On-Line Appendix
Groupy vs. Non-Groupy Social Preferences: Personality, Region, and Political Party

By RACHEL E. KRANTON AND SETH G. SANDERS*

AER Papers and Proceedings, May 2017.

This Appendix provides the empirical methodology for the social preference estimation, as well as the parameter estimates and the precision of fit of individuals to utility function types.

The income allocation tasks consisted of 26 different 2x2 allocation matrices with income to self and to another participant. All 26 matrices were (randomly) presented to subjects in each of the matches: control, Own-group, and Other-group. Following the methods of Fehr & Schmidt (1999), Charness & Rabin (2002), and Chen & Li (2009), these matrices, the collection of which is provided in Kranton, Pease, Sanders, and Huettel (2016), were designed to capture four different kinds of social preferences. Consider *i*'s choice in a normalized matrix $\begin{bmatrix} \pi_i & \pi_j \\ \pi_i' & \pi_j' \end{bmatrix}$, where *i* earns weakly more in the top row than the bottom. The choice of the top row is consistent with being "selfish." Choosing the bottom row, the subject sacrifices own income and exhibits preferences for: (1) "inequity aversion" if $|\pi'_i - \pi'_j| < |\pi_{i,} - \pi_j|$, (2) "maximizing total income" if $\pi'_i + \pi'_j > \pi_{i,} + \pi_j$, (3) "dominance-seeking" if $\pi'_i - \pi'_j > \pi_{i,} - \pi_j$.[1] A choice could involve more than one objective, and the structural estimation below distinguishes these motives.

Subjects received a $2 participation wage and received bonus payments for three different choices, each selected at random from the three matches—control, Own-group, and Other-group. The bonus payments were some fractions of $1 so participants received no more than $5 for the experiment. Payment was made to both the decision maker and to the recipient using standard MTurk payment methods.

[1] Previous literature has used some different terminology, e.g., total income maximizing has been called "social welfare maximizing" and "dominance-seeking" has been called "spitefulness" and "competitiveness." We choose total income maximizing since the utility function below is concerned only with income of others, not utility, and we choose dominance-seeking since it describes a subject who wants to decrease another subject's income relative to his own (whereas "competitiveness" in many economic settings leads to efficiency and alternatives such as "inequity loving" do not indicate the direction of the inequity).

To allow for the above social preferences and for continuity with previous studies, we adapt the utility specification of Fehr & Schmidt (1999), Charness & Rabin (2002) and Chen & Li (2009). Utility derives from π_i and the divergence between own and other's income, $(\pi_i - \pi_j)$, depending on whether $\pi_i \geq \pi_j$ or the reverse. Let

$$U_i(\pi_i, \pi_j) = \beta_i\pi_i + \rho_i(\pi_i - \pi_j)r + \sigma_i(\pi_j - \pi_i)s \ ,$$

where β_i is the weight on own income, ρ_i is the weight on income difference when $\pi_i \geq \pi_j$, r is an indicator variable for $\pi_i \geq \pi_j$, σ_i is the weight on income difference when $\pi_i < \pi_j$, and s is an indicator variable for $\pi_i < \pi_j$. Combinations of utility function parameters yield the four motives discussed above.[2]

The experimental design generates panel data, i.e., multiple choices for each individual, and thus it is possible to estimate a finite mixture model. It is assumed there is a finite number of types in the population, and each type t is characterized by utility parameters $(\beta_t, \rho_t, \sigma_t)$, and each type t is a proportion of the population p_t, where $\sum_t p_t = 1$. We estimate four types, i.e., four sets of utility parameters $(\beta_1, \rho_1, \sigma_1)$, $(\beta_2, \rho_2, \sigma_2)$, $(\beta_3, \rho_3, \sigma_3)$, $(\beta_4, \rho_4, \sigma_4)$, and four proportions (p_1, p_2, p_3, p_4), where μ denotes the full set of utility parameters and proportions. We choose four types because it is the minimum number that could capture four distinct motives.[3] While we estimate four types, it is important to emphasize that it is the data that yields the utility parameters and proportions of each type. That is, there is no presumption, a priori, that the types map into the four motives outlined above.

If each individual's type were known, we could estimate a binary choice model for choosing the bottom row in each matrix for the T individuals of type t. Assuming an extreme value distribution for the error terms, the parameters could be estimated for type t individuals by maximizing:

$$L(\beta_t, \sigma_t, \rho_t) = \prod_{i=1}^{T} \prod_{m=1}^{26} \Lambda_{mi}(\beta_t, \sigma_t, \rho_t | \pi_i, \pi_j)^{d_{mi}} \left(1 - \Lambda_{mi}(\beta_t, \sigma_t, \rho_t | \pi_i, \pi_j)\right)^{1-d_{mi}}$$

where

[2] Given $\beta_i > 0$, if $\rho_i = \sigma_i = 0$ then an individual places no weight on π_j; he is then *(purely) selfish*. If $\rho_i < 0$ and $\sigma_i > 0$ and $\beta_i + \rho_i - \sigma_i > 0$, utility is always increasing in both π_i and π_j, which corresponds to *total income maximizing*. The weights on π_i and π_j are not necessarily the same, but since marginal utility is always positive for both own and other's income, a person with such parameters would opt for an allocation that is higher in either or both. If $\rho_i < 0$ and $\sigma_i < 0$, an individual is *inequity averse*, since utility is always increasing when π_i and π_j are closer together. If $\rho_i > 0$ and $\sigma_i < 0$, then utility always increases when i's income rises relative to j's income, which corresponds to *dominance seeking*.

[3] We find estimation of five or more types does not yield qualitatively more information for the purposes of our analysis.

$$\Lambda_{mi}(\beta_t, \sigma_t, \rho_t) = exp\left(U_{mi}^{bot} - U_{mi}^{top}\right) / \left(1 + exp\left(U_{mi}^{bot} - U_{mi}^{top}\right)\right)$$

and

$$\left(U_{mi}^{bot} - U_{mi}^{top} | \beta_t, \sigma_t, \rho_t\right) = \left(\begin{array}{c} \beta_t\left(\pi_{i,m}^{bot} - \pi_{i,m}^{top}\right) + \\ \rho_t\left(\left(\pi_{i,m}^{bot} - \pi_{j,m}^{top}\right) \cdot r^{bot} - \left(\pi_{i,m}^{bot} - \pi_{j,m}^{top}\right) \cdot r^{top}\right) + \\ \sigma_t\left(\left(\pi_{i,m}^{bot} - \pi_{j,m}^{top}\right) \cdot s^{bot} - \left(\pi_{i,m}^{bot} - \pi_{j,m}^{top}\right) \cdot s^{top}\right) \end{array} \right).$$

Since we do not know each individual's type, we condition on an individual being a type and then sum over the distribution of types. That is, for four types, we estimate

$$L(\mu) = \prod_{i=1}^{1198} \prod_{m=1}^{26} \prod_{t=1}^{4} p_t \Lambda_{mi}\left(\beta_t, \sigma_t, \rho_t | \pi_i, \pi_j\right)^{d_{mi}} \left(1 - \Lambda_{mi}\left(\beta_t, \sigma_t, \rho_t | \pi_i, \pi_j\right)\right)^{1-d_{mi}}$$

where (p_1, p_2, p_3, p_4) is estimated along with the utility parameters for each type and $\Lambda_{mi}\left(\beta_t, \sigma_t, \rho_t | \pi_i, \pi_j\right)^{d_{mi}}$ is defined analogously to the above.

While the methodology is different, the results confirm the findings of previous studies of social preferences (e.g., Andreoni & Miller (2002) and Fisman, Kariv & Markovits (2007)) that most individuals are well described by a small set of distinct utility types. Table 1 provides the parameter estimates and estimated mixing proportions from the control condition: about 30% of subjects are selfish, 40% inequity averse, 25% total income maximizers, and 6% dominance seekers.[4] Table 2 shows the precision with which subjects are categorized into these types in the control and for Own and Other matches.

[4] These proportions largely replicate Kranton, Pease, Sanders, and Huettel (2016).

TABLE 1— MIXTURE MODEL RESULTS:
UTILITY FUNCTION TYPES AND SOCIAL PREFERENCES

	type1	type2	type3	type4
Beta	0.24	0.0656	0.0436	0.0197
	(0.008)	(0.003)	(0.001)	(0.002)
Rho	-0.0145	-0.0262	-0.0458	0.0098
	(0.001)	(0.001)	(0.001)	(0.002)
Sig	0.00965	0.00113	-0.00898	-0.0261
	(0.001)	(0.001)	(0.001)	(0.003)
Prop	30%	25%	40%	6%
	(1.4%)	(1.5%)	(1.6%)	(0.8%)
	SELF	TOT	INE A	DOM
Obs	30,322	30,322	30,322	30,322

TABLE 2— POSTERIOR PROBABILITIES OF BEING CLASSIFIED A TYPE

PANEL A: CONTROL

Types	Obs.	Mean	Std. Dev.	Post Prob. > 0.80
SELF (Type 1)	381	0.990	0.052	377
TOT INC(Type 2)	326	0.924	0.130	272
INQ A (Type 3)	512	0.966	0.081	481
DOM (Type 4)	79	0.939	0.129	68
All Types	1298	0.961	0.096	1,198

E

PANEL B: OWN GROUP MATCHES

Types	Obs.	Mean	Std. Dev.	Post Prob. > 0.80
SELF (Type 1)	418	0.980	0.070	404
TOT INC(Type 2)	110	0.845	0.137	81
INQ A (Type 3)	735	0.979	0.077	705
DOM (Type 4)	25	0.965	0.104	23
All Types	1288	0.967	0.091	1,213

PANEL C: OTHER GROUP MATCHES

Types	Obs.	Mean	Std. Dev.	Post Prob. > 0.80
SELF (Type 1)	451	0.975	0.079	422
TOT INC(Type 2)	130	0.845	0.144	89
INQ A (Type 3)	643	0.968	0.087	604
DOM (Type 4)	64	0.972	0.095	61
All Types	1288	0.959	0.100	1,176

REFERENCES

Andreoni, James and John Miller. 2002. "Giving according to GARP: An Experimental Test of the Consistence of Preferences for Altruism," *Econometrica* 70(2), pp. 737-753.

Charness, Gary and Matthew Rabin. 2002. "Understanding Social Preferences with Simple Tests," *The Quarterly Journal of Economics* 117(3), August 2002, pp. 817-869.

Fehr, Ernst and Klaus M. Schmidt. 1999. "A Theory of Fairness, Competition, and Cooperation," *Quarterly Journal of Economics* 114(3), pp. 817-68.

Fisman, Raymond, Shachar Kariv, and Daniel Markovits. 2007. "Individual Preferences for Giving." *American Economic Review*, 97(5), pp.1858-1876.

Kranton, Rachel, Matthew Pease, Seth Sanders, and Scott Huettel. 2016. "Groupy vs. Non-Groupy Behavior: Deconstructing Group Bias," working paper, Duke University. .