14.160 Experimental Economics
Problem Set 1

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1 Fehr-Schmidt and Redistribution

In this exercise we will explore how fairness affects preferences for redistribution.

There is a continuum of mass 1 of workers earning wage w where w is uniformly distributed over $[0, W]$.

Consider the following redistribution scheme: a linear tax $t \in [0, 1]$ applied to wages and redistributed uniformly as a lump-sum transfer.

Taxes are distortionary: a tax t leads to a lump-sum transfer $(t - \gamma t^2)W/2$ to all workers.

Therefore, the after-tax income of an agent earning wage w is:

$$y_w = (1 - t)w + (t - \gamma t^2)W/2$$

Workers vote on the redistribution policy after knowing their wage w.

Show that if agents have linear utility over income,

1.1) The median voter wants $t = 0$.

1.2) A central planner maximizing average utility also wants $t = 0$.

Assume now that agents have inequality-averse preference a la Fehr-Schmidt:

$$U(y_w) = y_w - \alpha \int_{y_w}^{\infty} (y - y_w) dF(y) - \beta \int_{-\infty}^{y_w} (y_w - y) dF(y)$$

where F is the CDF of **after-tax** incomes in the population and $\alpha > \beta > 0$.

1.3) Compute the utility of the agent earning wage w given tax t.

1.4) What does the median voter choose? (You can assume γ is large enough for an interior solution to exist.) How does it depend on W?

1.5) What would a central planner choose? Why is it different?

2 Fehr-Schmidt and Contracts

This problem will flesh out some of the theoretical details in **Contracts, Fairness, and Incentives** by Fehr, Klein and Schmidt (available on the course website).

In order to solve the problem, you will need to read pages 6-8 from the paper. Reading the rest of the paper will be quite helpful, as well.

This problem will use the effort cost function as described in Table 1 on page 9 of the paper and reproduced below.

e	1	2	3	4	5	6	7	8	9	10
c(e)	0	1	2	4	6	8	10	13	16	20

We will analyze the experimental game using the theory of inequity aversion. To simplify the calculations we assume that there are only two types of players. There are "selfish types" who are interested only in their own material payoffs and have $\alpha_i = \beta_i = 0$. But there are also "fair types" who are inequity averse and have $\alpha_i \geq \beta_i \geq 0.5$. These players are prepared to give away material resources to the other player in the experiment in order to reduce inequality. We assume that 60% of the population are of the selfish and 40% of the fair type. Furthermore, we abstract from integer problems and assume that all variables can be chosen continuously.

Recall that inequity averse players have a utility function given by

$$U_i(x) = x_i - \alpha_i \max\{x_j - x_i, 0\} - \beta_i \max\{x_i - x_j, 0\}$$

Trust contracts: Suppose that the principal can only offer a trust contract. **Show that:**

(a) The selfish principal offers $w = 0$ which is accepted by the selfish agent (who chooses $e = 1$) and rejected by the fair agent. It yields an expected monetary payoff of $M^P = 6$ for the principal and $M^A = 0$ for the agent.

(b) The fair principal offers $w = 5$ which is accepted by both agents who both choose $e = 1$. What monetary payoffs does it yield for the principal and for the agent?

Incentive Contracts: Suppose that the principal can only offer an incentive contract. **Show that:**

(c) A selfish principal offers $(w = 4, e = 4, f = 13)$ which is accepted by a selfish agent (who chooses $e = 4$) and rejected by a fair agent. This contract yields an expected monetary payoff $M^P = 15.6$ to the principal and $M^A = 0$ to both types of agent.

(d) A fair principal offers $(w = 17, e = 4, f = 13)$ which is accepted by both types of agents, all agents choose $e = 4$. What are the monetary payoffs to the principal and to the agent?

(e) When given a choice between trust and incentive contracts, which will all principals choose in equilibrium? What are the expected monetary payoffs to the principal and to the agent (where the expectation is taken over the different types of principals).

Bonus Contracts: Suppose now that the principal can only offer a bonus contract. With this contract the principal has to move twice, at stage 1 when she offers the contract and at stage 3 when she decides on the bonus payment. Thus, the contract offer can be a signal about the principal's type and the agents will update their beliefs about it. **Show that:**:

(f) There cannot be a separating equilibrium in which different types of principals make different wage offers. (Hint: Assume there is one and prove by contradiction).

(g) All pooling equilibria can be characterized as follows: Both principals offer $w, 0 \leq w \leq 15$, at stage 1. The selfish agents choose e = 7. The fair agents reject if $w < 5$, accept and choose $e = 1$ if $5 \leq w \leq 10$ and accept and choose $e = 2$ if $10 < w \leq 15$. The selfish principal does not pay a bonus at stage 3. The fair principal chooses $b(e) = max\{5e - w + \frac{c(e)}{2}, 0\}$.