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**SOCIAL STATUS AND INFORMATION TRANSMISSION IN
EXPERIMENTAL GAMES**

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Research Problem

A substantial share of social and economic interactions takes place between people of different social status: bosses and employees, parents and children, etc. Social status can be defined as prominence and respect that individuals enjoy in the eyes of other group members [Anderson et al., 2006], influence exerted on other people [Ridgeway, Correll, 2006]. Indicators of social status include education, wealth [Diemer et al., 2013] and even social popularity [Glaeser et al., 2000].

Two definitions of social status are used in this work: subjective social status (SSS) and objective or socioeconomic status (SES). Subjective social status is individual's perception of his or her place in the social hierarchy. Socioeconomic status is closer to the concept of social class and is measured based on objective personal characteristics: education, income, occupational prestige [Diemer et al., 2013].

An important research issue is to what extent one's social status affects social learning, or an individual consults different sources of information such as friends and colleagues, media and opinion leaders to arrive at a decision in almost any area – from buying goods and opening a bank deposit to voting [d'Adda, 2012; Bursztyn et al., 2014; Nair et al, 2010; Weeks et al, 2017].

The existence of relationship between social status and social learning is based on psychologic, sociologic and economic research. Since primeval times, people have benefited from copying high-rank group members [Henrich, Gil-White, 2001]. Low-status individuals show more empathy and are more attuned to other people than their high-status counterparts [Stellar et al., 2012; Varnum et al., 2015; Kraus et al, 2010]. Lower social class is associated with stronger response to others' pain and sufferings [Stellar et al., 2012; Varnum et al., 2015], more pronounced reaction to social stress and rejection [Muscatell et al., 2016]. Individuals of higher economic status, defined in terms of educational attainment and occupational prestige, are worse at judging the emotions of others [Kraus et al, 2010].

A possible explanation for such differences was proposed by Kraus et al, 2012 in the form of the concept “locus of control”. Life circumstances of low-status individuals are more likely to be influenced, or be perceived to be influenced, by forces outside of their control. As a result, these people tend to adapt to their environment and react to external constraints and threats. On the contrary, high-status individuals enjoy more independence, greater perception of control and greater attendance to their own state [Piff et al, 2018].

Object of Research

The object of research is the interaction between individuals. The subject of research is the process of social learning.

Research Objectives

The aim of the work is analysis of the effect of social status on the process of social learning.

The study includes the following steps:

- Systematization of theoretical and empirical research on social interactions including asymmetrical interactions between influential individuals and other agents;
- Development of the way to impose asymmetrical social status on agents and its evaluation in a laboratory experiment;
- Development of the game-theoretic model for the experiment on social learning;
- Development of the survey-based social status indicator;
- Development of the leadership and social capital indicators;
- Formulation of several hypotheses on the relationship of social status and weights placed on private information and on the action of the other player;
- Estimation of the econometric model describing the dependence of agent’s actions on the private signal, action of the other player and their

interaction with social status, cognitive and non-cognitive personal characteristics.

Literature review

This work is related to several strands of literature.

1. Social learning models studying information dissemination between naïve and Bayesian rational agents. These models usually imply some agents connected into a social network. Agents receive noisy private signals about an unknown variable (state of the world) and observe information signals or actions of other players. Using own information and information obtained while observing others, agents update their beliefs according to the Bayes rule or a simple fixed rule [DeGroot, 1974; DeMarzo et al, 2003; Golub, Jackson, 2010; Acemoglu et al, 2010; literature review of social learning models by Mobius, Rosenblat, 2014]. Under good circumstances, all agents, e.g. the society, should learn the true state of the world. This process is referred to as information aggregation. However, some individuals can exert more profound influence on their network neighbors. The presence of influential agents in the economic environment can disrupt or slow down information aggregation, for example, cause herd behavior, which is shown in theoretical models [Banerjee, 1992; Bikhchandani et al, 1992; Acemoglu et al, 2010]. High social status can provide a behavioral foundation for such asymmetry. High-status agents “enforce” their beliefs upon other agents [Acemoglu et al, 2010] or they are more listened to because of their central position in the network [Golub, Jackson, 2010], which can make the process of social learning more difficult.

2. Peer effect in experimental and empirical studies. Peer effect is observed when individuals tend to change their behavior following members of the group they belong to. This phenomenon is present in many areas: savings [Breza, Chandrasekhar, 2019], student grades [Sacerdote, 2001; Zimmerman, 2003; Van Ewijk & Slegers, 2010], labor productivity [Falk, Ichino, 2006], political preferences [Weeks et al, 2017], health outcomes [Trogon et al, 2008], adolescent behavior [Gaviria, Raphael, 2000]. Design of this work was influenced by Burzty

et al, 2014 who show in the field experiment that investment decisions of financial market professionals are subject to two channels of influence: social learning from other's experience and imitating other's behavior. The effect of social learning is higher if the subject has more developed financial literacy skills.

3. Conformism in social networks. In theoretical models of conformity agents may care about impression they create because the society punishes members who deviate from the social norms. Approval or denunciation takes the form of the parameter which describes the weight of others' attitude, and the individual has a choice to deviate or not. If the society's approval is important for the individual, he or she will share the social norms because in the opposite case, his or her utility will be lower [Bernheim, 1995; Liu et al, 2014; Patachini, Zenou, 2012; De Marti, Zenou, 2015].

4. Experimental research on effect of status on altruism, trust, cooperation, unethical behavior, willingness to share resources. In such works status can be imposed by different methods: randomly appointed, merit-based (for instance, earned by players during a task) or based on real characteristics, e.g. prestigious school or caste. For example, in [D'adda, 2012] social status is based on real characteristics. Participants interact in dyads, and information on leader's contribution to the public good affects contributions of other participants. In [Ball, Eckel, 1996; 1998] status is allocated based on quiz results. Higher status participants enjoy better conditions both as sellers and buyers.

Methodological basis of the work for the formulation of hypotheses is the social learning theory with Bayesian rational agents. The design of the game is based on previous laboratory experiments in social learning [Anderson, Holt, 1997; Celen, Kariv, 2004; Corazzinni et al, 2012]. Subjects are set in pairs. At the beginning of each round the computer randomly selects the state of the world – an integer from a discreet uniform distribution in the interval from -7 to 7. Each subject receives a noisy private signal about the state of the world where the noise is an integer from the same distribution as the state of the world, and has two attempts to guess the number. The more precise is the guess, the higher is the

payoff, and the further the decision from the true state of the world, the higher the fine. At the first attempt the subject relies only on his or her private signal. Then he/she observes the first attempt of the second player and has the second attempt to guess the state of the world. After that subjects learn the state of the world, their payoff and move on to the next game round.

The social status indicator is calculated based on two groups of questions. The first group of questions consists of seven semantic differential scales [Ridgeway et al, 1998]. According to this method, the subject evaluates on one or several scales, to what extent a certain quality is present in a certain stimulus or an object [Osgood, 1964]. Antonyms are present on the opposite ends of the scale, and the scale consists of 7 divisions. In this work the subject has to appoint himself/herself closer to the one or the other end where opposite adjectives associated with position in the social hierarchy are present (dominant – secondary, dependant – independent, etc.), that means, the grade of each scale is from 1 to 7. The second group is the question on the position on the social ladder of 10 steps where 1 stands for people who occupy lower positions and 10 – for people who occupy higher positions. This question is widely used in sociology and economics for measuring subjective social status [The MacArthur Scale of Subjective Social Status, Adler et al, 2000; PMЭЗ, 2015].

For the dictator game a standard design was used. One participant, the allocator, has to decide, how to divide a fixed budget (100 s.u.) between himself/herself and the receiver. The receiver's role, contrary to the allocator's role is passive – he or she accepts the allocator's choice and cannot affect either his/her or the other's payoff. Research shows that 60% of allocators give away a non-zero budget share and the median share allocated to the receiver is 20% of the budget [Levitt, List, 2007]. The dictator game was chosen for inducing lower social status by receivers and higher social status by allocators because people have different levels of knowledge and tend to rely on experts' opinion when making a decision in a certain area. If the asymmetrical status was performance-based as in previous

research, a higher-status subject would look more knowledgeable and regarding his or her actions in the social learning game with larger weights could be rational.

Leadership qualities are measured by nine questions scaled from 1 to 10 where 1 stands for “definitely did not do” and 10 – “definitely did” about how often subjects took part in activities associated with responsibility, initiative, not yielding to authority, etc. [International Personality Item Pool (IPIP); Kuhn, Weinberger, 2002]. Cognitive skills are measured by three standard non-incentivized questions [Frederick, 2005].

Social capital is defined as the number and frequency of social connections, and popularity and influence among peers and is based on the methodology of [Glaeser et al, 2000] (8 questions with several answer options). Additionally, subjects answer a standard question about trust – whether they think people can be trusted.

All experimental sessions of two experiments were held in the International Laboratory for Experimental and Behavioral Economics at the National University Higher School of Economics in Moscow using Z-tree [Fischbacher, 2007]. The experiment participants were recruited through the laboratory online base, and the majority were HSE students. Each experimental session lasted for 1.5 hours.

The tools for testing hypothesis are methods of econometric modeling. The main research model is the least square regression with clustered errors. Although this method allowed to test research hypotheses, it should be mentioned that linear models have limitations as they do not fully takes in account non-linear nature of experimental data.

Main findings

Several hypotheses were put forward and tested. For testing hypotheses 1–2 the research “Measurement of social status in experimental games” [Bondarenko, Zakharov, 2018] was conducted. 6 experimental sessions with 68 participants were carried out in 2016.

The first hypothesis is that asymmetric subjective social status can be imposed by the dictator game.

The second hypothesis is that subjective social status depends on characteristics associated with objective (socioeconomic) status – employment, family income, change in income and personal characteristics – leadership qualities, extraversion, etc.

Experiment design

Subjects were randomly allocated into pairs and played games of various degrees of asymmetry: dictator game, trust game and labor market game. The game order changed in different sessions. In the most asymmetric of all games, the dictator game, the allocator is asked to divide a fixed budget between herself/himself and the receiver. In the trust game the investor decides how to allocate a fixed budget between himself/herself and the other subject (trustee). The amount allocated to the trustee is tripled, and the trustee can return any part of that sum to the investor. In the labor market game the manager is allocated capital and decides on the amount of wage to be paid to the worker. The worker chooses the effort level which involves different costs. Higher effort results in higher manager's revenue but lower worker's payoff. Pairs are shuffled after five rounds of each game.

At the end of each game subjects completed a questionnaire, where their own subjective social status, and then the subjective status of the game partner (the other player) were measured. After that subjects completed another questionnaire on socio-demographic and personal characteristics: wealth, confident behavior and positive/negative affect, social norms, trust, active membership in organizations and other questions.

Main findings

For testing hypotheses the model was estimated where the dependent variable was the subjective status (own status, status of the second player and the difference between own subjective status and partner's subjective status – relative status) and independent variables – variables denoting the role in the game and personal characteristics. The first hypothesis is confirmed. For the dictator game, the difference between own subjective status and partner's subjective status

(relative status) is significantly higher for allocators than for receivers. In the trust game and the labor market game such difference was not observed. This result did not depend on the game order.

The second hypothesis is confirmed. Personal characteristics of subjects affect both absolute and relative social status indicators. Subjects with greater wealth have higher subjective social status; the same result was obtained for subjects with leadership qualities and with high extraversion level (positive affect). Males score higher on the social status indicator than women, which stays in line with previous research [Bleidorn et al, 2016]. Family structure also matters: if the subjects are youngest children in the family, their absolute and relative social status indicators are lower. A possible explanation for this is that in families with several children, younger children are allocated less financial and moral parents' resources than elder children [Chen, Liu, 2014; Keister, 2003]. Additionally, subjects who are employed part- or fulltime and subjects with higher family income have higher subjective social status.

For testing hypothesis 3 the research "Social status and social learning" [Zakharov, Bondarenko, 2021] was conducted. 9 experimental sessions with 114 participants were carried out in 2016–2018.

The third hypothesis is that subjects with higher subjective status place more weight on private signal than on the partner's action when making a decision.

Experiment design

At the beginning of the experiment subjects complete a questionnaire. After that they are randomly set in pairs and play five rounds of the dictator game. Each participant observes a caption "You are the allocator/receiver" in the lower part of the screen" through the whole experiment session. Then, in the same pairs, subjects play ten rounds of the social learning game. Next, subjects answer questions on their and their partner's subjective status. After that subjects play a standard risk lottery measuring risk attitude [Holt, Laury, 2002]. After the lottery they complete a questionnaire: standard socio-demographic questions, measurement of socio-economic status, leadership qualities, social capital and cognitive skills.

Main findings

In this experiment the subjective social status indicator is higher for subjects who played allocators in the dictator game than for receivers, but the difference is not significant. The role of the allocator did not affect the weight the subjects placed on the private signal or on partner's action either.

The third hypothesis is confirmed. For testing it a regression model was estimated where the dependant variable was the second-period choice in the social learning game and the independent variables was the individual's first-period choice in the social learning game, the second player's first-period choice and subjective social status and other personal characteristics as well as their interactions with first-period decisions of the player and his\her partner. Individuals with higher subjective status place more weight on the private signal and less weight on partner's first period action. This effect persisted for the first round as well as for all ten rounds of the social learning game.

The effect of personal characteristics on social learning such as leadership qualities, risk aversion, social capital, emotional state and other ones was also analyzed. Risk-averse individuals place more weight on partner's first-period actions and less weight on the private signal, and this effect is more pronounced in men. While there has not been found research analyzing the relation between risk aversion and increased attention to others' actions, risk aversion is associated with lower socioeconomic status, higher neuroticism level and lower extraversion level [Donkers et al, 2001; Guiso et al, 2018; Becker et al, 2011; Lönnqvist et al, 2015].

Individuals with higher leadership qualities rely less the partner's action while making the decision. The possible reason for it may be that leadership qualities correlate with higher self-confidence and extraversion [Bono, Judge, 2004; McCormick, 2001]. At the same time, various components of the social capital, trust, for example, negatively correlate with social learning.

Individuals with more developed cognitive skills place more weight on the first-period partner's actions than on the private signal. A possible explanation may be that all subjects, in general, place less weight on partner's actions than fully

Bayesian rational individuals would. On the other side, previous research shows that cognitive skills correlate with more rational behavior in experimental games [Cason, Mui, 2019; Duffy et al, 2019]. Indicators of objective social status (family income, parents' education, employment) do not affect social learning.

The implications of the work are as follows:

— This work is the first to show the significant relationship between social status measured in the laboratory experiment and social learning. It was demonstrated that individuals with higher subjective social status put more weight on private information and less weight on public information.

— Significant effect of some cognitive and non-cognitive characteristics on social learning was found. This work is the first to show the relationship between risk attitude, leadership qualities, cognitive abilities and weights placed on private and public information.

— A new indicator of subjective social status based on the survey was developed and tested. In previous research only the “social status ladder” measure was used.

— It was shown that behavior in the dictator experimental game, e.g. the played role affects subjective social status.

The obtained results contribute to the theoretical and empirical literature analyzing spreading and aggregation of information in social networks. High-status individuals place can worse react to information signals from other agents. As a result, information cascades decreasing social welfare will be more likely to happen.

Results obtained in this dissertation can be used in constructing any hierarchical structure, from the firm to the government authority, to avoid distortion of information flows between superiors and subordinates and avoid making non-optimal decisions.

The work also investigates which personal characteristics affect usage of private and social information by decision-making. This allows to forecast

behavior of agents in social networks, for example, technology adoption or change of social norms.

Approbation of research results

The findings of this dissertation were presented at the following conferences:

- XX International Academic Conference on Economic and Social Development, April 9–12, 2019, Moscow
- XXV International student, postgraduate and young scientist conference “Lomonosov”, MSU, Moscow. April 10–15, 2018, Moscow
- IV International Academic and Research student and postgraduate conference “Welt und Wissenschaft”, National Research University - Higher School of Economics, April 19, 2018, Moscow
- XVIII International Academic Conference on Economic and Social Development, April 11–14, 2017, Moscow
- Regular seminar of the Ronald F. Inglehart Laboratory for Comparative Social Research, September 28, 2017, Moscow
- Research seminar in neuroeconomics of the International Laboratory for Experimental and Behavioural Economics and the Centre for Cognition & Decision Making, October 21, 2016, Moscow.

The results of the dissertation were also reported at scientific seminars of the Doctoral School of Economics, National Research University - Higher School of Economics.

Publications

The main results of the dissertation research were published in three works with a total volume of 6,82 author's sheets; the personal contribution of the author is 4,17 author's sheets:

- Alexei Zakharov, Oxana Bondarenko (2021) Social status and social learning. *Journal of Behavioral and Experimental Economics*, 90. – 2,1 author's sheets (personal contribution –1 author's sheet)

- Oxana Bondarenko (2018) Influential Individuals: Approach to Modeling. *Voprosy Ekonomiki*, 9, 114-131. [In Russian]. –1,57 author's sheets
- Oxana Bondarenko, Alexei Zakharov (2018). Measurement of Social Status in Experimental Games, *Journal of the New Economic Association*, 2 (38), 6–37. [In Russian]. –3,15 author's sheets (personal contribution –1,6 author's sheets).

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