Distance from a distance: the robustness of psychological distance effects

Stefan T. Trautmann[1,2]

Abstract

Psychological distance effects have attracted the attention of behavioral economists in the context of descriptive modeling and behavioral policy. Indeed, psychological distance effects have been shown for an increasing number of domains and applications relevant to economic decision-making. The current paper questions whether these effects are robust enough for economists to apply them to relevant policy questions. We demonstrate systematic replication failures for the distance-from-a-distance effect shown by Maglio et al. (J Exp Psychol Gen 142:644–657, 2013), and relate them to theoretical arguments suggesting that psychological distance theories are currently too poorly specified to make predictions that are precise enough for economic analyses.

Keywords Construal level · Risk · Time preference

1 Introduction

The concept of psychological distance is widely used in psychology, and it has been the centerpiece of one of its most successful theories, Construal Level Theory (CLT; Liberman and Trope 1998; Trope and Liberman 2003, 2010). While CLT has originally been proposed as an account of intertemporal decision-making that can account for potential violations of discounting theory, the theory has subsequently substantially expanded its domain of application to the domains of uncertainty, spatial distance, and social distance (Liberman and Trope 2008; Trope and Liberman 2010). The descriptive success of the theory has also attracted attention in the field of economic/consumer psychology and behavioral economics (Fiedler 2007; Leiser et al. 2008; Onay et al. 2013). CLT and psychological distance effects have also been discussed in the context of behavioral tools for economic policy (World Bank 2015).

✉ Stefan T. Trautmann
s.t.trautmann@uvt.nl

1 University of Heidelberg, Bergheimer Strasse 58, 69115 Heidelberg, Germany

2 Tilburg University, Tilburg, The Netherlands

The application of psychological distance to descriptive applications in economics seems promising. Analyses of decision under uncertainty, time preference, as well as social interaction may benefit from taking into account the effects of psychological distance, over and beyond the standard repertoire of behavioral insights from prospect theory, present-biased time preference or social preference models. However, despite being optimistic about the theory, we claim that the current state of empirical and theoretical work on CLT and its extensions does not provide an appropriate framework for economic theorizing and policy yet. In particular, it will be argued that recent empirical evidence on CLT stretching beyond its basic domain of interest does not approximate the level of robustness typical in experimental economic research (Camerer et al. 2016), and that an underlying cause of these problems lies in the theoretical under-specification of central concepts of the theory.

The empirical lack of robustness will be demonstrated by a set of replication attempts of a recent extension of CLT distance effects, the distance-from-a-distance paradigm by Maglio et al. (2013). Maglio et al. (2013) provide simple experimental demonstrations of distancing effects across various dimensions of psychological distance. We describe the distance-from-a-distance paradigm in Sect. 2, and discuss our replication attempts in Sects. 3–5. Section 6 presents theoretical considerations regarding the specification of distance manipulations that suggest that CLT may not lend itself as easily to applications in economics as is the case for well-specified models like prospect theory or discounted utility, for example. Section 7 concludes with suggestions for a more robust study of CLT effects.

2 Distance from a distance

Construal level theory is based on the assumption that decisions are not about objective states of the world but rather about mental representations (construals) of those states. Following the original theory (Liberman and Trope 1998), a relative short-term perspective is associated with low-level construal, leading to a focus on concrete, detailed, context-dependent information. In contrast, a relative long-term perspective entails high-level construal, focusing on the abstract and general (superordinate) structure. High-level construals supposedly relate to general broader goals, in contrast to low-level construals that are related to specific concrete queries as to how to serve the superordinate goals best. More recently, the theory has been expanded to account for psychological distance effects inducing construal level through social distance, geographical distance, or likelihood distance (e.g., Liberman and Trope 2008; Fiedler et al. 2012, 2015; Trope and Liberman 2010). Importantly from a behavioral perspective, CLT predicts that both a (priming) manipulation of construal level and a change in construal level that is induced by the tasks itself have an effect on economic judgments and decisions.

Maglio et al. (2013) report a series of experiments studying psychological distance effects as predicted by construal level theory. Specifically, building on insights from psychophysics, the authors demonstrate (i) that sensitivity to distance effects is reduced by an initial experience of distance, and (ii) that such distancing of distance works across different dimensions of psychological distance (temporal, geographical,

likelihood, and social distance). The authors demonstrate distancing of CLT effects in eight experiments, each crossing two dimensions of distance (see Maglio et al. 2013, Table 1). Two additional experiments find the effect when distancing distance within the same dimension; these effects were reported in an earlier working paper version of the article (Maglio et al. 2011) and were not included in the published version. That is, overall, there are ten experiments supporting the distancing of distance effect across various dimensions of psychological distance.

The current paper describes a set of experiments attempting to replicate the results reported in Maglio et al. (2011, 2013). Our research was initiated by the observation that Study 4 in Maglio et al. (2013) is conceptually identical to the previously published work by Trautmann and van de Kuilen (2012). Trautmann and van de Kuilen (2012) were not testing the distance-from-distance effect, but were studying CLT effects in decision-making under uncertainty. Their design, however, was similar to the design of the related study in Maglio et al. (2013). However, in contrast to Maglio et al. (2013) and Trautmann and van de Kuilen (2012) did not find any evidence for the suggested effect. To investigate the robustness of these results in the light of the observed differences across published articles, we tested the effect of Maglio et al. (2013) Study 4 with a substantially larger sample size. Details on the design of Trautmann and van de Kuilen's (2012) experiment, as well as the results of the current replication are given in Sect. 3. In the following sections, we then report further attempts to replicate the distancing of distance effects shown in Maglio et al. (2011, 2013): two attempts to replicate the effect of spatially distancing spatial distance (Study 1B from Maglio et al. 2011); and attempts to replicate the effect of socially distancing temporal distance and money (studies 1A and 1B from Maglio et al. 2013).

3 Distancing probability

3.1 Conflicting results in the published work

We start by discussing one published and by reporting one new experiment (in Sect. 3.2.), demonstrating the difficulty in replicating distance-from-distance effects for probabilities. The first experiment is reported in Trautmann and van de Kuilen (2012, Experiment 4) and relates to what Maglio et al. (2013) refer to spatially and socially distancing probability. Maglio et al. (2013, Experiment 4) asked participants to choose between a high-probability–low-payoff gamble ($50, 80%; $0, 20%) and a low-probability–high-payoff gamble ($200, 20%; $0, 80%), with equal expected value. Following Sagristano et al. (2002), construal level theory predicts that the preferences over these gambles depend on psychological distance and the resulting construal of the gambles. In particular, they argue that the lower probability to win the prize in the high-payoff gamble induces larger psychological distance than the high probability to win the prize in the low-payoff gamble. This prediction crucially depends on the implicit assumption that the probability of the high prize in each gamble determines the psychological distance (discussed in Sect. 6).

Maglio et al. (2013) primed initial exposure to a distance by the location of a hypothetical random number generator that supposedly performs the lottery (New

York = near; Chicago = far; for their participants in New York). Congruent with the distancing of distance hypothesis, they report a relatively equal preference for the high-payoff–low-probability gamble (40% of the choices) and the low-payoff–high-probability gamble (60% of the choices) after an initial exposure to a large physical distance. In contrast, after an initial exposure to a small physical distance, strong distance effects emerge in the gamble choice task, with only 17% of the participants opting for the high-payoff–low-probability gamble. That is, after an initial large-distance exposure, the distance effect due to differences in likelihood becomes less important.

As in Maglio et al. (2013) experiment, participants in Trautmann and van de Kuilen (2012) were offered a choice between two lotteries with identical expected value. One lottery had a high probability of a modest payoff (€35, 75%; €0, 25%), while the other lottery had a low probability of a high payoff (€175, 15%; €0, 85%). The initial distance manipulation was primed (1) by having participants decide either for themselves or for a friend in a distant town; and (2) by having participants performing a 'how' vs. 'why' task (Wakslak and Trope 2009) before the decision task: subjects had to describe for three activities (e.g., opening a bank account) different ways of how they would do it, or why they would do it, respectively. 'How' ('why') priming has successfully been employed to prime low (high) psychological distance and construal level (Wakslak and Trope 2009). That is, participants in the low-distance condition were first primed using the 'how' task and then made a decision in the proximal self-condition. Participants in the high-distance condition were first primed using the 'why' task and then made a decision in the distal friend-in-other-town condition. The results showed that 40% of the participants chose the high-payoff–low-probability gamble in the high-initial distance condition, and 57% of the participants chose it in the low-initial distance condition. The difference, though not statistically significant, is contrary to the distance-from-distance prediction and in the opposite direction of the results reported by Maglio et al. (2013).

3.2 New results: experiment 1

Although the sample size was larger in Trautmann and van de Kuilen's study (2012; $N = 70$) than in Maglio et al's study (2013; $N = 60$), it was still modest and a null effect may be uninformative even if the direction of the effects points in the opposite direction. Moreover, the additional construal level priming task may have unanticipated effects. We, thus, made an attempt to identify the distancing-probability effects in an additional experiment.

3.2.1 Methods

The setup of the experiment was similar to the experiment by Trautmann and van de Kuilen (2012) described above except for deletion of the "how" or "why" priming task. In particular, $N = 174$ students of a teaching college (Fontys) in Tilburg participated in a vignette study as part of a larger computerized survey for a fixed payment. The sample size was, thus, significantly increased to more than three times the size in Maglio et al. (2013). Based on the observed effect in the above-described Experiment 4 in Maglio

et al. (2013), the current sample implies a large statistical power of above 90% to detect the effect assuming it exists. Initial distance was manipulated by having participants decide either for themselves ($N = 90$) or for a friend in a distant town (spatial and social distance; $N = 84$). Participants had to decide between a high-payoff–low-probability gamble (€180, 15%; €0, 85%), and a low-payoff–high-probability gamble (€60, 45%; €0, 55%). The English translation of the vignette reads as follows:

> {You have}[An acquaintance from Groningen called you to tell you that he has] received €500 as a birthday gift that {you want} [he wants] to place on a savings account to save for a holiday trip. {You} [He] would like to obtain a considerable return on {your} [his] savings, but {you} [he] also want [wants] to be sure to receive {your} [his] deposit back to pay {your} [his] trip. Therefore, {you} [he] selected a savings-guaranteed investment account: with this account, {you get your} [he gets his] deposit back for sure, while at the same time participating in the upward potential of risky investment funds.
>
> There are two alternative variations of the account that differ with respect to the potential return and risk. On the basis of the expected returns of the underlying risky investments, the bank has devised the following two savings options: Option A offers a 15% chance to obtain a return of €180 (and zero else), and Option B offers a 45% chance to obtain a return of €60 (and zero else). [Your acquaintance is asking your advice which option to choose.]
>
> Note that {you always receive your} [your acquaintance always receives his] deposit of €500 back. {Which Option do you choose?} [Which option do you advise your acquaintance to choose?]
>
> O Option A (15% chance to gain €180) or O Option B (45% chance to gain €60).

3.2.2 Results and discussion

We find that in the high-initial distance condition, 25% of the participants choose the high-payoff–low-probability gamble, compared to 28% in the low-initial distance condition. This difference again points in the opposite direction of Maglio et al. (2013) results, though it is not statistically significant.

We, thus, find no support for the distance-from-distance effect reported in Maglio et al. (2013). Given our sample sizes, statistical power is an unlikely candidate for the failed replication. Although very similar, there are, obviously, differences in the design of the experiment that may have caused the effects to vanish. For example, in contrast to Maglio et al., the current studies used spatial and social priming jointly for the initial distance manipulation. Although slightly different, this manipulation should make the initial distancing effect stronger. Presentation of the gambles in the current vignette mentions the loss case, instead of only the winning case ("an 80% chance of winning $50" in Maglio et al.). However, the choice options are marked similarly. Moreover, making choices on your own account and giving advice to an acquaintance may induce different risk attitudes. Importantly, however, a psychological foundation of such differences is exactly what may be provided by the

psychological distance effects we tried to induce here (see Leiser et al. 2008, Sects. 4.1 and 4.2).

While minor variations in study design can have strong effects of empirical results, it is unfortunate that the distance-from-distance model does not give any guidance as to how these variations would affect its predictions. The theory cannot unambiguously be tested and rejected. This stands in sharp contrast to the more formal behavioral approaches like prospect theory. Consider the overall share of choices for the high-payoff–low-probability gamble in the study by Trautmann and van de Kuilen (2012), 49% (not significantly different from 50%), and in the new replication, 26% (smaller than 50%, $p < 0.01$, binomial test). These results provide a rejection of prospect theory with inverse-S probability weighting function, which implies overweighting of small, und underweighting of modest and large probabilities. In particular, the choice pattern is, thus, opposite of the prediction by prospect theory in the widely used specification of Tversky and Kahneman (1992). Incidentally, our results on prospect theory replicate findings reported by Harbaugh et al. (2010) and Schmidt and Trautmann (2014). Thus, while abstaining from drawing conclusions for prospect theory modeling, we observe that prospect theory can be tested, rejected, and potentially be improved to provide a better descriptive account of decisions under uncertainty.

4 Spatially distancing spatial distance

The observed lack of robustness in the above-discussed experiments may be specific to the dimension of probability distance as a dependent variable and to the effect of social distance as manipulated dimension. We, therefore, consider the effect of spatial distance as a dependent variable in the next two studies. In two experiments, we attempted to exactly replicate Experiment 1B in Maglio et al. (2011). The experiment examines New York University students' perception of a spatial distance (a taxi ride) after an initial instance of large distance or a small distance (trip takes place in L.A. vs. N.Y.; details on the study are given in Appendix B).

4.1 Experiment 2

According to Maglio et al. (2011), the distance-from-a-distance theory predicts that a certain distance should feel shorter after an initial exposure to a large- vs. a short-distance priming. This prediction is tested by assessing the perception of a taxi trip in a remote vs. a distant location.

4.1.1 Methods

$N = 75$ student participants at Tilburg University participated in a vignette study for course credit. Employing a between-subjects design, we measured participants' predictions of the cost of a 2.2-km taxi trip from Tilburg central station to Tilburg University ($N = 40$) versus the cost of the same trip in the city of Groningen (located

Table 1 Spatial distancing spatial distance (taxi trip)—first replication

Question	Tilburg ($N = 40$)	Groningen ($N = 35$)	
Expected cost of trip (€)	9.28	10.59	$p = 0.365$
Knowledge of location	4.43	1.51	$p < 0.001$
Knowledge of city	3.93	2.17	$p < 0.001$
How often do you think about the city	4.35	1.71	$p < 0.001$
How difficult to imagine the situation	3.33	3.71	$p = 0.277$
How positively do you feel about the city	4.70	4.00	$p = 0.009$

Entries for manipulation checks are mean scores on scales ranging from 1 to 7; p values based on two-sample t test

in the north of the Netherlands, 270 km away from Tilburg; $N = 35$). As the experiment was run in Tilburg, Tilburg constitutes a low-initial distance condition, while Groningen constitutes a high-initial distance condition. As in the previous studies, this initial distance is predicted to affect the participants' evaluation of the 2.2-km-distance taxi ride. In particular, because the additional distance of the trip should feel shorter after initial large-distance priming, the Tilburg students should perceive the taxi trip in Groningen as shorter and cheaper compared to the trip in Tilburg. Note that students did not have to form subjective beliefs about the true distance because, like in Maglio et al.'s study, we explicitly provided information that the distance between the station and the university equals 2.2 km (which is accurate in both cities). Clearly, if construal level affects the expected costs of the trip as predicted, it would be important to account for these effects in economic analyses. The English translation of the vignette reads as follows:

> Imagine the following situation: You are on your way to {Tilburg University} [the University of Groningen]. You take a taxi from the central station in {Tilburg} [Groningen] to the university. The distance between the station and {Tilburg University} [the University of Groining] is 2.2 km. How much do you think the taxi trip will cost you?

To control whether the construal level priming has been successful, we included the same manipulation checks as Maglio et al. (2011): knowledge about the location, the city in general, how often participants think about the city, how difficult they found it to mentally simulate the situation in the task, and how positive they feel about the city.

4.1.2 Results and discussion

Table 1, rows 2–6 show that the distance manipulation was effective as indicated by the manipulation checks: participants in Tilburg had more knowledge, more thoughts, and more positive feeling about Tilburg than about Groningen. However, they could equally well imagine a taxi trip in either city. Importantly, inspection of row 1 shows that they did not perceive the trip in distant Groningen as cheaper. If anything, the effect (though not significantly) appears to be in the opposite direction of the prediction and findings reported by Maglio et al. (2011). Stroebe and

Table 2 Spatial distancing spatial distance (taxi trip)—second replication

Question	Tilburg ($n = 81$)	Groningen ($n = 83$)	
Expected cost of taxi trip (€)	9.59	10.21	$p = 0.427$
Knowledge of location	3.97	1.33	$p < 0.001$
Knowledge of city	3.35	1.89	$p < 0.001$
How often do you think about the city	4.44	1.52	$p < 0.001$
How difficult to imagine the situation	3.73	4.10	$p = 0.168$
How positively do you feel about the city	5.01	4.30	$p < 0.001$

Entries for manipulation checks are mean scores on scales ranging from 1 to 7; p values based on two-sample t test

Strack (2014, p. 62) have emphasized that it is essential to demonstrate that a replication task in fact activates the very same constructs as the original task. Inspection of Table 1 suggests that our task achieved exactly this. Only the proposed effect of the primed construal level on the cost expectations apparently did not show up.

4.2 Experiment 3

Although the manipulation checks show highly significant differences in Experiment 2, the sample size was modest with a total of 70 participants. If the predicted psychological distance effect is relatively weak, lack of power may be an issue. We, thus, report another replication attempt of the same experiment, with a substantially increased sample size and a different participant pool.

4.2.1 Methods

$N = 164$ student participants from a teaching college located in Tilburg (Fontys) participated in the same vignette study as in Experiment 2. The experiment was part of a larger computerized survey for a fixed payment. All other aspects of the experiment were identical to Experiment 2.

4.2.2 Results and discussion

The results shown in Table 2 perfectly replicate those of Experiment 2. As in Experiment 2, the effect of an initial distancing on the evaluation of the taxi ride proposed and demonstrated by Maglio et al. (2011) was not found. Again, the expected costs of the trip pointed (though not significantly) in the opposite direction of the prediction of the distance-from-a-distance theory. Moreover, with a total sample size of 239 across the two replication attempts in Experiments 2 and 3, sample size is significantly larger than in the original study with 142 participants.

5 Socially distancing temporal distance and money: experiment 4

The four studies described above failed to identify distance-from-distance effects for probability distance and for spatial distance. In all four experiments, the effect pointed in the opposite direction as predicted by the original studies. Sample sizes were substantially larger than in the original studies. However, as discussed above, the theory gives little guidance as to how differences between our implementations and the original studies may cause these replication failures. Assuming that variations in design across different studies affect the results idiosyncratically, a larger variety of designs may help to identify the effect at last, if it exists. We, therefore, report yet another replication attempt, now using social distancing of temporal distance.

We attempted to replicate experiments 1A and 1B from Maglio et al. (2013). These experiments study the effect of an initial social distance (in terms of affiliation of an institute with participants' university or with a different university) on the perception of a temporal distance and a monetary amount, respectively. These experiments replaced experiments 1A and 1B from the working paper version, Maglio et al. (2011), discussed in the previous section. They were, thus, conducted later, as additional experiments, leading to a total of ten studies successfully demonstrating the distance-from-distance effect.

5.1 Methods

$N = 204$ Tilburg University psychology students participated in a replication of Experiment 1A in Maglio et al. (2013) ($N = 102$, vs. $N = 49$ in Maglio et al.'s study) and Experiment 1B in Maglio et al. (2013) ($N = 102$, vs. $N = 48$ in Maglio et al.'s study). The experiment was conducted as part of a test week at the beginning of the first semester; participants received course credit for participation. Both conditions describe an organization called Earth Clinic, affiliated with either Tilburg University (low distance) or the University of Groningen (large distance). In Condition A, participants were presented with a description of the election schedule for the chairperson of the organization, which is elected for a 2-year period. They had to indicate how long this period feels to them. Distance-from-a-distance theory predicts that the election period (temporal distance) feels shorter after an initial high-distance experience induced by the more socially distant group (in our case Groningen). Maglio et al. (2013) results confirmed their prediction.

In Condition B, participants evaluate a budget increase for the Earth Clinic for the two conditions, affiliation with Tilburg University or University of Groningen. Maglio et al. (2013) argue that the distance-from-a-distance theory would predict no difference in this case, as the monetary amount is not representing a distance measure. That is, the initial distance manipulation should not simply affect any subsequent magnitude evaluation. Maglio et al. (2013) results confirmed their prediction, finding no effect on condition B. The English translation of the two vignettes reads as follows:

> The 'Earth Clinic' is a research institute dealing with societal problems in the area of sustainable development. The institute consists of faculty from different disciplines, affiliated to {Tilburg University} [the University of Groningen].

Table 3 Socially distancing temporal distance and money

	Tilburg	Groningen	
1A: temporal distance: how long does the 2-year period feel (min 1 to max 7)?	3.33 ($N = 51$)	3.06 ($N = 51$)	$p = 0.310$
1B: money: how large does the increase in €150 K feel (min 1 to max 7)?	5.00 ($N = 52$)	5.36 ($N = 50$)	$p = 0.113$

p values based on two-sample t test

(Condition A then reads:)
The 'Earth Clinic' has a committee that every second year selects a chairperson who acts as the director of the institute. The next election is scheduled for September 2015, and the following election for September 2017.
On the basis of this information, how long would this 2-year election period (from September 2015 to September 2017) feel to the chairperson of the 'Earth Clinic?'
(Condition B then reads:)
In the following 2 years, between September 2015 and September 2017, the budget of the 'Earth Clinic' is expected to increase from €300.000 to €450.000.
On the basis of this information, how large would this increase by €150.000 feel to the steering committee of the 'Earth Clinic?'

5.2 Results and discussion

The results are shown in Table 3. The upper panel shows results for the replication of Experiment 1A. We observe that the Tilburg priming indeed induces larger subjective evaluations of the 2-year period. However, the effect is insignificant despite having twice the sample size of the original study. The lower panel of Table 3 shows results for the replication of Experiment 1B. We do successfully replicate the Null effect of no difference in the judgment of the monetary budget increase.

6 Robustness of psychological distance effects: theoretical considerations

Construal level theory is based on two premises. First, experience of temporal, social, geographical, or likelihood distance primes a unique concept of psychological distance. Second, larger psychological distance as defined by the first assumption leads individuals to construe their environment at a higher level of abstraction. To make CLT relevant to economic applications, a third assumption needs to be made, namely that differences in construal level lead to differences in behavior. Such effects have been demonstrated, for example, in the work by Maglio et al. (2011, 2013). Clearly, construal-level-theory effects are potentially very important to behavioral economics applications. If construal level effects predictably induce violations of standard rationality assumptions, the theory can be used to organize empirical data and provide

novel behavioral models [as discussed in Leiser et al. (2008)]. However, the current study did not succeed in finding any robust effects in five replication experiments. We next discuss theoretical aspects of CLT that may contribute to lack of testability and the lack of robustness across experimental implementations.

What is a large psychological distance (absolute degree)? The question of what should be regarded as high vs. low distance is unspecified by the theory, and follows either from the researcher's introspection or ex post from the successful demonstration of the implied construal level effects. For example, do students have a long-term perspective that leads to an abstract high-level construal of the situation when thinking about an exam that takes place 2 weeks from now vs. tomorrow morning at 8 o'clock, or vs. 2 months from now? Or, to rephrase, what is a large distance and what is a small distance? If an experiment does not support construal level effects, it can always be due to the fact that the primed distance manipulation was unsuccessful; had it been successful, the predicted effect would have shown.

With temporal and geographical distance, at least comparative distance is always clear. Tomorrow induces less distance than a 2-week delay; a 2-week delay induces less distance than a 2-month delay. However, the question remains as to how strong the effect of a 1-day delay on observed behavior or preferences would be. When studying variations of temporal discounting theory, we are able to predict that a 1% change in the discount rate should lead to an $x\%$ change in the value of a delayed payment. With noisy data, we may possibly not be able to detect it, but the prediction is clear. Such predictions are not possible with CLT (see also the discussion of the effect of the role of the person versus the situation, given below).

With uncertainty and social distance, even comparative statics become difficult to define Comparative distance effects seem to allow the researcher to confirm construal level effects (but not to reject the theory, as argued above). However, with uncertainty and social distance, even comparative distance becomes problematic. Various studies used binary lotteries of the form "10% chance to win $20, and $0 otherwise," indicating a low chance, and thus high distance, versus "90% chance to win $20, and $0 otherwise" indicating high chance, and thus low distance. Often, the second part of the description ("and $0 otherwise") is not even mentioned explicitly. Describing the first lottery more appropriately as a "10% chance to win $20 and 90% chance to win $0" immediately shows that the lottery may as well be construed as a high probability of losing the prize, thus implying low psychological distance. Since for any probability p there is the complementary probability $q = 1 - p$ of the complementary event, distance is in fact undefined in the uncertainty domain. If the short-hand description is used, participants may or may not in an ad hoc fashion consider the missing event.

The social domain suffers from similar problems. In contrast to time and geographical distance, social distance is no unidimensional measure. Who is closer in terms of social distance, a good friend you meet once a year, or a colleague you meet almost every day but have little private interaction with? In practical applications, social distance seems too multidimensional to be of much guidance for construal level effects. Moreover, the social domain might be affected by other, confounding factors (e.g., accountability, altruism). Should we explain any observed effects in terms of construal level theory if they are consistent with the theory, and in terms of confounding factors if they are inconsistent with the theory?

Social distance and uncertainty distance manipulations have often been used in the literature, e.g., in the above-discussed studies by Maglio et al. (2013). Moreover, Fiedler et al. (2012, 2015) explicitly test the assumption that perceptions of temporal, spatial, social, and uncertainty distance are positively correlated. Their results support the important assumption of construal level theory that there is a unique concept of psychological distance, the absence of which would question the foundation on which CLT is build. However, while these effects are consistent with the existence and importance of the unique concept of psychological distance, they do not provide a test of the behavioral predictions derived from construal level theory. With social and probabilistic distance, virtually all behavior could be consistent with construal level theory, if we assume that one dimension of social distance or one interpretation of the probabilistic information is most relevant in the setting under investigation. Vice versa, inconsistencies with CLT can easily be explained by assuming that the wrong interpretation of the probabilistic information has been adopted by the participant, or that an ambiguous dimension of social distance has been more prominent than the one implying clear psychological distance ordering.

The person versus the situation Many theories are not precisely specified in quantitative terms. For example, expected utility theory does not prescribe how risk averse a person should be. Moreover, risk aversion may differ across situations. It is often assumed that in the domain of losses (insurance, health), people are more risk-seeking than in the domain of gains. However, expected utility theory does make within-person predictions about behavior if the domain is held constant. If Peter is more risk averse than Paul in the domain of losses in experiment 1, the theory predicts that Peter should also be more risk averse than Paul in the domain of losses in experiment 2. Formal theories like prospect theory or discounted utility theory all allow for such within-person comparisons. A rejection of the within-person prediction is typically considered as a rejection of the theory (see the discussion in Blanco et al. 2011, for the case of social preference theory; and Friedman et al. 2014, chapter 3, for the case of risk preferences). Often, such rejections lead to reconsideration or refinement of the theory. In fact, the original contribution of construal level theory was to explain data that violated discounted utility theory. No such analyses of within-person calibration and prediction data are possible with CLT in its current form.

7 Conclusions

Observing an inconsistency between results reported by Maglio et al. (2013) and those reported in an earlier article by Trautmann and van de Kuilen (2012), we set out to examine the distancing paradigm in more detail. With a total of ten studies supporting the theory in Maglio et al. (2011, 2013), we expected strong effects to emerge with sufficient statistical power and considering a variety of experimental designs. This expectation did not materialize. Trying to replicate three different designs of Maglio et al., two of them in multiple experiments with different participant pools, we were unable to replicate any of the significant findings of the original authors. That is, we did not find any evidence for the theory. We did replicate the null effect shown by Maglio et al. (2013) though, showing that distance priming has

no effect on the judgment of monetary amounts. This, in itself, can be an important insight.

What are possible reasons for the discrepancy between the results obtained by Maglio et al. and those reported here? Trying to account for this gap should be cautiously done. A multitude of different reasons may serve as a potential account for the difference in results making it difficult to unequivocally discern the true cause. As we noted, we were careful to use large samples, thus excluding the possibility that statistical power is a main cause. In our replication attempts, we tried to remain close to the procedures described by the original authors. Yet, even minor deviations cannot be ruled out as a cause for replication failure (for example, we used a different population of subjects and the language we employed was Dutch). It is certainly not possible to discern from the current experiments what may have caused the discrepancy and we prefer not to speculate on this issue. We only note that a robust theory should be immune to minor negligible procedural differences. Alternatively, a robust theory should specify, as accurate as possible, the conditions and constraints associated with its predictions. We have argued that this is not the case for CLT.

As Fiedler (2007) or Leiser et al. (2008) have argued, there is a host of applications in consumer decision-making and behavioral economics in which the consideration of psychological distance might potentially lead to fruitful insights and improved descriptive modeling. However, to make the framework applicable to economic analyses and policy, the field should agree on what constitutes a rejection of the theory. The theory can then be reconsidered and improved, or possibly discarded as an explanation for some phenomena. Specification of a theory's constraints and the range of conditions to which it is applicable are essential towards this end. In the case of CLT, a first step in this direction would require the specification of an accepted manipulation check instrument, possibly provided and endorsed by the proponents of the theory. Any valid test of the theory should preferably include the manipulation check: if and only if the manipulation check demonstrates that construal level was affected by the priming task used in some study, should the result be interpreted as support or rejection of the theory. Any such specification of the open ends of the theory would put it on equal footing with formal, parametric theories such as utility theory or discounting theory. Most importantly, it would make CLT a testable theory.

Appendix

A. Supporting material for experiments

Experiment by Trautmann and van de Kuilen (2012): Data and materials can be found at http://dx.doi.org/10.11588/data/10040. Data and materials for the new experiments can be found at https://doi.org/10.11588/data/0HJW2A.

B. Description of experiment 1B in Maglio et al. (2011)

We provide here the exact description of Experiment 1B design and results from the Maglio et al. (2011, pp. 12–13) working paper:

"One hundred and forty-two undergraduates from New York University participated in this study as part of a larger series of questionnaires in exchange for course credit. They were told that the study related to travel planning. They imagined that they were in either a spatially near (New York City, $n = 72$) or distal (Los Angeles, $n = 70$) location and that they had to take a taxi between two parts of town. Those in the New York City condition were to travel from "the West Village to Morningside Heights"; those in the Los Angeles condition were to travel from "Pasadena to Glendale." All participants were told that their trip would span a distance of 7 miles, an objectively accurate value for both. They then indicated how much they would expect their trip to cost in dollars.

Next, participants were asked a series of questions to address potential confounds (as in Fujita et al. 2006). They were asked to indicate how familiar they were with the location, how much they knew about the location, how often they thought about the location, and how difficult the situation was to imagine. They also indicated how positively and negatively they felt about the location. All scores were made on a scale from 1 (not at all) to 9 (very much).

Results and discussion

Spatial distance significantly affected valuations, $F(1, 140) = 4.78$, $p = 0.03$, $\eta^2 = 0.03$.

Specifically, the expected cost among participants in the distal condition ($M = 21.32$, SD$= 15.1$) was less than that among those in the proximal condition ($M = 26.94$, SD$= 15.5$). Next, we conducted a MANOVA analysis on the potential confounds. The distance manipulation significantly affected each of them, with the exception of the negative feeling question, Fs$(1, 139) > 7$, ps< 0.01. Compared to Los Angeles, participants were more familiar with, knew more about, thought more often about, and felt more positively about New York City.

Additionally, participants had more experience taking taxis in New York City and had an easier time imagining taking a taxi in New York City. Importantly, the effect of spatial distance on cost estimates held after separately adjusting for each variable, ANCOVA Fs> 3.5, ps< 0.07."

References

Blanco, M., Engelmann, D., & Normann, H. T. (2011). A within-subject analysis of other-regarding preferences. *Games and Economic Behavior, 72,* 321–338.

Camerer, C. F., Dreber, A., Forsell, E., Ho, T.-H., Huber, J., et al. (2016). Evaluating replicability of laboratory experiments in economics. *Science, 351,* 1433–1436.

Fiedler, K. (2007). Construal level theory as an integrative framework for behavioral decision-making research and consumer psychology. *Journal of Consumer Psychology, 17,* 101–106.

Fiedler, K., Jung, J., Wänke, M., & Alexopoulus, T. (2012). On the relations between distinct aspects of psychological distance: An ecological basis of construal-level theory. *Journal of Experimental Social Psychology, 48,* 1014–1021.

Fiedler, K., Jung, J., Wänke, M., Alexopoulos, T., & de Molière, L. (2015). Toward a deeper understanding of the ecological origins of distance construal. *Journal of Experimental Social Psychology, 57,* 78–86.

Friedman, D., Isaac, R. M., James, D., & Sunder, S. (2014). *Risky curves: On the empirical failure of expected utility*. New York: Routledge.

Fujita, K., Henderson, M. D., Eng, J., Trope, Y., & Liberman, N. (2006). Spatial distance and mental construal of social events. *Psychological Science*, *17*, 278–282.

Harbaugh, W. T., Krause, K., & Vesterlund, L. (2010). The fourfold pattern of risk attitude in choice and pricing tasks. *Economic Journal, 120,* 595–611.

Leiser, D., Azar, O. H., & Hadar, L. (2008). Psychological construal of economic behavior. *Journal of Economic Psychology, 29,* 762–776.

Liberman, N., & Trope, Y. (1998). The role of feasibility and desirability considerations in near and distant future decisions: A test of temporal construal theory. *Journal of Personality and Social Psychology, 75,* 5–18.

Liberman, N., & Trope, Y. (2008). The psychology of transcending the here and now. *Science, 322,* 1201–1205.

Maglio, S. J., Trope, Y., & Liberman, N. (2011). *Distance from a distance: Psychological distance reduces sensitivity to any further psychological distance*. Mimeo: New York University.

Maglio, S. J., Trope, Y., & Liberman, N. (2013). Distance from a distance: Psychological distance reduces sensitivity to any further psychological distance. *Journal of Experimental Psychology: General, 142,* 644–657.

Onay, S., La-Ornual, D., & Öncüler, A. (2013). The effect of temporal distance on attitudes toward imprecise probabilities and imprecise outcomes. *Journal of Behavioral Decision Making, 26,* 362–374.

Sagristano, M., Trope, Y., & Liberman, N. (2002). Time-dependent gambling: Odds now, money later. *Journal of Experimental Psychology: General, 131,* 364–376.

Schmidt, U., & Trautmann, S. T. (2014). Common consequence effects in pricing and choice. *Theory and Decision, 76,* 1–7.

Stroebe, W., & Strack, F. (2014). The alleged crisis and the illusion of exact replication. *Perspectives on Psychological Science, 9,* 59–71.

Trautmann, S. T., & van de Kuilen, G. (2012). Prospect theory or construal level theory? Diminishing sensitivity vs. psychological distance in risky decisions. *Acta Psychologica, 139,* 254–260.

Trope, Y., & Liberman, N. (2003). Temporal construal. *Psychological Review, 110,* 403–421.

Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychological Review, 117,* 440–463.

Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty, 5,* 297–323.

Wakslak, Cheryl, & Trope, Yaacov. (2009). The effect of construal level on subjective probability estimates. *Psychological Science, 20,* 52–58.

World Bank. (2015). *World development report 2015: Mind, society, and behavior*. Washington, DC: The World Bank.