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Three-Person Envy Games. Experimental Evidence and a Stylized Model

by

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Experimental Evidence and a Stylized Model

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Abstract

In three-person envy games, an allocator, a responder, and a dummy player interact. Since agreement payoffs of responder and dummy are exogenously given, there is no tradeoff between allocator payoff and the payoffs of responder and dummy. Rather, the allocator chooses the size of the pie and thus – being the residual claimant – defines his own payoff. While in the dictator variant of the envy game, responder and dummy can only refuse their own shares, in the ultimatum variant, the responder can accept or reject the allocator's choice with rejection leading to zero payoffs for all three players. Comparing symmetric and asymmetric agreement payoffs for responder and dummy shows that equality concerns are significantly context-dependent: allocators are willing to leave more money on the table when universal equality can be achieved than when only partial equality is at stake. Similarly, equality seeking of responders is most prominent when universal equality is possible.

Keywords: Envy games, experimental economics

JEL Classification: C72, C91, D63

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1. Introduction

Equality concerns are usually studied in situations where one person can sacrifice own payoff and at the same time increase the payoff of others – thus reducing inequality between players (see, e.g., Fehr and Schmidt 1999 or Bolton and Ockenfels 2000). In our paper, we analyze equality concerns in an envy game (see Casal et al. 2012) where there is no trade-off between own and others' payoff. Studying this game thus enables us to analyze a person's willingness to pay for equality without that money being transferred to the other party – disentangling a person's willingness to pay for equality from the person's willingness to increase the payoff of others (on the relevance of the "price of giving" see, e.g., Jakiela 2013).

In envy games, allocators do not distribute a given pie as in standard ultimatum or dictator games but rather choose the pie size from some generic interval.[1] Since the other players' agreement payoffs are exogenously given and since the allocator acts as the residual claimant, the choice of the pie size only determines the allocator's agreement payoff and does not affect the agreement payoffs of the others. Hence, there is no trade-off between allocator's and others' payoff. Choosing a pie size below the maximal size is equivalent to leaving money "on the table". Choosing the maximal pie size may indicate that the allocator is efficiency seeking, but it is also self-serving – potentially provoking feelings of envy[2] on the part of the responder and the dummy player.

Choosing the pie size rather than directly what one, as a proposer participant, demands for oneself is possibly influential (see, e.g., List 2007). But this applies to all experiments where the proposer decides on the size of the pie (e.g., also to generosity experiments, see below). A real life application of the envy game might be a situation where one member of a joint venture has the opportunity to receive a larger reward than the others (e.g. because of an exclusive access to a subsidy program) and where (s)he might not want to take the money in order not to provoke feelings of envy by the other members of the joint venture (especially when envy might result in a break-up of the team).

In the literature, the envy game has been introduced by Casal et al. (2012). In contrast, we study the envy game in a three-player context with a proposer, a responder and a dummy player. We do so because we want to study the effect of symmetric vs. asymmetric agreement payoffs for responder and dummy on the proposer's willingness to pay for (universal or only partial) equality. Similarly, Güth et al. (2010) have studied the effect of symmetric vs. asymmetric agreement payoffs in the so-called generosity game where the responder or the dummy player act as residual claimant. By choosing the maximal pie size, the allocator may hence display *generosity* towards the responder or dummy and

[1] On the role of equality vs. efficiency concerns in other distribution experiments see, e.g., Engelmann and Strobel (2004), Loewenstein, Thompson and Bazerman (1989) or Charness and Rabin (2002).

[2] On the role of envy in ultimatum games see, e.g., Kirchsteiger (1994) and on the relation between envy and egalitarian preferences see Kemp and Bolle (2013).

thus increase the probability of acceptance. The generosity game was introduced by Güth (2010) and experimentally analyzed in a two-player context by Güth, Levati, and Ploner (2012) and by Bäker et al. (2014) where the latter focus on the role of "entitlement".[3]

To disentangle intrinsic equality seeking and a corresponding intrinsic willingness to pay for equality from a willingness to pay that is motivated by fear of rejection, we compare a dictator (DEG) and an ultimatum variant (UEG) of the envy game. In DEG, only intrinsic equality concerns suggest to leave money on the table and forego own payoff for the sake of equality. In UEG, fear of rejection by potentially "envious" responders might add to intrinsic equality concerns and thus increase the willingness to pay for equality. The introduction of a third (dummy) player in both variants (DEG and UEG) allows to compare games with exogenous symmetric and asymmetric agreement payoffs and explore if the allocator's willingness to pay for equality is affected by whether universal or only partial equality is possible.

We find, that an allocator's willingness to pay for equality is larger in the ultimatum than in the dictator variant of the game, and that it is – and this is our new finding – context-dependent in the sense that it is larger when universal and not only partial equality can be achieved. That is, allocators in DEG and UEG are more willing to leave money on the table when this results in all players receiving the same payoff (universal equality) as compared to the situation where only partial equality is possible. With respect to the above described application of a joint venture this means that in a situation where the other team members' rewards from the joint venture are unequal from the outset, the readiness to leave money on the table will be reduced.

The remainder of the paper is organized as follows: In Section 2, we introduce the games formally and describe the experimental protocol. In Section 3, we analyze the experimental data and state our results. Section 4 presents a stylized model accounting for the observed effects. Section 5 concludes.

2. Experimental Design

2.1. The Class of Games

Let X denote the allocator, Y the responder, and Z the dummy player in the three-person envy game. Further, let p be the pie size, i.e., the monetary amount which the three players can share. The decision process in the UEG is as follows:

- First X chooses $p \in \left[\underline{p}, \overline{p}\right]$ where $0 < \underline{p} < \overline{p}$ (for further restrictions on $\underline{p}$ and $\overline{p}$ see below).
- After learning the choice of p, responder Y can either accept $(\delta(p) = 1)$ or reject $(\delta(p) = 0)$ the choice.

[3]For a recent survey on ultimatum bargaining experiments including envy and generosity games, see Güth and Kocher (2014).

- Only in case of $\delta(p) = 1$, dummy player Z can accept $(\rho(p) = 1)$ or reject $(\rho(p) = 0)$ his share what ends the game.[4]

Let y and z denote the exogenously given positive agreement payoffs for Y and Z, respectively, satisfying $min\{y, z\} > \underline{p} - y - z \geq 0$ so that $p = \underline{p}$ would give less to X than to Y or Z but still cause no loss for X. Furthermore, $\bar{p} - y - z > max\{y, z\}$ allows allocator X to earn more than the others. The payoffs depend on the choices and the exogenous payoff parameters as follows:

- X earns $\delta(p)(p - y - z)$,
- Y earns $\delta(p)\, y$, and
- Z earns $\rho(p)\,\delta(p)\, z$.

We played five treatments: three UEGs and two DEGs. The three UEGs differ in the relation between exogenous agreement payoffs. We analyze three cases: $y > z, y = z$, and $y < z$. The parameter restrictions guarantee that X can claim less, the same (at least partially), or more than what the others get in case of $\delta(p) = 1$ and $\rho(p)\delta(p) = 1$.

The two DEGs with payoff $p - y - z$ for X, irrespective of $\delta(p)$ and $\rho(p)$ allow the two dummy players Y and Z to individually refuse their own share. Their earnings are $\delta(p)y$ and $\rho(p)z$, respectively. We analyze one case where $y = z$ and one where $y < z$.

If all three players are only concerned about their own payoff, the solution for all games requires $\delta^*(p) = 1$, $\rho^*(p) = 1$ for all p and $p^* = \bar{p}$ implying the payoff vector $(\overline{p} - y - z, y, z)$ if Y's behavior is anticipated by X in UEG. In DEG, the latter assumption is not needed.

2.2. Experimental Protocol

To elicit the "natural" attitudes of participants who confront a three-person envy game for the first time, we implemented a one-shot game as a pen-and-paper classroom experiment, conducted at the University of Tübingen with participants of an Intermediate Microeconomics course who were not yet familiar with game theory.[5]

After reading the instructions carefully and privately answering questions (see the English translation of material in the Appendix), participants filled out the control questionnaires and the decision forms. Only the decisions of students who correctly answered the control questions entered the empirical analysis. Rather than playing the game sequentially, we implemented it as a

[4] Forcing the dummy player to accept whatever is given to him would render him not only powerless but also voiceless (see, e.g., Forsythe et al. 1994).

[5] Different colors were used for the instructions of the five different treatments. After blocks of X-, Y-, and Z-participants were formed in the large lecture room, neighboring participants in the same block and the same role type (X, Y, or Z) received the instructions, control questionnaires, and decision forms of different treatments to discourage any attempts to learn from others.

normal-form game by employing the strategy method for players Y and Z.[6] We set $\underline{p} = 12$ and $\overline{p} = 22$ and allowed only for integer pie choices $p \in [\underline{p}, \overline{p}]$. Thus, X had eleven possible pie choices p, and Y could chose $\delta(p) \in \{0, 1\}$ for each of these possible values of p. Z could only decide on whether, in case of $\delta(p) = 1$, to accept z or not by choosing $\rho(p) \in \{0, 1\}$. Payments were received after the next lecture of the course.

3. Results

3.1. Structure of the Data

Of the students participating in the experiment, 266 answered all control questions correctly, were included in the data set and matched with one participant of each of the other roles. Table 1 displays the number of participants with correct answers to all control questions, separately for each role (X, Y, Z) and all game variants.[7]

Game variant	X	Y	Z
UEG $(y = 9, z = 3)$	19	26	12
UEG $(y = 6, z = 6)$	20	30	9
UEG $(y = 3, z = 9)$	22	27	10
DEG $(y = 9, z = 3)$	25	14	6
DEG $(y = 6, z = 6)$	23	14	9
$\sum$	109	111	46

Table 1: Number of participants in the different games and roles

3.2. Allocator Behavior

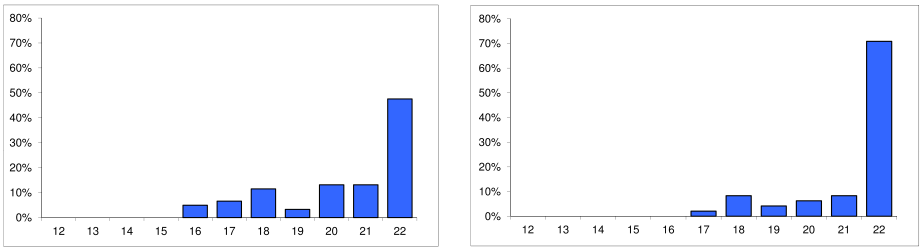
Figure 1a combines all UEG pie choices over all three UEG treatments, and Figure 1b combines all DEG pie choices over the two DEG treatments. In both, UEG and DEG, the by far most prominent pie choice is the "efficient" maximal pie size $p = 22$. However, the share of allocators choosing $p = 22$ in UEG is significantly (p-value of two-sided Fisher exact test = 0.019) lower than the corresponding share in DEG (48 vs. 70 percent). While choosing less than the maximal pie size in DEG hints at (intrinsic) equality concerns and an

[6] The obvious advantage of more interactive data gained by the strategy method is sometimes questioned by its "coldness". But the evidence so far is mixed and "hot" versus "cold" seems less crucial for the tension between efficiency and equality seeking.

[7] We assigned less participants to the role of Z and matched these participants repeatedly where, of course, Z-players were only paid according to one match.

intrinsic willingness to pay, in UEG it is also motivated by a fear of rejection.[8] As a consequence, allocators in UEG on average choose smaller pie sizes than allocators in DEG: The average pie size in UEG is 20.43, the one in DEG is 21.23. This leads to our first result:

Result 1: Pie choices in UEGs are significantly smaller than pie choices in DEGs.



(a) UEG (b) DEG

Figure 1: Pie choices of allocators X in (a) UEG and in (b) DEG, both pooled across game variants

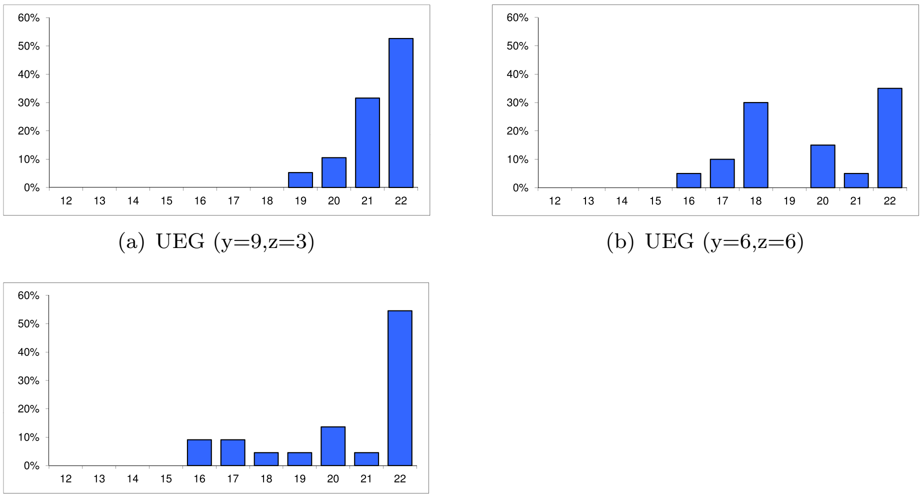
Figure 2 shows the pie choices for the different UEG variants. In each of them, choosing the maximal pie size ($p = 22$) is the most prominent choice, but evidence for (partial or universal) equality seeking is strong as well. However, equality concerns are context-dependent in the sense that allocators are more likely to leave money on the table (i.e. not to choose the efficient pie size) if universal (and not only partial) equality can be achieved: In the asymmetric UEGs, 47 and 45 percent of allocators, respectively, choose a pie size below $\bar{p} = 22$, while in the symmetric UEG, 65 percent of allocators choose a pie size below $\bar{p} = 22$. Further, equality seeking is almost as prominent in the symmetric UEG as in the asymmetric UEG with $y = 9$ and $z = 3$, even though it is far more costly: In the symmetric UEG, 30 percent of allocators are ready to incur costs of 4 ECU (=Experimental Currency Units) to then achieve universal equality, while in the asymmetric UEG with $y = 9$ and $z = 3$, only slightly more (32 percent of allocators) are ready to incur costs of 1 ECU to hence achieve partial equality with the responder.[9] As a result of this context-dependency,

[8] Other than in standard ultimatum games, responder rejection in the UEG is not the result of responders having hoped for more (their agreement payoff is fixed in advance), but a result of responders wanting the allocator to get less.

[9] In the asymmetric UEG with $y = 3$ and $z = 9$, equality with the responder ($p = 15$) is never chosen, i.e. no allocator is ready to incur costs of 7 ECU to then only achieve partial equality. This indicates that the proposer does not simply focus on the player who has strategic power in the game but (s)he additionally takes into account how much (s)he would have to pay in order to achieve equality with that player. The average pie choice for the different UEGs are illustrative in this respect: in the UEG with $y = 3$, the average pie size is 20.36, for the UEG with $y = 6$, it is 19.65 and for the UEG with $y = 9$, it is 21.36. When we correlate the chosen pie size p and responder agreement payoff y, we do find a positive correlation, but

pie choices in the asymmetric UEGs are on average higher than the ones in the symmetric UEG: In the asymmetric UEGs, the average pie size is 20.81, in the symmetric UEG it is 19.65. According to a Wilcoxon rank-sum test, there is a (at the five percent level) statistically significant difference between pie choices in the asymmetric UEGs and the symmetric UEG (p-value = 0.0465). Hence our second result reads:

Result 2: In the symmetric UEG, pie choices are significantly smaller than pie choices in the asymmetric UEGs.



(a) UEG (y=9,z=3)

(b) UEG (y=6,z=6)

(c) UEG (y=3,z=9)

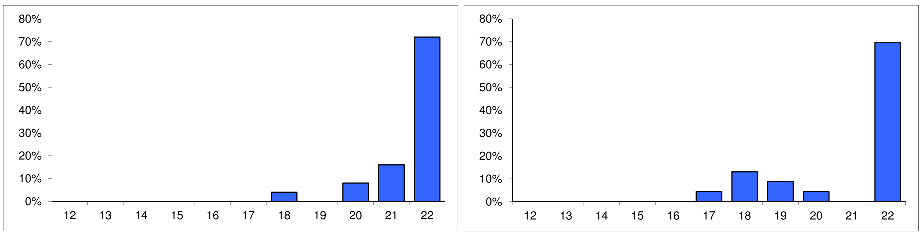
Figure 2: Pie choices of allocators X in UEG by treatment

Figure 3 displays the pie choices for the two DEG variants. In each of them choosing the maximal pie size is by far the most prominent choice, but again there is also – though considerably weaker – evidence for (partial or universal) equality seeking. Comparing symmetric and asymmetric variants, dictators are again (slightly) more likely to leave money on the table in the symmetric than in the asymmetric variant: In the asymmetric DEG, 28 percent of dictators choose a pie size below $\bar{p} = 22$, while in the symmetric DEG, 30 percent of allocators choose a pie size below $\bar{p} = 22$. Further, even though equality seeking in the symmetric DEG is substantially more costly for the dictators, equality seeking is almost as prominent in the symmetric DEG as in the asymmetric DEG: In the asymmetric DEG, 16 percent of allocators choose $p = 21$ and thus are ready to incur costs of 1 ECU to equalize their own payoff with the better off dummy player (no dictator decides to equalize her payoffs with the worse off dummy), while in the symmetric DEG, only slightly less (13 percent of dictators) opt for

it is not statistically significant.

(universal) equality by choosing $p = 18$, thus incurring costs of 4 ECU. As a result, dictators, on average, choose lower pie sizes in the symmetric DEG as compared to the asymmetric DEG: in the symmetric DEG, the average pie size is 20.91, in the asymmetric DEG, it is 21.52. According to a Wilcoxon rank-sum test, however, the difference is not statistically significant (p-value $> 10\%$). Accordingly, our third result reads:

Result 3: In the symmetric DEG, pie choices are slightly lower than those in the asymmetric DEG.



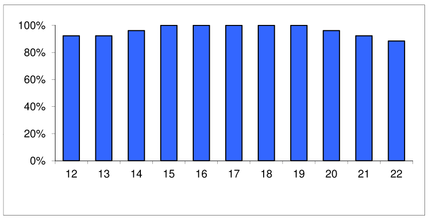
(a) DEG (y=9,z=3) (b) DEG (y=6,z=6)

Figure 3: Pie choices of allocators X in DEG by treatment

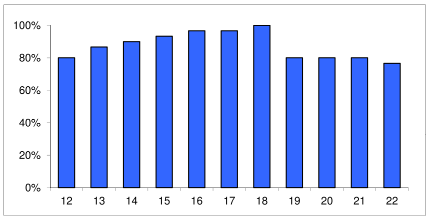
3.3. Responder Behavior

Figure 4 displays the acceptance behavior of responders Y in the different UEG variants. Due to the strategy method, we have information on acceptance behavior concerning all possible pie sizes from all responders.[10]

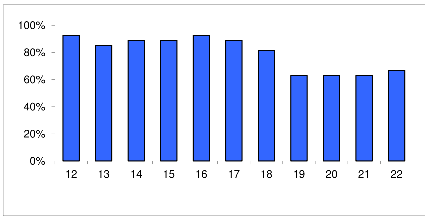
[10] We only analyze the acceptance behavior of responders. The dummy players were also allowed to reject, but only the payoff that was assigned to themselves. No dummy player rejected his or her own amount.



(a) UEG (y=9,z=3)



(b) UEG (y=6,z=6)



(c) UEG (y=3,z=9)

Figure 4: Acceptance rates for the eleven possible pie sizes, separated by UEG variants

Comparing the different UEG variants, acceptance rates increase in Y's agreement payoff: For any pie size, acceptance is highest in the asymmetric UEG with $y = 9$ and $z = 3$ and lowest in the asymmetric UEG with $y = 3$ and $z = 9$ with the symmetric UEG lying in between. This suggests that responder behavior is largely driven by how much (s)he has to lose.

In the symmetric UEG (Figure 4b), the highest acceptance rate (100 percent) is achieved for $p = 18$, equalizing all payoffs (universal equality). All other pie choices run a risk of rejection. On the whole, acceptance rates for the different pie choices tend to display an inverted U shape with a maximum at $p = 18$, indicating equality seeking Y-participants.

In the asymmetric UEG with $y = 9$ and $z = 3$ (Figure 4a), "medium" pie choices ($15 \leq p \leq 19$) are always accepted whereas lower pie choices ($p \leq 14$) as well as higher ones ($p \geq 20$) confront a risk of rejection. Interestingly, partial equality of X and Y ($p = 21$) is not particularly valued (second lowest acceptance rate). Y rather seems to compare X's payoff with the average of y and z.

In the asymmetric UEG with $y = 3$ and $z = 9$ (Figure 4c), the picture looks quite different: no single pie choice - not even the most humble proposal of $p = 12$ implying a zero-payoff for the allocator - is accepted by all of the responders. Acceptance rates vary between 63 and 93 percent with the two "partial equality" seeking pie choices $p = 15$ (equality with Y) and $p = 21$ (equality with Z) not "sticking out" in terms of higher acceptance rates.

Result 4: In the symmetric UEG, acceptance rates display an inverted U-shape and are highest for $p = 18$. In asymmetric UEGs, rejection tendencies of Y-participants are less clear.

4. Capturing Context-Dependency in a Stylized Model

In what follows, we align equilibrium predictions from a stylized formal with the experimental findings of the experiment by including other regarding concerns and accounting for context-dependency in the sense that unequal exogenous agreement payoffs may weaken equality concerns and reduce an allocator's willingness to pay for equality. Similar to Bolton and Ockenfels (2000), we consider quadratic utility functions.

Let the allocator's utility be

$$
\begin{aligned}
U_x = (p - y - z) &- ((\alpha_x - |y - z|)/2)(p - 2y - z)^2 \\
&- ((\beta_x - |y - z|)/2)(p - y - 2z)^2 - (\gamma_x/2)(y - z)^2 \ ,
\end{aligned}
$$

where $\alpha_x \geq \beta_x > |y - z|$ is assumed to hold throughout.

The first term in the utility function ($p - y - z = x$) captures efficiency seeking/allocator self interest. α_x indicates how the allocator (intrinsically) values an inequality between his own payoff $p - y - z$ and the payoff of the responder y, and β_x and γ_x indicate how the allocator values an inequality between the payoff of the dummy z and his own payoff ($p - y - z$) and an inequality between the payoff of the dummy z and the payoff of the responder y, respectively. High values of α_x, β_x and γ_x each indicate a higher willingness to pay for equality.

The rationale for assuming $\alpha_x \geq \beta_x$ is that β_x captures intrinsic equality concerns while – in case of UEG – α_x additionally indicates the allocator's fear of rejection due to responder envy. Consequently, in DEG, $\alpha_x = \beta_x$.

With $|y - z|$ we introduce a new term and capture a potentially dampening effect of exogenously imposed inequality on (intrinsic as well as fear-of-rejection-driven) inequality aversion. If only partial equality can be achieved, the allocator's willingness to pay for equality is reduced as compared to a situation where universal equality is at stake.

Maximizing the utility function with respect to the pie size p leads either to the corner solution $p = \bar{p}$ or to the interior solution

$$
p^* = y + z + \frac{1 + (\alpha_x - |y - z|)y + (\beta_x - |y - z|)z}{\alpha_x + \beta_x - 2|y - z|} \ .
$$

A comparative-static analysis shows that the partial effect $\partial p^*/\partial \alpha_x < 0$ of an increase in α_x – as compared to $\alpha_x = \beta_x$ – is negative for $y \leq z$, i.e. $y \in \{3, 6\}$, but ambiguous for $y > z$, i.e. $y = 9$. As a result, in a pooled data set (across the different values for $|y - z|$) one would predict lower pie choices in UEG (where $\alpha_x > \beta_x$) than in DEG (where $\alpha_x = \beta_x$). This provides a rationale for *Result 1.*

Further, the influence of unequal exogenously imposed agreement payoffs y and z ($y + z = 12$ is constant across all games) on the pie size p^* is clearly positive in case of $y > z$, but ambiguous in case of $y < z$. As a result, we expect the allocator's willingness to pay for equality to be stronger in the symmetric

UEG than in the asymmetric UEG with $y > z$. For the asymmetric UEG with $y < z$, the predictions are not as clear cut. Still, theoretical predictions are in accordance with the experimental evidence summarized in *Result 2* which suggests higher pie choices in case of asymmetric agreement payoffs as compared to symmetric agreement payoffs.

In DEG (where $\alpha_x = \beta_x$), inequality in the exogenous agreement payoffs ($|y - z| > 0$) clearly implies higher pie choices of the allocator compared to the symmetric variant with $y = z$ when starting from an interior solution. Otherwise, of course, the corner solution persists. This inequality effect closely coincides with *Result 3*.

For the responder, we specify responder utility in an analogous way as

$$
\begin{aligned}
U_y = y &- ((\alpha_y - |y - z|)/2)(p - 2y - z)^2 \\
&- ((\beta_y - |y - z|)/2)(p - y - 2z)^2 - (\gamma_y/2)(y - z)^2
\end{aligned}
$$

where $\alpha_y \geq \beta_y > |y - z|$ is assumed to hold throughout. Here, a difference between α_y and β_y captures feelings of envy by the responder.

Utility of the responder is maximal at pie size

$$p^{**} = \frac{2\alpha_y + \beta_y - 3|y - z|}{\alpha_y + \beta_y - 2|y - z|}\, y + \frac{\alpha_y + 2\beta_y - 3|y - z|}{\alpha_y + \beta_y - 2|y - z|}\, z\ .$$

In case of equal exogenous agreement payoffs $y = z$, this induces $p^{**} = 3(y + z)/2$. With unequal exogenous agreement payoffs, we find $p^{**} > 3(y + z)/2$ in case of $y > z$. The effect in case of $y < z$, however, is ambiguous. Consequently, the model predicts that, in the symmetric UEG, acceptance rates peak at pie size $p^{**} = 18$. However, if $y > z$, the peak will shift to the right whereas for $y < z$ the peak may shift in both directions. *Result 4* supports our supposition concerning the UEGs, especially in the symmetric variant.

5. Conclusion

In our paper, we studied three-person envy games where an allocator, a responder, and a dummy player interact. Since agreement payoffs of responder and dummy are exogenously given, there is no tradeoff between allocator payoff and the payoffs of responder and dummy. Rather, the allocator chooses the size of the pie from a given interval and thus – being the residual claimant – defines his or her own payoff. While in the dictator variant of the envy game, responder and dummy can only refuse their own shares, in the ultimatum variant, the responder can accept or reject the allocator's choice with rejection leading to zero payoffs for all three players. Comparing symmetric and asymmetric agreement payoffs for responder and dummy shows that equality concerns are significantly context-dependent: allocators are willing to leave more money on the table when universal equality can be achieved than when only partial equality is at stake. Similarly, equality seeking of responders is most prominent when universal equality can be achieved.

Appendix

Instructions for the UEG

Thank you for your participation in this experiment. You will interact with two other participants. We will not inform you about their identity. Due to time constraints it is not possible to give you the money that you can earn in this experiment today. But on presentation of your code-card you will receive it after next week's lecture.

For the statistical analysis of the decision-making process, it is essential that you make your decision independently of other participants. Therefore we ask you to refrain from contacting anyone; otherwise we have to exclude you from the experiment and the payoff.

How is your payoff determined? Three interacting participants - you and two other randomly selected participants - will each be randomly assigned one of three roles, namely X, Y, and Z. The tasks of these roles vary.

The participant in role X can choose an integer amount B between 12 and 22 ($12 \leq B \leq 22$), which will be divided among X, Y, and Z if the participant in role Y accepts the chosen amount B. That implies that the participant in role Y has to decide for every possible amount B whether he accepts or not.

If the participant in role Y accepts the offer,

- the participant in role X receives a payoff of [a-variant: Euro B-9-3, b-variant: Euro B-6-6, c-variant: Euro B-3-9]
- the participant in role Y receives a payoff of [a-variant: Euro 9, b-variant: Euro 6, c-variant: Euro 3]
- the participant in role Z receives a payoff of [a-variant: Euro 3, b-variant: Euro 6, c-variant: Euro 9] on the condition that the participant in role Z accepts his amount.

If the participant in role Z rejects his payoff, he loses the payoff. This has no effect on the payoffs of the participants in roles X and Y.

But if the participant in role Y rejects the offer, all three parties receive nothing.

These are the rules for the interaction of the participants in role X, Y, and Z. You will be informed shortly of your role.

First, we briefly recapitulate the rules again:

- X chooses an integer amount B with $12 \leq B \leq 22$
- For every given amount B, Y has to decide whether he accepts the offer or not.
- Z has to decide whether he accepts his amount or not.
- If Y accepts the decision of X, and if Z also accepts his payoff, the payoffs for the following roles are

  - X: [a-variant: Euro B-9-3, b-variant: Euro B-6-6, c-variant: Euro B-3-9]
  - Y: [a-variant: Euro 9, b-variant: Euro 6, c-variant: Euro 3]
  - Z: [a-variant: Euro 3, b-variant: Euro 6, c-variant: Euro 9]

- If Y accepts the decision of X, but Z rejects his payoff, the payoffs for the following roles are
  - X: [a-variant: Euro B-9-3, b-variant: Euro B-6-6, c-variant: Euro B-3-9]
  - Y: [a-variant: Euro 9, b-variant: Euro 6, c-variant: Euro 3]
  - Z: Euro 0

- If Y rejects the decision of X, then X, Y, and Z receive nothing (Euro 0).

Instructions for the DEG

Thank you for your participation in this experiment. You will interact with two other participants. We will not inform you about their identity. Due to time constraints it is not possible to give you the money that you can earn in this experiment today. But on presentation of your code-card you will receive it after next week's lecture.

For the statistical analysis of the decision-making process, it is essential that you make your decision independently of other participants. Therefore we ask you to refrain from contacting anyone; otherwise we have to exclude you from the experiment and the payoff.

How is your payoff determined? Three interacting participants - you and two other randomly selected participants - will each be randomly assigned one of three roles, namely X, Y, and Z. The tasks of these roles vary.

The participant in role X can choose an integer amount B between 12 and 22 ($12 \leq B \leq 22$), which will be divided among X, Y, and Z.

For the amount B chosen by X

- the participant in role X receives a payoff of [a-variant: Euro B-9-3, b-variant: Euro B-6-6]

- the participant in role Y receives a payoff of [a-variant: Euro 9, b-variant: Euro 6] on the condition that the participant in role Y accepts his amount

- the participant in role Z receives a payoff of [a-variant: Euro 3, b-variant: Euro 6] on the condition that the participant in role Z accepts his amount.

If the participant in role Y rejects his payoff, he loses the payoff. This has no effect on the payoffs of the participants in roles X and Z. The same applies to the participant in role Z. If he rejects his payoff, he loses the payoff. This has no effect on the payoffs of the participants in roles X and Y.

These are the rules for the interaction of the participants in role X, Y, and Z. You will be informed shortly of your role.

First, we briefly recapitulate the rules again:

- X chooses an integer amount B with $12 \leq B \leq 22$
- Y has to decide whether he accepts his amount or not
- Z has to decide whether he accepts his amount or not.
- If Y accepts his payoff, and if Z also accepts his payoff, the payoffs for the following roles are
  - X: [a-variant: Euro B-9-3, b-variant: Euro B-6-6]
  - Y: [a-variant: Euro 9, b-variant: Euro 6]
  - Z: [a-variant: Euro 3, b-variant: Euro 6]
- If Y accepts his payoff, but Z rejects his payoff, the payoffs for the following roles are
  - X: [a-variant: Euro B-9-3, b-variant: Euro B-6-6]
  - Y: [a-variant: Euro 9, b-variant: Euro 6]
  - Z: Euro 0
- If Y rejects his payoff, but Z accepts his payoff, the payoffs for the following roles are
  - X: [a-variant: Euro B-9-3, b-variant: Euro B-6-6]
  - Y: Euro 0
  - Z: [a-variant: Euro 3, b-variant: Euro 6]
- If Y rejects his payoff, and Z also rejects his payoff, the payoffs for the following roles are
  - X: [a-variant: Euro B-9-3, b-variant: Euro B-6-6]
  - Y: Euro 0
  - Z: Euro 0

Control Questions

If X chooses the amount $B =$€17, how much receives
X: €
Y: €
Z: €
if Y accepts the amount B, but Z rejects amount?

If X chooses the amount $B =$€18, how much receives
X: €
Y: €
Z: €
if Y rejects the amount B, and Z accepts his amount?

If X chooses the amount $B =$€16, how much receives
X: €
Y: €
Z: €
if Y accepts the amount B, and Z accepts his amount?

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