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Travellers' Types

Travelers' Types*

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Abstract

This paper uses subjects' self-reported justifications to explain discrepancies between observed heterogeneous behavior and the unique equilibrium prediction in a one-shot traveler's dilemma experiment (TD). Principal components (PC) analysis suggests that iterative reasoning, aspiration levels, competitive behavior, attitudes towards risk and penalties and focal points may be behind different choices. Such reasons are coherent with same subjects' behavior in other tests and experiments in which these particular issues are prominent. Overall, we identify types of subjects whose motivations are consistent across tasks.

Keywords: *traveler's dilemma, self-reports, principal components, experiments.*

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1 Introduction

The traveler's dilemma (TD) is one of the classic examples used to highlight discrepancies between the concept of rationality in Game Theory and the way real individuals take strategic decisions. As such, its intuitive outcome and the game theoretic prediction do not coincide. It was first introduced by Basu [3] to point out that discrepancies between game theoretic reasoning and actual behavior may not only occur due to problems with backwards induction, as it also may occur in single shot games.[1]

The original formulation of the TD is as follows:

> "Two travelers lose their luggage during a flight. Each travelers' luggage contains exactly the same object. To compensate for damages, the airline manager asks each traveler to independently make a claim for the value of the lost object between $\underline{c}$ and $\overline{c}$. To discourage false claims, the manager offers to pay each traveler the minimum of the two claims, plus a reward of p to the lowest claimant and minus a penalty of p to the highest claimant."

All standard game theoretic solution concepts predict that both players will select the lowest possible choice $\underline{c}$ and thus, the predicted outcome will be $(\underline{c}, \underline{c})$. This is the unique Nash equilibrium, the unique strict equilibrium, the unique strong equilibrium and the only rationalizable equilibrium. Yet, it seems intuitive that subjects may play differently since, for example, if they believe others will make high claims, choosing higher cs is beneficial for both subjects. Previous experimental evidence (Capra et al. [9], Capra et al. [10], Goeree and Holt [17]) shows that a significant proportion of experimental subjects choose values which are higher than the equilibrium prediction and that the size of the penalty (p) influences choices. In particular, lower penalties are associated to higher choices. Becker et al. [8] show that even a large proportion of experts in Game Theory do not choose according to the Nash prediction when playing an anonymous electronic version of the TD among them. Therefore, ignorance on how to reason in game theoretic terms cannot be the only reason behind the observed heterogeneous choices in TD experiments.

Previous theoretical attempts have focused on explaining convergence to the Nash prediction after repeated play in the TD.[2] However, we are interested in explaining the

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[1] "The traveler's dilemma seems to be one of the purest embodiments of the paradox of rationality in game theory, because it eschews all unnecessary features, like play over time or the nonstrictness of the equilibrium". (Basu, [3]).

[2] For example, Capra et al. [10] rationalize observed behaviour in repeated versions of the game through a learning process in a probabilistic choice model in which players update their beliefs about rivals while using a noisy best response.

underlying motivations behind subjects' intuitive and heterogeneous choices and thus we focus on initial play.[3]

Rubinstein [18], in a one-shot not rewarded TD experiment with an extensive sample, studies subjects' time responses under the hypothesis that more cognitive demanding choices take longer to be taken. Results confirm this hypothesis, although most non-extreme choices remain unexplained. We take a complementary approach in the aim to understand all heterogeneous behavior.

We asked for subjects' self-reported justifications of their choices in the TD. This approach is similar to Protocol Analysis, which has proven to be successful in psychological studies.[4] However, an structured use of variables emerging from unpaid questionnaires is far from being standard in economic experiments.[5] We find that not only choices are heterogeneous, but that alleged reasons behind those different choices in the TD are also consistently heterogeneous. Given such heterogeneity, we approach the TD as an ideal candidate to study different motivations behind subjects' experimental choices. We use independent research assistants to codify subjects' self-reports into variables and we then use principal components analysis (PC) in order to rationalize choices in the TD and classify subjects according to their most prominently alleged reasons. We find that some classic experimental issues such as cognitive complexity, payoff aspirations, social preferences, risk and penalty aversion and focal points are closely related to alleged reasons in our TD experiment.

We also took independent measures of same subjects' personal characteristics and behavior in other tasks and experiments. In particular and with respect to subjects' characteristics, we obtained subjects' scores in a GRE-type math test, subjects' self-evaluation in academic activities and gender. With respect to experimental measures, we obtained how much they give in a dictator game experiment and their choices when facing uncertainty in two different tasks. Given the intuitive relationship between subjects' self-reported justifications in the TD and these other measures, we check whether subjects prominently motivated by one particular feature in the TD also score high in the particular task or experiment designed to check such feature. For example, we study whether subjects reporting more cognitively complex reasoning procedures in the TD score high in the GRE-type test or whether subjects using antisocial justifications in the TD give less in dictator games. We obtain coherent and consistent relationships between both types of measures. Overall, we conclude that there exists different types

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[3]Crawford [14] argues that by foregoing repetition as a teaching device, one-shot experiments place a heavier burden on subjects' understanding, with a premium on simplicity and clarity of design.

[4]See Austin and Delaney [2], Crutcher [15] and Ericsson and Simon [16].

[5]There exists however an increasing tendency in Economics to use subjects' self-reports to explain laboratory choices and go beyond using this information as just anecdotal evidence. A successful example is Apesteguia et al.[1]

of subjects whose first intuitive response to a strategic situation are driven by different motivations and that such motivations are relatively consistent across tasks.

The paper is organized as follows. Section 2 introduces the experimental design and describes subjects' choices in the TD. Section 3 explains how PCs were extracted from subjects' self-reported comments. Section 4 shows how PCs explain subjects' choices in the TD. Section 5 studies the relationship between PCs and subjects' choices in other tasks and experiments. Section 6 concludes. Appendices contain instructions and data.

2   Experimental Design, Procedures and Results

The complete set of experimental data reported in this paper was collected during the spring semester 2005 in several sessions with first year Economics students at Universidad de Granada (Spain). Subjects were informed that the number of experimental points obtained during each of the sessions in which they would participate contributed to their final grade in their Microeconomics I course in the following way: the student in each of four sections who obtained the highest number of experimental points in total during the term would add three extra points (out of ten) to her final grade. Other subjects' grade depended on how close their performance was to the winner's in their section. Subjects were not informed of their performance and others' performances in any of the experiments and tasks until all experiments had concluded.[6]

The sequence of experiments carried out by subjects was as follows: a dictator game (March), a GRE-type math test (beginning of April), risk aversion experiments (end of April), and the session detailed below containing four tasks (June). Data from all sessions were gathered and added to an ongoing database at Universidad de Granada which contains information about subjects' behavior across experiments and their academic performance.

The final experimental sessions referred above (June) contained the traveler's dilemma experiment and are thus the main focus of this paper. In these sessions subjects performed four tasks: i) predict their relative performance in the final Microeconomics I exam with respect to other students in their class; ii) decide between a binary lottery and the outcome of a 2x2 game in which they played; iii) choose a number in a TD and give an explanation for their decision and iv) predict their overall performance in

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[6]Grade rewards allowed us to mitigate order effects by informing subjects of their results once all tasks had ended, which may not have been credible had we used monetary rewards. Rubinstein [18], in a TD experiment with no rewards reports a similar percentage of non-equilibrium choices to previous TD experiments with monetary rewards. Brañas-Garza [7] compares monetary rewards with grade points in Dictator Games and shows that extra-credit reward mechanisms increases subjects' payoff-maximizing behavior.

the courses taken during that term.

Experimental procedures for these final sessions were as follows: Once in the classroom and during the usual time slot for Microeconomics I, students were handed instructions for the four tasks. They were asked to perform the tasks in no particular order. With respect to the TD, they were informed that they had been randomly matched with another student from the same group. They were handed instructions and asked to choose a number in the interval $[20, 120]$, to which we will refer as their choice (b). They were also asked to voluntarily provide written comments -on the same answer sheet- on how they had reached their decision. After one hour, students handed back the answer sheets for all four tasks and left. Students were informed about their performance in all experimental sessions at the end of the course and graded accordingly, once all experiments had finished.

The TD was framed as two firms competing in prices, such that the content of the experiment could be used to explain oligopolistic competition in subsequent Microeconomics courses.[7] Notice that at the time of the experiment, subjects had received no lectures on oligopolistic competition nor on Game Theory. It is true that the frame may have not only affected subjects' choices but also their reasoning process, and thus the reasons behind our results may not perfectly apply to the TD but to a game with our frame. In any case, results below show that the distribution of heterogeneous choices was clearly similar to the usually obtained results in TD experiments with neutral frame. Thus, our experiment may help us study the same failures of rationality as in the original TD.

There were 243 subjects participating in the experimental sessions containing the TD; 241 turned in an answer for the TD game, although 3 subjects answered with an interval instead of a number so that these three observations were eliminated, leaving 238 valid observations of the TD.

There were two treatments varying in the size of the penalty p in the TD. Students in three groups (184 subjects) were assigned to the treatment with penalty size $p = 20$, while students in the fourth group (54 subjects) faced a penalty $p = 5$.[8]

Figure 1 shows the distribution of subjects' choices in the TD for the two penalty sizes.

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[7]The game is similar to a Bertrand duopoly in which firms have to choose prices from a given set. The analogy is not perfect since in our game, the firm choosing the lowest price does not sell to the whole market. However, it is sufficiently close to a duopoly model in which there is some product differentiation. In any case, few subjects mentioned the duopoly framing and subjects' explanations indicate that they understood the strategic situation they were facing.

[8]Previous experiments with the TD show that the Nash equilibrium is a relatively better prediction with high incentives (high p). Our highest penalty ($p = 20$) provides relatively lower incentives than the highest penalty in previous experiments designed to study how behavior changes with the penalty size (Capra et al. [10]). We did so expecting to obtain more heterogenous choices in the TD.

Figure 1: CHOICES AND PENALTY SIZE (N=238)
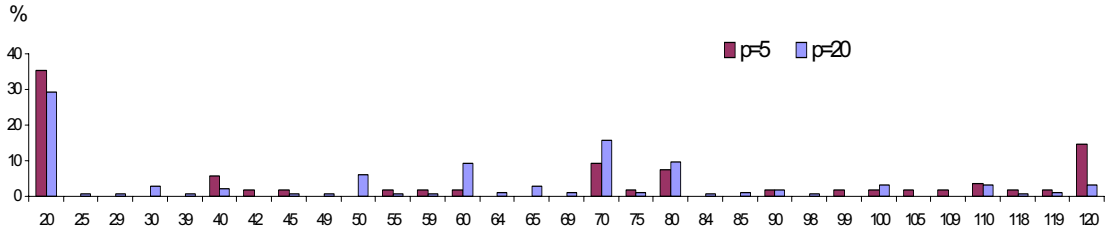
Although a significant percentage of subjects made Nash Equilibrium choices (c=20), a higher proportion of subjects in both treatments made different choices (65% with $p = 5$, 71% with $p = 20$). The distribution is similar to previous experimental tests of the TD and shows three peaks: i) the Equilibrium prediction ($c = 20$), ii) choices around the average of the interval ($c = 70$), and iii) the highest possible number ($c = 120$). The higher percentage of equilibrium choices may be partially explained by the Bertrand duopoly framing.[9] A Mann-Whitney test comparing the distributions under both penalty sizes shows that they are not statistically different ($z = -0.968$, $p-value = 0.33$) and thus we conclude that the size of the penalty made no difference.[10]

In sum, as in previous experiments on the TD, we observe a high percentage of non-equilibrium heterogeneous choices. In the following section we turn to subjects' own explanations of their behavior to study whether there were also heterogeneous reasons driving these choices.

3   Principal Components analysis

Codification of subjects' comments into variables

Our aim was to use an independent, systematic and judgement-free method to codify in a standard response format the comments voluntarily written by subjects after they had played the TD. We asked two independent research assistants to help us in this task.

First, we started by reading subjects' comments. We defined 26 ternary variables taking values $\{0, 1, 2\}$ and referring to the content in subjects' comments and its sign.

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[9]Suetens and Potters [21] review the experimental evidence on Betrand duopoly and find that Bertrand produces more collusive behavior than Cournot.

[10]Capra et al. [10] show changes in the distribution when varying the penalty size, but penalty changes were much more pronounced (from 5 units to 80 units, when choices could be made in the interval $[80, 200]$). Rubinstein [18] uses a single hypothetical $5 penalty when choices are made in a $[180, 300]$ interval.

If a subject's comment did not contain any information on a particular variable, such variable would take value zero, while it would take value 1 if the comment contained it and its effect went in one direction and 2 if the comment contained it but its effect went in the opposite direction. For example, the variable $Risk$ would take value 1 if the subject expressed that her decision was motivated to avoid risk, while it would take value 2 if it expressed that she was willing to take risks. The variable would take value 0 if risk was not mentioned.[11]

Second, our two independent research assistants (RAs) received instructions on how to codify subjects' comments into variables.[12] RAs were not informed of the objective of our study.[13] They were explicitly told that their task was to capture and classify what had been said rather than to interpret or rationalize subjects' choices.[14] Both RAs worked separately and independently and only met at the time of receiving instructions. There were no requirements on the number of variables used for each subject and RAs were allowed to create new variables if they thought they were necessary, although they did not do so. RAs returned two spreadsheets associating subjects' comments to variables.

No effort was made to force agreement between coders. One of the coders was more prone to classify comments into variables than the other. While coder 1 gave a positive value to 843 entries (13.62% out of $238 * 26 = 6188$ entries), coder 2 gave a positive value to 525 entries (8.48%). In any case, the degree of agreement between both coders was relatively high. Taking the average over the value of all original ternary variables for all subjects, both coders assigned the same value (0, 1 or 2) to 92.26% of them.[15] Coders never disagreed on the direction of the original ternary variables.

Once this information was collected, we duplicated the number of variables by transforming the ternary variables (0, 1 or 2) into dummy variables (0 or 1) reflecting the direction of the comment that the variable captures. For example, the variable $Risk$, became two variables: $Risk1$ (1 if wanting to avoid risk, 0 if it did not refer to risk) and $Risk2$ (1 if wanting to take risks, 0 if it did not refer to risk).[16]

Our analysis below shows that this codification of subjects' self-reports proved useful in explaining subjects' choices in the TD.

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[11] Variables $Calc$ and $Error$ were binary (0 or 1), as its content could not take different directions.

[12] The defintion of variables and written instructions given to RAs can be found in Appendix C.

[13] The RAs hold a BSc in Physics (coder 1) and a BSc in Mathematics (coder 2). At the time, they were enrolled in a PhD. program in Quantitative Finance.

[14] Our methods closely followed the methodology in Brandts and Cooper [4] and Cooper and Kagel [11].

[15] Maximum agreement was reached in variables $CutR$ and $Fair$ (100%) while minimum agreement occurred in variable $Zero$ (70.17%).

[16] Definitions for the ternary variables appear in the Instructions for coders in Appendix C, and from them it is inmediate to obtain the dummy variables.

Descriptive statistics of subjects' comments

Table 1 shows the percentage of subjects whose comments were reflected in our dummy variables (x) at least according to one of the coders. The table contains a brief description of the meaning of the variables. Variables are classified in five groups. The names used to describe these groups are only orientative and should help the reader, but they were never used in the analysis.

CONCERNS includes variables referring to subjects' motivations for their choices: attitudes towards risk, loss aversion, aspiration levels, etc.

REASONING refers to subjects' procedures to reach their decision: whether they wrote calculations on their answer sheets, used economic theories to help them make a decision, understood the game or thought they could reach a solution through logical reasoning.

STRATEGY refers to own decisions: choosing the middle of the interval or one of the extremes, undercutting the predicted rival's choices, or choosing (or not) a high value.

RIVALS refers to beliefs about rivals' choices: whether they mentioned a possible distribution for rivals' choices or had point beliefs, thought their rival would choose a high value, a higher value than their own, etc.

INTERDEPENDENT PREFERENCES includes variables reflecting equity considerations, appreciation for fairness or desire to compete.

Variables which both coders thought were absent were eliminated.[17] Notice that no subject mentioned choosing a number due to it being "an equilibrium" neither explicit equilibrium reasoning was found in subjects' comments. No individual mentioned imitating their rival. In contrast, some of them tried to coordinate –typically on 120.

There exists notable heterogeneity on the explanations given by subjects for their choices in the TD. Some reasons were mentioned by a low percentage of subjects. We eliminated from the following analysis those variables mentioned by less than 5% of the subjects. This leaves us with the 23 variables that appear with a $^+$ sign in Table 1.[18]

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[17]This was the case for variables $Penalty2$, $Lose2$, $Cut2$, $CutR2$, $Fair2$, 20_2, 120_2, and $Coord2$. $Theory2$ was eliminated for being redundant.

[18]Qualitative results form the remaining of the paper were maintained when all variables were included in the analysis.

Table 1: SUBJECTS EXPLANATIONS OF OWN CHOICES IN THE TD

x	%	Content	x	%	Content
	CONCERNS			STRATEGY	
$Risk1$	13.4^+	Risk averse	$Average1$	19.3^+	Average
$Risk2$	4.6	Risk loving	$Average2$	5.5^+	$\neq$ Average
$Zero1$	32.8^+	Win zero averse	20_1	1.3	Focal Point 20
$Zero2$	0.4	Win zero like	120_1	5.0^+	Focal Point 120
$Win1$	9.7^+	Win loving			
$Win2$	1.3	Win aversion	$Coord1$	1.7	Coordinate
			$Cut1$	10.5^+	Undercut rival
$Penalty1$	6.3^+	Penalty averse	$CutC1$	5.0^+	Undercut 1 unit
$Size1$	0.4	Penalty high	$CutC2$	3.4	Undercut >1 unit
$Size2$	0.8	Penalty low	$CutR1$	0.8	Undercut twice
$Lose1$	7.6^+	Loss aversion	$Low1$	17.6^+	Choice is low
			$Low2$	5.0^+	Choice is high
$Aspi1$	7.6^+	Aspiration low		RIVALS	
$Aspi2$	5.0^+	Aspiration high	$Prob1$	28.6^+	Probability beliefs
	REASONING		$Prob2$	0.4	Point beliefs
$Calc1$	20.2^+	Calculations	$High1$	14.7^+	Beliefs high
			$High2$	2.5	Beliefs low
$Theory1$	8.4^+	Economic theory	$Higher1$	13.9^+	Beliefs higher
			$Higher2$	0.4	Beliefs lower
$Error1$	8.8^+	Errors			
			$AverageR1$	2.9	Beliefs average
$Nolog2$	0.8	Solvable	$AverageR2$	0.4	Beliefs not average
$Nolog1$	6.3^+	Unsolvable		INTERDEPENDENT PREFERENCES	
			$Soci1$	3.4	Equity
$Ermean2$	10.1^+	Average is 70	$Fair1$	0.4	Fairness
$Ermean1$	4.2	Average not 70	$Soci2$	12.2^+	Competitive

As it is frequently argued in protocol analysis, our variables may just be a subset of the reasons that could have influenced subjects' choices. In any case, there are a number of arguments which were prominent and systematically repeated in subjects' comments. Subjects' main concerns were risk and earning no payoff (*Risk1*, *Zero1*) and they also expressed a desire to "win" (*Win1*). A significant proportion of subjects used mathematical calculations to come up with a choice (*Calc1*) and some of them

mentioned the average of the interval (*Ermean2*). Among the most quoted strategies were either choosing low or intermediate values and undercutting rivals' choices (*Low1, Average1 and Cut1*, respectively). With respect to opponents, many subjects provided information about their subjective probability distribution on rivals' choices (*Prob1*), and/or stated beliefs indicating that rivals may choose high values or higher values than their own (*High1* and *Higher1*). Finally, subjects indicated a preference for earning more than their rivals (*Soci2*). Notice that more altruistic forms of social preferences such as fairness or equity concerns (*Fair1, Soci1*) were barely mentioned.[19]

Converting Variables into Indexes

To convert the above information into a more tractable data set, for each variable x we created an *index* variable adding up the value of the dummies assigned by each of the two coders ($d_1(x)$ and $d_2(x)$).

$$index(x) = d_1(x) + d_2(x)$$

Our *index* variables take value 0 if no coder thought the subject's comment referred to such variable, value 1 if one of the coders thought it did and value 2 if both coders thought the variable was mentioned. Given the lack of complete agreement among coders, our index may be interpreted as reflecting the degree of intensity in the codification of each variable. Out of a possible total of 5474 entries (238 subjects $*$ 23 dummy variables), there were 4823 zeros ($88, 1\%$), 435 one's ($7, 9\%$) and 216 two's ($3, 9\%$). An alternative would have been to have let data decide which of the two coders was more effective and use only such coder's classification. However, we favour having independent classifications and a measure of intensity.

Next we explain how we turned the index variables into Principal Components (PC).

Principal Components Analysis

Given the nature and length of our data set, the use of PC analysis was natural: *i*) we were interested in summarizing the information obtained through codification in a more tractable format; and *ii*) several variables may have conveyed the same information. For example, we were uncertain a priory about the possible relationship between *loss* and *risk aversion*.

The most salient features of PC analysis are precisely that (1) it *reduces* the number of variables and (2) it *detects structure* in the relationships between them, i.e., it

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[19]This may be partially induced by using grade points as rewards which depend on the overall relative performance across all experiments and tasks.

*classifies variable*s according to their content. We extracted 6 Principal Components explaining $48, 5\%$ of the variance.[20]Appendix A shows the matrix of rotated components with their saturation level.

Table 2 shows the indexes associated to each of the PCs and their saturation level. We identified which indexes are predominant in each new PC through their saturation level. Our selection criteria was to assign each original index to the component in which it shows its highest value as long as this value is clearly highest for one PC.[21] We assign an orientative name to each of the PCs (Name) and we briefly remind the content of the indexes that form each PC (Explanation). The last column shows the scoring of each index in its component and the direction of its participation (its sign).

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[20]We did not predefine the number of orthogonal components, rather we used as extraction criterion an eigenvalue higher than 1 ($\lambda \geq 1$); we also did not limit the number of computational iterations. To study the significance of each component, we rotated the new variable using the Varimax-Kaiser procedure. Initially we got nine components including three with only one variable which did not contribute much in terms of interpretation or explained variance.

[21]Indexes *Zero1*, *Theory1* and *Nolog1*, dissapear of the analysis as they score low and similar values in more than one PC.

Table 2: INDEXES ASSOCIATED TO PRINCIPAL COMPONENTS

PC	Name	Index	Explanation	Saturation
PC1	*Undercutting*	$Cut1$	Undercuts on rival	0.825
		$CutC1$	Undercuts 1 unit	0.709
		$Higher1$	Rival chooses higher	0.673
		$Prob1$	Uses probability	0.619
		120_1	Rival chooses 120	0.562
		$High1$	Rival chooses high	0.560
PC2	*Aspirations*	$Low2$	Considers own choice as high	0.800
		$Aspi2$	Aspires to high value	0.692
PC3	*Competitive*	$Soci2$	Wants to earn more than rival	0.801
		$Win1$	Wants to beat rival	0.760
PC4	*Risk aversion*	$Aspi1$	Expects low value	0.663
		$Risk1$	Risk averse	0.634
		$Low1$	Choice is low	0.503
		$Lose1$	Hates to earn less than rival	0.395
PC5	*Average*	$Ermean2$	Mean is 70	0.637
		$Average2$	Chooses not mean	0.582
		$Average1$	Chooses the mean	0.444
PC6	*Penalty*	$Penalty1$	Penalty averse	0.454
		$Calc1$	Writes calculations	-0.477
		$Error1$	Errors calculating payoffs	-0.653

The indexes grouped under each PC and presented in Table 2 suggest consistent arguments for making a choice.[22]

The set of indexes contained in **PC1** indicates that there is a number of subjects who reason in terms of probability distributions on choices ($Prob1$) and believe that this distribution has more weight on high values ($High1$, $Higher1$, 120_1). Given these beliefs subjects show some level of iterative reasoning as they best respond by *Undercutting* the choice they expect from their rivals ($Cut1$, $CutC1$).[23]

The second component, **PC2**, includes indexes reflecting high payoff aspirations ($Aspi2$) and, consequently high choices ($Low2$). We thus label this PC as *Aspirations*.

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[22]Using a different number of PCs does not yield a different result. For example, with 9 PCs the first four are identical and the fifth and sixth are very similar.

[23]Notice that subjects scoring high in PC1 justify their choices following a similar reasoning to the *L1* cognitive level as defined by Stahl and Wilson [19], [20]. Few subjects justified their choices using higher levels of iterative reasoning such as *L2*, since variables like *Cut2, CutC2* and *CutR2* were rarely codified.

PC3 reflects *Competitive* behavior. In particular, indexes scoring high in this PC correspond to motivations such as earning more than rivals (*Soci*2), or desire to beat them (*Win*1).

PC4 refers to choices partly motivated by *Risk aversion.* Indexes scoring high in this PC reflect desire to avoid risks (*Risk*1, *Lose*1) and thus, acknowledgement of low values chosen (*Low*1) and low aspiration values (*Aspi*1).

PC5 contains indexes related to comments made about the *Average* of the interval. For example, stating its value (*Ermean*2) or justifying choices due to precisely being in the average of the interval (*Average*1) or close to it, but not being the average (*Average*2).

PC6 includes two types of variables: subjects who are averse to being penalized (*Penalty*1) and subjects who make calculations (*Calc*1) or make mistakes in calculating payoffs (*Error*1). There exist no clear a priory relationship among the indexes grouped in this last PC.

Two important remarks concerning the interpretation of principal components:

i) We interpret the components as types of behavior, in the sense that they represent the revealed motivations driving subjects' choices.

ii) Principal components and thus types, are uncorrelated. Although any subject might exhibit a combination of these types, there exists no systematic relationship among them.

As we later classify subjects according to the principal component in which they score highest, let us have a clear prediction of the choice made by subjects classified under each component.

PC1: Choices should be made in the high part of the interval, but should be lower than the highest value (<120), as subjects undercut on their rival. Depending on the exact expectation subjects may have on their rivals' choice, their choice may be spread along the interval. Undercutting behavior may thus contribute to the dispersion of choices.

PC2: Choices made should be in the high part of the interval.

PC3: The indexes contained in this PC indicate that subjects should choose the lowest possible number (20) in order to beat their rival and this earn more than her.

PC4: Since these subjects indicate their desire to avoid risk and loses and acknowledge and expect to obtain low numbers, they should choose the lowest possible number (20).

PC5: Choices made should be in the middle of the interval (70).

PC6: The prediction of the choice made by subjects classified under this component is not so clear cut. Aversion to being penalized should drive subjects to make low

choices, but other indexes in the PC do not allow to make clear predictions. As such, we expect these choices to be spread along the interval.

Figure 3 below shows that these predictions were relatively well fulfilled. Notice that PC3 and PC4 predict the same choice as the unique Nash equilibrium of the TD. Although people using equilibrium reasoning may be motivated by some of the variables contained in this PCs, notice that no subject justified their choice with equilibrium arguments.

In the next section we check whether the different types help us in predicting choices in the TD.

4 Predicting TD choices through Principal Components

We now check coherence between subjects' comments, summarized in the PCs, and their choices. Given the indexes contained in each of the PCs we conjecture that: *i)* PC1(*Undercutting*) and PC2 (*Aspirations*) have a positive impact on choices. *ii)* PC3 (*Competitive*), PC4 (*Risk Aversion*) and PC6 (*Penalty*) have a negative impact. *iii)* PC5 (*Average*) drives choices towards the average of the interval.

Table 3 below shows the result of a Tobit censored regression of each subject's choice in the TD with the 6 principal components as regressors.

Table 3: PCs DRIVING TD CHOICES (N=238)

PC	Name	$\widehat{\beta}$	$p-value$
c		50.21	0.00
PC1	*Undercutting*	12.47	0.00
PC2	*Aspirations*	15.09	0.00
PC3	*Competitive*	-12.47	0.00
PC4	*Risk Aversion*	-18.76	0.00
PC5	*Average*	7.61	0.00
PC6	*Penalty*	-15.03	0.00

Notice that all PCs are significant (p-values of virtually 0 and have the expected sign).

Figure 2 shows the differences between actual and fitted choices. Interestingly, low and intermediate values are better fitted than high ones, which are underestimated.

Figure 2: ACTUAL VS. FITTED CHOICES
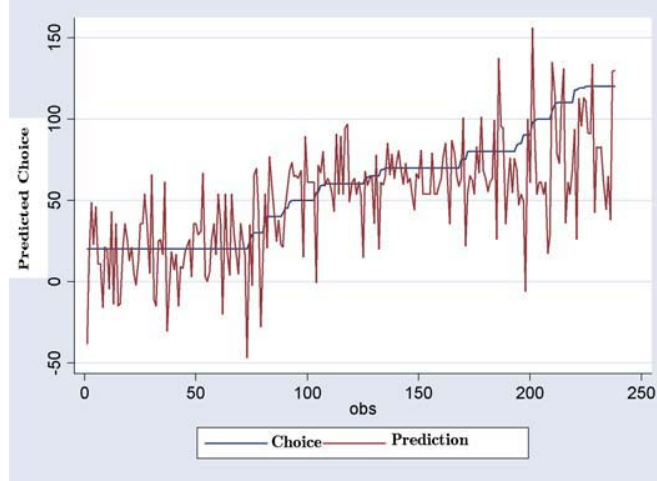
We now identify different *types* of subjects following their self-reported main motivation for their choices in the TD. For each subject, we counted the number of indexes showing a positive value in each PC. We then assign each subject to the PC in which she scores highest. For example, according to our RAs, subject 3 scored a positive value in 4 of the indexes contained in PC1 and 1 of the indexes in PC5. We thus classify subject 3 as PC1. Although there are several ties, we are able to classify 144 subjects (60.5% of the subject pool) using this simple method. We focus only on these cases. Table 4 below reports the percentage of the 144 subjects classified in each PC along with their average choice in the TD and standard deviations. Very few of these 144 subjects were classified as PC2 and PC3. Notice that subjects classified in each PC make on average choices which are consistent with the interpretation previously given to each PC. High choices are taken on average by subjects classified as PC1 and PC2, which constitute around one third of the subject pool. Choices around the mean of the interval are taken on average by subjects classified as PC5, which are almost one fourth of the subjects. Finally, low choices are made, as expected, by those subjects classified as PC3, PC4, and PC6.

Table 4: SUBJECTS CLASSIFIED BY PCs (N=144)

Subject Type	Explanation	*% of Subjects*	*Average Choice*	*Standard Deviation*
PC1	*Undercutting*	29.17	83.48	29.54
PC2	*Aspirations*	2.08	100	20
PC3	*Competitive*	6.25	37	34.19
PC4	*Loss Aversion*	20.83	28.33	17.77
PC5	*Average*	23.61	67.46	9.76
PC6	*Penalty*	18.06	39.55	31.49

Figure 3 shows the distribution of the TD choices made by the 144 subjects classified into the six PCs. Notice once again that the distributions tend to be concentrated around the values one would expect from the indexes contained in each PC, although as shown by the standard deviations there exist some dispersion, especially for PC1, PC3 and PC6.

Figure 3: DISTRIBUTION OF TD CHOICES BY TYPES (N=144)

PC1 (Undercutting)

PC2 (Aspirations)

PC3 (Competitive)

PC4 (Risk Aversion)

PC5 (Average)

PC6 (Penalty)
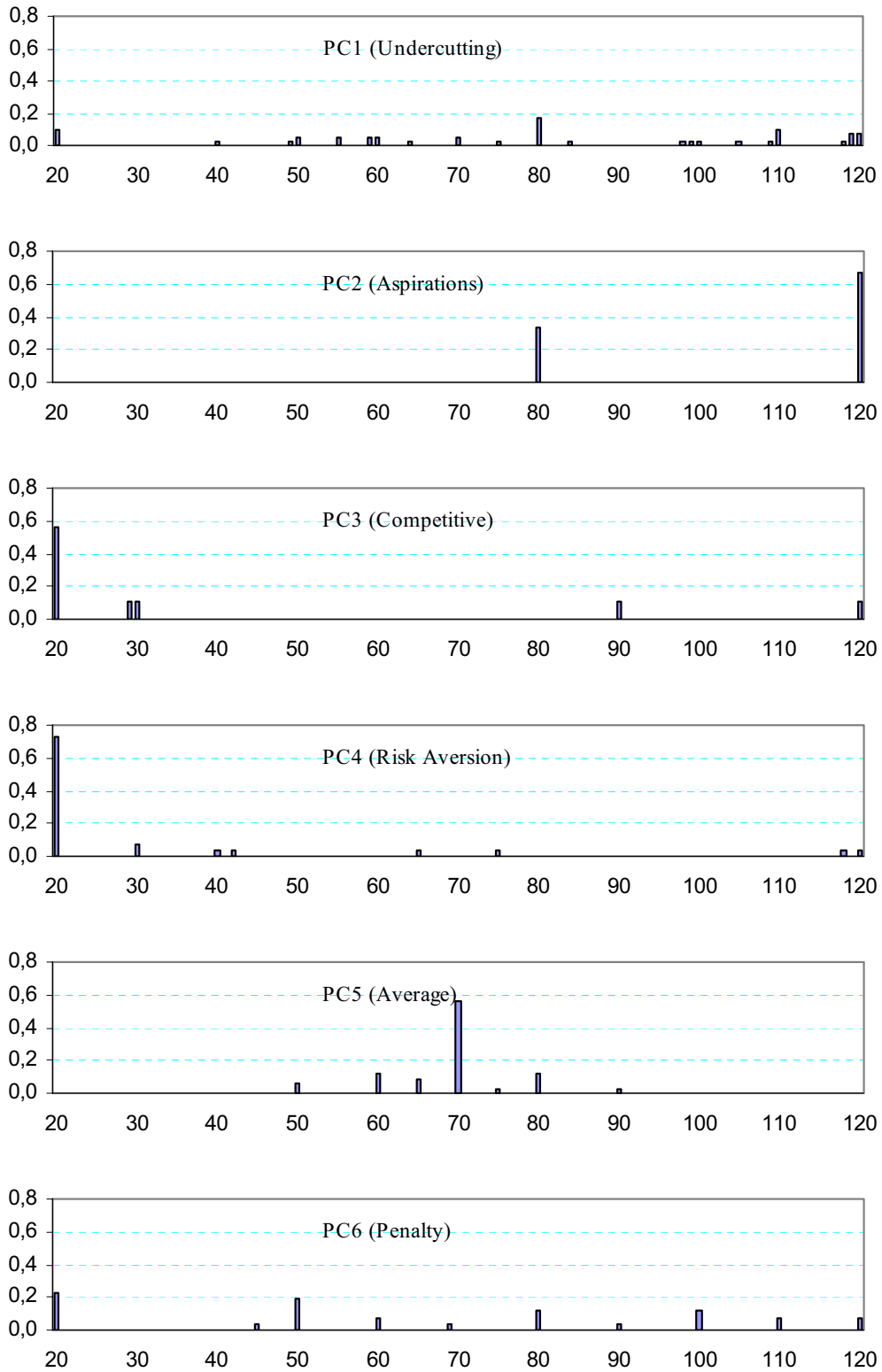
Overall, we have been able to identify different types of subjects whose heterogeneous choices in the TD are justified by heterogeneous reasons. Subjects self-reporting similar reasons make similar choices which coincide with our initial conjectures. The most important reasons driving choices in the TD are related to strategic and iterative reasoning (PC1), high payoff aspirations (PC2), competitive preferences (PC3), attitudes towards risk and losses (PC4) and focal points such as the average of the interval (PC5).[24] In the following section we check whether these identified types are consistent with some of subjects' personal characteristics and their choices in independent tasks and experiments.

5   Type Coherence Across Tasks

The following variables were obtained from the same sample of subjects performing different tasks in the experimental sessions detailed in Section 2. The number of observations (n) was not the same across tasks, as some individuals were absent from certain experimental sessions and some answers were erroneously reported in the session containing the TD (June session).

We first describe the variables related to subjects' PERSONAL CHARACTERISTICS or attitudes:

Gender: A dummy variable (1 = male, 2 = female).

GRE: Subjects' scores in a GRE-type math test containing 25 mathematics questions.

Self-evaluation: Proportion of correct answers subjects expected to get in the GRE-type test.

Optimism: Average grade subjects expected to obtain in the second term exams minus average grade obtained in the first term.

We now describe those variables which reflect SUBJECTS' CHOICES in other experiments:

Selfish: A dummy variable indicating how much subjects gave compared to the median of the subjects in their treatment playing the same dictator game (1 = gave less, 0 = gave equal or more).[25]

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[24]As previously mentioned, PC6 , which captures the lowest percentage of the variance, has a less clear interpretation.

[25]We created this variable because different groups played dictator games with different initial allocations.

Risk-love: A variable in the interval $[0, 10]$ indicating how much a subject has to be paid to avoid playing a 2x2 game with uncertain outcome. This variable may reflect the degree of individuals' strategic risk–love.

Lottery-aversion: A variable in the interval $[0, 1]$ which reflects the average degree of risk–aversion showed by individuals playing four different lotteries.[26]

First we explore the correlations among the variables regarding personal characteristics together with the Principal Components. Table 5 reports Pearson-χ^2 tests among both types of variables. The number in parenthesis indicates p-values while the number on brackets shows the number of observations available for each of the personal characteristics. Numbers in bold indicate significant coefficients at upmost the 10% level.

Table 5: PERSONAL CHARACTERISTICS (χ^2 CORRELATIONS)

	GRE	Self-evaluation	Optimism	Gender
PC1	**0.21** (0.00)	0.05 (0.38)	0.11 (0.14)	**-0.19** (0.00)
Undercutting	[180]	[224]	[176]	[238]
PC2	0.07 (0.30)	**0.12** (0.06)	**0.12** (0.10)	**-0.11** (0.08)
Aspirations	[180]	[224]	[176]	[238]
PC3	0.10 (0.17)	0.07 (0.25)	-0.02 (0.79)	-0.04 (0.50)
Competitive	[180]	[224]	[176]	[238]
PC4	-0.10 (0.16)	**-0.11** (0.09)	0.03 (0.65)	**0.10** (0.10)
Risk aversion	[180]	[224]	[176]	[238]
PC5	-0.05 (0.47)	0.04 (0.55)	0.05 (0.44)	**0.18** (0.00)
Average	[180]	[224]	[176]	[238]
PC6	0.01 (0.88)	-0.02 (0.68)	-0.00 (0.92)	-0.04 (0.52)
Penalty	[180]	[224]	[176]	[238]

* (p-value) and [sample size].

Our *GRE* variable measures mathematical skills, which may be related to subjects' analytical and cognitive abilities, and thus we may expect that subjects using more cognitively demanding justifications for their TD choices may be those who score high in the GRE-type math test.[27] Table 5 indicates that individuals' math abilities are positively correlated to *PC1*.

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[26] As described in Brañas-Garza et al. [6].

[27] Notice that unercutting rivals' choices is a cognitively demanding reasoning process according to the literature on K-level thinking (starting with Stahl and Wilson [19], [20]).

Self-evaluation may capture how confident subjects feel about their abilities. Confident subjects may thus expect to obtain high payoffs, and in particular they may aspire to a high payoff in the TD. Therefore the positive relationship observed between *self-evaluation* and *PC2* (*Aspirations*) was to be expected. Additionally, the negative correlation between *self-evaluation* and *PC4* may indicate that confident subjects are not concerned about the strategic uncertainty in the TD, as they may feel assured they will obtain high payoffs.

Optimism may relate to the expectation of getting better outcomes than previously obtained. This optimism may drive subjects to hold high aspirations in the TD, which would explain the positive correlation between *optimism* and *PC4*.

Finally, we observe some *Gender* effects. In the TD, *men* are more likely to *undercut* their rivals (*PC1*) and have higher *aspirations* (*PC2*). On the contrary, women express more concerns about *risk* (*PC4*) and tend to mention choosing values because of their proximity to the *average* of the interval (*PC5*).

Now we check the possible relationship between choices in different experiments. The heterogeneity observed in the different justifications of subjects' actions in the TD, makes it an ideal candidate to study the translation of subjects' motivations across tasks. In such case, we would expect PCs to be able to capture subjects' intrinsic motivations not only in TD but in other experimental tasks, and thus there may exist an intrinsic component in defining *types of subjects*, which may not be completely task-dependent. For example, we want to check whether those individuals mentioning risk concerns in the TD are those behaving as risk averse when facing lotteries. Table 6 reports regressions of dictator game choices (*selfishness*), choices under uncertainty involving strategic risk (*risk-loving*), and lottery choices (*lottery-aversion*) on the six PCs obtained from the TD. Therefore, we should observe significant coefficients for those PCs capturing the most relevant feature for each task.

Notice that the translation of the motivations captured by PCs to other tasks may not be perfect. For example, subjects in the TD may have mentioned only a subset of the motivations driving their choices. However, we should expect that self-reports may reveal the most prominent motivation underlying TD choices, and thus, our exercise may show meaningful results. Table 6 shows that most of the significant coefficients in our regressions in Table 6 have the expected sign and are easy to interpret. Below we discuss the significant coefficients for each of the PCs.

Table 6: PREDICTING ACTIONS

		Selfishness	Risk–love	Lottery–aversion
		probit	tobit	tobit
PC1	Undercutting	-0.29 (0.75)	0.05 (0.58)	**-0.04** (0.00)
PC2	Aspirations	**0.25** (0.01)	-0.78 (0.46)	**0.03** (0.02)
PC3	Competitive	0.07 (0.43)	0.08 (0.46)	-0.00 (0.60)
PC4	Risk Aversion	-0.03 (0.71)	**-0.23** (0.02)	**0.03** (0.02)
PC5	Average	-0.07 (0.46)	0.03 (0.77)	0.00 (0.70)
PC6	Penalty	0.04 (0.69)	0.09 (0.40)	-0.00 (0.84)
C		-0.44 (0.00)	5.40 (0.00)	0.48 (0.00)
n		169	234	184

* (p-value).

The most salient results appear in bold in Table 6. We now describe a possible interpretation of the results:

- Subjects reporting their choices were motivated by a desire to avoid risks (*PC4*) are precisely those who also avoided strategic risk (*risk-love*). Consistently, they are also those who are more risk averse (*lottery-aversion*).

- Subjects justifying their TD choices using arguments contained in *PC1* (*Undercutting*) less prone to buy *insurance* in lotteries (*lottery-aversion*), which may be related to the fact that those who choose high values in the TD may underestimate the risk of obtaining bad outcomes. This same behavior would lead them to buy less insurance in other uncertain situations such as lotteries.

- Subjects mentioning arguments contained in *PC2* (*Aspirations*) aims to obtain a high payoff in the TD. This same behavior would lead them to keep everything for themselves in dictator games (*selfishness*). Such subjects are also more prone to buy insurance (*lottery-aversion*), possibly also in order to maintain their payoffs.

6   Discussion

This paper starts by providing reasons behind observed heterogeneous behavior in one-shot traveler's dilemma experiments. We use subjects' self-reported justifications for their behavior and we find that their claims turn out to be coherent and consistent reasons for making different choices in the TD. Among the most prominent arguments, we find that different levels of strategic sophistication, heterogeneous beliefs on opponents' choices, payoffs aspirations, competitive preferences, different degrees of risk and

loss aversion and focal points such as the average of the interval are behind one-shot choices in the TD.

Although self-reported explanations are obtained using no incentives and they may only be a subset of the possible reasons leading to heterogeneous choices in the TD, we find that they are useful in understanding behavior. Thus, our paper is in line with recent experiments using a variety of sources easily available in the laboratory to obtain higher explanatory power than relying only in choices made in the laboratory. Similar recent approaches have successfully studied subjects' sequence of payoff look-ups to identify reasoning processes (Costa-Gomes and Crawford [12]), elicited beliefs of opponents' choices (see Costa-Gomes & Weizsäcker [13]), recorded communication among subjects (Brandts and Cooper [5]) or measure response-times (see Rubinstein [18]) to explain laboratory behavior.

The traveler's dilemma is an ideal game to study heterogeneous motivations behind behavior since the typical distribution of choices is heterogeneous. However, if we want to study how consistent those motivations are across different tasks, using only the actions observed in a TD experiment might not be enough. The reason is that we show that several different reasons may be behind the same TD choice. For example, we find several subjects choosing the equilibrium strategy but none of them claim to be using euqilibrium reasoning. Thus, using self-reported justifications we are not only able to better understand choices in the TD, but also to identify types of motivations behind such choices.

Our second contribution consists in showing that some of such motivations are intrinsic to subjects. Thus we observe that motivations are coherent with choices by the same subjects in other tasks for which such motivations should be prominent. Although our results are limited to the number of tasks and experiments available using the same subjects, our paper is a first promising step towards identifying types of subjects in a given population. We have shown that it may be possible to predict subjects' behavior in different tasks using subjects' self-reported reasoning in other tasks. Further research aiming to identify the relationship between different types of individuals and their strategic behavior should follow.

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Appendix

Appendix A: Matrix of rotated components

	Varimax					
Variables	1	2	3	4	5	6
$Risk1$	-0,065	0,013	-0,242	**0,634**	0,197	0,142
$Zero1$	-0,021	-0,125	0,280	0,386	-0,351	0,302
$Penalty1$	-0,040	-0,048	0,098	0,076	-0,168	**0,454**
$Lose1$	0,018	-0,068	0,208	**0,395**	0,014	-0,018
$Calc1$	0,048	-0,422	0,024	-0,090	-0,143	**-0,477**
$Theory1$	0,198	-0,075	0,068	0,092	0,309	0,244
$Error1$	-0,111	0,118	-0,018	0,124	-0,020	**-0,653**
$Prob1$	**0,619**	0,197	0,071	0,121	0,262	-0,006
$Ermean2$	0,089	-0,170	-0,046	-0,074	**0,637**	-0,126
$Nolog1$	-0,143	-0,108	-0,220	-0,308	-0,010	0,224
$High1$	**0,560**	0,526	0,032	-0,010	-0,067	-0,048
$Higher1$	**0,673**	0,099	0,053	0,105	0,114	0,021
$Cut1$	**0,825**	-0,036	0,061	-0,086	-0,020	0,083
$CutC1$	**0,709**	-0,120	-0,013	-0,115	-0,035	0,019
$Soci2$	0,099	-0,066	**0,801**	0,002	0,145	0,017
$Average1$	-0,070	0,012	-0,344	-0,328	**0,444**	0,250
$Average2$	-0,077	0,040	0,160	0,042	**0,582**	-0,060
120_1	**0,562**	0,260	-0,020	-0,131	-0,275	-0,097
$Win1$	0,023	0,018	**0,760**	0,050	-0,012	0,145
$Aspi1$	-0,010	-0,043	-0,124	**0,663**	-0,059	-0,055
$Aspi2$	0,175	**0,692**	0,030	-0,088	-0,111	-0,132
$Low1$	-0,132	-0,053	0,288	**0,503**	-0,164	0,071
$Low2$	0,013	**0,800**	-0,090	-0,070	-0,038	-0.041

Appendix B: Experimental Instructions

NAME: _

ID: _

TASK 3: Your performance in this task DOES count for your grade in Micro I.

In this test you must decide on prices. Assume that YOU are a firm competing in a market with only two firms. Now we will explain to you who is the other firm and what your task is.

Your competitor is a clasmate in your Micro I section. The matching will be made such that everyone has a single partner.

Task : You must fix a price in the interval [20, 120], both extremes included. Since you compete with a rival firm you must consider that:

- If the other company fixes a price lower than yours, then you will earn what the other has fixed minus a 20 point penalty (she will earn her price plus 20 extra points).

- if the other company fixes a price higher than yours, then you will earn what you have fixed plus 20 extra points (she will earn your price minus a 20 point penalty

- if both prices coincide then BOTH of you will earn the price you have fixed.

The price that I choose is: _ _ _ _

You can use the following space for whatever you may need. Please indicate how you have come up with your decision.

Appendix C: Instructions to Classifiers

Your task consists in classifying the comments made by the 242 subjects who participated in the experiment. We have created the variables listed below and you must codify the written information provided by subjects in these variables. Your task does not consist in interpreting why the subjects write what they write, but only in accurately attesting what they write. Our objective is to find out regularities on what subjects write, so please be careful when classifying comments, you should reflect only what subjects wrote.

The forms are in the same order that the names in the Excel file you will be working on. Please, start by reading the name of the subject and his/her comment. Next, move along the row corresponding to that subject and fill up the cells you think should be filled.

You must use "ones" (1) and "twos" (2) to fill up the cells, according to the explanation for each variable provided below. In the cases in which the subject's comments do not convey any information on a particular variable, please do not change the entry in the corresponding cell (leave the "zero").

Consider the cells as independent: filling up a cell with a number does not imply anything about the number you enter in another cell.

Finally, you can add columns of variables if you think that our variables do not allow you to reflect what a subject writes. In that case, please, write your codification system in a Word document similar to the table "VARIABLES" shown below.

Please, before you start reading subjects' comments, have a look at the list of variables and their codification below. You will need to check the codification again while you fill up the Excel file, specially with the first subjects. Please, be patient and do it carefully.

The instructions of the experiment appear in each subjects' forms. Please, before you start make sure that you understand the experiment and the payoff mechanism.

Thank you very much for your help.

VARIABLES

Variable	**Column**

Risk   **C**
Explanation: Does not like / Does not want to take risks
"1" if: Says does not want /does not like to take risks /takes a decision because implied risk is low or moderate
"2" if: Says wants / likes taking risks
Leave "0" if: Does not mention this issue

Zero   **D**
Explanation: Does not want to earn zero points / Wants to earn a positive number of points
"1" if: Says wants to avoid earning zero points / Wants to earn a positive number of points
"2" if: Says wants to earn zero points
Leave "0" if: Does not mention this issue

Penalty   **E**
Explanation: Wants to avoid being penalized
"1" if: Says wants to avoid being penalized

"2" if: Says wants to be penalized

Leave "0" if: Does not mention this issue

Lose   F

Explanation: Wants to avoid having less points than rival

"1" if: Says does not want to lose / to have less points than the rival

"2" if: Says wants to lose / to have less points than the rival

Leave "0" if: Does not mention this issue

Size   G

Explanation: Decision depends on size of the penalty

"1" if: Says penalty is "high" and that it affects decision

"2" if: Says penalty is "low" and that it affects decision

Leave "0" if: Does not mention this issue

Calc   H

Explanation: Writes calculations on sheet

"1" if: There are calculations written on sheet

Leave "0" if: There are no calculations on sheet

Theory   I

Explanation: Gives an economic explanation of decision

"1" if: Comment explains an economic theory (correct or not) /talks about firms/ uses terms like "undercutting", etc.

"2" if: Comment does not contain economic theories or about how firms compete, etc.

Leave "0" if: Does not mention this issue

Error   J

Explanation: Makes mistakes when calculating payoffs

"1" if: Comments show subject does not understand payoff mechanism

Leave "0" if: Understands payoff mechanism or it is not possible to infer whether the payoff mechanism has been understood

Prob   K

Explanation: Thinks that the rival can choose different values

"1" if: Says that certain values will be chosen with probability / are likely / most probably / a high percentage of times /in the majority of cases

"2" if: Says that rival will choose some value for sure

Leave "0" if: Does not say anything about the probability of values chosen by rival

Ermean   **L**

Explanation: Does not know how to calculate the interval 's mean

"1" if: Says mean is different from 70

"2" if: Says mean is 70

Leave "0" if: Does not mention the value of the interval's mean

Nolog   **M**

Explanation: Does not think it is possible to choose using reasoning

"1" if: Says it is not possible to choose using reasoning / chooses randomly

"2" if: Says it is possible to choose using reasoning

Leave "0" if: Does not mention "reasoning"

High   **N**

Explanation: Thinks rival will choose a high value

"1" if: Says rival will choose a high value

"2" if: Says rival will choose a low value

Leave "0" if: Does not mention rival's value

Higher   **O**

Explanation: Thinks that rival will choose higher value than self

"1" if: Says rival will choose higher value than self

"2" if: Says rival will choose lower value than self

Leave "0" if: Does not mention rival's value

Cut   **P**

Explanation: Chooses a value lower than what that thinks rival will do

"1" if: Says "undercuts" what thinks rival will do

"2" if: Says chooses same as rival

Leave "0" if: Does not mention rival's value

CutC   **P**

Explanation: Chooses a value lower than rival's expected value

"1" if: Says chooses just one unit less than rival's expected value

"2" if: Says chooses a somewhat lower value (5, 12, "a little lower") than rival's expected value

Leave "0" if: Does not mention value rival will choose

CutR   **Q**

Explanation: Thinks rival will undercut and undercuts even more

"1" if: Says undercuts just one unit to the rival's undercut value

"2" if: Says chooses a somewhat lower value (5, 12, "a little lower") than rival's undercut value

Leave "0" if: Does not mention rival's value

Fair   S

Explanation: Chooses a value for being "fair"

"1" if: Says choice is motivated to make payoff distribution fair / talks about "fairness"

"2" if: Says choice is motivated to make payoff distribution unfair

Leave "0" if: Does not mention payoff distribution fairness

Soci   T

Explanation: Cares about rival´s payoffs

"1" if: Says wants both players to earn more or less the same

"2" if: Wants to earn more than rival

Leave "0" if: Does not mention payoff distribution

Average   O

Explanation: Chooses an average value

"1" if: Says chooses a value so that it is average (or intermediate)

"2" if: Says chooses a value for not being the average (above, below...)

Leave "0" if: Does not mention choosing average value or not

AverageR   V

Explanation: Rival /Rivals will choose average value

"1" if: Says rivals will probably choose/on average an average value

"2" if: Says believes rivals will choose /probably/ on average another value

Leave "0" if: Does not mention rival's value

20   W

Explanation: Rival /Rivals will choose 20

"1" if: Says rival will choose /probably/ on average 20

"2" if: Says thinks rivals will choose /probably/ on average another value

Leave "0" if: Does not mention rival's value

120   X

Explanation: Rival /Rivals will choose 120

"1" if: Says rival will choose /probably/ on average 120

"2" if: Says thinks rivals will choose /probably/ on average another value

Leave "0" if: Does not mention rival's value

Coord   **Y**

Explanation: Wants to coordinate with rival

"1" if: Says wants to coordinate value with rival´s

"2" if: Says does not want to coordinate value with rival´s

Leave "0" if: Does not refer to coordination

Win   **Z**

Explanation: Wants to beat rival

"1" if: Says wants to beat rival

"2" if: Says does not want to beat rival

Leave "0" if: Does not mention whether wants to win or not

Aspi   **AA**

Explanation: Aims to / Expects / Accepts a value

"1" if: Says aims to low value

"2" if: Says aims to high value

Leave "0" if: Does not mention aspirations

Low   **AB**

Explanation: Considers own value to be low

"1" if: Says own value is low

"2" if: Says own value is high

Leave "0" if: Does not mention the size of own value

Appendix D: Descriptive Statistics

	Mean	st. dev	Min.	Max.	n
TD choice	58.22	32.66	20	120	238
Gender	1.54	*	1	2	238
Selfishness	0.33	*	0	1	169
Self-evaluation	0.41	0.20	0	1	224
Optimism	0.15	0.90	-4	3	176
Risk-love	5.39	1.63	0	10	234
Lottery-aversion	0.48	0.21	0	1	186
GRE	29.94	15.10	-7	72	180
PC1	0	1	-1.39	4.34	238
PC2	0	1	-2.16	5.31	238
PC3	0	1	-1.60	4.25	238
PC4	0	1	-1.73	4.24	238
PC5	0	1	-2.09	4.69	238
PC6	0	1	-3.68	2.43	238