Focusing model and preference reversals across domains

Geoffrey Castillo*

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Similar anomalies have been documented in risky choice, intertemporal choice, and choice across social distances. I explain this similarity with the focusing model of Kőszegi and Szeidl (2013). The model gives a unique explanation to the common ratio effect, the common difference effect, the common social distance effect, and magnitude effects. It also provides a characterisation of procedural preference reversals between choice and valuation. I confirm in a laboratory experiment the existence of these preference reversals with social distances.

Keywords: preference reversals, focusing effect, risky choice, intertemporal choice, social distance
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1 Introduction

A substantial literature shows that risk and time are connected: anomalies observed in one domain have their counterpart in the other domain; and adding, say, risk to

*Vienna Centre for Experimental Economics, University of Vienna, Austria. geoffrey.castillo@univie.ac.at. I am indebted to Nick Netzer who was at the source of this project. I thank Mohammed Abdallaoui, Despoina Alempaki, Robin Cubitt, Daniel Seidmann and Chris Starmer for their comments on earlier versions. I also thank numerous seminar and conference participants for helpful comments. The Nottingham School of Economics Research Ethics Committee approved the experiment reported in this paper.

a decision problem brings forth the same phenomena as would adding time.[1] To explain this connection, some have argued that risk comes before time, for delaying a reward makes it more risky. Others, that time comes before risk: if a random process repeats every period, a low-probability event will on average happen later than a high-probability one.[2]

I provide a new explanation using the model of Kőszegi and Szeidl (2013), according to which people put more weight on attributes that differ more in their choice set. I show that this 'focusing effect' explains the anomalies observed in the different domains. It also makes new predictions in the domain of social distances, one of which I verify in a laboratory experiment.

To apply Kőszegi and Szeidl's (2013) model across domains I use the concept of psychological distance. Psychological distances measure the distance between us and things that we cannot directly experience: things that are unlikely, remote in time, or experienced by others. Construal level theory (Liberman et al., 2007; Trope and Liberman, 2010) has shown how these distances—risk, temporal distance, social distance—are manifestations of a unique psychological distance.[3] It has also shown that people use the same mental processes to 'traverse psychological distance', whatever the specific type.[4] As a consequence, whether people deal with risk, with time, or with social distances, they will use the same mental processes.

Focusing, the mental process at the heart of Kőszegi and Szeidl (2013), has a long tradition in psychology. For example, Goldstein (1990) asked subjects to rate 6 apartments characterised by monthly rent and time to walk to campus. Some subjects faced a wide spread of rents, from $250 to $500. Others faced a narrow spread, from $300 to $400. Goldstein found that subjects cared more about rent

[1] See the early observations by Rotter (1954) and Quiggin and Horowitz (1995). For empirical evidence, see in psychology Benzion et al. (1989); Chapman and Weber (2006); Keren and Roelofsma (1995); Weber and Chapman (2005a); and in economics, Anderhub et al. (2001); Baucells and Heukamp (2010); Dean and Ortoleva (2015). Finally, see Prelec and Loewenstein (1991) for a comparison of the anomalies of expected utility and exponential discounting.

[2] For the first approach see Baucells and Heukamp (2010); Epper et al. (2011); Halevy (2008). For the second one see Rachlin et al. (2000, 1987, 1986, 1991); Rachlin and Siegel (1994).

[3] Some studies have shown that one distance affects the perception of others (Bartels and Rips, 2010; Pronin et al., 2008; Pronin and Ross, 2006; Stephan et al., 2011; Wakslak, 2012; Yi et al., 2011). Others have directly studied the interplay between the distances and the mechanisms behind their perception (Bar-Anan et al., 2007; Fiedler et al., 2012; Maglio et al., 2013).

[4] In time see temporal construal theory (Liberman and Trope, 1998; Trope and Liberman, 2000, 2003). In risk see Todorov et al. (2007); Wakslak and Trope (2009); Wakslak et al. (2006). More generally see Liberman and Trope (2008, 2014) for reviews.

when rent was widely spread. Similar evidence comes from the weight-change literature and the similarity literature (Mellers and Biagini, 1994) that broadly found that people place more weight on attributes that are more outspread.[5]

One of the main innovations of this paper is the application of the model to social distances. The model assumes that people have a social discount function, meaning that people discount money received by others as a function of the social distance. This assumption can be traced back to Smith and Edgeworth and matches a large number of observations from economics and psychology. The model transposes well-known anomalies from the risk and time domain to the social distance domain and predicts preference reversals between choice and valuation of allocations characterised by an amount of money and a social distance.

I test this prediction in a laboratory experiment where I study and measure real social distances. The experiment demonstrates how social distances can be studied in the laboratory and confirms the prediction of the model.

These preference reversals mean that, for example, recruiters who judge job candidates on their potential productivity and on how well they would fit in the company, inferred from the social distance between recruiters and candidates, would make different hiring decisions if they directly chose between the candidates or if they first assigned a value to each candidate and then selected the candidate with the highest value. To take another example, contingent valuation studies of projects involving social distances, for instance if they impact different communities or countries, would not reveal true preferences, which might lead one to implement the wrong project.

The model considered in this paper is a special case Kőszegi and Szeidl (2013). While they consider general options with K attributes and additive utility, I restrict to two-attribute prospects and add assumptions on the utility functions to get a multiplicative representation. The mechanics of the model then follow directly from their work. I show how their focusing model can be repurposed to explain preference reversals in different domains.

As previously mentioned there are other explanations to the link between risk and time, for example Baucells and Heukamp (2012). Compared to these models

[5]For the weight-change literature, see Fischer (1995); Mellers and Cooke (1994); von Nitzsch and Weber (1993); Wedell (1998); Wedell and Pettibone (1996). For the similarity literature, see also Mellers et al. (1992a,b).

the advantage of my approach is the use of a single effect, the focusing effect, to provide a simple explanation of the parallels between the domains. The explanation is independent of the domains and so can be easily extended to other domains, such as the domain of social distances. It also easily captures preference reversals between choice and valuation, which these papers do not consider.

The approach is also closely related to Prelec and Loewenstein (1991), who use two functions—one to capture attitude toward probabilities or delays, the other the attitude toward amounts of money—and impose restrictions on their shape to explain the parallels between risky choice and intertemporal choice. I complement their work by showing that focusing may explain *why* the functions change their shape in the first place.

2 Focusing model applied to time, risk and social distances

2.1 Setup

The agent faces two-attribute prospects $\omega = (x, d) \in \mathcal{C} \subseteq X \times D$. x is an amount of money, $x \in X = [0, +\infty[$, while d measures the psychological distance between the agent and an option, $d \in D = [0, +\infty[$. Following Prelec and Loewenstein's (1991) terminology, d has a positive polarity if a larger d improves the prospect, and a negative polarity otherwise. Under a minimal set of axioms (see Prelec and Loewenstein, 1991, for details), there exist functions u and f_d capturing attitudes toward money and psychological distance such that the agent's utility is $U(x, d) = f_d(d)u(x)$ with $u(0) = 0$.

I consider three psychological distances. When we interpret d as a date t, the prospects are simple delayed payments (x, t), indicating an amount of money x received at a date t. Because we prefer to receive money sooner than later t has a negative polarity, implying a decreasing $f_t(t)$. The discounted utility model being the standard model of intertemporal choice, I take $f_t(t) = \delta^t$ with δ the temporal discount factor.

When we interpret d as a probability p, the prospects become simple binary gambles (x, p) indicating an amount of money x received with probability p. We prefer sure money to risky money so p has a positive polarity, implying an increasing $f_p(p)$. In risky choice the standard model is expected utility: $f_p(p) = p$.

Finally, when d is a social distance s we deal with allocations (x, s) that provide an amount of money x to a person or a group socially separated from the agent by a social distance s. Like t, s has a negative polarity, implying a decreasing $f_s(s)$. In the literature $f_s(s)$ is referred to as the social discount function: people discount payments received by others as a function of the social distance. This idea stems from Smith (1759) and, even more explicitly, from Edgeworth (1881);[6] and since then several studies have verified that people care about social distances and that decreasing social distance increases generosity.[7]

Previous studies have revealed similarities between time and social distances (Bartels and Rips, 2010; Pronin et al., 2008; Pronin and Ross, 2006; Stephan et al., 2011; Yi et al., 2011), leading researchers to use functionally equivalent models to describe decision-making in the presence of one or the other (Goeree et al., 2010; Jones and Rachlin, 2006; Rachlin and Jones, 2008; Vekaria et al., 2017). Therefore I take $f_s(s) = \sigma^s$ where σ is the social discount factor.

2.2 Focus-weighted utility

But instead of maximising U, the agent actually maximises the *focus-weighted utility*

$$\tilde{U}(x, d; \mathcal{C}) = f_d(d)^{g_d} u(x)^{g_x} \tag{1}$$

in which g_d is the weight on psychological distance d and g_x the weight on money x. The weights are determined as follows:

Assumption 1 (Attribute ranges)**.** The weights are given by $g_d = g\Big(\Delta_d(\mathcal{C})\Big)$ and

[6]For a discussion of altruism and social distances in the works of Edgeworth, see Collard (1975). For a discussion of sympathy in the works of Adam Smith, see Sally (2001).

[7]For example, in dictator games, dictators are less generous under double-blind procedures that increase the subjective social distance between dictators and receivers (Hoffman et al., 1994, 1996), and more generous when identification increases, thus decreasing the social distance (Bohnet and Frey, 1999a,b; Charness and Gneezy, 2008; Frey and Bohnet, 1997). Minimal groups (Chen and Li, 2009; Tajfel et al., 1971) and natural groups (Klor and Shayo, 2010; Ruffle and Sosis, 2006) also generate subjective and objective social distance and affect generosity. Similarly, distance on a network decreases generosity (Brañas-Garza et al., 2010; Goeree et al., 2010; Leider et al., 2009).

$g_x = g\Big(\Delta_x(\mathcal{C})\Big)$ where

$$\Delta_d(\mathcal{C}) = \max_{\omega\in\mathcal{C}} f_d(d) - \min_{\omega\in\mathcal{C}} f_d(d) \qquad \text{and} \qquad \Delta_x(\mathcal{C}) = \max_{\omega\in\mathcal{C}} u(x) - \min_{\omega\in\mathcal{C}} u(x),$$

and the function $g(\Delta)$ is strictly increasing in Δ.

Equation (1) is a special case of Kőszegi and Szeidl (2013) who consider options with K-attributes $c = (c_1, \ldots, c_K) \in \mathcal{C}$ and write the focus-weighted utility as $\tilde{U}(c, \mathcal{C}) = \sum_{k=1}^{K} g_k \cdot u_k(c_k)$. To obtain a multiplicative form, necessary to study the parallels between the different domains, I restrict to simple prospects, $K = 2$, and use the utility functions $u_1 = \ln u$ and $u_2 = \ln f_d$.

Keeping with Kőszegi and Szeidl's (2013) terminology, the set $\mathcal{C}$ is the consideration set: the agent only considers options in $\mathcal{C}$ and only these affect the ranges and so the weights.

The results we will see hold with a general, strictly increasing g. To simplify the notation I assume that g is linear, which makes ranges and weights interchangeable:

Assumption 2 (Linearity of g)**.** $g(\Delta_d) = \Delta_d$ and $g(\Delta_x) = \Delta_x$.

I also ignore the subscript on f_d, unless needed.

Simple algebra shows that U and $\tilde{U}$ make the same predictions in case of dominance, $u(x_1) > u(x_2)$ and $f(d_1) > f(d_2)$. Therefore, assume that one option is psychologically closer and that the other offers more money:

Assumption 3. $\omega_1 = (x_1, d_1)$ and $\omega_2 = (x_2, d_2)$ are such that $f(d_1) > f(d_2)$ and $u(x_2) > u(x_1)$. As a consequence,

$$\Delta_d = f(d_1) - f(d_2) \qquad \text{and} \qquad \Delta_x = u(x_2) - u(x_1).$$

3 Preference reversals across domains

3.1 Simple preference reversals in choice

In simple pairwise choice only ratios of attributes matter for U: $U(x_1, d_1) = U(x_2, d_2) \Leftrightarrow \frac{f(d_1)}{f(d_2)} = \frac{u(x_2)}{u(x_1)}$. So choice has no reason to change as long as the attribute ratios stay constant.

For $\tilde{U}$, however, attribute differences also matter:

Proposition 1 (Simple reversals)**.** *Assume that* $\tilde{U}(\omega_1;\mathcal{C}) = \tilde{U}(\omega_2;\mathcal{C})$.

(1) If d_1 *and* d_2 *change such that* $f(d_1)/f(d_2) = f(d_1')/f(d_2')$, *then* $\tilde{U}(\omega_1;\mathcal{C}) > \tilde{U}(\omega_2;\mathcal{C})$ *if and only if* $\Delta_d' = f(d_1') - f(d_2') > \Delta_d = f(d_1) - f(d_2)$.

(2) If x_1 *and* x_2 *change such that* $u(x_2)/u(x_1) = u(x_2')/u(x_1')$, *then* $\tilde{U}(\omega_2;\mathcal{C}) > \tilde{U}(\omega_1;\mathcal{C})$ *if and only if* $\Delta_x' = u(x_2') - u(x_1') > \Delta_x = u(x_2) - u(x_1)$.

Proof. (1) $\tilde{U}(\omega_1;\mathcal{C}) = \tilde{U}(\omega_2;\mathcal{C}) \Leftrightarrow (f(d_1)/f(d_2))^{\Delta_d} = (u(x_2)/u(x_1))^{\Delta_x}$. Now change d_1', d_2' such that $f(d_1')/f(d_2') = f(d_1)/f(d_2)$. $\tilde{U}(\omega_1;\mathcal{C}) > \tilde{U}(\omega_2;\mathcal{C}) \Leftrightarrow (f(d_1')/f(d_2'))^{\Delta_d'} > (u(x_2)/u(x_1))^{\Delta_x}$ occur if and only if $\Delta_d' > \Delta_d$.
(2) Similar. □

Hence, *increasing* the range of an attribute tilts choice toward the option better in *this* attribute. An interpretation is that increasing the range increases the attention of the agent toward this attribute.

Note the contrapositive of Proposition 1; for example, $\tilde{U}(\omega_2;\mathcal{C}) > \tilde{U}(\omega_1;\mathcal{C})$ if and only if $\Delta_d' < \Delta_d$. In other words, *decreasing* the range of an attribute tilts choice toward the option better in the *other* attribute. The focusing effect is thus the mirror of the similarity effect of Mellers and Biagini (1994), by which attributes receive less weight when their range decreases.

Proposition 1 coincides with well-known anomalies in the different domains once we replace the general psychological distance d with delays t, probabilities p or social distances s.

3.1.1 Application to time

Common difference. Let $t_1 = t$ and $t_2 = t + \tau$ with $\tau > 0$. We have $\omega_1 \sim \omega_2 \Leftrightarrow u(x_1)/u(x_2) = \delta^\tau$. Hence, if τ stays constant, U predicts the same choice in pairs (ω_1, ω_2) for any t. In the discounted utility model this property comes from the stationarity axiom.

However, the range $\Delta_t = \delta^t - \delta^{t+\tau} = \delta^t(1 - \delta^\tau)$ is decreasing in t. So, if t increases, Proposition 1 predicts that the agent chooses ω_2. Similarly, if t decreases, the agent chooses ω_1. This pattern is the common difference effect (Benzion et al., 1989; Thaler, 1981).[8] Typically interpreted as hyperbolic discounting, it is here the result of focusing.

[8] See Frederick et al. (2002) for many additional references.

Magnitude effect with time. Instead, let $u(x_1) = u(x)$ and $u(x_2) = \beta u(x)$ with $\beta > 1$. We have $\omega_1 \sim \omega_2 \Leftrightarrow \delta^{t_1 - t_2} = \beta$. Similarly to the common difference example, if β stays constant then U predicts the same choice in pairs (ω_1, ω_2) for any $u(x)$. This is a consequence of the separation between attitude toward time and attitude toward money in the discounted utility model.

However, $\Delta_x = u(x)(\beta - 1)$ is increasing in $u(x)$, so if $u(x)$ increases Proposition 1 predicts that the agent chooses ω_2. In other words, as $u(x)$ increases the agent becomes more patient. This is the magnitude effect (Kirby, 1997; Thaler, 1981).[9]

3.1.2 Application to risk

Common ratio. Let $p_1 = p$ and $p_2 = \alpha p$ with $\alpha \in]0, 1[$. We have $\omega_1 \sim \omega_2 \Leftrightarrow u(x_1)/u(x_2) = \alpha$. Hence, if α stays constant, U predicts the same choice in pairs (ω_1, ω_2) for any p. In expected utility theory this property comes from the independence axiom.

But $\Delta_p = p - \alpha \cdot p = p(1 - \alpha)$ is increasing in p, so if p increases Proposition 1 predicts that the agent chooses ω_1; and, if p decreases, the Proposition predicts that the agent chooses ω_2. This is the common ratio effect (Allais, 1953; Kahneman and Tversky, 1979).[10] Researchers have explained it with the fanning-out of indifference curves or with decision weights (Starmer, 2000); for us it results, again, from focusing.

Magnitude effect with risk. The magnitude effect in the risk domain operates as in the time domain: U predicts the same choice in pairs (ω_1, ω_2) for any $u(x)$; increasing $u(x)$, however, increases Δ_x and Proposition 1 predicts that the agent chooses ω_2. In other words, as $u(x)$ increases the agent becomes more risk *tolerant*.

At first glance this prediction contradicts the peanuts effect, which says that increasing x makes people more risk *averse* (Markowitz, 1952; Weber and Chapman, 2005b). However, the prediction and the peanuts effect are slightly different: in the prediction above the *utilities* increase, but in the peanuts effect the *amounts of money* increase.[11] Note further that the 'reverse peanuts effect', closer to the

[9] See again Frederick et al. (2002) for additional references.

[10] See also Battalio et al. (1990); Carlin (1992); Starmer and Sugden (1989), and finally Starmer (2000) for more references.

[11] The prediction and the peanuts effect contradict each other only if u is homogeneous of degree 1, in which case increasing the payoffs while keeping their ratio constant also increases the

prediction above, is also sometimes observed (Chapman and Weber, 2006; Jones and Oaksford, 2011; Weber and Chapman, 2005b).

3.1.3 Application to social distances

Common social distance. Let $s_1 = s$ and $s_2 = s + \tau$ with $\tau > 0$. We have $\omega_1 \sim \omega_2 \Leftrightarrow \frac{u(x_1)}{u(x_2)} = \sigma^\tau$, which does not depend on s. Hence, if τ stays constant, U predicts the same choice in pairs (ω_1, ω_2) for any s. In other words, only the degree of separation τ between the recipients of the allocations should matter, not the distance s between the agent and the closest recipient.

However, $\Delta_s = \sigma^s - \sigma^{s+\tau} = \sigma^s(1 - \sigma^\tau)$ is decreasing in s. Proposition 1 thus predicts that, for small social distances, the agent favours the closest recipient and chooses ω_1; but that, for large social distances, the agent favours the more distant recipient and chooses ω_2. Social discounting is then hyperbolic, similarly to what happens in the time domain.

Hyperbolic social discounting has been observed in psychology but only with hypothetical social distances (Bradstreet et al., 2012; Jones and Rachlin, 2006, 2009; Rachlin and Jones, 2008; Sharp et al., 2012). In economics, Goeree et al. (2010) observed an hyperbolic social discount function after measuring social distances on a network.

Magnitude effect with social distances. As we already did for previous magnitude effects, assume now $u(x_1) = u(x)$ and $u(x_2) = \beta u(x)$ with $\beta > 1$. We have $\omega_1 \sim \omega_2 \Leftrightarrow u(x_2)/u(x_1) = \beta$: U predicts the same choice as long as β stays constant.

However, Δ_x is increasing in $u(x)$, creating a magnitude effect. We should thus observe people favouring their close friends over distant strangers for small amounts of money but then favouring the strangers for sufficiently large amounts.

3.2 Preference reversals between choice and valuation

Simple pairwise choice is one way to get at people's preferences. There is a second one: asking people to report a valuation for each option, typically a monetary equivalent, and comparing the valuations. The two elicitation procedures should

utilities while keeping their ratio constant.

reveal the same preferences; instead, researchers have found that different procedures reveal different preferences (see Seidl, 2002, for a review of this literature). I will now show how the model provides an intuitive explanation of these preference reversals.

Imagine an experiment where subjects face ω_1 and ω_2 and complete two tasks. In the first task, 'Choice', they make a pairwise choice between ω_1 and ω_2. As we have already seen the consideration set is $\mathcal{C}^{\text{C}} = \{\omega_1, \omega_2\}$ and the ranges are $\Delta_x = u(x_2) - u(x_1)$ and $\Delta_d = f(d_1) - f(d_2)$.

In the second task, 'Monetary Valuation', subjects report an amount of money x_i^{MV} that makes them indifferent between the option ω_i and $(x_i^{\text{MV}}, 0)$. $(x_i^{\text{MV}}, 0)$ is the monetary valuation of ω_i. I model the process of forming a monetary valuation as a sequence of choices between ω_i and the implicit options $\left\{(x_i^{\text{MV}}, 0),\ x_i^{\text{MV}} \in [0, x_i]\right\}$, or $\left\{(x_i^{\text{MV}}, 0)\right\}_0^{x_i}$ for short. The smallest valuation considered by a subject is 0; the largest is the amount of money offered by the option. The consideration set resulting from these many implicit options is $\mathcal{C}_i^{\text{MV}} = \left\{\omega_i, \left\{(x_i^{\text{MV}}, 0)\right\}_0^{x_i}\right\}$, which generates the ranges

$$\Delta_{x,i}^{\text{MV}} = u(x_i),$$
$$\Delta_{d,i}^{\text{MV}} = f(0) - f(d_i),$$

both represented in Figure 1. The monetary valuations are such that $\tilde{U}(\omega_1; \mathcal{C}_1^{\text{MV}}) = \tilde{U}(x_1^{\text{MV}}, 0; \mathcal{C}_1^{\text{MV}})$ and $\tilde{U}(\omega_2; \mathcal{C}_2^{\text{MV}}) = \tilde{U}(x_2^{\text{MV}}, 0; \mathcal{C}_2^{\text{MV}})$. If $x_1^{\text{MV}} > x_2^{\text{MV}}$, ω_1 is indirectly revealed preferred to ω_2.

Comparing Choice and Monetary Valuation, we say that

Definition 1. A subject has a consistent preference for ω_1 if ω_1 is chosen and ω_1 receives a higher monetary valuation; and a consistent preference for ω_2 if ω_2 is chosen and ω_2 receives a higher monetary valuation.

A subject exhibits a *standard preference reversal* if ω_1 is chosen and ω_2 receives a higher monetary valuation; and a *counter preference reversal* if ω_2 is chosen and ω_1 receives a higher monetary valuation.

The terms 'standard' and 'counter' come from the preference reversal literature, which found that people tend to choose close and small-stake options but report higher valuations for distant and large-stake options.

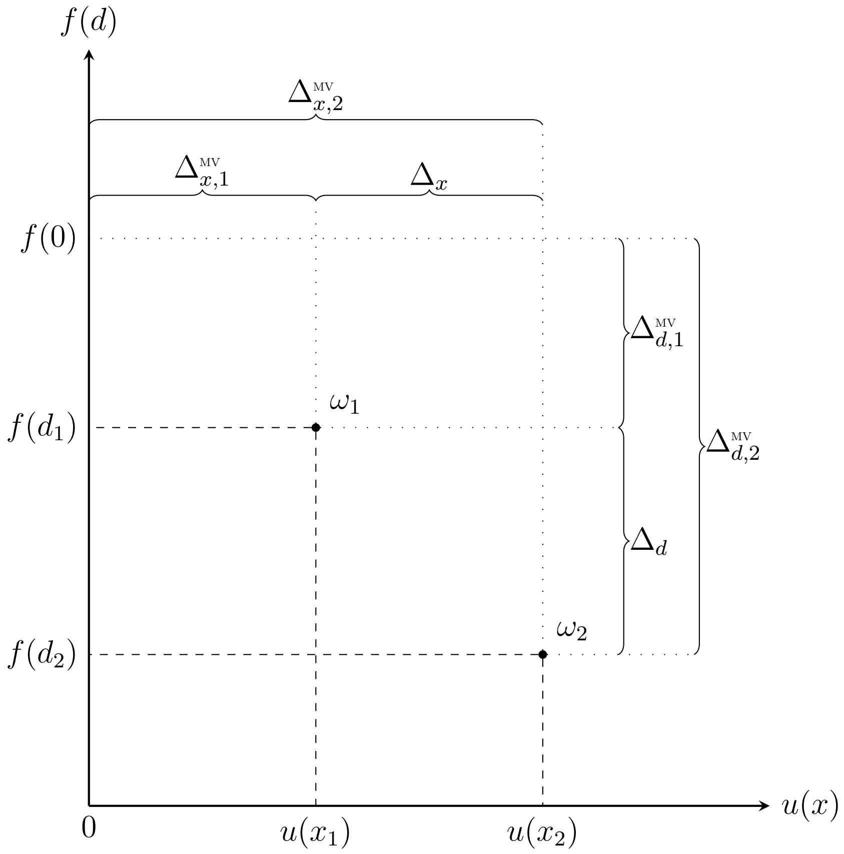


Figure 1: Parameters and ranges in Choice and Monetary Valuation.

With all the elements in place, I can now characterise preference reversals between choice and valuation.

Proposition 2 (Reversals between choice and valuation)**.** *The agent exhibits a standard preference reversal if*

$$\left(\frac{f(d_1)}{f(d_2)}\right)^{\frac{\Delta_d}{\Delta_x}} > \frac{u(x_2)}{u(x_1)} > \frac{\Big(f(d_1)/f(0)\Big)^{\Delta^{\text{MV}}_{d,1}/\Delta^{\text{MV}}_{x,1}}}{\Big(f(d_2)/f(0)\Big)^{\Delta^{\text{MV}}_{d,2}/\Delta^{\text{MV}}_{x,2}}},$$

and a counter preference reversal if the inequalities are reversed.

Proof. If the agent chooses ω_1 in Choice, $\tilde{U}(\omega_1;\mathcal{C}^{\text{c}}) > \tilde{U}(\omega_2;\mathcal{C}^{\text{c}}) \Leftrightarrow f(d_1)^{\Delta_d}u(x_1)^{\Delta_x} > f(d_2)^{\Delta_d}u(x_2)^{\Delta_x} \Leftrightarrow (f(d_1)/f(d_2))^{\Delta_d/\Delta_x} > u(x_2)/u(x_1)$, which gives the first inequality.

Then, from the Monetary Valuation of ω_1, we have

$$\tilde{U}(\omega_1; \mathcal{C}_1^{\text{MV}}) = \tilde{U}(x_1^{\text{MV}}, 0; \mathcal{C}_1^{\text{MV}}) \Leftrightarrow f(d_1)^{\Delta_{d,1}^{\text{MV}}} u(x_1)^{\Delta_{x,1}^{\text{MV}}} = f(0)^{\Delta_{d,1}^{\text{MV}}} u(x_1^{\text{MV}})^{\Delta_{x,1}^{\text{MV}}}$$
$$\Leftrightarrow u(x_1^{\text{MV}}) = u(x_1) \left(\frac{f(d_1)}{f(0)}\right)^{\Delta_{d,1}^{\text{MV}}/\Delta_{x,1}^{\text{MV}}},$$

and similarly from the Monetary Valuation of ω_2,

$$\tilde{U}(\omega_2; \mathcal{C}_2^{\text{MV}}) = \tilde{U}(x_2^{\text{MV}}, 0; \mathcal{C}_2^{\text{MV}}) \Leftrightarrow u(x_2^{\text{MV}}) = u(x_2) \left(\frac{f(d_2)}{f(0)}\right)^{\Delta_{d,2}^{\text{MV}}/\Delta_{x,2}^{\text{MV}}}.$$

Then, preference for ω_2 is indirectly revealed in Monetary Valuation if

$$x_2^{\text{MV}} > x_1^{\text{MV}} \Leftrightarrow u(x_2) \left(\frac{f(d_2)}{f(0)}\right)^{\Delta_{d,2}^{\text{MV}}/\Delta_{x,2}^{\text{MV}}} > u(x_1) \left(\frac{f(d_1)}{f(0)}\right)^{\Delta_{d,1}^{\text{MV}}/\Delta_{x,1}^{\text{MV}}}$$
$$\Leftrightarrow \frac{u(x_2)}{u(x_1)} > \frac{\big(f(d_1)/f(0)\big)^{\Delta_{d,1}^{\text{MV}}/\Delta_{x,1}^{\text{MV}}}}{\big(f(d_2)/f(0)\big)^{\Delta_{d,2}^{\text{MV}}/\Delta_{x,2}^{\text{MV}}}},$$

which gives the second inequality. □

The first inequality in Proposition 2 means that the agent chooses ω_1. The second inequality ensures that the agent gives a higher monetary valuation to ω_2. In the model preference reversals arise because the attributes, money and psychological distance, are subject to different attribute ranges in Choice and Monetary Valuation and so are weighted differently, giving rise to different revealed preference.

Since standard preference reversals come primarily from the overvaluation of ω_2 (Cubitt et al., 2004; Tversky et al., 1990), let us focus on the second inequality and do simple comparative statics.

Corollary 2.1. *The larger the spread between $f(d_1)$ and $f(d_2)$, the less pronounced the overpricing of ω_2.*

Proof. Fix $f(d_2)$ and take $f(d_1) = f(d_2) + \Delta_d$. The right-hand term of the inequality in Proposition 2 becomes

$$\frac{\Big(\big(f(d_2) + \Delta_d\big)/f(0)\Big)^{(f(0)-f(d_2)-\Delta_d)/\Delta_{x,1}^{\text{MV}}}}{\big(f(d_2)/f(0)\big)^{\Delta_{d,2}^{\text{MV}}/\Delta_{x,2}^{\text{MV}}}}.$$

The top-part of this fraction increases as Δ_d increases, bringing it closer to the middle term of the inequality in Proposition 2. □

This Corollary to Proposition 2 predicts that the more dissimilar ω_1 and ω_2 are in terms of psychological distance, the less ω_2 is going to be overpriced in Monetary Valuation and so the less should we observe preference reversals.

Preference reversals of this type have been observed with time (Tversky et al., 1990) and with risk (Cubitt et al., 2004; Lichtenstein and Slovic, 1971, 1973; Lindman, 1971; Plott and Grether, 1979; Seidl, 2002), but they still have not been observed with social distances:

Preference reversals between choice and valuation with social distances. For some ω_1 and ω_2 people choose the allocation ω_1 but report a higher monetary valuation for ω_2.

I will verify these predictions in an experiment.

4 An experiment on preference reversals between choice and valuation involving social distances

As we have already seen, the basic elements of a preference reversal experiment are as follows: In Choice, subjects choose between ω_1 and ω_2; in Monetary Valuation, they report for each option an amount of money that makes them indifferent between this amount and that option. If the preference reversal phenomena carries over to the social distance domain, standard preference reversals should be more common than counter preference reversals. We first need to translate this basic setup to the social domain.

4.1 Experimental design

4.1.1 Social distances in the laboratory

In principle the model accommodates two types of social distance: social distance between individuals, and social distance between individuals and social groups. The experiment studies both types with two separate settings. In the first one, the 'Faculty Setting', I invited subjects from a given faculty at the University of Nottingham, and the allocations benefited students from other faculties. In the second setting, the 'Charity Setting', the allocations benefited charities.

To construct ω_1 and ω_2 we need to be able to tell what are small and large social distances, therefore we need to measure them. For the distance between individuals I use the Inclusion of Other in the Self scale (Aron et al., 1992). This measure has proven popular in psychology (see for example Aron and Mashek, 2004; Aron et al., 2004; Cialdini et al., 1997) and has recently entered the toolbox of economists (Gächter et al., 2015, 2017). Its counterpart to measure the social distance between individuals and groups is the Inclusion of Ingroup in the Self scale (Schubert and Otten, 2002; Tropp and Wright, 2001; Wright et al., 2004).

I conducted online surveys using these measures to find small and large social distances. For the Faculty Setting I invited students from all faculties at the University of Nottingham and administered the Inclusion of Other in the Self scale with targets being students from other Faculties. Members of the Faculty of Arts reported the greatest difference between members of the Faculty of Social Sciences and the Faculty of Engineering. Therefore, I decided to invite members of the Faculty of Arts in the Faculty Setting, with members of the Faculty of Social Sciences serving as recipients in ω_1 and members of the Faculty of Engineering serving as recipients in ω_2. For the Charity Setting I administered the Inclusion of Ingroup in the Self scale with one of several charities as the target. Participants reported that Cancer Research UK was their closest charity, and The Salvation Army, their most distant; these charities were thus selected as recipients in ω_1 and ω_2.

To isolate the effect of the social distances, the experiment controlled for selfish motives by having allocations that never benefited the subjects themselves. For example, in the Faculty Setting subjects chose between a member of the Faculty of Arts receiving a small amount or a Member of the Faculty of Engineering receiving a large amount, but the subjects themselves received the same show-up fee regardless. The experiment also controlled for reputation concerns and second-order beliefs by making the recipients of the allocations unaware of the experiment. For them receiving money was a surprise and appeared to come from the experimenters. Finally I controlled for social image concerns by running the experiment double-blind. The assistants checking the register were the only ones to know the names of the subjects, they stayed outside the laboratory and they were blind to the treatment. Effectively, subjects knew that we could never find who made which choice.

4.1.2 Tasks and procedures

In the two settings, the payment in ω_1 was fixed at £5 and the payment in ω_2 varied between £6 and £10, resulting in five pairs of allocations: (£5, £6), (£5, £7), (£5, £8), (£5, £9) and (£5, £10). For each pair, subjects made a pairwise Choice and reported their Monetary Valuation for each allocation, so in total subjects made 5 Choices and reported 6 Monetary Valuations. Figure 2 gives a sample of these and subsequent tasks.

In addition, subjects completed the Inclusion of Other in the Self (in the Faculty Setting) or the Inclusion of Ingroup in the Self (in the Charity Setting) scales. This way, we can check for each subject whether what we call small and large social distances matches their perception of the social distances. Subjects in the Charity Setting also indicated how familiar they were with Cancer Research UK and The Salvation Army. The order of the tasks was randomised independently for each subject.

The ordinal payoff scheme (Cubitt et al., 2004; Tversky et al., 1990) made Choice and Monetary Valuation strategically equivalent: At the end of the experiment a random mechanism chose a pair of allocations. Then, for this pair of allocations another random mechanism chose Choice or Monetary Valuation. If Choice was selected then we implemented the allocation that the subject chose; if Monetary Valuation was selected then we implemented the allocation that received the higher valuation. The instructions (see Appendix A) explained the ordinal payoff scheme in details and featured control questions.

I implemented the allocations as follows. If, in the Faculty Setting, the allocation to implement was, for example, £7 to a member of the Faculty of Engineering, a member of the Faculty of Engineering was invited to participate in the Charity Setting and was paid £7 at the end of this experiment. Participants in the Faculty Setting were provided the date, time and location of the experiments featuring the participants of the Charity Setting and they were actively encouraged to come monitor the payments. In the Charity setting, Cancer Research UK and The

Option A: We give £5 to *the member of the Faculty of Social Sciences*
Option B: We give £10 to *the member of the Faculty of Engineering*

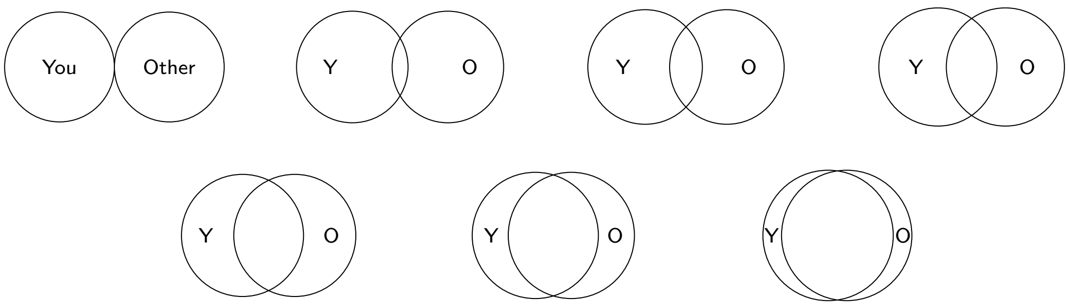
Choose **A** or **B**:

How much money *given to you* would be just as good as us giving £6 to *the Salvation Army*?

Please write the amount here:

We will refer to this amount as your equivalence valuation of giving £6 to the Salvation Army.

Please consider the member of the Faculty of Engineering. Select the pair of circles that best represents how you feel toward *the member of the Faculty of Engineering*:



Indicate your answer by drawing a line around the pair of circles you select.

Indicate how familiar you are with *The Salvation Army* by ticking one of the following options:

- ☐ I have never heard of it
- ☐ I have only heard the name
- ☐ I know the name but I have only a vague idea of what it does
- ☐ I know the name and I have a good idea of what it does

Figure 2: Examples of the tasks.

Salvation Army were also paid as a result of the ordinal payoff scheme and the choices of the participants. Participants in the Charity Setting were told that we would send them the receipts of the donations, which we did.

4.2 Results

The experiment was conducted in the CeDEx laboratory at the University of Nottingham. Subjects were recruited with ORSEE (Greiner, 2015). 108 subjects participated in the experiment (56 in the Faculty setting and 52 in the Charity setting) over 6 sessions between mid-December 2014 and mid-January 2015. The average payment was £10.9 (SD = £3.5) and the average session lasted 1 hour 15 minutes.

4.2.1 Preference reversals

A subject is *Consistent for* ω_1 if she chooses ω_1 and reports a weakly higher Monetary Valuation for ω_1; and *Consistent for* ω_2 if she chooses ω_2 and reports a weakly higher Monetary Valuation for ω_2. A subjects commits a *Standard Reversal* if she chooses ω_1 but reports a strictly higher Monetary Valuation for ω_2; and a *Counter Reversal* if she chooses ω_2 but reports a strictly higher Monetary Valuation for ω_1.

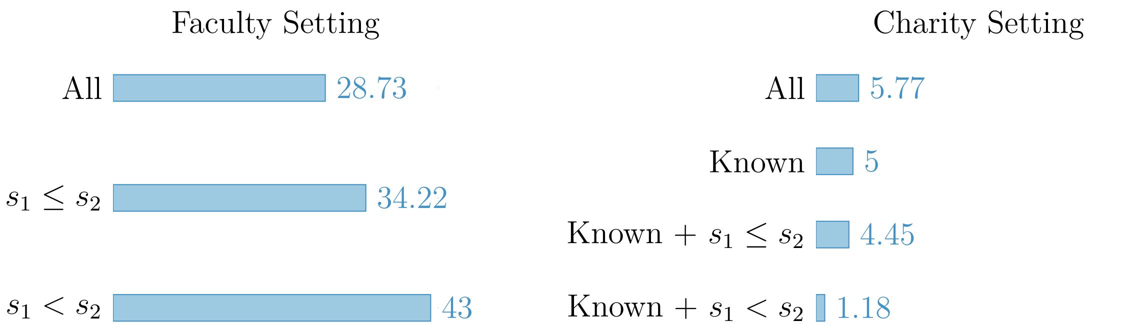
Table 1 reports the frequencies of these patterns for each parameter set and at the aggregate level. For the time being focus on the column 'All' that looks at the raw data without any added requirement, so we have 56 subjects in the Faculty Setting and 52 subjects in the Charity Setting. Note that some subjects are consistent for ω_1; if none were they would have simply maximised the amount of money of the allocation. Instead subjects traded off social distance and money, a result that goes in the same direction as the literature on social distance reviewed previously.

Following Cubitt et al. (2004) we say that there is a preference reversal phenomenon if the proportion of Standard Reversals is greater than the proportion of Counter Reversals; or, equivalently, if the net proportion of reversals (proportion of Standard Reversals minus proportion of Counter Reversals) is significantly greater than 0. Figure 3 displays this net proportion aggregating over all parameter sets.

Table 1: Frequencies of the different patterns, for each parameter set and for each Setting.

		Faculty			Charity			
		All	$s_1 \leq s_2$	$s_1 < s_2$	All	Known	Known $+ s_1 \leq s_2$	Known $+ s_1 < s_2$
(£5,£6)	Consistent for ω_1	11	10	6	23	13	12	10
	Consistent for ω_2	22	17	4	22	20	13	6
	Standard reversal	18	16	9	5	3	2	1
	Counter reversal	4	2	1	2	0	0	0
(£5,£7)	Consistent for ω_1	9	9	4	16	8	8	7
	Consistent for ω_2	23	17	6	23	21	13	6
	Standard reversal	19	18	9	10	6	5	3
	Counter reversal	4	1	1	3	1	1	1
(£5,£8)	Consistent for ω_1	4	2	1	15	7	7	6
	Consistent for ω_2	26	19	7	29	26	17	9
	Standard reversal	20	19	10	4	1	1	0
	Counter reversal	5	5	2	4	2	2	2
(£5,£9)	Consistent for ω_1	3	3	2	13	5	5	4
	Consistent for ω_2	25	17	7	30	27	19	10
	Standard reversal	25	23	10	5	2	1	1
	Counter reversal	2	2	1	4	2	2	2
(£5,£10)	Consistent for ω_1	1	1	0	11	5	5	4
	Consistent for ω_2	34	27	10	29	27	18	10
	Standard reversal	16	14	10	8	3	3	2
	Counter reversal	4	3	0	4	1	1	1
Aggregate	Consistent for ω_1	28	25	13	78	38	37	31
	Consistent for ω_2	130	97	34	133	121	80	41
	Standard reversal	98	90	48	32	15	12	7
	Counter reversal	19	13	5	17	6	6	6

Notes. $s_1 \leq s_2$: recipient of ω_1 received a weakly higher Inclusion of Other in the Self (in the Faculty Setting) or Inclusion of Ingroup in the Self (in the Charity Setting) score than recipient of ω_2; $s_1 < s_2$: strictly higher.
Known: subject indicated for both charities 'I know the name but I have only a vague idea of what it does' or 'I know the name and I have a good idea of what it does'.



Notes. $s_1 \leq s_2$: recipient of ω_1 received a weakly higher Inclusion of Other in the Self (in the Faculty Setting) or Inclusion of Ingroup in the Self (in the Charity Setting) score than recipient of ω_2; $s_1 < s_2$: strictly higher. Known: subject indicated for both charities 'I know the name but I have only a vague idea of what it does' or 'I know the name and I have a good idea of what it does'.

Figure 3: Net proportion of preference reversals, at the aggregate and by Setting.

At a glance we see that the preference reversal phenomenon is prevalent in the Faculty Setting but that it is much smaller in the Charity Setting.

To test for the preference reversal phenomenon I rely on one-sided McNemar tests. Table 2 reports the corresponding χ^2 values and significance levels We see that in the Faculty Setting the preference reversal phenomenon is significant for all parameter sets. In the Charity Setting, it is significant only for one parameter set and at the aggregate level. This result confirms what we saw in Figure 3: preference reversals are more pronounced in the Faculty Setting.

In the Charity Setting, however, some subjects might have been unfamiliar with Cancer Research UK or The Salvation Army. To control for this, 'Known'—in Table 1 and Figure 3—only looks at subjects who indicated for both charities 'I know the name but I have only a vague idea of what it does' or 'I know the name and I have a good idea of what it does'. This requirement decreases the number of subjects available for analysis in the Charity Setting to 36. In Figure 3 we see that preference reversals decrease but Table 1 shows that they stay significant at the aggregate level.

We can also control for the perception of social distances using the Inclusion of Other in the Self (in the Faculty Setting) and the Inclusion of Ingroup in the Self (in the Charity Setting) scores reported by the subjects during the experiment. The allocations are correctly constructed when the recipient of ω_1 is socially closer than the recipient of ω_2, $s_1 \leq s_2$, otherwise subjects face no trade-off between amounts

Table 2: Tests of the preference reversal phenomenon, McNemar's χ^2 and significance levels.

	Faculty			Charity			
	All	$s_1 \leq s_2$	$s_1 < s_2$	All	Known	Known + $s_1 \leq s_2$	Known + $s_1 < s_2$
(£5,£6)	8.91***	10.89***	6.40***	1.29	3.00**	2.00*	1.00
(£5,£7)	9.78***	15.21***	6.40***	3.77**	3.57**	2.67*	1.00
(£5,£8)	9.00***	8.70***	5.33**	0.00	0.33	0.33	2.00*
(£5,£9)	19.59***	17.64***	7.36***	0.11	0.00	0.33	0.33
(£5,£10)	7.20***	7.12***	10***	1.33	1.00	1.00	0.33
Aggregate	53.34***	57.56***	34.89***	4.59**	3.86**	2.00*	0.08

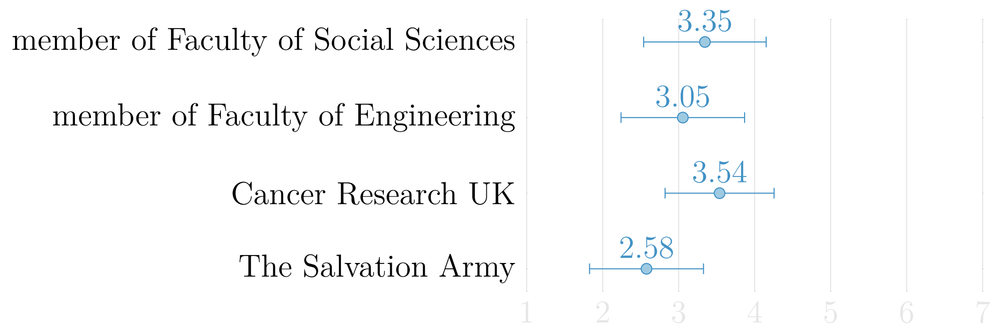
Notes. One-sided McNemar tests. One, two, and three symbols indicate significance at $\alpha = 0.1$, 0.05, and 0.01.
$s_1 \leq s_2$: recipient of ω_1 received a weakly higher Inclusion of Other in the Self (in the Faculty Setting) or Inclusion of Ingroup in the Self (in the Charity Setting) score than recipient of ω_2; $s_1 < s_2$: strictly higher.
Known: subject indicated for both charities 'I know the name but I have only a vague idea of what it does' or 'I know the name and I have a good idea of what it does'.

of money and social distance.

The scores range from 1 to 7 with a larger score meaning for us a smaller social distance. Imposing the requirement that $s_1 \leq s_2$—that the recipient of ω_1 received a weakly higher score than the recipient of ω_2— decreases the number of subjects to 45 in the Faculty Setting and to 27 in the Charity Setting. With a strict inequality, $s_1 < s_2$, the number of subjects drops to 20 and 17. Figure 3 shows that these requirements increase the net proportion of preference reversals in the Faculty Setting but decrease it in the Charity Setting. Despite the small sample size, Table 2 shows that preference reversals remain significant in the Faculty Setting. In the Charity Setting, however, the significance decreases and ultimately vanishes.

4.2.2 Social distances

Why are preference reversals less frequent in the Charity Setting? Corollary 2.1 gives us a clue: social distances might have been more spread out in the Charity Setting than in the Faculty Setting, thus creating less overpricing of ω_2 in Monetary Valuation. Indeed, students of the Faculty of Social Sciences and of the Faculty of Engineering have a lot in common—they study in the same city, in the same university and even sometimes in the same buildings, and they also share extra-curricular activities—whereas Cancer Research UK and The Salvation Army are



Notes. The scores obtained with the Inclusion of Other in the Self scale and the Inclusion of Ingroup in the Self scale range between 1 and 7, 7 corresponding to the smallest social distance. Error bars represent one standard deviation.

Figure 4: Average of the reported Inclusion of Other in the Self (Faculty Setting) and Inclusion of Ingroup in the Self (Charity Setting) scores.

nothing alike—they use different means to reach different goals and they attract different kinds of people.

Figure 4 reveals the averages of the Inclusion of Other in the Self (Faculty Setting) and the Inclusion of Ingroup in the Self (Charity Setting) scores. As anticipated, in the Faculty Setting subjects perceived similarly a member of the Faculty of Social Sciences and a member of the Faculty of Engineering: the difference is not significant (two-sided Wilcoxon signed rank test, exact $p = 0.1428$) and 25 out of 55 subjects (45%) reported the same score for both. On the other hand in the Charity Setting subjects thought Cancer Research UK and The Salvation Army were different: the difference is significant (two-sided Wilcoxon signed rank test, exact $p < 0.001$) and only 11 out of 52 subjects (25%) reported the same scores.

Therefore, more spread out social distances do indeed engineer less preference reversals. This result further confirms the predictions of the model.

5 Conclusion

To explain the similarities between risky choice and intertemporal choice I have used Kőszegi and Szeidl's (2013) model based on a simple psychological mechanism: people put more weight on attributes that differ more. The model explains the common ratio effect, the common difference effect, and magnitude effects as a result of the focusing effect. It also gives a simple characterisation of preference reversals between choice and valuation. Since the model does not depend on a particular domain, I apply it to choice across social distances. One of the new predictions of the model is that we should observe preference reversals between choice and valuation when the options involve social distances. I confirm this prediction in a laboratory experiment, which further gives support to the model.

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Appendices

Appendix A Instructions

The next pages reproduces the instructions used in the Faculty Setting. They are here reproduced two-pages-on-one to save space. Instructions in the Charity Setting were similar, except that they mentioned charities instead of Faculties and that the subjects were told that we would send them the receipts of the donations after the experiment.

Instructions

Welcome to the experiment. It is composed of two parts: Part 1 and Part 2. You will receive a fixed payment of £5 at the end of the experiment and you will earn more depending on your choices during Part 2. Please remain silent and do not speak with other participants. If you have a question of any kind, please raise your hand at any time and an experimenter will come to your desk.

You have in your possession two envelopes, respectively labelled 'Part 1' and 'Part 2'. They contain the material you will need for this experiment. Please do not open any of the envelopes until instructed to do so by the experimenters.

Before we proceed, we would like you to verify that you are from the Faculty of Arts. If this is the case, please tick the following checkbox:

☐ I acknowledge I am a member of the Faculty of Arts.

If this is not the case, please raise your hand and wait for an experimenter to come to your desk.

We have a lot of procedures in place throughout the experiment designed to ensure your anonymity. The first one is the use of an identification number. This is the number printed at the top of this page. Each of the experimental packages that you saw outside the room had a different identification number. In effect, one of the identification numbers has been randomly attributed to you as you randomly selected one of the experimental packages. Your decisions are linked to this identification number, not to your identity. We are trying our best not to link your decisions to your identity, so please play your part in not allowing anyone—*including the experimenters*—to see this identification number. For similar reasons, do not write anything on any of the pages that would allow us to identify you.

We will now present Part 1 of the experiment in detail.

Part 1

You will be randomly matched with one participant from the Faculty of Social Sciences and one participant from the Faculty of Engineering. From now on, we will use the expressions 'the member of the Faculty of Social Sciences' and 'the member of the Faculty of Engineering' to refer to the two participants you will be matched with. This matching will be constant throughout the experiment. You will not be told who these people are either during or after the experiment. The only information disclosed is their Faculty membership. Also, they will not be told who you are. As a matter of fact and as explained below, participants from the Faculty of Social Sciences and the Faculty of Engineering will not even know that this experiment took place.

In this part of the experiment, we will give money to the member of the Faculty of Social Sciences or to the member of the Faculty of Engineering depending on your choices. Hence, *the money donated is not your money* and nothing is taken from you.

There are only members of the Faculty of Arts in this room; hence, none of your choices in Part 1 will affect someone in this room nor will their choices affect you.

The experimental material for Part 1 of the experiment is composed of the present instructions and the envelope labelled 'Part 1'. Do not open the envelope until instructed to do so.

We will start by describing the tasks.

Tasks

There will be three types of tasks, which we call **allocation tasks**, **equivalence tasks** and **circle tasks**.

Allocation tasks

Allocation tasks ask you to choose between two alternatives. Here is an example:

Option A: We give £y to *the member of the Faculty of Social Sciences*
Option B: We give £z to *the member of the Faculty of Engineering*

Choose **A** or **B**:

You will choose one of the two options by writing 'A' or 'B'. There will be a range of such tasks involving different money amounts.

Equivalence tasks

In equivalence tasks, we propose an allocation of a specific amount to either the member of the Faculty of Social Sciences or the member of the Faculty of Engineering. We then ask you to specify how much money we would have to *give to you* instead so that you would think that amount of money was just as good as the proposed allocation. Here is an example:

How much money *given to you* would be just as good as us giving £w to *the member of the Faculty of Social Sciences*?

Please write the amount here:

We will refer to this amount as your equivalence valuation of giving £w to the member of the Faculty of Social Sciences.

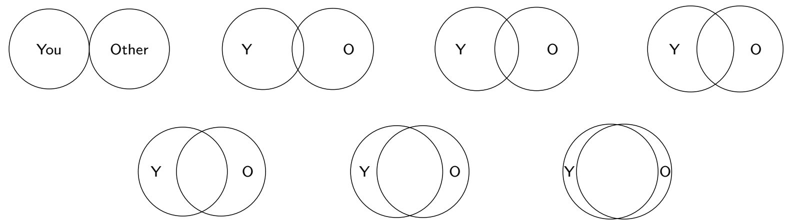
The participant (and hence the Faculty) and the amount of the allocation will change from task to task.

We will never actually give money to you as part of those tasks, but as explained later your answers to the equivalence tasks may affect which participant we will give money to, so please give considered and careful answers.

Circle tasks

For these tasks, we will ask you how you feel toward the participants you have been matched with. You will be asked in this way:

Please consider the member of the Faculty of Engineering. Select the pair of circles that best represents how you feel toward *the member of the Faculty of Engineering*:



Indicate your answer by drawing a line around the pair of circles you select.

Procedure

In a minute, we will ask you to open the envelope labelled 'Part 1'. In it, you will find a booklet containing several of the aforementioned tasks in a random order. On each page, just as at the top of these instructions, you will notice a number: this is your identification number.

As a consequence of your decisions, one of two people with whom you will be matched with—the member of the Faculty of Social Sciences and the member of the Faculty of Engineering—will get paid. We will now explain who and how much. After the experiment and after everybody has left, we will open the envelopes. We will then randomly select one pair of amounts, say $(£y, £z)$, independently for each participant. You would have encountered each of those two amounts twice:

- both of them at the same time in an allocation task, where you had to choose between giving $£y$ to the member of the Faculty of Social Sciences and giving $£z$ to the member of the Faculty of Engineering;
- each of them separately in equivalence tasks, where you had to tell us the amount of money given to you that you think is just as good as giving to the member of the Faculty of Social Sciences or to the member of the Faculty of Engineering.

We will then flip a coin to select between the allocation task and the equivalence task:

- If the allocation task is selected, we will give the money to the person you chose;
- If the equivalence task is selected, we will give the money to the person for which you indicated a higher equivalence valuation.

Let us illustrate this with an example. Imagine two fictitious Faculties: the Faculty of Xenostudies and the Faculty of Patascience. As explained earlier, assume you have been paired with one member from each of those fictitious Faculties. Imagine that the amounts (£5,£10) are selected. During the experiment, you encountered those amounts in the following allocation task:

Option A: We give £5 to the member of the Faculty of Xenostudies
Option B: We give £10 to the member of the Faculty of Patascience

Choose **A** or **B**: A

Suppose you chose **A**, that is, giving £5 to the member of the Faculty of Xenostudies you have been paired with.

You also faced an equivalence task with the member of the Faculty of Xenostudies:

How much money given to you would be just as good as us giving £5 to the member of the Faculty of Xenostudies?

Please write the amount here: 4

We will refer to this amount as your equivalence valuation of giving £5 to the member of the Faculty of Xenostudies.

This example supposed that you stated that the member of the Faculty of Xenostudies having £5 and you getting £4 makes you indifferent. You faced a similar question with the member of the Faculty of Patascience:

How much money given to you would be just as good as us giving £10 to the member of the Faculty of Patascience?

Please write the amount here: 2

We will refer to this amount as your equivalence valuation of giving £10 to the member of the Faculty of Patascience.

Here, imagine that you stated that the member of the Faculty of Patascience having £10 and you getting £2 are just as good.

Finally, we use a coin flip to determine whether it is your response to the allocation task, or your responses to the equivalence tasks that determine the person we will pay on your behalf:

- If the allocation task is selected, we are going to give £5 to the member of the Faculty of Xenostudies because this is what you chose in the allocation task involving the member of the Faculty of Xenostudies and the member of the Faculty of Patascience.
- If the equivalence task is selected, we are going to give £5 to the member of the Faculty of Xenostudies because your equivalence valuation of giving £5 to the member of the Faculty of Xenostudies (£4) is greater than your equivalence valuation of giving £10 to the member of the Faculty of Patascience (£2).

Hence, in this particular example, the money is always given to the member of the Faculty of Xenostudies. This would not have been the case had the answers been different.

At this stage, we will know to whom the money is allocated and we will give the money accordingly. Members of the Faculty of Social Sciences and the Faculty of Engineering will get paid on 13 January 2015 during an experimental session at 10am or at 3pm. You are free to come to the laboratory that day at any of these times to monitor the payment.

We will never tell members of the Faculty of Social Sciences and of the Faculty of Engineering about this experiment. For participants receiving money, the money will appear to come from the experimenter. Participants not receiving money will not know they could have received some money had your choices be different.

Questions on the procedure

We would like to make sure you understand the procedure fully. Please answer the following questions. Once you have finished, raise your hand and an experimenter will come to your desk to verify your answers. There is no identification number on top of those pages so that the experimenters cannot learn your identification number. When s/he comes, please make sure s/he cannot see the other pages. Your answers here have no consequence for the rest of the experiment.

Question 1

Imagine the amounts (£5,£12) are selected after the experiment. The following choices have been made in the relevant allocation tasks and equivalence tasks:

Option A: We give £5 to the member of the Faculty of Social Sciences
Option B: We give £12 to the member of the Faculty of Engineering

Choose **A** or **B**: B

How much money given to you would be just as good as us giving £5 to the member of the Faculty of Social Sciences?

Please write the amount here: 4

We will refer to this amount as your equivalence valuation of giving £5 to the member of the Faculty of Social Sciences.

How much money given to you would be just as good as us giving £12 to the member of the Faculty of Engineering?

Please write the amount here: 14

We will refer to this amount as your equivalence valuation of giving £12 to the member of the Faculty of Engineering.

What happens if the allocation task is selected? Please tick one:

- ☐ We will give £5 to the member of the Faculty of Social Sciences
- ☐ We will give £12 to the member of the Faculty of Engineering

What happens if the equivalence task is selected? Please tick one:

- ☐ We will give £5 to the member of the Faculty of Social Sciences
- ☐ We will give £12 to the member of the Faculty of Engineering

Question 2

Imagine the amounts (£5,£8) are selected after the experiment. The following choices have been made in the relevant allocation tasks and equivalence tasks:

Option A: We give £8 to the member of the Faculty of Engineering
Option B: We give £5 to the member of the Faculty of Social Sciences

Choose **A** or **B**: B

How much money given to you would be just as good as us giving £5 to the member of the Faculty of Social Sciences?

Please write the amount here: 7

We will refer to this amount as your equivalence valuation of giving £5 to the member of the Faculty of Social Sciences.

How much money given to you would be just as good as us giving £8 to the member of the Faculty of Engineering?

Please write the amount here: 3

We will refer to this amount as your equivalence valuation of giving £8 to the member of the Faculty of Engineering.

What happens if the allocation task is selected? Please tick one:

- ☐ We will give £5 to the member of the Faculty of Social Sciences
- ☐ We will give £8 to the member of the Faculty of Engineering

What happens if the equivalence task is selected? Please tick one:

- ☐ We will give £5 to the member of the Faculty of Social Sciences
- ☐ We will give £8 to the member of the Faculty of Engineering

Question 3

Which tasks are relevant if the amounts (£5,£10) are selected? Tick all that apply:

☐ How much money given to you would be just as good as us giving £20 to the member of the Faculty of Engineering?

Please write the amount here:

We will refer to this amount as your equivalence valuation of giving £20 to the member of the Faculty of Engineering.

☐ **Option A**: We give £5 to the member of the Faculty of Social Sciences
Option B: We give £8 to the member of the Faculty of Engineering

Choose **A** or **B**:

☐ **Option A**: We give £5 to the member of the Faculty of Social Sciences
Option B: We give £10 to the member of the Faculty of Engineering

Choose **A** or **B**:

☐ How much money given to you would be just as good as us giving £5 to the member of the Faculty of Social Sciences?

Please write the amount here:

We will refer to this amount as your equivalence valuation of giving £5 to the member of the Faculty of Social Sciences.

☐ **Option A**: We give £5 to the member of the Faculty of Social Sciences
Option B: We give £12 to the member of the Faculty of Engineering

Choose **A** or **B**:

☐ How much money given to you would be just as good as us giving £10 to the member of the Faculty of Engineering?

Please write the amount here:

We will refer to this amount as your equivalence valuation of giving £10 to the member of the Faculty of Engineering.

You can now open the envelope labelled ‘Part 1’, take out the booklet and start completing the tasks. *Once you have completed a task, please turn the page and do not consider it again.* Once you have completed all the tasks, replace the booklet in the envelope along with the present instructions and close the envelope. Then, please raise your hand. When everybody has finished, we will collect the envelopes and mix them under the supervision of several randomly selected participants.

Notice that each envelope returned will look exactly the same, and since your identification number is attributed randomly we will not be able to tell who filled which booklet.

If you have any question, please raise your hand and an experimenter will come to your table to answer it.