altruism that in the least could be considered wide-spread, in the sphere of symbolic actions; they include demonstration of courtesy, attentiveness (sometimes in the way reminiscent of the popular ignorant heroes of Russian literature, Mr. Bobchinskii and Mr. Dobchinskii, described by the famous Russian writer N.V. Gogol’). Other examples of altruism can be found in areas where the interests of the participant in question are not appreciably affected (for instance, philanthropy). With coming commercialization, even the “noble professions” gradually lose their special status. We should mention important exceptions such as the rules of conduct in emergency (in a shipwreck, women and children should be saved first, etc.), although not always these rules are followed. In general, altruism remains the prerogative of noble people, whose number is few in any era.

It appears that no changes towards altruism can be found in international politics. As before, foreign policy of any government is to protect the interests of the state it represents; this often leads to cynical attitude towards the interests of other nations. Domestic policy has similar tendencies when representatives of elected authorities, even protecting the interests of the electorate, are often willing to ignore interests of other citizens.

The above political examples give samples of corporate (cooperative) behavior. A representative of a state (or a community, or a corporation) protects the interests of his community that competes with the others. We should emphasize that consideration of the complete range of social strategies
from egoism to altruism makes it possible to give examples of cooperative behavior that correspond to every segment of this range.

As has been noted, the case of cooperative behavior within an opened and competitive (and, thus, increasing) union of participants, deserves particular attention. As soon as the union increases, cooperative behavior tends to altruistic one. This social mechanism may be referred to as “snezhnyi kom kooperatsii” (“snowball” of cooperation). In jest, setting hopes on it may be termed “snezhnyi kom”-munizm (“snowball communism”). In the following sections, we study the model described in Section 2.

4. WHEN IS THE “SNOWBALL” GROWING AND WHEN IS IT MELTING?

First of all, consider a society consisting of social agents of two types, egoists and group members. Let us ask a question on how the benefits of the group, the egoists and the whole society depend on group size.

Formulas obtained in [12] provide a complete answer to this question. The approximate expressions presented in the theorem below are less cumbersome than the precise ones; the approximation introduces acceptably small errors, with the only exception in the case of small groups, where we use accurate formulas. In the following theorem, a pair of values in square brackets stands for a row matrix or a column matrix, while $\lfloor \theta n \rfloor$ denotes the integer part of $\theta n$.

**Theorem** [12]. Let $M(\tilde{d}_e)$ and $M(\tilde{d}_G)$ be the mathematical expectations of the one-step capital increments for the egoists and group members, respectively. Suppose that the group supports a proposal if and only if this proposal ensures a positive increment of the total group capital. Then the standard normal approximation of the binomial distribution provides the following expressions:

$$
M(\tilde{d}_e) \approx \left[ P_G \ Q_G \right] \left( \mu \left[ \frac{P_G}{F_\alpha} \right] + \frac{\sigma f}{\sqrt{pq\ell}} \left[ \frac{f_\gamma}{f_\alpha} \right] \right),
$$

$$
M(\tilde{d}_G) \approx \left[ F_\gamma \ F_\alpha \right] \left( \mu \left[ \frac{P_G}{Q_G} \right] + \frac{\sigma f_G}{\sqrt{g}} \left[ \frac{1}{-1} \right] \right),
$$

where $P_G = F\left(\frac{\mu\sqrt{g}}{\sigma}\right)$, $Q_G = 1 - P_G = F\left(-\frac{\mu\sqrt{g}}{\sigma}\right)$, $F_\theta = F\left(-\lfloor \theta n \rfloor + 0.5 - \frac{p\ell}{\sqrt{pq\ell}}\right)$, $f_\theta = f\left(\frac{\lfloor \theta n \rfloor + 0.5 - p\ell}{\sqrt{pq\ell}}\right)$, $\theta \in \{\alpha, \gamma\}$, $\gamma = \alpha - g/n$, $p = F\left(\mu/\sigma\right)$, $q = 1 - p$, $f_G = f\left(\mu\sqrt{g}/\sigma\right)$, $f = f\left(\mu/\sigma\right)$, $F(\cdot)$ and $f(\cdot)$ are the standard normal distribution function and the corresponding density function, $\ell$ and $g$ denote the number of egoists and the group size, respectively, and $n = \ell + g$ is the number of participants.

A typical example of the relationship between one-step capital increments of the participants and the group size is given by Fig. 1. In this example, the society consists of 1000 agents; the $x$-axis refers to the group size (in the range between 0 and 1000). The group members vote as stated in the theorem above. The parameters of the distribution of proposals are: $\mu = -0.8$ and $\sigma = 30$; the voting threshold is $\alpha = 0.5$. On the ordinate, the average (expected) one-step capital increments for a group member, an egoist and a randomly selected participant are plotted.

It should be noted that the group, irrespective of its size, has a significant advantage over the egoists. Therefore, it is profitable for the egoists to join the group. The members of a small group gain a lot of benefits from increasing the group size. On the contrary, expansion of a small group is not profitable for the egoists and the whole society. In the example under consideration, the most profitable (for the group members) size of the group is 50 persons. Further expansion of the group
leads to the decrease of the average capital increments of the participants. However, starting from 88 members, further expansion of the group becomes profitable for the whole society, and starting from 102 members, it is beneficial for the egoists either. The whole society enters the domain of positive average capital increments with 488 members of the group and it reaches the one-step capital increment typical of the group-free case when the group has 649 members.

This leads to the following conclusion, which is relevant in the design of control algorithms. If the “rules of play” are established by those interested in maximizing the total capital of the society, then the group should be open to new members. Then a likely scenario is that all participants join the group and thereby the group egoism becomes a version of altruism. Note that this altruism is conditional: should any member start voting for his personal interests conflicting with the interests of the group, and the rest of the group will stop protecting this member’s interests. In other words, “all for one” as long as “one for all.” It is precisely this condition that ensures the stability of “cooperative” (reciprocal, in the terminology of Robert Trivers) altruism; this stability distinguishes it from the “absolute” one (also called hard-core altruism).

Now imagine that the “rules of play” are determined by the participants themselves. In this case, every participant is interested in such a minimum ceiling of group size that exceeds 49 and guarantees the presence of this participant within the group. If the group already has 50 members, then they will seek to draw a line (i.e., do not invite new members). In this case, the group constitutes a “solid elite” that resembles the party in a one-party political system. The existence of such a group is unprofitable to the whole society; but the worse is when the group exceeds its (internally) optimal size. In the example under consideration, the minimum value of the total social capital is reached when the group contains 88 members.

Certainly, in addition to attempts to join the group, which is de facto an “elite,” there exists an alternative and more natural strategy: it consists in organizing a competitive group. The consequences are discussed in Section 5.
5. THE SECOND “SNOWBALL”

Let the group reach its internally optimal size; assume that further expansion is blocked. Consider the organization of the second group. The analysis techniques we use involve, on the one hand, a simulation model implemented on a computer and, on the other hand, analytical expressions analogous to Eqs. (1) and too cumbersome to be presented here. Figure 2 demonstrates how the expected one-step capital increments of the egoists, the members of two groups and randomly chosen participants depend on the size of the second group.

It is easily seen that the expansion of the second group is extremely disadvantageous for the first one: it causes a swift decrease of the average capital increments of the first group. The capital increment of the second group member, per contra, grows reaching its maximum level at 96 members. In the present example, this maximum level is 72% of that for the sole first group. If the second group further expands via the addition of egoists, the advantage of the first group over the egoists vanishes; this happens as the size of the second group approaches 150 members.

The continued addition of the egoists to the second group (which reduces its “elitism”) is profitable for them, for the remaining egoists, for the first group and for the whole society. The first group attains its minimum level of average capital increment when the second one has 144 members.

Thus, for a single group, it is beneficial to have a small size; if two groups compete, it is the larger one that wins. However, the winning group is not interested in exceeding the other one by a factor of more than 2–2.5.

Let us stress the following point. In the presence of two competing groups, the egoists benefit the most when the groups compete “as equals;” i.e., the average capital increment of an egoist is maximal when the groups have the same size. A political counterpart of this situation is the two-party system with the parties having the same vote share. In the above example, such a situation is optimal for the “unorganized” part of the society. The mechanism of this phenomenon is as follows: the closer are the parties in their power, the more they value the votes of “unorganized” citizens. Accordingly, the greater is the impact of those votes on the decisions being made.

![Fig. 2. Average one-step capital increments for: (1) a member of the first group, (2) a member of the second group, (3) an egoist, (4) a randomly selected participant. The community of 1000 participants includes 50 members in the first group, the second group and egoists; \( \mu = -0.8, \sigma = 30, \alpha = 0.5 \).]
present example, the situation where one of the groups considerably outnumbers the other is even slightly worse for the egoists than the presence of only one group having the combined size of those two.

6. TWO "SNOWBALLS" THAT GROW TOGETHER

In Section 5 we have established the fact that an existing group loses to another one that has just appeared and has a higher rate of size increase. A conclusion is: with the appearance of the second group, the first one should not "freeze" its size. On the contrary, it should strive to maintain its advantage in size. Consider the case where two groups are characterized by the same rate of size increase, with the first group having 50 extra members. A corresponding example is shown in Fig. 3.

As could be expected, the first group succeeds in keeping a dominant position over the second one using such a policy. With the increase of the group size, the average capital increment of a Group 1 member is reduced five times, but it still remains much higher than the increments of the other participants (which do not leave the domain of negative values). During this process, the increment of the whole society goes up, because the leading group becomes less "elite." In the very beginning, the average capital increment of a Group 2 member grows swiftly; however, it soon reaches its maximum (approximately, \(-0.1\) at 10 members) and starts to decrease, reaching the minimum value of \(-0.245\). Within this segment, the benefit of the second group is even less than that of the egoists; with further growth of the groups, it slightly increases. In fact, the second group goes broke since it loses to the more powerful first group in votes almost always. The difference in 50 votes is so significant that only in extremely rare cases it can be compensated by the votes of the egoists.

In contrast to this, if the difference between the groups is small (say, 5 members instead of 50), then the dynamics is quite different, cf. Fig. 4.

![Fig. 3. Average one-step capital increments for: (1) a member of the first group, (2) a member of the second group, (3) an egoist and (4) a randomly selected participant. The society consists of 1000 participants; the first group has 50 extra participants compared to the second one; \(\mu = -0.8\), \(\sigma = 30\), \(\alpha = 0.5\).]
ANALYSIS OF COLLECTIVISM AND EGOISM PHENOMENA

In addition to other status of the second group, we would like to attract the reader’s attention to the curve of the average capital increment of an egoist: in particular, it has a “rise” and a “drop” in the right-hand side of the diagram in Fig. 4. A well-known effect consisting in the advantages of a “small party” in the presence of two greater ones having an approximate balance can be observed here. The egoists are uncoordinated; nevertheless, when they are few and none of the groups is able to secure a majority, the society mainly accepts the proposals supported by a substantial proportion of the egoists. Naturally, this situation is profitable for them. This explains the “rise” of the average capital increment of the egoists and their advantage over both groups in the corresponding segment. However, when the number of egoists is less than 5, all decisions are simply made by the first group; thus the capital increment of this group goes up while the curves describing the benefits of the other participants go down. Interestingly, the minimum capital increment of a society member is reached when the second group has the size (i.e., 40 participants) approximately twice that (though the absolute difference is moderate) providing the maximum capital increments for the groups (22 and 23 members, respectively). This dynamics is similar to that shown in Fig. 1. The maximum level of the society’s capital increment is observed when the two groups, as well as the egoists, compete most intensively and “as equals” (the corresponding size of the second group is 367 members). When the size of the second group reaches 384, the benefit of the egoist “catches up” the one of a randomly selected participant. The formulas we derived allow one to elucidate the mechanism of the above phenomena (as well as some others). However, keeping within the limits of this paper makes it impossible to discuss the point in detail.

7. TWO “BALLS OF WOOL”

Now let us consider the case where redistribution of participants between two groups does not involve egoists, i.e., the sum of the two group sizes, as well as the number of egoists, remain constant. A corresponding example is shown in Fig. 5; the x-axis refers to the size of the first group; with the size of the second group it adds up to 1000. The society consists of the two groups and 500 egoists. Other parameters are: \( \mu = -0.8, \sigma = 100, \alpha = 2/3 \) (a qualified majority).
In contrast to “snowball,” this scenario resembles the hourglass or two balls of wool with a shared thread, \textit{viz.}, what is wound off the first ball is wound on the second one.

The results presented in Fig. 5 are somewhat unexpected; below we comment them.

To accept a proposal, 1001 votes are needed. If the first group has more than 780 members and supports a proposal, then the remaining votes (no more than 220) are usually provided by the egoists; the proposal cannot be accepted without the support of the first group. Therefore, in this size segment, the first group has a high level of average capital increments. If the size of the first group is increased in the range of 780 to 1000 members, then its average capital increment is reduced. The reason is that the larger is the group, the smaller the frequency of its satisfaction with the proposals will be. Along with this, the average capital increments of its members measuring this satisfaction are decreased. If the group includes 720 to 780 members, then, provided that it supports a proposal, the egoists often fail to supply the remaining votes. However, if the egoists manage to bring those votes, then the proposal, which is quite profitable for them, will be accepted. That is why the segment in question is remarkable for top capital increments of the egoists. Moreover, when the size of the first group belongs to [720, 750] and this group supports a proposal, the lacking votes are often provided by the second group, which gains from this; therefore the capital increments of the second group are significant here. In the segment [750, 780], the remaining votes are more and more frequently provided by the egoists, which results in a great drop of the capital increment of the second group. In [280, 720], almost all accepted proposals are supported by both groups. This situation is more favorable for the smaller one since, according to the law of averages, its satisfaction, in the mean, is expressed by greater levels of capital increment. At the same time, this segment is more favorable for the egoists than [780, 1000] as far as here, the number of accepted proposals having negative average capital increments for the egoists is smaller. The cause is that here, to accept such a proposal, the agreement of both groups is required, whereas for the segment [780, 1000], the support of the first group is sufficient. The segment [220, 280] is symmetric to [720, 780]. The segment [0, 220] is characterized by the fact that almost all proposals favorable

Fig. 5. Average one-step capital increments for: (1) member of the first group, (2) member of the second group, (3) egoist and (4) randomly selected participant: 1500 participants, the first and the second group have 1000 members totally; $\mu = -0.8$, $\sigma = 100$, $\alpha = 2/3$.  

\begin{figure}[h]
  \centering
  \includegraphics[width=\textwidth]{fig5.png}
  \caption{Average one-step capital increments for: (1) member of the first group, (2) member of the second group, (3) egoist and (4) randomly selected participant: 1500 participants, the first and the second group have 1000 members totally; $\mu = -0.8$, $\sigma = 100$, $\alpha = 2/3$.}
\end{figure}
to the second group are accepted here and so the first group and the egoists cannot protect their interests.

Let us note that the two-party system with the parties having equal powers is very stable in the present example. Indeed, if two groups have 450 and 550 members, then the members of the larger group will gain some benefits from joining the smaller one since the latter has advantages. This leads to the size of the groups becoming almost equal with the lapse of time. However, the stable two-party system is not the most profitable for the egoists and the whole society. The matter is that, due to a high voting threshold, the votes of the egoists do not allow any party to secure the acceptance of a beneficial proposal without the support by the second party. Therefore, the interest of egoists is actually ignored here. Their votes are highly demanded when the groups have approximately 750 and 250 members. In this case, to accept a proposal beneficial to the egoists, it is sufficient to enlist the support of the larger group. On the contrary, to accept a proposal disadvantageous (at the average) to the egoists, both groups must support it, which is far less probable. Thus the egoists have the maximum capital increments when the first group includes 250 or 750 members.

8. CONCLUSION

The real state of things is much more intricate than the simple model considered in this paper; in particular, there exist many subjective factors that have not been taken into account within the framework of the model. Nevertheless, analysis of the model allows identification of certain hidden mechanisms of social processes. The model can serve as a “zero-order approximation” that highlights many relevant phenomena, e.g., benefits of the two-party system with parties having almost the same power, advantages of a small party in the presence of two rival large parties, and so on. The model may be implemented with respect to a society, a parliament, a collective, etc., provided that the distribution of power and the decision-making procedures are known; analysis of the model enables one to understand the special features of the social system under study and, possibly, to optimize its performance. The results of such analysis are sometimes difficult to forecast; even a few examples discussed above give an indication of the numerous types of system performance that can be implemented by varying the model parameters.

The “snowball” of cooperation is the central metaphor of the paper; it refers to the group that efficiently protects the interests of its members and is open to new members. Through its expansion, such a group becomes more altruistic.

It turns out, however, that, starting from a certain group size, further expansion of the group may become disadvantageous for its members by causing a decrease of the capital increments. From this point on, the interests of the group and of the remaining participants diverge. This phenomenon was studied in Section 4; it is related to many actual economic and political situations (for example, to the problem of dividing the Arctic shelf among the competing states).

When the members of a group are not interested in its expansion, a rival group can be organized. As was demonstrated in Section 5, the primary group loses if during this process it tries to “freeze” its optimal size. Contrariwise, to maintain a dominant position, this group should grow; the rate of this growth should be moderate (see Section 6). The case of two large groups having almost the same size turns out to be beneficial for the “unorganized” members of the society, provided that the decisions are made by simple majority. For the whole society, the most beneficial situation is reaching consensus; in the absence of consensus the society should aim at the situations of real competition involving all participants. This conclusion should be taken into account while designing control algorithms for social and economic systems.

Finally, Section 7 was devoted to the analysis of the “interchange” of members between two groups. It might seem surprising that the members of a smaller group have more benefits than
the members of the larger one. Such a phenomenon can ensure the stability of the two-party system with parties of almost the same size. The “inorganized” part of the society naturally has the highest benefit when its votes are highly demanded. It has been shown that such a situation occurs not only in the two-party system with equal parties; some unbalanced situations may also be profitable for the egoists, especially, under qualified majority voting systems.

This paper does not claim to provide a systematic description of all types of social dynamics implemented within the framework of the model; the limits of a short article make such a description impossible. Our task was to consider a few typical examples which are relevant to social issues.

Getting back to the “snowball” of cooperation, let us emphasize that there exist many cases where the members of an alliance have no reason to “freeze” its size. In particular, this is apparently typical of international cooperation on global problems such as the problem of reducing emissions into the atmosphere. The members of such an alliance implement joint projects for the sake of the alliance and, to some extent, of the other counties. Since this activity does not contradict the interests of the third parties, the alliance is typically interested in its further expansion. On the other hand, in situations where an alliance (an “elite”) is concerned with limiting its size, its openness can be established as a standard as far as it meets the interests of the society. In all cases mentioned above the mechanism of “snowball” of cooperation can be used to create stable “conditionally altruistic” communities (see Section 4). Notably, this mechanism can be involved in the development of civil society, which is one of the main problems of today (see, e.g., [14]). This relies on the fact that the cells of civil society benefit from joining associations that maintain a high level of solidarity and coordinate their actions.

REFERENCES

1. Margolis, H., *Selfishness, Altruism and Rationality: A Theory of Social Choice*, Cambridge: Cambridge Univ. Press, 1982.
2. Levine, D.K., Modeling Altruism and Spitefulness in Experiments, *Rev. Econom. Dynam.*, 1998, vol. 1, pp. 593–622.
3. Lindenberg, S., *Social Rationality Versus Rational Egoism*, *Handbook of Sociological Theory*, New York: Kluwer, 2001, pp. 635–668.
4. Romer, T., Individual Welfare, Majority Voting, and the Properties of a Linear Income Tax, *J. Public Econom.*, 1975, vol. 4, pp. 163–185.
5. Roberts, K.W.S., Voting Over Income Tax Schedules, *J. Public Econom.*, 1977, vol. 8, pp. 329–340.
6. Kranich, L., Altruism and the Political Economy of Income Taxation, *J. Public Econom. Theory*, 2001, vol. 3, no. 4, pp. 455–469.
7. Galasso, V. and Profeta, P., The Political Economy of Social Security: A Survey, *Eur. J. Political Economy*, 2002, vol. 18, no. 1, pp. 1–9.
8. Mirkin, B.G., *Problema gruppowego wyboru* (Selection Problem in Groups), Moscow: Nauka, 1974.
9. McKelvey, R.D., Intransitivities in Multidimensional Voting Models and Some Implications for Agenda Control, *J. Econom. Theory*, 1976, vol. 12, pp. 472–482.
10. Chebotarev, P.Yu. and Kochubei, B.A., Small Democratic Tricks, *Vek XX i Mir*, 1990, no. 6, pp. 2–3.
11. Borzenko, V.I., Lezina, Z.M., Loginov, A.K., Tsodikova, Ya.Yu., and Chebotarev, P.Yu., Strategies of Voting in Stochastic Environment: Egoism and Collectivism, *Autom. Remote Control*, 2006, vol. 2, pp. 311–328.
12. Chebotarev, P.Yu., Analytical Expression of the Expected Values of Capital at Voting in the Stochastic Environment, *Autom. Remote Control*, 2006, vol. 3, pp. 480–492.
13. Chebotarev, P.Yu., Borzenko, V.I., Lezina, Z.M., Loginov, A.K., and Tsodikova, Ya.Yu., Cooperation and Egoism as Voting Strategies in a Stochastic Environment, *Trudy III mezhd. konf. po problemam upravleniya*, (Proc. III Int. Conf. on Control Problems), Moscow: Inst. Probl. Upravlen., 2006, pp. 304–311.

14. Zhordan, I., The One to Be the First, *Na Zlobu*, 2007, no. 9, http://www.nazlobu.ru/publications/print2188.htm.

*This paper was recommended for publication by F.T. Aleskerov, a member of the Editorial Board*