**Introduction**

In the Erb Colloquium of November 7, I summarized research I have done (with coauthors Heintzelman and Schott) on a "partnership solution" to the common property problem This problem is ubiquitous, arising not only in the well-known examples of natural resource extraction but equally in research races (Baye et. al., 2003; Salant, 2007 ), and rent-seeking contests. In the conventional formulation, the equilibrium fishing effort of each individual exceeds socially optimal levels because each fisherman disregards the negative impact of his additional effort on the other fishermen. The paper presented at the Colloquium analyzes theoretically an institution anthropologists have traced to hunter gatherers and ancient civilizations but which nonetheless still persists in modern world (e.g. Japanese fishing agreements, research joint ventures). Instead of competing as individuals when exploiting a common property, individuals band together into groups in which individuals incur their own costs of effort but share the catch with fellow group members on a per-capita basis or some basis other than their effort relative to the efforts of their colleagues. Such partnerships inevitably induce free riding. As is intuitive (see Heintzelman et. al for details) the larger the group, the lower the equilibrium effort of each member of the partnership and the lower his resulting payoff. If everyone joins one partnership, aggregate effort is below the social optimum; if everyone remains in his own "solo partnership", aggregate effort exceeds the social optimum. If players are partitioned into the "correct number of partnerships," however, then socially optimal effort can be achieved.

Whether people will stay in those partnerships, however, is another matter. If the difference between the size of two groups exceeds one, every member of the larger group would want to migrate unilaterally to the smaller group and hence the original configuration would not be stable even though it would have induced socially optimal effort. To be stable, an additional restriction is needed: every partnership must either be the same size or differ by one member. In that case, no one has the opportunity to migrate to a partnership which would be strictly smaller (after the deviator joined) than the partnership he contemplated leaving.

The Partnership Solution is a stable configuration that neutralizes the excessive effort associated with the common property problem by introducing just the right amount of free riding. This mechanism is equivalent to optimally set Pigouvian taxes but only if all Pigouvian tax revenues are rebated to participants on a lump sum basis. *Since in reality such rebates rarely if ever occur, agents using the common property should embrace the Partnership Solution.* That this solution can be implemented without government interference is presumably another point in its favor.

There is, however, a difficulty with the scheme. There are other self-enforcing equilibria in the partnership game which are not socially optimal. Suppose for example that there are 6 players and solo production is impossible (team production is required). Then there will be five stable configurations, three of which have groups of equal size: 1 group of six, 2 groups of three or 3 groups of two. In addition, there are two configurations where groups would differ in size by

exactly one: 4 groups (2,2,1,1) or 5 groups (1,1,1,1,2). Although all of these configurations are stable, only one of them (the “Partnership Solution”) is best for each individual.

This partnership game is a member of a class called “coordination games.” Such games have multiple Nash equilibria. This raises the question of which equilibrium will be selected (so-called equilibrium selection). Received theory provides little guidance on this question but there is a substantial experimental literature on how such games are played.[1] However, the literature on institutions that will induce subjects to play the payoff-dominant equilibrium of such games is extremely limited. I would like to contribute to this latter literature and request Erb funding to cover expenses for proposed experiments. My collaborator in this experimental project is Joshua Cherry, a second-year PhD student in the Department of Economics. We have already received IRB approval for the proposed research and have each received PEERS certification. As evidence of my capacity to conduct experiments and to publish them prominently with a graduate student, note that I have previously published in the *Rand Journal* an experimental investigation of voting, coauthored with a PhD student in our Department (Salant and Goodstein, 1990).

[1] Katharine Anderson, a third-year PhD student at UM, is developing a theory to predict the equilibrium that will be selected in the absence of the interventions we propose to study, in a related game of group choice (Anderson, 2007).