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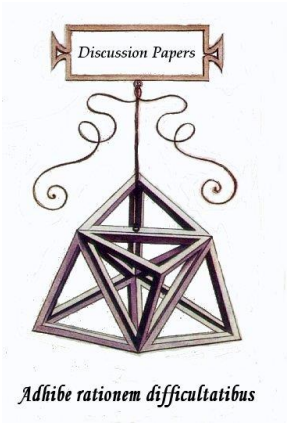

Marco Catola, Simone D'Alessandro,
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Personal norms in the online public good game

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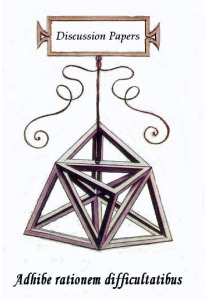

Marco Catola, Simone D'Alessandro, Pietro Guarnieri, Veronica Pizziol

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Keywords: Public good game; online experiment; personal norms; social norms; belief elicitation; social dilemma.

JEL: C90; D71; H41

Personal norms in the online public good game

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Abstract

This paper shows that personal norms have a prominent role in explaining pro-social contributions in an online public good game. This finding suggests that the role of social norms might be loosened when subjects are distanced, and interaction occurs online and in complete anonymity. Through cluster analysis, we show that a) subjects who contributed more hold both high expectations about the social norms followed by others and a high personal normative commitment; b) subjects who contributed less hold both low expectations and have low personal commitment. However, for both clusters the personal norm is the main driver of decisions. Moreover, we elicited personal and social norms in a group of subjects not performing the contribution task, thus obtaining a measure of norms not affected by self-justification and ruling out a potential endogeneity issue.

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1 Introduction

The evidence that subjects tend to contribute considerable amounts in the public good game (PGG), even in one-shot anonymous interactions, has been replicated across several designs (Ledyard, 1995; Chaudhuri, 2011). This circumstance has led to the use of the public good game as a social thermometer revealing the role of social norms in affecting pro-sociality across different cultures and institutional contexts (Henrich et al., 2001; Bigoni et al., 2019). The main explanations for the over-contribution phenomenon that have been advanced in the public good literature are in terms of behaviour conditional on social expectations. This is, for example, the case of the theory of conditional cooperators: subjects contribute to public goods only when they believe that a significant number of others do the same (Fischbacher et al., 2001; Thöni and Volk, 2018). Moreover, when the designs included the possibility of punishments (Herrmann et al., 2008), the role of injunctive norms emerged: subjects contribute because they believe that significant others expect them to do so (and may punish them accordingly).

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However, recent studies have found that when interactions take the form of one-shot games or have a higher degree of anonymity – i.e. when the relative reference group is not perceived as salient or choices are private (Schram and Charness, 2015) – subjects rely on their personal norms (Capraro and Perc, 2021; Bašić and Verrina, 2020; Eriksson et al., 2017; Biziou-van Pol et al., 2015). They comply with what they personally and unconditionally intend to be the right thing to do. This line of research appears worth pursuing in light of the increasing number of online interactions, often anonymous and occasional, allowed by technological developments and further boosted by the recent COVID-19 pandemic.

We contribute to this literature by analysing the role of personal norms in the context of an online public good game. Specifically, we devise an experiment to study the role of personal norms in motivating contribution decisions as compared to social norms. To measure both personal and social norms we apply the procedure developed by Bicchieri and Xiao (2009) and Bicchieri and Chavez (2010), thus eliciting personal normative beliefs (PN), empirical expectations (EE) and normative expectations (NE). While PN can be considered a measure of one's unconditional normative conviction and thus representative of the subjects' personal norms, the combination of EE – expressing subjects' expectations on others' behaviour – and NE – expressing subjects' expectations on others' normative judgements – are representative of what subjects believe the social norm to be. Our results show that personal norms are indeed the stronger predictor of the contribution choice. Thus, we provide additional evidence for the argument that, at least in one-shot online interactions, people tend to follow their individual normative judgements rather than social norms.

In addition, we also take into account a potential issue of endogeneity. This concerns the elicitation of personal and social norms due to a possible self-justification bias. Indeed, given that norms are elicited just after the decision task, subjects may be responding to the norm-elicitation questions just justifying *ex post* their actual decision. To check whether this is the case, we run an additional online experiment with an independent pool of subjects in the spirit of Krupka and Weber (2013). In this second experiment, subjects faced only the norm-elicitation task, without performing the decision task. In this way, we identified personal and social norms which cannot be affected by any self-justification. By comparing the two sets of norms, we show that there is no statistically significant difference between norms elicited in the two experiments, thus confirming the reliability of our main results.

2 Experimental design and procedure

2.1 Experimental design

Our experimental design consists of two online experiments.[1] In the first experiment, we investigated a one-shot linear PGG. Subjects were randomly assigned to groups of four members. Each individual received an initial endowment of 10 tokens that could be either kept in the private account or contributed to a common pool. The

[1]Both experiments were part of larger preregistered experimental sessions which included four other separate treatments where subjects played a multilevel public goods game. For further details see Catola et al. (2020, 2021).

contributions could be of any integer from 0 to 10 tokens. The monetary payoff of each individual was determined by the amount privately kept plus the earnings from the group common pool. The marginal per capita return (MPCR) was set to 0.6.

After the contribution decision, the subjects were asked some questions aimed at eliciting their personal and social norms (Bicchieri and Xiao, 2009; Bicchieri and Chavez, 2010). Personal normative beliefs were elicited by asking each participant their opinion about how much one ought to contribute to the group common pool. Social norms were also identified by eliciting empirical and normative expectations. Each subject was asked what they believed was the average contribution of the other members to the group account, as well as their opinion on how much the other members believed one ought to contribute to it. As is standard practice, questions on social norms were incentive-based while the elicitation of personal norms was not subject to incentives. In particular, for both empirical and normative expectations, participants received £0.10 extra for each answer that correctly matched the average choice of the other members. Finally, we asked participants to solve three comprehension questions, a three-item Cognitive Reflection Test (Frederick, 2005), and to respond to some questions of the Global Preference Survey (Falk et al., 2018).

In the second experiment, we asked a sample of individuals independent of that of the first experiment to express their beliefs about personal and social norms, following the approach pioneered by Krupka and Weber (2013). These subjects had to answer questions concerning their opinion on the average contribution of the group members who were given the task in the first experiment, on what a group member ought to contribute and on what group members in the first experiment thought others ought to contribute. Therefore, with this approach, we were able to assess the reliability of our measures of elicited norms of the participants in the first experiment by comparing them with those of the external sample.

2.2 Procedure

The experiments were programmed in oTree (Chen et al., 2016) and conducted online using Prolific (Palan and Schitter, 2018; Peer et al., 2021). For the first experiment, we recruited a total of 164 UK nationals in two different sessions. We were able to safely aggregate the observations of the first session, run as a pilot with 15 subjects, with those of the second session, which involved the participation of 144 subjects, as the design of the experiment did not change between the two sessions. Also, the two sessions were deliberately run a few days apart and roughly at the same time of day in order not to target potentially different samples. In the second experiment, 104 UK nationals were recruited in a single session. The second experiment was launched a few days after the first in order to avoid seasonal confounding factors. Also, we excluded from the second experiment those subjects who took part in the first. In both experiments, the conversion rate was 1 token = £ 0.025. With regard to the entire first experimental session, subjects earned on average £ 1.13, of which £ 0.50 represented show-up fees. For the whole of the second experimental session, the average payment was £ 0.16, including a show-up fee of £ 0.10.

3 Results

Figure 1 shows the average contribution choice to the common pool as well as the average values of each elicited norm.[2]

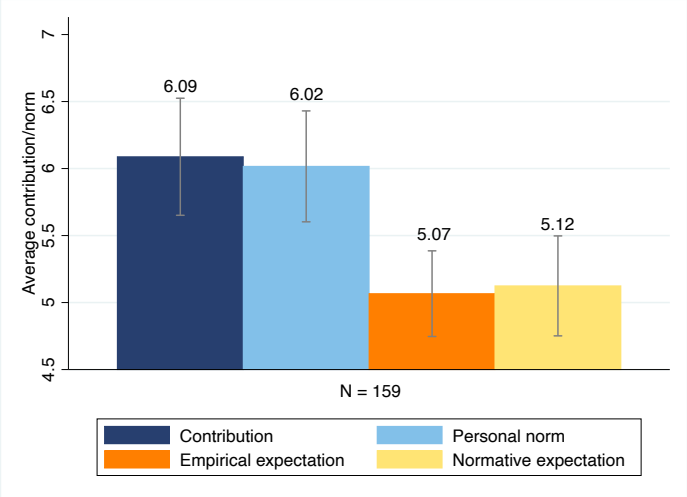

Figure 1: Average contribution to the PGG and average personal normative belief, empirical expectation and normative expectation. CI at the 95% level.

The average contribution to the public good and the average personal normative beliefs are clearly both considerably higher than empirical and normative expectations and reach about the same level.[3] This evidence suggests that in the context of our experiment, personal normative beliefs are the main drivers of individuals' contribution decisions. This intuition is confirmed by the analysis of a set of non-parametric Wilcoxon signed-ranks tests. Indeed, on the one hand we find no statistically significant difference between contribution and personal normative beliefs ($z = 0.883$, $p = 0.3773$) or between empirical and normative expectations ($z = 0.153$, $p = 0.8787$). On the other, the difference is statistically significant when it comes to comparing contributions with empirical and normative expectations ($p < 0.0001$ in both cases) and personal normative beliefs with empirical and normative expectations ($p < 0.0001$ in both cases).

In addition to the non-parametric analysis, we also run a Tobit regression where the contribution is the dependent variable and norms are the regressors. We run the regression for four models: three in which we include only two norms and a fourth where we include all three. These models were run both without any further control and with a battery of controls, taking into account both socio-demographic variables and individual-specific characteristics regarding some preferences. Results are provided in Table 1.

[2]We discarded five observations out of 164 due to implausible answers in some of the questions on norm elicitation.

[3]The three norms are also fairly correlated with one another. In particular, the correlation between PN and EE is 0.6860, the correlation between PN and NE is 0.7006 and between EE and NE is 0.6866 ($p< 0.001$ in all cases).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PN	0.878***	1.180***		0.992***	0.828***	1.114***		0.944***
	(0.105)	(0.098)		(0.106)	(0.0986)	(0.104)		(0.109)
EE	0.486**		1.174***	0.616***	0.423**		1.098***	0.591***
	(0.160)		(0.163)	(0.163)	(0.145)		(0.159)	(0.139)
NE		-0.084	0.233	-0.292*		-0.0969	0.128	-0.336*
		(0.104)	(0.122)	(0.118)		(0.130)	(0.144)	(0.140)
ctrl	No	No	No	No	Yes	Yes	Yes	Yes
N	159	159	159	159	158	158	158	158

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1: Tobit regressions with contribution as dependent variable. The controls are individual-specific characteristics about preferences (altruism, patience, risk, trust, negative and positive reciprocity), time spent on the task page, a score variable for comprehension, a score variable for Cognitive Reflection Test, age, gender, student status, socioeconomic status, education.

Table 1 confirms our non-parametric result about the relative importance of personal norms compared to social norms. In all specifications in which personal norms are included, the attached coefficients are always highly significant and their magnitudes are the strongest. This result is also very robust to the inclusion of all the controls.

Furthermore, we may expect a low significance of normative expectations in explaining contribution choices. As explained in Bicchieri and Xiao (2009) individuals usually build their normative expectations upon their empirical ones; if they have no reason to expect any contrast between them, both types of norm end up capturing the same phenomenon. Our one-shot anonymous online setting seems to suit these conditions perfectly, and indeed the impact of NE is absent in all the models where only two regressors are included. However, when all three variables are present, NE exhibit a significant and negative impact over the contribution. This result, albeit not affecting our main finding, is worth some further investigation.

For this purpose, we further explore our dataset looking for the existence of clusters that differ in terms of norms. The analysis suggests the existence of two clusters.[4] The first cluster, which amounts to roughly one-third of observations (57 out of 159 observations), is characterised by very high average contributions and personal norms and high average empirical and normative expectations. The second cluster (102) features significantly lower average contributions and norms. The relevant information for the two clusters is reported in Figure 2.

[4]The analysis was performed through k-means clustering. See the appendix for further details.

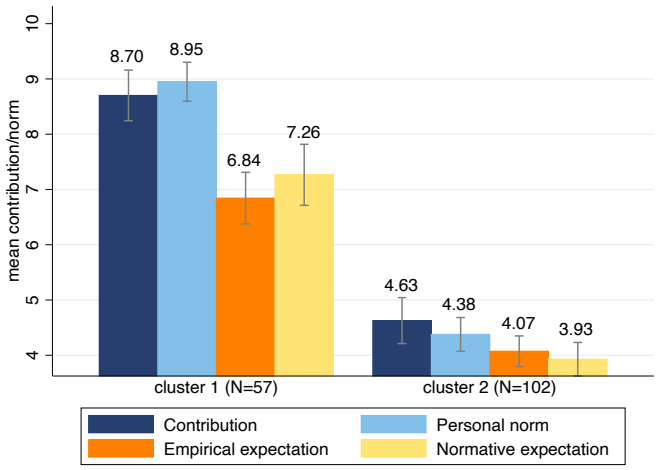

Figure 2: Average contribution to the PGG and average personal normative belief, empirical expectation and normative expectation per cluster. CI at the 95% level.

Based on the clustering, we define a dummy variable that accounts for the cluster division. Then we evaluate two Tobit regression models (with and without controls) including the dummy variable and the interaction between the dummy and each elicited norm. The results reported in Table 2 confirm our main result once again: personal normative beliefs are the best explanatory variable for the contribution choice. Moreover, once controls are included, empirical expectations retain a positive effect on individual contributions. As for normative expectations, their effect is not statistically significant, unlike the interaction term with the dummy of the second cluster. Thus, the significant negative effect of NE in Table 1 is not typical of the whole sample but is characteristic of those in the second cluster, as if subjects in that cluster negatively react when they believe that others are overstating their normative commitment.

	(1)	(2)
PN	1.143***	1.179***
	(0.179)	(0.174)
EE	0.487	0.508*
	(0.315)	(0.252)
NE	-0.0862	-0.0993
	(0.164)	(0.170)
low	1.966	3.575
	(2.507)	(2.272)
$PN \times low$	-0.107	-0.216
	(0.222)	(0.229)
$EE \times low$	0.292	0.244
	(0.360)	(0.303)
$NE \times low$	-0.399	-0.483*
	(0.224)	(0.216)
$ctrl$	No	Yes
N	159	158

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Tobit regressions with contribution as dependent variable. The variable *low* takes value 1 if the subject belongs to the second cluster and 0 otherwise. The controls are individual-specific characteristics about preferences (altruism, patience, risk, trust, negative and positive reciprocity), time spent on the task page, a score variable for comprehension, a score variable for the Cognitive Reflection Test, age, gender, student status, socioeconomic status, education.

4 Endogeneity Issue

We address the problem of potential endogeneity in the responses to questions eliciting beliefs by using the data collected in the second experiment. First, we check for the homogeneity of the two samples of participants employed in the experiments, as we wish to exclude that the two samples are drawn from populations with different distributions for some pivotal demographic and socio-economic characteristic. Altogether, we found that there is no statistically significant difference at the 5% level of significance for any characteristic.[5] Comparison between the average value of each norm between the two experiments is presented in Figure 3.

[5]Wilcoxon rank-sum tests are used for the continuous variables: age, income, socio-economic status and education; Fisher's tests for the dummy variables: gender, student status and employment status.

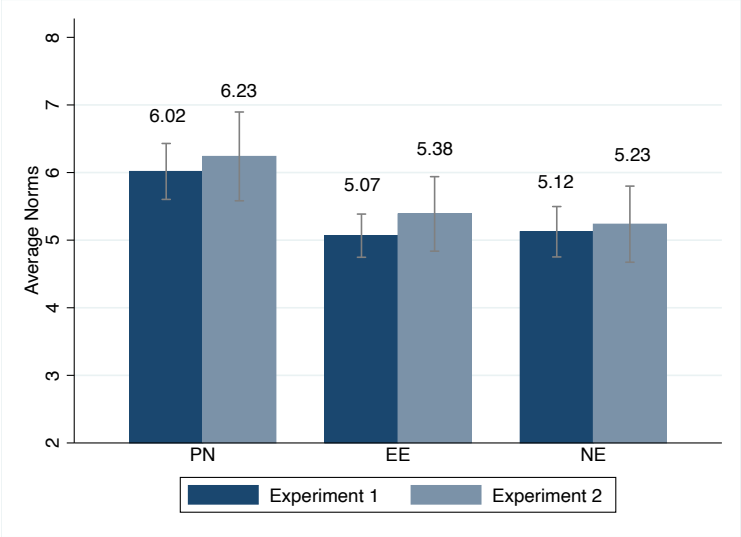

Figure 3: Average norms in Experiment 1 vis-a-vis Experiment 2. CI at the 95% level.

From the graphical analysis, it is evident that the subjects have similar personal and social norms irrespective of whether or not they participated in the public good task. We confirm this intuition by pairwise comparisons of each type of norm in the two experiments through a Wilcoxon rank-sum test and find no statistically significant difference between any of the elicited norms (PN: $z = -0.901$, $p = 0.3687$; EE: $z = -0.808$, $p = 0.4201$; NE $z = -0.122$, $p = 0.9033$). We also performed Tobit regressions on the whole merged samples from both experiments, including a dummy for the experiment which the subjects participated in. Specifically, the dependent variable was alternatively PN, NE and EE for each specification, while the regressor was a dummy variable *play* which takes value one if subjects were from experiment 1 and therefore played the PGG, and 0 otherwise. We find that *play* is never statistically significant (all p's$>$0.1). Thus, these results support the argument that norms elicited in the main experiment do not depend on the task.

5 Discussion

The COVID-19 crisis has forcibly moved many social interactions online. It will take time before we will be able to understand whether this technological shift has caused stable changes in our socialisation modes and habits. However, the issue is of crucial significance since the digitalisation of communication in the context of long-lasting social distancing could jeopardise our sense of belonging to communities and our ability to develop and behave based on pro-social motives.

This paper shed light on the motives that drive contributions in the PGG when this strategic interaction occurs online. In our online PGG, contributions are mainly driven by subjects' personal norms, i.e. the personal belief in what the individual ought to do, unconditional on others' behaviour and others' beliefs about what is right. This does not mean that expectations about others' contributions and normative judgements do not play a role. However, once called upon to decide in complete anonymity and separation from the social context, with the only mediation of a

technological device, people assign a lower weight to their expectations concerning others, and rely more on their own normative preferences.

The issue of potential endogeneity between the task and the applied norm elicitation is even more critical in the light of this result. Indeed, the risk that subjects *ex post* justify their own decision after the task is higher with non-incentivised self-declared personal preferences. In this regard, the result we obtained in our second experiment, where we elicited the same personal and social norms in a sample of individuals who do not face the task, is even more striking. Thus, we can conclude that no self-justification by our decision-makers is at stake; personal norms are the main driver of pro-social behaviour in our online interaction.

The recent literature has highlighted the potential role of the manipulation of social expectations in inducing pro-social behaviour (Bicchieri and Dimant, 2019). The circumstance that personal norms are not conditional on social expectations makes them apparently more stable, less prone to be affected by contingent information and deeply rooted in subjects' remote experience and education. This paper does not address how personal norms are formed and further research will be needed to investigate whether acting on the framework of the decision or on the efficiency of the public good can affect such norms, thereby possibly sustaining pro-sociality. However, in the face of the possible long-term social and behavioural consequences of the COVID-19 pandemic, the capacity of forming, sustaining and, if necessary, changing personal norms held by isolated and digitalised individuals appears an absolute priority among the objectives of future policy-making.

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Appendices

Appendix A Additional Tables

Summary Statistics

	Contribution	PN	EE	NE
Experiment 1	6.09	6.02	5.07	5.12
	(2.80)	(2.66)	(2.05)	(2.39)
Experiment 2	-	6.24	5.39	5.24
		(3.41)	(2.86)	(2.92)

Table 3: Participants' experimental choice and elicited beliefs by experiment.

Demographic characteristics

	Age	Male	Income	Student	Soc. status	Education	Employed
Experiment 1	36.38	0.33	2.61	0.23	5.40	3.69	0.71
	(12.74)	(0.47)	(1.56)	(0.42)	(1.54)	(1.00)	(0.46)
Experiment 2	35.45	0.34	2.19	0.30	5.58	3.50	0.71
	(14.64)	(0.48)	(1.18)	(0.46)	(1.38)	(0.96)	(0.46)

Table 4: Participants' average characteristics by experimental session. Education is coded as: 1 "no formal qualifications", 2 "secondary education", 3 "high school diploma", 4 "undergraduate degree", 5 "graduate degree", 6 "doctorate degree". Personal income is coded as: 1 "less than 10 k", 2 "10–20 k", 3 "20–30 k", 4 "30–40 k", 5 "40-50k", 6 "50-60k", 7 "60-70k", 8 "80-90k", and 9 "greater than 90 k". Socioeconomic status refers to what participants self-reported as their place in a ladder representing society that goes from 1 to 10.

Tobit Regression with controls

	(1)	(2)	(3)	(4)
PN	0.828***	1.114***		0.944***
	(0.0986)	(0.104)		(0.109)
EE	0.423**		1.098***	0.591***
	(0.145)		(0.159)	(0.139)
NE		-0.0969	0.128	-0.336*
		(0.130)	(0.144)	(0.140)
altruism	0.000975	0.000589	0.00142	0.000927
	(0.000862)	(0.000916)	(0.00104)	(0.000832)
patience	0.234*	0.234*	0.435**	0.253**
	(0.0949)	(0.107)	(0.141)	(0.0899)
risk	0.0107	0.0169	-0.00265	-0.0504
	(0.0720)	(0.0782)	(0.116)	(0.0656)
neg.reciprocity	-0.0384	-0.0217	-0.0730	-0.0340
	(0.0582)	(0.0647)	(0.0792)	(0.0554)
trust	0.0719	0.141+	-0.0264	0.0635
	(0.0711)	(0.0729)	(0.0933)	(0.0708)
pos.reciprocity	-0.0173	-0.0136	0.0497	-0.0377
	(0.111)	(0.114)	(0.138)	(0.108)
comprehension	0.0374	0.0216	0.0870	0.0385
	(0.148)	(0.153)	(0.215)	(0.137)
crt	0.144	0.0773	0.469*	0.224+
	(0.136)	(0.139)	(0.197)	(0.135)
age	0.000148	-0.00602	0.00852	-0.00979
	(0.0134)	(0.0141)	(0.0209)	(0.0139)
gender	-0.198	-0.225	-0.354	-0.333
	(0.357)	(0.384)	(0.518)	(0.366)
stud.status	-0.574	-0.658	-0.0880	-0.511
	(0.435)	(0.498)	(0.553)	(0.438)
socioeco.status	-0.0855	-0.0774	-0.118	-0.0272
	(0.0888)	(0.0978)	(0.124)	(0.0913)
education	0.266	0.334+	0.171	0.285+
	(0.170)	(0.171)	(0.208)	(0.166)
constant	-3.409**	-2.919*	-3.757**	-3.048**
	(1.120)	(1.201)	(1.386)	(1.097)
N	158	158	158	158

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Tobit regressions. The dependent variable is the contribution. The regressors are different types of norms: personal normative beliefs (PN), empirical expectations (EE) or normative expectations (NE). The other explanatory variables are individual-specific characteristics about: preferences (altruism, patience, risk, trust, negative and positive reciprocity), time spent on the task page, a score variable for comprehension, a score variable for Cognitive Reflection Test, age, gender, student status, socioeconomic status, education.

Appendix B Cluster Analysis

Figure 4 presents the pairwise scatterplot matrix among the three elicited measures. We can especially see how when PN is included there appears to be two main groups, one in the central area of the plots and a second characterised by high values of norms.

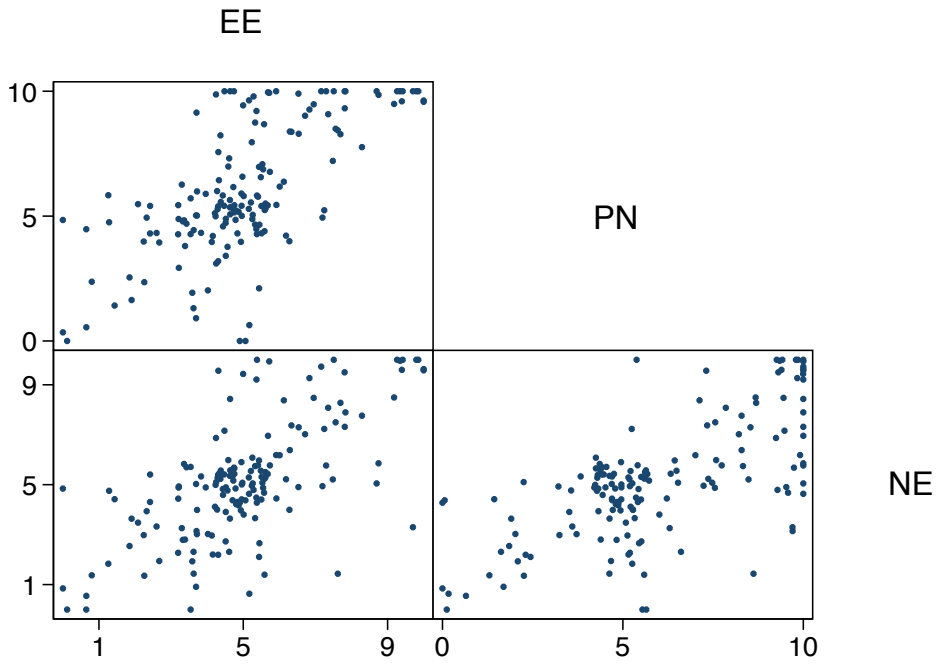

Figure 4: Scatterplot Matrix for PN, EE and NE. Observations are jittered for readability purposes.

We start the analysis by an hierarchical clustering method relying the weighted-average linkage criterion and using both the Calinski-Harabasz pseudo-F statistic and the Duda-Hart pseudo-T^2 as stopping rules. These measures indicate the dissimilarity between the clusters. A larger value of the Calinski-Harabasz pseudo-F statistic indicates more distinct clusters, while a smaller value of the Duda-Hart pseudo-T^2 indicates more distinct clusters. The results are reported in Table 6.

N	Calinski-Harabasz pseudo-F	Duda-Hart pesudo-T^2
2	116.75	22.16
3	70.68	11.67
4	55.90	10.85
5	44.87	3.17
6	36.55	174.25
7	31.09	102.71
8	58.72	7.89
9	4.75	10.78
10	50.86	14.79

Table 6: Weighted Average Linkage Cluster

On the one hand, the Calinski-Harabasz pseudo-F clearly points towards 2 clusters, on the other hand the Duda-Hart pseudo-T^2 suggests that the best number of clusters is 5, although also smaller numbers of clusters seem likely. The result of this first step of the analysis suggests that the most likely scenarios are either 2 or 5 clusters. Therefore, we computed the same pseudo-F statistic, up to seven clusters, but using non-hierarchical k-means clusters. Results are reported in Table 7

N	2	3	4	5
Calinski-Harabasz peudo-F	184.51	153.87	123.51	123.51

Table 7: K-means Clusters

The results once again clearly indicate that the differences between clusters rise as the number of clusters increases. Therefore we opt for 2 clusters. Table 8 reports the mean values of the two clusters.

k	EE	PN	NE
1	6.84386	8.949123	7.264912
2	4.073039	4.377451	3.928431
Total	5.066352	6.016352	5.124528

Table 8: Clusters means

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