UNIVERSITÀ DEGLI STUDI DI FERRARA
DIPARTIMENTO DI ECONOMIA ISTITUZIONI TERRITORIO
Via Voltapaletto, 11 – 44100 Ferrara

Quaderno n. 8/2008

March 2008

Social *vs.* Risk Preferences under the Veil of Ignorance

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Abstract

This paper reports experimental evidence from a series of a simple Dictator Games in which, randomly matched in pair, subjects choose repeatedly one out of four alternatives involving a pair of fixed monetary prizes, one for them and the other for an anonymously matched subject. While in some treatments player position (i.e. the identity of the best paid agent) is known in advance before subjects have to select their favorite option, in one treatment subjects choose under "the veil of ignorance", only knowing that either role is equally likely. Finally, we also collect evidence from another treatment, in which the same options correponds to binary lotteries, in which subjects may win one prize or the other with equal probability. Subjects' decisions are framed in the realm of a simple mean-variance utility maximization problem, where the parameter associated to the variance is interpreted (depending on the treatment) as a measure of risk or inequality aversion, or some combination of the two.

KEYWORDS: Social preferences, risk preferences, functional identification
JEL CLASSIFICATION: D86

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*We are grateful to Maria Elena Bontempi, Jaromir Kovarik, Susanna Mancinelli, Elena Martinez, Nora Piva and José Antonio Porto for stimulating comments and suggestions. We are also especially thankful to Antonio Cabrales, Raffaele Miniaci and Marco Piovesan, whose paper [5] provided us with motivation, the experimental design and part of the experimental evidence. Usual disclaimers apply. Financial support from the Generalitat Valenciana (GV06/275) and the Instituto Valenciano de Investigaciones Económicas (IVIE) is gratefully acknowledged.

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1 Introduction

At first sight, *risk* and *inequity* aversion appear to be rather unrelated concepts. By the former, we refer to "the reluctance of a person to accept a bargain with an uncertain payoff rather than another bargain with a more certain, but possibly lower, expected payoff"; by the latter, "the preference for fairness and resistance to inequitable outcomes."[1] This consideration notwithstanding, these concepts can be related on several grounds. The first, intuitive connection comes from the fact that, no matter how you want to operationally define them, they both rely on some measure of *distance* (or distribution) *of outcomes*. In this respect, a risk-averse individual is willing to accept a lower expected reward in search of a smaller outcome variability and -by the same token- an inequity averse individual is willing to opt for a poorer society, if this implies less income inequality.

The hypothetical frame of the *veil of ignorance* (VOI hereafter) is built exactly upon this intuitive similarity. Rousseau's [22] *original position* is, probably the first example of the VOI: the simple idea is to look at constitutional rules from the point of view of an outside observer, not knowing which will be our *role* (say: income, social status, opportunities) in the society. A similar viewpoint is taken by John Rawls' [21] influential book, *The Theory of Justice*, in which the VOI is applied to put forward the *maxmin* principle, as the (rational) principle to implement social justice. As it is well known, this view has been strongly criticized by John Harsanyi's treatment of the VOI, by which the utilitaristic approach is justified by the fact that the preferences of an "impartial and sympathetic" observer should be concerned with ". . . *the welfare of each participant but having no partial bias in favor of any participant...* (p. 49)". At the core of this line of argument lies the idea that *it is possible to make distributional judgements taking expectations over purely self-interested preferences*, once the probability (and the associated risk) of being any "participant" in the society is properly taken into account. In this respect, it is exactly the VOI hypothetical frame which provides purely self-interested preferences with a distributional taste.

Thirty years later, many economists are now used to think that distributional (or "social") preferences may well exist even without the fictitious frame of the VOI. This view has been largely influenced by the vast experimental literature showing that subjects, in many classic experimental protocols, exhibit *social* (i.e. interdependent) preferences, with a strong

[1] Both definitions are borrowed from the correponding entries of *Wikipedia* (http://www.wikipedia.org).

taste against inequality.[2] This, implicitly, challenges Harsanyi's claim, unless it is provided a suitable frame in which we can disentangle risk from distributional concerns, when it comes to situations in which individuals have to choose among risky prospects which affect the well-being of others.

In this respect, there is a growing empirical literature which use questionnaire data to jointly estimate risk and distributional preferences under several functional forms. Paradigmatic is the case of Carlsson *et al.* [7], who measure subjects' preferences for risk and inequality through choices between imagined societies and lotteries. They also collect personal information on the socio-demographic characteristics of their subject pool, concluding that " ... *(even under the veil of ignorance) many people appear to have preferences regarding equality per se. We have also found that both relative risk aversion and inequality aversion vary with sex and political preferences. On average, women and left-wing voters have higher parameter values for both relative risk aversion and inequality aversion*" (p. 391).[3]

In this literature, subjects mainly face hypothetical situations and, in this sense, their viewpoint resembles that of Harsanyi's "impartial and sympathetic observer". To the best of our knowledge, this is the first paper in which risk and distributional concerns are estimated using observations from subjects' actual decisions (that is, *decisions which directly affect their own, together with others', financial rewards* in the experiment).[4]

To this aim, we borrow the design (and part of the experimental evidence) from the work of Cabrales *et al.* [5], who set up a complex 3-phase experimental design to estimate subjects' distributional and reciprocity concern (within the realm of Charness and Rabin's [8] model, C&R hereafter) to explain (and predict) their behavior in a stylized (matching) labor market. Distributional preference parameters are estimated in the first phase of the experiment, a simple Dictator Game in which subjects repeatedly select their favorite option among a fixed menu, which changes at every round, of four options which consist in two monetary prizes, one for them, one for another (randomly and anonymously matched) subject participating to the experiment.

In the experiment, player position (i.e. the identity of the best paid agent) is constant across options, and known in advance by subjects before they have to make their decisions. While Cabrales *et al.* [5] employ C&R's model to estimate subjects' purely distributional preferences, we do

[2] The experimental evidence is well summarized in the excellent surveys of Fehr-Schmidt [13] and Sobel [23].

[3] See also Amiel *et al.* [2], Kroll and Davidovitz [19]and Bosmans and Schokkaert [4]

[4] In this respect, our experimental setting is closer to that of Horish [18].

so by means of a simple mean-variance utility function in which the parameter associated with the variance, basically, estimates subjects' inequality aversion.

In this paper, we also complement Cabrales *et al.*'s [5] evidence with two additional treatments in which

1. the same sequence of choices is made under the VOI, that is, before being acknowledged of their player position, but knowing that either role is equally likely and;

2. the same sequence of choices is under a "lottery frame", in which player position is unknown (and equally likely), but no other subject is involved in the decision.

Also for these new treatments, subjects' decisions are framed by the same mean-variance behavioral model, where, for the lottery treatment, the parameter associated with the variance reflects pure risk attitudes, while in the VOI treatment, supposingly, both risk and inequality concerns condition subjects' decisions. In this respect, the exercise here is rather different from that of the literature cited above: instead of disentangling risk by inequality by functional identification, we exploit the experimental methodology by designing specific economic environments which are characterized by the presence of either variable (or a combination of the two), checking how these alternative specifications of the strategic setting affect the estimates of the *same parameter,* under the same statistical model. Finally, we also conditions our estimates to our subject pool's socio-demographic characteristics we infer from a detailed questionnaire, administered to all subjects at the end of each section.

The remainder of this paper is arranged as follows. In Section 2 we briefly describe our experimental design, where in Section 3 we present the results of our econometric exercise, Finally, Section 4 concludes, followed by an Appendix containing the experimental instructions.

2 Experimental design

In what follows, we describe the features of our experimental environment.

2.1 Sessions

We run sessions each under four different treatments, T_1 to T_4 (2 sessions in case of T_4, 3 sessions for each of the other treatments). All 11 experimental sessions were conducted at the Laboratory of Theoretical and Experimental Economics (LaTEx), of the Universidad de Alicante. A total of 264 students (24 per session) were recruited among the undergraduate population of the Universidad de Alicante -mainly, students from the Economics Department with no (or very little) prior exposure to game theory. The experimental sessions were computerized. Instructions were read aloud and we let subjects ask about any doubt they may have had.[5] In all sessions (but those of T_4), subjects were divided into two *matching groups* of 12, with subjects from different matching groups never interacting with each other throughout the session. Given this design feature, we shall read the data under the assumption that the history of each matching group (6 in total, for each treatment T_1 to T_3) corresponds to an independent observation.[6]

The experimental layout of treatments T_1 to T_3 was rather complex. In all sessions, subjects played three *phases,* P_1 to P_3, of increasing complexity, for a total of 72 rounds (24 rounds per phase). In this paper, we shall only report on evidence of the first *phase* of the experiment (i.e. the first 24 rounds), P_1.

In P_1, the timing for each round t and matching group is as follows:

1. At the beginning of the round, six pairs are formed at random.

2. Then, after being informed about the choice set $C_t = \{b^k : k = 1, ..., 4\}$, $b^k = (b_1^k, b_2^k)$ -where b_1^k corresponds to player i's monetary payoff (with $b_1^k \geq b_2^k$)- each subject has to choose her favorite option.

3. Once choices are made, all relevant information is revealed and payoffs are distributed.

2.2 Treatment

We now explain the details of the four experimental treatment condition

2.2.1 T_1 : The control treatment

In T_1, choices are made by subjects conditional of being informed of their player (i.e. their relative) position within the pair. Remember that, since

[5] The experiment was programmed and conducted with the software z-Tree (Fischbacher, 2007). The complete set of instructions, translated into English, can be found in the Appendix.

[6] Clearly, the same does not apply in case of T_4 in that, since each subject faces individual decisions, each subject's experimental history corresponds to an independent observation.

$b_1^k \geq b_2^k$ for all k, player 1 (2) looks at the distributional problem implicit in the choice of an option from the (dis)advantageous viewpoint. Once choices are made, another iid draw fixes the identity of the *Dictator* (for that couple and round), that is, the subject whose choice determines the monetary rewards for that pair and round.

In T_1, *subjects alternate player and Dictator positions in a (iid) random fashion.* This, in turn, implies that:

1. thanks to the strategy method, we are able to track the choices of both the Dictator and the non Dictator;

2. since subjects experience both player positions across rounds, fairness can be achieved by *i)* choosing options with smaller variability across players or *ii)* selecting options very unfair for the disadvantaged Player 2, and letting random player allocation achieving fairness across rounds.

2.2.2 T_2 : Fixing player position

In T_2 we modify the control treatment, T_1, in two respects:

a) Subjects experience one player position only, either Player 1 or Player 2, throughout the entire experiment and

b) we don't apply the strategy method, in that a public random draw selects the Dictator *before* agents are asked to pick up their favorite contract. While the Dictator decides, the other player simply waits for the result.

The reason for these modifications was exactly to check the robustness of our estimations under two alternative specifications of the design features highlighted by points 1. and 2. in the previous section.

2.2.3 T_3 : The VOI control treatment

In T_3 we modify the control treatment, T_1, by introducing the VOI. Here subjects make their choice not knowing their player (i.e. their relative) position, but only knowing that each position is equally likely. Everything else is just as in T_1, in particular the fact that subjects alternate player and Dictator positions in a (iid) random fashion.

2.2.4 T_4 : The lottery treatment

Finally, our lottery treatment T_4 replicates T_3 *at the individual level:* player position is uncertain (and equally likely), but each subject decides in isolation, without any payoff externality on others.

2.3 The Questionnaire

At the end of each session, subjects were asked to answer a detailed questionnaire to which we distilled the following variables, which will be used in Section 3.3:

1. **gender**=1 for females;
2. **RiskLover**$\in [0, 1]$, indicating the relative frequency of "risky" choices in a series of 5 binary lotteries Holt and Laury's [17] style.
3. **WorkedLastWeek**$\in \{1, 6\}$, a proxy of subjects' disposable income.
4. **RoomSizeRatio**: the ratio between number of rooms in the main residence and the number of the family members (i.e., a proxy of the family's wealth).
5. **InequalityAnswer**$\in \{0, 1\}$. A classic test of concerns for inequality, contained in many Social Capital questionnaires. **Q.** "*Consider the following situation: Two secretaries with the same age do exactly the same work. However, one of them earns 20 euros per week more than the other. The one that is paid more is more efficient and faster, while working. Do you believe it is fair that one earns more than the other?*". **IA**$= 1$ if the answer is no, and 0 otherwise.
6. **PARents**$\in \{0, 1\}$. Another classic question. Choose between "*Independently of the qualities and deficiencies of parents, they should always be loved and respected*" (**PAR**=0) and "*Parents who have not earned the love by their attitudes and behavior should not be loved*" (**PAR**=1).

3 Estimating social and risk preferences

In this Section, we propose a simple econometric model by which we simultaneously estimate subjects' risk and distributional preferences. In what follows, i (and j) identify our subjects in T_4 (matched in pair in T_1 to T_3).

Let $\mu(k) = \frac{b_1^k + b_2^k}{2}$ and $\sigma(k) = \sqrt{(b_1^k - \mu(k))^2 + (b_2^k - \mu(k))^2}$ denote the arithmetic mean and standard deviation of the monetary payoffs associated with option k, respectively. We assume that subject i's preferences by choosing option $k = 1, ...4$, are defined by the following

Definition 1 (Mean-Variance Preferences)

$$u_i(k) = v_i(k) - \gamma_i \sigma(k) + \varepsilon_i^k, \tag{1}$$

where $v_i(k) = b_i^k$ in treatments T_1 and T_2 and $v_i(k) = \mu(k)$ in treatments T_3 and T_4, and ε_i^k is an idiosyncratic error term (with zero mean and fixed variance) to facilitate estimation. In other words, we postulate that subjects evaluate options by way of a simple mean-variance utility function (with noise), where γ_i measures, depending on the treatment, i's sensitiveness either to risk or to inequality aversion (or some combination of the two).

In particular:

1. As for T_1 and T_2, γ_i is clearly a measure of pure distributional concern. Since, in both treatments, subjects are informed about their player position before they have to decide their favorite option, using Fehr and Schmidt's [12] terminology, we can think of γ_1 as a measure of "guilt", and γ_2 as a measure of "envy".

2. In T_4 subjects face ordinary binary lotteries. In this case, γ_i measures "pure" risk aversion (with $\gamma_i = 0$ indicating the null hypothesis of risk-neutrality).

3. Also in T_3 i chooses among lotteries, but this decision has distributional consequences for player j, too. In this sense, we expect γ_i to capture some combination of both effects, one related to risk, the other related to inequality.

According to this notation, subject i chooses contract $\hat{k}$ at round t if

$$\hat{k} = \arg\max_k \{u_i(k)\}.$$

Under the assumption that the stochastic term ε_i^k is iid with an extreme value distribution, the probability that individual i chooses the contract k at round t is therefore

$$\Pr\left(y_{it} = \hat{k}\right) = \frac{\exp\left(u_i(\hat{k})\right)}{\sum_{k=1}^{4} \exp\left(u_i(k)\right)}. \tag{2}$$

Notice that (2) allows for parameter heterogeneity across subjects. Thus, the iid assumption does not stem from neglected individual unobserved heterogeneity, and it is consistent with the random order of the four contracts in the choice set C_t. In what follows, we shall provide estimates of (2) for different models specifications.

3.1 Model 1: constant parameter

In this Section, we estimate (2) assuming that $\gamma_i = g_0$, that is, γ_i is a constant parameter. We shall propose two sets of estimates: one in which (2) is applied to each subject participating in the experiment (using 24 observations for each individual estimate), one in which we impose a constant (i.e. a pool) estimate within each treatment, T_1 to T_4.

Figure 1 reports the distributions of individual γ_i, disaggregated for treatment condition, T_1 to T_4.

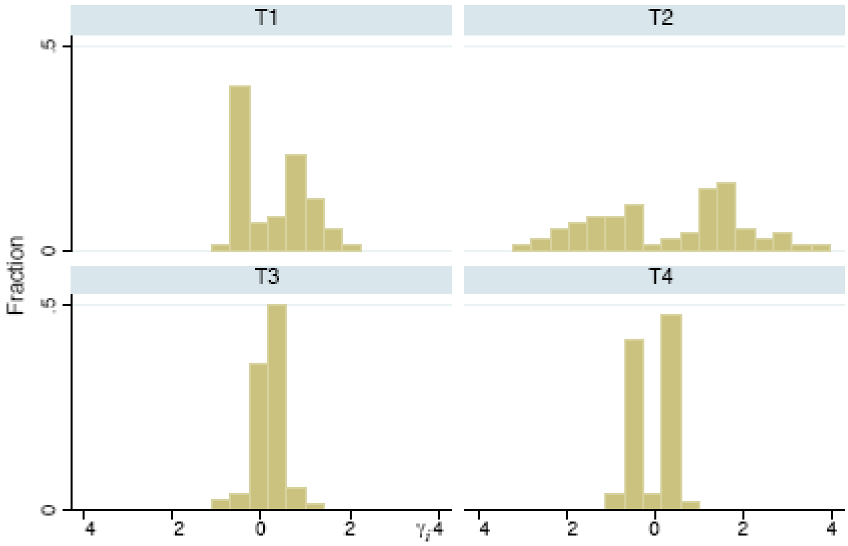

Figure 1. Individual estimates of γ_i

As Figure 1 shows, distributions are positively skewed (i.e. for which aversion to inequality and/or risk is predominant) and, with the exception of T_3, bimodal. These two features have different implications, depending on the treatment under consideration. For example, while in T_4 bimodality implies a basic heterogeneity with respect to risk attitudes, in T_2 bimodality may reflect heterogeneous concerns to inequality, depending on the relative position within the pair (remember that in T_2 player positions are constant across rounds).[7]

In Table 1 we report estimates of γ_i "pooled" by treatment, i.e. when (**??**) is estimated under the assumption that γ_i is constant across treatment T_h (i.e. $\gamma_i = g^h$, $h = 1, ..., 4$).

	Coeff.	*Std. err.*	$p - value$	*95% conf. int.*	
g^1	.1889	.0215	0.000	.14675	.231
g^2	.1744	.0747	0.020	.02797	.3208
g^3	.2451	.0093	0.000	.22683	.26333
g^4	.1712	.0279	0.000	.11645	.22586

Table 1: Pool estimates of γ_i

As Table 1 shows, all estimated parameters are significantly greater than zero, indicating aggregate inequality/risk aversion. As for the comparison across treatments, we notice that T_3 is characterized by the highest value for γ, and T_2 by the highest dispersion. The only significant differences between parameters are those between T_3 and T_1 (T_4), which are significant at the 1.6% (1.2%) confidence level, respectively. In other words, this seems to suggest that, in T_3, subjects' actions seem to be guided by motives that cannot be explained by inequality aversion (as in T_1) or risk aversion (as in T_4) alone.[8]

3.2 T1 *vs.* T2: conditioning for player position

In this Section, we shall condition (wherever possible, that is, in T_1 and T_2) the estimate of γ_1 upon player position, getting separate estimates (and independent, in case of T_2, where subjects hold the same position throughout the experiment). In other words, consistently with Fehr and Schmidt [12], we can here identify what of "inequality aversion" is due to "guilt" (i.e. sensitiveness to payoff difference when enjoying an advantageous relative position), and what is due to "envy" (i.e. sensitiveness to player position when suffering the lower end of the stick). Let $L_i = (2 - i)$ be an index variable which equals 1 (0) for subjects in player position 1 (2):

[7] We shall return to this aspect later in Section 3.2, when we report pool estimates of γ_i for T_1 and T_2 conditioning for player position.

[8] By the same token, we notice that the sum of the estimated γ_i in T_1 and T_4 is significantly higher than the paramter estimated in T_3 (diff. .115, $z = 3.15$, $p = 0.002$).

$$\gamma_i = L_i g_1^h + (1 - L_i) g_2^h. \quad (3)$$

In Table 2 we report the estimated coefficients of $g_i^h; i, h = 1, 2$. Since, as we already discussed in Section 2.2.2. in T_2 we only keep track of the Dictators' choices, we drop all observations of T_1 where this is not the case.

g_0	*Coeff.*	*Std. err.*	$p-value$	*95% conf. int.*	
g_1^1	-.4326	.0328207	0.000	-.4969	-.368
g_2^1	.6936	.260513	0.008	.183	1.205
g_1^2	-.7168	.426751	0.093	-1.553	.12
g_2^2	1.565	.0329913	0.000	1.5	1.63

Table 2: Pool estimates of γ_i in T_1 and T_2 conditioning for player position

As Table 2 shows, in both treatments, the representative subject exhibits *status seeking* preferences (i.e. utility is decreasing in the other player's payoff, independently on player position), with higher distributional concerns on behalf of the disadvantaged player 2 and in case of T_2. In other words, when relative positions remain constant over time, (status-seeking) aversion to inequality is exacerbated.

3.3 Model 2: interacting with socio-demographics and Social Capital

As we already discussed in Section 2.3, we collected information on individual socio-demographics, risk and social attitudes. In Table 3, we condition the estimates of γ_i upon this personal information. To simplify the intricate structure of interactions that would be needed by running a single regressions (and taking into account the fact that no subject participated to more than one session/treatment), we run four separate regressions, one for each treatment.

Table 3. Estimates of γ_i conditioned on socio-demographics

In what follows, we shall comment on the role of each variable in the four regressions.

1. **gender** is (negative and) significant in T_1 only. In particular, despite the negative correlation between **gender** and **RL** (coeff. -0.2733, $p =$

0), women exhibit in T_4 an attitude to risk which is comparable to that of men, but do not show higher risk aversion in T_4.

2. **RL** is negative and significant for all treatments, except for T_3. While the coefficient for T_4 is easy to rationalize (subjects with less risk averse attitudes according to the questionnaire, also reveal lower risk aversion thought their experimental decisions), the same result is more difficult to interpret in case of T_1 and T_2.

3. **WLW** is significant in T_1 and T_3 only, with opposite sign, indicating a lower concern for inequality on behalf of subjects with higher disposable income who, at the same time, are more risk/inequality averse when choosing under the VOI.

4. **RoomSizeRatio** is (positive and) significant in T_1 and T_4 only.

5. **IA**. Not surprisingly, this variable is highly (positively) significant in T_1 and T_3 (but not in T_2, where an estimation conditional to player position would be more appropriate for this purpose). It is more intriguing the fact that IA is also positively affecting the estimate for risk aversion in T_4.

6. **PAR**. By the same token, it is not transparent the (positive and) significant relation between PAR and the risk-aversion estimate of γ_i in T_4 (and T_4 only).

4 Conclusion

Our study confirms that risk and inequality aversion are distinct, but related, concepts on more than one dimension. First, as we saw in Section 3.1, their magnitude is similar in situations in which only one of these factor is present, but they do not perfectly substitute each other in situations in which, such as that of the VOI, they both act on the same decision process. Looking at socio-demographic determinants, we also see that the same personal characteristics operate in rather different ways, depending on whether only risk or inequality characterizes the choice environment, or both. In addition, typical proxies for risk attitude (such as our **RL** variable) have a significant impact in subjects' distributional choice, so as typical Social Capital proxies have a significant impact on purely risky decisions.

Next step in the analysis would be to use such a rich database to attempt the functional identification exercise carried out by the literature we cited in the introduction. In our setting, this exercise may be complicated by the fact that subjects, through their decisions, directly affect the level of risk and/or inequality that characterizes the environment, so that usually assumptions such as "constant" relative (or absolute) risk [inequality] aversion are very hard to achieve (at least, with sufficiently "portable" utility functional specifications).

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i	Coef.	Robust Std. Err.	Z	P>z	[95%Conf.	Interval]
gender	-.5084824	.1933779	-2.63	0.009	-.887496	-.1294687
RL	-.7404646	.2447184	-3.03	0.002	-1.220104	-.2608254
WLW	-.0703946	.0392035	-1.80	0.073	-.1472321	.0064428
RSR	.2933679	.0923997	3.17	0.001	.1122679	.4744679
IA	.5546606	.1458157	3.80	0.000	.268867	.8404542
PAR	.2132141	.1334673	1.60	0.110	-.048377	.4748052
const.	.1088606	.2548725	0.43	0.669	-.3906804	.6084015

T1

i	Coef.	Robust Std. Err.	Z	P>z	[95%Conf.	Interval]
gender	.1990619	.5628741	0.35	0.724	-.9041511	1.302275
RL	-.9218785	.8792918	-1.05	0.294	-2.645259	.8015018
WLW	.1275199	.0591158	2.16	0.031	.0116551	.2433847
RSR	-.2206764	.1692358	-1.30	0.192	-.5523725	.1110196
IA	-.1182409	.2019921	-0.59	0.558	-.5141382	.2776564
PAR	-.0142805	.2956002	-0.05	0.961	-.5936463	.5650852
const.	.5860101	1.014338	0.58	0.563	-1.402056	2.574076

T2

i	Coef.	Robust Std. Err.	Z	P>z	[95%Conf.	Interval]
gender	-.0325223	.021243	-1.53	0.126	-.0741579	.0091132
RL	-.1159411	.053701	-2.16	0.031	-.2211931	-.0106892
WLW	-.0007792	.0094494	-0.08	0.934	-.0192997	.0177413
RSR	.0042689	.0114192	0.37	0.709	-.0181124	.0266502
IA	.0435397	.0221387	1.97	0.049	.0001487	.0869306
PAR	-.001484	.0090121	-0.16	0.869	-.0191473	.0161793
const.	.2892552	.044734	6.47	0.000	.2015781	.3769323

T3

i	Coef.	Robust Std. Err.	Z	P>z	[95%Conf.	Interval]
gender	-.0984323	.0814818	-1.21	0.227	-.2581338	.0612691
RL	-.7273696	.2277896	-3.19	0.001	-1.173829	-.2809102
WLW	-.0483744	.0361787	-1.34	0.181	-.1192834	.0225346
RSR	-.0560649	.0268807	-2.09	0.037	-.1087501	-.0033798
IA	-.1406967	.0835131	-1.68	0.092	-.3043793	.0229859
PAR	.1519787	.069652	2.18	0.029	.0154633	.2884942
const.	.5195515	.0947208	5.49	0.000	.3339022	.7052008

T4

Table 3