



Giving in Unilaterally Risky Dictator Games: A Model of Allocation Decisions Under Existential Threat

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Abstract

This study reports experimental results from variations of the standard dictator game that capture different variants of unilaterally risky allocation decisions where only the dictator's payoff is subject to risk. Thereby, it addresses the question of whether decisions under existential threat, modeled as a risk to the dictator's payoff, encourage or discourage generosity in individual decision making. It aims at bridging the gap between experimental economics and psychological research on the behavioral impact of mortality salience. Results show that giving in unilaterally risky dictator games increases with the risk imposed on the dictator's payoff. Risk aversion falls short of explaining the increase in generosity. Instead, the observed behavior is most likely motivated by a preference for efficient capital employment. Moreover, dictator games prove to be an apt model for decisions under existential threat.

Keywords: dictator games; risky decisions; mortality salience; generosity; existential threat.

1. Introduction

How do we decide when death is looming? Whenever we talk about scarcity, we also talk about value. Scarcity does not only cause the fundamental economic resource allocation problem but typically also raises the value of goods. Recently, the infamous street artist Banksy hit the news because he equipped one of his paintings with a self-destructive mechanism which was triggered after the painting was sold during a Sotheby's auction. Although the painting was cut to pieces, its market value increased within hours after the auction. Scarcity spurs value.

This principle also extends to immaterial goods. When we are busy, hence time-constrained, we value our time higher. In fact, the association between scarcity and value is so overlearned that some researchers argue that its converse also holds: highly valued goods are often perceived as rare, referred to as the scarcity heuristic. Extending this heuristic, King et al. (2009) examine the bidirectional link between scarcity and value applied to the meaning of death. For that purpose, they define death as the scarcity of life.

But what happens to our allocation decisions when not money, but lifetime is the limited variable? Does the endowment effect increase and drive a valuation gap between our own utility expectations from a set amount of money and the expected value after discounting for a limited time horizon

(or: limited usability)? Eventually, do we become more selfish or more generous when facing death? These questions shall guide the scientific endeavor behind this experimental study. At the intersection between economics and psychology, it will investigate allocation decisions under existential threat, with special focus on generosity.

One of the most popular publications addressing the behavioral consequences of a doomsday scenario is *Death and the Afterlife* (Scheffler and Kolodny, 2013) in which the authors discuss a scenario where the inevitable demise of the earth is known to occur in 30 days and leads to a grave erosion of human values. Substantiating evidence for a higher tendency towards anti-social behavior close to doomsday can be found in a gaming study analyzing the data of more than 80.000 subjects playing a virtual apocalypse scenario (Kang et al., 2017). Results indicate that the homicide rate increases close to the end.

The present study will neither follow Scheffler and Kolodny, 2013 path of philosophical inquiry, nor study behavior in computer simulations, but instead, take an approach based on an economic game. More importantly, it will not focus on doomsday scenarios where all life on earth comes to an end, but rather consider a scenario where only one individual, the decision-maker, faces an elevated risk of dying in the close future. The experiment conducted as part of this

study is based on a dictator game modified to the effect that the dictator's payoff is subject to risk while the conditions of the recipient's payoff are equal to those in the standard dictator game.

From research on dictator games under ambiguity, it is known that dictators choose unfair splits more frequently when the recipient's payment allocation depends on an ambiguous lottery (Haisley and Weber, 2010). Put differently, dictators' estimates of the expected value of the recipient's allocation are inflated under ambiguity. Experiments with bargaining games, however, have shown that payoff uncertainty on the part of the seller is likely to influence the terms of the settlement in favor of the seller because the buyer is willing to make concessions (see, e.g., Church and Zhang, 1999). Analogously, this study will observe whether a dictator in a dictator game setting is willing to allocate more money to the recipient whose expected payoff from the money is higher relative to the dictator's. Such behavior would be indicative of strong other-regarding preferences triggered by an existential threat. Deception games, for instance, provide a strong example for such preferences: One third of the subjects in Erat and Gneezy (2012) willingly engage in lying that financially harms the sender but benefits the receiver, so-called altruistic white lying. It will be the purpose of this study to examine whether mortality awareness encourages non-selfish motives in allocation decisions.

One might ask why an elevated risk of dying should impact allocation decisions in the first place. The answer is two-fold: Firstly, many factors typically influencing decision-making become obsolete under anticipated death. Secondly, new determinants may be added.

First addressing those factors which turn obsolete, one example that comes into mind is hyperbolic discounting. The tendency to choose a smaller-sooner reward over a larger-later reward (Laibson, 1997) naturally does not play a role for death-doomed individuals. Another example would be the so-called forward consumption effect, defined by Loewenstein and Elster (1992) as deriving utility from the future through anticipatory savoring. Upon looming death, contemplating the future will most likely not affect the utility considerations behind the type of decisions this study is concerned with.

Turning to those factors which may newly emerge as decision variables under existential threat, we must first introduce the term of mortality salience. Research on this topic works with artificially activated death awareness and argues that decisions under this condition are partially dependent on self-defense mechanisms against anxiety, which usually results in selfish or socially endorsed behavior (Kasser and Sheldon, 2000). In the context of allocation decisions, one might also imagine that mortality salience and the concomitant limited time horizon to derive utility from a monetary endowment may either encourage excessive spending or large transfers to others driven by generosity and the realization that the own relative utility is lower. To test which effect is dominant, the experiment presented in this study attempts to align economic research with the tradition of mortality salience exper-

iments.

"A common method of operationalising mortality salience, however, takes the form of open-ended questions asking individuals to express the feelings and thoughts they experience when thinking about their own death," (Cozzolino et al., 2004b, p.279).

Since priming and open-ended question do not match the format of an economic experiment, the present study will attempt to model an allocation decision under existential threat by means of a modified dictator game.

Henceforth, the present study is organized as follows: Section 2 provides a review of the related economic and psychological literature. In section 3, the design of the experiment underlying this study is outlined in detail. Section 4 explains the theoretical model behind the experiment as well as the resulting hypotheses, followed by a comprehensive report of the experimental results in section 5. Finally, Section 6 discusses the findings and their implications, the limitations of this study, as well as proposals for future research.

2. Related Literature

2.1. Dictator Games under Risk

Early research on behavior in dictator game setting goes back 25 years (Forsythe et al., 1994). In the standard scenario, the game is played between two randomly paired players, one in the role of the dictator and one in the role of the recipient. The dictator may then distribute an unearned pie of \$10 between the recipient and him-/herself. According to the predictions of classic game theory, the strictly rational decision in this setting is to allocate zero funds to the recipient. In these early versions of the dictator game, average allocations are typically 10-25% (Camerer, 2003). Attempts to explain these non-trivial splits are manifold, but most of them anchor at a concept of fairness. Since allocations in dictator games are significantly different from those in simple ultimatum games where the recipient has the choice to accept or reject the dictator's proposal, fairness considerations alone cannot entirely explain behavior in either of the games, but instead strategic considerations also have an impact (Forsythe et al., 1994). In subsequent studies, the dictator's action space was anonymized (with so-called double-blind treatments) to test rule out the effect of social influence (Hoffman et al., 1994). Generally, the dictator games are sensitive to changes in the instructional setting: if the dictator earns his/her role through a contest, giving is significantly lower compared to treatments based on a random role allocation (Hoffman et al., 1994).

In the standard dictator game, the total allocation amount is fixed. Modified versions where the joint payoff can vary, however, have studied the trade-off between efficiency, i.e., choosing an allocation which maximizes the joint output, and equity, i.e., choosing a more equal allocation (Charness and

Rabin, 2002; Engelmann and Strobel, 2006). The equity-efficiency tradeoff will be helpful to the understanding of the experimental data gained in this study. Aside from concerns for efficiency, inequality aversion is another motivation prominently used to explain non-selfish allocations in dictator games (e.g., Bolton and Ockenfels, 2000).

Brock et al. (2013) extend the discussion around non-selfish giving to risky dictator treatments, which is an especially valuable research direction for the purpose of this study. Their experiment involves treatments with one-sided risk on the part of the recipient and such with two-sided risk. The discussion of the results centers around two manifestations of inequality aversion, namely *ex post* comparison and *ex ante* comparison. A fairness concept based on *ex post* comparison values equality with regard to outcomes after the resolution of uncertainty whereas *ex ante* comparison values equality with regard to chances to gain a certain income, i.e., uses expected values as benchmark variable. Brock et al. (2013) adapted these definitions from a study exploring consequentialist (*ex post*) and procedural (*ex ante*) fairness in dictator games where the outcome either depends on mutually exclusive or on independent probabilistic events, i.e., comparing competitive with non-competitive treatments (Krawczyk and Le Lec, 2010). Both papers find that a combination of the concepts may be warranted. Freundt and Lange (2017) present a paper extending the study of risky dictator games to self- versus other-risk treatments. They find that on average, giving decreases when the payoff to the recipient is risky. Risk imposed on the dictator's own payoff even leads to a relatively larger decline. The observed behavior is explained by a crowding out effect of social preferences if in conflict with risk preferences as defined by Güth et al. (2008).

Although the present study also presents an experiment based on unilaterally risky dictator treatments, the design will deviate from that of Freundt and Lange (2017) to the extent that our dictators will have safe transfer options, i.e., their own payoff risk does not increase with the amount given to the recipient. Additionally, another gap in the literature will be addressed through a variation of the risk level imposed to the dictator across all five treatments.

2.2. Mortality Salience

Progressing from the analysis of dictator games, the experiment presented in this study also takes inspiration from the psychological literature on behavior under mortality salience. Experiments working with mortality salience aim to activate subjects' awareness of their own transience and then test for changes in behavior.

A critical pillar for this stream of research is terror management theory (TMT). TMT hypothesizes that cultural beliefs are a coping mechanism against the anxiety resulting from the awareness of life's inevitable demise (Solomon et al., 1991). For capitalist cultures, or people who endorse extrinsic values, TMT predicts that mortality salience activation will promote greedy behavior. The meaning maintenance model (MMM), a related theory, interprets death as

a threat to meaning, effectively de-valuing life, and views the effect of mortality salience as an attempt to reinstate meaning (Heine et al., 2006). Both theories coincide in the assumption that death is a psychological threat necessitating defense mechanisms. This is the angle point for mortality salience research.

One economic approach used to test the behavioral effects of mortality salience is the resource dilemma. As Kortenkamp and Moore (2006) elaborate, this type of game provides two interesting properties: a social dimension, expressed in the trade-off between individual and group benefit, and a temporal dimension contingent upon the fact that resource exploitation typically has immediate positive but delayed adverse effects. Harnessing such an environment, Kasser and Sheldon (2000) designed an experiment in which subjects were instructed to represent companies bidding against each other to harvest timber in a forest. The researchers found that the mortality salience condition induces higher consumption of resources and enhances greed. However, the experiment relied on an imaginary scenario limiting its external validity. Nevertheless, other studies have corroborated the link between mortality salience and greed (see, e.g., Cozzolino et al., 2004a). Two similar studies found that death-related stimuli increase consumption quantities of luxury goods (Mandel and Heine, 1999) as well as food and beverages (Mandel and Smeesters, 2008).

Jonas et al. (2002), by contrast, provided evidence that mortality salience elicits more favorable attitudes towards charities, and increases the amount of money donated (a form of prosocial behavior), which they referred to as Scrooge effect. The observed behavior, however, is limited to charities that match the subject's worldview. Thus, the results substantiate that mortality salience triggers a desire to express culturally endorsed, in this case prosocial, behavior. Supporting evidence for a correlation between mortality awareness and prosocial behavior can be found in a study focusing on intergenerational decisions (Wade-Benzoni et al., 2012). Usually, intertemporal and interpersonal distance complicate generosity towards future generations. In this study, subjects exhibited higher intergenerational beneficence under death-priming, which the researchers attribute to a reversal of the intertemporal distance effect counteracting intergenerational discounting.

Overall, experimental evidence on the effect of mortality salience is ambivalent. Some researchers have attempted to broaden the spectrum of death priming to increase the clarity of the results. Referring back to the definition of Kasser and Ryan (1993), a study by Cozzolino et al. (2004a) postulates that individuals scoring high on extrinsic value orientation (EVO) have a higher inclination towards greed under a mortality salience condition, but not under a death reflection condition. The latter was designed to render the association of death more tangible and complement it with an element of life review. Whenever the present study refers to mortality salience, especially in the data analysis section, the term shall be defined as "mortality awareness" and thus cover a broad spectrum of death-related cognition.

3. The Experiment

3.1. Experimental Design

The experiment conducted for the purpose of this study consisted of a series of modified dictator games. An online questionnaire was used to test responses to five dictator game scenarios with different levels of risk. In each scenario, the dictator is endowed with a fund of € 10 million and must decide how to split this amount between him-/herself and an anonymous receiver. The counterpart has no decision power, i.e., he/she cannot reject the dictator's allocation. Treatments differed concerning the payoff consequences for players. One treatment replicates the standard dictator game whereas the other four treatments present the dictator with different levels of risk imposed on his/her payoff.

A total of 178 subjects, all students, and predominantly from the WHU – Otto Beisheim School of Management campus in Vallendar, responded to the invitation for the online experiment within one week in April 2019. All respondents have an academic background in either business administration or economics. Subjects were invited to participate in the experiment via e-mail. After clicking on the link to the experiment, subjects were presented a set of general instructions including an indication of the amount of time necessary to complete the experiment. Prior to the dictator tasks, the subjects were asked to state their willingness to pay for a lottery with a 50% chance of winning € 200 and an equal chance of being left with zero. In alignment with standard measurements for risk aversion (Hartog et al., 2000), this pre-test was designed to identify the individual risk attitude of each respondent. A complete overview of the instructions can be found in the Appendix (see Table A1 and Appendix 7).

Since all subjects participated in all five decision tasks, the results presented in this study are within-subject comparisons. Dictators accessed the decision form from their private devices and submitted all allocation choices online. They were not informed of the outcomes of their decisions between rounds. Lacking any decision power, the receiver was treated as a dummy variable in the setting of this experiment.

After the deadline for participation had passed, a random draw determined which subject would receive the cash payoff corresponding to the cumulative outcome of his/her allocation decisions. The winner of the draw received € 1 in cash for each € 1 million kept to him-/herself in the experiment. For the risky choices, i.e., tasks two to five, the outcome was determined according to a dice roll reflecting the respective risk attributed to the dictator's own share. The winner of the draw was contacted and paid in private. Subjects were not informed of the outcomes of their choices during or after the experiment.

3.2. Treatments

In each treatment, the dictator was asked to allocate € 10 million (experimental currency) between him-/herself and an anonymous counterpart. Thus, allocation options allowed

him/her to keep $10 - x$ [all in m€]¹ to him-/herself and transfer $x \in [0, 1, \dots, 10]$ to his/her counterpart. The choice was constrained to discrete steps of full millions.

Treatment 1 (T_C) is the baseline treatment and replicates the standard dictator game with a stake size of € 10 million. Player's payoffs can be denoted as $(\pi_1, \pi_2) = F(10 - x, x)$ where π_1 is the dictator's income and π_2 is the counterpart's income, both a function of the initial allocation decided upon by the dictator. This treatment serves as a benchmark for the other treatments and aims to position this study within the existing literature on dictator games.

In treatments 2, 3 and 4 (T_{25} , T_{50} , and T_{75}), the dictator allocates his/her endowment as in treatment 1. While the amount transferred to the recipient is not subject to any additional conditions, the amount kept by the dictator is subject to a 25% (T_{25}), 50% (T_{50}), and 75% (T_{75}), risk of value loss, respectively. Put differently, in each of the treatments, a lottery determines if the dictator realizes a gain equivalent to the share kept to him-/herself or realizes zero income. Chances of losing the money amount to 25%, 50%, and 75%, respectively. More formally, for all three treatments, payoffs can be denoted as

$$\pi_1 = \begin{cases} 0, & \text{with } p_k^1 \\ 10 - x, & \text{with } 1 - p_k^1 \end{cases}, \quad (1)$$

where $p_k^1 = 0,25$ for T_{25} , $p_k^1 = 0,5$ for T_{50} and $p_k^1 = 0,75$ for T_{75} , and $\pi_2 = x$. This notation clearly shows that only the dictator him-/herself faces a risk in these treatments. Across all three allocation tasks, it holds that $E(x) < E(10 - x)$ for any unit of x . A dictator interested in maximizing the joint payoff would thus transfer the money to his/her counterpart. The purpose of these treatments is to resemble a situation as described in the introduction where the dictator has an elevated risk of sudden death. In the event of sudden death, the money will be worth nothing to the dictator. For any other person, however, the money will not use its value, as it is modeled by π_2 that has the same expected value as in the baseline treatment.

Treatment 5 (T_H) is similar to T_{50} , but the role of the recipient changes from an unrelated counterpart to that of an heir. The purpose of T_H is to challenge the robustness of the experimental design and more specifically, to test whether the introduction on an heir who can, in the event of the dictator's death (in the model: realization of zero income determined by the lottery), still derive utility from the dictator's share of the endowment, has an impact on the dictator's allocation decision. Payoffs are structured similarly to T_{50} . For the dictator, it can be denoted as

$$\pi_1 = \begin{cases} 0, & \text{with } p_k^1 \\ 10 - x, & \text{with } 1 - p_k^1 \end{cases}, \quad (2)$$

where $p_k^1 = 0.5$. Meanwhile, the heir's payoff function can be

¹All monetary amounts referred to in this paper are indicated in units of m€

described as follows:

$$\pi_2 = \begin{cases} x + \left(\frac{10-x}{1+0.1}\right), & \text{with } p_k^1 \\ x, & \text{with } 1 - p_k^1 \end{cases}, \quad (3)$$

It is important to highlight that the heir's payoff is conditional not only on the dictator's allocation choice but also on the lottery outcome. If the lottery determines that the dictator can keep his/her share, the heir will, as in the ordinary dictator game scenario, realize a payoff of $\pi_2 = x$. Yet, if the dictator loses his share to fate, the heir automatically gains the amount equivalent to the dictator's loss discounted by a factor of $d = 0.1$. Thus, in this treatment, the heir receives a minimum endowment of x , with an additional chance to gain the dictator's share discounted by 10%. In terms of social welfare, this treatment forecloses the possibility of money loss through the lottery. In fact, the lottery, here, serves as a second allocation mechanism. Although the dictator can still decide on the initial allocation of the endowment, the lottery decides whether the split will be implemented or not. If the outcome is at odds with the dictator's luck, the lottery prescribes a re-allocation of to the endowment to the counterpart with only a small deduction. Chances for both outcomes are equal. *T_H* was designed to render the model of allocation decisions under existential threat more realistic concerning two aspects: Firstly, it may be assumed that most people facing a 50% risk of dying within the next few days seek necessary precautions such as instructing a will which settles the allocation of their wealth after their death. Secondly, even if an individual freely decided whether or not he/she should transfer his/her endowment to somebody else prior to his/her death, the recipient of the money would most likely be a close friend or family member. Since a common attribute to legal successions is that they only comprise individuals closely related to the deceased, the designation of the recipient as an heir within the design of a dictator game equips the anonymous counterpart with a natural familiarity. The discount rate applied to the heir's additional gain – implemented only if the dictator's income is zero after the lottery draw – models a delayed payment. Since the legal proceeding of wills is typically lengthy, the heir must expect to receive the endowment significantly later compared to a situation where the ancestor decides to transfer his/her wealth prior to his/her death.

The five dictator treatments are complemented by one additional task designed to provide an indication of the experiment's external validity. Subjects were instructed to imagine a situation in which they just left the hospital after they had been diagnosed with a lethal disease predicting a 75% probability of terminating their life within the next couple of days. Given this situation, subjects were asked to indicate what they would do with their money if they had € 10 million in the bank account. They were explicitly invited to consider different consumption and transfer options. Prescribing a 75% chance of sudden death, this task was designed as a qualitative benchmark to the *T_75* dictator treatment. The framing of the question aimed at priming the subjects with a

certain degree of mortality salience. Answers could be submitted in key points or full sentences.

4. Related Theory and Hypotheses

4.1. Theoretical Model

For the development of the hypotheses to be tested in the experimental part of this study, a model that helps to test for allocation preferences needs to be formalized. [Fehr and Schmidt \(1999\)](#) and [Bolton and Ockenfels, 2000](#), for instance, propose a model of social preferences which measures payoff differences to study fairness concepts based on inequality aversion. In the present study, the focus will be on social welfare implications of initial allocations. As established in the introduction, the discussion of fairness under risk must capture two dimensions: ex ante comparison and ex post comparison. In alignment with existing literature ([Brock et al., 2012](#)), social preferences will be examined over a joint payoff function $S(\pi_1, \pi_2)$ accounting for individual utilities derived from the initial money allocation, denoted as $u(m_1)$ for the dictator and $u(m_2)$ for his/her counterpart. It will be assumed that $E[u(m_1)]$ is equal to $E(\pi_1)$. Modeling the joint payoff function over individual utilities instead of expected payoffs only, however, allows for the possibility to drop this assumption in future extensions of the model.

Tailored to our five dictator treatments, the function of joint expected payoff is described by

$$E[S(\pi_1, \pi_2)] = E[u(m_1)] + E[u(m_2)], \quad (4)$$

which can be rewritten as

$$E[S(\pi_1, \pi_2)] = u(m_1)p_k^1 + u(m_2)p_k^2 \quad (5)$$

where p is the probability with which a player will eventually realize the income corresponding to the dictator's allocation decision. For the baseline treatment, it holds that $p_k^1 = p_k^2 = 1$. In the risky treatments 2, (3; 4), $p_k^2 = 1$ remains unchanged whereas p_k^1 is equal to 0.75 (0.5; 0.25). Values for treatment 5 are equal to those of treatment 2. Starting from there, it can be established that the social welfare maximizing allocation $[m_1, m_2]$ is $[10 - x; x]$ with $x \in [0, 1, \dots, 10]$ for the baseline treatment and $[0; 10]$ for all other treatments. Yet, it must be assumed that social welfare maximization is not the most common decision rule among dictators, especially if it coincides with zero payoff for themselves (treatments 2-5). Only purely altruistic players will favor such an allocation.

Going forward, the implications of fair splits based on ex ante and ex post comparison, two alternative decision rules, shall be discussed with regard to our experimental treatments. According to the principles of ex ante comparison, only an equal split of the total endowment may be considered fair. It follows that for all our treatments, the fair allocation would be $[5; 5]$. In the baseline treatment, this split still allows for the maximization of joint payoff. For the risky treatments, social welfare implications must be assessed based

on expected individual utilities. Since $E[u(m_1)]$ decreases with a smaller p_k^1 , not only the dictator's expected payoff but also the joint payoff is negatively impacted for all allocations $\neq [0; 10]$. In treatment 2 (3; 4), a fair allocation complying with the principles of ex ante comparison yields

$$E[S(\pi_1, \pi_2)] = (10-x)p_k^1 + xp_k^2 \quad (6)$$

with $x = 5$, $p_k^1 = 0.75$ (0.5; 0.25) and $p_k^2 = 1$, which equals an expected joint payoff $S(\pi_1, \pi_2)$ of 8.75 (7.5; 6.25). For treatment 5, the case is more complex. It can be calculated as follows:

$$E[S(\pi_1, \pi_2)] = E[u(m_1)] + E[u(m_2)] \quad (7)$$

where $E[u(m_1)] = (10-x)0.5$

and $E[u(m_2)] = x + 0.5 \left(\frac{10-x}{1.1} \right)$.

Substituting x with 0.5 yields $E[S(\pi_1, \pi_2)] = 9.78$ which is close to the maximum of 10. Table 1 summarizes individual expected utilities and joint payoffs for equal splits in all five treatments.

Turning to decisions based on ex post comparison, the definition of fair allocations as equal splits between the dictator and his/her counterparts becomes obsolete. Fair splits, under this principle, require equal expected utilities for both players. More formally, the requirement for a fair allocation according to the principle of ex post comparison can be denoted as:

$$E[u(m_1)] = E[u(m_2)] \quad (8)$$

For our baseline treatment, this still implies an equal split $[0; 10]$ between the players. In the risky treatments, however, the one-sided risk on the part of the dictator needs to be compensated for with a higher endowment.

This can be easily derived if we rewrite our requirement in the following way:

$$(10-x)p_k^1 = xp_k^2 \quad (9)$$

For $p_k^1 < p_k^2$ and $x \in [0, 1, \dots, 10]$, which applies to all risky treatments of the experiment, this equation can only hold if $x < 5$. In the following, the process will be exemplified for treatment 5 (T_H). From the previous analysis, it is known that for T_H

$$E[u(m_1)] = 0.5(10-x) \text{ and } E[u(m_2)] = x + 0.5 \left(\frac{10-x}{1.1} \right) \quad (10)$$

Equating the two expected utilities yields $x = \frac{10}{23}$, corresponding to an allocation of $\left[\frac{220}{23}; \frac{10}{23} \right] \cong [9.57; 0.43]$ and an expected social welfare of $E[S(\pi_1, \pi_2)] = 9.57$. Table 3 summarizes individual expected utilities and joint payoffs for fair allocations according to the requirements of ex post comparison.

Notably, perfectly fair splits according to ex post comparison can only be realized in the baseline treatment and treatment four because allocation decisions in the experiment are subject to the constraint that $x \in [0, 1, \dots, 10]$. To accommodate this constraint in the experimental design, it will be assumed that a discrete split of the initial endowment is compliant with the concept of fairness based on ex post comparison if x takes on the value closest to the corresponding $x \in \mathbb{R}$. In treatment 2, for instance, a fair allocation as defined by ex post comparison would be $[6; 4]$, corresponding to an expected social welfare of $E[S(\pi_1, \pi_2)] = 8.5$. Table 2 summarizes individual expected utilities and joint payoffs for fair allocations under the constraint that the definition range of x encompasses discrete value only and compliant with the rules of ex post comparison.

It may be highlighted that the fair allocation in the heir treatment (5) is for the dictator to keep the entire endowment to him-/herself and give nothing to his/her heir. With a 50% chance of receiving a slightly discounted amount of the dictator's share, the heir's expected payoff over the initial split, even if he/she is awarded nothing, is sufficiently high to justify an allocation of $[10; 0]$ according to the principle of ex post comparison.

Fair splits compliant with the requirements of ex ante versus ex post comparison will be considered in the analysis of the experimental data. More precisely, it will be evaluated to which degree individuals are willing to compromise on both individual utility maximization and social welfare maximization in order to implement an allocation that is considered fair. Generally, it may be noteworthy that fair splits compliant with ex post comparison yield higher expected utilities for the dictator as well as a higher expected joint payoff.

Aside from inequality aversion, concerns for efficiency will also be taken into account. Hence, an additional factor considered in the analysis will be the efficiency of capital employment, defined as

$$e = \frac{E[S(\pi_1, \pi_2)]}{\max(S)} \quad (11)$$

The higher e , the closer is the expected joint payoff corresponding to the dictator's allocation choice to the maximum possible joint payoff.

4.2. Theoretical Predictions

Prediction 1: Giving in the standard dictator game is not fully consistent with allocation decisions unilaterally risky dictator games.

This assumption extends to two levels: Firstly, dictators' allocation decisions under personal risk will deviate from decisions without risk in absolute terms. Secondly, a difference will also be observed in relative terms, implying that the share of dictators complying with the concept of ex ante or ex post fairness, as well as those making purely altruistic decisions will vary across treatments. Prediction 1 allows for two alternative hypotheses as explained in the following.

H_1 : Facing personal risk, dictators will allocate more money to their counterpart.

Table 1: Expected utilities for equal splits

Exp. utilities with a fair split according to ex ante comp.					
	max (S)	Allocation	$E[u(m_1)]$	$E[u(m_2)]$	$E[S(\pi_1, \pi_2)]$
T_C	10	[5; 5]	5	5	10
T_25	10	[5; 5]	3,75	5	8,75
T_50	10	[5; 5]	2,5	5	7,5
T_75	10	[5; 5]	1,25	5	6,25
T_H	10	[5; 5]	2,5	7,28	9,78

Table 2: Expected utilities for fair splits according to ex post comparison (discrete)

Exp. utilities with a fair split according to ex post comp.					
	max (S)	Allocation (discrete)	$E[u(m_1)]$	$E[u(m_2)]$	$E[S(\pi_1, \pi_2)]$
T_C	10	[5; 5]	5	5	10
T_25	10	[6; 4]	4,5	4	8,5
T_50	10	[7; 3]	3,5	3	6,5
T_75	10	[8; 2]	2	2	4
T_H	10	[10; 0]	5	4,55	9,55

Table 3: Expected utilities for fair splits according to ex post comparison (stationary)

Exp. utilities with a fair split according to ex post comp.					
	max (S)	Allocation (stationary)	$E[u(m_1)]$	$E[u(m_2)]$	$E[S(\pi_1, \pi_2)]$
T_C	10	[5; 5]	5	5	10
T_25	10	[5,71; 4,29]	4,44	4,44	8,88
T_50	10	[6,67; 3,33]	3,33	3,33	6,66
T_75	10	[8; 2]	2	2	4
T_H	10	[9,57; 0,43]	4,785	4,785	9,57

H_1 is consistent with the idea that dictators care about their decisions' impact on joint payoff (social welfare). If their own share is subject to risk, but the counterpart's share is unaffected, dictators who honor the social welfare dimension of their decisions will give higher amounts (in relative and absolute terms) to their counterparts than non-risky conditions. On a higher level, H_1 would imply that individuals facing existential threat favor a transfer of their endowment over excessive self-consumption because others might derive more sustainable utility from the money. In other words, mortality salience will reinforce other-regarding preferences.

H_2 : Facing personal risk, dictators will keep more money to themselves.

H_2 assumes that dictators will try to equalize expected payoffs for both players, which is consistent with the concept of fairness based on ex post comparison. Compared to the standard dictator game, decisions involving personal risk will incentivize dictators to increase the share kept to themselves (in absolute terms). In the context of decisions made under an elevated risk of sudden death, this hypothesis would imply that mortality salience will reinforce selfish motives. Individuals who are aware of their limited time and consumption

horizon will try to maximize their own utility without regard for the social consequences of their consumption decisions.

Although both hypotheses can be sufficiently justified, H_1 is considered to be more likely than H_2 and will serve as the basis for predictions 3 and 4.

Prediction 2: Allocation decisions in risky dictator games are not exclusively driven by the dictator's degree of risk aversion.

Modeling existential threat through a risky lottery comes at the disadvantage that upward deviations from giving in the standard dictator game may be induced by sheer risk avoidance. Put differently, dictator's allocating more to their counterpart in the risky treatment might just be risk-averse. By contrast, prediction 2 anticipates a weak correlation between risk aversion and higher giving in risky dictator games. Instead, risk aversion should be treated as a confounding variable in the regression run on giving in the unilaterally risky dictator games dependent on giving in the baseline treatment.

Prediction 3: Neither ex post nor ex ante comparisons can explain giving in unilaterally risky dictator games. Instead, non-selfish allocations reflect a preference for efficient capi-

tal employment.

Instead of reflecting the dictator's degree of risk aversion, higher giving in risky dictator games may be explained by the dictator's preference for efficient capital allocations. This prediction is construed *ex negativo*: From the review of the existing literature on risky dictator games, it is hypothesized that neither altruism nor *ex ante* or *ex post* comparison can fully explain allocation decisions in unilaterally risky dictator games. Instead, a preference for efficient capital employment aimed at a constrained optimization of the joint payoff may be a driver behind non-zero giving in the risky treatments. An interest in social welfare, in this case, is equal to the understanding that other players may derive higher utility from the endowment.

Prediction 4: Generous giving in dictator games increases with the level of risk assigned to the dictator's own payoff. As stated earlier, prediction 3 is conditional on higher giving in the unilaterally risky dictator games relative to the baseline treatment. In extension to the preceding conjecture, it may be expected that the predicted behavior is amplified by a higher degree of risk attributed to the dictator's share. Notably, this is not equivalent to the assumption that the dictator's concern about the joint payoff increases with the level of harm he/she can cause to social welfare. Any theory based exclusively on the correlation between giving in risky dictator games and the level of unilateral risk will be not consistent with varying results across treatments T_{50} and T_H . Both treatments assign a 50% chance of value loss to the dictator's share but with significantly less downside for social welfare in the heir treatment (5).

Prediction 5: One-sided risk in dictator games can effectively simulate allocation decisions under existential threat. Lastly, the experimental design presented in this study is based on the assumption that unilateral exposure to risk in a dictator game scenario resembles a simulation where an individual faces a life-endangering hazard. Prediction 4 will be tested by comparing the subjects' responses to QMS_{75} to those of the dictator treatment T_{75} . If it holds, the relative number of selfish versus other-regarding use cases listed in QMS_{75} will mirror the quantitative split between self-use and transfer to the counterpart in the fourth dictator treatment.

5. Experimental Results (Data Analysis)

A summary of the dictator's allocation decisions is provided in Table 4.

The table average choices and the proportion of players choosing $x > 0$, $x \geq 5$ and $x = 10$ for all five treatments. Average giving in the standard dictator game, for instance, is $x = 2.63$ ($\cong 26\%$) and thus consistent with the results reported previous studies (Engel, 2011). Notably, significant positive giving can be observed in all treatments. Figure A5 shows the average contribution by task whereas Figure A6 depicts the fraction of dictator's giving non-zero amounts and those giving more than the fairness concept based on *ex post*

comparison requires (both in the Appendix). In the following, it will be explored in detail how allocation decisions differ across treatments in detail.

Result 1: Behavior in the standard dictator game is not a good predictor of giving in unilaterally risky treatments. On average, dictators behave more generously when exposed to risk.

Evidently, average contributions in the standard dictator game are significantly different (at 1% level) from giving in the risky dictator treatments (Table 5). The summary statistics of the Wilcoxon signed-rank test run on all treatments also reveals that the group means are, in fact, significantly different between any two treatments except for T_{50} and T_H . This outlier was to be expected because the heir treatment is an adaptation of T_{50} and exposes the dictator to the same level of risk.

Table 6 displays the results of a linear regression which tries to explain the allocation decisions in risky dictator games as a function of allocation choice in the standard dictator game (T_C). Regression results substantiate that giving in the standard dictator game is not always predictive of giving under personal risk: the significance of the coefficient for giving in T_C decreases with the level of risk imposed on the dictator treatments. This implies that decisions under risk are not driven by the same motives as decisions in ordinary dictator games. Nevertheless, generosity in the standard dictator game is predictive of a tendency of giving under mild risk (coefficients are significant at 1% level for T_{25} and T_H).

Result 2: The dictator's degree of risk aversion does not moderate the effect of risk on allocation decisions in dictator games.

To control for the correlation between risk profile and behavior in the dictator game treatments on the individual level, the experimental design comprised a task testing for the willingness to pay (WTP) for a risky lottery. The lottery was designed in a way that subjects would face an expected value of € 100 with a 50% chance of winning € 200. Subjects could state their upper price threshold for a ticket to participate in the lottery. Results were evaluated on both descriptive and analytical statistics.²

Firstly, subjects were assigned to a specific cluster according to the WTP stated in the lottery task. Four different clusters are used based on the definition of different levels of risk-aversion. Cluster 1 comprises strictly risk-averse subjects with a WTP between € 0 and € 49 ($n = 70$), i.e., below half of the lottery's expected value. Cluster 2 also contains risk-averse agents but with a WTP above half of the lottery's expected value, specifically between € 49 and € 98 ($n = 53$). The third cluster counts subjects ($n = 53$) with an approximately risk-neutral profile displaying a WTP between € 99 and € 100. Subjects with a risk-loving attitude, i.e., stating a WTP above the lottery's expected value, are classified as cluster 4. Yet, this cluster only comprises a very small portion of the original sample ($n = 4$). All four clusters were

²Task is referred to as QL in the data analysis

Table 4: Summary statistics of the allocation decisions

*For the individual treatments, this means: $x \geq 5$ (T_C); $x \geq 4$ (T_25), $x \geq 4$ (T_50), $x \geq 2$ (T_75); $x \geq 0$ (T_H)

	n	Mean giving	SD of giving	% of dictators giving $x > 0$	% $x \geq$ 'fair split ex post'*	% of dictators giving $x \geq 5$	% of dictators giving $x = 10$
T_C	178	2,63	2,22	68%	32%	32%	1%
T_25	178	4,65	3,42	84%	57%	47%	20%
T_50	178	5,47	3,42	90%	76%	63%	25%
T_75	178	6,22	3,75	88%	83%	67%	33%
T_H	178	5,28	3,90	79%	100%	61%	29%

Table 5: Differences in giving ($n = 178$)

Differences tested with Wilcoxon signed-rank tests. *** (**, *) indicates significance at 1% (5%, 10%) level.

	T_25	T_50	T_75	T_H
T_C	2,02 ***	2,84 ***	3,60 ***	
T_25		0,81 ***	1,57 ***	
T_50			0,76 ***	-0,19

Table 6: Linear regression of allocation decisions in a standard dictator game treatment (independent variable: x in T_C) on giving under risk (clustering at the individual level)

Differences tested with Wilcoxon signed-rank tests. *** (**, *) indicates significance at 1% (5%, 10%) level.

	Dependant variable			
	T_25	T_50	T_75	T_H
Amount given in T_C (coeff.)	0,4009 ***	0,2727 **	0,1848	0,3593 ***
Constant	3,60 ***	4,75 ***	5,74 ***	4,34 ***
Pseudo R-squared	0,07	0,02	0,01	0,04
F-statistic	12,84 ***	5,7 **	2,14	7,37 ***

evaluated with regard to deviations in average giving from the sample mean per treatment. The descriptive analysis reveals three main observations: Firstly, cluster deviations occur across all treatments including the non-risky baseline game, implying that individual risk attitudes may be influential to dictator games in general, not only in risky treatments. Secondly, average deviations in giving are positive for cluster 1 and become increasingly negative from there. Only cluster 4 seems to show an average deviation above 5% from the sample mean (close to the 20% level), but due to its small sample size, the effect may be distorted. Thirdly, there seems to be no consistent pattern as to which treatment elicits the most substantial deviations on cluster level. This may serve as an indication that risk attitudes are not predictive of giving in risky dictator games. Table A2 provides the summary statistics of differences in giving by cluster whereas Table A3 displays a consolidated overview of the standard deviation by cluster on treatment level.

Secondly, in order to verify the assumed weak correlation between individual risk attitude and the dictator game results, a regression was run on the WTP in the lottery de-

pendent on giving in the different dictator game treatments. Table 7 summarizes the results on treatment level. Notably, coefficients are negative for all treatments.

In extension to the previous analysis, the regression reveals for which treatments groups risk attitudes are most influential. The coefficient for the risk level is only significant for T_75 (at 5% level) and T_H (at 10% level). Thus, in contrast to the intuition derived from the descriptive analysis, individual risk attitudes seem to gain in decision weight with the level of risk attached to the dictator's payoff consequences. Nevertheless, the effect is negligibly weak since the coefficient size is considerably small for both treatments.

Overall, it may be concluded that allocation decisions in risky dictator games are not primarily attributable to the dictator's risk attitude, even though a small effect can be observed for the high-risk treatment.

Result 3: Neither ex post nor ex ante comparisons can explain giving in unilaterally risky dictator games. Allocation decisions may be influenced by a preference for efficient capital employment rooted in the dictator's concern for the joint payoff.

Table 7: Linear regression of risk aversion (independent variable: P in QL) on allocation decisions in dictator game treatments (clustering at the individual level)

	Dependant variable				
	<i>T_C</i>	<i>T_25</i>	<i>T_50</i>	<i>T_75</i>	<i>T_H</i>
WTP in QL (coeff.)	-0,0035	-0,0061	-0,0054	-0,0104 *	-0,0074 *
Constant	2,83 ***	5,01 ***	5,79 ***	6,84 ***	5,72 ***
Pseudo R-squared	0,01	0,01	0,01	0,03	0,01
F-statistic	1,94	3,41	2,03	6,35 **	2,94 *

While the joint payoff, or social welfare, can be maximized by any choice of x in the baseline treatment, the risky dictator games presented in this study only allow for the maximum joint payoff if the purely altruistic choice ($x = 10$) is realized. Previous studies have shown that only a minor fraction (approx. 5%) of dictators exhibits purely altruistic behavior (Engel, 2011). Consequently, if the dictator's interest in the joint payoff shall recoup attention in this study, it needs to be in form of a constrained maximization. Constrained, in this case, means that the dictator tries to employ the initial endowment of 10m€ efficiently without forgoing his own payoff entirely. More generally, it refers to all allocations which are attentive towards the social welfare implications but do not leave the dictator with an expected payoff of zero.

Prior to evaluating the relevance of social welfare concerns going along with efficient capital employment, the new experimental data will be screened for evidence supporting the application of four other decision rules emphasized in the existing literature: aversion against a purely selfish maximization of payoff chances, ex post comparison, ex ante comparison, and altruistic maximization of joint payoff (listed in order of decreasing x required to comply with the rule). Table 4, presented at the beginning of this section, shows the proportion of dictators exceeding the minimum requirements for these rules as specified in Table 8.

Overall, the experimental results show that all four types of non-selfish allocations occur across all five treatments, although altruistic maximization of the joint payoff is almost non-existent in the standard dictator game. The fraction of subjects choosing allocations which exceed one of the four thresholds for compliance seems to increase with the risk imposed to the dictator's endowment. Growth rates are generally the highest between the baseline treatment and T_{25} and maintain a rate for ex ante comparison and altruism, while the incremental fraction of subjects complying with the other two decision rules seem to abate with an increasing level of risk.

Remarkably, a closer look at the fraction of dictators implanting an allocation choice which exactly equals one of the four minimum requirements (cf. Table 9) reveals that especially for the risky treatments, the portion of subjects who do not exactly comply with any of those four strategies is considerably high (51% for T_{25} , 40% for T_{50} , and 46% for T_{75}). Since these treatments equally induce a significantly higher percentage of non-zero giving than the stan-

dard dictator game which, hence, cannot be explained by fairness concepts based on ex post or ex ante comparison, there is an explanation gap as to which other drivers motivate non-zero giving in unilaterally risky dictator games. It stands to reason that the observed behavior reflects the dictator's preference for efficient capital employment allowing for constrained joint payoff maximization.

Result 4: Generosity in risky dictator games increases with the dictator's own risk, not the risk attached to the joint payoff.

As a next step, the analysis needs to address the role of risk imposed on the dictator's own share versus the risk affecting the joint payoff. As reported earlier, unilaterally risky dictator games seem to elicit more generous giving than the baseline scenario, and the effect seems to increase with the level of risk assigned to the dictator's payoff. To test for the robustness of this result against the hypothesis that higher giving correlates with the degree to which the dictator's decision affects the joint payoff, the heir treatment (T_H) was introduced. In treatments T_{25} , T_{50} and T_{75} , a higher level of risk for the dictator comes along with a higher level of risk to the joint payoff. In T_H , however, the risk assigned to the dictator's own payoff is equal to T_{50} whereas the risk to the joint payoff is significantly cut. The minimum payoff for the dictator is 0€ at a 50% probability whereas the minimum social payoff is 9.09m€ at a probability of $\leq 50\%$. For both values, 10m€ marks the upper margin. Hence, of dictators behaved significantly more generous in T_{50} compared to T_H , this would imply that higher giving in unilaterally risky dictator games is not dependent on the risk imposed to the dictator's own payoff, but the risk imposed to the joint payoff. Results show that more dictators transfer the entire endowment to their counterparts in T_H ($x = 10$), but likewise, more dictators keep the money to themselves ($x = 0$) in T_H compared to T_{50} (Table 9). In aggregate, the two effects seem to cancel each other out. Average giving is $x = 5.28$ in T_H and $x = 5.47$ in T_{50} . A Wilcoxon signed-rank test run on the results indicates that the difference is not significant (Table 5). Consequently, the data suggests that more generous giving in unilaterally risky dictator games, de facto, increases with the level of risk attributed to the dictator's payoff, not the level of risk attributed to the joint payoff. With regard to the motivational drivers behind this behavior, the results encourage the assumption that the generosity exhibited in unilaterally risky dictator games is not

Table 8: Minimum requirements for four non-selfish decision rules in dictator games

Decision Rule	Minimum Requirement
Aversion against purely selfish maximization	Allocation such that $x > 0$
Ex post comparison of payoff chances	Allocation such that $E(\pi_1) = E(\pi_2)$ holds for $\min(x)$
Ex ante comparison of payoff chances	Allocation such that $x \geq 5$
Altruistic maximization of joint payoff	Allocation such that $x = 10$

Table 9: Fraction of dictators pursuing a one out of four strategies: pure selfishness, ex post comparison, ex ante comparison or pure altruism

*For the individual treatments, this means: $x = 5$ (T_C); $x = 4$ (T_25), $x = 4$ (T_50), $x = 2$ (T_75); $x = 0$ (T_H)

	Mean giving	% of subjects with $x=0$	% $x =$ 'fair split ex post**	% of subjects with $x=5$	% of subjects with $x = 10$	Remaining subjects
T_C	2,63	6%	31%	31%	1%	31%
T_25	4,65	4%	10%	15%	20%	51%
T_50	5,47	7%	8%	20%	25%	40%
T_75	6,22	6%	9%	6%	33%	46%
T_H	5,28	6%	21%	16%	29%	29%

induced by regret minimization but by a preference for allocating the money efficiently.

Result 5: Unilaterally risky dictator treatments hold considerable external validity for decisions under existential threat.

As stated earlier, the experiment presented in this study incorporated a qualitative task priming subjects with ephemerality-related thoughts while asking what subjects would use their money for if they only had a 25% chance of surviving the next days.

Remarkably, the responses accurately reflect the split pointed to in prediction 1 in which two different scenarios were anticipated: under existential threat, individuals would either become more generous considering that their own utility from a monetary endowment is subject to a high level of risk (H_1), or they would become increasingly selfish because the time horizon for consumption is suddenly very limited and social consequences carry little weight (H_2). Yet, while the answers carry clues for both hypotheses, they also provide a good indication of which scenario prevails. Evidence of H_1 is not only voiced more frequently but also more resolutely as illustrated by these two examples:

I would not spend the money in the next few days. [...] Spending the money on personal pleasure and dying right afterwards would be a waste.

I wouldn't consume anything but rather find a person that can make better use of the money.

Support for H_2 is usually restricted to only a fraction of the money, which can be exemplified referring to these two responses:

I would fly out all my friends and myself to Tasmania for a final dinner. [...] Whatever is left of the money after all this, I would give to the Tasmanian Wildlife fund. 10 million can be better employed elsewhere.

Give 6 million to charity and waste the rest like it is the end of the world.

For a comprehensive evaluation of the answers, six designated use cases were identified from the most frequently used keywords: self-use (luxury/gambling), self-use (event/experiences), long-term investments/trust funds, therapy research, (charitable) donations, and transfers to family and friends (F&F). While the first two use cases clearly resemble an allocation decision in favor of the dictator and the last two use cases resemble an allocation in favor of his/her counterpart, the use cases named third and fourth do not explicitly fall into one of those categories. Additionally, it is essential to note that these use cases are collectively exhaustive but not mutually exclusive since subjects were not restricted in the number of items when answering the question. Table 10 provides an overview of the popularity of each use case relative to the number of subjects and relative to the total number of items listed in the responses to QMS_75.

In order to verify the external validity of the experimental design, however, it is necessary to assess whether the relative number of selfish versus other-regarding use cases listed in QMS_75 mirrors the quantitative split between self-use and transfer to the counterpart in the T_75 dictator game treatment. As a reminder, the mean in the fourth treatment amounts to $x = 6.22$, meaning that on average, dictators transferred 62.25% of their endowment to the other player.

Table 10: Common use cases for the endowment (sorted by popularity, $n = 52$)

* Number of responses applicable to Question QMS_75. Percentages within this row indicate how many subjects relative to the total number of subjects would spend money on the respective use case.

** Number of items accounting for the possibility of multiple answers. Percentages within this row indicate how many times a use case is mentioned relative to the total number of items listed

	n	Therapy Research	Self-use: Luxury/ Gambling	Long-term invest- ments/Trust funds	(Charitable) Donations	Self-use: Event/ Experiences	Transfer to F&F
Fraction by subjects	176*	10%	14%	24%	32%	49%	60%
Fraction by items	333**	5%	7%	13%	17%	26%	32%

Accounting for the number of use cases which clearly classify as self-use (luxury/gambling and event/experiences, to be specific) relative to the total number of items listed in the responses to QMS_75 and balancing the result against the share of other-regarding use cases (donations and transfers to F&F) while subtracting out those use cases that do not explicitly match either category yields a 33% share of selfish use-cases. This result is approximately consistent with the 37.75% share predicted by T_{75} . However, this comparison is imprecise to the extent that it only considers the relative number of times certain use cases are listed, not the amount of money allocated towards them.

For the purpose of refining the analysis of the qualitative data collected in QMS_75, only those answers which indicated a clearly quantifiable allocation of the endowment to one or more use cases were extracted from the sample ($n = 52$). Table 11 summarizes the total as well as the relative amount of money [in m€ and %, respectively] across the applicable responses allocated to any of the six designated use cases.

Coloring indicates whether the use case counts as self-use (orange), transfer to others (green), or matches neither of those categories (white). It can be discerned that only 7% of the money is used for self-consumption, 18% is allocated towards long-term investments and trust funds, and 75% is transferred to family and friends. Even if it is argued that long-term investment and trust funds can be classified as self-use and thus, on average, subjects keep 25% of their endowment to themselves, an average of 75% transferred to others still does not exactly match the average of 62.25% predicted in the corresponding dictator treatment (T_{75}). One explanation for this incongruence may be that the QMS_75 task allowed subjects to specify to whom exactly they would transfer the money and a large fraction chose to endow their family and friends, which is also the reason why one of the six high-level use cases is called “transfer to F&F” instead of “transfer to others”. Transfers to close friends or relatives can be assumed to earn subjects a higher social utility than transfers to the anonymous counterpart they were paired with in the dictator treatments. The effect of social distance is undis-

puted in the dictator game literature (Leider, Möbius, Rosenblat, and Quoc-Anh, 2009; Goeree et al., 2010). Unsurprisingly, also in the present experiment, only four subjects in the entire sample explicitly stated that they would like to transfer a portion of the money to strangers.

I would give away cash to random people on the street as well as to people on my day-to-day ways (e.g. the salesperson at REWE, the bakery etc.)

With this in mind, it may be concluded the data collected from the QMS_75 task and the T_{75} dictator game is consistent in the result that a vast majority of subjects prefers to grant a portion well above 50% of their endowment to another person. This substantiates the claim made in H_1 and opens it to a broader context: Facing personal risk, e.g., under existential threat, not only dictators in a dictator game setting but individuals, in general, become more generous and transfer a higher fraction of their endowment to others. Overall, the results suggest that the experimental design features a sufficient level of external validity for decisions under existential threat. This result is diluted only by the fact that baseline frequencies under artificial dictator games contexts, in general, are inflated relative to those exhibited in a natural setting (Winking and Mizer, 2013).

6. Discussion and Conclusion

6.1. Contribution to the Academia

In extension to the existing literature on both risky dictator games and mortality salience, the present study contributes an account of allocation decisions under existential threat. Numerous studies on giving in dictator (and ultimatum) games attempt to explain behavior inconsistent with the predictions of classic game theory by models of social preferences that allow for non-selfish motives such as inequality aversion or concerns for efficiency. It remained to be assessed how such social behavior changes with different levels of risk attached to the dictator’s payoff, or, equivalently, under existential threat. Hence, this study does not only contribute an entirely new variation of the dictator game comparing

Table 11: Fraction of money allotted to most popular use cases (sorted by popularity, $n = 52$)

* Number of subjects who clearly quantified their allocation of money in QMS_75.

	n	Therapy Research	Self-use: Luxury/ Gambling	Self-use: Event/ Experiences	Long-term invest- ments/Trust funds	(Charitable) Donations	Transfer to F&F	Total
Money allocated [m€]	52*	4	12	24	92	148	238	518
Money allocated [%]	52*	1%	2%	5%	18%	29%	46%	100%

behavior under different degrees of self-risk but simultaneously provides a first attempt to synthesize research in the field of experimental economics with (mainly psychological) research dedicated to understanding behavior under the condition of mortality salience.

The study finds that allocation decisions in dictator's games tend to become more generous when only the dictator's payoff is at risk. This is inconsistent with the findings of Freundt and Lange (2017) and is also at odds with evidence suggesting that mortality awareness spurs greed (Kasser and Sheldon, 2000; Cozzolino et al., 2004a). However, the new results can be aligned with another stream of mortality salience research arguing that existential threat actually increases pro-social behavior (Jonas et al., 2000; Wade-Benzoni et al., 2012). Similarly, consistency with the existing literature on dictator games can be stabilized under the assumption that giving in unilaterally risky dictator games is motivated by a preference for efficient capital employment (Charness and Rabin, 2002). Freundt and Lange (2017) did provide their dictators with a safe transfer option, which made giving, even in the self-risk treatments, disadvantageous to the social welfare. A concern for social welfare which motivates non-selfish allocation decisions is also consistent with findings from experiments on social lotteries indicating that subjects are also more risk-averse in social lotteries compared to a situation where only their own payoff is exposed to risk (Gaudeul, 2013).

Moreover, the presented results reveal that generosity in risky dictator games increases with the dictator's own risk, not the risk attached to the joint payoff, and show that risk aversion falls short of explaining dictators' behavior in unilaterally risky games. Therewith, this study provides a first attempt towards a better understanding of allocation decisions under unilateral risk and simultaneously bridges the gap to research on allocation decisions under existential threat. Eventually, it needs to be acknowledged that the study does not claim to portray an exhaustive model of dictator giving under elevated mortality awareness and the omission of decisive determinants cannot be precluded.

6.2. Limitations

The presented experiment is subject to a set of limitations, especially from a methodological perspective. Chiefly, the subject pool is rather homogeneously composed of students with a background in economics. Additionally, the gender split is not equal, which might skew the results downwards, since allocation decisions in all treatments show significant differences depending on the dictator's gender (Table 12; for the gender-specific breakdown of the means per treatment, see Table A4 in the Appendix). Another issue is that the within-subject design naturally bears the risk of carry-over and position effects distorting the latter treatments.

When it comes to the design of the treatments, it must be acknowledged that the standard dictator game is played with an endowment of € 10 instead of 10m€ and research has shown that a larger stake size has a small but significant adverse effect on giving in dictator games (Larney et al., 2019). Moreover, the qualitative response task (QMS_75) could be optimized for comparison with the dictator treatment T_{75} by requesting quantifiable allocations of the 10m€ to predefined use-cases. Yet, the current design gives a better account of the experiment's external validity. Overall, however, the equivalences between allocation decisions in unilaterally risky dictator treatments and such under existential threat must be proven by additional side-treatments controlling for the experiment's validity.

6.3. Concluding Remarks

Unilateral risk on the part of the dictator's payoff encourages more generous allocation decisions. The observed effect is largely independent of the dictator's risk profile and is stronger for higher-risk treatments. On a higher level, the witnessed behavior indicates an increase in other-regarding preferences under existential threat. Since psychological experiments on mortality salience are inconclusive about this effect, further research should be dedicated to modeling decisions under existential threat with different types of economic games in order to improve the robustness of the results. Another interesting angle for further research on economic decisions under existential threat would be a compar-

Table 12: Average deviation from sample mean giving by gender

	n	T_C	T_{25}	T_{50}	T_{75}	T_H
Dev. (F)	64	0,68	0,52	0,56	0,95	1,05
Dev. (M)	114	-0,38	-0,29	-0,32	-0,53	-0,59

ative analysis of the relevance ascribed to different consumption options for a given amount of money. Similar to the retrospective use case analysis applied to *QMS_75*, it would be intriguing to present subjects with a set of consumption options from different categories, for instance spending money on travel, luxury goods, psychedelic drugs or an R&D investment for the own family business. Such trade-off decisions would be especially interesting in combination with research suggesting the affective deconstruction of the probability weighting function. [Rottenstreich and Hsee \(2001\)](#), for instance, provide evidence that individuals' sensitivity towards changes in probabilities near certainty and impossibility increases with the level of affect attached to a lottery. On the background of these findings, it may be possible that individuals favor affect-rich consumption choices under existential threat. Finally, another research proposal would be to take an economic view on actual doomsday decisions. Doomsday decisions, as shortly referred to in the introductory section, require a situation where not only one affected party but all parties of a decision are confronted with an elevated risk of dying within the next few days. Economically speaking, not only the payoff uncertainty is affected, but the time horizon for consuming utility from money is limited for all affected stakeholders. In synopsis, it may be concluded that the academic potential in the synthesis of economic and psychological research on decisions under existential threat is far from being exhausted. Nevertheless, the present study sets the first impulse towards a better understanding of the economic preferences of terminally ill individuals. Simultaneously, artificially induced mortality salience may be leveraged to nudge people into more generous giving or to improve long-term strategic planning in (family) businesses.

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