

Can long lasting forest institution survive market economy? The case of historical common property forest regime in Slovakia.

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Presented at the 9th. International Conference of the European Society for Ecological Economics, Istanbul June 2011.

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Abstract

Central Europe is rich in forests and characterized not only by the existence of a long forestry tradition, but also by a dynamic evolution of the forest ownership which originated in the 17th century. Institutional changes, in particular the establishment of the communist regime in 1948 followed by large nationalization of property, has had a significant impact on forest management practice in particular a shift to state large scale and centralized forest management. Transformation and denationalization after the fall of communism, in the 90s' returned forests to original owners but the absence of proper institutions prevented re-establishment of effective regimes. Our paper concentrates on the analysis of the historical forest common property regime in central Europe—urban that transformed into the present forest governance structure after 40 years of interruption during socialism. Applying a multiple methods approach including common pool resource experiments and field research to study collective actions on social dilemmas we argue that urban can be seen to be long lasting institutions for sustainable forest management under the market and democratic regime. Flexibility and local experience creates conditions for renewal and increases ability for adaptation to external factors.

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Keywords: forests, common property regimes, evolution, adaptation, transition

Introduction

Common pool resources (CPRs) are natural and human constructed systems that generate finite quantities of resource units so that one person's use does subtract from the quantity of resource units available to others. Exclusion of beneficiaries through physical and institutional means is especially costly (Ostrom, Gardner, and Walker 1994). Examples include fisheries, irrigation systems, groundwater basins, grazing ranges or forests. Individuals jointly using a CPR are assumed to face potential social dilemmas in which individual short-term interests are in conflict with long-term society interest and thus make governance of the commons challenging field of economic research and policy.

There are disputes based on both – theoretical and empirical evidence – over the optimal or robust property regimes which would balance use and protection of the resources. Traditional approaches for natural resource management suggest private or state-centralized management as the only viable solution to prevent resource degradation (Gordon, 1954; Hardin, 1968; Scott, 1955). Numerous empirical studies provides evidence of capacity of local users to solve social dilemmas of the commons and use the resource efficiently, contrary to the prediction (Berkes, 1985, 1986, Netting, 1972, Ostrom, 2005, Acheson 2003; Wilson, and Steneck 1998, Poteete et al, 2010 and others). In most of those cases no external authority is needed to solve the resource management problems, self-management and self-governance increases willingness to follow the rules and monitor others than when an authority simply imposes rules (Fleischman et al, 2010, Ostrom and Nagendra, 2006).

In Central European (CE) countries the management of forest CPR is characterized by the existence of a long forestry tradition, and dynamic evolution of the forest ownership structure originated in the 17th century. However, the central planning and the transition to a market economy have presented a substantial challenge to the forest commons in CE countries. The nationalization of the land in 1948 by the socialist government has had a significant impact on traditional forest management practices, in particular a shift to state large scale and centralized forest management. In the early 90's the land was restored by restitution and

privatization to the previous owners. The political transformation and changes in the property rights structure has created the opportunity for forestry owners to re-establish their traditional management practices. However emergence of a market with the absence of well established market institutions may affect the robustness and vulnerability of those historical regimes as governing to sustainability is a continuing struggle and depends on the capacity of the institutions to adapt to ongoing changes.

Managing natural resources sustainable requires a firm understanding of the natural system, institutional context and social dimension and their mutual interaction. No single method overcomes all possible challenges of such interaction, hence observation and appraisal calls for interdisciplinary approach and use of mixed methods (Poteete et al., 2010). This approach is seen to achieve holistic and multi-scale comprehension of resource management problems (Ostrom and Nagendra, 2006).

The aim of the paper is to analyze how institutional changes in particular nationalization and re-nationalization of land affected the historical forest property regime in central Europe. Our interest is to determine whether this historical forest regime can adapt to the emergence of the market and contribute to the sustainable economy. To account for this challenge and complex issue, this study chose a combination of multiple methods, namely case study approach and field experiments.

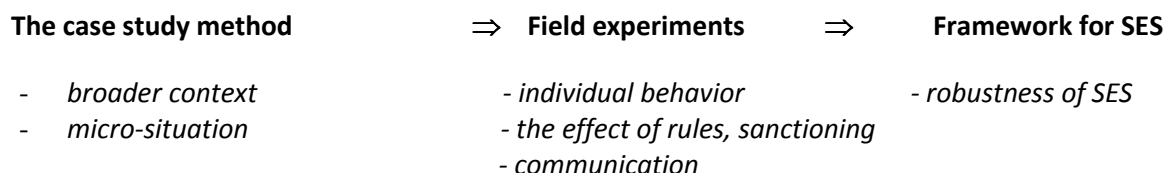
Within the paper we first describe our methodological approach. In part two, broader socio-economic context of Slovak forestry is introduced. Part 3 constitutes a micro-situation and the existence of long lasting institution in forest governance. Then we analyze group and individual dynamics of collective actions on social dilemmas obtained from a field experiment. Key findings on the role of rules, self governance and repeated communication in navigating long lasting institutions in economic and political complexity are summarized in conclusion.

Methodological framework

A call for multiple methods and collective (collaborative) research constitutes major methodological challenges of the interdisciplinary research on the borders of natural and social sciences. No single method is immune to poor application (Poteete et al., 2010). Quantitative methods often work with incomplete or inaccurate data, field studies tend to overestimate the effect of results (internal validity) and conventional experiments (laboratory) are known for external validity, in particular the abstract nature of decision making, the limited subject pool, the small incentive and the subject self selection (Ahn, et al., 2010; Cooper, 2006; Henrich et al., 2005; Levitt and List, 2007a, 2007b, 2008; Prediger et al., 2010). Combinations of methods, e.g. field studies and field experiments increases ambitions to overcome validity problems of both laboratory experiments and case study approaches (Cameron, 1999; Carpenter et al., 2005; 2007; Cardenas, 2001, Cardenas et al., 2004, Cardenas et al., forthcoming, List, 2004; Slonim and Roth, 1998; Potters and van Winden, 2000 etc.). Additionally experimenting with real decision making subjects in the field offers the opportunity to test a replicated decision making situation and the effect of institutional innovations on the behavior under the controlled situation (Janssen, 2008; Ostrom 1998).

Following Poteete et al. (2010) and Henrich et al. (2004) we designed our methodological framework on the combination of common pool resource experiments and case (field) study research and framework for analyzing social-ecological systems (SES). Case studies, by application of in depth interviews with urban representatives (approximately 20), direct observations and secondary information collection were employed to collect qualitative information on the social, political and environmental context (broader content variables) as well as specific conditions of the resource users and resource property regimes (micro-situational variables) of forestry in Central Europe following design principles of robust institutions (Ostrom, 1999, 2008). Field experiments provided information and analytical view on individual behavior, the effect of rules and communication. Experiments followed by focus group discussions and post experiment workshops complemented case studies and verified individual data. Analysis of robustness of forest common property regimes based on the analytical framework for SES (Anderies et al. 2004) will be employed in separate study. The Figure 1 illustrates our methodological approach.

Figure 1: Multiple methods methodological framework. Based on Castillo et al., forthcoming, Poteete et al., 2010 and authors view.



Broader socio – economic content of forestry in Central Europe

Forestry has traditionally been a strong resort in most of the Central European countries. The long history of Austro-Hungarian forest management, which dates back to the 16th century, with legal regulation originated in 1754 and 1879, enabled the establishment of state territorial administrative structures for forestry with well-developed long-term management plans already by the end of the 19th century (Kolbert and Balasz, 2010, Řezáč, 2001). In 1857 harvesting rights started to be systematically regulated and state control over forests was established. In 1879, the first state forest management plans came into force (Nozicka, 1956, Řezáč, 2001).

At the beginning of the 20th century, about 80 % of forests were in the hands of Austro-Hungarian aristocracy, towns but also by traditional collective ownership -common property regimes (Oliva, 2006). In 1918 after the 1st World War, the new state – Czechoslovakia implemented land reform that for the first time significantly affected property structure when the land of former Austro-Hungarian Emperor and the opposing German and Hungarian aristocracy was confiscated by the new Czechoslovakian state (the Law on Conquest No. 215/1919). Further, the maximum land tenure for an individual owner was designated to 250 ha. At that time, forests covered one third of the countries territory (4.7 mil. ha) of which 50 % was expropriated during the land reform. The most affected owners were large owners over 2000 ha (aristocracy).

After the Second World War, new land reform was undertaken in 1945 and 1948 respectively when most forests that remained in non state hands were confiscated by the socialist regime

(Act No. 46/1948). This process affected all individual owners as well as various non-state entities, such as municipal forests or co-common property regimes. The nationalization of forests was completed in 1958 (UHUL, 2009).

As a result of democratization after the political transformations of 1989, the denationalization (private property renewal) process was initiated in the early 90s'. Land ownership structure prior to socialism was implemented following the property register from 1948. Re-nationalization was completed after the separation of Czechoslovakia into the Czech Republic and the Slovak Republic in 1993. Table 1 illustrates present forest ownership structure in the Slovak Republic.

Table 1: Ownership structure of Slovak forests in 2007

Source: MZE, 2008; MP, 2008

Ownership	(%)
State	41.4
Individual	14.3
Municipal	9.8
Common	25.5
Others (the Church, etc.)	3.4
Unknown	5.6
TOTAL	100.0

Micro-situation context: the existence of the common property regimes in Slovak forestry

In the Slovak Republic, a significant share of forests belongs to common property (Table 1) of so-called "urbars" (25.5%). They constitute a form of self-governed historical land co-ownership regime mainly of forested land and pastures usually within one village. The name

originally referred to a register of serfs' properties and their respective duties towards a feudal lord (Štefanovič, 1999), created in the 18th century for the use of feudalists' pastures and forests for their own purposes. Gradually, serfs were freed from their obligations towards landlords. However, they continued to use pastures and forests and they paid a rent to the landlord in return. After the abolition of serfdom in 1848 those pastures and forests were transferred to them in the form of common property from aristocratic landlords (in 1853) or later (beginning of the 20th century) were bought at the stock market as a number of aristocracies went bankrupt. Urbars are currently regulated by Slovak Law on Land Associations (No. 181/1995). Property in the urbar is inherited from parents to children.

The boundaries of the resource are defined by the size of the land in the form of common property regime and individual rights are derived from the size of the share each member of the urbar inherit. However these boundaries seldom match ecosystem boundaries. This calls for more co-operation among forest owners in the same ecological unit. Two land reforms undertaken in the 20th century (described in previous session) significantly affected ownership and the governance of urbars. First, undertaken at the establishment of Czechoslovakia (1918) enabled expansion of urbars by transfer of ownership from aristocracy however the second disconnected operation of urbars for more than 40 years by nationalization of private land by communist government (1948). In particular nationalization (1945-1990), when land was in the hands of the state interrupted the inheriting process resulting in significant land share fragmentation and reduced the sizes of individual shares to sometimes less than 1 ha. Urbars were re-established in the process of land re-nationalization initiated in 1993. Numbers of eligible individuals claiming for land in re-nationalization has tripled over 3 generations. For this reason, a law was amended in 1995 regulating the size of one share to 2 ha at minimum (Štefanovič, 1999). This stabilized numbers of co-owners but not all members of an urbar can participate in the management. Additionally connection to the local resource has eroded over 40 years of disconnection.

Majority of urbar land is situated in mountainous areas with extreme climatic conditions, at present has become part of national parks. To undertake managerial responsibilities, community rules for harvesting, replanting and self management were developed over time. Most significant was forest degree of Maria Teresa –Austro –Hungarian imperator, issued in

1767 to manage wood as strategic resource for mining industry but also protect forest from overexploitation by overgrazing, illegal timber and inappropriate land use changes (Nozicka, 1956). Translated into Hungarian and Slovak this document served as management guidelines for forest industry since 1770 and was adopted also by urbars. The guidelines contained 55 management rules for harvesting and forest revitalization designed to maintain forest quantity and quality for the long term. These include age of the trees permitted for timber, harvesting techniques, harvesting (rotation) and forest revitalization calendars, measures to protect wood from mechanical damage and soil against erosion, duty of registration of type and quantity of timber. The degree also contains regulations for inspections, planting, guidelines for flood protection, regulation of housing and fire protection. Division of the responsibilities and rights were also regulated. Each co-owner of urbar had a duty to participate in the management according to the size of the shares and having the right to collect an annual benefit from the land.

Appropriation and provision rules are derived from historical practices, which to the large extent still reflect local circumstances. However only a small part of members take part in the management of the forest due to the diversification of economic activities, change in life style, in particularly for those members who change their residency. Resulting from technological modernization during the state property regime (1945-1990) a number of original forest management practices do not exist anymore although they contributed to the sustainable harvesting such as seasonal harvesting calendar (interviews with urbar leaders).

Today urbars operates on ten-year programs designed and controlled by the state forest authority. Timber, replanting and other activities are planned for this period and each subject has a certain flexibility to decide on the strategy for each year. Such system enables flexibility of decisions to reflect external social and natural shocks for example timber price decline, wind blow damaging forest and others. Social equity is also used as a reason behind decision-making (interview with urbar leaders). *Number of urbars also uses regular self monitoring mechanism to control harvesting process and internal sanction system mainly in the form of gradual exclusion of the rules violators from group benefits. External sanctions are imposed by governmental authorities to regulate forest use.*

Members can take part in collective choice arrangements. The main decision-making body is

an assembly of owners, which takes place once a year, and adopts an annual harvesting strategy and approves budget. It also delegates all day-to-day decisions to the economic committee, consisting of elected and professional members (Act no. 181/1995 on Land Associations). All important issues (i.e., expenditures on forests maintenance, earnings, etc.) are discussed during general assemblies, and they make decisions collectively (everybody has a right to vote according to the size of their share). Long term planning and direct connection to the resource enabled the evolution of sustainable forest management. The fact that urbars boundaries do not match with ecosystem boundaries provide positive incentive for cooperation among urbars and make their relations inter-dependent (interview with urbar leader).

Annual profit may be distributed to members according to their shares or redeemed in firewood. As the amount of land owned per owner is usually very small, the individual earnings are rather minor. Share in the urbar can be sold only with the approval of the assembly. Priority of existed members is legally binding. Erosion of local knowledge resulting from 40 years of socialism did not abolish all personal skills. Some survived thanks to the transfer between generations and today such representatives become elected leaders (focus group with urbar members and interview with urbar leader). Those conditions created a platform for the evolution of informal norms and habits respecting the economic interests of shareholders, social equity and ecosystem dynamics (Slavikova et al, forthcoming). This has enabled the re-establishment of the long existence and tradition (Šulek, 2007). Members of urbars thus can participate in modifying the operational rules have the opportunity to contribute to creation of the rules, which define their rights and duties. Following Ostrom (1990) they are more likely to create arrangements that are mutually acceptable and adaptable to changes.

Urbars have access to informal conflict-resolution mechanisms within the borders of the unit, however it does not apply to the external agents such as official authorities at national level. As a significant proportion of urbar land is today part of nature protected regimes (national reserves or EU Habitat Directive protected areas: Natura 2000), they are receiving small compensations for the restriction on their activities. Many private owners complain about the compensations being inadequate compared to the economic loss that resulted from nature

protection regimes or that national and NATURA 2000 compensation schemes are difficult to administrate. Additionally, contradicting is forest and nature conservation legislation, defining management rules in protected forests. This creates numerous conflicts over the use of the forest (interview with the leader) and challenge the right of urbars to devise their institutions not rarely resulting in overexploitation or even in open access (Slavikova et al, forthcoming). In particular the younger generation may see this as a weak incentive to continue in sustainable management and call for more intense production to generate profit as the compensation for the loss of opportunities for income generation under the national law or Natura 2000 does not function effectively (Klůvanková-Oravská et al., 2009). Exceptions are few examples where such conflicting situations lead to the adaptive process and shift of management strategy from intense harvesting towards participation at EU agri-environmental measures (interview with urbar leaders).

Despite several problematic issues discussed above urbars can adopt voluntary monitoring of members or other forest users, willing to invest private costs into informal sanctioning (interview with urbar leaders), which has been found as an effective low-cost control also previously reported by Ostrom et al. (1994). Flexibility, self-governance and local experience helps create conditions for the renewal of long-lasting institutions that have demonstrated their ability of adaptation to external factors.

Given formal and informal arrangements for operation of urbars discussed above, it is possible to declare that urbars are nested within existed forest organizational structure. Problematic is connection of self-governing urbars within existed forest management and governance structure which is fully hierarchical. The misfit exists between forest and nature conservation systems at national level as well as vertical coordination within EU multi-level governance is still weak.

Socio-ecological dynamics of forest property regime: individual and group characteristics

Field experiments

Experiments related to collective action of the commons represent a form of social dilemma where human subjects face a situation in which private interests are in conflict with group interests (Poteete et al., 2010). The field experiment applied in this study had been originally developed by Cardenas et al. (forthcoming) and was applied initially in Colombia and Thailand. A novel and challenging element of field experiments with common pool resources is to address the ecosystem institution fit (Young, 2002) by the inclusion of ecosystem dynamics into the game design (Cardenas et al., forthcoming). The experimental design in this paper was modified by including effect of communication and replicated in Europe within the European Marie Curie Research Training Network “GoverNat: *Multi-level Governance of Natural Resources: Tools and Processes for Water and Biodiversity Governance in Europe*” (Zikos et al., 2010).

Design of the experiment consisted of three stages each having 10 rounds. The game starts with 100 trees. The target of the players is to harvest from a common pool (forest) that regenerates slowly depending on the number of trees remaining at the end of each round, given technical maximum 5 trees per player and the round. The harvest is reimbursed in cash at the end of the game. The fee was calculated as an average equal to two days of work. The first stage runs with a maximum harvesting rate of 5 trees per each round and communication of the players is prohibited. In the second stage of the game, a decision rule is voted – again privately. The applied rule regulates harvesting, either by setting a maximum harvesting limit to the players, by rotating the harvesting players or by allocating harvesting rights randomly, in a lottery, to different players each round. Breaking the rule is possible, but includes a certain risk of being inspected. The probability of inspection is 1 out of 6. If inspected, the illegal harvest is confiscated and an additional sanction is imposed on the cheating player. The third part of the game, allows communication among the players every second round. As such, subjects discuss face-to-face the rules to be implemented, customize an existing rule or invent a completely new rule. Furthermore, the subjects decide on the sanctions and jointly

decide on any modifications they wish, with no formal enforcement. This arrangement allows for self-governing.

Subjects and statistics

In total 9 games were undertaken with members of urbans in Slovakia, with 45 subjects. After the experiment, all subjects participated in semi-structured interviews to find out demographic characteristics and on, reasoning of individual behavior and similarities of the experimental design to the real decision making situation. In cases where a group was homogeneous and capable to respond collectively, a focus group discussion was undertaken instead of individual interviews (seven groups). In total 4 games were previously undertaken by master students of environmental sciences and spatial planning and 4 games with individual private forest owners in the Czech Republic. These are used in our paper for comparison with urbans. In order to determine statistical significance of results between stages and groups, the statistical inferential analysis strategy – Mann Whitney U test was applied using the software SOCR http://socr.ucla.edu/htmls/SOCR_Distributions.html. Tests were undertaken for differences in harvest and forest remains between first and second stage (I. vs. II.), first and third stage (I. vs. III.), second and third stages (II. Vs. III.) within each group separately. Two hypothesis were tested within each group: H_0 : there is no difference in harvest (remains of the forest) between stages, termed the so-called null hypothesis, and H_1 : there is significant increase in harvest (remains of the forest) between stages, termed the alternative hypothesis. In order to accept or reject the null hypothesis of Mann Whitney test, the value of U for each test structure and for a given group has to be compared with the critical value of U for number of observations for each group. The number of each group observations is 10 for each stage. If the U is less than critical value then the H_0 is rejected otherwise it is accepted. Critical value for U was calculated as 23 at 0,05 and as 27 at 0,025. Differences between groups (urbans-students-individual owners) were not tested due to the small sample.

Table 2: Micro characteristics of urbans and players

Group	Age of players	Size of urbar (ha)	Size of the share in ha (average)	Number of members
SK1	55	250	0.8	596
SK2	50	310	0.8	316
SK3	53.8	300	0.8	na
SK4	55	312	1,5	na
SK5	46	4349	0-6 – 26	700
SK6	48	902.4	1.7	800
SK7	53	680	10-70	349
SK8	50	2010	2,8	883
SK9	53	4200	20	918

Source: author

Results

Data on the group harvest and forest remains gathered during games (SK1-SK9) were compared to results of pre-test in lab (four group of Master students S1-S4) and individual private forest owners in the Czech Republic from which C1-2 constitutes small owners with forest size 2 ha on average and group C3-4 are owners with forest size around 20 ha. Mean values per each round and three stages compared to students and individual owners are illustrated in Figure 2 and for forest remains in Figure 3.

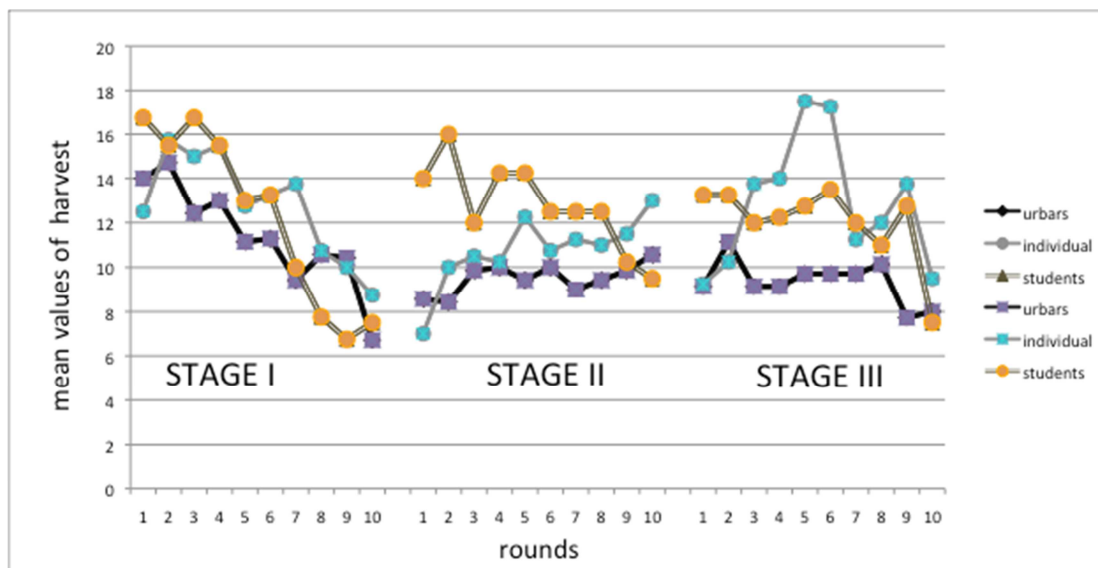


Figure 2: Harvesting per rounds (mean values): comparison of urbars to students and individual (private) owners.

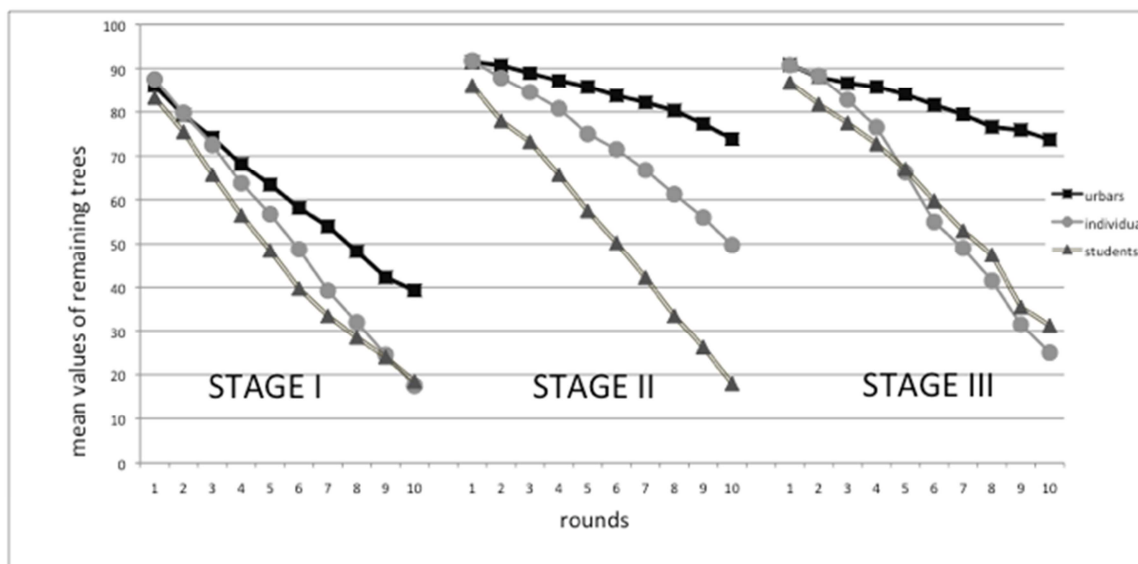


Figure 3. Forest depletion by rounds (mean values): comparison of urbars to students and individual (private) owners.

As seen in Figure 2 urbans harvesting was much lower compared to students but also individual owners. Only at the end of each stage students harvested less as such by that time their resource was mostly depleted or maximum harvest rules reduced their effort. No significant differences were observed in harvesting strategy of urbans between stage two (harvesting rules and sanctions) and three (communication and self-governance). This is in contrast with individual owners who for most of stage three increased their harvesting and students, whose strategy was similar over all three stages. Also the standard deviation calculated for each group was almost 30 to 50% higher for students than urbans, similarly with private forest owners.

Figure 3 shows depletion of forest stock in three stages. Resulting from harvesting strategy of three groups, urbans behavior resulted in highest forest remains in all three stages. In stage I more than 50% of forest stock remains. When external rules were imposed in stage II and in stage III when self-governance and communication was allowed forest stock of urbans remained above 70%. In some cases (SK2, SK6, SK9) forests remained nearly at maximum.

Significant differences (increase) of harvest were observed only for one group. Significant differences in forest remains (Table 3) between stages were observed in all urbans except SK4. Differences occurred mainly between stage I and II and I and III, in case of SK3, SK5 and SK7 also between stage II and III at the level of significance 0,05. Significant differences in forest remains of individual owners occurred mainly in the case of small owners (CZ1-2) and no significant differences occurred among students. Further testing on the effect of learning will be addressed in a separate paper.

Table 3: Results of Mann Witney test for harvest and forest remains

	Harvest			Forest remains		
	I. vs. II.	I. vs. III.	II. vs. III.	I. vs. II.	I. vs. III.	II. vs. III.
Group	U	U	U	U	U	U
sk1	5,5++	3,5++	46,5	3,5++	0,5++	34
sk2	29	41	29,5	0++	0++	30
sk3	42,5	44,5	28	0++	6++	6,5++
sk4	46	31,5	29,5	36	41,5	41,5
sk5	47	29,5	36,5	14++	5++	22,5++
sk6	31	28	36,5	20 ++	19++	45,5
sk7	38	29	35	7,5++	25,5+	15,5++
cz1	26,5+	39,5	41	6,5++	35,5	15,5++
cz2	34	45,5	30	18,5++	45	32
cz3	24,5+	55,5	37,5	23++	35,5	38,5
cz4	49	53	29,5	52,5	0++	0++
s1	27+	0++	12,5++	30	30	45,5
s2	49	47	38	26+	43	35
s3	28	30,5	44	41	73,5	38
s4	49	48	47	38	40,5	31,5

significant differences at the level of 0,025, significant differences at the level of 0,05

Note: reported value of test-statistic U (the lower of U).

DISCUSSION

The effect of rules, sanctions

As seen from MW tests imposing rules on players did not show significant effect on harvesting strategy of urbars. Sanctions imposed in stage II slightly reduces harvesting of individual owners and students but does not trigger behavioral change of urbars. In stage III use of sanctioning was reduced in most of urbar groups eliminated. Additionally incidents of cheating were significantly reduced (halved) in stage III in games with no external sanctions cheating did not occur at all (research protocol). Thus it is possible to summarize that similarly to Janssen et al, 2010) punishment was found effective only with repeated communication.

In stage II compared to stage I there were significantly (statistically) higher remains of forests stock (approximately 80%) for urbars. This phenomenon may be due to the homogeneity of urbar groups and the optimalization of harvesting strategy. Several subjects indicated that experimental design in this respect strongly correlates with their real forest management practices, such as a 10 year management plan and long lasting management practices. This enabled them to identify optimal harvesting strategy by the end of stage I resulting in high forest remains but the same harvesting. Thus resource management experience and character of urbars as self-governance regime improved the understanding of players in stage II and enabled the evolution of self-management regime in stage III. The fit of pre-existed institutions with ecosystems and game rules can be seen as main factors affecting behavior of urbars towards sustainable forest stock.

Communication

In recent behavioral studies, communication was found a key factor of cooperative behavior. For example, a meta analysis of more than 100 experiments, showed that communication increased cooperation in about 45% (Sally 1995). In experiments with common pool resources, communication was found having positive effect on the reduction of over

harvesting against theoretical assumption (Janssen 2008). The positive effect of face-to-face communication in common pool resource dilemma was further explored by a number of studies (Ostrom and Walker 1991, Ostrom et al 1992, 1994, Ostrom 1998). In particular, recently published study (Ahn et al., 2010) reporting on the effect of cheap talks from laboratory experiments with non –undergraduate participants of summers schools from 41 countries conducted between 1998 and 2007. In those experiments face-to-face communication was identified as a mechanism for fostering cooperation in social dilemma settings. Results also indicated that communication in a smaller group is more efficient and the level of trust also increased in the small group discussion. No clear pattern of common characteristics was found across gender, age, residence, or field of expertise (Ahn et al., 2010).

Behavior of subjects in the third stage of our experiment indicated that face-to-face communication played an important role. In groups with higher homogeneity and managerial experience (urbars) repeated communication enables adopting a self-governance regime. Monitoring among players was observed in most urbars groups. As a result, the players largely respected informal rules keeping income and forest stock similar to stage II but with no sanctions and no cheating.

Communication and self-management contributed to a more sustainable and cost effective strategy than external rules. In a real world situation urbars have to co-ordinate and adjust their behavior accordingly and it is practically impossible to cut the forest without communicating with the others (focus group with players). These findings are similar to Ahn et al, (2010). Communication improved understanding of resource dynamics, created collective feeling as previously reported in Janssen et al., (2010). Exception is the behavior of subjects in group SK4, which consisted of members of 2 different urbars. This reduced the homogeneity of the group resulting in the behavior similar to students. Students and individual forest owners did not achieve similar results and in majority preferred individual strategy for income generation and forest depletion (Figure 2 and 3).

Based on the above analysis, we see face-to-face communication and indigenous rules as variables that influence group dynamics and behavior towards sustainable manners and reflexive governance balancing social, individual and environmental issues.

Conclusion

Our study supports previous findings (Poteete et al, 2010, Ostrom, 2010, etc.) that common property regime lead to effective management and sustainable use of natural resources.

Field research provided evidence how self-governed urbans succeeded in renewal of long-lasting institution also adaptable to external factors, in particular nationalization and recently emergence of the market under the absence of market institutions. This supports arguments of Gibson, Williams, Ostrom (2005) that long-lasting institutions such as informal rules, regular monitoring by a local group is more influential in enhancing forests conditions than type of formal organization, dependence of the users of forest or social capital.

Common property regimes studied in our paper generally exhibited a much more resource-friendly behavior than individual users in central Europe. Behavior of subjects, in particular higher forest remains of urbans compared to individual owners or subjects from lab confirmed that ecosystem dynamics is a useful variable to improve forest stability and greatly contributed to find equilibrium between the individual, social and natural optimums.

Communication in our experimental design allowed the formation of informal and customized rules that were largely accepted by subjects and highlighted the importance of trust concerning the management of a common pool resource (Ahn et al, 2010, Cardenas et al., forthcoming, Janssen et al, 2010).

A long lasting institution was identified as perspective attributes of resource regime competitive to cope with institutional diversity and adaptive to complexity of global governance and economy. Application of multiple methods can be seen as an innovative tool to study in depth social dilemmas and paradigms of collective action that could substantially contribute to good “governing of the commons”.

Acknowledgements

Our thanks go to the members of the CETIP team, who contributed to the successful completion of the experiments and in particular to Martina Lubyova who provided statistical tests, to Marco Janssen for his kind assistance in shaping the experiments and his comments on the early versions. Finally, our gratitude belongs to the 35 players for their participation in the experiment and their kind hospitality in the field. We are also grateful to the GoverNat project and COST action ISO 802 for the support. This publication is also the result of the project SPECTRA Centre of Excellence for the Settlement Infrastructure Development of the Knowledge Based Society (no. 26240120002), supported by the Research & Development Operational Program funded by the ERDF.

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