Four essays on the role of distance for economic decision-making

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Synopsis

Distances affect economic decision-making in numerous situations. The time at which we make a decision about future consumption has an impact on our consumption behavior (e.g. Read and van Leeuwen, 1998; DellaVigna and Malmendier, 2006). The spatial distance to employer, school or university impacts the place where we live and vice versa (e.g. Choudhury and Bint Ayaz, 2015). The emotional closeness to other individuals influences our willingness to give money to them (e.g. Small and Loewenstein, 2003; Jones and Rachlin, 2006).

This cumulative thesis aims to enrich the literature on the role of distance for economic decision-making. Thereby, each of my research projects sheds light on the impact of one kind of distance for efficient decision-making. By doing so, I am able to test whether the assumption of the Construal Level Theory (CLT) (Trope et al., 2007; Trope and Liberman, 2010) − that individuals' decisions depend on the closeness of objects or events − holds for different kinds of distance.

I conducted in total four research projects. Table I gives an overview about my studies and provides information on the title, authors as well as publication status.

Section	Title	Authors	Status of research project
1	*How do people discount over spatial distance?*	Lisa Bruttel, Niklas Ziemann	Accepted for publication *German Economic Review*
2	*Faster, harder, greener? Empirical evidence on the role of the individual Pace of Life for productivity and pro-environmental behavior*	Christin Hoffmann, Julia Hoppe, Niklas Ziemann	Published *Ecological Economics* Vol. 191, January 2022
3	*Are individuals less inequity averse in a foreign language?*	Niklas Ziemann, Daniel Zingel	In preperation for submission
4	*You will receive your money next week! Experimental evidence on the role of Future-Time Reference for intertemporal decision-making*	Niklas Ziemann	Published *CEPA Discussion Paper* Vol. 56, October 2022

Table I: Overview of the dissertation

The experimental designs of my projects show similarities and differences (see for an overview Table II). Each project analyzed the effect of distance (emotional, spatial or temporal) for economic decision-making. Thereby, the participants could always make more or less efficient decisions. Furthermore, each project involved consequential individual decisions and a laboratory experiment. Finally, the experiments were always computerized with zTree (Fischbacher, 2007) and the participants were always recruited via ORSEE (Greiner, 2015). One difference between the four projects lays in the involvement of personal stakes. In study 1 no personal stakes were involved when making a decision. Contrary, in studies 2-4 the participants' payment depended on their decision-making. Besides, studies 1 and 2 made use of a within-subject design, whereas studies 3 and 4 contained a

between-subject design.

Component	Study 1	Study 2	Study 3	Study 4
Distance involved in the decision-making	Yes	Yes	Yes	Yes
More and less efficient choices possible	Yes	Yes	Yes	Yes
Consequential decision-making	Yes	Yes	Yes	Yes
Individual choices	Yes	Yes	Yes	Yes
Lab experiment	Yes	Yes	Yes	Yes
Personal stakes involved in the decision-making	No	Yes	Yes	Yes
Within-subject design	Yes	Yes	No	No
Between-subject design	No	No	Yes	Yes
Computerization with zTree	Yes	Yes	Yes	Yes
Recruitment with ORSEE	Yes	Yes	Yes	Yes

Table II: Overview of the experimental designs

In the following, I introduce each of my four research projects. In this regard, I outline my motivation for the research project, its experimental design, my findings as well as my contribution to the specific literature. Subsequently, I discuss potential similarities and differences of the results and the policy implications of all four research projects.

My first research project (section 1) has the title *How do people discount over spatial distance?* and is joint work with Lisa Bruttel. The starting point of this study was a potential similarity between time preferences as captured by a two-parameter hyperbolic discounting model (Phelps and Pollak, 1968; Laibson, 1997; O'Donoghue and Rabin, 1999) and spatial preferences.

To disentangle spatial preferences from non-spatial motives, we decided to focus on spatial preferences for the provision of goods associated with existence value (Krutilla, 1967). Thereby, we used charitable goods to answer our research question since charities often provide the same goods at different locations and enable donors to choose the precise location their money should go to. Besides, donors often provide goods although they do not use these goods for themselves (Vesterlund, 2006). Using a within-subject design, the participants allocated money between two locations which provided the same charitable goods. The locations differed with regard to the spatial distance to the participants. In one condition the nearer location was in the immediate vicinity. In another condition the nearer location was about 250 km away from the participant. The distant location was always 250 km farther away from the participants compared to the nearer location. In experiment 1 the participants simply divided a fixed amount between the two locations. In experiment 2 we introduced a trade-off between efficiency in terms of charitable input and giving more money to one location. The participants' decisions were only consequential for the provision of goods but not for their own payment. They received a fixed sum of 10.00 euros for participation.

Our findings show that individuals prefer to support nearer goods associated with existence value.

They are even willing to give up a sum of the total donation to provide nearer goods. We find this effect also for charitable projects which mirror no direct-use value but an existence value to the participants. Interestingly, our results hold only for goods which are located in the individuals' immediate vicinity. Once the immediate vicinity is not involved, no location is favored. These findings imply that one parameter which represents a special weight for the immediate vicinity is sufficient to capture spatial preferences appropriately. This is contrary to time preferences and a new contribution to the literature on distance-discounting (O'Donoghue and Rabin, 1999; Jones and Rachlin, 2006). We also enrich the literature on the role of spatial distance for the provision of goods. Thereby, the isolation of spatial preferences from self-serving motives is different to previous studies (e.g. Kühl and Szech, 2017; Gallier et al., 2019a; Adena et al., 2020). Besides, our focus on goods associated with existence value represents an innovative feature in the literature. Finally, to the best of our knowledge, we are the first who implemented a trade-off between efficiency in terms of charitable input and giving more money to one certain location.

My second research project (section 2) has the title *Faster, harder, greener? Empirical evidence on the role of the individual Pace of Life for productivity and pro-Environmental behavior.* This study is joint work with Christin Hoffmann and Julia Hoppe.

In this project we examined whether the individual *Pace of Life* which, e.g. involves how fast individuals pass spatial distances, can be related to productivity and pro-environmental behavior on the individual level. This research project was motivated by the current "Speed-Up Society" (Colvile, 2016; Sullivan and Gershuny, 2018) which appears to be advantageous for economic output but disadvantageous for the environment (Rosa, 2003).

We addressed these relations in a controlled laboratory environment with students in Germany, where we measured the participants' *Pace of Life* by recording *walking time* and various aspects of *working time.* Applying a within-subject design, we quantified their productivity in completing a real effort task with monetary consequences. Additionally, we measured the participants' pro-environmental behavior by giving them the opportunity to donate to a tree-planting project. In this context, our research project shows similarities with the research project *How do people discount over spatial distance?.* In both studies the participants could decide about the provision of more or less charitable goods.

Our findings give evidence that a "Speed-Up Society" might be associated with a trade-off between productivity and pro-environmental behavior which so far has only been studied theoretically by Rosa (2003). On the one hand, our results highlight a positive relationship between a fast *Pace of Life* and productivity, which is of high economic importance. On the other hand, our findings suggest that a fast *Pace of Life* is negatively associated with the individual's pro-environmental behavior. However, we find this effect exclusively for men. When it comes to women, individuals with a fast *Pace of Life* behave more pro-environmentally. These results add to the literature on the individual *Pace of Life* (Levine and Norenzayan, 1999; Bettencourt et al., 2007) as well as enrich the literature on the role of gender in pro-environmental behavior (Lee, 2009; De Leeuw et al., 2015; Meyer, 2016;

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López-Bonilla et al., 2020).

My third research project (section 3) has the title *Are individuals less inequity averse in a foreign language?* and is joint work with Daniel Zingel. In this project, we wanted to explore whether a "Foreign Language Effect" (FLE) on individual inequity aversion persists. This research question was motivated by the fact that individuals increasingly make decisions about more or less equal outcomes in different language environments. For instance, employees of an international firm decide on a more or less equal distribution of workload or salaries in a language that is not necessarily their native language.[1] Similarly, there is recent evidence that individuals behave differently in a native compared to a foreign language environment (Keysar et al., 2012b; Costa et al., 2014a; Geipel et al., 2016; Dylman and Champoux-Larsson, 2020). This is explained by a larger emotional distance in a foreign language which, in turn, leads to more rational decisions. Thus, the distance involved in the third study is emotional distance.

We addressed our research question in a controlled and incentivized laboratory experiment with students in Germany. We implemented two different treatments in a between-subject design. In NATIVE, the experiment was computerized and conducted in German. In FOREIGN, the experiment was computerized and conducted in English. In both treatments, we elicited advantageous and disadvantageous inequity aversion. We measured individuals' advantageous inequity aversion by focusing on the amount of money they were willing to give up to move in the direction of more equitable outcomes if they were better off than another individual. We measured individuals' disadvantageous inequity aversion by focusing on the amount of money they were willing to give up to move in the direction of more equitable outcomes if they were worse off compared to another individual. This division of inequity aversion was theoretically embedded and established by Fehr and Schmidt (1999). The research design shows similarities with the research design of the project *Faster, harder, greener? Empirical evidence on the role of the individual Pace of Life for productivity and pro-Environmental behavior* because in both studies the participants could decide about keeping more or less of their own money.

With this research project we are - to the best of our knowledge - the first who studied a potential FLE on inequity aversion. Furthermore, we enrich the literature on the FLE by measuring the participants' emotional arousal and investigating their individual relationship to their foreign language. Finally, we provide statistical evidence from consequential decision-making. So far, most of the studies on a FLE in decision-making used hypotetical scenarios (Keysar et al., 2012b; Costa et al., 2014a; Geipel et al., 2016; Dylman and Champoux-Larsson, 2020).

Our findings show no effect of our treatment variation on individual advantageous or disadvantageous inequity aversion. Additionally, we find no differences in the level of emotionality between NATIVE

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[1]According to the business newspaper *Handelsblatt*, in 2017 18 of the 30 top companies listed in the German stock index DAX stated that English was their official business language. Only three companies declared that their official language remained solely German. `https://www.handelsblatt.com/english/companies/ve-talk-gut-how-german-companies-adopted-english-as-their-lingua-franca/23573406.html?ticket=ST-592664-Qc4Tvu3s4ab5rnw39uag-cas01.example.org`

and FOREIGN. However, we find that individuals who participated in FOREIGN and acquired their foreign language skills in an emotionally neutral context (classroom context) were less willing to reduce their financial advantage to move in the direction of more equitable outcomes, which suggests that the context of acquisition might be a driver for a potential FLE in decision-making (Čavar and Tytus, 2018; Dylman and Champoux-Larsson, 2020). For those individuals we also found a lower level of emotionality since they took significantly more time in making a decision.

My last research project is introduced in section 4 and has the title *You will receive your money next week! Experimental evidence on the role of Future-Time Reference for intertemporal decision-making.* This research project is work on my own. Similar to the project *Are individuals less inequity averse in a foreign language?*, I tried to relate language to distance and measured language-dependent economic decision-making. Starting point of this research project was the influential paper by Chen (2013) who has developed the "Linguistic Saving Hypothesis (LSH)." According to the LSH for speakers who have the opportunity to talk in a present tense (close tense) in prediction-based context, the future seems to be less distant since these speakers associate the present and future linguistically. In contrast, those who have to refer in future tense (distant tense) in prediction-based contexts, the future seems to be more distant since they disassociate present and future linguistically.

In my study I examined whether the targeted use of close tense and distant tense *within* the same language affects intertemporal decision-making. This is contrary to the previous literature on the LSH, which compared the behavior of individuals who speak different languages (e.g. Chen et al., 2017; Pérez and Tavits, 2017; Mavisakalyan et al., 2018; Sutter et al., 2018; Herz et al., 2020; Kim et al., 2021; Mavisakalyan et al., 2021). For instance, they focused on Chinese (enables to use a close tense in prediction-based contexts) and English (forces to use a distant tense in prediction-based contexts) speakers. With their procedure, cultural issues as potential drives of the results might not be isolated (Roberts et al., 2015).

With my focus on one language, I was able to disentangle cultural motives. Thereby, I took advantage of the grammatical particularities of the German language which enable their speakers to talk either in a close or distant tense in prediction-based contexts. Using a between-subject design, I implemented an incentivized economic experiment with two treatments. Both treatments contained the same choices between two rewards of various sizes being available at different dates in the future. The treatments differed in the framing of the payment dates. In the treatment CLOSE I associated the earlier reward with a statement in a close and the later reward with a statement in a distant tense. In the treatment DISTANT I linked a statement in a distant tense to both rewards.

In line with my prediction, I find that individuals in CLOSE prefer to a greater extent the earlier but smaller future rewards compared to participants in the treatment DISTANT. Interestingly, I find this effect exclusively for males. When it comes to females, no significant treatment-dependant differences occurred.

These results are new in the context of the LSH and provide further evidence on the role of linguistic stimuli as factors for economic decision-making (e.g. Brañas-Garza, 2007; He, 2017; Bruttel et al.,

2021). Thereby, my findings add to the debate on "gender-as-culture" which highlights that males and females approach language significantly different (Mulac et al., 2001). Newman et al. (2008) and Schwartz et al. (2013) have already reported that males and females use tenses significantly different. My results are complementary to them by showing that males and females react also differently to tenses when making choices.

The results of my four studies show similarities and differences. Table III provides an overview. In each study distance affects the efficiency of choices with respect to charitable input (study 1) or the participants' own income (study 2 - 4). However, distance always has to be linked to another aspect to be effective. In the first study smaller but spatially nearer goods are only preferred if the nearer location is in the immediate vicinity. In the second study, we find that the impact of the individual *Pace of Life* on giving behavior depends on gender. In the third study, we ascertain a lower level of financial transfers in a foreign language only if the language was acquired in a classroom-setting. Finally, I find an effect of the variation of close and distant tenses on decision-making only for males in the fourth study. Whereas the second and fourth studies have in common that gender is crucial for the effect of distance on the efficiency of choices, in study 1 and 3 other characteristics (involvement of the immediate vicinity, context of acquisition) play a role.

Component	Study 1	Study 2	Study 3	Study 4
Distance impacts the efficiency of choices	Yes	Yes	Yes	Yes
Distance alone impacts the efficiency of choices	No	No	No	No
Relationship between (passing a) distance and efficiency of choices	+	(+)	+	(+)
Relationship between (passing a) distance and pro-social behavior	+	mixed	−	n.a.
Gender differences	n.a.	Yes	No	Yes

Table III: Overview of the results across the four studies

My research projects show rather a positive relationship between (passing a) distance and the efficiency of choices. If the immediate vicinity is not involved, the charitable input is larger (spatial distance). If individuals make decisions in a foreign language and acquired their English skills in a classroom context, they keep more money (emotional distance). If only a distant tense is involved in an intertemporal task, males prefer more strongly the larger but later rewards (perceived temporal distance). If individuals pass distances faster, (i) they improve their financial outcome in a real effort task and (ii) give up less. However, (ii) holds only for males. Females show an opposite behavior.

In contrast, the relationship between (passing a) distance and pro-social behavior is mixed. My results show that individuals who make decisions in a foreign language and have learned English in a classroom context give less to others (study 3). Besides, a fast *Pace of Life* is associated with less giving behavior among males (study 2). In contrast, females give more if they have a fast *Pace of Life* (study 2) and individuals provide more charitable goods if the immediate vicinity is not at play

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(study 1).[2]

When it comes to gender differences, we find a positive relationship between (passing a) distance and efficiency for males in studies 2 and 4 and a negative (study 2) or no relationship (study 4) for females. Males with a fast *Pace of Life* give less (and keep more money for themselves), whereas females with a fast *Pace of Life* give more (and keep less money for themselves). Males select stronger the larger but later rewards in study 4 if they face only a distant tense. In contrast, females reveal no treatment-effect. Study 3 shows no gender differences.[3]

My findings imply various policy-measurements. The results of study 1 suggest that charities which enable their donors to select a project in the immediate vicinity might acquire more charitable input compared to those which do not. However, this incentive for a spatial dispersion of locations may bias the number of locations upwards compared to the efficient level of dispersion. Furthermore, our results imply that charitable projects in strongly populated regions may gain more charitable input compared to those in weakly populated regions since more donors have the opportunity to support donation projects in their preferred immediate vicinity. As a consequence, strong preferences for projects in the immediate vicinity could lead to inefficiency in terms of the marginal return if the populations of donation regions differ. Thus, the charity has to weigh whether the pros or cons of a stronger spatial dispersion of locations predominate. If the pros predominate, the charities should inform potential donors about the opportunity to support donation projects in their immediate vicinity explicitly.

The results of my second paper deliver a mixed picture for policy-implications as well. On the one hand, speeding up the society by promoting the benefits of "higher, faster, further" appears to be economically advantageous. On the other hand, the impact on pro-environmental behavior is negative when it comes to males but positive when it comes to women. Thus, it seem to be a good strategy to address males and females differently according to their *Pace of Life* if the society wants to improve pro-environmental behavior.

The findings of study 3 are hard to apply in practice for several reasons. At first, they are only applicable for individuals who speak German as a native and English as a foreign language. Secondly, the change from German to English increases the competition between individuals but at the cost of pro-social behavior. Finally, our result holds only for individuals who have acquired English mainly in a classroom context. Thus, the context of acquisition must be known.

The results of my fourth paper are easier to apply. For instance, policy-makers could highlight the positive future effects of vaccinations and professional dental cleaning, such as a lower probability to get infected or to undergo a serious surgery by using a close tense instead of a distant tense when referring to future benefits to make such actions more attractive. Such a priming into more future-oriented behavior would be also beneficial to the society in the long-run.

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[2]As study 4 does not contain pro-social behavior with respect to others, I skip it here (see not available (n.a.) in Table III).

[3]We did not control for gender in study 1.

To sum up, I carried out four studies in my thesis. All of them contained the role of distance for more or less efficient decision-making. My findings show that emotional or (passing) temporal and spatial distance impact the efficiency of choices differently. Similarly, each kind of distance has to be associated with another aspect to be effective. These findings contradict the CLT which suggests that the effect of distance on individual behavior can be generalized. Practically, my findings can be used by policy-makers. However, policy-makers have to weigh which aims they want to fulfill because many of my results are associated with a trade-off.

1 How do people discount over spatial distance?[*]

Abstract

This paper studies how individuals discount the utility they derive from their provision of goods over spatial distance. In a controlled laboratory experiment in Germany, we elicit preferences for the provision of the same good at different locations. To isolate spatial preferences from any other direct value of the goods being close to the individual, we focus on goods with "existence value." We find that individuals put special weight on the provision of these goods in their *immediate vicinity*. This "vicinity bias" represents a spatial analogy to the "present bias" in the time dimension.

1.1 Introduction

Many charities allow donors to select the precise location to which their donation should go.[1] From a cost perspective, it seems counterproductive for a charity to give donors this choice, because it limits the charity's freedom to allocate the donations they receive to the locations where the marginal benefit is largest. Thus, the observation that charities nevertheless offer the option of location-dependent donations suggests that they expect this feature to increase the total donations.

In this paper, we study whether and to what extent donors indeed have such spatial preferences. In particular, we test whether donors prefer charitable projects located close to their places of residence, even if we control for any direct-use value.[2] We implement two related laboratory experiments in a within-subject design with participants in Germany. The participants make real decisions as to the provision of charitable goods at different locations at no cost to themselves. To reduce the risk that we may accidentally consider goods in our study that have more than just existence value for our participants, we (i) select three different goods provided by charities (owl protection, children's villages, and cancer research) and (ii) elicit other non-spatial motives as control variables for our estimations. For instance, we ask the participants whether they or people they know use the goods provided directly at the different locations in a post-experimental questionnaire.[3] Furthermore, the experiments take place at two different locations to ensure that the effects we measure do not depend on the participants' location.

In *Experiment 1*, the participants make six decisions and receive a fixed budget for each decision, which they have to split across two different locations. In each decision, the same charitable project is carried out at both locations, but the locations differ in their distance from the decision maker. In CONDITION AB, one location (region A) is in the immediate vicinity of the participants; the second location is about 250 kilometers away (region B). In CONDITION BC, the participants distribute the money between region B and another location 250 kilometers away from the second one (region C). With *Experiment 1*, we are able to get some initial insight into individuals' spatial discounting when it comes to the utility of providing goods associated with existence value. In *Experiment 2*, we quantify the strength of the spatial preferences in more detail. Participants distribute money between two locations in the same way as in the first experiment, but this time we impose a conflict between the efficiency of the charitable input (the total amount invested in the charitable good) and a greater amount given to one location. Assuming that, ceteris paribus, individuals prefer the charity

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[1]For example, *SOS Children's Villages* allow donors to fund assistance to children in need at a specific village, and donors to *Atmosfair* are given the option to select the location of the environmental project they prefer to support.

[2]Vesterlund (2006) has shown that people like to donate to projects without using the goods they are providing. This suggests that charitable goods mainly have existence value, and that donors derive utility from providing such goods without also consuming them (Krutilla, 1967). Thus, the location of the goods should not matter.

[3]Placing our focus on goods associated with existence value and controlling for non-spatial motives has the advantage that we can study spatial preferences separately from transportation costs (Agimass et al., 2018), direct-use values (Hanley et al., 2003), information bias (Elliott et al., 2012; Grebitus et al., 2013) or cultural aspects (Kim, 2017).

to receive a larger amount of the charitable good compared to a smaller one,[4] this allows us to elicit their willingness to pay for favoring one location over the other. At the end of the experiments, one decision is randomly chosen and implemented: We transfer the money based on the participant's decisions to the charitable project at the specific location(s).

Our results from the two experiments suggest that individuals place special importance on the provision of goods in their immediate vicinity. Their average willingness to pay for one marginal cent more to this location is about 1.8 cents in terms of the total donation. Interestingly, they do not seem to prefer the goods to be nearer to them once the immediate vicinity is not available. Our findings imply two insights: Individuals show a "vicinity bias" in the spatial dimension, which is similar to a "present bias" in the time dimension. Similarly, they do not consistently discount the utility of donations over spatial distance as they do over (perceived) social distance (Jones and Rachlin, 2006) or over time (O'Donoghue and Rabin, 1999). Hence, our data suggest that a one-parameter model that involves a parameter for a "vicinity bias" is sufficient to capture spatial preferences.

Our research project enriches the literature on spatial preferences for the provision of (charitable) goods in different ways. By giving the participants the opportunity to split up money between nearer and farther charitable goods both with and without involving a location in the immediate vicinity, we can estimate parameters of a discounting model and link our results to the findings in intertemporal decision-making. Another innovative feature of our research design is the exclusion of self-serving motives from a potential trade-off between efficiency in terms of charitable input and spatial preferences: The participant's decisions are only consequential regarding the spatial provision of goods but not regarding their own payments.

In the following, we refer to the related literature in section 1.2. Afterwards, we describe our experimental design and the procedures in sections 1.3 and 1.4. In section 1.5 we develop hypotheses. We then present the experimental results in section 1.6. Finally, we conclude and discuss our findings in section 1.7.

1.2 Related Literature

This study is closely related to the literature on spatial preferences for charitable goods (Kühl and Szech, 2017; Brown et al., 2017; Kessler and Milkman, 2018; Gallier et al., 2019a; Adena et al., 2020). Adena et al. (2020) explored whether individuals donate more of their own money if this increases the probability of a future project being implemented locally using a field experiment in Kyrgyzstan. Their results show no significant relationship. Brown et al. (2017) gave individuals a list of charities that were either local or national, whereby the information about the charities' quality varied. The authors found no strong difference in the preference for local or national charities. There are also

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[4]This assumption is backed up by the finding that individuals generally assign a positive value to a charitable cause receiving a larger donation. They avoid supporting charities with higher overhead costs and give more if their payment is scaled up by a matching mechanism (see, e.g., Gneezy et al., 2014).

studies that have reported a significant impact of spatial preferences on the provision of charitable goods. Gallier et al. (2019a) showed – by conducting a field experiment on charitable giving for two food banks – that participants prefer to give more money to the food bank nearby if they know the locations of the food banks. Kessler and Milkman (2018) highlighted that donors give more if the potential donors are primed to adopt a shared local identity and Kühl and Szech (2017) revealed that the individual willingness to donate to refugees declined sharply as the spatial distance from the refugee projects increased.

Furthermore, our study adds to the literature on spatial distance for the provision of environmental goods. Recent studies found that individuals are more willing to support the improvement of environmental goods if these goods are located nearer to them (Czajkowski et al., 2017; Löschel et al., 2021; Bartels et al., 2021). As our study involves a trade-off between spatial preferences and efficiency, it also relates to studies that have examined links between parochialism and efficiency in the past. Gallier et al. (2019b) reported no evidence for a link between parochialism and efficiency, but Bernhard et al. (2006) did: By running a third-party punishment game in Papua New Guinea with two indigenous groups, they showed that individuals were more willing to reduce their own payoffs in order to punish a norm violator if a member of the same indigenous group suffered from the norm violation.

We enrich these studies by focusing on spatial preferences for goods associated with existence value, which places a new focus and enables us to isolate spatial preferences more completely from non-spatial motives like direct-use values. Thereby, our research design consists of a potential trade-off between efficiency in terms of charitable input and spatial preferences. By doing so, we disentangle self-serving motives in the sense that no personal stakes are involved. We deviate from the existing literature in this respect.

On top of this, our focus on how individuals discount the utility of donations over spatial distance relates our study to the literature on distance discounting by providing evidence for the spatial dimension. There is already evidence on the role of (perceived) social distance. Thereby, it was reported that individuals keep more money for themselves instead of giving it up for others[5] and are more willing to give up money for friends than for strangers (Leider et al., 2009; Brañas-Garza et al., 2012). Besides, the individual willingness to give up money in order to increase the income of another person decreased as the (perceived) social distance from the other person increased. In this context, social discounting proved to follow a hyperbolic function (Jones and Rachlin, 2006). A hyperbolic discounting function has also been shown to appropriately model time preferences. Studies on how individuals discount over temporal distance underscore that individuals discount the utility derived from consumption over time (Samuelson, 1937; Bickel et al., 1999; Odum and Rainaud, 2003) and that many of them are present-biased in the sense that they put additional weight on immediate consumption compared to any future consumption (for reviews, see, e.g., Read and van Leeuwen,

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[5]Engel (2011) conducted a meta-analysis with 129 studies on the dictator game. He figured out that individuals kept 71.65% of the pie for themselves and gave 28.35% to a responder.

1998; DellaVigna and Malmendier, 2006; O'Donoghue and Rabin, 2015; Cohen et al., 2020). These time preferences are captured formally by a two-parameter quasi-hyperbolic discounting model which consists of a long-run, temporally consistent discounting parameter δ and a parameter β that represents the bias toward the present (Phelps and Pollak, 1968; Laibson, 1997; O'Donoghue and Rabin, 1999).

With our research project, we are able to measure whether the two-parameter quasi-hyperbolic discounting model is also capable of displaying spatial preferences appropriately. By doing so, we have the opportunity to examine whether spatial preferences are similar to time or social preferences.

1.3   Experimental Design

In our study, we recruit participants from the Potsdam Laboratory for Economic Experiments (PLEx) and Dusseldorf Institute for Competition Economics (DICE) to ensure that we will not measure a "one-location effect" and let them decide how to allocate money between different regions that provide the same goods associated with existence value. Independent of their allocation, the participants receive a fixed show-up fee at the end. The goods we consider for provision are three different donation projects: owl protection, assistance to children in need, and cancer research.[6] We chose these donation projects since we believe they hold existence value for most individuals. Furthermore, they differ thematically and also in the extent to which the target group of these goods is more or less spatially dependent. Cancer research is a public good, whereas the question of where it takes place should be of little relevance as far as benefiting from research successes. In contrast, assistance to children in need and owl protection conducted by farmers have more spatially dependent properties, since they address disadvantaged children and the population size of the owls in a certain region. By considering the three different donation projects, we are able to make statements about the generalization of our results at the end.

Each type of donation project is offered in three regions in Germany, which differ with regard to the distance from the participants. We do not include locations outside of Germany to avoid our results being affected by a nationality-driven home bias. Assistance to children in need is provided by SOS-Children's Villages and the Evangelical Youth Aid, owl protection is carried out by the Nature and Biodiversity Conservation Union (NABU), and cancer research is implemented by medical centers.[7] In the following, we denote the region in the participants' immediate vicinity as *region A*. The second region, located about 250 kilometers away from the participants, is denoted as *region B*, and the third region, 250 kilometers away from region B and about 500 kilometers away from

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[6]The owl protection project entails the erection of nesting aids for owls on farms to maintain this species' population size, which is under pressure. Assistance to children in need refers to sheltered housing groups in which disadvantaged children are supported psychologically and socially. The cancer research focuses on the development of medicines to combat cancer diseases.

[7]In the instructions, we did not associate one region with one certain charity, but gave general information on the charities considered to avoid a certain charity driving the donation behavior in one region.

region A, is denoted as *region C*. For the participants at DICE in Dusseldorf, Dusseldorf and the surrounding area formed region A, while Potsdam and the surrounding area formed region C. For the participants at PLEx in Potsdam, Potsdam and the surrounding area formed region A, while Dusseldorf and surrounding area formed region C. For the participants at both locations, region B was Hanover and the surrounding area. Figure 1.1 indicates the position of the regions on a map of Germany.[8]
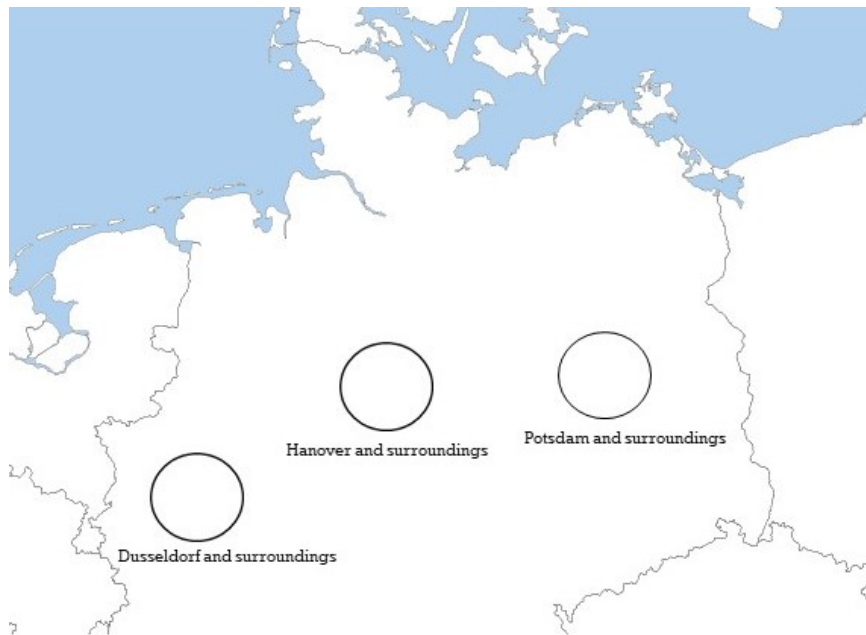
Figure 1.1: Location of the project regions

We decided on these regions, since the distance between A and B is just as long as between B and C (250 kilometers) and the distance between A and C is double the distance between A and B (500 kilometers), which enables us to investigate the role of the immediate vicinity on giving to the nearer and farther locations. Furthermore, in all three regions, the donation projects of owl protection, assistance to children in need, and cancer research are all carried out, which is a very important requirement for answering our research questions.

In the experiment, each participant takes part in two different experiments (*Experiment 1* and *Experiment 2*) and two different conditions (CONDITION AB and CONDITION BC). Thus, we are applying a within-subject design. Table 1.1 provides an overview of the experimental design.

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[8]Participants in the experiment saw a similar map, but only the two circles for their current decision and no city names.

Experiment	Condition	Decision	Total charitable input affected by spatial allocation
1	AB	Cancer research region A vs. Cancer research region B	No
1	AB	Assistance to children region A vs. Assistance to children in region B	No
1	AB	Owl protection region A vs. Owl protection region B	No
1	BC	Cancer research region B vs. Cancer research region C	No
1	BC	Assistance to children region B vs. Assistance to children in region C	No
1	BC	Owl protection region B vs. Owl protection region C	No
2	AB	Cancer research region A vs. Cancer research region B	Yes
2	AB	Assistance to children region A vs. Assistance to children in region B	Yes
2	AB	Owl protection region A vs. Owl protection region B	Yes
2	BC	Cancer research region B vs. Cancer research region C	Yes
2	BC	Assistance to children region B vs. Assistance to children in region C	Yes
2	BC	Owl protection region B vs. Owl protection region C	Yes

Note: Each participants took part in both experiments and both conditions and made all twelve decisions.

Table 1.1: Overview of the experimental design

In *Experiment 1*, the participants make in total six decisions. In each decision they allocate just 1200 cents between a nearer and a farther location, both of which provide the *same* charitable good. In CONDITION AB, the nearer location reflects region A (immediate vicinity) and the farther location is region B. In CONDITION BC, the nearer location is region B and the farther location represents region C.

For every decision, participants see information about the charitable good and a blank map of Germany on their screen. On the map, the two project regions relevant for the current decision are neutrally labeled as the "left" and "right" regions and are indicated in the form of circles of equal diameter. Furthermore, the exact location of the laboratory where the experiment takes place is indicated on the map.

In *Experiment 2*, the participants make the same six decisions as in *Experiment 1*, with one exception: The participants do not allocate a fixed budget. Instead, we implement a trade-off between efficiency in terms of charitable input (the total amount allocated) and a preference for one of the locations. If the participants distribute the money equally between the two different project locations, each location receives a donation of 600 cents, i.e. a total amount of 1200 cents will be given. We define this decision as the most efficient one, since it maximizes the charitable input. Each additional cent a participant gives to one project location results in a monetary loss for the other location of more than one cent. The total sum of the donation decreases at an increasing rate as illustrated in Figure 1.2.[9] The marginal efficiency loss (MEL) with the allocation chosen by a participant allows us to elicit the individual willingness to pay for giving one additional cent to the preferred location.

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[9]The function behind this graph is $MEL = \frac{-3(x^2)}{10000} + 0.1203x - 0.06$. We used data from a pretest, in which some participants were willing to sacrifice up to 9 cents in terms of the total donation in exchange for one cent additionally given to their preferred location, to calibrate this function. Note that this function applies to a preference for either the nearer or the farther location. Thus, our design would also be able to capture spatial preferences for the more distant location.
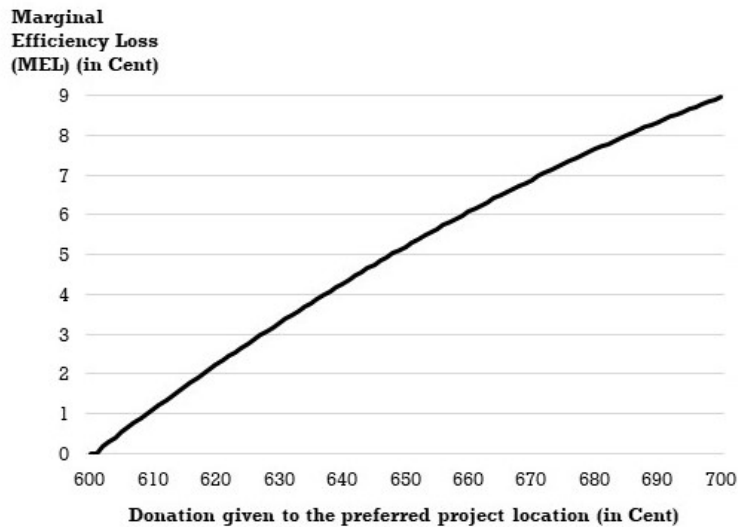
Figure 1.2: Donation decisions and MEL

At the end of the experiment, each participant has made 12 decisions (2 experiments x 2 conditions x 3 donation projects). Each participant receives a fixed sum of 10.00 Euros in our study. This way, we are able to study a potential trade-off between efficiency in terms of charitable input and spatial preferences in isolation from self-serving monetary motives. On top of this, there is recent evidence that the absence of self-serving motives is advantageous, since decision errors occur less frequently (Exley and Kessler, 2019). Besides, we know from the literature that a large share of individuals keep the whole amount of money for themselves if personal stakes are affected by their giving behavior (see, e.g. Hoffmann et al., 2022a; Brown et al., 2017), which would weaken the statistical power of our findings.

Despite the absence of self-serving monetary incentives, the participant's decisions are consequential and meaningful: One of the twelve decisions will be drawn randomly and the allocation implemented. The experimenters transfer – based on the decision – money to the charities at the different locations.

1.4 Procedures

In total, 163 students (83 at PLEx, 80 at DICE) participated in the experiment, with 16 to 22 participants per session.[10] The laboratory experiments were run in November 2019.

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[10]Based on a pretest with 11 participants, we calculated that we would need 159 observations for our study to reach a power of at least 0.80. Due to possible no-shows, we invited slightly more participants than needed to our experiment to ensure that we reached our target sample.

At the beginning of each session, the participants had to sign an informed consent form. Before the experiment started, participants received written instructions. The instructions verbally and graphically explained the two different allocation mechanisms in *Experiment 1* and *Experiment 2*. Furthermore, participants were given the opportunity to familiarize themselves with the consequences of their decisions for the total donation in both experiments in a trial stage on the computer screen. Then, they made their 12 decisions. Each participant in our experiment started with *Experiment 1* and approached the donation projects in the same order. However, we varied the order of the two conditions across the participants. This procedure enabled us to control whether differences in individual decision-making between CONDITION AB and CONDITION BC in the two experiments occured due to an "order-effect" of the conditions.

With our research design, we want to study the participants' decision regarding the spatial provision of goods associated with existence value as well as possible. However, we cannot rule out in advance that our donation projects may not reflect goods associated with existence value. Therefore, we ran a post-experimental questionnaire, in which we controlled for potential non-spatial motives as well as for aspects that could contradict the assumption that the chosen donation project represent goods associated with existence value.

We asked the participants whether they had positive (coded as 1), negative (coded as -1), or no information (coded as 0) about the different donation projects in each region, taking into account that the goods' reputation might bias decision-making (Brown et al., 2017). We decided to only give them these three opportunities (positive, negative, no information) as potential answers, since we believed they were sufficient to provide us the information we needed. Furthermore, we asked for this information for every region (A, B and C) and for each donation project (owl protection, assistance to children in need, and cancer research). Thus, by limiting the potential answers to three, we kept the questionnaire from getting too long.

Apart from this, we asked the participants about their attitudes[11] toward the different goods considered in this study because we know from the literature that donors' attitudes toward charitable goods are crucial for their motivation (Ariely et al., 2009).

Furthermore, we elicited whether the participants or people they knew use the goods provided at the various locations directly, which would question our claim that the goods provide existence value only. Section 1.9.3 summarizes the questions asked in the experiment. We used participants' answers to these questions as control variables in our regression analyses. Only after answering the questionnaire were participants informed which decision was randomly chosen for implementation. Subsequently, they received their own payment, a fixed sum of 10.00 Euros, in cash.[12] One session lasted for approximately 30 minutes. The experiment was computerized with z-Tree (Fischbacher, 2007), and the recruitment process was conducted using ORSEE (Greiner, 2015).

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[11] We used a rating scale ranging from -5 (very negative) to +5 (very positive).

[12] 10.00 Euros ≈ 11.02 Dollars at the time of the experiment.

Based on the decisions in the lab, we transferred 2041.29 Euros[13] to the charitable projects introduced in the experiment. We informed the participants about the donations via email and published the donation receipts on the university's homepage. Furthermore, we reported how the different donation amounts were achieved referring to an anonymous individual code that each participant entered during the experiment.[14]

1.5 Hypotheses

To develop hypotheses on how people discount the utility of providing goods associated with existence value over spatial distance, (i) we need a definition of spatial distance as well as (ii) a model that captures spatial preferences appropriately. We understand spatial distance as the physically measurable distance from someone or something. In our study, we are interested in the physically measurable distance (in kilometers) from goods associated with existence value.

To model spatial preferences, we make use of the two-parameter quasi-hyperbolic discounting model, which has been established to model temporal preferences appropriately in the past (Phelps and Pollak, 1968; Laibson, 1997; O'Donoghue and Rabin, 1999), and adapt it to the spatial dimension. We use this model because the Construal Level Theory argues that spatial and temporal distance are cognitively related (Fujita et al., 2006) and treated similarly (Trope and Liberman, 2010), which suggests that they can be modeled analogically. We use a short-run version of the two-parameter hyperbolic discounting model, as our research design only enables us to make statements about three different distant locations (l, l+1, l+2).

$$U_i = u_l + \beta(\delta u_{l+1} + \delta^2 u_{l+2})$$

In our model, an individual (i) derives utility from providing goods associated with existence value (U). Thereby, the individual not only derives utility from goods that s/he provides in the immediate vicinity (u_l), but also from goods provided farther away (u_{l+1} and u_{l+2}). These assumptions are in line with the literature on a warm-glow effect, which reports that individuals derive utility from donating toward the provision of a charitable good (Andreoni, 1990), as well as the findings of Kühl and Szech (2017) and Bartels et al. (2021): They have shown that individuals make a positive donation to provide goods even if the spatial distance is very great.

We know from the literature that individuals prefer goods to be provided nearer to them (Kühl and Szech, 2017; Gallier et al., 2019a; Bartels et al., 2021; Löschel et al., 2021), and that location is more meaningful to individuals for nearer compared to more distant locations (Laczko, 2005). These

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[13]This number contains the total sum of donations, also including those from the pretest. We did not consider the data from the pretest in our data analysis.

[14]The code was a nine-digit number that the participants individually chose in the experiment after making their decisions. The codes of all participants were linked to the donation receipts. Thus, the participants could retrieve feedback on how their decision affected the provision of charitable goods.

results suggest that an individual derives more utility if the goods are located closer. Keeping such a tendency into account, we consider a spatially-consistent discounting parameter δ in our model. Thereby, we define $\delta < 1$ as individuals preferring goods in closer proximity to them.

The literature suggests that individuals do not only prefer nearer over more distant goods, but place a special value on goods that are located in their immediate vicinity. For instance, the study of Kühl and Szech (2017) has reported that cooperation sharply declines once a certain spatial distance from the decision-maker has been reached. This result suggests that individuals derive a particular warm-glow effect from the provision of goods in their immediate vicinity. In addition, the literature on place attachment reports that individuals care the most about places in which their home is located (see for a review on place attachment, Lewicka, 2011). This is explained by the social closeness to people living nearby (e.g. neighbours, family or friends) (Porteous, 1976; Marcus, 2006).[15]

As the studies of Jones and Rachlin (2006) and Small and Loewenstein (2003) have shown that individuals are particularly willing to give money to people who are perceived as very close in the social dimension (social discounting), we find further support that the participants in our experiment might derive a particularly strong warm-glow effect from the provision of goods in their spatial vicinity. Therefore, we consider a "vicinity bias" β in our model, which we define as $\beta < 1$, since the literature suggests that individuals place special importance on goods that are located in their immediate vicinity.

With our research design, we want to measure whether individuals discount the utility of providing goods associated with existence value over spatial distance as our model predicts. Thus, we formulate the following two hypotheses.

Hypothesis 1: *The spatially-consistent discounting parameter δ can be specified as $\delta < 1$ when it comes to the spatial provision of goods associated with existence value.*

Hypothesis 2: *The "vicinity bias" parameter β can be specified as $\beta < 1$ when it comes to the spatial provision of goods associated with existence value.*

We test both hypotheses in *Experiment 1*, in which participants allocate a given amount of money to two goods associated with existence value. If the participants give more money to provide goods at the nearer location – irrespective of whether the nearer of the two locations is in their immediate vicinity or not – the spatially-consistent discounting parameter can be specified as $\delta < 1$. If the

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[15]Although social distance, which is the "degree of closeness or acceptance that an individual or group feels towards another individual or group" (Boguná et al., 2004) and spatial distance often correlate, they are not always identical. Individuals might feel socially closer to individuals who are spatially farther away but belong to the same social group. Another example is an individual who has stronger bonds with people in his former but now more spatially distant home (Hannon, 1994). To take into account that the participants might care about people at the different locations, we asked about direct-use values as well as information on each donation project at all three locations that provide charitable goods.

participants give more money to the nearer location A in CONDITION AB than they give to the nearer location B in CONDITION BC, they have a vicinity bias described as $\beta < 1$.

With *Experiment 2*, we can test the same hypotheses and additionally quantify the strength of the spatial preferences more precisely. If the participants reveal a MEL due to spatial preferences for the nearer location in CONDITION AB and CONDITION BC, the spatially-consistent discounting parameter can be specified as $\delta < 1$. If the MEL due to spatial preferences for the nearer location is larger in CONDITION AB compared to CONDITION BC, they have a vicinity bias described as $\beta < 1$.

The findings in the two experiments yield evidence of the appropriateness of our model to capture spatial preferences involved in an individual's provision of goods associated with existence value. However, they also allow us to examine whether the assumed analogy between spatial and time preferences can be supported empirically.

1.6 Results

1.6.1 Experiment 1: total amount fixed

(a) Decisions in CONDITION AB   (b) Decisions in CONDITION BC
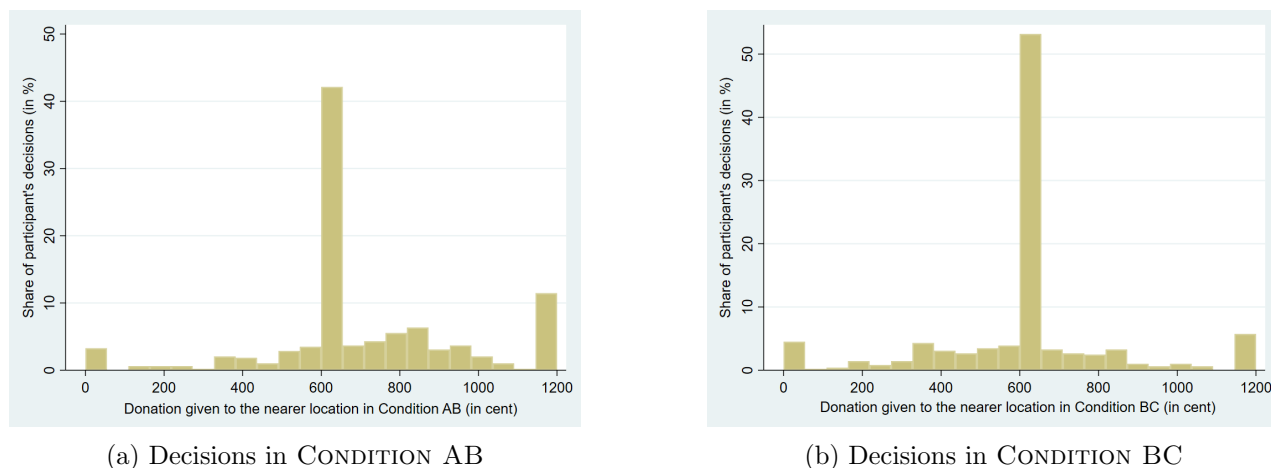
Figure 1.3: The share of participants' decisions regarding the donation given to the nearer location for both treatments

We use the donation given to the nearer location as our variable of interest to test the two hypotheses in *Experiment 1*. In this context, we start our analysis by focusing on the donation given to the nearer location in CONDITION AB. In 11% of the decisions, the participants allocate the whole sum of money (1200 cents) to the nearer location. On the contrary, in 3% of the decisions the participants donate all the money to the distant location and, consequently, no money to the nearer location (0 cents). The most frequent decision (38%) is an equal split between the two locations (600 cents to the nearer and thus 600 cents to the farther location). Figure 1.3a shows the distribution of the donations given

to the nearer location in CONDITION AB.

If the participants prefer to give more than the equal allocation to the nearer location (> 600 cents), they give on average 911 cents to the nearer location and 289 cents to the farther location (std. dev. $=$ 199). If the participants prefer to give less than the equal allocation to the nearer location (< 600 cents), they give on average 356 cents to the nearer location and 844 cents to the farther location (std. dev. $=$ 214).

We proceed by focusing on the average donation given to the nearer and to the farther location in CONDITION AB across all donation projects (see Figure 1.4a). The participants give on average 701 cents to the nearer location and 499 cents (std. dev. $=$ 195) to the farther location. This difference is highly significant ($p < 0.001$, two-sided Wilcoxon signed-rank test, Pearson's r $= 0.50$[16]).

(a) CONDITION AB	(b) CONDITION BC
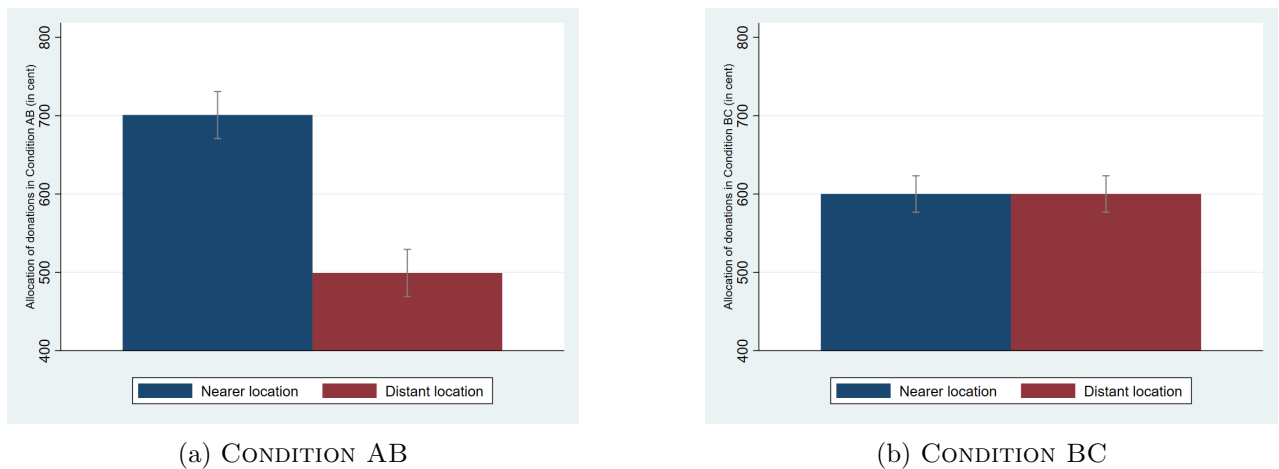
Figure 1.4: Mean values of donation allocations across all donation projects and 95% intervals in both treatments

Project	Region	Condition	Donation	Project	Region	Condition	Donation	Pearson's r	Diff.
Cancer research	A	AB	721.21 (274.68)	Cancer research	B	AB	478.79 (274.68)	0.44	$p = 0.00$
Cancer research	B	BC	622.55 (254.12)	Cancer research	C	BC	577.45 (254.12)	0.09	$p = 0.27$
Cancer research	A	AB	721.21 (274.68)	Cancer research	B	BC	622.55 (254.12)	0.33	$p = 0.00$
Owl protection	A	AB	672.99 (261.79)	Owl protection	B	AB	527.01 (261.79)	0.30	$p = 0.00$
Owl protection	B	BC	612.48 (233.53)	Owl protection	C	BC	587.52 (233.53)	0.01	$p = 0.91$
Owl protection	A	AB	672.99 (261.79)	Owl protection	B	BC	612.48 (233.53)	0.28	$p = 0.00$
Assistance to children	A	AB	708.15 (251.49)	Assistance to children	B	AB	491.85 (251.49)	0.42	$p = 0.00$
Assistance to children	B	BC	564.95 (217.71)	Assistance to children	C	BC	635.04 (217.71)	0.10	$p = 0.20$
Assistance to children	A	AB	708.15 (251.49)	Assistance to children	B	BC	564.95 (217.71)	0.38	$p = 0.00$

Note: Standard deviations are in parentheses. Pearson's r gives evidence on the effect size. According to the classification of Cohen (1988, 1992) r = 0.1 reflects a small, r = 0.3 a medium and r = 0.5 a large effect size. P-values are based on two-sided Wilcoxon signed-rank tests.

Table 1.2: Comparison of donations: fixed donation projects, different regions

Rows 1, 4, and 7 of Table 1.2 show that in CONDITION AB the participants prefer the nearer (location in region A) over the farther location (location in region B) for every donation project as

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[16]Pearson's r gives evidence of the effect size. According to the classification of Cohen (1988, 1992) r = 0.1 reflects a small, r = 0.3 a medium, and r = 0.5 a large effect size.

well. If we focus on inter-charity differences in the amount of money given to the nearer location in CONDITION AB (region A), we find that cancer research is preferred over owl protection (row 1 of Table 1.3) in the immediate vicinity but not over assistance to children in need (row 3 of Table 1.3). Furthermore, assistance to children in need and owl protection show no significant differences in the participants' preference to provide these goods in their immediate vicinity (row 2 of Table 1.3).

Project	Region	Condition	Donation	Project	Region	Condition	Donation	Pearson's r	Diff.
Cancer research	A	AB	721.21 (274.68)	Owl protection	A	AB	672.99 (261.79)	0.17	$p = 0.03$
Assistance to children	A	AB	708.15 (251.49)	Owl protection	A	AB	672.99 (261.79)	0.10	$p = 0.19$
Assistance to children	A	AB	708.15 (251.49)	Cancer research	A	AB	721.21 (274.68)	0.03	$p = 0.74$
Cancer research	B	BC	622.55 (254.12)	Owl protection	B	BC	612.48 (233.53)	0.05	$p = 0.50$
Assistance to children	B	BC	564.95 (217.71)	Owl protection	B	BC	672.99 (261.79)	0.17	$p = 0.03$
Assistance to children	B	BC	564.95 (217.71)	Cancer research	B	BC	612.48 (233.53)	0.17	$p = 0.03$

P-values are based on two-sided Wilcoxon signed-rank tests.

Table 1.3: Comparison of donations: fixed regions, different donation projects

If we turn to the CONDITION BC, we find that in 6% of the decisions, the participants allocate the entire sum (1200 cents) to the nearer location. In contrast, in 5% of the decisions the participants donate the whole sum to the distant location and, consequently, no money to the nearer location (0 cents). As in CONDITION AB, the participants most often (47%) prefer to split the money equally between the two locations (600 cents to the nearer and 600 cents to the farther location). Figure 1.3b shows the distribution of the donations given to the nearer location in CONDITION BC. If the participants prefer to give more than the equal allocation to the nearer location (> 600), they give on average 851 cents to the nearer location and 349 cents to the farther location (std. dev. = 216). If the participants prefer to give less than the equal allocation to the nearer location (< 600 cents), they give on average 345 cents to the nearer location and 855 cents to the farther location (std. dev. = 195).

The average donation given to the nearer and to the more distant location in CONDITION BC across all donation projects is displayed in Figure 1.4b. On average, the participants give 600 cents to the nearer location and 600 cents to the more distant location (std. dev. = 151). Thus, no difference between the nearer and farther locations can be observed in CONDITION BC ($p = 0.86$, two-sided Wilcoxon signed-rank test, Pearson's r = 0.01). We also find no differences between the two locations in CONDITION BC if we focus on each donation project separately (see rows 2, 5, and 8 of Table 1.2).[17] If we focus on inter-charity differences in CONDITION BC, we find a significantly lower

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[17]The effect sizes by comparing the donations given to B and C in CONDITION BC are small according to the classification of Cohen (1988, 1992). This is the case across all donation projects (Pearson's r = 0.0137), as well as for each donation project individually (Pearson's r varying between = 0.01 and = 0.10). Our effect sizes in CONDITION BC are comparable to those of Bartels et al. (2021). Bartels et al. (2021) showed that the share of individuals who made a positive donation in distance category 2 (60-120 miles away from the environmental good) and distance category 3 (120-180 miles away from the environmental good) was 48% (cat. 2) and 59% (cat. 3) based on 49 observations (22 in cat. 2 and 27 in cat. 3). Based on this result, we calculate no significant difference in a two-sided proportion test ($p = 0.44$) between the two distance categories, as well as an effect size of Pearson's r = 0.11, which is close to our effect sizes in CONDITION BC.

donation to the nearer location for the assistance to children in need compared to owl protection and cancer research (see rows 5 and 6 of Table 1.3). We find no differences between owl protection and cancer research in Condition BC (row 4 of Table 1.3).

If we compare the donation given to the nearer location in Condition AB (701 cents across all donation projects) and the donation given to the nearer location in Condition BC (600 cents across all donation projects), we find that the donation given to the nearer location in Condition AB is significantly larger ($p < 0.001$, two-sided Wilcoxon signed-rank test, Pearson's r = 0.45). We find this difference also if we analyze each donation project individually (see rows 3, 6, and 9 of Table 1.2).

We continue our analysis by running a random-effects panel regression on the money given to the nearer location above the equal allocation (> 600 cents).[18] We used the following basic equation:

Money given to the nearer location in excess of the equal allocation$_{i,t} = \alpha + \beta_1 \cdot$ Immediate vicinity$_{1i,t} + \beta_2 \cdot X_{2i,t} + u_{i,t} + \epsilon_{i,t}$

Here, $i = 1, ..., 163$ identifies the participant and $t = 1, ..., 6$ the participant's decision. $\beta_1 \cdot$ Immediate Vicinity$_{1i,t}$ is a dummy variable that equals 1 if the participant made the decision in Condition AB and equals 0 if the participant made the decision in Condition BC. $\beta_2 \cdot X_{2i,t}$ is a vector of control variables, i.e. order-dummies, information about the projects or direct-use value. Furthermore, $u_{i,t}$ reflects a between-entity error and $\epsilon_{i,t}$ a within-entity error. We apply a step-up approach and present in Table 1.4 our estimation results. We consider in each model dummies for the order of the conditions and our variable of interest Immediate Vicinity.[19] In model (2), we add the information regarding the donation project in the nearer and farther locations, as well as a potential direct-use value associated with the donation project at both locations as control variables. In model (3), we interact more positive information about the donation project at the nearer location with our variable of interest, as well as direct-use value of the donation project at the nearer location with our variable of interest. In model (4), we additionally control for the attitude toward the donation project.[20]

Across all models, we find that the Constant – which provides information about spatial preferences in Condition BC – is not significantly different from zero. This means that individuals do not prefer one location over the other if the immediate vicinity is not involved. Furthermore, in all models the Immediate Vicinity has a highly significant and positive impact on the donation given to the nearer location ($p < 0.001$).[21] If we run an OLS regression and cluster the standard errors at the individual level, our main findings do not change (see Table 1.8 in the Appendix).

From the results for the Constant, we can derive that δ can be interpreted as $\delta = 1$, as no spatial

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[18]We used a random-effects model instead of a fixed-effects model since it enables us to include time-invariant variables (such as the order of the decisions).

[19]The order of the conditions had no significant effect in any of the models.

[20]Only a small share of the participants had a negative attitude toward the different donation projects (1 - 5 %), so we did not exclude those from the data analysis. If we were to exclude them, our main findings would not change.

[21]We find a significantly positive effect of the "Immediate vicinity" on the money additionally given to the nearer donation project compared to the equal allocation to both lab locations.

location is favored in CONDITION BC. This contradicts our assumption of $\delta < 1$ (Hypothesis 1), since our results show that individuals in general do not prefer the nearer location. Based on the findings of the *Immediate Vicinity*, we can derive that the "vicinity bias" parameter β can be defined as $\beta < 1$, as the location in the immediate vicinity is significantly more favored than the nearer location in CONDITION BC, which is in line with our Hypothesis 2.

| | Money given to the nearer location (in cent) | | | |
| | more than the equal allocation | | | |
	(1)	(2)	(3)	(4)
Immediate Vicinity	100.79***	88.44***	87.76***	89.56***
	(15.01)	(15.61)	(17.20)	(17.18)
More positive information about nearer project		52.80**	11.21	5.86
		(20.39)	(32.58)	(32.62)
More positive information about distant project		-28.83	-19.87	-25.92
		(24.03)	(24.49)	(24.63)
More positive information about nearer project x *Immediate Vicinity*			58.04	56.44
			(35.34)	(35.27)
Direct-use value nearer project		18.58	80.95*	76.86*
		(27.24)	(45.52)	(45.47)
Direct-use value distant project		-57.47	-64.81*	-66.09*
		(34.41)	(34.55)	(34.50)
Direct-use value nearer project x *Immediate Vicinity*			-87.55*	-0.015
			(50.84)	(0.015)
More positive attitude towards the donation project				8.80**
				(4.36)
Constant	-6.57	-6.76	-6.58	-35.40
	(16.07)	(16.52)	(16.88)	(22.12)
Observations	978	978	978	978
Subjects	163	163	163	163
R^2	0.05	0.06	0.07	0.07

Note: Subject as panel. Six decisions for each subject included. All models include dummies for the order of the conditions. Standard errors are in parantheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 1.4: Random effects panel regression on the money given to the nearer location

Our findings in model (2) indicate that more positive information about the nearer donation project increases the donation given to the nearer location. If we focus on interaction effects (see Figure 1.5a), we find that the participants give significantly more to the nearer location in the immediate vicinity CONDITION AB as the information about it improves ($p < 0.01$).

If we focus on the direct-use value of the donation project at the nearer location, we find no effect on the money given to the nearer location in CONDITION AB. However, we find that considering the direct-use value of the nearer donation project has a significant impact on the money given to the nearer location in CONDITION BC ($p = 0.09$).

If we focus on the different donation projects (see Figure 1.6), we find a significantly positive impact of the *Immediate vicinity* on the donations given to the nearer location for each donation project

($p < 0.05$). In CONDITION AB, we do not find differences between the three charities in the amount of money given to the nearer location. However, we do find differences in CONDITION BC. When it comes to assistance for children in need, the money given to the nearer location is significantly lower compared to that for cancer research and owl protection ($p < 0.05$). One possible explanation for these results may lie in the different rates of (child) poverty between the nearer (region B) and the more distant location (region C) in CONDITION BC. Thus, the participants in our experiment may perceive the provision of assistance to children in need in region C as more important than the provision of cancer research or owl protection.[22]

(a) Information about nearer location   (b) Direct-use value nearer location
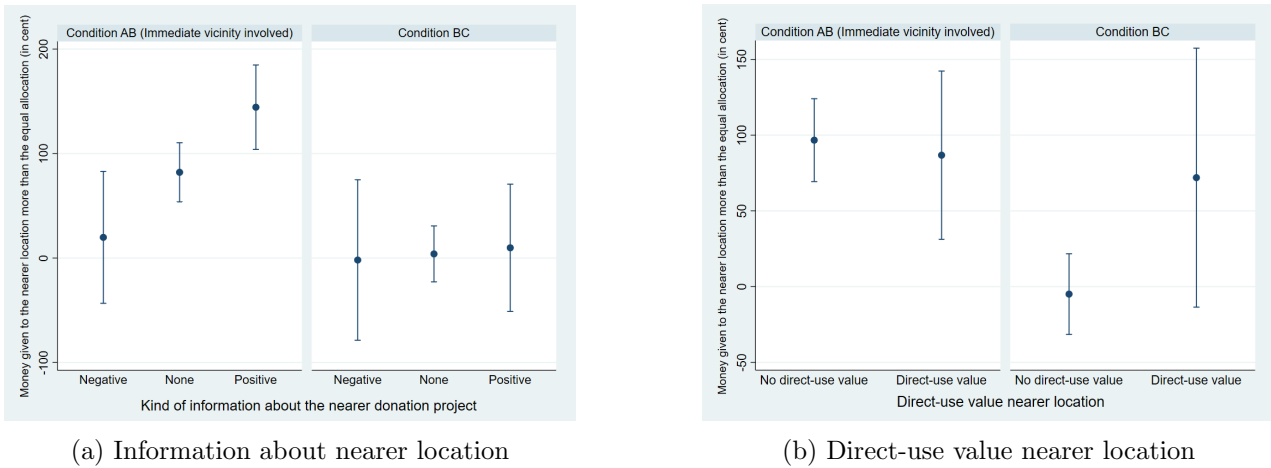
Figure 1.5: Linear prediction of the direct-use value for the project at the nearer location/information about the project at the nearer location regarding the money given to the nearer location by the two conditions with 95% intervals

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[22]According to the Hans Boeckler Foundation, the poverty rates in Dusseldorf and surrounding area (region C for participants at PLEx as well as in Berlin and surrounding area (region C for participants at DICE) were higher (25,1% and 26,8%) than in Hanover and surrounding area (20,6%, region B) `https://www.boeckler.de/pdf/wsi_vm_kinderarmut_2014.pdf`.
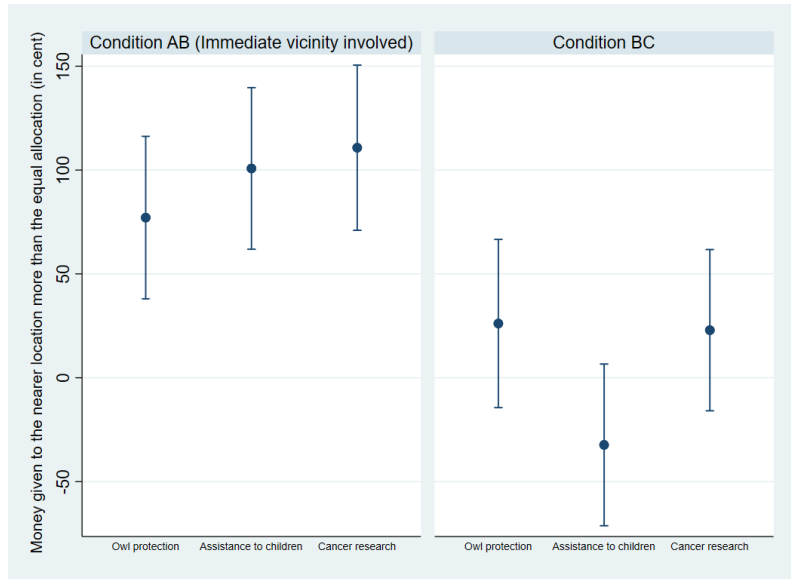
Figure 1.6: Linear prediction of the kind of donation project regarding the money given to the nearer location by the two conditions with 95% intervals

1.6.2 Experiment 2: willingness to pay for vicinity

We use the Marginal Efficiency Loss (MEL) as our variable of interest to test both hypotheses in *Experiment 2*. The MEL indicates the average amount participants are willing to give up in terms of the total donation in order to favor their preferred location by one marginal cent. In this context, a positive MEL implies a preference for the nearer location and a negative value implies a preference for the farther location.

(a)

(b)
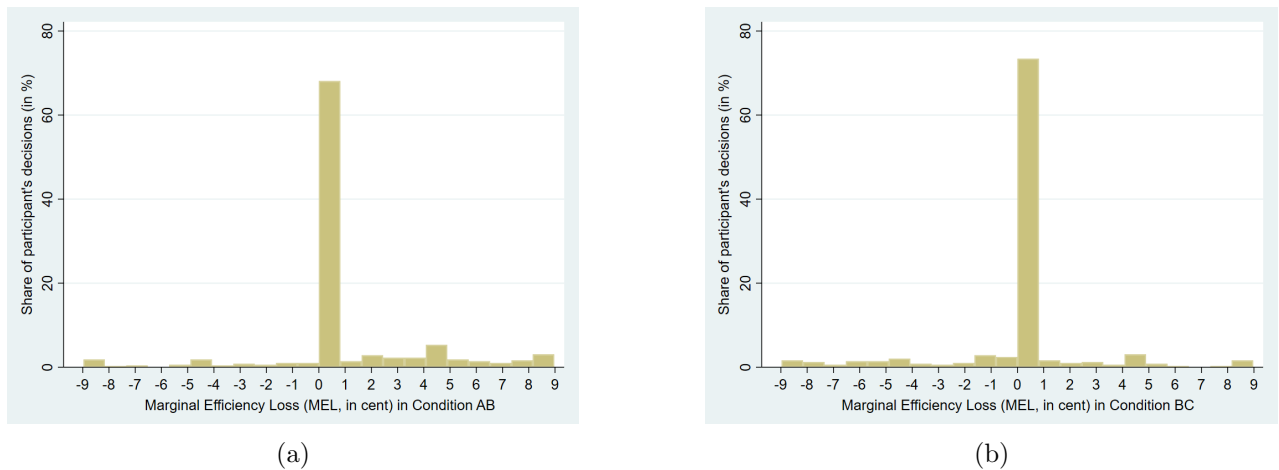
Figure 1.7: The share of participants' decisions regarding the MEL for both treatments
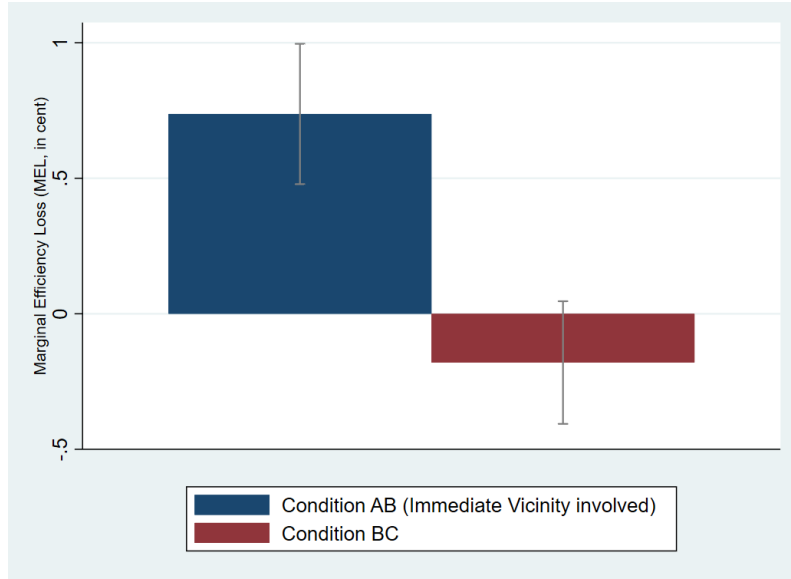
Figure 1.8: Mean values of MEL over all donation projects and 95% intervals in both treatments

We start our analysis by focusing on the MEL in CONDITION AB. In 2.2% of the decisions, the participants indicate the maximum MEL due to preferences for the nearer donation projects (9 cents). In contrast, in 1.6% of the decisions, the participants select the maximum MEL due to preferences for the distant donation projects (-9 cents). The most frequent decision (64%) is a MEL of 0 cents, which means that individuals are not willing to give up a part of the total donation to favor one of the two locations. Figure 1.7a shows the distribution of the MEL in CONDITION AB.

If the participants show a positive MEL (MEL > 0 cents), the MEL is on average 4.2 (std. dev. = 2.7). If the participants reveal a negative MEL (MEL < 0 cents), the MEL is on average -4.4 (std. dev. = 3.0). The average MEL in CONDITION AB across all donation projects is 0.74 (std. dev. = 2.2, Figure 1.8) and is driven by a minority of participants who have a strong spatial preference for the provision of charitable goods in their immediate vicinity. This result is in line with the findings on temporal discounting, which have also shown that a minority of participants drive hyperbolic temporal discounting (e.g. Dittrich and Leipold, 2014; Herz et al., 2020). If we focus on differences between the three donation projects and the MEL in CONDITION AB, we find no significant differences (see also Table 1.6).

Project	Condition	MEL	Project	Condition	MEL	Pearson's r	Diff.
Cancer research	AB	0.79 (2.90)	Cancer research	BC	0.23 (2.51)	0.15	$p = 0.06$
Owl protection	AB	0.60 (2.95)	Owl protection	BC	-0.19 (2.55)	0.24	$p = 0.00$
Assistance to children	AB	0.82 (2.91)	Assistance to children	BC	-0.59 (2.53)	0.38	$p = 0.00$

Note: P-values are based on two-sided Wilcoxon signed-rank tests.

Table 1.5: Comparison of MEL's: different regions, fixed donation projects

Project	Condition	MEL	Project	Condition	MEL	Pearson's r	Diff.
Cancer research	AB	0.79 (2.90)	Owl protection	AB	0.60 (2.95)	0.03	$p = 0.75$
Assistance to children	AB	0.82 (2.91)	Owl protection	AB	0.60 (2.95)	0.12	$p = 0.12$
Assistance to children	AB	0.82 (2.91)	Cancer research	AB	0.79 (2.90)	0.06	$p = 0.45$
Cancer research	BC	0.23 (2.51)	Owl protection	BC	-0.19 (2.55)	0.09	$p = 0.26$
Assistance to children	BC	-0.59 (2.53)	Owl protection	BC	-0.19 (2.55)	0.10	$p = 0.20$
Assistance to children	BC	-0.59 (2.53)	Cancer research	BC	0.23 (2.51)	0.23	$p = 0.00$

Note: P-values are based on two-sided Wilcoxon signed-rank tests.

Table 1.6: Comparison of MEL's: fixed regions, different donation projects

If we analyze the MEL in CONDITION BC, we find in 1.6% of the decisions that the participants indicate the maximum MEL due to preferences for the nearer donation projects (9 cents) and that the participants display the maximum MEL due to preferences for the farther donation projects (-9 cents). The most frequent decision (71%) is a MEL of 0 cents. Figure 1.7b shows the distribution of the MEL in CONDITION BC.

If the participants show a positive MEL (MEL > 0 cents), the MEL is on average 3.6 (std. dev. = 2.7). If the participants display a negative MEL (MEL < 0 cents), the MEL is on average -4.0 (std. dev. = 2.9).

The average MEL in CONDITION BC across all donation projects is -0.18 (std. dev. = 1.7), and thus significantly smaller compared to CONDITION AB (see Figure 1.8, $p < 0.001$, two-sided Wilcoxon signed-rank test, Pearson's r = 0.38). This is also the case if we analyze each donation project separately (see Table 1.5).

If we focus on differences between the three donation projects and the MEL in CONDITION BC, we find a significant difference between assistance to children in need ($MEL = -0.59$) and cancer research ($MEL = 0.23$) (see also Table 1.6).

We continue with a random-effects panel regression. Thereby, we use the same approach as in *Experiment 1* except for the dependent variable, which reflects the MEL now.

$\text{MEL}_{i,t} = \alpha + \beta_1 \cdot Immediate\ vicinity_{1i,t} + \beta_2 \cdot X_{2i,t} + u_{i,t} + \epsilon_{i,t}$

As before, positive values of the MEL imply a preference for the nearer location and negative values a preference for the farther location. We use the same stepped approach as in *Experiment 1*. Table 1.7 provides the full estimation results.[23]

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[23]The order of the conditions had no significant effect in any of the models.

	Marginal efficiency loss (MEL, in cent) due to spatial preferences			
	(1)	(2)	(3)	(4)
Immediate Vicinity	0.92***	0.85***	0.87***	0.86***
	(0.16)	(0.17)	(0.17)	(0.18)
More positive information about nearer project		0.52**	0.71**	0.73**
		(0.22)	(0.35)	(0.35)
More positive information about distant project		0.04	0.00	0.02
		(0.26)	(0.27)	(0.27)
More positive information about nearer project x *Immediate Vicinity*			-0.26	-0.26
			(0.38)	(0.38)
Direct-use value nearer project		-0.25	-0.45	-0.43
		(0.29)	(0.49)	(0.49)
Direct-use value distant project		0.38	0.41	0.41
		(0.37)	(0.37)	(0.37)
Direct-use value nearer project x *Immediate Vicinity*			0.28	0.27
			(0.55)	(0.55)
More positive attitude towards the donation project				-0.02
				(0.05)
Constant	-0.01	-0.10	-0.10	-0.03
	(0.18)	(0.19)	(0.19)	(0.25)
Observations	978	978	978	978
Subjects	163	163	163	163
R^2	0.04	0.05	0.05	0.05

Note: Subject as panel. Six decisions for each subject included. All models include dummies for the order of the conditions. Standard errors are in parantheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 1.7: Random effects panel regression on the marginal efficiency loss due to spatial preferences

We find across all models – in line with the findings in *Experiment 1* – that the *Constant* does not differ from zero and the involvement of the *Immediate vicinity* has a significantly positive impact. If we run an OLS regression and cluster the standard errors at the individual level, our main findings do not change (see Table 1.9 in the Appendix).

As the *Constant* does not differ from zero, our findings imply that the participants in CONDITION BC are not willing to give up a significant amount of the total donation in order to give one cent more to any location. Thus, δ can be interpreted as $\delta = 1$, which contradicts our assumption of $\delta < 1$ (Hypothesis 1) and confirms our findings from *Experiment 1*.

The significantly positive effect of *Immediate Vicinity* on the MEL across all models varies between 0.85 and 0.92 cents due to spatial preferences for the nearer location. This means that the average participant is willing to reduce the total donation to the more distant region by about 1.85 to 1.92 cents in order to give 1 cent to the nearer region if the region in the immediate vicinity is involved in the decision.[24] Based on this result, we can calculate the vicinity bias parameter β as ranging between $\frac{1}{1.92} = 0.52$ and $\frac{1}{1.82} = 0.55$. This finding confirms our result from *Experiment 1* and is in line with our Hypothesis 2, which suggests that a "vicinity bias" parameter β can be defined as

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[24]Again, this effect can be found statistically significant for both lab locations.

$\beta < 1$.

If we focus on the role of information on the MEL across the two conditions, we find that the MEL increases in both conditions if the information about the nearer donation projects improves (see Figure 1.9a,$p < 0.10$). If we turn to the impact of direct-use value, our findings reveal that the MEL is not significantly affected in either condition (see Figure 1.9b, $p > 0.10$). If we compare the findings across the three donation projects, our main findings are confirmed: The immediate vicinity shows a significantly positive impact of the MEL across all projects ($p < 0.10$). Although we find no differences among the projects in CONDITION AB, our results indicate that the MEL is larger when it comes to cancer research compared to assistance to children in need in CONDITION BC ($p < 0.01$). To sum up, the results of both experiments suggest that $\delta = 1$ and $\beta < 1$. Thus, only a one-parameter model that consists of a "vicinity bias" parameter β seems necessary to appropriately display the utility individuals derive from the spatially-dependent provision of goods associated with existence value.
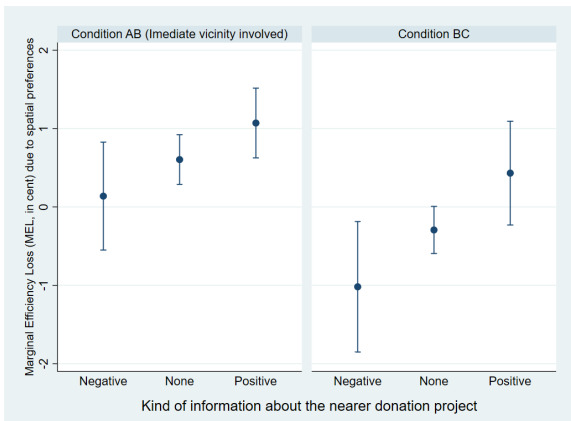
(a) Information about nearer location
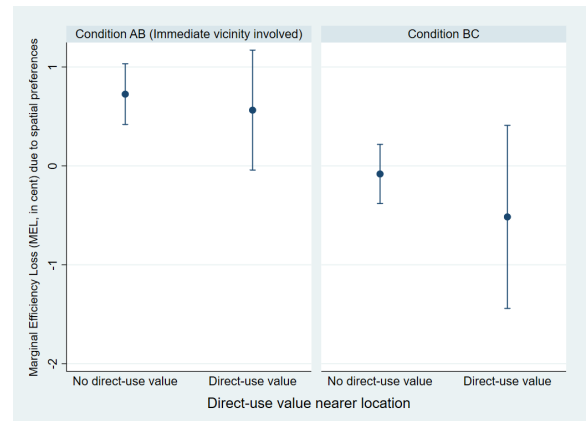
(b) Direct-use value nearer location

Figure 1.9: Linear prediction of the direct-use value for the project at the nearer location/information about the project at the nearer location on the MEL by the two conditions with 95% intervals
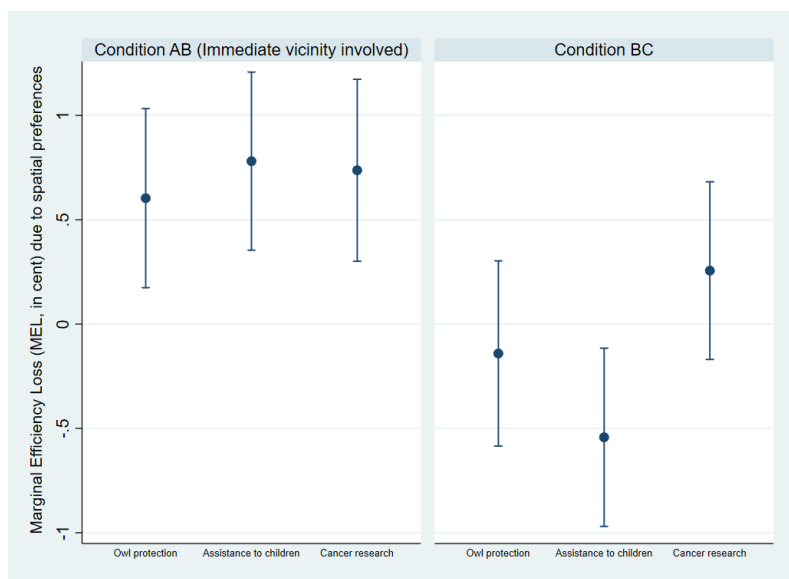
Figure 1.10: Linear prediction of the kind of donation project on the MEL by the two conditions with 95% intervals

1.7 Discussion and Conclusion

In a controlled lab experiment, we studied how individuals discount the utility of providing charitable goods with mere existence value at varying spatial distances from themselves. Participants in the experiment were asked to allocate money to two locations where identical charitable projects were being run. These locations differed with respect to their spatial distance from the participants. In some decisions, the nearer location was in the participants' immediate vicinity, while in other decisions it was merely less distant than the second location. To disentangle spatial preferences from non-spatial motives, we controlled for potential direct-use values for the participants and people they knew, as well as for a potential information bias regarding the charitable goods.

We find that individuals have a preference for providing goods associated with existence value in their immediate vicinity. This is the case even if it comes at the cost of reducing the total charitable input. The result holds for both lab locations and for each of the three donation projects that we introduced (owl protection, assistance to children in need, and cancer research). Furthermore, it is robust to controlling for any direct-use value or type of information associated with the good being provided at a specific location.

These results imply that individuals have a "vicinity bias," which is similar to a "present bias" in the time dimension. Interestingly, if the immediate vicinity is not involved in the decision, the participants do not prefer one location over the other. Thus, our findings imply that individuals do not discount the utility of donations over spatial distance in general, which implies that a one-parameter model only including a parameter for a "vicinity bias" seems sufficient to describe spatial discounting

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appropriately. This result is contrary to studies from the social and time dimensions, which suggest that individuals in general prefer closer over more distant subjects or goods (O'Donoghue and Rabin, 1999; Jones and Rachlin, 2006), indicating that spatial preferences work differently. Thereby, our findings add to the assumption of Porteous (1976) that individuals' spatial interest is classified as either home or not-home.

Furthermore, our findings contribute to the literature on spatial preferences for charitable goods, which has reported evidence for (Bartels et al., 2021; Löschel et al., 2021; Gallier et al., 2019a; Kessler and Milkman, 2018; Kühl and Szech, 2017; Kessler and Milkman, 2018; Gallier et al., 2019a; Bartels et al., 2021; Löschel et al., 2021) and against (Brown et al., 2017; Adena et al., 2020) a significant relationship. Our results are closest to those of Kühl and Szech (2017), who report that the willingness to donate to a charity drops sharply if the location of the charity is more than a few miles away from the participant, but from then on does not decrease anymore.

Although our results give evidence that individuals are willing to give up money to provide goods with an existence value in their immediate vicinity, the participants could assign an "option value" (e.g. de Groot et al., 2010) to these goods. They might provide them at a certain location, keeping open the option that they - or people they know - might use them directly at this location someday in the future. Thus, we can only make a statement about a "vicinity bias" for goods that have an existence value for the participants at the moment.

Regarding the discussion on inter-charity competition for efficient decision-making (Ryazanov and Christenfeld, 2018; Perroni et al., 2019; Lohse and Scharf, 2021), we provide new evidence regarding the spatial dimension of such competition. Our finding of strong spatial preferences for charitable goods in the donor's immediate vicinity suggests that charities that enable their donors to select a donation project in the donor's immediate vicinity have an advantage over charities that do not. This creates an incentive for a spatial distribution of locations that may bias the number of locations upward compared to the most efficient number. Furthermore, our results imply that charitable projects in strongly populated regions may gain more charitable input compared to those in weakly populated regions, since more donors have the opportunity to support donation projects in their preferred immediate vicinity. As a consequence, strong preferences for projects in the immediate vicinity could lead to inefficiency in terms of the marginal return if the populations of donation regions differ.

1.8   Special acknowledgements

in the public, commercial or not-for-profit sectors. Declaration of interest: None.

1.9 Appendix

1.9.1 Robustness Check: OLS regression on the money given to the nearer location

	Money given to the nearer location (in cent) more than the equal allocation			
	(1)	(2)	(3)	(4)
Immediate Vicinity	100.79***	88.75***	87.82***	89.44***
	(18.38)	(20.00)	(21.87)	(22.13)
More positive information about nearer project		53.04**	10.83	6.73
		(22.43)	(37.53)	(37.47)
More positive information about distant project		-32.51	-22.39	-26.59
		(28.98)	(29.33)	(29.48)
More positive information about nearer project x *Immediate Vicinity*			58.17	56.56
			(47.68)	(47.93)
Direct-use value nearer project		15.29	76.48*	73.92*
		(31.00)	(43.43)	(45.35)
Direct-use value distant project		-61.41*	-70.85**	-71.20**
		(34.70)	(34.04)	(34.30)
Direct-use value nearer project x *Immediate Vicinity*			-85.13*	-85.53*
			(47.11)	(46.70)
More positive attitude towards the donation project				7.24
				(5.09)
Constant	-6.57	-5.70	-5.37	-29.33
	(13.70)	(14.56)	(16.88)	(25.29)
Observations	978	978	978	978
Subjects	163	163	163	163
R^2	0.04	0.05	0.05	0.06

Note: Robust standard errors (clustered at the individual level) are in parantheses. Six decisions for each subject included. All models include dummies for the order of the conditions. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 1.8: Robustness Check: OLS regression on the money given to the nearer location

1.9.2 Robustness Check: OLS regression on the marginal efficiency loss due to spatial preferences

	Marginal efficiency loss (MEL, in cent) due to spatial preferences			
	(1)	(2)	(3)	(4)
Immediate Vicinity	0.92***	0.86***	0.89***	0.88***
	(0.20)	(0.21)	(0.24)	(0.25)
More positive information about nearer project		0.50**	0.71*	0.74*
		(0.25)	(0.42)	(0.42)
More positive information about distant project		-0.03	-0.09	-0.08
		(0.31)	(0.33)	(0.33)
More positive information about nearer project x *Immediate Vicinity*			-0.33	-0.33
			(0.49)	(0.49)
Direct-use value nearer project		-0.31	-0.52	-0.52
		(0.32)	(0.55)	(0.56)
Direct-use value distant project		0.46	0.50	0.50
		(0.35)	(0.36)	(0.36)
Direct-use value nearer project x *Immediate Vicinity*			0.29	0.27
			(0.58)	(0.55)
More positive attitude towards the donation project				-0.01
				(0.07)
Constant	-0.01	-0.09	-0.10	-0.03
	(0.14)	(0.15)	(0.16)	(0.25)
Observations	978	978	978	978
Subjects	163	163	163	163
R^2	0.03	0.04	0.04	0.04

Note: Robust standard errors (clustered at the individual level) are in parantheses. Six decisions for each subject included. All models include dummies for the order of the conditions. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 1.9: Robustness Check: OLS regression on the marginal efficiency loss due to spatial preferences

1.9.3 Questions asked in the experiment

General questions:

How is your attitude towards the introduced project owl protection (-5 = very negative, +5 very positive)?
☐ -5 ☐ -4 ☐ -3 ☐ -2 ☐ -1 ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
How is your attitude towards the introduced project cancer research (-5 = very negative, +5 very positive)?
☐ -5 ☐ -4 ☐ -3 ☐ -2 ☐ -1 ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
How is your attitude towards the to the introduced project assistance children in need (-5 = very negative, +5 very positive)?
☐ -5 ☐ -4 ☐ -3 ☐ -2 ☐ -1 ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Location-based questions:[25]

Do you or any person you know personally benefits directly from the following project in Region A?
Owl protection: ☐ Yes ☐ No
Assistance to children in need: ☐ Yes ☐ No
Cancer research: ☐ Yes ☐ No

What kind of information did you have before attending this experiment about the following project in Region A?
Owl protection: ☐ Negative information ☐ No information ☐ Positive information
Assistance to children in need: ☐ Negative information ☐ No information ☐ Positive information
Cancer research: ☐ Negative information ☐ No information ☐ Positive information

Do you or any person you know personally benefits directly from the following project in Region B?
Owl protection: ☐ Yes ☐ No
Assistance to children in need: ☐ Yes ☐ No
Cancer research: ☐ Yes ☐ No

What kind of information did you have before attending this experiment about the following project in Region B?
Owl protection: ☐ Negative information ☐ No information ☐ Positive information
Assistance to children in need: ☐ Negative information ☐ No information ☐ Positive information
Cancer research: ☐ Negative information ☐ No information ☐ Positive information

Do you or any person you know personally benefits directly from the following project in Region C?
Owl protection: ☐ Yes ☐ No
Assistance to children in need: ☐ Yes ☐ No
Cancer research: ☐ Yes ☐ No

What kind of information did you have before attending this experiment about the following project in Region C?
Owl protection: ☐ Negative information ☐ No information ☐ Positive information
Assistance to children in need: ☐ Negative information ☐ No information ☐ Positive information
Cancer research: ☐ Negative information ☐ No information ☐ Positive information

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[25]In the experiment we have shown the location of the regions to the participants in the context of the questionnaire.

1.9.4 Original instructions translated in English (PLEx)

Instructions

Welcome to this experiment. From now on, please do not leave your place and stop talking to the other participants. Please turn off your electronic devices as well. It is important that you follow these rules otherwise we reserve the right to exclude you from this experiment and the payment associated.

Each participant receives the same instructions. Please read this instructions very carefully. If you have any questions, raise your hand. In that case, we will come to you and answer your questions individually.

You participate in an experiment in which you have to make various decisions. Every decision involves the support of charities. At each time, a donation project will be introduced which is conducted in two different regions. You have to decide which project region you want to support financially. After having made all decisions, one decision will be chosen randomly which we will implement. Thus, decision making in the lab has actual consequences. Yourself will receive a show-up fee of 10.00 euros for your participation at the end of the experiment.

On the following pages we will explain the procedure of this experiment. At first we will clarify the procedure in general. Subsequently, we will explain the procedure at the screen. Afterwards, you have the opportunity to get familiar with the experiment on the computer screen directly, before the experiment will start.

The Experiment

Various donation purposes will be introduced during the experiment. These projects really exist and charities put them into execution at different locations.

- One donation project engages in the improvement of education for socially disadvantaged children by Children Villages. Provider of these projects are SOS-Children's Villages and the Evangelical Youth Aid.

- The second donation project aims at the protection of owls. The Nature and Biodiversity Conservation Union (NABU) is the provider.

- The third project supports cancer research implemented by different medical centers.

In this experiment you make several decisions whereby you are in charge of the funding of charitable activities. **At each time, you will receive a budget you can split up regionally**. The sums

in the experiment are expressed in Cent.

You have to make twelve decisions overall. One of the decisions will be selected randomly and implemented by the experimenters. Thus, we will transfer the money to the charities based on your decision making.

Procedure at the Computer Screen

At the beginning of this experiment a computer screen opens which enables you to get familiar with the mechanism associated with decision making. In this experiment we have got **two kinds of mechanisms**.

Initially, the **first version** will be displayed. In this case, you move a slider. If you steer the slider to the right, the donation sum given to location B increases, while the donation sum given to location A declines. If you move the slider to the left the donation sum given to location A increases whereas the donation sum for the location B decreases. The whole donation sum remains constant and is unaffected by your decision making (Figure 1). If you are familiar with this version, please push the OK-Button.

Figure 1: First decision mechanism

Subsequently, the **second version** will be explained. This mechanism of decision making leads to smaller donation sums overall if you split up the money unequally. The larger the distance between the donations given to the two different locations, the stronger the donation sum overall will decrease (Figure 2). Please get familiar with this slider as well and push the OK-Button if you have finished.

Figure 2: Second decision mechanism

The experiment starts now.

On the screen a description of the donation project is shown (Figure 3). On the left you can see an extract of a map. On the map two areas are drawn. In each of the two areas the donation project introduced take place. Furthermore, the location of the lab (PLEx) you attend currently is marked. Additionally, you receive information about the kind of mechanism associated with decision making you apply here.

Figure 3: Example of a decision stage in the experiment

You can see the slider below which enables you to split up money. Underneath, the money given to the projects in the two regions based on your decision making is displayed. If you are satisfied

with your decision, please click the OK-Button. You cannot change your decision after clicking the OK-Button. The next decision scenario follows immediately.

After twelve decisions the experiment will be finished. Afterwards, we ask you to fill out a questionnaire at the monitor. Finally, we will inform you about the decision randomly chosen at the screen. Then, we will begin with the payment of your show-up fee.

We will inform you about the donations transferred to the charities on behalf of the decisions in the lab in the upcoming weeks via e-mail and on the website of the Chair of Economics, especially Markets, Competition and Institutions.

1.9.5   Original instructions translated in English (DICE)

Instructions

Welcome to this experiment. From now on, please do not leave your place and stop talking to the other participants. Please turn off your electronic devices as well. It is important that you follow these rules otherwise we reserve the right to exclude you from this experiment and the payment associated.

Each participant receives the same instructions. Please read this instructions very carefully. If you have any questions, raise your hand. In that case, we will come to you and answer your questions individually.

You participate in an experiment in which you have to make various decisions. Every decision involves the support of charities. At each time, a donation project will be introduced which is conducted in two different regions. You have to decide which project region you want to support financially. After having made all decisions, one decision will be chosen randomly which we will implement. Thus, decision making in the lab has actual consequences. Yourself will receive a show-up fee of 10.00 euros for your participation at the end of the experiment.

On the following pages we will explain the procedure of this experiment. At first we will clarify the procedure in general. Subsequently, we will explain the procedure at the screen. Afterwards, you have the opportunity to get familiar with the experiment on the computer screen directly, before the experiment will start.

The Experiment

Various donation purposes will be introduced during the experiment. These projects really exist and charities put them into execution at different locations.

• One donation project engages in the improvement of education for socially disadvantaged children by Children Villages. Provider of these projects are SOS-Children's Villages and the Evangelical Youth Aid.

• The second donation project aims at the protection of owls. The Nature and Biodiversity Conservation Union (NABU) is the provider.

• The third project supports cancer research implemented by different medical centers.

In this experiment you make several decisions whereby you are in charge of the funding of charitable activities. **At each time, you will receive a budget you can split up regionally**. The sums

in the experiment are expressed in Cent.

You have to make twelve decisions overall. One of the decisions will be selected randomly and implemented by the experimenters. Thus, we will transfer the money to the charities based on your decision making.

Procedure at the Computer Screen

At the beginning of this experiment a computer screen opens which enables you to get familiar with the mechanism associated with decision making. In this experiment we have got **two kinds of mechanisms**.

Initially, the **first version** will be displayed. In this case, you move a slider. If you steer the slider to the right, the donation sum given to location B increases, while the donation sum given to location A declines. If you move the slider to the left the donation sum given to location A increases whereas the donation sum for the location B decreases. The whole donation sum remains constant and is unaffected by your decision making (Figure 1). If you are familiar with this version, please push the OK-Button.
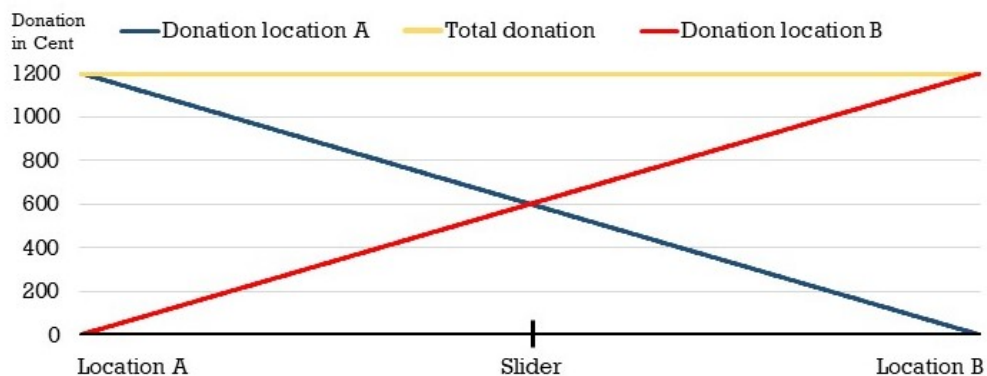

Figure 1: First decision mechanism

Subsequently, the **second version** will be explained. This mechanism of decision making leads to smaller donation sums overall if you split up the money unequally. The larger the distance between the donations given to the two different locations, the stronger the donation sum overall will decrease (Figure 2). Please get familiar with this slider as well and push the OK-Button if you have finished.
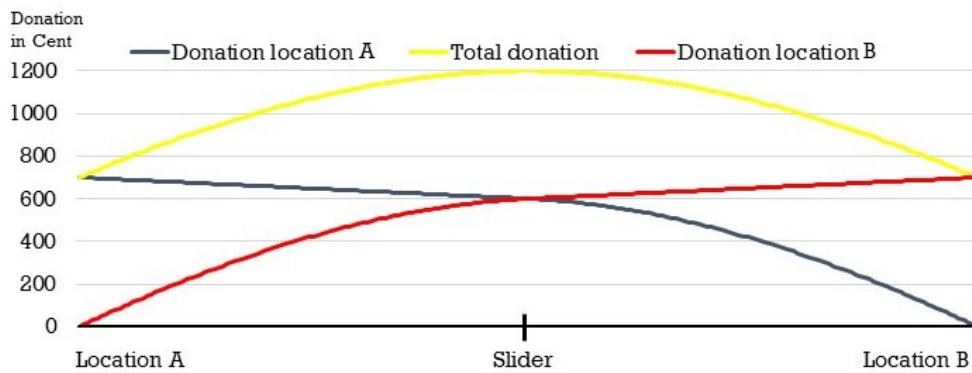
Figure 2: Second decision mechanism

The experiment starts now.

On the screen a description of the donation project is shown (Figure 3). On the left you can see an extract of a map. On the map two areas are drawn. In each of the two areas the donation project introduced take place. Furthermore, the location of the lab (DICE) you attend currently is marked. Additionally, you receive information about the kind of mechanism associated with decision making you apply here.
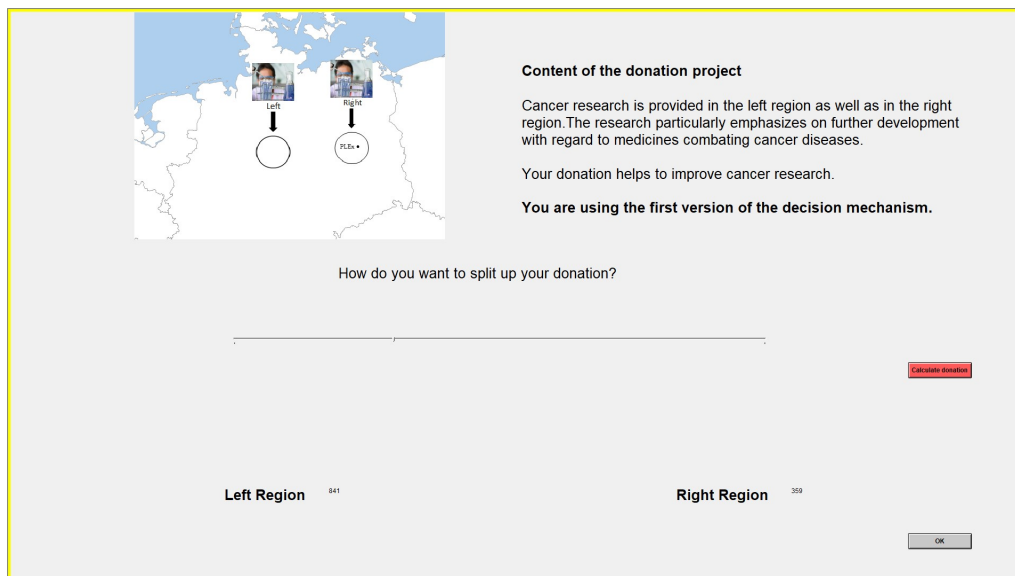

Figure 3: Example of a decision stage in the experiment

You can see the slider below which enables you to split up money. Underneath, the money given to the projects in the two regions based on your decision making is displayed. If you are satisfied

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with your decision, please click the OK-Button. You cannot change your decision after clicking the OK-Button. The next decision scenario follows immediately.

After twelve decisions the experiment will be finished. Afterwards, we ask you to fill out a questionnaire at the monitor. Finally, we will inform you about the decision randomly chosen at the screen. Then, we will begin with the payment of your show-up fee.

We will inform you about the donations transferred to the charities on behalf of the decisions in the lab in the upcoming weeks via e-mail and on the website of the Chair of Economics, especially Markets, Competition and Institutions.

1.9.6 Screenshots

Im folgenden Experiment stellen wir Ihnen ein Spendenprojekt vor, das an verschiedenen Orten durchgeführt wird. In diesem Zusammenhang entscheiden Sie, wie Sie Spendengelder auf die Projektstandorte aufteilen möchten. Die Summen werden in Cent angegeben.

Im Experiment gibt es zwei unterschiedliche Entscheidungsmechanismen. Im Folgenden haben Sie Gelegenheit sich mit der **ersten Version des Entscheidungsmechanismus** vertraut zu machen. Wenn Sie den Schieberegler nach links bewegen, nimmt die Spendensumme an den Ort A zu, die Spendensumme an den Ort B nimmt ab. Wenn Sie den Schieberegler nach rechts bewegen, ist es umgekehrt. Bei der ersten Version bleibt die gesamte Spendensumme (1200 Cent = 12,00 Euro) von Ihrer Aufteilung unberührt.

Bitte probieren Sie die **erste Version des Entscheidungsmechanismus** jetzt aus. Bedienen Sie hierzu den Schieberegler und drücken Sie den Berechnen-Button. Wenn Sie mit Ihrer Aufteilung einverstanden sind, drücken Sie den OK-Button.

Wie wollen Sie die Spendensumme aufteilen?

Spendensummen berechnen

Ort A   0   **Ort B**   0

OK

Figure 1.11: Trial stage to get familiar with decision mechanism 1 (experiment 1)

Nun haben Sie Gelegenheit sich mit der **zweiten Version des Entscheidungsmechanismus** vertraut zu machen. Wenn Sie den Schieberegler nach links bewegen, nimmt die Spendensumme an den Ort A zu, die Spendensumme an den Ort B nimmt ab. Wenn Sie den Schieberegler nach rechts bewegen, ist es umgekehrt. Bei der zweiten Version führen ungleiche Zahlungen an die beiden Projekte zu einer geringeren Gesamtspendensumme und zwar umso stärker, je größer der Abstand zwischen den beiden Zahlungen wird.

Bitte probieren Sie die **zweite Version des Entscheidungsmechanismus** jetzt aus. Bedienen Sie hierzu den Schieberegler und drücken Sie den Berechnen-Button. Wenn Sie mit Ihrer Aufteilung einverstanden sind, drücken Sie den OK-Button.

Wie wollen Sie die Spendensumme aufteilen?

Spendensummen berechnen

Ort A   0   **Ort B**   0

OK

Figure 1.12: Trial stage to get familiar with decision mechanism 2 (experiment 2)

Figure 1.13: Example for experiment 1, treatment AB

Figure 1.14: Example for experiment 1, treatment BC

Figure 1.15: Example for experiment 2, treatment AB
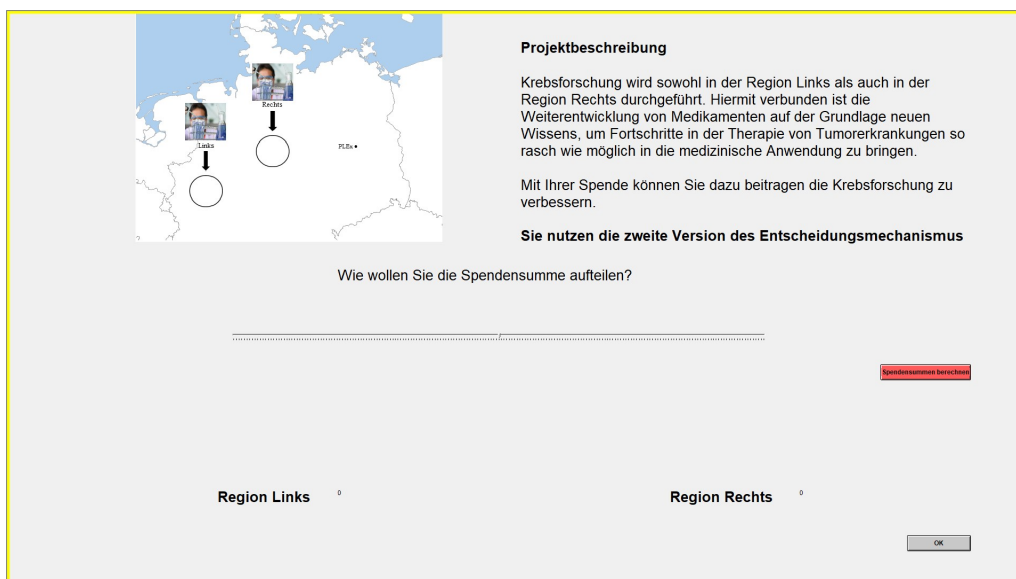
Figure 1.16: Example for experiment 2, treatment BC

Vielen Dank für Ihre Entscheidungen. Sie haben zwölf Entscheidungen über die Aufteilung von Spendengeldern getroffen. Davon wird gleich nach dem Fragebogen eine zufällig gezogen.

Sie haben nun die Gelegenheit eine neunstellige Zahlenkombination einzutragen. Anhand dieser können Sie zurückverfolgen, dass Ihre Entscheidung in die Tat umgesetzt wurde. Die zugehörigen Spendenquittungen werden wir Ihnen in den nächsten Wochen zur Verfügung stellen.

Bitte geben Sie eine neunstellige Zahl ein, wobei Sie nicht mit einer null beginnen dürfen. Orientieren Sie sich beispielsweise an folgender Vorgehensweise: Zahlen 1-4: **Geburtsjahr Ihres Vaters** , Zahlen 5-6: **Ihre Schuhgröße** , Zahlen 7-8: **Ihre Abiturnote** , Zahl 9: **Anzahl Ihrer Geschwister**.

Figure 1.17: Stage for individual code (tracking of the implementation of the participants' decision)

2 Faster, Harder, Greener? Empirical Evidence on the Role of the Individual Pace of Life for Productivity and Pro-Environmental Behavior[*]

Abstract

Against the background of the current "Speed-Up Society," which seems to foster a trade-off between economic success and climate change, we study whether the individual *Pace of Life* is associated with productivity and pro-environmental behavior on the micro-level. In a controlled laboratory environment with students in Germany, we measured the productivity of participants in a real effort task, quantified their pro-environmental behavior, and recorded their individual *Pace of Life*. We find that individuals with a fast *Pace of Life* are significantly *more* productive. However, individuals with a fast *Pace of Life* behave *less* pro-environmentally if they are men and *more* pro-environmentally if they are women.

2.1 Introduction

The current "Speed-Up Society" (Colvile, 2016; Sullivan and Gershuny, 2018), which is characterized by social acceleration through globalization and digitalization (Robinson and Godbey, 1996; Rosa, 2003; Chesley, 2010), is beneficial when it comes to economic prosperity (Bhagwati, 2004). However, faster living has also unfavorable implications since it goes along with social alienation as well as the devaluation of the (human) environment (Milgram, 1970). No time is taken to live conscientiously and sustainably, e.g. to grow one's own food or even to prepare a balanced meal (Pearson, 2011; Hauser, 2018). These aspects suggest that a faster living might be associated with an increase in environmental problems.

In this context, research should aim to understand whether poor pro-environmental behavior is grounded in an increased *Pace of Life* and thus a symptom of the "Speed-Up Society."

The *Pace of Life* is defined as the rate (Lauer, 1981), speed (Amato, 1983), and "relative rapidity or density of experiences, meanings, perceptions and activities" (Werner et al., 1988) and is measured through walking speed, working speed, and clock accuracy (Levine and Norenzayan, 1999). Economists report remarkable differences in the *Pace of Life* between cities and countries on the aggregate level, showing that a collective faster *Pace of Life* in a society is associated with more economic prosperity on the macro-level (Bettencourt et al., 2007). However, to the best of our knowledge, there are as of yet no studies that have focused on the role of an individual's *Pace of Life* in economic and pro-environmental behavior on the micro-level.

Hence, the aim of this study is to establish a standardized procedure to measure an individual's *Pace of Life* and to examine whether an individual's *Pace of Life* is associated with productivity and pro-environmental behavior on the micro-level. We address these relations in a controlled laboratory environment with students in Germany, where we measured the participants' *Pace of Life* by recording *walking time* and various aspects of *working time*. Moreover, we quantified their productivity in completing a real effort task with monetary consequences. Additionally, we measured the participants' pro-environmental behavior by giving them the opportunity to donate to a tree-planting project.

Our findings give evidence that a "Speed-Up Society" might be associated with a trade-off between productivity and pro-environmental behavior which so far has only been studied conceptually by Rosa (2003). On the one hand, our results highlight a positive relationship between a fast *Pace of Life* and productivity, which is of high economic importance on the macro-level and, as we exclusively find, also on the micro-level. On the other hand, our findings suggest that on the micro-level a fast *Pace of Life* is negatively associated with the individual's pro-environmental behavior. However, we find this effect exclusively for men. When it comes to women, individuals with a fast *Pace of Life* behave more pro-environmentally. These results add to the literature on the individual *Pace of Life* as well as on the role of gender in pro-environmental behavior.

The remainder of our paper is structured as follows. First, we review the literature that is available

for the relation between *Pace of Life* and both productivity and pro-environmental behavior on the macro level. Second, we describe our experimental design, the key variables for our analysis, and the main results based on our regression models. We conclude by discussing the impact of *Pace of Life* and the significance of this study for the existing knowledge about the individual perception of time in the economic and environmental contexts.

2.2 Time and Pace of Life

According to the socio-emotional selectivity theory, individuals differ in their ability to assess time and organize different time frames and periods (Carstensen et al., 1999). However, there are different approaches to measuring the perception of time studied by anthropologists, philosophers, scientists, sociologists, and psychologists. On the one hand, time can be described as a subjective internal phenomenon, as a lived or psychological time. As such, time is processed by the individual human mind (Gorman and Wessman, 1977). According to this subjective paradigm, there is further research on the subjective duration of experience, time estimation, time personality, time intensity, time congruity, time urgency, poly- and monochronicity, perceived time use, and time perspectives (McGrath, 1988; Kaufman et al., 1991; Zimbardo and Boyd, 1999; Boniwell, 2005). In this context, temporal orientation, experiences, and attitudes are even interpreted as persisting personality traits (Gorman and Wessman, 1977). Zimbardo and Boyd (1999) focus on the psychological time perspective theory and divide the time orientation of individuals into five time perspectives: future, present (present-hedonistic, present-fatalistic), and past (past-positive, past-negative) orientation.

On the other hand, time can also be seen as an objective phenomenon, regarded as continuous, universal, measurable, and homogeneous. This refers to a shared representation of time (Boniwell, 2009), such as clock or geographical time, which is used in time budgets or in research on time use (Pentland et al., 1999). Sociologists investigate time in societies that is defined by their nations or regions (Levin, 1997; Levine and Norenzayan, 1999). This view has been shown particularly in Western societies, where they coordinated or scheduled time and where time is externally reinforced by the society (Boniwell, 2009). One example is the *Pace of Life* approach introduced by Levine and Norenzayan (1999). For the *Pace of Life* index, they examine three indicators: (1) the average walking speed, which is measured over a distance of 60 feet in downtown locations in each city under consideration; (2) the working speed, which measures the time it took postal workers to complete a simple request, and (3) the clock accuracy, which measures 15 public clocks in selected downtown banks. In this study, we focus on the objective phenomenon of time using the *Pace of Life* approach. Levine and Norenzayan (1999) measure the *Pace of Life* of regions with regard to economic success and find remarkable differences between cities as well as countries on the macro-level: faster paced regions or countries tend to be more economically productive as measured by the per capita gross national product. Based on this, Bettencourt et al. (2007) report that a collective faster *Pace of*

Life in a society is associated with higher collective economic outcomes, such as economic prosperity. This claim can be supported by the fact that Western Europe shows the fastest *Pace of Life*, whereas non-industrialized countries such as those in Latin America or Asia demonstrate the slowest (Levine and Norenzayan, 1999). Moreover, Levine et al. (1980) as well as Levine and Bartlett (1984) support previous results by reporting higher punctuality and walking speed in economically developed countries like the United States compared to developing countries. Furthermore, Brislin and Kim (2003) demonstrate that a faster *Pace of Life* is related to higher economic outcomes and productivity in a country. Additionally, previous literature shows - on the macro-level - that faster paced places often experience higher economic outcomes and wealth along with faster perceptions of time, and are associated with a faster *Pace of Life* (Levine and Norenzayan, 1999). Moreover, Vedula and Kim (2018) explore whether a region's *Pace of Life* influences how much work effort founders exert when starting and running their new ventures. They argue that a region's *Pace of Life* creates normative expectations, e.g., about work ethics, and these influence the time founders spend on their business. Provided that founders are embedded in a broader social system, Vedula and Kim (2018) disclose that their region's faster *Pace of Life* positively affects the effort they put into their business. Based on the previous literature that confirms the relation between the *Pace of Life* and economic success on the macro-level, we derive the following hypothesis on the role of an individual's *Pace of Life* for productivity:

Hypothesis 1: A faster individual Pace of Life is associated with more individual productivity.

Faster individuals, who are part of the current "Speed-Up Society" (Colvile, 2016; Sullivan and Gershuny, 2018), seem to be beneficial when it comes to economic success (Bettencourt et al., 2007), although we still have to support this relationship on the micro-level. However, acceleration processes might have unfavorable side effects as well. In this context, Milgram (1970) argues that social alienation and the devaluation of the environment are consequences of faster living. To explore whether a "Speed-Up Society" has an impact on conservation, it might be helpful to understand the impact of the individual *Pace of Life* on pro-environmental behavior at the micro-level, e.g. support for reforestation to reduce the CO_2 level and improve biodiversity.

So far, different results have been found on the influence of a fast *Pace of Life* regarding the environment on the macro-level. For instance, Wang et al. (2016) show that a faster *Pace of Life* (especially a higher walking speed) in a country is associated with more patience, and more patience is related to environmental protection. In contrast, Mayer and Knox (2009) report that cities work towards slowing down the *Pace of Life* and similarly enhance the uniqueness of the urban experience and commit to sustainability.

On the micro-level, the literature shows more consistent evidence. Levine and Norenzayan (1999) argue that individuals with a faster *Pace of Life* tend to find less or no time for social responsibilities. Milgram (1970) supports this argument by stating that individuals who are confronted with more

sensory impressions than they can handle often experience mental overload. This is often the case in modern, large cities where individuals can more easily become overwhelmed. Therefore, these individuals will focus mainly on the realization of their goals and try to reach them as soon as possible, meanwhile, perceiving a diminished social responsibility (Milgram, 1970). Moreover, Pearson (2011) argues that an increasing *Pace of Life* as well as the associated distractions of modern life reduce people's interest in or ability to grow their own food or even prepare a balanced meal. Putting the research focus on the traveling pace of backpackers, Iaquinto (2018) finds that backpackers who travel with others by car have a slower pace, since traveling by car takes longer than flying. However it enables environmental sustainability by reducing carbon emissions. In contrast, if the travel pace maintains fast, the pace will obstruct sustainable practices. To the best of our knowledge, there is no study yet that surveys a *direct link* between the individual *Pace of Life* and pro-environmental behavior. However, because the literature suggests that faster individuals care less about social issues, we derive the following hypothesis:

Hypothesis 2: A faster individual Pace of Life is associated with less individual pro-environmental behavior.

2.3 Research Design

2.3.1 Experiment

Each of the experimental sessions started in a meeting room at the University of Potsdam. To reduce waiting time, every session consisted of 10 participants at most. After registration in the meeting room, participants left individually and were asked to walk directly to the Potsdam Laboratory for Economic Experiments (PLEx).

At PLEx, the participants signed an Informed Consent Form, and the experiment began. During the experiment, we introduced the Word Encryption Task with Double Randomization (WEDR task) developed by Benndorf et al. (2019b) to measure the participants' productivity.[1] The WEDR task ran for 15 minutes, and participants received a certain monetary revenue for each word encrypted correctly. The revenue was featured by decreasing marginal rates as the number of words correctly

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[1]Each word contained three different letters, and each letter was associated with a three-digit number. The participants had to find the suitable number from a table that displayed all 26 capital letters of the German language and their associated three-digit numbers. Whenever the participants encrypted a word correctly, a new word was created, new numbers were allocated to the letters, and the positions of the letters were randomly re-arranged. You can find an example of the WEDR task in the instructions in the Appendix (SI -Instructions for Participants of the Experiment). In order to ensure that participants understood the encryption task, we implemented a trial stage during which they could familiarize themselves with the word encryption task without financial incentives. Measuring productivity by applying a word encryption task is established in the literature, see, i.a., (Erkal et al., 2011; Benndorf et al., 2019a; Dorner, 2019).

encoded increased.[2] Afterwards, the participants were informed of their total private payoff and the opportunity to donate a share of their revenue to a tree-planting project. The share of the total private payoff given to the tree-planting project served as our proxy for pro-environmental behavior.[3] At the end of the experiment, which lasted for about 35 minutes, the participants were asked to fill in a questionnaire, received their payment, and returned to the meeting room.[4]).

During the experiment, we explored different aspects of time in order to analyze an individual's *Pace of Life*. In this context, we did not use different treatments to analyze the individual *Pace of Life* since it is interpreted as a personality trait that refers to the individual exposure to time, but adapted the established approach by Levine and Norenzayan (1999), who used walking speed, working speed, and clock accuracy to derive a *Pace of Life* index. We recorded the participant's *walking time* on one section on their way from the meeting room to the PLEx, where there was no reason to pause along the way (see Figure 2.1).[5,6]
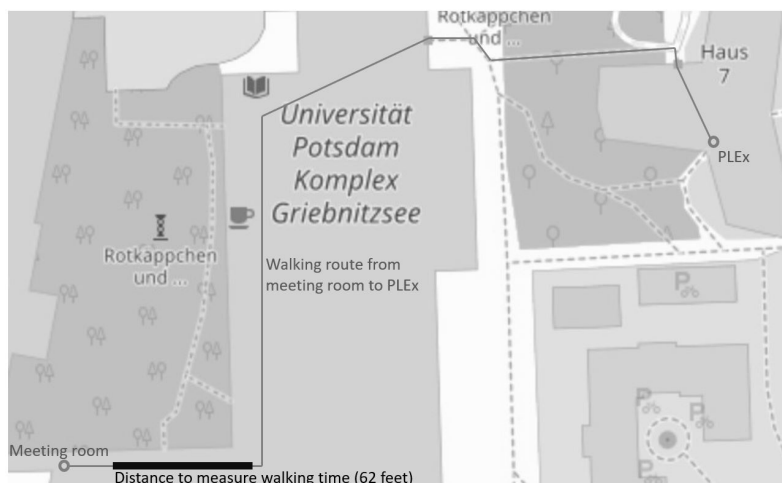
Figure 2.1: Locations of the experiment

We used two different daily life actions to quantify individual *working time*. In doing so, we aimed to obtain greater insight into the participant's time management. Before running the WEDR task, participants were asked to enter a certain number displayed to them using their keyboard. A similar action is typically conducted when logging in to online services like online banking.[7] We recorded the

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[2]For each of the words 1-5 encrypted correctly they received 0.40 EUR per word, for words 6-10 they obtained 0.30 EUR per word, for words 11-15 they got 0.20 EUR per word and for words 16 and up they received 0.10 EUR.

[3]Measuring pro-environmental behavior with the donation to a tree-planting project is already established in the literature, see e.g. Jacquet et al. (2013); Clements et al. (2015); Vesely and Klöckner (2018); Lange and Dewitte (2019).

[4]With this research design we additionally studied a potential speed-accuracy trade-off (Hoffmann et al., 2021) as well the role of time perspectives and gender (Hoffmann et al., 2022b)

[5]We conducted this experiment during the out-of-session period in mid-October 2020 to avoid crowded corridors at the University and thus be able to record unbiased individual *walking time*.

[6]The distance measured for *walking time* was 18.90 meters, which corresponds to about 62 feet and is thus comparable to the distance used in Levine and Norenzayan (1999).

[7]Other examples are logging in to email and social media, or when filling out forms with a student ID, tax, or social security number.

time the participant's needed for this task as a proxy for the component *working time$_{number}$* of our individual *Pace of Life* measure. Secondly, we timed how long the participant's needed to fill out the questionnaire at the end of the experiment as component *working time$_{questionnaire}$* in our individual *Pace of Life* analysis, because questionnaires have to be completed for applications, registrations, etc. and can consequently be conceived as a common task of daily life.

Thus, both actions considered as measuring working time differed from the WEDR task: individuals had performed them several times previously in their daily lives in a natural environment and the actions were neither monetarily incentivized nor associated with a deadline. In contrast, participation on the WEDR task was new, monetarily incentivized, and associated with a deadline.

Since the participants in our study overwhelmingly used digital watches, measuring an individual's clock accuracy would have been meaningless. Thus, we recorded the participant's *inner clock accuracy*. We informed the participants after the WEDR task that they would soon see a blank screen for a certain period of time and have to run their inner clock until the black screen disappeared. Afterwards, they had to guess how long they had just waited. During this task, the students were sitting in an empty computer booth, unable to see any clock, and could do nothing other than wait. We incentivized perfect guesses with an additional payment of 2.00 EUR. For every second the participant's guess deviated from the correct waiting time (200 seconds), their additional payment was reduced by 0.10 EUR. We assumed that individuals who felt that time passed slowly tend to have a higher *Pace of life*. Thus, we have, in contrast to the other three measures (which are objectively measured by a second person or the experimental software), a subjective measure for an individual's perception of time.

Overall, 11 sessions were carried out at PLEx from 12 October 2020 to 14 October 2020. We were able to include 97 observations[8] of German students in our data set.[9] The experiment was ethically approved by the German Association for Experimental Economic Research and computerized with z-Tree (Fischbacher, 2007). The recruitment process was conducted using ORSEE (Greiner, 2015).[10]

Based on the spending decisions of the participants in our experiment, we transferred 154.37 EUR[11]

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[8]We use the data provided by Benndorf et al. (2019b) on the productivity achieved on their real effort task to identify how many observations we need to reach satisfactory statistical power. In their study, participants solved, on average, 9.94 (SD 1.69) tasks correctly. Given these values, we obtain a statistical power of $0.743(0.834, 0.895)$ if we assume to increase this value by $1(2,3)$ tasks given a sample of $80(100, 120)$ observations. Therefore, we aimed at a sample size of 100 observations. Computing the statistical power of our results (given the mean productivity of about 60 tasks solved correctly, with a standard deviation of 9.434 and a possible increase of the average number of tasks solved correctly by 5 to 6, we reach a power of 0.729 to 0.869).

[9]Every session consisted of 9 or 10 participants. Overall 106 out of 110 invited students showed up at the meeting room. We decided to exclude 9 of them from the sample, because no reliable measurement of their *walking time* was possible. This was the case when students decided to walk in pairs (-6 observations), when technical problems in measuring time occurred (-1 observation), when students did not follow our route instructions (-1 observations), or when students arrived late at the meeting room and their walking time have been potentially biased by subjective time pressure (-1 observation).

[10]Data and codes are available via the Project "Faster-Harder-Greener" on OSF: https://osf.io/2bqnx/

[11]154.37 EUR ≈ 182.35 USD at the time of the experiment.

to a donation project that plants trees. We informed the participants about the donations via email and disclosed the donation receipt on the University's homepage.[12]

2.3.2 Research Design - Dependent Variables

To test our hypotheses, we had to quantify the individuals' productivity as well as their pro-environmental behavior. Productivity was measured by the net revenue obtained in the real effort task. Pro-environmental behavior was measured by the share of the total revenue that was donated to a tree-planting project. 25.77% of the participants did not donate at all. Figure 2.2a and Figure 2.2b show the distribution of the variables. As you can see there are two outliers with a very high productivity as well as two outliers when it comes to pro-environmental behavior: they donated their entire revenue to the tree planting project.

| (a) Productivity | (b) Pro-environmental behavior |
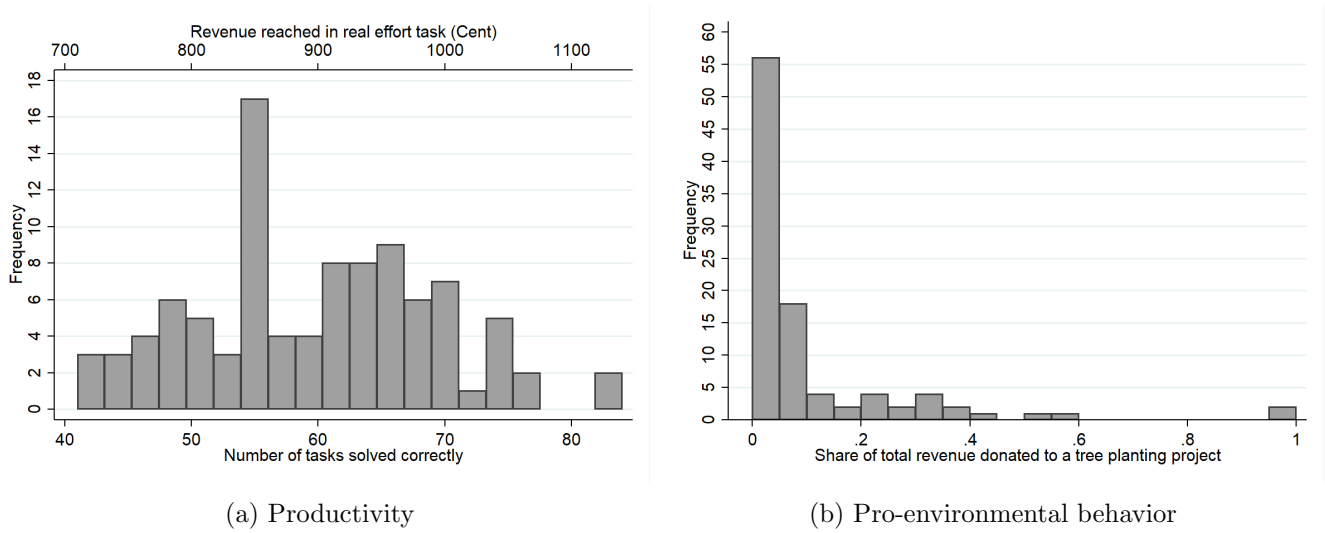
Figure 2.2: Distribution of dependent variables

Table 2.1 summarizes the characteristics of the dependent variables. On average, participants solved about 60 tasks correctly and achieved a revenue of about 8.97 EUR on the real effort task. On average, the share of the total revenue donated to the tree planting project was about 10.23%.

	Observation	Mean	Std. Dev.	Min	Max
Revenue from real effort task (Cent)	97	896.907	94.344	710	1140
Share of total revenue donated (%)	97	10.229	17.741	0	100

Table 2.1: Summary statistics for dependent variables

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[12]The participants could review how their decision affected the provision of charitable goods, via a code of their choosing.

2.3.3 Research Design - Independent Variables

Variable of Interest

The key variable for our analysis of productivity and pro-environmental behavior is the individual's *Pace of Life*. As explained in the previous section, we measure the individual *Pace of Life* following and adapting the approach used by Levine and Norenzayan (1999) by capturing the (1) *walking time* (we recorded a section of 62 feet on their way from the meeting room to the PLEx), (2) *working time$_{number}$* (we recorded the time participants needed to enter a certain number displayed to them using their keyboard), (3) *working time$_{questionnaire}$* (we recorded the time to fill in a questionnaire), and (4) *inner clock accuracy* (participants estimated the time sitting in front of a black screen). The internal consistency of this set of variables is measured by Cronbach's $\alpha = 0.212$. But, this value increases clearly to $\alpha = 0.304$ if we remove the fourth variable, *inner clock accuracy*.[13] We assume that the variation in these three or four variables mainly reflects the variation in the unobserved latent variable individual *Pace of Life*, and use the confirmatory factor analysis (overall Kaiser-Meyer-Olkin measure for both alternatives: 0.49) to derive an individual *Pace of Life* index. However, we find *inner clock accuracy* to load very poorly in the factor analysis. Additionally, we find a very low and insignificant correlation between *inner clock accuracy* and the individual *Pace of Life* index (-0.083) if this variable is included. Due to this fact, and because *inner clock accuracy* is in contrast to the other three measures no objective measurement, we decided to use only variables (1) to (3) to derive an index for the individual *Pace of Life* via confirmatory factor analysis.

We assume that the less time the participants need to complete the working tasks and walk a certain section, the faster their individual *Pace of Life*. Therefore, the result of the confirmatory factor analysis has to be multiplied by -1 to allow the interpretation that a fast *Pace of Life* is associated with faster individuals. The three time measures correlate significantly with the individual *Pace of Life* measure, see Table 2.2. Figure 2.2 plots the distribution of the variable individual *Pace of Life*, whereby we find one outlier with a very slow *Pace of Life*. The interpretation of the *Pace of Life* as continuous variable is inconvenient, especially as an (even percentage) increase is only hardly transferable and imaginable in real human behavior. To allow a more convenient interpretation of our results we median split the variable individual *Pace of Life*. Therefore, we compute the median of the distribution which is 0.063 (0.056, if we include the outlier for robustness checks) and interpret all individuals with a *Pace of Life* above 0.063 as fast and all individuals with a *Pace of Life* below 0.063 as slow. In the following we predominantly use the resulting dummy variable *Fast Pace of Life*, whereby the parameter value is equal to 1 if an individual's *Pace of Life* is fast and 0 if an individual's *Pace of Life* is slow.

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[13]Although, the internal consistency is rather small, it is comparable to that of the original *Pace of Life* measurement developed and applied by (Levine and Norenzayan, 1999), which is reported as $\alpha = 0.25$ in (Kirkcaldy et al., 2001).
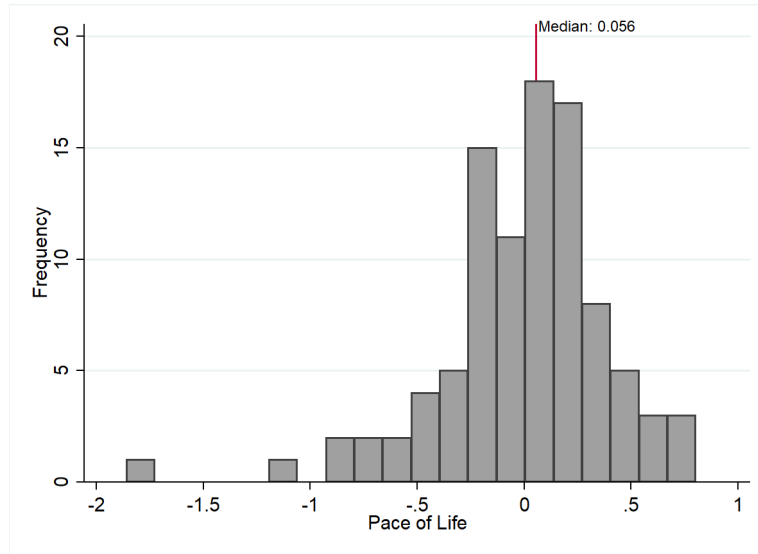
Figure 2.3: Distribution of the individual *Pace of Life*

	Pace of Life	*Fast Pace of Life*	*walking time*	*working time$_{number}$*	*working time$_{questionnaire}$*
Pace of Life	1				
Fast Pace of Life	0.718***	1			
walking time	-0.308**	-0.287**	1		
working time$_{number}$	-0.780***	-0.448***	0.187	1	
working time$_{questionnaire}$	-0.735***	-0.622***	0.005	0.189	1

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, ***
$p < 0.001$

Table 2.2: Correlation matrix: The individual *Pace of Life*

Control variables

Next to the individual *Pace of Life*, there are certainly further socio-demographic characteristics and personality traits that drive productivity and pro-environmental behavior. For instance, age seem to play a major role, but results are ambiguous for productivity (Haltiwanger et al., 1999; Neumark et al., 1999; Aubert et al., 2006) as well as for pro-environmental behavior (Zimmer et al., 1994; Roberts, 1996; Abeliotis et al., 2010; Schwartz et al., 2020). The same also applies to the role of income on productivity and pro-environmental behavior (Temin, 1990; Wildegren, 1998; Gatersleben et al., 2002; Corral-Verdugo et al., 2009; Gunawan and Amalia, 2015; Zhou et al., 2020).

Although, gender seems to have no or little effects for productivity (Robb and Watson, 2012; Roth et al., 2012; Bönte and Krabel, 2014), it is crucial in pro-environmental behavior: women behave significantly more pro-environmentally than men (Kollmuss and Agyeman, 2002; Lee, 2009; De Leeuw et al., 2015; Meyer, 2016; Vicente-Molina et al., 2018; López-Bonilla et al., 2020; Schwartz et al., 2020). Apart from socio-demographic characteristics, personality traits proved to contribute to productivity (Bolton et al., 2010; Cubel et al., 2016) and pro-environmental behavior (Soutter et al., 2020). In

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addition to that, recent evidence suggest that a positive relationship between nature relatedness (NR) and pro-environmental behavior exists (Obery and Bangert, 2017).

We aim to control for such effects in our data analysis. Therefore, we use a questionnaire at the end of our experiment to obtain information about the participant's age, disposable income each month, and gender, as well as their personality traits (Reuschenbach et al., 2013) and nature relatedness (Nisbet et al., 2009).[14] The summary statistics of all independent variables are presented in Table 2.3.[15]

	Percentage	Min	Max	Mean	Std. dev.
Pace of Life		-1.859	0.804	0	0.396
Fast (1)	50.515				
Slow (0)	49.485				
Gender: Female (1)	55.670				
Male (0)	44.330				
Age		19	36	23.619	3.898
Big Five: Neuroticism		-1.697	1.797	0	1
Extraversion		-1.627	2.140	0	1
Agreeableness		-1.857	1.587	0	1
Conscientiousness		-1.645	1.718	0	1
Openness to experience		-1.315	2.022	0	1
Nature Relatedness: Experience		-1.958	1.790	0	1
Perspective		-1.822	2.781	0	1
Self		-2.128	2.129	0	1
Income category 0: < 500 EUR/Month	26.804				
1: $501 - 750$ EUR/Month	29.897				
2: $751 - 1000$ EUR/Month	26.804				
3: $1001 - 1250$ EUR/Month	8.247				
4: 1250+ EUR/Month	8.247				

Table 2.3: Summary statistics for explaining variables

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[14]Applying the NR scale of Nisbet et al. (2009), we find a very high internal consistency of the variables, measured by Cronbach's alpha ($\alpha = 0.833$). NR is divided into three sub-scales: NR-Self „represents an internalized identification with nature"($\alpha = 0.809$); NR-Perspective „reflects an external, nature-related worldview, a sense of agency concerning individual human actions and their impact on all living things"($\alpha = 0.636$); NR-Experience refers to „an individual's physical familiarity with the natural world, the level of comfort with and desire to be out in nature"($\alpha = 0.718$) (Nisbet et al., 2009).

[15]See the correlation matrix for all independent variables in Appendix 2.7.2

2.4 Results

2.4.1 Descriptive results

We are interested in understanding whether a *Fast Pace of Life* is associated with (1) higher productivity and (2) less pro-environmental behavior. For productivity, we find a positive and significant correlation between the individual *Pace of Life* and productivity, measured as revenue from real effort task ($\rho = 0.372$ - significance level< 0.01). This is also illustrated in Figure 2.4, where we find that a *Fast Pace of Life* corresponds to higher productivity. Additionally, individuals with a *Fast Pace of Life* achieved on average 0.52 EUR more from the real effort tasks than slower participants. The individual *Pace of Life* is on average slightly negatively but not significantly correlated with the share of total revenue donated to a tree-planting project ($\rho = 0.033$ - significance level> 0.1). The relationship is plotted in Figure 2.4. Individuals with a *Fast Pace of Life* donate on average about 2.2%-point less to the tree-planting project than those with a *Slow Pace of Life*.
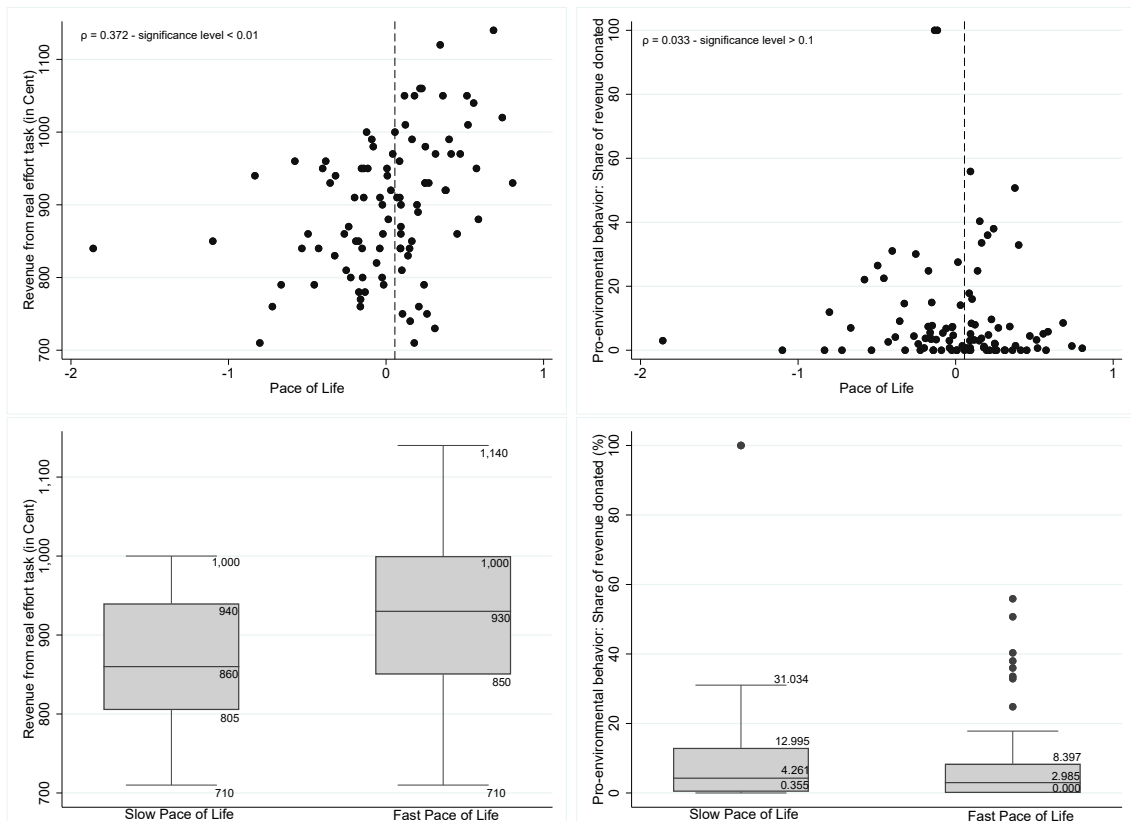
Figure 2.4: Relationship between the individual *Pace of Life* and productivity and and pro-environmental behavior respectively

2.4.2 Regression results

The individual Pace of Life and productivity

For our multivariate analysis, we first run ordinary least square regressions using the revenue from the real effort task as proxy for productivity. All models presented in Table 2.4 include session-day dummies and use income category as a control variable.

| | Revenue from real effort task | | |
	(1)	(2)	(3)
Fast Pace of Life [1 = *yes*]		58.864***	47.588**
		(19.883)	(19.347)
Female [1 = *yes*]	18.983	19.805	44.931**
	(20.912)	(19.529)	(20.924)
Age	3.139	2.139	2.772
	(3.406)	(3.090)	(3.090)
Extraversion			10.669
			(8.591)
Agreeableness			21.918**
			(9.830)
Openess			13.478
			(10.535)
Conscientiousness			14.186
			(10.803)
Neuroticism			6.838
			(11.3131)
Constant	861.670***	848.031***	821.701***
	(113.478)	(104.635)	(106.480)
N	96	96	96
R^2	0.195	0.275	0.378

Note: Add models include session-day and income category dummies.
Robust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.4: Ordinary least squares (OLS) regression, Impact of a *Fast Pace of Life* on productivity

We run our analysis excluding one extreme *Pace of Life* outlier initially. In model (1), we run the regressions without considering the participant's individual *Pace of Life*. In model (2), we include our variable of interest as a binary dummy that specifies whether a participant is characterized by a *Fast Pace of Life* or a *Slow Pace of Life*. Individuals with a *Fast Pace of Life* received about 0.58 EUR more compared to individuals with a *Slow Pace of Life*. This effect is statistically highly significant. Even if we additionally control for further, established, personality traits by considering the Big Five inventory variables in model (3), the participant's *Fast Pace of Life* correlates positive and significantly with productivity. Among the control variables, gender was associated with productivity: women were consistently more productive than men. This relationship is significant in model (3). The Appendix shows robustness checks, whereby we include one extreme *Pace of Life* outlier from our data analysis, and exclude extreme outlier for donation behavior as well as productivity,

respectively (see, Table 2.8, Table 2.9 and Table 2.10). Our results remain robust to these changes. We also run regressions without our *Pace of Life* approach by including *walking time* as behavioral and *inner clock accuracy* as psychological measure but did not find robust effects on productivity (see Table 2.11 and 2.12).

The individual Pace of Life and pro-environmental behavior

We test whether the participants' *Pace of Life* is linked to less pro-environmental behavior by running a Tobit regression. Pro-environmental behavior is defined as the share of total revenue given to the tree-planting project. As shown in Figure 2.2 and Table 2.1, this variable is left-censored at 0.

	Share of total revenue donated (%)				
	(1)	(2)	(3)	(4)	(5)
Fast Pace of Life [1 = yes]		0.361	-11.003	-13.439*	-12.730*
		(4.706)	(7.826)	(7.520)	(7.465)
Female [1 = yes]	-1.577	-1.585	-10.439	-14.917**	-14.564**
	(4.676)	(4.678)	(6.730)	(7.307)	(7.229)
Fast Pace of Life [1=yes] x Female [1=yes]			18.775*	24.037**	22.394**
			(10.405)	(10.181)	(9.970)
Age	-0.940	-0.945	-0.978	-1.383**	-1.323*
	(0.657)	(0.662)	(0.661)	(0.668)	(0.678)
Extraversion				-3.221	-2.898
				(2.191)	(2.144)
Agreeableness				0.416	0.403
				(2.252)	(2.298)
Openess				-6.686***	-7.294***
				(2.462)	(2.455)
Conscientiousness				1.507	2.253
				(2.456)	(2.446)
Neuroticism				0.820	0.557
				(2.345)	(2.290)
NR-Experience					-1.790
					(2.722)
NR-Perspective					-2.846
					(2.506)
NR-Self					-4.031
					(2.720)
Constant	25.981	25.910	31.094	39.422*	38.105*
	(19.862)	(19.889)	(20.039)	(19.980)	(19.712)
N	96	96	96	96	96
Loglikelihood	-330.243	-330.240	-328.607	-324.032	-321.271
$PseudoR^2$	0.029	0.029	0.034	0.047	0.056

Note: All models include session-day and income category dummies. Robust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.5: Tobit regression, Impact of the individual *Fast Pace of Life* on pro-environmental behavior

We run our analysis excluding one extreme *Pace of Life* outlier initially. The variable of interest, individual *Fast Pace of Life*, is not considered in model (1) but first presented in model (2). From
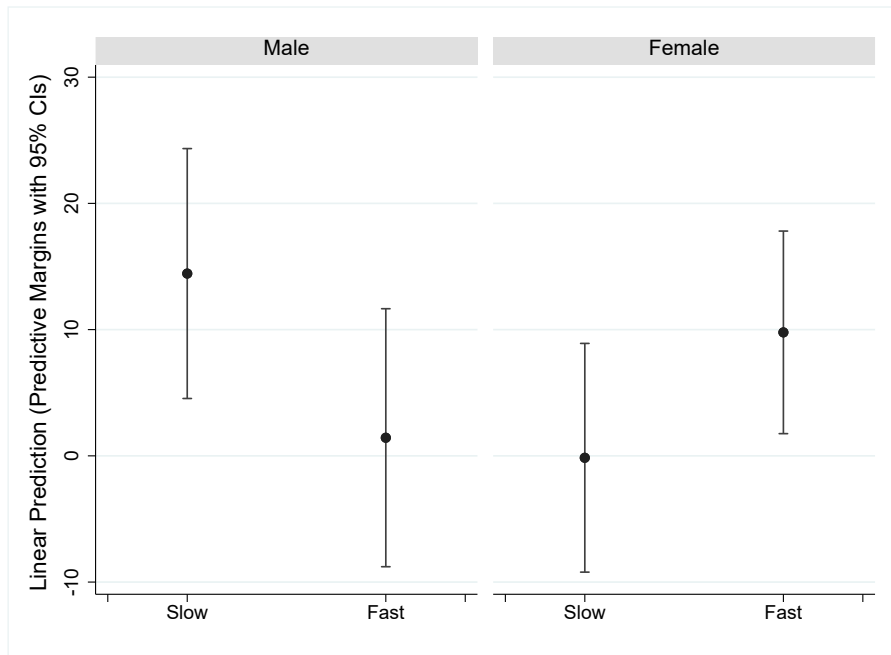
Figure 2.5: Linear prediction of the impact of the individual *Fast/Slow Pace of Life* on pro-environmental behavior by gender

the literature (Shaw, 1998; Garhammer, 2002), we know that there might be a relationship between an individual's gender and the individual *Pace of Life* (Shaw, 1998; Garhammer, 2002), as well as between an individual's gender and pro-environmental behavior (Lee, 2009; López-Bonilla et al., 2020). Therefore, we introduce an interaction term between both binary variables, the individual's *Fast Pace of Life* and gender, in model (3): individual *Fast Pace of Life* x Female. Furthermore, we control for the Big Five inventory variables in model (4) and nature relatedness in model (5).

Our results show that an individual's *Fast Pace of Life* is consistently negative associated with pro-environmental behavior which becomes statistically significant in models (4) and (5). Furthermore, female and older participants behave less pro-environmentally compared to male and younger participants. Statistically robust results for these relationships are disclosed in models (4) and (5). However, the interaction of the individual *Fast Pace of Life* and gender shows the most consistent and robust relationship with pro-environmental behavior in our analysis: among men, individuals with a *Fast Pace of Life* behave significantly less pro-environmentally compared those with a *Slow Pace of Life* ($p < 0.1$). Interestingly, this linkage is reversed if we focus on women ($p < 0.1$) (see also Figure 2.5). We find this effect although our variable of interest, the individual *Pace of Life*, is not differently distributed depending on the individual's gender (Figure 2.6). Similarly, only a very low and insignificant correlation ($\rho = -0.004$) between gender and the *Pace of Life* exists.

The Appendix shows robustness checks, whereby we run a fractional response regression (see Table 2.7) as well as focus on outliers in our data analysis (see Table 2.8, Table 2.9 and Table 2.10). Our main results do not change. We also run regressions without our *Pace of Life* approach by including

walking time as behavioral and *inner clock accuracy* as psychological measure but did not find robust effects on pro-environmental behavior (see Table 2.11 and 2.12).
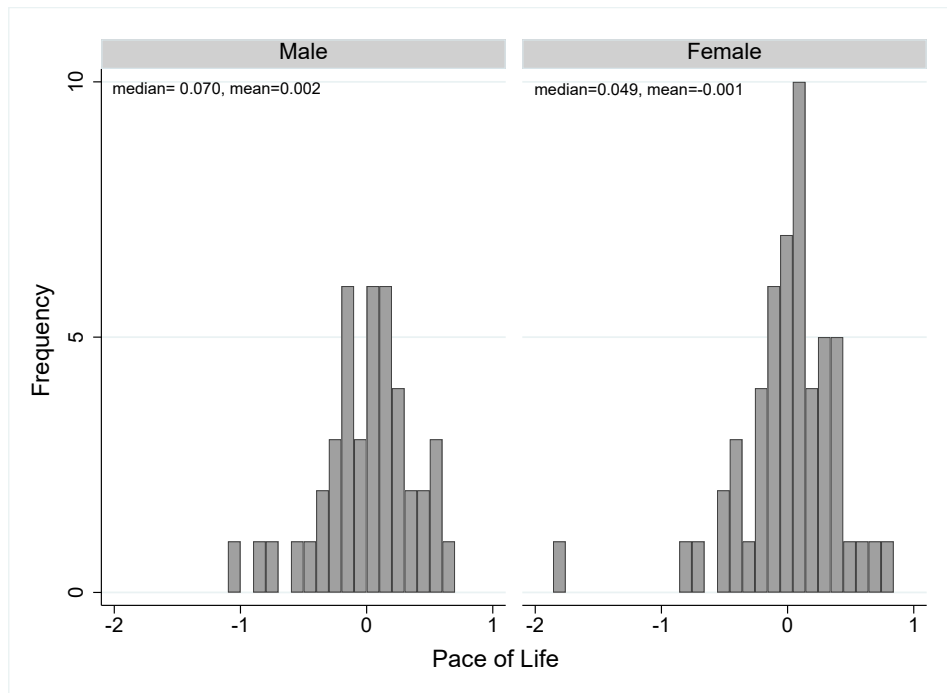
Figure 2.6: Distribution of the individual *Pace of Life* by gender

2.5   Discussion and Conclusion

This paper explores the origin of a drawback of the current "Speed-Up Society" (Colvile, 2016; Sullivan and Gershuny, 2018). While acceleration processes, such as digitilization and globalization, foster economic prosperity (Bhagwati, 2004), we are simultaneously confronted with severe environmental impacts (Jorgenson and Givens, 2014). One source of this development on the macro-level may be well-grounded in a personality trait that concerns the individual relation to time: the *Pace of Life*. Thereby, time processes have been studied more deeply in the recent past, e.g., research on the *Pace of Life*. On the macro-level, studies have shown that a faster *Pace of Life* is associated with more economic prosperity in societies (Levine et al., 1980; Levine and Bartlett, 1984; Bettencourt et al., 2007; Brelsford et al., 2017) and, more happiness and greater well-being (Levine and Norenzayan, 1999; Garhammer, 2002; Brislin and Kim, 2003). Similarly, a faster *Pace of Life* seems to come at the expense of social needs (Milgram, 1970).

We placed an entirely new focus by shedding light on the individual behavior that may explain results on the macro level. Therefore, our study is the first to survey both trends simultaneously and empirically on the micro-level: by focusing on the individual *Pace of Life*, we explored whether the *Pace of Life* is simultaneously associated with higher productivity and more pro-environmental

behavior at the micro-level. In doing so, we enrich the current literature in three different ways. First, by using the clear setting of a controlled laboratory experiment, we show a suitable approach to study the individual *Pace of Life*. In this experiment we used two *working time* measures which individuals are using more commonly in every day life (e.g. typing in displayed numbers on a keyboard and filling in a questionnaire), than the measurement of Levine and Norenzayan (1999) and Kirkcaldy et al. (2001). They investigated working time by taking the time it took postal workers to complete a standard request for stamps. Another beneficial aspect of how we measure *working time* in our setting, lays in the exclusion of selection effects that may occur if working time is measured as proposed by Levine and Norenzayan (1999) and Kirkcaldy et al. (2001). As a consequence, this project opens up the research field to the individual *Pace of Life* and its role in economic decision making at the micro-level alongside the established literature on the *Pace of Life* at the macro-level (Levine and Norenzayan, 1999; Brislin and Kim, 2003; Bettencourt et al., 2007).

Second, we demonstrate that the faster the individual *Pace of Life*, the higher the productivity. Here, we ascertain a robust, significant, and strong relationship. With this result at the micro-level, we contribute to the previous literature which reported similar effects at the macro-level (Levine and Norenzayan, 1999; Brislin and Kim, 2003; Bettencourt et al., 2007).

Third, we find that individuals with a fast individual *Pace of Life* act *less* pro-environmentally. This result confirms the negative association between a faster individual *Pace of Life* and social responsibility empirically and on the micro level which has already been discussed conceptually (Milgram, 1970; Pearson, 2011; Iaquinto, 2018). However, we find a negative association between a fast *Pace of Life* and pro-environmental behavior only for men. When it comes to women, we find the opposite result. This adds to the literature on the relationship between gender and pro-environmental behavior (Lee, 2009; De Leeuw et al., 2015; Meyer, 2016; López-Bonilla et al., 2020). In this context, future research should focus on the reasons why women seem to act more but men less pro-environmentally if their lives speed up.

Our findings on the role of the individual *Pace of Life* for productivity and pro-environmental behavior was ascertained by observing the behavior of students in Germany. Future research should aim at understanding whether our results hold also true in other contexts. Nevertheless, they mirror a development that has been observed on the macro-level for years: the faster the development in a society, the greater the economic success (Brislin and Kim, 2003; Bettencourt et al., 2007). However, as the literature shows faster living is not for granted. It goes along with social alienation and the devaluation of the human environment (Milgram, 1970; Davis et al., 2018). No time is taken to live conscientiously and sustainably, e.g. to grow one's own food or even to prepare a balanced meal (Pearson, 2011).

According to previous research, social acceleration (scarcity of time) has, especially in Western societies, increased over recent decades because of the digitalization, e.g. increase in technology use (Chesley, 2010) and the processes of globalization (Robinson and Godbey, 1996; Rosa, 2003). Van der Loo and Van Reijen (1992), for instance, divide the types of acceleration into four different perspec-

tives relating to social structure, culture, personality type (*Pace of (social) Life*), and the relation to nature. Thereupon, Rosa (2003) uses this approach to highlight that there are "deceleratory perspectives" for social structure, culture, and personality type, but that there is no complementary deceleration even with respect to nature. He only finds the possibility that environmental disasters could decelerate exogenously. This research highlights, the importance of understanding the individual human pro-environmental behavior. Additionally, this could even be another important direction for further research to focus on the dramatic increase of environmental problems in the last decades as one symptom of this "high-speed" development in society, especially with regard to the *Pace of Life* of individuals.

Our results may support the discussion on "degrowth"(Martínez-Alier et al., 2010; Schneider et al., 2010; Kallis, 2011), "a-growth" (Van den Bergh, 2011; Van den Bergh and Kallis, 2012) and "post-growth" (Strunz and Schindler, 2018; Walker et al., 2021) strategies that aim to understand if environmental sustainability goes at the expense of economic growth (Van den Bergh, 2011; Van den Bergh and Kallis, 2012). Traditional economic theories emphasize the importance of the price to determine allocation and distribution over time (see for example Stephan (2013)). For instance, The Stern - Nordhaus debate emphasizes how important it is to understand the human's value of time and to derive an empirically sound measure to build up effective as well as efficient environmental policy measures (Stern, 2006; Nordhaus, 2007; Weitzman, 2007; Tol, 2008). Hence, changes in the individual and social evaluation of time, such as given in the so called "Speed-Up Society," might have an impact on environmental economic discussions.

Additionally, our results may help to explain individual pro-environmental behavior, that is strongly needed in order to "understand the dynamics of the Anthropocene" (Schill et al., 2019). This is especially important as, e.g., Diederich and Goeschl (2017) and Dorner (2019) emphasize the potential of intrinsically motivated behavioral changes for reaching climate change mitigation targets next to extrinsically induced behavior changes. Diederich and Goeschl (2017) also outline that voluntary pro-environmental behavior can be interpreted as a complement to or even substitute for obligatory policy measures that aim at mitigating climate change. In this regard, our results also add to the complex discussion on the identification of climate change as an important moral imperative (see also Markowitz and Shariff (2012); Bolderdijk et al. (2013); Thøgersen (2013); Taufik et al. (2015); Van Der Linden (2015); Zaikauskaite et al. (2020)).

2.6   Special acknowledgements

2.7 Appendix

2.7.1 Instructions for Participants of the Experiment

Instructions[16]

Welcome to the experiment. We ask you to stay seated and quit communication with the other participants as of now. Please turn off your mobile and electrical devices. It is of the utmost importance to adhere to the rules. Otherwise, we reserve the right for ourselves to exclude you from the experiment and, with that, from the payment. Every participant received identical instructions. Please read these instructions very carefully. Raise a hand in case you have any questions. We will answer questions personally.

By participating in this experiment, you can earn money. You already collected 5 EUR by arriving on time. This experiment is about a word encryption task. It takes exactly 15 minutes. In the course of this exercise, you are being shown words to encrypt. Every word consists of three letters. Each letter has a matching numerical code, which you have to find in the chart below. You are supposed to enter this code in the empty space underneath the letters. If you executed this task correctly for all three letters, you successfully encrypted a word, earning an additional amount of money. After that, you will see a new chart and a new word to decode. For each encrypted word from 1 to 5, you receive 40 cents. For the decoded words 6 to 10, you receive 30 cents. For the encrypted words 11 to 15, you receive 20 cents, and from the 16th word on, you receive 10 cents per word encrypted correctly.

Following the word encryption task, you take part in a time estimation task. The time will be counted down invisibly from a certain moment. Afterwards, we will ask you to estimate how much time has passed. You can also earn money with your estimation: in case your estimation was accurate, your payment will be raised by 2 EUR. For every second, your estimation differs from the actual time, you lose 10 cents. Hence you will not receive an additional payment in this task if you deviate more than 20 seconds from the actual time.

Overall, your profit consists of the 5 EUR for showing up on time, the earned amount in the word decoding task, and your bonus from the accuracy in the time estimation task. At the end of the experiment, you can decide if and how much of your earned money you would like to donate to a tree-planting project. After that, we ask you to complete a questionnaire. Finally, we ask you separately to the payment counter.

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[16]English translation of the original German instructions for the participants at PLEx

2.7.2 Correlation matrix for all independent variables

	Revenue from Real effort task	Share donated	Pace of Life	Fast Pace of Life	Female	Age	Neuroticism	Extraversion	Agreeableness	Conscientiousness	Openess	NR	Income Category
Revenue from Real effort task	1												
Share donated	-0.133	1											
Pace of Life	0.372***	-0.033	1										
Fast Pace of Life	0.279***	-0.063	0.718***	1									
Female	0.044	-0.032	-0.004	-0.012	1								
Age	0.215**	-0.167	0.091	0.142	-0.163	1							
Neuroticism	-0.071	0.098	-0.041	-0.058	-0.187*	-0.190*	1						
Extraversion	-0.037	-0.077	-0.125	-0.065	0.054	-0.186*	0.176*	1					
Agreeableness	0.322***	0.031	0.136	0.134	-0.181*	0.270***	-0.073	-0.202**	1				
Conscientiousness	0.133	0.096	0.192*	0.142	-0.317***	-0.076	0.037	0.094	0.167	1			
Openess	0.058	-0.150	0.205**	0.132	-0.174*	-0.148	0.019	0.026	-0.026	0.252**	1		
NR	-0.149	-0.146	0.00304	0.00365	0.139	0.128	-0.049	-0.019	-0.061	0.066	-0.218**	1	
Income category	-0.047	0.075	0.046	0.084	-0.249**	-0.0630	-0.005	-0.020	0.045	0.09	0.083	-0.0450	1

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2.6: Correlation matrix for all independent variables

2.7.3 Robustness Check: Fractional Regression

	(1)	(2)	(3)	(4)	(5)
			Share of total revenue donated [0,1]		
Fast Pace of Life [1 = yes]		0.009	-0.462	-0.579*	-0.583*
		(0.195)	(0.290)	(0.329)	(0.320)
Female [1 = yes]	-0.087	-0.087	-0.455*	-0.654*	-0.644*
	(0.188)	(0.187)	(0.264)	(0.348)	(0.362)
Fast Pace of Life [1 = yes] x			0.782**	0.958**	0.933**
Female [1 = yes]			(0.389)	(0.448)	(0.451)
Age	-0.034	-0.034	-0.037	-0.052**	-0.047*
	(0.025)	(0.025)	(0.024)	(0.023)	(0.024)
Nature relatedness					Yes
Big Five				Yes	Yes
Constant	-0.858	-0.860	-0.650	-0.373	-0.509
	(0.736)	(0.739)	(0.750)	(0.727)	(0.771)
N	97	97	97	97	97
$PseudoR^2$	0.080	0.080	0.091	0.128	0.142
Log pseudolikelihood	-29.473	-29.473	-29.119	-27.937	-27.471

Note: All models include session-day and income category dummies. Robust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.7: Robustness Check: Fractional response regression for the impact of the individual *Fast Pace of Life* on pro-environmental behavior

2.7.4 Robustness Check: OLS/Tobit Regression with *Pace of Life*-Outlier

	Revenue from real effort task		Share of total revenue donated (%)			
	(1)	(2)	(3)	(4)	(5)	(6)
Fast Pace of Life [1 = yes]	64.340***	51.589**	-0.238	-10.527	-13.006*	-12.287
	(19.530)	(19.998)	(4.743)	(7.748)	(7.442)	(7.384)
Female [1 = yes]	18.483	43.466**	-1.603	-9.743	-14.594**	-14.211*
	(19.003)	(20.685)	(4.643)	(6.689)	(7.292)	(7.209)
Fast Pace of Life [1=yes] x				16.963*	22.941**	21.219**
Female [1=yes]				(10.159)	(10.006)	(9.799)
Age	1.967	2.627	-0.932	-0.969	-1.387**	-1.327*
	(3.029)	(3.081)	(0.657)	(0.658)	(0.664)	(0.674)
Nature relatedness						Yes
Big Five		Yes			Yes	Yes
Constant	851.075***	824.142***	26.018	31.144	39.722**	38.338*
	(102.792)	(105.700)	(19.721)	(19.916)	(19.851)	(19.576)
N	97	97	97	97	97	97
$Loglikelihood$			-334.159	-332.763	-328.101	-325.298
R^2	0.288	0.384				
$PseudoR^2$			0.029	0.033	0.047	0.055

Note: Add models include session-day and income category dummies. Robust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.8: Robustness Check: Impact of a *Fast Pace of Life* on productivity (OLS) and pro-environmental behavior (Tobit)

2.7.5 Robustness Check: OLS/Tobit Regression without Donation-Outlier

	Revenue from real effort task		Share of total revenue donated (%)			
	(1)	(2)	(3)	(4)	(5)	(6)
Fast Pace of Life [1 = yes]	57.837***	47.504**	3.758	-7.405	-9.433*	-7.955
	(19.825)	(19.721)	(3.297)	(5.392)	(5.081)	(5.088)
Female [1 = yes]	16.073	42.547*	-1.316	-10.256**	-16.380***	-17.285***
	(19.962)	(21.793)	(3.330)	(4.746)	(5.127)	(5.035)
Fast Pace of Life [1=yes] x				18.418**	24.057***	22.179***
Female [1=yes]				(7.182)	(6.942)	(6.819)
Age	1.879	2.727	-0.763	-0.794*	-1.118**	-1.178**
	(3.119)	(3.142)	(0.459)	(0.451)	(0.444)	(0.450)
Nature relatedness						Yes
Big Five		Yes			Yes	Yes
Constant	857.674***	824.662***	22.744	27.966**	36.869***	37.812***
	(105.994)	(107.403)	(13.858)	(13.742)	(13.383)	(13.171)
N	95	95	95	95	95	95
Loglikelihood			-301.333	-298.066	-292.594	-289.674
R^2	0.274	0.370				
$PseudpR^2$			0.029	0.039	0.057	0.066

Note: Add models include session-day and income category dummies. Robust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.9: Robustness Check: Impact of a *Fast Pace of Life* on productivity (OLS) and pro-environmental behavior (Tobit)

2.7.6 Robustness Check: OLS/Tobit Regression without Productivity-Outlier

	Revenue from real effort task		Share of total revenue donated (%)			
	(1)	(2)	(3)	(4)	(5)	(6)
Fast Pace of Life [1 = yes]	63.714***	48.749**	-0.573	-12.066	-15.188*	-13.831*
	(18.946)	(19.218)	(4.858)	(8.092)	(7.836)	(7.784)
Female [1 = yes]	24.310	50.771**	-1.304	-10.030	-15.369**	-14.761*
	(19.039)	(19.711)	(4.754)	(6.805)	(7.455)	(7.402)
Fast Pace of Life [1=yes] x				18.575*	25.764**	23.194**
Female [1=yes]				(10.518)	(10.407)	(10.263)
Age	1.897	2.623	-0.941	-0.966	-1.398**	-1.357*
	(2.962)	(2.934)	(0.666)	(0.666)	(0.671)	(0.683)
Nature relatedness						Yes
Big Five		Yes			Yes	Yes
Constant	790.908***	758.356***	24.018	27.672	35.858*	36.187*
	(98.193)	(95.455)	(20.502)	(20.514)	(20.299)	(20.033)
N	95	95	95	95	95	95
Loglikelihood			-326.214	-324.649	-319.791	-317.404
R^2	0.310	0.420				
$PseudoR^2$			0.030	0.034	0.049	0.056

Note: Add models include session-day and income category dummies. Robust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.10: Robustness Check: Impact of a *Fast Pace of Life* on productivity (OLS) and pro-environmental behavior (Tobit)

2.7.7 *Pace of Life* Alternatives and Productivity

	Revenue from real effort task			
	(1)	(2)	(3)	(4)
Walking time	-20.211*	-16.598		
	(11.147)	(10.467)		
Inner clock accuracy			0.214	0.184
			(0.236)	(0.224)
Female	31.479	56.652***	21.377	48.345**
	(19.017)	(20.622)	(20.569)	(21.565)
Age	2.848	3.409	3.546	3.790
	(3.237)	(3.162)	(3.396)	(3.189)
Big Five		Yes		Yes
Constant	843.580***	815.749***	853.067***	826.299***
	(108.536)	(109.271)	(112.036)	(110.311)
N	97	97	97	97
R^2	0.231	0.351	0.205	0.335

Note: All models include session-day and income category dummies. Robust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.11: Robustness Check: *Pace of Life* proxies and productivity

2.7.8 *Pace of Life* Alternatives and Pro-Environmental Behavior

	Share of total revenue donated (%)					
	(1)	(2)	(3)	(4)	(5)	(6)
Walking time	-3.795	-4.261	-2.538			
	(2.438)	(3.587)	(3.509)			
Inner clock accuracy				-0.031	0.051	0.049
				(0.055)	(0.075)	(0.076)
Female	0.520			-1.948		
	(4.764)			(4.665)		
Walking time x		0.822	-1.356			
Female [1=yes]		(4.656)	(4.669)			
Inner clock accuracy x					-0.182	-0.153
Female [1=yes]					(0.116)	(0.114)
Age	-0.973	-0.983	-1.237*	-0.985	-1.052	-1.327**
	(0.640)	(0.642)	(0.654)	(0.656)	(0.651)	(0.659)
Big Five			Yes			Yes
Constant	22.823	22.702	28.084	26.786	28.506	32.762*
	(19.451)	(19.437)	(19.553)	(19.699)	(19.520)	(19.559)
N	97	97	97	97	97	97

Note: All models include session-day and income category dummies. Robust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.12: Robustness Check: *Pace of Life* proxies and pro-environmental behavior

2.7.9 Screenshots

Trial Stage

Encrypt three words. You have to click next after each encrypted word to proceed. Once you have encrypted three words correctly, the actual and monetarily consequential word encryption task begins.

WORD: B   C   G

CODE:

X	Y	T	S	N	J	M	Q	O	C	B	V	K	U	L	G	D	P	W	I	F	A	H	Z	E	R
846	470	968	247	139	236	414	321	632	961	996	461	245	476	735	994	684	700	402	690	464	986	161	346	300	650

Out of **3** words, you are currently encrypting number   1
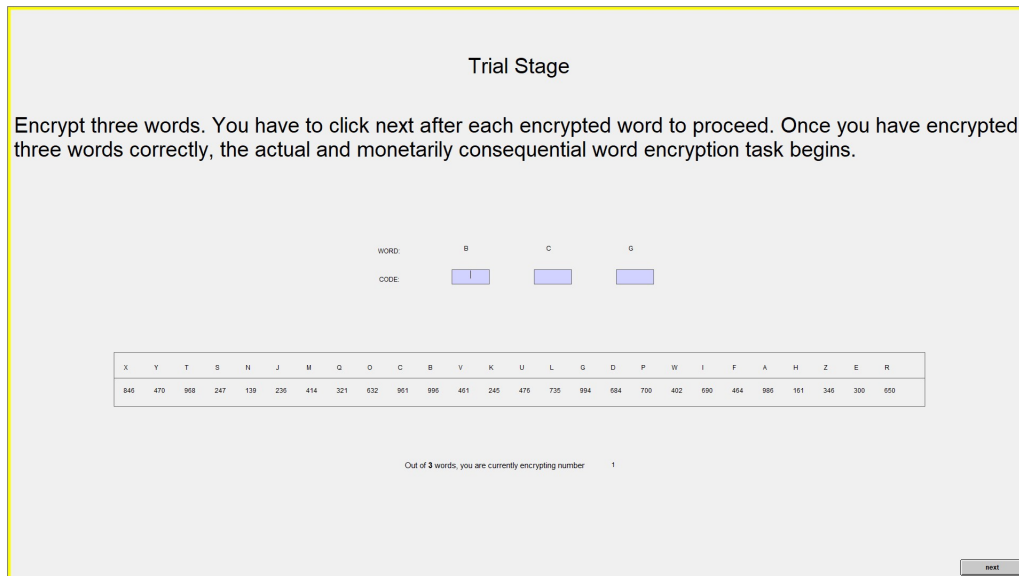
next

Figure 2.7: Trial stage of the word encryption task

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3 Are individuals less inequity averse in a foreign language?

Abstract

Against the background that individuals are increasingly making decisions about more or less equal outcomes in a foreign language, we studied a potential "Foreign Language Effect" on individual inequity aversion. In a controlled and monetarily incentivized laboratory experiment in Germany, we implemented two treatments in a between-subject design, whereby the treatment NATIVE was computerized and conducted in German and the treatment FOREIGN in English. Both treatments had in common that the participants could give up money to move in the direction of more equitable outcomes twice: In one situation they had a financial advantage, while in the other they had a financial disadvantage over the other group member. Our results show *no* general effect of our treatment language variation on advantageous or disadvantageous inequity aversion. However, we find that individuals who participated in the treatment FOREIGN *and* learned their foreign language in a less emotional environment are less willing to reduce advantageous inequity. This finding highlights the context of acquisition as a potential driver of a "Foreign Language Effect" on decision-making.

3.1 Introduction

When individuals make decisions in a foreign-language setting, they make more (self-)utilitarian choices (Geipel et al., 2015; Cipolletti et al., 2016; Shin and Kim, 2017), are less affected by framing bias (Keysar et al., 2012b; Miozzo et al., 2020) and are more consistent in their actions (Costa et al., 2014a). To sum up, they behave more like the concept of the *homo oeconomicus* predicts. These results are explained by a "Foreign Language Effect (FLE)" on individual decision-making: If individuals enter a foreign-language environment they are less emotional compared to in a native-language environment, which results in more rational decisions.

In this study, we want to explore whether a FLE exists for individual inequity aversion. This research question matters because individuals increasingly make decisions about more or less equal outcomes in different language environments. For instance, employees of an international firm decide on a more or less equal distribution of workload or salaries in a language that is not necessarily their native language.[1] Another example involves international summits at which policy-makers decide on measures for global equity when it comes to welfare, access to vaccines or climate protection. In this regard, for some decision-makers the summit language reflects their native language, for others a foreign language.[2]

We address our research question in a controlled and incentivized laboratory experiment with students in Germany. In this context, we implemented two different treatments that differed with respect to the language used in a between-subject design. In NATIVE, the experiment was computerized and conducted in German. In FOREIGN, the experiment was computerized and conducted in English. In both treatments, we elicited advantageous and disadvantageous inequity aversion. We measured individuals' advantageous inequity aversion by focusing on the amount of money they were willing to give up to move in the direction of more equitable outcomes if they were better off than another individual. We measured individuals' disadvantageous inequity aversion by focusing on the amount of money they were willing to give up to move in the direction of more equitable outcomes if they were worse off compared to another individual. This division of inequity aversion was theoretically embedded and established by Fehr and Schmidt (1999).

Furthermore, we focused on the origins of the FLE by approaching the participants' emotions when making their decisions, as well as their individual relations to the foreign language. By doing so, we enrich the literature on the FLE by providing statistical evidence from consequential decision-making. In this context, to the best of our knowledge, our focus on a potential FLE on advantageous

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[1] According to the business newspaper *Handelsblatt*, in 2017 18 of the 30 top companies listed in the German stock index DAX stated that English was their official business language. Only three companies declared that their official language remained solely German. `https://www.handelsblatt.com/english/companies/ve-talk-gut-how-german-companies-adopted-english-as-their-lingua-franca/23573406.html?ticket=ST-592664-Qc4Tvu3s4ab5rnw39uag-cas01.example.org`

[2] Out of the Group of Twenty (G20), only six countries (Australia, Canada, India, South Africa, United Kingdom and United States) have English - which is the official language at most conferences - as a national or official language.

and disadvantageous inequity aversion has not been studied before. With our research design, we also add to the literature on inequity aversion in decision-making by studying language-dependent differences.

Our findings show no effect of our treatment variation on individual advantageous or disadvantageous inequity aversion. Additionally, we find no differences on the level of emotionality between NATIVE and FOREIGN. However, we find that individuals who acquired their foreign language skills in an emotionally neutral context were less willing to reduce their financial advantage to move in the direction of more equitable outcomes, which highlights the context of acquisition as a driver for a potential FLE (Čavar and Tytus, 2018; Dylman and Champoux-Larsson, 2020). We discuss our findings in more detail in section 3.5.

The remainder of our paper is structured as follows. We start by reviewing the literature on the FLE in section 3.2. Afterwards, we describe our methods in section 3.3 and show our results in section 3.4. Finally, we conclude and discuss our findings in section 3.5.

3.2 Literature

Recent studies have shown that individuals' decision-making differs in a foreign language environment compared to in a native environment (e.g. Keysar et al., 2012b; Costa et al., 2014a; Geipel et al., 2015). The most consistent evidence for such a FLE in economic decision-making stems from individual answers in two hypothetical scenarios: the *Asian Disease Problem* and the *Footbridge Dilemma*.

In the *Asian Disease Problem*, participants are asked to select one of two different programs that should be introduced after a hypothetical outbreak of a severe disease that could kill up to 600,000 people. The programs are presented in terms of either lives saved (version 1) or lives lost (version 2): In version 1, participants can choose between saving 200,000 lives for sure or 600,000 lives with a probability of one-third. In version 2, participants can choose to kill either 400,000 people for sure or 600,000 people with a probability of two-thirds. While participants using their native language have been shown to be affected by the framing effect of being risk averse in version 1 but risk-seeking in version 2, no such difference was observed for participants using a foreign language (Keysar et al., 2012b; Costa et al., 2014a; Miozzo et al., 2020).

In the hypothetical *Footbridge Dilemma*, one has to decide whether or not to push an innocent man in front of an arriving train in order to save the lives of five people standing on the track. Compared to participants in native-language treatments, individuals using a foreign language have been shown to be more likely to sacrifice that one man in order to save the lives of the others (Costa et al., 2014b; Geipel et al., 2015; Cipolletti et al., 2016; Miozzo et al., 2020).

Furthermore, there is evidence that individuals in a foreign language treatment are less willing to bring back lost wallets (hypothetical scenario) (Geipel et al., 2015) and are more willing to suffocate

their own baby to save the lives of a whole group (hypothetical scenario) (Shin and Kim, 2017). Furthermore, they are less risk averse and more consistent in making decisions by choosing lotteries yielding higher expected payoffs from among ten different lottery pairs in the *Holt-Laury test* (Costa et al., 2014a) (consequential scenario).

There are mixed results regarding the direction of the FLE on consequential cooperation behavior: Gargalianou et al. (2017) observed that playing a prisoner's dilemma game in a foreign compared to a native language significantly increases cooperation among individuals. The exact opposite was found by Akkermans et al. (2010). In addition, studying individuals' behavior in a Public Goods Game, Urbig et al. (2016) found out that participants in the foreign-language condition were less likely to be cooperative than participants in the native-language treatment.

Researchers found no evidence for a potential FLE in economic decision-making in a more impersonal variant of the *Footbridge Dilemma*, the so-called *Switch Dilemma*, in which individuals have to decide whether or not to kill an innocent man by redirecting an arriving train to the man's track in order to save the lives of five people (hypothetical scenario) (Costa et al., 2014b; Geipel et al., 2015; Cipolletti et al., 2016), and no consistent evidence for an FLE on lying behavior (consequential scenario) (Alempaki et al., 2021).

To sum up, there is evidence for a FLE that makes individuals act more like a homo oeconomicus: they are more rational, consistent and self-utility-maximizing when using a foreign language. However, these findings remain constrained to certain decisions so far. Additionally, they frequently involve hypothetical scenarios which meaningfulness is often called into question (Beshears et al., 2008). With this research project, we aim to enrich the literature on the FLE by conducting a consequential lab experiment. In this context, our focus is on a potential FLE on individual inequity aversion, which "means that people resist inequitable outcomes; i.e., they are willing to give up some material payoff to move in the direction of more equitable outcomes" (Fehr and Schmidt, 1999). Inequity aversion can be split into advantageous and disadvantageous inequity aversion. Advantageous inequity aversion refers to a situation in which an individual is better off compared to another but derives disutility from this fact. Thus, he/she is willing to give up money to reduce inequity in the outcomes. Disadvantageous inequity aversion has the same implications, but arises once the individual is worse off than the other (Gao et al., 2018). Additionally, we enrich the literature on inequity aversion by studying the role of a (foreign) language context.

When it comes to the reasons for the FLE, the role of *emotions* is often mentioned (Harris et al., 2003; Costa et al., 2014a; Shin and Kim, 2017). Individuals seem to be more emotional (and less rational) when making decisions in a native language compared to a foreign language. This argument is supported by the findings of previous studies (Harris et al., 2003; Dewaele, 2004; Caldwell-Harris and Ayçiçeği-Dinn, 2009; Puntoni et al., 2009; Dylman and Bjärtå, 2018): Individuals reacted more emotionally in a native compared to a foreign language environment. These differences are assumed to go back to the context of acquisition in which the language was learned. While a native language is usually acquired in a highly emotional and familiar environment, a foreign language is often learned

in a neutral classroom setting (Caldwell-Harris and Ayçiçeği-Dinn, 2009; Shin and Kim, 2017; Dylman and Bjärtå, 2018).

However, there are also researchers who instead outline the role of *cultural accommodation* in the context of a potential FLE on decision-making (Akkermans et al., 2010; Gargalianou et al., 2017). The main idea behind this concept is that individuals' decisions made in one language depend on the very culture associated with the language. Thus, by making decisions in one language, individuals adhere to the values and norms of the respective culture linked to the language. In this context, *cultural accommodation* tends to be more pronounced for individuals with a high level of *exposure* to the respective language and culture (Akkermans et al., 2010; Gargalianou et al., 2017). With our research project, we also want to explore the role of emotion, as well as the individual's relationship to the foreign language for a potential FLE in more detail.

3.3 Methods

3.3.1 Study Design

We implemented two experimental treatments (NATIVE and FOREIGN) in a between-subject design. The treatments differed only in terms of the language in which the experiment was conducted and computerized. The treatment NATIVE was conducted and computerized in German, the treatment FOREIGN in English. Our assumption was that almost all participants in the experimental sessions were speaking German as their native language and English as a foreign language because we conducted the experiment at the University of Potsdam, Germany, and it is obligatory to take classes in English as a foreign language at school in Germany. However, we also controlled for the participant's native and foreign language in a post-questionnaire.

The participants were randomly assigned to groups of two. They were not informed about the identity of the other group member. *Each participant* made two kinds of *Distribution Decisions* to choose the income of Person A and the income of Person B. In this context, the income of Person A always reflected the potential income of the decision-maker, while the income of Person B always represented the potential income of the other group member. In one version (hereafter defined as ADVANTAGEOUS), the income of Person A varied from 20.00 Euros to 15.00 Euros, the income of Person B from 10.00 Euros to 15.00 Euros. For each marginal unit of money, the participant reduced the income of Person A (the smallest monetary step was 0.01 Euros); the income of Person B increased by one marginal unit, and inequity between the two people's incomes decreased by two marginal units. If the participant reduced the income of Person A by 5.00 Euros (from 20.00 Euros to 15.00 Euros), the income of Person B increased by 5.00 Euros (from 10.00 Euros to 15.00 Euros) and both people received equal incomes (see Figure 3.1a). We introduced the scenario ADVANTAGEOUS

to figure out whether a FLE on the participant's advantageous inequity aversion exists.

In the other version (hereafter defined as DISADVANTAGEOUS), the income of Person A varied from 10.00 Euros to 5.00 Euros, the income of Person B from 20.00 Euros to 5.00 Euros. For each marginal unit of money, the participant reduced the income of Person A (the smallest monetary step was again 0.01 Euros), the income of Person B was reduced by three marginal units, and the inequity between the two people's incomes decreased by two marginal units. Consequently, if the participant reduced the income of Person A by 5.00 Euros (from 10.00 Euros to 5.00 Euros), the income of Person B decreased by 15.00 Euros (from 20.00 Euros to 5.00 Euros) and both people received equal incomes (see Figure 3.1b). Thus, in both scenarios the reduction of Person A's income by one marginal unit reduced the inequity in incomes by two marginal units and perfect equality was given if Person A's income was reduced by 5.00 Euros. We introduced the scenario DISADVANTAGEOUS to determine whether we could find evidence of a FLE when it comes to the participant's disadvantageous inequity aversion.
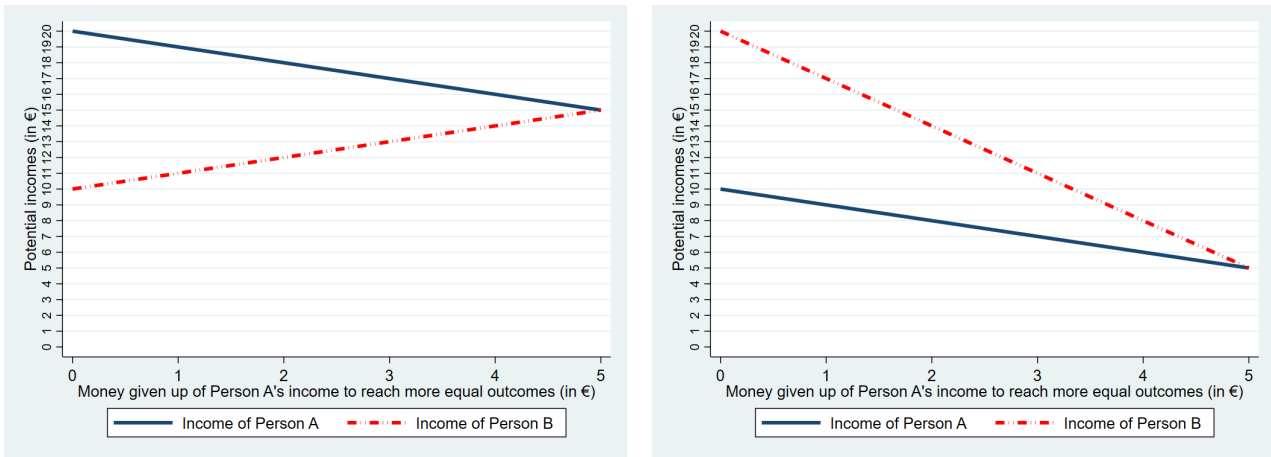
(a) Potential incomes in ADVANTAGEOUS   (b) Potential incomes in DISADVANTAGEOUS

Figure 3.1: Potential incomes of Person A and Person B in the two scenarios

Although the two different decision scenarios show similarities regarding the monetary calibration, they differ in one important aspect - the efficiency of choices in terms of the effect of different decisions on the total of both incomes. In the scenario ADVANTAGEOUS, the incomes of both players remain constant at 30 Euros across every decision. Thus, the participants could not make more or less efficient decisions regarding the total income. On the contrary, in the scenario DISADVANTAGEOUS, more equity in outcomes goes along with less efficiency, as the total of both incomes decreases.

A reduction of disadvantageous inequity by the disadvantaged individual is always associated with a decrease in the two incomes as a whole. For instance, if a responder in an *Ultimatum Game* rejects a proposer's offer, both players receive no income and the decision with respect to both incomes was

inefficient. However, the reduction of advantageous inequity by the dictator in the *Dictator Game* is mostly associated with giving money to the responder. In this case, there is also no efficiency loss when it comes to both incomes as a whole.

Our research design is therefore in line with previous studies on advantageous and disadvantageous inequity aversion. Furthermore, it matches the assumptions of Fehr and Schmidt (1999), who have ruled out the possibility that there may be individuals who are prepared to throw money away in order to reduce their monetary advantage.

The order in which the two different versions were displayed to the participants in our experiment was random. *After* having made the decisions, two random selection mechanisms took place ((1) + (2)). At first, one of the two group members was chosen (1). Subsequently, one of his/her decisions (scenario ADVANTAGEOUS or DISADVANTAGEOUS) was selected (2). This decision determined the income of the chosen decision-maker (he/she received the money that he/she had assigned to Person A) and the other group member (the income the chosen decision-maker had given to Person B). A similar procedure was applied in previous research on inequity aversion (Engelmann and Strobel, 2004).

3.3.2 Hypotheses and explorative questions

Our main research focus is on language-dependent differences in individual advantageous and disadvantageous inequity aversion. In this context, we would expect advantageous and disadvantageous inequity aversion to be less pronounced in a foreign language condition. Thus, we formulate the following two hypotheses:

Hypothesis 1: Advantageous inequity aversion is less pronounced in FOREIGN *compared to* NATIVE.

Hypothesis 2: Disadvantageous inequity aversion is less pronounced in FOREIGN *compared to* NATIVE.

Our assumptions go back to the previous findings on a FLE, which have shown that individuals are more rational and display more self-serving motives in a foreign language compared to a native language. These results suggest that individuals are more interested in maximizing their own income and less willing to give up money in order to achieve more equal outcomes in a foreign language. Furthermore, there is evidence that a higher level of emotionality is associated with more inequity aversion (see for a review, Zheng et al., 2017). Keeping in mind that higher emotionality was linked to decisions in native-language environments in the past (Harris et al., 2003; Dewaele, 2004; Puntoni et al., 2009), we find further support for our hypotheses.

Empirical support for our two hypotheses will be provided if the participants in FOREIGN give up

significantly less money in order to achieve more equitable outcomes compared to participants in NATIVE in the two scenarios ADVANTAGEOUS and DISADVANTAGEOUS.

In addition, we aim to understand whether the individual relationship to the foreign language impacts a potential FLE on inequity aversion. According to the literature on the FLE, language-dependent differences on decision-making go back to a different context of acquisition. A native language is learned in an emotionally rich environment (family, friends, daily situations), whereas a foreign language is often acquired in a neutral classroom context. Against this background, we want to check whether differences in inequity aversion are more pronounced for individuals who take part in FOREIGN and have learned English particularly in a neutral classroom setting. To gather this information, we ask about the context of acquisition for the participants in FOREIGN in a post-experimental questionnaire.

Furthermore, we know from the study of Dylman and Champoux-Larsson (2020) that exposure to a foreign language in daily life seems to be crucial for the occurrence of a FLE in decision-making. The authors showed that a FLE for Swedish native speakers only existed when making decisions in French but not in English. This was explained by the strong exposure of Swedish people to English in their daily lives. In this light, we want to ask individuals in FOREIGN about their frequency of English use in their daily lives. Based on this information, we want to check whether individuals who are less exposed to English and participate in FOREIGN show a different behavior pattern.

Besides this, we want to study whether individuals who lived for a longer time in an English-speaking country and participate in FOREIGN show a different behavior pattern due to a potential cultural accommodation. Doing so, we ask the participants in FOREIGN whether they have lived a longer period in an English-speaking country.

Finally, we want to test whether potential language-dependent differences can actually be linked to a different level of emotions by making decisions. Our measures for emotionality are explained in the next section 3.3.3.

3.3.3 Procedure

We collected data from July 19 to August 05, 2021, at the Potsdam Laboratory for Economic Experiments (PLEx). We conducted a total of 14 sessions with 10 participants at most in each session.[3] Each session was randomly assigned to one treatment variation (NATIVE or FOREIGN), whereby the random assignment to one treatment variation took part *after* the recruitment process.[4] So each session was conducted entirely in one language, including all interactions with the experimenters. To ensure comparability, all materials were translated from German to English and the English transla-

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[3]This limitation was due to the Covid-19 measurements at the University of Potsdam.

[4]Thus, the participants did not know which treatment condition would be implemented when signing up for an experimental session. In the invitation to the experimental sessions, we merely told the participants that English and German language skills were needed but did not give further information.

tion was translated back into German by research assistants with native-level German and English skills. This procedure was established in the past in studies that surveyed the role of different languages in decision-making (Cipolletti et al., 2016; Li, 2017; Hayakawa et al., 2019).

At the beginning of each session, the participants were welcomed in the designated language and randomly assigned to one seat in the laboratory, ensuring that nobody could observe the other participants' behavior. The experiment started after all participants gave their informed consent.[5] At the beginning, the participants received the instructions for the experiment.[6] After having read the instructions, they had to answer control questions referring to the content of the instructions. Subsequently, they were informed whether or not they had answered the control questions correctly. This was to ensure that the participants understood the experiment. Next, they had the opportunity to familiarize themselves with the two different scenarios, ADVANTAGEOUS and DISADVANTAGEOUS, without any financial consequences (trial stages). Afterward, the actual consequential decisions were made, whereby the order of ADVANTAGEOUS and DISADVANTAGEOUS differed. After having made the decisions, the participants had to answer a questionnaire and finally received their payment in cash. During the experiment, we controlled for the level of emotion by making use of two different measurements. Firstly, we recorded the time the participants needed at the different stages in the experiment, since more immediate and intuitive responses are related to more feeling-based decisions (Kirkebøen and Nordbye, 2017). In this context, the time was measured by the experiment's software (ztree). Secondly, we asked the participants about their emotional arousal with regard to each decision-making scenario.[7]

To further increase the predictive power of our data analysis, we controlled in a post-experimental questionnaire for several aspects that have had an effect on inequity aversion in the past, such as age (Margoni et al., 2021), gender (Friedl et al., 2020), and financial well-being (He and Wu, 2016). We also examined the individuals' lab experience, as well as whether the participants were enrolled in an economics study program because these aspects have proven to matter for economic decision-making too (Bauman and Rose, 2011; Conte et al., 2019; Schmidt et al., 2020). In addition, in the treatment NATIVE we controlled for whether the participant's native language actually was German. In contrast, in the treatment FOREIGN we controlled for whether English actually proved to be the participant's foreign language. In the treatment FOREIGN, we additionally asked the participants to provide a self-estimation regarding their English skills, the context in which they acquired English skills, the frequency of their English use in their daily lives, and whether they had lived for a longer period in an English-speaking country. We controlled for these variables in order to study the role of an individual's relationship with the English language and culture when making decisions in an English-speaking environment.

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[5]The informed consent form given to the participants was also written in the assigned language.

[6]Please find the instructions for both treatments in the Appendix.

[7]In this context, we used a rating scale associated with different facial expressions, from very angry to very happy.

The experiment lasted for about 35 minutes and the participants received on average 14.46 Euros.[8] Our study design was approved by an ethics committee (German Association for Experimental Economic Research e.V.). The experiment was computerized with ztree (Fischbacher, 2007) and the recruitment process conducted via ORSEE (Greiner, 2015). Furthermore, our study design, target sample size, and our two main hypotheses were preregistered in an Open Science Framework repository and can be approached via this link:

`https://osf.io/uf2bv/?view_only=00bd6b04856d4b57b08db55292c8489d`.

3.3.4 Participants

Table 3.1: Summary statistics of control variables across the two different treatments.

	NATIVE				FOREIGN			
	min	max	mean	std.dev.	min	max	mean	std.dev.
Profit	5.00	20.00	14.429	0.578	7.21	20.00	14.287	0.500
Female	0	1	0.560	0.501	0	1	0.521	0.505
Age	19	46	23.860	4.777	19	45	22.833	4.596
Financial Well-Being	0	1	0.880	0.328	0	1	0.875	0.334
Study in Economics	0	1	0.340	0.479	0	1	0.375	0.489
Lab Experience	0	1	0.780	0.418	0	1	0.646	0.483
Correct Answers	3	5	4.440	0.675	3	5	4.312	0.776
Classroom English					0	1	0.771	0.061
Anglophone Living Experience					0	1	0.250	0.438
English Usage					0	5	1.396	1.540
English Skills					4	10	7.438	1.287
observations	$N = 50$				$N = 48$			

Note: The variable *Profit* reflects the participants' final payoff (in €). The dummy variables *Female*, *Financial Well-Being*, *Study in Economics*, and *Lab Experience* indicate whether the participant fulfilled these criteria (= 1) or not (= 0), whereby *Financial Well-Being* represents whether the participant would be able to pay a sudden bill of 400 €. *Age* reports the age of the participants in years, and *Correct Answers* sums up the number of the individuals' correct responses with regard to the five control questions. The dummy variable *Classroom English* describes whether the participant's English skills were acquired in a classroom context (= 1) or not (= 0), while *Anglophone Living Experience* indicates whether participants had lived in an anglophone country for more than six months (= 1) or not (= 0). The variable *English Usage* reports the participants' self-rated English usage on a 6-point scale (0 = every day, 1 = a few times a week, 2 = once a week, 3 = a few times a month, 4 = once a month, and 5 = less than once a month)). *English Skills* reports participants' self-rated English skills on a ten-point scale (1 = very low skills, 10 = very high skills). We conducted two-sided t-tests as well as two-sided proportion tests to examine whether the individual characteristics that we observed in both treatments differed between the two treatments. We did not find statistically significant differences for any of them.

In order to pre-calculate the number of participants needed to obtain significant results on our mean comparison tests, we made use of the effect sizes reported by Geipel et al. (2015). From their paper,

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[8]14.46 Euros was about 17.06 Dollars at the time we conducted the experimental sessions.

Fig. 6 shows the resulting effect sizes of different footbridge dilemmas in the context of the Foreign Language Effect, whereby the overall effect size was $d = 0.52$. Using the software G*Power (Faul et al., 2007), we calculated that we needed 98 participants in order to achieve a power of 0.8 in a one-tailed Wilcoxon-Mann-Whitney test ($\alpha = 0.05$, allocation ratio $N2/N1 = 1$), when using $d = 0.52$. Hence, we aimed for 49 participants for the treatment NATIVE and 49 participants for the treatment FOREIGN.

We collected data for a total of 106 participants. We excluded 8 observations from our data analysis because they were of participants who were either non-native German speakers and participated in the treatment variation NATIVE or whose mother tongue was English and who participated in the treatment variation FOREIGN.[9] Thus, we were able to include 98 observations in our data analysis (50 observations in NATIVE and 48 observations in FOREIGN).[10] Table 3.1 shows the demographic characteristics of the participants as well as their ability to answer the control questions correctly across the two different treatments.

3.4   Results

(a) Decisions in ADVANTAGEOUS

(b) Decisions in DISADVANTAGEOUS
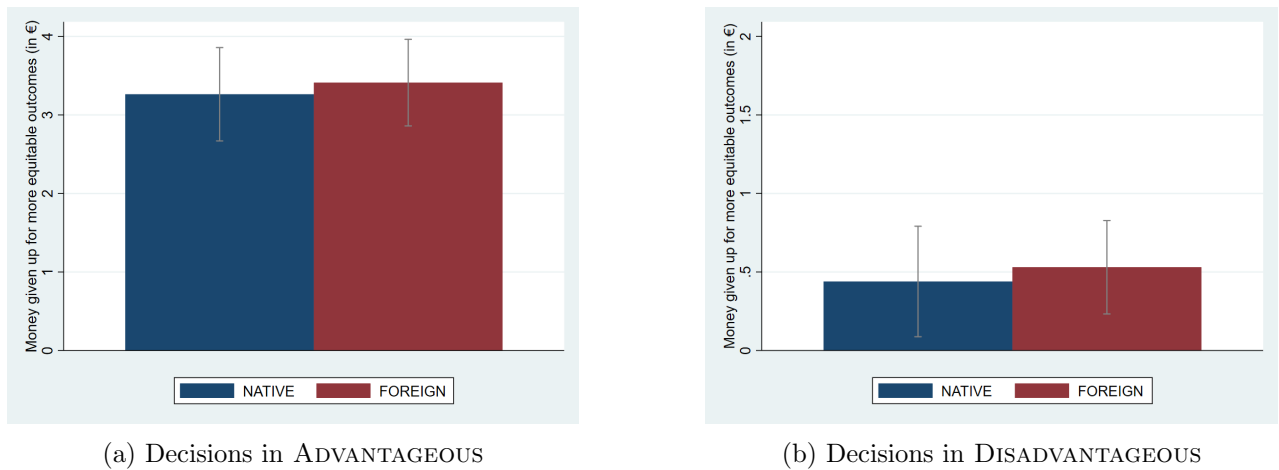
Figure 3.2: Money given up for more equal outcomes in the two scenarios by treatment variation with 95% intervals

Figure 3.2 shows the average amount of money given up to achieve more equitable outcomes in ADVANTAGEOUS and DISADVANTAGEOUS across the two treatments. In both scenarios, individuals tended to give up slightly more in FOREIGN compared to NATIVE, but these differences are not statistically significant (one-sided Wilcoxon-Mann-Whitney tests, $p = 0.456$ and $p = 0.254$). However, we find that in both treatments individuals gave up significantly more money in ADVANTAGEOUS

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[9]A similar procedure was reported by Gargalianou et al. (2017).

[10]Unfortunately, some students who were invited to our last session, which was conducted in English, did not show up. Therefore, we obtained slightly fewer observations in FOREIGN compared to NATIVE.

compared to DISADVANTAGEOUS (one-sided Wilcoxon-Signed-Rank tests $p < 0.001$).

Table 3.2: Regression analysis

	Money given up for more equitable outcomes					
	(1a)	(2a)	(3a)	(1b)	(2b)	(3b)
FOREIGN	0.402	0.430	0.401	0.021	-0.007	0.042
	(0.668)	(0.744)	(0.671)	(1.412)	(1.441)	(1.424)
DISADVANTAGEOUS	-2.864***	-2.837***	-2.993***	-5.229***	-5.276***	-5.610***
	(0.244)	(0.337)	(0.299)	(0.396)	(0.551)	(0.497)
FOREIGN x DISADVANTAGEOUS		-0.056			0.092	
		(0.493)			(0.908)	
FOREIGN and *Neutral Acquisition of English*	-0.792**	-0.792**	-0.960*	-1.507**	-1.507**	-1.812**
	(0.372)	(0.373)	(0.502)	(0.699)	(0.697)	(0.771)
FOREIGN and *Cultural Accommodation*	-0.281	-0.281	-0.282	-0.401	-0.399	-0.416
	(0.401)	(0.402)	(0.402)	(0.714)	(0.711)	(0.708)
FOREIGN and *Lower Exposure to English*	-0.038	-0.038	-0.039	-0.038	-0.037	-0.029
	(0.439)	(0.440)	(0.439)	(0.726)	(0.724)	(0.708)
FOREIGN and *Neutral Acquisition of English* x DISADVANTAGEOUS			0.342			0.950
			(0.517)			(0.929)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.746**	2.731**	2.801**	0.720	0.733	0.806
	(1.053)	(1.081)	(1.066)	(1.749)	(1.767)	(1.777)
N	196	196	196	196	196	196
R^2	0.495	0.495	0.496			
Pseudo R^2				0.198	0.198	0.200
Regression Model	OLS	OLS	OLS	Tobit	Tobit	Tobit

Note: OLS regressions (models (1a), (2a), (3a)) and Tobit regressions (models (1b), (2b), 3(b)) on the money given up to achieve more equitable outcomes across both scenarios. Two observations for each participant. Robust standard errors (clustered at the individual level) are in parentheses. All models include session dummies, dummies for the order of the decisions, as well as the control variables mentioned above. In the Tobit regressions, the data are censored at the lower limit (0). *** p<0.010, ** p<0.050, * p<0.100

We continue our data analysis by running OLS regressions, whereby the money given up to move in the direction of more equitable outcomes (in €) represents the dependent variable (Table 3.2). Model (1a) includes our variable of interest FOREIGN, which equals 1 if the participant took part in the treatment FOREIGN and 0 if the participant took part in the treatment NATIVE. Besides this, we consider the variable DISADVANTAGEOUS, which equals 1 if the participant made a decision in the scenario DISADVANTAGEOUS and 0 if the participant made a decision in the scenario ADVANTAGEOUS. Apart from this, we consider variables that refer to individuals who took part in FOREIGN and their individual relationship to the foreign language. By doing so, we were able to examine whether participants in FOREIGN who learned English in a classroom context (if FOREIGN and *Neutral Acquisition of English* take the value 1), lived in an anglophone country (if FOREIGN and *Cultural Accommodation* take the value 1) or used English less often in their daily lives (if FOREIGN and *Lower Exposure to English* take the value 1) showed a different level of inequity aversion.

Apart from this, we consider control variables[11] as well as session dummies and dummies for the order of the decisions.

Our results from model (1a) show no significant effect of our variable of interest FOREIGN on the

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[11]age, financial well-being, lab experience, gender, study in economics, time needed to make a decision, emotional arousal, English skills

money given up for the sake of more equitable outcomes. Model (1a) confirms that the participants were less willing to give up money in DISADVANTAGEOUS compared to ADVANTAGEOUS. Interestingly, we find evidence that the context of acquisition plays a significant role: Individuals who took part in FOREIGN and learned English in the classroom context (*Neutral Acquisition of English*) were significantly less inequity-averse.

In model (2a), we introduce FOREIGN x DISADVANTAGEOUS for the scenario to interact with our treatment variation. We do not find a significant effect of this specification on FOREIGN and the interaction term FOREIGN x DISADVANTAGEOUS. Model (2a) confirms the significantly negative effect of FOREIGN and *Neutral Acquisition of English* on the money given up to reach more equitable outcomes.

To study whether the significant effect of FOREIGN and *Neutral Acquisition of English* holds in both scenarios, we introduce the interaction term FOREIGN and *Neutral Acquisition of English* x DISADVANTAGEOUS in model (3a). The main effect remains significantly negative ($p = 0.059$).

If we focus on the predictive margins (see Figure 3.3), our results show a lower amount of money given up for more equitable outcomes in ADVANTAGEOUS and DISADVANTAGEOUS for individuals who took part in FOREIGN and had acquired English in a neutral context. However, we find a significant difference only for ADVANTAGEOUS.
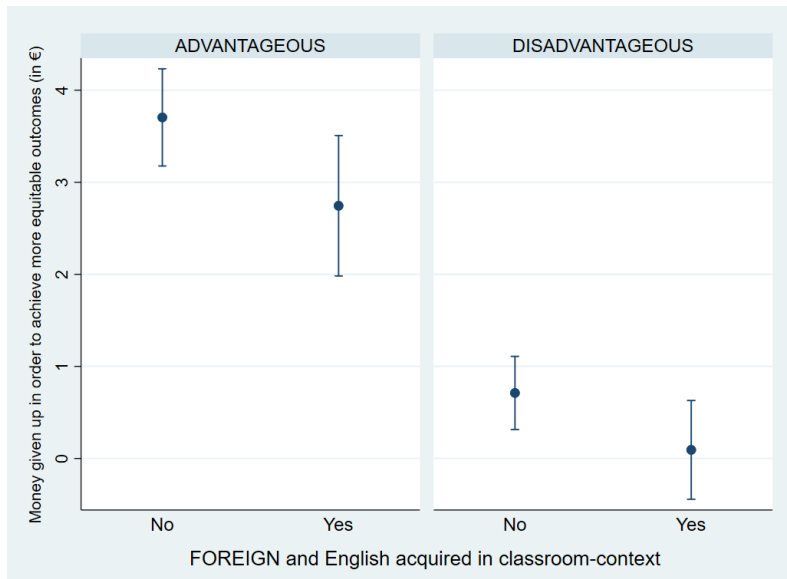
Figure 3.3: Linear prediction of the amount of money given up in order to achieve more equitable outcomes across scenarios if participants took part in FOREIGN and acquired their English skills in a neutral classroom context with 95% intervals

To sum up, based on our data analysis we have to reject our two hypotheses, since we find no lower level of advantageous and disadvantageous inequity aversion in FOREIGN. Instead, our results show a

similar level of advantageous and disadvantageous inequity aversion in both treatments. However, we find some evidence for a FLE on advantageous inequity aversion for the participants who took part in FOREIGN and acquired their foreign language skills in an emotionally neutral classroom context: They were less willing to give up money to achieve more equitable outcomes. Our findings are confirmed if we run Tobit regressions instead of OLS (model (1b), (2b) and (3b)) or if we look only at participants in FOREIGN (see Table 3.3 in the Appendix).

We accomplish our data analysis by focusing on the two proxies, which we used to identify whether the emotional distance was more pronounced in FOREIGN compared to NATIVE: Emotional arousal measured by a rating scale after having made the decisions (1) and the time needed to make a decision (2). We do not find any differences for (1) and (2) between NATIVE and FOREIGN across both scenarios (one-sided t-tests). However, we find that the participants took more time making a decision in ADVANTAGEOUS if they took part in FOREIGN and their language skills were neutrally acquired (in a classroom context) (one-sided t-test, $p = 0.062$) (see, Figure 3.4).
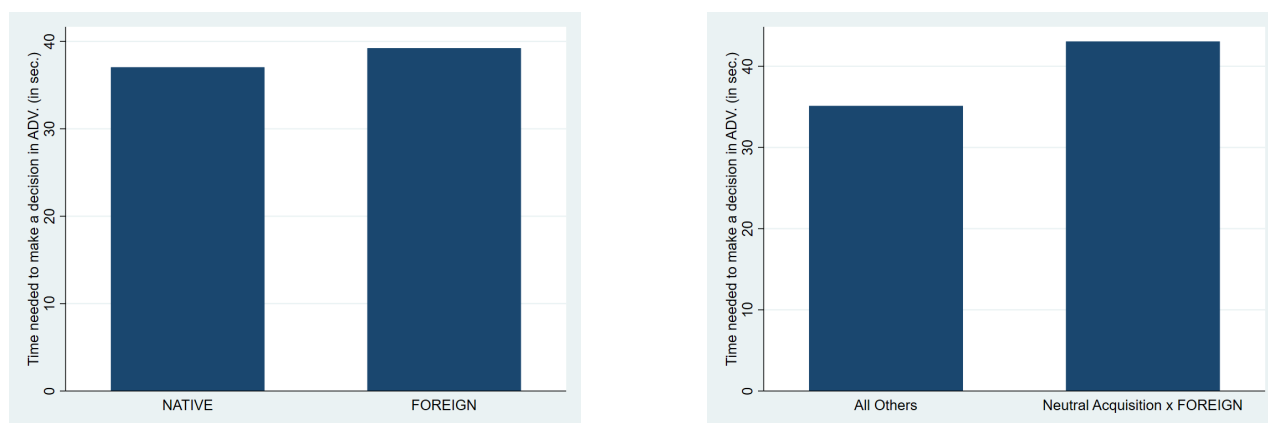
(a) Time and treatment variations

(b) Time and Context of Acquisition

Figure 3.4: Time needed to make decisions in ADVANTAGEOUS (in seconds)

3.5 Discussion and Conclusion

We studied whether individuals' inequity aversion is less pronounced in a foreign language environment compared to a native language environment. This research question has relevance, since many individuals are increasingly making decisions about more or less equal outcomes using a foreign language in a globalized world. For instance, at international summits, which are mostly held in English, some policy-makers make decisions about more or less equal access to wealth or medical treatments for developing countries in their native language. Other policy-makers make these decisions in a foreign language. Similarly, recent evidence shows that a "Foreign Language Effect" in decision-making might exist (Keysar et al., 2012b; Costa et al., 2014a; Geipel et al., 2015).

In an incentivized and controlled laboratory experiment with students in Germany, we implemented

two treatments in a between-subject design that differed with regard to the language spoken (NATIVE = German language, FOREIGN = English language). Within the experiment, we measured the participants' advantageous and disadvantageous inequity aversion by implementing two scenarios of a *Distribution Game*. In this context, the participants had two opportunities to reduce their own payoff in order to move in the direction of more equitable outcomes (scenarios ADVANTAGEOUS and DISADVANTAGEOUS).

Our results show no effect of the treatment variation on advantageous or disadvantageous inequity aversion. Thus, we find no general FLE on inequity aversion, which is in stark contrast to previous studies that reported a FLE on decision-making. However, we observe a FLE on advantageous inequity aversion for participants who made their decisions in a foreign language *and* acquired their foreign language skills in a classroom context.

As mentioned previously, a FLE on decision-making is assumed to go back to a lower level of emotionality when making a decision in a foreign language. This is explained by different contexts of acquisition for a native and a foreign language. Whereas the native language is acquired in an emotionally rich environment (e.g. in the family), a foreign language is mainly acquired in an emotionally neutral context such as in a classroom (Caldwell-Harris and Ayçiçeği-Dinn, 2009; Shin and Kim, 2017; Dylman and Bjärtå, 2018). Thus, making decisions in a certain language environment is associated with more or less emotional load, which leads to more or less rational decisions (Harris et al., 2003; Costa et al., 2014a; Shin and Kim, 2017).

Taking this explanatory approach of a FLE on decision-making at face value, our findings can be put into a reasonable context. We might find no general FLE on advantageous and disadvantageous inequity aversion, since for the participants in FOREIGN English may have been acquired too emotionally *on average*. Even though English is not an official language in Germany and is taught in school as a foreign language, the influence of English might have been too prevalent in the daily lives of the participants *on average*, especially in areas associated with strong emotions (movies, music, series, and videos).[12] The two proxies we used to examine emotionality in our setting support this argument, since we do not find language-dependent differences on our emotional rating scale or for the time needed to make a decision. In this context, a less culturally influential foreign language might be associated with a general effect of a language-dependent treatment variation on individual inequity aversion.

The findings of Dylman and Champoux-Larsson (2020) are in good agreement with this interpretation. Dylman and Champoux-Larsson (2020) could not identify any FLE for the Asian Disease Problem or the Footbridge Dilemma when Swedish participants - for whom the English language is also very influential - made decisions in English. However, they found a FLE for the same settings

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[12]Anecdotal evidence: The German Youth Word of the Year, an annual publication that reviews trends in German youth language, was an English word for the first time in 2020 (*lost*). Even in 2021, an English word (*cringe*) won first place (second and third places were English words as well), which confirms the growing cultural influence of English in the daily lives of younger Germans.

if the participants made decisions in French. Against this background, future research should aim to understand whether a general FLE on individual inequity aversion appears once individuals make decisions in a non-culturally influential foreign language.

If we focus on those participants in FOREIGN who acquired English mainly in a classroom setting, we find a FLE on advantageous inequity aversion in the expected direction. Then, the individuals were less willing to give up a material payoff to move in the direction of more equitable outcomes, and thus to act more rationally, as a *homo oeconomicus*. For those individuals we also find evidence for a lower level of emotionality, since they took more time to make a decision. However, we did not find a different level of disadvantageous inequity aversion for them. There may be different reasons for this: Perhaps the monetary calibration in our scenario DISADVANTAGEOUS failed to trigger any effect. Compared to ADVANTAGEOUS, giving up a material payoff in DISADVANTAGEOUS was associated with a loss of efficiency, since the pie size (the incomes of both players in one group) decreased with increasing equity in outcomes. Thus, efficiency concerns - which often drive economic decisions (Engelmann and Strobel, 2004; Güth and Kocher, 2014; Hong et al., 2015) - may be one reason. Another explanation could be that our scenario DISADVANTAGEOUS was associated with actively taking away money from the other person to reach a more equitable outcome. In this regard, the moral imperative "Thou shalt not steal" may be too strongly embedded in an individual who is making choices to be affected by differences in the language environment. This interpretation is in line with the results of Alempaki et al. (2021), who surveyed language-dependent differences with respect to another morally questionable behavior pattern: lying. They also did not find a consistent FLE on consequential lying behavior.

3.6 Special acknowledgements

3.7 Appendix

3.7.1 Instructions in Native

Willkommen und vielen Dank für Ihre Teilnahme an diesem Experiment. Von jetzt an bitten wir Sie, an Ihrem Platz zu bleiben und nicht mehr mit den anderen Teilnehmer*innen zu kommunizieren. Schalten Sie bitte auch Ihre mobilen elektronischen Geräte aus. Es ist sehr wichtig, dass Sie diese Regeln einhalten. Andernfalls behalten wir uns vor, Sie vom Experiment und damit auch von der Bezahlung auszuschließen.

Diese Instruktionen sind für alle Personen, die an diesem Experiment teilnehmen, identisch. Lesen Sie sich diese Instruktionen sehr aufmerksam durch. Sollten Sie Fragen haben, heben Sie bitte Ihre Hand. Wir werden dann zu Ihnen kommen und Ihre Fragen persönlich beantworten.

Ihre Einnahmen während des Experiments werden in Euro angegeben. Nachdem Sie alle Entscheidungen getroffen haben, bitten wir Sie noch einen Fragebogen auszufüllen. Im Anschluss daran bekommen Sie Ihre Einnahmen in bar ausgezahlt.

Sie nehmen heute an einem Entscheidungsexperiment teil. Dabei bilden Sie mit einer anderen Person, die am Experiment teilnimmt, eine Gruppe. Sie werden nicht darüber informiert, wer das andere Gruppenmitglied ist. Auch das andere Gruppenmitglied wird nicht über Ihre Identität informiert.

In diesem Experiment gibt es zwei Rollen: *Person A* und *Person B*. Erst **nachdem** alle Entscheidungen getroffen worden sind, wird zufällig entschieden wer Person A und wer Person B ist.

In diesem Experiment entscheiden Sie in zwei unterschiedlichen Szenarien über die Einkommen von Person A und Person B. Dabei sollen Sie sich in die Lage von Person A versetzen.

Falls Ihnen am Ende tatsächlich die Rolle der Person A zugeordnet wird, wird eine *Ihrer* Entscheidungen zufällig ausgewählt und implementiert. Sie erhalten dann als Bezahlung den Betrag, den Sie für Person A bestimmt hatten. Das andere Gruppenmitglied erhält den Betrag als Bezahlung, den Sie für Person B bestimmt hatten.

Für den Fall, dass Ihnen am Ende die Rolle der Person B zugeordnet wird, sind Ihre Entscheidungen aus diesem Experiment für die Bezahlungen irrelevant. Dann wird eine Entscheidung *des anderen* Gruppenmitglieds zufällig ausgewählt und implementiert.

Sie werden gleich die Möglichkeit haben sich mit den beiden Entscheidungssituationen vertraut zu machen und erst nachdem sie daran teilgenommen haben erscheinen die *echten* mit Konsequenzen verbundenen Entscheidungen. Zunächst bitten wir Sie allerdings ein paar Kontrollfragen zu beantworten, um sicherzustellen, dass Sie die Instruktionen verstanden haben.

3.7.2 Instructions in Foreign

Welcome and thank you for your participation in this experiment. From now on, we would ask you to remain seated and to not communicate with other participants any longer. Furthermore, please switch off your electronic devices. It is crucial to follow these rules. Otherwise, we reserve the right to exclude you from the experiment and from its payment.

These instructions are identical for all participants. Please make sure to read them carefully. If you have questions at any time, please indicate so by raising your hand. We will then approach you to answer your questions personally.

Your earnings during the experiment will be given in euros. After having made your decisions, we will ask you to fill out a questionnaire. Afterwards, you will receive the earnings in cash.

Today, you are taking part in a decision-making experiment. You will be assigned to a group consisting of you and another participant of the experiment. You will not be informed about the identity of the other group member and the other group member will not be informed about your identity.

This experiment consists of two roles: *Person A* and *Person B*. Only **after** all decisions were made, it will be randomly chosen which member of the group is Person A and which one is Person B.

In this experiment, you have to decide about the income of Person A and Person B in two different scenarios. In this context, you should imagine that you are in the position of Person A.

If you are actually assigned to the role of Person A at the end, one of *your* decisions will be randomly chosen and implemented. You will then receive as payment the amount of money which you had assigned to Person A. The other group member will receive the amount of money which you had assigned to Person B.

However, if you get assigned to the role of Person B at the end, then your decisions made in this experiment do not influence the payment. In this case, one of the decisions of the *other group member* will be randomly chosen and implemented.

You will have the opportunity to get familiar with both situations of decision-making. Only after participating in the trial stages the *actual* and consequential decisions will appear. But previously we ask you to answer a few control questions to ensure that you have understood the instructions.

3.7.3 Robustness Check: Regressions for participants in Foreign

	Money given up for more equitable outcomes			
	(1a)	(2a)	(1b)	(2b)
DISADVANTAGEOUS	-2.919***	-3.620***	-4.844***	-6.612***
	(0.357)	(0.629)	(0.543)	(1.339)
Neutral Acquisition of English	-0.856**	-1.292**	-1.493**	-2.123***
	(0.369)	(0.607)	(0.634)	(0.732)
Cultural Accommodation	-0.397	-0.405	-0.569	-0.680
	(0.411)	(0.409)	(0.682)	(0.670)
Lower Exposure to English	-0.218	-0.225	-0.349	-0.335
	(0.465)	(0.463)	(0.684)	(0.664)
Neutral Acquisition of English x DISADVANTAGEOUS		0.910		2.224
		(0.783)		(1.525)
Control variables	Yes	Yes	Yes	Yes
Constant	4.481***	4.758***	3.448**	3.896**
	(0.945)	(0.941)	(1.567)	(1.550)
N	96	96	96	96
R^2	0.551	0.559		
Pseudo R^2			0.221	
Regression Model	OLS	OLS	Tobit	Tobit

Note: OLS regressions (models (1a), (2a)) and Tobit regressions (models (1b), (2b)) on the money given up to achieve more equitable outcomes across both scenarios in treatment FOREIGN. Two observations for each participant. Robust standard errors (clustered at the individual level) are in parentheses. All models include session dummies, dummies for the order of the decisions, and the control variables mentioned above. In the Tobit regressions the data are censored at the lower limit (0). *** p<0.010, ** p<0.050, * p<0.100

Table 3.3: Robustness Check: Regressions for participants in FOREIGN

3.7.4 Time measures at different stages across treatments

	Native		Foreign		
	mean	std.dev.	mean	std.dev.	diff. means
timeinstructions	133.420	32.200	162.899	45.685	-29.479***
timecontrolcheck	15.950	9.420	18.551	9.873	-2.560*
timetrialadv	57.163	24.836	63.130	34.088	-5.967
timetrialdisadv	67.266	34.514	71.097	35.558	-3.830
timedecisionadv	37.042	20.315	39.227	27.077	-2.185
timedecisiondisadv	39.951	27.374	42.985	27.414	-3.034
observations	$N = 50$		$N = 48$		

Note: We conducted one-sided t-tests to examine whether the participants needed more time in FOREIGN compared to DISTANT at the different stages of the experiment.*** p<0.010, ** p<0.050, * p<0.100

Table 3.4: Time measures (in seconds) across different stages in the experiment and treatments

3.7.5 Screenshots
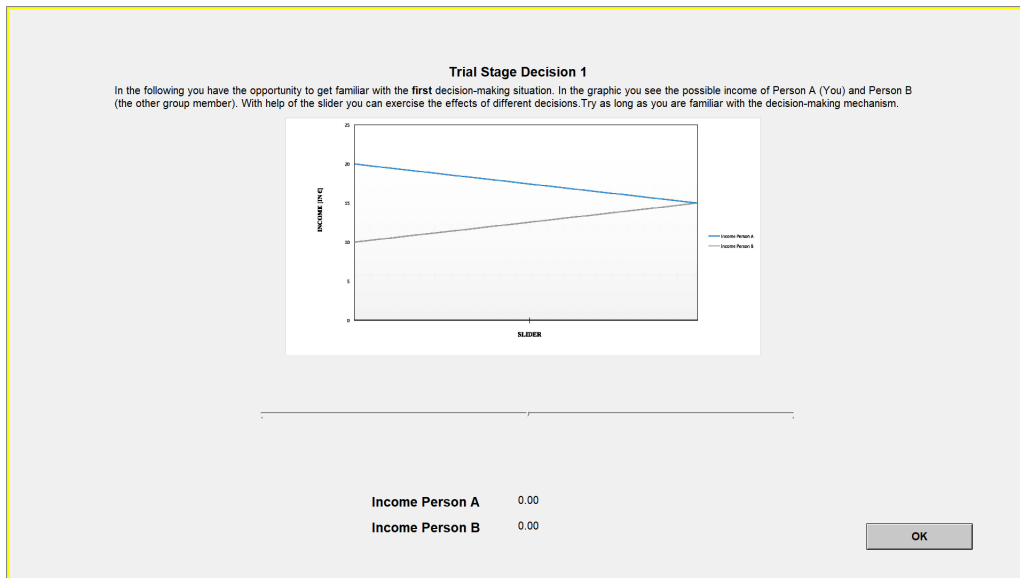
Figure 3.5: Trial stage for ADVANTAGEOUS
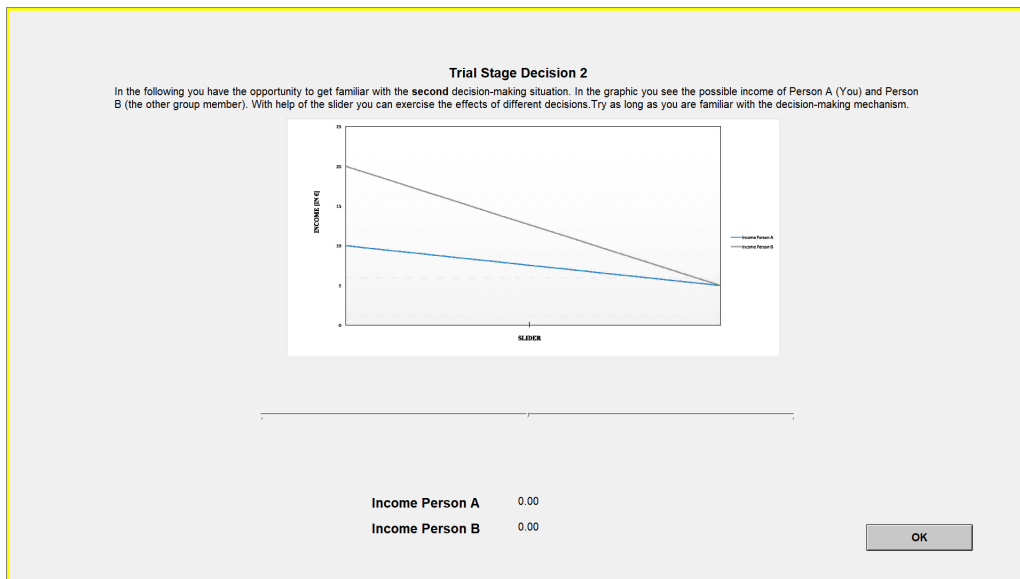
Figure 3.6: Trial stage for DISADVANTAGEOUS

4 You will receive your money next week! Experimental evidence on the role of Future-Time Reference for intertemporal decision-making[*]

Abstract

Against the background of the increasingly discussed "Linguistic Saving Hypothesis" (Chen, 2013), I studied whether the targeted use of a present tense (close tense) and a future tense (distant tense) *within* the same language have an impact on intertemporal decision-making. In a monetarily incentivized laboratory experiment in Germany, I implemented two different treatments on intertemporal choices. The treatments differed in the tense in which I referred to future rewards. My results show that individuals prefer to a greater extent rewards which are associated with a present tense (close tense). This result is in line with my prediction and the first empirical support for the Linguistic Saving Hypothesis *within* one language. However, this result holds exclusively for males. Females seem to be unaffected by the linguistic manipulation. I discuss my findings in the context of "gender-as-culture" as well as their potential policy-implications.

4.1 Introduction

According to the increasingly discussed Linguistic Saving Hypothesis (LSH)[1], for individuals who have the opportunity to talk about the future in a present tense (close tense) the future seems to be temporally closer since they can associate present and future linguistically. As a consequence, they display a more future-oriented behavior compared to individuals who have to refer to the future by using a future tense (distant tense) (Chen, 2013).

There is growing support for the LSH in the literature (e.g. Pérez and Tavits, 2017; Mavisakalyan et al., 2018; Sutter et al., 2018; Herz et al., 2020; Kim et al., 2021). However, all of these studies have in common that they compared the behavior of individuals who speak different languages, for instance, Chinese (enables to use a close tense in prediction-based contexts) and English (forces to use a distant tense in prediction-based contexts). This raises the question whether rather cultural issues instead of linguistic differences drive the results (Roberts et al., 2015).

In this study, I change the research focus on the LSH and examine whether the targeted use of close tense and distant tense *within* the same language affect intertemporal decision-making. In this context, I take advantage of the grammatical particularities of the German language which enables their speakers to talk either in a close *or* in a distant tense in prediction-based contexts. This procedure provides the opportunity to isolate cultural motives. Using a between-subject design, I implement an incentivized economic experiment with two treatments. Both treatments contain the same choices between two rewards which are available at different dates in the future. The treatments differ in the framing of the payment dates. In the treatment CLOSE the earlier reward is associated with a statement in a close and the later reward is associated with a statement in a distant tense. In the treatment DISTANT a statement in a distant tense is linked to the earlier and the later reward.

In line with my hypothesis, I find that individuals in CLOSE prefer to a larger extent the earlier future rewards compared to participants in the treatment DISTANT. Interestingly, I find this effect exclusively for males. Females show no significant treatment-dependant differences.

My finding enriches different strands of the literature. On the one hand, my study is - although this effect is constrained to males - the first which reports evidence that using a close or a distant tense makes a difference in intertemporal decision-making *within* one language. This result reflects a novel contribution to the research on the LSH (e.g. Chen, 2013; Sutter et al., 2018; Mavisakalyan et al., 2021). On the other hand, my study contributes to the literature on linguistic framing for decision-making (e.g. Brañas-Garza, 2007; He, 2017; Bruttel et al., 2021). Thereby, my findings add to studies about gender differences due to linguistic stimuli (e.g. Schubert et al., 1999; Mayer and Tormala, 2010; Ellingsen et al., 2013). In this context, my results provide further evidence on the "gender-as-culture" hypothesis (Mulac et al., 2001) which proposes that males and females treat language significantly different. Practically, the variation of close and distant tenses might reflect a

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[1]More than 700 citations for the paper of Chen (2013) were counted on GoogleScholar as of Mai 2022.

useful nudge to be applied by policy-makers. For instance, vaccination, professional dental cleaning or healthy nutrition could be made more attractive for males if their future benefits are associated with statements in a close tense instead of a distant tense.

The remainder of my paper is structured as follows. I start by reviewing the literature on the LSH as well as the literature on the role of linguistic framing for decision-making in section 4.2. Afterwards, I describe my methods in section 4.3 and show my results in section 4.4. Finally, I conclude and discuss my findings in section 4.5.

4.2 Literature Review

This research project contributes to different strands of the literature, especially to the *literature on the Linguistic Saving Hypothesis* and to the *literature on the role of linguistic framing for decision-making.*

Literature on the Linguistic Saving Hypothesis (LSH)

According to Chen (2013), differences in intertemporal decision-making go back to differences in the obligation of marking the future by using Future-Time Reference (FTR) in languages. Weak-FTR speakers (weak-FTR's) are able to talk about the future in present tense (*close tense*).[2] In contrast, strong-FTR speakers (strong-FTR's) are forced to use future tense (*distant tense*) in prediction-based contexts.[3] As weak-FTR's are able to associate present and future linguistically, Chen (2013) assumes, that the future seems to be temporally closer for them. As a consequence, weak-FTR's care more about future outcomes and behave more future-oriented compared to strong-FTR's (Linguistic Saving Hypothesis).

Starting with the study of Chen (2013), who reported that weak-FTR's save more, retire with more wealth, smoke less, practice safer sex and are less obese, a wide range of studies on the LSH has been published. For instance, Falk et al. (2018), Sutter et al. (2018) and Herz et al. (2020) showed that weak-FTR's are more patient compared to strong-FTR's. Pérez and Tavits (2017) and Mavisakalyan et al. (2018) reported a higher level of pro-environmental behavior for weak-FTR's compared to strong-FTR's. Even religiosity and the level of suicides has been linked to differences in FTR in the past. Lien and Zhang (2020) found that the rates of suicides are lower for individuals who speak a strong-FTR language whereas Mavisakalyan et al. (2021) showed higher religiosity among weak-FTR's compared to strong-FTR's. Both results were explained by the underlying assumptions of

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[2]In German you can say "Morgen regnet es". In Finnish you can say "huomenna on sateista". In both sentences a present statement is used to make predictions about the future.

[3]In English you can either say "It will rain tomorrow" or "It is going to rain tomorrow" to talk about future weather conditions. Thus, you have to apply a future tense making predictions.

the LSH: Under the context of suicide, talking about the future in a distant tense weakens the pain and unhappiness that will occur in the future which leads to fewer suicide commitments. When it comes to religiosity, weak-FTR's value future rewards of being faithful (as an afterlife in heaven) more highly since they locate it closer to their own temporal position.

Furthermore, it was shown that firms located in weak-FTR language countries are less myopic, give less weight to short-term income targets (Fasan et al., 2016), hold more cash (Chen et al., 2017), and face less problems with underinvestment compared to firms which are located in strong-FTR language countries (Kim et al., 2021). Moreover, the investment in research, development and patent generation is higher in weak-FTR language countries (Chi et al., 2020; Kong et al., 2022).

To isolate cultural motives as potential drivers of their findings, some studies compared the behavior in weak-FTR's regions with the behavior in strong-FTR's regions of the same country (Chen, 2013; Chen et al., 2017). Another focus was on differences in decision-making of weak-FTR and strong-FTR speakers who are located in multilingual regions such as South-Tirol, Italy (Sutter et al., 2018) or Röstigraben, Switzerland (Herz et al., 2020). Nevertheless, the question remains whether cultural motives might affect the findings (Roberts et al., 2015). Therefore, this project uses a different approach to disentangle cultural motives and examines the role of close and distant tenses for intertemporal decision-making *within* one language.

Literature on the role of linguistic framing for decision-making

The literature has shown that linguistic framing plays an important role for decision-making. It proved to impact the engagement in tasks (Bruttel et al., 2021), the willingness to share money with another individual (Brañas-Garza, 2007), intertemporal choices (Faralla et al., 2017) or the willingness to take risks (He, 2017). In this context, linguistic framing took different shapes. It referred to the application of native or foreign language, (Geipel et al., 2015; Costa et al., 2014a), the variation of social contexts, (Capraro and Vanzo, 2019; Stark et al., 2019) the variation of outcomes in terms of losses or gains (Tversky and Kahneman, 1985), the usage of pronouns (He, 2017) or phrases (Bruttel et al., 2021).

The effect of linguistic framing was often different for males and females (e.g. Fujimoto and Park, 2010; Ellingsen et al., 2013; Chowdhury et al., 2017; Stark et al., 2019). Bruttel and Stolley (2018) showed that only males allocated more money due to statements which highlighted their responsibility whereas only females allocated more money due to statements which referred to their decision power and freedom of choice in a dictator game. Making use of a dictator game as well, Chowdhury et al. (2017) observed that females allocated more and men allocated less money under a taking-frame than under a giving-frame. When it comes to the ultimatum game, Sarlo et al. (2013) reported that males accepted more offers if the offers were framed as gains ("I give you") instead of losses ("I take") compared to females. Furthermore, Schubert et al. (1999) as well as Fagley and Miller (1997) showed

that women were more risk averse in a gain-frame but less risk averse in the loss-frame compared to men. Hasseldine and Hite (2003) revealed that males' tax compliance increased significantly if the consequences of non-compliance were framed negative, whereas females' tax compliance significantly increased if the consequences of compliant behavior were framed positive. Fujimoto and Park (2010) reported that women contributed significantly more to a good in a negative frame compared to males and Mayer and Tormala (2010) found that females reacted more positively to statements which involved the word "feel", whereas males reacted more positively to statements which involved the word "think".

There is also evidence on gender differences due to linguistic framing in intertemporal decision-making. If the statements which refer to the smaller but sooner rewards not only contain the size of the reward (as the later rewards do) but also the difference to the later reward framed as penalty, males chose significantly more often the smaller but sooner rewards compared to females. Interestingly, if the statements which are associated with the smaller but sooner and larger but later rewards are framed similarly, no gender differences occurred (Faralla et al., 2017).

I contribute to the literature on linguistic framing by providing evidence on the role of tenses for intertemporal decision-making. Thereby, I place a focus on potential gender differences.

4.3 Methods

4.3.1 German as research object

I need a language which enables to speak in a close *and* distant tense about the future to answer my research question. In this context, I make use of the German language. In general, German can be classified as weak-FTR language. This goes back to the opportunity to use the German tense *Präsens* in prediction-based contexts. *Präsens*, which main purpose lays in the marking of present events (Fandrych, 2018), is formed by a verb stem and a suitable personal ending. However, it can be used to talk about the future if adverbs of future time (like soon and tomorrow) or adverbial phrases of future time (like on Tuesday, next summer) are considered as in the following example: "Ich schreibe Dir *morgen* eine Mail."[4] Using Präsens in prediction-based contexts associates a present tense with a statement about the future.

Apart from *Präsens*, German speakers are also able to use the tense *Futur 1* in prediction-based contexts. *Futur 1* refers only to future events and does not require adverbs or adverbial phrases of future time. It is formed by the German counterpart to the English word "will" - *werden* - which directly refers to a future action and an infinitive as in the following example: "Ich *werde* Dir eine Mail schreiben."[5] Using *Futur 1* in prediction-based contexts results in the disassociation of the

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[4]Directly translated into English this would mean "I write a mail to you *tomorrow*."

[5]Translated into English this would mean "I *will* write a mail to you." As you can see *Futur 1* in German is closely related to the *will-future* in English.

present and the future. If *Futur 1* would be the only grammatical tense in the German language to apply to the future, German would be classified as a strong-FTR language.

Transferring the underlying assumptions of the LSH to the different grammatical tenses in German, I would assume that the use of *Präsens* makes future events to be felt nearer because *Präsens* can be classified as a close tense. Similarly the use of *Futur 1* makes future events to be felt more distant since *Futur 1* can be classified as distant tense.

4.3.2 Experimental Design

I implement an incentivized laboratory experiment with two treatments in a between-subject design. In both treatments a multiple price-list - which is often used to observe intertemporal behavior (e.g. Coller and Williams, 1999; Dittrich and Leipold, 2014; Sutter et al., 2018; Chen et al., 2019; Herz et al., 2020) - stands at the center of the decision-making.

In my design the multiple price list consists of 11 binary decisions between two future rewards. The rewards differ with regard to the amount and the payment date. One reward is in all but 1 decision smaller and will always be paid after three weeks (hereafter referred to as the sooner reward). The other reward will be paid always after six weeks (hereafter referred to as the later reward). The sooner reward is fixed at 7.00 €. The later reward varies between 7.00 € and 12.00 € in steps of 0.50 €.[6] The treatments differ in the way I frame the sooner payment dates linguistically. In the treatment CLOSE I associate the earlier rewards with a statement in a close tense (*Präsens*), whereas in the treatment DISTANT I associate the earlier rewards with a statement in a distant tense (*Futur 1*). The later payment dates in both treatments are associated with a statement in a distant tense. I manipulate the earlier rewards instead of the later rewards since individuals tend to place a larger value on sooner rewards (Odum, 2011; Woolley and Fishbach, 2018) and less emotional attention to delayed rewards (Albrecht et al., 2013). These findings suggest that individuals might be less attentive to the linguistic manipulation of later rewards which, in turn, is in line with the finding of Chen et al. (2019): By examining the link between future tense and time preference within the Chinese language they varied the wording of the later choices using different Chinese tenses but found no treatment-effect.

Table 4.1 shows the linguistic manipulation in CLOSE, Table 4.2 the linguistic manipulation in DISTANT. In this context, X represents a proxy for the financial reward associated with the later payments dates, varying between 7.00 € and 12.00 €. Section 4.7.3 shows screenshots of the decision stages in both treatments from the experiment.

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[6]This gradation of the rewards was chosen due to individual switching points revealed in previous studies (Sutter et al., 2018; Herz et al., 2020).

Reward	Statement	Statement translated in English
Sooner Reward	"Sie erhalten 7.00 € in drei Wochen."	"You receive 7.00 € in three weeks."
Later Reward	"Sie werden X € in sechs Wochen erhalten."	"You will receive X € in six weeks."

Table 4.1: An overview of treatment CLOSE

Reward	Statement	Statement translated in English
Sooner Reward	"Sie werden 7.00 € in drei Wochen erhalten."	"You will receive 7.00 € in three weeks."
Later Reward	"Sie werden X € in sechs Wochen erhalten."	"You will receive X € in six weeks."

Table 4.2: An overview of treatment DISTANT

4.3.3 Hypothesis

Based on the assumptions of the LSH that the application of a close tense referring to future rewards makes these to be felt temporally nearer compared to the usage of a distant tense, my linguistic manipulation should have the following effect: the association of the sooner future rewards with a close tense (*Präsens*) in treatment CLOSE should make these rewards to be felt temporally nearer compared to the same rewards in treatment DISTANT which are associated with statements in a distant tense (*Futur 1*). Keeping in mind that individuals place more value on earlier rewards even if they are smaller (e.g. Read and van Leeuwen, 1998; O'Donoghue and Rabin, 1999; DellaVigna and Malmendier, 2006), I expect individuals to prefer to a larger extent the smaller but sooner future rewards in CLOSE compared to DISTANT.

Hypothesis: Individuals in the treatment CLOSE prefer to a larger extent the smaller but sooner future rewards compared to individuals in the treatment DISTANT.

4.3.4 Procedure

Experimental sessions took part from October 14 until December 16, 2021 at Potsdam Laboratory for Economic Experiments (PLEx). At the beginning of each experimental session, the participants had to sign an informed consent form. Subsequently, the experiment started at the screen whereby the computer's software assigned the participants to CLOSE or DISTANT at random. After having read the instructions, the participants made their decisions.[7] Subsequently, the participants had to answer questions of a post-experimental questionnaire in which they were asked for their age, financial well-being, gender as well as whether German reflects their native language and potential bilingualism. These aspects proved to play a significant role for intertemporal decision-making (Harrison et al., 2002; Read and Read, 2004; Jappelli and Pistaferri, 2010; Dittrich and Leipold, 2014; Carvalho

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[7]Please find the instructions (translated into English) in section 4.7.1.

et al., 2016; Pérez and Tavits, 2017) and language-dependent decision-making (Basnight-Brown and Altarriba, 2007; Schoonbaert et al., 2007; Keysar et al., 2012a; Costa et al., 2014a; Bruttel and Stolley, 2018).

At the end of the experiment, the participants were informed about their payment and the payment date. The payments were transferred[8] to the participants after three or six weeks - dependent on the individual choices and the random mechanism. The experiment took about 15-20 minutes. It was approved by an ethics committee (German Association for Experimental Economic Research e.V.) and computerized with ztree (Fischbacher, 2007). For the recruitment process I made use of ORSEE (Greiner, 2015). Data and codes are available in an Open Science Framework repository which can be accessed via this link: `https://osf.io/rwd6x/?view_only=c32053cff49941fa9ef22cd3bb616930`

4.3.5 Participants

In total 174 individuals took part in the experimental sessions. About 48 percent of the participants were randomly assigned by the computers software to the treatment CLOSE. The participants were on average 22.40 years old (*Standard Error* = 0.28) and earned on average 9.18 € (*Standard Error* = 0.13) by taking part in the experiment.[9] About 54 percent of the participants were male.

4.4 Results

I start my data analysis with focusing on the share of individuals who preferred smaller but sooner (7.00 € in three weeks) over larger but later rewards (7.50 - 12.00 € in six weeks) across the two treatments CLOSE and DISTANT. A larger share of individuals prefers smaller but sooner over larger but later rewards in the treatment CLOSE (Figure 4.1a). However, this tendency diminishes with growing size of the later reward. This finding is similar to the one of Herz et al. (2020) who compared intertemporal choices between German (weak-FTR's) and French people (strong-FTR's). If I focus on the amount of smaller but sooner choices by treatment variation (Figure 4.1b)[10], I observe that participants in CLOSE choose on average more smaller but sooner rewards (1.800 smaller but sooner rewards, *Standard Error* = 0.271) compared to participants in DISTANT (1.589 smaller but sooner rewards, *Standard Error* = 0.240). This finding is in line with my hypothesis but not statistically significant ($p = 0.282$, one-sided t-test / $p = 0.330$, one-sided Wilcoxon rank-sum test).

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[8]Keeping transaction costs constant, I transferred the money to the participant's bank account.

[9]9.16 € corresponded to 10.40 $ at the time of the experimental sessions.

[10]Due to the fact in 10 out of 11 binary choices one reward was smaller (the sooner one), the participants could make 10 smaller choices at most.
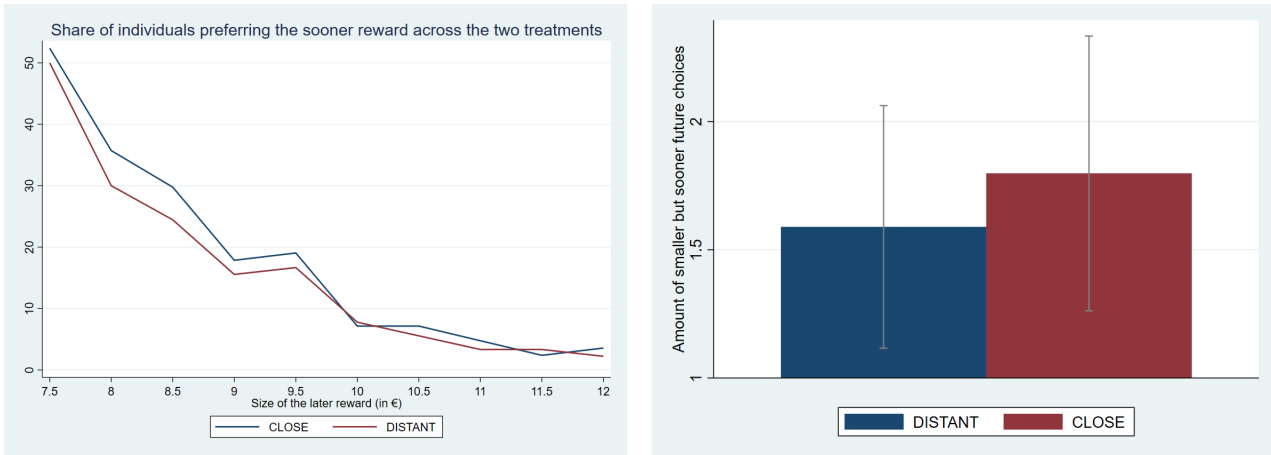
(a) Shares of individuals preferring smaller but sooner (7.00 €) over larger but later rewards across the two treatments (in %)

(b) Amount of smaller and sooner future rewards chosen across the two treatments with 95% intervals

Figure 4.1: Smaller but sooner future rewards by treatment variation

I proceed by analyzing the individual switch-point across the two treatments. The switch-point shows at which size of the later reward the participants switch from the smaller but sooner one. This procedure is established in the literature on multiple price lists (e.g. Chen et al., 2019; Herz et al., 2020) and gives evidence on the willingness to pay for earlier rewards.

In my study 89% of the participants reveal a single switch-point. They switch at a certain size of the later reward from the smaller but sooner one and prefer before switching the sooner and after switching the later reward. These individuals will be the main focus of my further analysis.[11],[12] However, I will also refer to the results of non-unique switchers later.

Figure 4.2a shows at which sizes of the later rewards the participants decide to switch across the two treatments. Participants with an unique switch-point switch mainly at the lower sizes of the later rewards from the smaller but sooner one in both treatments. In Close, in which we associated the sooner rewards with a statement in a close tense and the later rewards with a statement in a distant tense, the average switch-point is 8.032 ($Standard\ Error = 0.122$). In Distant, in which we associate the sooner and later rewards with a statement in a distant tense, the average switch-point

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[11] There are lots of studies (Holt and Laury, 2002; He, 2017; Sutter et al., 2018; Epperson and Gerster, 2021) which dropped observations who made it difficult to estimate a reasonable switch-point from the main data analysis. Thus, my procedure is in line with other literature applying multiple price lists in either lottery or intertemporal choice tasks.

[12] For my study I aimed at 153 independent observations across the two treatments to analyze individual switch-points. This target size goes back to an assumed effect size of $f^2 = 0.052$ (based on an increase of R^2 of 0.05 by my model).

I oriented at the studies of He (2017) and Bruttel and Stolley (2018) as well as the sample size of Chen et al. (2019) which reported 155 observations in linguistic manipulation of Taiwans to calculate the appropriate effect and sample size. In this context, $f^2 = 0.052$ is in the range between a small ($f^2 = 0.02$) and a medium effect size ($f^2 = 0.15$) according to Cohen (1988). I aim at a power of at least 0.80 and a p-value (α) of 0.05. 153 independent observations were calculated with G*Power (Faul et al., 2007). Thus, keeping only unique switchers into account (154) my sample size should be large enough to reach a power of at least 0.80.

is 7.985 ($Standard\ Error = 0.116$) (see, Figure 4.2b). The difference is not statistically significant ($p = 0.391$, one-sided t-test / $p = 0.324$, one-sided Wilcoxon rank-sum test).
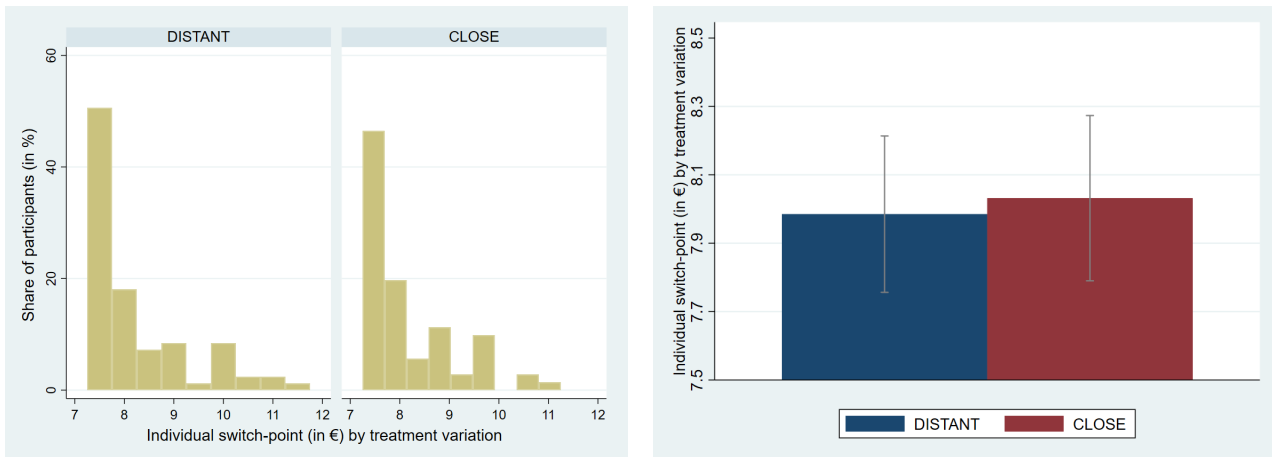
(a) Frequency of individual switch-points across the two treatments (in %)

(b) Average individual switch-point from the smaller but sooner to the larger but later reward in € by treatment variation with 95% intervals

Figure 4.2: Individual switch-points across the two treatments

I continue my data analysis by running regressions (see, Table 4.3) and include CLOSE as my variable of interest. CLOSE takes the value 0 if the participant takes part in DISTANT and 1 if the participant takes part in CLOSE. I consider as control variables female (takes the value 1 if the participant is female), age, financial well-being (takes the value 1 if the participant is able to pay a sudden bill of 400 € from his income or savings), German native speaker (takes the value 1 if the participant's native language is German) as well as Bilinguality (which takes the value 1 if the participant was raised bilingual with German and a strong-FTR language).[13]

At first I run regressions on the individual switch-point by using a tobit model (model (1a)), whereby I censor the data at the lower limit (7.25). Subsequently, I apply an OLS model (model (2a)) to check the robustness of my findings. Although the treatment variation from DISTANT to CLOSE has - in line with my expectation - a positive effect on the individual switch-point, the estimates fail to be statistically significant.

There are also studies which use multiple price lists and do not focus on the individual switch-point

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[13]In the questionnaire I controlled for potential bilinguality. Based on the answers of the participants and according to the overview of weak- and strong-FTR languages as described in Chen (2013), I could assign individuals who were raised bilingual with a weak-FTR language (German) and a strong-FTR language (for instance, English, Russian, Turkish in my experiments) to one group. This seems to be useful as the findings of Pérez and Tavits (2017) and Ayres et al. (2020) have shown and the significant effects in my regression models underscore.

About 1% of the participants stated to be of diverse gender. For simplicity of the data analysis, I assigned them to the group of females. However, if I would exclude them from the data analysis or use in the regressions female as a continuous instead of a binary variable to account for diverse individuals my main findings would stay the same.

in the regression analysis. Instead, they analyze the amount of specific choices (e.g. He, 2017). I also run regressions on the amount of smaller but sooner rewards as further robustness check. This procedure enables me to include those who reveal no unique switch-point. In this case, the lower limit is censored at 0 in the tobit model. I find that individuals choose in total more smaller but sooner rewards in CLOSE in a tobit (model (1b)) and an OLS model (model (2b)). These estimates fail to be statistically significant too.

Table 4.3: Regression analysis

	Individual switch-point				Amount of smaller choices			
	(1a)	(2a)	(3a)	(4a)	(1b)	(2b)	(3b)	(4b)
CLOSE	0.376	0.088	0.813**	0.467**	0.920	0.363	1.816**	1.047**
	(0.294)	(0.173)	(0.380)	(0.231)	(0.621)	(0.363)	(0.829)	(0.493)
CLOSE x Female			-1.039*	-0.855**			-2.003	-1.498**
			(0.577)	(0.351)			(1.232)	(0.740)
Female	-0.592**	-0.336*	-0.137	0.032	-0.665	-0.307	0.278	0.392
	(0.296)	(0.177)	(0.381)	(0.230)	(0.616)	(0.366)	(0.836)	(0.500)
Age	0.025	0.026	0.011	0.015	0.083	0.081	0.055	0.062
	(0.047)	(0.027)	(0.046)	(0.027)	(0.101)	(0.058)	(0.100)	(0.059)
Financial Well-Being	-0.813**	-0.381	-0.792**	-0.374	-0.943	-0.248	-0.918	-0.232
	(0.376)	(0.236)	(0.368)	(0.231)	(0.823)	(0.510)	(0.811)	(0.505)
German Native Speaker	-1.533**	-0.734**	-1.711***	-0.877**	-3.056**	-1.536**	-3.344***	-1.743**
	(0.586)	(0.356)	(0.583)	(0.354)	(1.225)	(0.756)	(1.223)	(0.755)
Bilingual (weak & strong-FTR)	-1.050*	-0.511*	-0.937*	-0.472	-2.590**	-1.241*	-2.434**	-1.201*
	(0.551)	(0.307)	(0.538)	(0.301)	(1.217)	(0.658)	(1.195)	(0.651)
Constant	8.076***	8.077***	8.300***	8.157***	-0.239	0.410	0.136	0.510
	(1.707)	(0.968)	(1.639)	(0.950)	(3.737)	(2.113)	(3.665)	(2.092)
N	154	154	154	154	174	174	174	174
$Pseudo\ R^2$	0.124		0.132		0.095		0.100	
R^2		0.269		0.303		0.261		0.281
$Regression\ Model$	Tobit	OLS	Tobit	OLS	Tobit	OLS	Tobit	OLS

Note: Standard errors are in parantheses. All models include session-dummies. *** p<0.010, ** p<0.050, * p<0.100

My results show no general treatment-effect of my linguistic manipulation. However, the literature has shown that gender makes a difference for intertemporal decision-making and for the effect of linguistic framing (e.g. Mayer and Tormala, 2010; Ellingsen et al., 2013; Dittrich and Leipold, 2014). Therefore, I introduce an interaction term CLOSE x Female to check potential gender effects.

I find a significant and positive main effect of CLOSE on the individual switch-point as well as a significant negative effect for the interaction term CLOSE x Female for a tobit (model (3a)) and an OLS regression (model (4a)). For a better interpretation of my findings, Figure 4.3a displays the predictive margins. Males switch later in CLOSE compared to DISTANT, whereby this difference is statistically significant ($p = 0.045$). The contrary result holds for females: they switch later in DISTANT compared to CLOSE. However, this finding is *not* statistically significant ($p = 0.137$).[14]

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[14]This holds for both models (tobit and OLS). Here, I showed the marginsplot of model (4a) since the significance

Whereas males and females' switching behavior is not different in DISTANT ($p = 0.890$), males switch significantly later in CLOSE compared to females ($p = 0.002$). If I investigate the interaction of gender and the treatment variation for the amount of smaller but sooner choices my findings are similar (regression models (3b) and (4b)). For this case, Figure 4.3b shows the predictive margins. Here, I find a significant effect of the treatment variation when it comes to males as well: they choose to a larger extent the smaller but sooner rewards if they are associated with a statement in a close tense (CLOSE) instead of a distant tense (DISTANT) ($p = 0.035$). The treatment-variation had no impact for females' decisions to select smaller but sooner rewards too ($p = 0.404$).
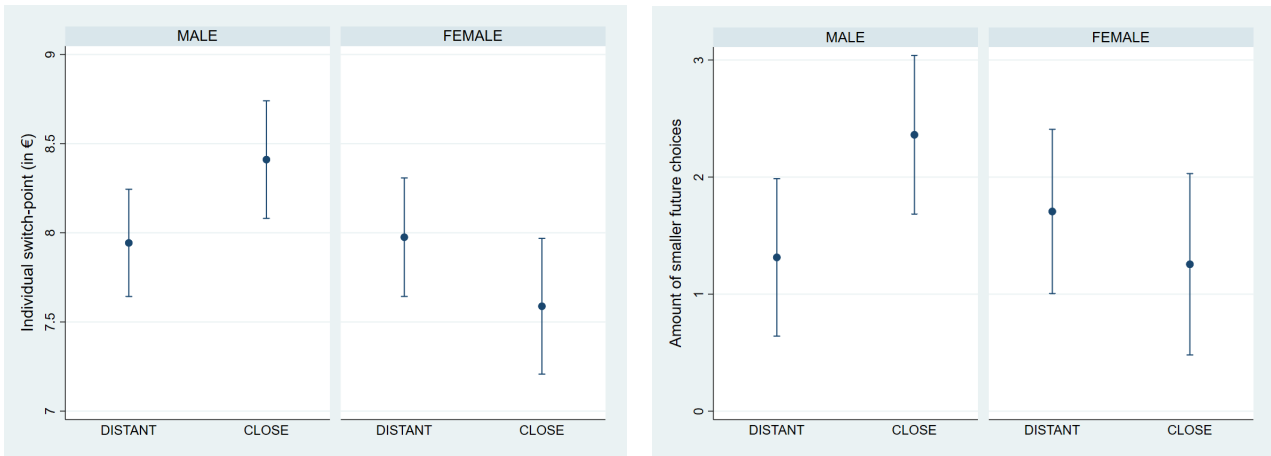
(a) Linear prediction of the treatment variation on the individual switch-point by gender

(b) Linear prediction of the treatment variation on the amount of smaller but sooner future rewards by gender

Figure 4.3: Linear predictions of the treatment variation on the individual switch-point/amount of smaller future choices by gender with 95% intervals

To sum up, my results show support for my hypothesis that individuals prefer to a larger extent smaller but sooner rewards over larger but later ones in CLOSE compared to DISTANT since they switch later. However, this result holds exclusively for males. For females, I find no significant effect of the treatment-variation. I observe these results although gender is not differently distributed across the two treatments ($p = 0.66$, two-sided proportion test).[15]

4.5 Discussion and Conclusion

Against the background of the increasingly discussed "Linguistic Saving Hypothesis" (Chen, 2013), I studied whether the targeted use of a close and a distant tense affects intertemporal decision-making

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level of the interaction effect proved to be higher ($p = 0.016$) which made it more likely to find a significant difference between the two treatments when it comes to females and their switching-behavior.

[15]Table 4.4 in the appendix shows the summary statistics of the control variables across the two treatments.

within one language. In this context, I decided to choose the German language to answer my research question since German enables its speakers to talk about the future either in a close or in a distant tense. I implemented a consequential laboratory experiment with German students on decisions between two rewards which were available at different dates in the future. Thereby, I varied the tenses with which I described the sooner future rewards between a close tense (treatment CLOSE) and a distant tense (treatment DISTANT).

My results show - in line with my prediction - a stronger preference for smaller but sooner over larger but later rewards in CLOSE compared to DISTANT. Interestingly, this finding holds exclusively for males. For females I find no effect of my treatment-variation. This finding is new in the literature on the LSH (Chen, 2013) and on linguistic framing for economic decision-making (Mayer and Tormala, 2010; Ellingsen et al., 2013; Chowdhury et al., 2017; Bruttel and Stolley, 2018).

In general there is lot of support that males and females treat with language differently. In this context, the term "gender-as-culture" has been proposed (Mulac et al., 2001) to highlight structural contrasts. For instance, males use more often prepositions, numbers, swearwords and articles compared to females (see, for an overview Schwartz et al., 2013). In contrast, females refer more often to family and friends in their language and use more frequently negations (see, for an overview Newman et al., 2008). Besides, previous studies have shown that males' and females' economic responses to linguistic stimuli are often significantly different (Mayer and Tormala, 2010; Ellingsen et al., 2013; Chowdhury et al., 2017; Bruttel and Stolley, 2018). My findings provide new evidence on the role of "gender-as-culture" in linguistics. While the studies of Newman et al. (2008) and Schwartz et al. (2013). have already reported that males and females use tenses significantly different in their daily lives[16], I additionally show that they also react differently to the variation of tenses when making economic choices.

My findings are complementary to those of Faralla et al. (2017) on gender differences due to framing in intertemporal choices. They did not find gender differences if the wording for the sooner and later rewards are similarly (treatment *standard monetary choice questionnaire*) which is in line with our finding in DISTANT in which we framed both rewards in a distant tense and find no gender differences either. However, Faralla et al. (2017) observed that males selected significantly more often the smaller but sooner rewards compared to females once the wording of the sooner rewards changed compared to *standard monetary choice questionnaire* and contains also information on the difference to the later reward (treatment *explicit penalty choice questionnaire*). We find a similar pattern in CLOSE in which we changed the wording of the sooner rewards compared to DISTANT. Then, we also find that males choose significantly more often compared to females the smaller but sooner rewards.

My study has limitations. For example, I can only make a statement about the effect of a targeted use of close and distant tenses of the German language on intertemporal behavior. Therefore, it

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[16]Both studies reported that females use present significantly more often compared to males in their daily lives. However, they mainly focused on the English language in which present tense cannot be used in prediction-based contexts which makes their results hard to compare with our findings.

seems worth to study the targeted use of close and distant tense within further languages aside German and Chinese (Chen et al., 2019) which also enable their speakers to use both tenses when referring to the future. In this context, future research projects may involve languages, such as Danish, Dutch or Japanese to name just a few. Nevertheless, my findings can be used by policy-makers in German-speaking countries (Austria, German, Switzerland) as well as German-speaking regions (such as, South Tirol in Italy) to attain more socially desirable outcomes when it comes to males. For instance, policy-makers could highlight the positive future effects of vaccinations and professional dental cleaning, such as a lower probability to get infected or to undergo a serious surgery by using *close tense* instead of *distant tense* when referring to future benefits to make such actions more attractive. In this context, the variation of *close* and *distant tenses* might reflect a useful nudge.

4.6 Special acknowledgements

4.7 Appendix

4.7.1 Instructions

Welcome and thank you very much for your participation in this experiment. From now on we ask you to remain seated in your booth and do not talk with other participants anymore. Please turn also your electronic devices off. It is very important that you follow these rules. Otherwise, you will be excluded from this experiment and from the payment. If you have technical problems please raise your hands. During the experiment it is possible that you have to wait for some time. This is no error in the program but refers to the fact that the experiment can only proceed if all participants have left a stage.

Please read the following instructions carefully. If you have questions with regard to the instructions please raise you hands.

You are making decisions in an experiment today. In this context, you make in total 11 decisions between two financial rewards (**Option A** and **Option B**).

You receive Option A in three weeks.[17]   **You will receive Option B in six weeks.**

If you have made all your decisions, one of the 11 decisions will be selected at random. You will be informed about the randomly selected decision. We will carry out this decision and transfer the money at the specific date to you.

---

[17]**You receive Option A in three weeks** was the wording in Close. In treatment Distant it was replaced by **You will receive Option A in three weeks.**

4.7.2 Balance of Covariates

	Treatment DISTANT	Treatment CLOSE	Difference
Female	0.458	0.423	0.035
	(0.055)	(0.059)	$p = 0.660$
Age	22.181	22.662	-0.481
	(0.373)	(0.500)	$p = 0.434$
Financial Well-Being	0.831	0.817	0.014
	(0.041)	(0.046)	$p = 0.815$
German Native Speaker	0.940	0.915	0.025
	(0.026)	(0.033)	$p = 0.560$
Bilingual (weak & strong-FTR)	0.048	0.141	-0.093
	(0.024)	(0.041)	$p = 0.046$

Table 4.4: Summary statistics of control variables

Note: Reporting means with standard deviations in parentheses based on the 154 observations which I focused on mainly. Difference column reports mean difference: CLOSE minus DISTANT and p-values based on two-sided t-tests and two-sided proportion tests.

4.7.3 Screenshots

Figure 4.4: Decisions in CLOSE in original German language

Figure 4.5: Decisions in CLOSE translated into English

Figure 4.6: Decisions in DISTANT in original German language

Figure 4.7: Decisions in DISTANT translated into English

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