

Experimental economics and public choice

Lisa R. Anderson and Charles A. Holt

June 2002

Prepared for the *Encyclopedia of Public Choice*, Charles Rowley, ed.

There is a well-established tradition of using laboratory techniques to study issues in public choice, dating back to the 1970's. For example, Fiorina and Plott (1978) and Plott and Levine (1978) reported results of voting experiments, and Bohm (1972) used an experimental approach to estimate demand for public goods. This connection is reflected in the fact that the Economic Science Association (of experimental social scientists) meets jointly with the Public Choice Society each spring in the United States. This chapter provides a selective survey of experiments on public goods, common pool resources, rent seeking, and voting.

Experiments have revealed that people do free ride on others' contributions to public goods, but the problem is not as severe as economists once thought. A typical public goods experiment involves a group of people who must decide whether to contribute to a group project or account. For example, Ensminger (2001) divided a sample of East African men into groups of four. Each person was given 50 shillings and offered the opportunity to contribute some, all, or none to a "group project." The men placed their contributions in envelopes that were collected and shuffled (to preserve anonymity) and counted in front of the group. All contributions were doubled and then divided equally among the four participants. For example, a contribution of 10 shillings would be doubled to 20 and divided 4 ways, for a return of 5 shillings per person. Therefore, the individual receives a private benefit of $\frac{1}{2}$ for each shilling contributed to the group project. In the public goods literature, this private benefit is called the marginal per capita return (MPCR).

With a group of size N , the social benefit for each shilling contributed to the group project is N times the MPCR. There is a social dilemma when the MPCR is less than 1 and greater than $1/N$, which is typically the case for a public goods experiment.

With a group of size 4 and an MPCR of $\frac{1}{2}$, Ensminger observed that about 60 percent of the shilling endowments were contributed to the group project. This contribution level is slightly higher than the 40 to 60 percent range that is commonly observed in the first round of a public goods experiment involving college students in the United States (Anderson, 2001 and Ledyard, 1995).

Nearly 200 public goods experiments have been conducted (see the Y2K Bibliography of Experimental Economics at <http://www.people.virginia.edu/~cah2k/y2k.htm>). The main finding is that significant contributions are observed despite the individual incentive to free ride. Economists have designed experiments with a variety of treatments to better understand motives for contributing. Altruism provides one possible explanation, since contributions may be rational if enough utility is derived from helping others. Many studies have shown that an increase in the MPCR raises contributions, but the interpretation of this result is complicated by the fact that the MPCR affects both one's private return (the "internal return") and the benefit to others (the "external return"). It is possible to hold the internal return constant (e.g., at $\frac{1}{2}$) and increase the external return for each token contributed (e.g., $\frac{3}{4}$). Goeree, Holt and Laury (2002) report that contributions are positively related to the external return, holding the internal return constant. Not surprisingly, contributions are also positively related to the internal return. Another implication of altruism is that contributions will be higher as the number of beneficiaries (i.e. group size) increases, and this is supported by a number of studies. These results are summarized in the first four rows of table 1.

All of the experiments discussed thus far were done for a single round. In a multi-round experiment some people might reciprocate by contributing more in response to cooperative actions of others. Such reciprocity also opens up the possibility for strategic behavior, where a person might contribute more in early rounds to encourage others to do the same. This explanation is consistent with the observation that contributions decline with repetition. Contributions are also somewhat lower for people who have participated in a public goods experiment on a previous date. Despite the negative effect of repetition and experience on contribution rates, some people contribute in all rounds.

Table 1. Treatment effects in public goods experiments.

Variable	Study	Effect on contribution rates
MPCR	Isaac and Walker (1988)	Positive
Internal Return	Goeree, Holt and Laury (2002)	Positive
External Return	Goeree, Holt and Laury (2002)	Positive
Group Size	Isaac, Walker, and Williams (1994)	Positive
Repetition	Isaac, Walker and Thomas (1984)	Negative
Experience	Isaac, Walker and Thomas (1984)	Negative
Anonymity	Laury, Walker and Williams (1995)	None
Communication	Isaac and Walker (1988)	Positive

Another explanation for positive contributions is that people do not want to appear to be stingy to the researcher, who generally tracks each individual's contributions. This explanation is not supported by the work of Laury, Walker and Williams (1995), who ran parallel treatments; in one case they tracked individual contributions and in the other they did not. Contributions have also been observed to depend on factors such as the ability of subjects to communicate in advance, the presence of a required level of contribution (provision point), and the ability to exclude or punish non-contributors.

Just as a contribution to a public good provides a positive externality, the use of a common pool resource provides a negative externality by reducing the value to other users. A classic example of a common pool resource is a fishery, where an increase in one person's harvest may reduce the productivity of others' fishing efforts. In a standard common pool resource experiment, each person chooses a level of effort (or usage), and the average product is a decreasing function of the sum of all efforts. Alternatively, each person can allocate effort to a private investment that has a fixed return. This is analogous to a Cournot model where individuals ignore the negative externalities associated with

their own quantity decisions, and the resulting Nash equilibrium quantity is too high relative to the socially optimal level. Gardner, Ostrom and Walker (1990) report that aggregate usage is higher than the socially optimal level and is often close to the Nash equilibrium prediction, but there is considerable variability in behavior across individuals. Many people devote all effort to the common pool resource as long as the average product exceeds the private return and otherwise switch all effort to the private investment. Over thirty papers on this topic can be found at <http://www.people.virginia.edu/~cah2k/y2k.htm>. Many papers examine factors that mitigate the amount of overuse, such as communication and monitoring.

Another topic that has been investigated with experimental methods is the effect of rent-seeking activities. The standard rent-seeking experiment is based on the simplest Tullock (1980) model in which the probability of obtaining a prize is equal to one's share of the total lobbying activity. Each subject chooses a level of lobbying activity, and the payoff is the prize, if it is obtained, minus the person's own lobbying cost. In a Nash equilibrium for this game, the fraction of the value of the prize that is dissipated is an increasing function of the number of competitors. Experiments show that the total cost of rent-seeking activity is significant and greater than predicted in a Nash equilibrium (Millner and Pratt, 1989 and 1991; Davis and Reilly, 1998). Moreover, an increase in the number of contenders tends to raise the total cost of this rent-seeking activity (Holt, 2002 chapter 29; and Anderson and Stafford, 2002).

One area of public choice where there has been a considerable amount of disagreement is voting behavior. As a consequence, this is a fruitful area for experimental research. Early voting experiments focused on testing theoretical concepts, such as the core. Support for this notion is reported in Fiorina and Plott (1978) and Plott (1991). Subsequent studies investigated whether or not voters behave strategically in agenda-controlled committee meetings. Strategic voting requires that decisions made in the initial stages of a meeting are rational given correct expectations about what will happen in subsequent stages. Not surprisingly, subjects tend to behave more myopically in such situations (Plott and Levine, 1978). Strategic voting is more likely to arise after subjects have gained considerable experience in prior meetings (Eckel and Holt, 1989). Additionally, a considerable amount of strategic voting has been observed in single-stage

voting games where backward induction is not required (Rapoport, Felsenthal and Maoz, 1991). Recent voting experiments have studied alternatives to majority rule. For example, Forsythe et. al. (1996) compared voting outcomes with majority rule, Borda rule and approval voting. Additionally, McKelvey and Palfrey (1998) compared outcomes with unanimity versus majority rule.

A number of excellent survey papers and collected volumes cover the topics discussed above in more depth. Ledyard (1995) is the standard reference for public goods experiments. Holt and Laury (2002) survey the more recent research on treatment effects in public goods experiments. Kinder and Palfrey (1993) is a collection of experimental papers on various topics in political science including survey-based experiments and bureaucratic agenda control. Finally, many of the experiments described above have been adapted for classroom use: Holt and Laury (1997) for public goods, Holt and Anderson (1999) for strategic voting, Goeree and Holt (1999) for rent seeking, Anderson and Stafford (2001) for tradable pollution permits, and Hewett et al. (2002) for the Tiebout hypothesis and the median voter theorem. Web-based versions of many of these experiments can be found at <http://veconlab.econ.virginia.edu/admin.htm>.

LISA R. ANDERSON

Associate Professor of Economics
College of William and Mary

CHARLES A. HOLT

Merrill Bankard Professor of Economics
University of Virginia

References

- Anderson, L. (2001). Public choice as an experimental science. In W. Shugart and L. Razzolini (Eds.), *The Elgar companion to public choice*, chapter 23. Northampton, MA: Edward Elgar Publishing.
- Anderson, L. and S. Stafford (2001). Choosing winners and losers in a permit trading game. *Southern Economic Journal* 67(1): 212-219.
- Anderson, L. and S. Stafford (2002). An experimental analysis of rent seeking under varying competitive conditions. *Public Choice* forthcoming.
- Bohm, P. (1972). Estimating demand for public goods: An experiment. *European Economic Review* 3(2): 111-130.
- Davis, D. and R. Reilly (1998). Do too many cooks always spoil the stew? An experimental analysis of rent-seeking and the role of a strategic buyer. *Public Choice* 95(1-2): 89–115.
- Eckel, C. and C. A. Holt (1989). Strategic voting in agenda-controlled committee experiments. *American Economic Review* 79(4): 763–73.
- Ensminger, J. (2001). Market integration and fairness: evidence from ultimatum, dictator, and public goods experiments in East Africa. Discussion Paper, California Institute of Technology.
- Fiorina, M. P. and C. R. Plott (1978). Committee decisions under majority rule: An experimental study. *American Political Science Review* 72(2): 575–98.
- Forsythe, R., T. Rietz, R. Myerson and R. Weber (1996). An experimental study of voting rules and polls in three-candidate elections. *International Journal of Game Theory* 25(3): 355–83.
- Gardner, R., E. Ostrom and J. M. Walker (1990). The nature of common pool resource problems. *Rationality and Society* 2: 335-358.
- Goeree, J. and C. Holt (1999). Classroom Games: Rent seeking and the inefficiency of non-market allocations. *Journal of Economic Perspectives* 13(3): 217-226.
- Goeree, J., C. Holt and S. Laury (2002). Private costs and public benefits: Unraveling the effects of altruism and noisy behavior. *Journal of Public Economics* 83(2): 257-278.

- Hewitt, R., C. Holt, G. Kosmopoulou, C. Kymn, C. Long, S. Mousavi, and S. Sarang (2002). Voting with feet and with ballots: A classroom experiment, Discussion Paper, University of Virginia.
- Holt, C. (2002). *Webgames and strategy: Recipes for interactive learning*. Unpublished manuscript, University of Virginia.
- Holt, C.A. and L. R. Anderson (1999). Agendas and strategic voting. *Southern Economic Journal* 65(3): 622–29.
- Holt, C.A. and S. K. Laury (2002). Theoretical explanations of treatment effects in voluntary contributions experiments. In C. R. Plott and V. L. Smith (eds), *The Handbook of Experimental Economics Results*, Amsterdam: North-Holland, forthcoming.
- Holt, C. and S. Laury (1997). Classroom games: Voluntary provision of a public good. *Journal of Economic Perspectives* 11(4): 209-215.
- Isaac, R. M. and J. M. Walker (1988). Communication and free-riding behavior: The voluntary contributions mechanism. *Economic Inquiry* 26(4): 585–608.
- Isaac, R. M., J. M. Walker and A. W. Williams (1994). Group size and the voluntary provision of public goods: Experimental evidence utilizing large groups. *Journal of Public Economics* 54(1): 1-36.
- Isaac, R. M., J. M. Walker and S. H. Thomas (1984). Divergent evidence on free riding: An experimental examination of possible explanation. *Public Choice* 43(2): 113-149.
- Kinder, D. and T. Palfrey, eds. (1993). *Experimental Foundations of Political Science*. Ann Arbor: University of Michigan Press.
- Laury, S. K., J. M. Walker and A.W. Williams (1995). Anonymity and the voluntary provision of public goods. *Journal of Economic Behavior and Organization* 27(3): 365–80.
- Ledyard, J. (1995). Public goods: A survey of experimental research. In J. H. Kagel and A.E. Roth (eds.), *The Handbook of Experimental Economics*, 111-194, Princeton, NJ: Princeton University Press.
- McKelvey, R.D. and T. R. Palfrey (1998). An experimental study of jury decisions. unpublished manuscript, California Institute of Technology.

- Millner, E.L. and M.D. Pratt (1989). An experimental investigation of efficient rent seeking. *Public Choice* 62(2): 139–51.
- Millner, E.L. and M.D. Pratt (1991). Risk aversion and rent seeking: An extension and some experimental evidence. *Public Choice* 69(1): 91–92.
- Plott, C. R. (1991). A comparative analysis of direct democracy, two-candidate elections and three-candidate elections in an experimental environment. In T. Palfrey (ed.), *Laboratory research in political economy*, 11-31, Ann Arbor: University of Michigan Press.
- Plott, C.R. and M.E. Levine (1978). A model of agenda influence on committee decisions. *American Economic Review* 68(1): 146–60.
- Rapoport, A., D. S. Felsenthal and Z. Maoz (1991). Sincere versus strategic voting behavior in small groups. In T. Palfrey (ed.), *Laboratory research in political economy*, 201-235, Ann Arbor: University of Michigan Press.
- Tullock, G. (1980). Efficient rent seeking in J. M. Buchanan, R. D. Tollison and G. Tullock (eds) *Toward a Theory of the Rent-Seeking Society*, 97-112, College Station: Texas A&M University Press.