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PUBLICNESS AND MICRO-LEVEL RISK BEHAVIOUR: Experimental Evidence on Stereotypical Discounting Behaviour

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Abstract

Anti-public stereotypes suggest that public agents are more likely to shun risk and tolerate delay in decision making compared with private sector agents. Drawing on the idea of context dependence of administrative behaviour, this study reports experimental evidence from 22,800 choice tasks to explore the effects of publicness as a mental frame for individual risk judgement. Decision makers are not automatically triggered to deviate from predicted economic discounting behaviour by a public sector context. However, public sector employees systematically overestimate risks and tolerate delay in rewards compared with the general population, linking public sector affiliation with biases in risk behaviour.

Key words: *Publicness, risk behaviour, probability discounting, delay discounting, behavioural public administration.*

INTRODUCTION

Risk is a pervasive factor of economic life and determining the adequate and acceptable amount of risk is the core activity of strategic management. Both acting overly risk averse and overly risk affine can have negative effects and bias strategic choice (Dohmen *et al.*, 2011): On the one hand, taking risks is a necessary prerequisite for innovation (Brown & Osborne, 2013), on the other hand, underestimating risks can be detrimental because this behaviour leads to missing out on chances to realize strategic leverage. While risk-affine exploitation of potentially risky opportunities is typically associated with rent seeking private sector agents, evaluating individual risk strategies is an equally relevant issue for public sector decision makers (Baarspul & Wilderom, 2011): For instance, public employees are often in charge of managing public welfare and pension funds or assets on public-private co-investments in PPPs and state-owned enterprises, in which revenues have to be generated through active and risk-sensitive strategies.

According to popular stereotypes worldwide, public organizations are the typical habitat of individuals that tolerate red tape and lower procedural efficiency because they inhibit a relatively low tolerance for taking risks and a high tolerance for delay (Rainey & Bozeman, 2000; Baarspul & Wilderom, 2011). In contrast, private sector employees are stereotypically characterized as being primarily self-interested individuals who are risk-savvy decision makers with little concern for externalities imposed onto public welfare as a result of their risk-affine behaviour (Brewer & Brewer, 2011; Buurman *et al.*, 2012). Both stereotypes are overly simplistic, yet, there is a considerable body of research indicating that individuals might (unwillingly) respond differently toward economic risk when working in a public vs. a private sector environment (Baarspul &Wilderom, 2011).

Drawing on the classic theory of bounded rationality (Simon, 1945; Kahneman & Tversky, 1979; Thaler, 1981; Kahneman, 2003), this article explores the effects of a public vis-à-vis a private sector contextual framing treatment on individuals' revealed choice behaviour under risk and delay. At its core lies the perennial question whether individuals perform differently when making decisions in the public realm and with public funds (Bozeman & Bretschneider, 1994; Klijn & Teisman, 2003). The experiment reported in the subsequent third and fourth section of this study explores whether, *ceteris paribus*, risk behaviour is biased by *publicness as a context of choice* and whether work experience in the public sector moderates this effect. In methodological terms, its design responds to recent calls for more behavioural and experimental research in public administration (PA) and public management (PM) scholarship by demonstrating the value of conducting systematically controlled and between-subject randomized survey experiments as a means to study the latent causal-mechanisms of risk behaviour in specific contexts and with a relevant subject pool (Grimmelikhuijsen *et al.*, 2017; James *et al.*, 2017; James & Van Ryzin, 2017; Tepe & Prokop, 2018). Specifically, this study contributes to the discourse on the micro-level factors that result in observable differences in risk behaviour across-sectors (Bozeman & Bretschneider, 1994; Nutt, 2005; Chen & Bozeman, 2012; Eshuis & van Buuren, 2014) by conducting a series of 57 behavioural choice experiments on the judgement of risk and delay with a balanced population-based sample of N=400 German citizens. In total, the empirical evidence is based on 22,800 individual observations of discounting behaviour complemented with a sociodemographic questionnaire to determine whether and in which way actual public sector employees' behaviour deviates from their peers' in private sector employment. It introduces two novel measures originally derived from behavioural economics to the field of experimental PA and PM research: Madden *et al.*'s (2009) *Probability Discounting (PD) Questionnaire* and Kirby *et al.*'s (1999) *Delay Discounting (DD) Scale*. By corroborating these two implicit measures with explicit attitude

scales, this study heeds to calls for more rigorous behavioural – i.e. micro-level – experimental designs by Baarspul and Wilderom (2011), Brewer and Brewer (2011), van Witteloostuijn (2016), Grimmelikhuijsen *et al.* (2017), and Walker *et al.* (2017) and demand for a more thorough exploration of why people tend to exhibit idiosyncratic choice behaviour in the context of public sector institutions (Baarspul & Wilderom, 2011; Baekgaard, 2017; Tepe & Prokop, 2018).

The remainder of this article is structured as follows: Based on the idea of context dependency of risk perception, section two presents a theory building literature review of how and why discounting behaviour under risk and delay could be influenced by the 'publicness' as a cognitive frame for decision making and derives a set of hypotheses. Section three describes the treatment design, the logic behind estimating discounting parameters, the sample, and the experimental procedure. Section four presents the empirical findings, which reveal that sector-specific differences in discounting behaviour are not merely related to abstract contextual framing effects but that actual civil servants do exhibit significant anomalies in choice. The last section summarizes and discusses the theoretical and practical implications of these findings and presents avenues for future research.

THEORY

Individuals' risk propensity – i.e. their tendency to seek or shun risk based on their interpretation of the perceived probabilities of entry for specific choice outcomes – is not an inherent and absolutely stable characteristic but it is strongly influenced by context (Kanner, 2005). What people consider to be adequate risk behaviour in one specific situation might be perceived as inadequate under different circumstances. The ability to evaluate risk in context is acquired knowledge that is socially constructed (Kanner, 2005; Gigerenzer, 2015). With

regard to risk adversity, Gigerenzer (2015: 76) points out that people "tend to fear whatever their peers fear." The 'adequate' response to the prospect of risk is directly related to the risk culture nested in decision makers' immediate social and organizational environment in the sense of an implicit choice architecture setting norms, frames, and boundaries to choice behaviour (Kanner, 2005). This holds true if we compare micro-level risk strategies across sectoral boundaries because the public and the private sector are characterized by dissimilar institutional logics that constrain and direct individual (managerial) choice in a potentially heuristic manner (Simon, 1945; Fottler, 1981; Boyne, 2002). The sector we work in constitutes a certain risk culture that we gradually learn about and adapt to (Oltedal *et al.*, 2004).

The statistical probability of an outcome is not the only dimension that influences decision maker's *perception of riskiness*. The riskiness of an outcome is constituted by its probability – i.e. the statistical likelihood of its entry – on the one hand and by its temporal dimension i.e. its delay in time on the other hand. These two dimensions of risk are psychologically interrelated: For instance, decision makers who are generally risk averse exhibit a strong tendency to discount rewards that are remote in time more steeply than immediate outcomes because decision makers (falsely) perceive them as seemingly more uncertain (Anderhub *et al.*, 2001). Perceptions regarding the adequacy of delay are important because time is the 'silent language' of management that determines the pace of professional behaviour (Hall, 1973). Following the popular stereotype, direct comparisons in large-scale quantitative studies indicate that, on the organizational level, decision making processes take more time in public compared with private sector organizations (Bozeman *et al.*, 1992). As a negative consequence, public organizations often tend to shy away from risky but innovative endeavours (Chen & Bozeman, 2012). Furthermore, Bozeman and Bretschneider (1994), Nutt (2005), and Eshuis and Van Buuren (2014) provide robust empirical evidence that micro-level decision making

takes more time in public compared with private organizations when structural differences between sectors are controlled for (Scott & Falcone, 1998; Boyne, 2002).

Publicness & risk behaviour

Investigating cross-sectoral anomalies in risk behaviour is a hen-and-egg problem: Does a public sector context trigger psychological effects that result in deviances in risk behaviour or do public sector organizations primarily attract people who already exhibit a preference to shun risk? Prior studies suggest two logical streams of argumentation: The first is that the particular context of public organizations elucidates psychological information cues that trigger and bias choice behaviour under risk in favour of a certain – potentially stereotypical risk-averse – direction (Simon, 1945; Kanner, 2005). The second is based on prior empirical research indicating that people with a certain tendency to shun risk could be especially likely to being drawn into public sector employment (Rainey *et al.*, 1976; Roessner, 1977; Bozeman & Kingsley, 1998; Parker & Bradley, 2000; Boyne, 2002; Tepe & Prokop, 2018) because they assume – presumably from this very same signal of organizational 'publicness' – that these organizations fit their preferences and, hence, adapt their risk behaviour accordingly.

To date, the empirical evidence regarding either perspective is scarce and contradictory. In two out of their three data sets, Hartog *et al.* (2002) find that public sector employees are explicitly more risk averse than private sector employees. These results correspond with prior research by Bellante and Link (1981) who provide evidence that risk-averse individuals are significantly more likely to choose public sector employment. In contrast, a study by Nutt (2005) on managerial decision making reports that public sector managers are prepared to take more risks on the job compared with private sector managers. Regarding risk behavior, Tepe and Prokop (2018) provide experimental lottery-game based evidence that, ceteris paribus, higher levels of risk aversion are positively associated with higher levels of public service motivation (PSM)

and with a higher likelihood of studying PA. However, in Tepe and Prokop's (2018) study, students of PA are not found to be more likely to behave more risk averse (i.e. choosing the less risky lottery option) compared with students studying business management or law. Furthermore, students of PA take more time to come to their decision under risk. Other studies by Barton and Waldron (1978), Pfeifer (2010), and Tzioumis (2018) comparing public and private sector employees find no evidence for micro-level differences in risk behaviour or risk preferences. Why do we observe this inconclusive evidence?

Publicness as a cognitive frame for risk evaluation

The idea that public and private sector agents respond differently to the prospect of risk is rooted in Simon's (1945) classic description of administrative behaviour: He argues that "in private organizations [decision-making] is much simpler than in public agencies. The private organization is expected to take into consideration only those consequences of the decision which affect it, while the public agency [and its agents] must weigh the decision in terms of some comprehensive system of public or community values" (Simon, 1945: 69). Kanner (2005) points out that this context-dependency is a common dilemma for research into risk behaviour because while decision makers' individual risk attitudes vary, their risk behaviour is also an outcome of their sectoral environment that provides a *dynamic directive frame for choice*. Risk is rarely evaluated purely on objective measures; rather, decisions are made based on decision makers' perceived state of their environment and risk is rarely assigned purely on objective measures (Kanner, 2005). Explicitly or implicitly, individuals' worldview and interpretation of the context (i.e. the sectoral environment of their strategic decision, their socialization, or their sector-related attitudes) will affect their choice behaviour so that observable "changes in risk attitude reflect changes in the belief set being used by the decision maker to assess the most likely state of nature in the future" (Kanner, 2005: 334) within a specific directive choice frame provided by the context of the choice situation.

In a professional context, organizational culture defines this greater contextual paradigm, the cognitive and psychological meaning, and the relative adequacy of any behaviour or process within an organization. It defines the norms and implicit patterns of behaviour against which any kind of structural element of decision making is evaluated, interpreted and *framed* against (Nachbagauer & Schirl-Bieck, 2019). The tangible and intangible constitution of an organization's culture is the system of what individuals regard as self-evident within a certain sectoral context thus facilitating sense-making in strategic dilemmas (Tompkins 2005; Weick *et al.*, 2005). Unsurprisingly, organizational risk cultures across sectors vary (Bozeman & Kingsley, 1998; Tompkins 2005) and especially public organizations with a higher degree of red-tape, weak political independence, and weak links between employee promotion and employee performance are more likely to feature risk cultures hostile to risk-taking (Bozeman & Kingsley, 1998).

Particularities of risk preference between sectors

More than 40 years of research into behavioural economics revealed that people often do not respond as predicted by classic economic theory of rational choice. When faced with the task of making good [1] decisions under risk, people tend to be easily distracted by factually unimportant side information nudging them toward more risk averse or risk-affine behaviour (Kahneman & Tversky, 1979; Thaler, 1981). This does not mean that people are automatically 'biased' by the context – e.g. the sector – they are supposed to make decisions in but it indicates that they automatically adapt to what they (*implicitly*) assume to be *adequate risk behaviour* within this context.

[1] In this context, a *good* decision is defined as a decision that increases the likelihood that any specific desired outcome will become more likely to be achieved based on this choice (Gigerenzer & Goldstein, 1996; Gigerenzer & Gaissmaier, 2011).

Individuals' prior experiences with and derived attitudes about public organizations and the individuals working in these organizations prime individual choice behaviour (Kahneman, 2003). The result is a (often negative) contextual expectation bias: Many studies demonstrate that sector-specific contextual framing biases individuals' behaviour in the sense that individuals' choices under risk violate the economic principle of invariance – preference stability in the context of inconsequential variations in the description of outcomes (Tversky & Kahneman, 1986) – one of the basic assumptions of rational choice theory (e.g. James, 2011; Hvidman & Andersen, 2016; Olsen, 2015; Baekgaard & Serritzlew, 2016). These frames can also come in the guise of heuristic "prototypes" (Kahneman, 2003) – i.e. anti-public stereotypes stored (implicitly) in memory – that are activated automatically once certain information cues become salient (Marvel, 2015, 2016; Hvidman & Andersen, 2016). Given that 'publicness' elicits strong stereotypes mainly related toward risk-aversion and based on prior research indicating that public sector organizations typically shun risk (Bozeman & Kingsley, 1998), it follows that 'publicness' functions as a contextual information cue affecting individuals' interpretation of risk in the sense that

> *HYPOTHESIS 1 (H1): Individuals discount probabilistic rewards more steeply in a public sector setting compared with a private sector setting.*

Delay discounting in cross-sectoral context

Anecdotal evidence codified in common anti-public stereotypes worldwide characterizes public sector employees as slow working, and as excessively long-term-oriented bureaucrats who differ greatly from their peers in private sector organizations regarding their perception and use of time (Taylor *et al.*, 2001). In their qualitative case-based study on team-level decision making, Eshuis and Van Buuren (2014) conclude that public sector employees are oriented toward medium- and long-term goals, while private sector employees are more short-

term-oriented. The authors argue that public agents' lack of urgency in short-term decision making poses a serious problem for public sector governance because the transaction costs of innovative ventures mainly consisted of time. Furthermore, the authors find that public and private sector actors perceive time pressure rather differently: While civil servants value the investment of time in the preparation of decisions as a means to increase the quality and acceptability of decisions by their subordinates, private sector actors tend to regard this investment as an unnecessary access cost of transaction, echoing loudly prior conceptual research by Simon (1945. The conclusions that Eshuis and Van Buuren (2014) draw correspond well with previous findings by Bozeman and Bretschneider (1994), who used a large sample of research labs in the US to disentangle the nature and effect of publicness on the organizational level of behaviour. When asked explicitly, respondents reported that decision making – especially with respect to personnel and procurement – generally required more time in public sector organizations than in private sector organizations. These studies indicate that a public sector context is generally associated with higher complexity in choice which results in need for more scrutiny in decision making and hence takes more time (i.e. delay adequacy). This idea is not new: Hall (1973) stated that whether individuals perceive time spent before making decisions as a necessary investment or a tedious delay greatly depends on both their individual temporal preferences and the institutional context of decision making (Hall, 1973). The institutional logics regarding time vary greatly between the sectors and are often codified in (time consuming) bureaucratic rules and processes to determine to what extent actors *should* take temporal aspects into account when making decisions (Frederick *et al.*, 2002; Fulmer *et al.*, 2014) and, consequently, how much temporal delay is regarded as acceptable in completing a task. It is likely that delay is perceived as socially more acceptable in a public sector context because it is associated with higher scrutiny. It follows that,

HYPOTHESIS 2 (H2): decision-makers discount delayed rewards less steeply (i.e. are more likely to tolerate delay in rewards) in a public sector context

compared to a private sector context.

MATERIALS AND METHODS

Experimental procedure

Hypotheses are tested with an online survey experiment based on a series of systematically varied economic discounting tasks. After a short introduction, respondents were randomly assigned to one of two vignette scenarios, putting them either in a public or a private sector context (*treatment*). In each treatment, respondents were framed into identical roles of a managerial decision maker faced with the task of making a series of independent financial investment choices (*discounting tasks*) under risk and delay in a way that were beneficial for their organization (i.e. a public institution or an equivalent for-profit private firm in the vignette scenario).[2] Each participant responded to 57 discounting tasks, resulting in a full dataset of 22,800 observations nested in N=400 participants, complemented by a socio-demographic questionnaire. The conceptual model is presented in Figure 1.

*** Please insert **FIGURE 1** about here ***

[2] See Appendix A.1 for a translation of the exact wording of the vignettes used for the contextual framing treatment. Respondents were explicitly reassured that both their salary in this hypothetical scenario and their actual pay-out for participating in the experiment were independent of their subsequent choices in the experiment.

Dependent Variables: Discounting Parameters *h* and *k*

Using Madden *et al.*'s (2009) *Probability Discounting Questionnaire* and Kirby *et al.*'s (1999) *Delay Discounting Scale*, participants responded to 30 decisions trading off probabilistic vs. secure outcomes and 27 trade-offs between delayed vs. immediate outcomes, all of which are systematically varies by the magnitude of prospected rewards, probabilities, and temporal delay. Both measures result in a single characteristic logarithmic discounting parameter (*h* for probabilistic and *k* for delayed rewards), which allows for metrical comparison of individuals' implicit revealed discounting behaviour across treatment groups.[3] Myerson *et al.* (2003) and Bickel *et al.* (2014) provide strong evidence for the validity and reliability both discounting measures.[4]

Probability discounting. The logic of the parameter estimation procedure is essentially rooted in an advanced, hyperbolic form of Samuelson's (1937) discounted utility theory and the premise of rational choice (Mazur, 1987; McKerchar *et al.*, 2009). Hyperbolic utility models are more reliable in predicting actual choice behaviour in the prospect of risk and delay than self-reported measures of risk preferences (Kirby & Maraković, 1996; Frederick *et al.*, 2002). In a controlled setting, well-informed individuals make choices under conditions of risk on the basis of their individual estimation of the expected value of the choice options given: For instance, in a scenario in which only two options exist – one option offering a fixed reward of €20 (i.e. the secure choice option), the other offering a 25% chance of receiving €80 and a 75% chance of receiving €0 (i.e. the risky choice option) – risk-neutral actors should be indifferent to the two choice options because both options offer an expected reward of €20. However, most people individuals are not indifferent to risk and tend to either seek out or shy away from

[3] See Appendix A3 and A4 for a complete list of the trade-off tasks.
[4] Following the example of Grey *et al.* (2015) and the spirit of open science, the online supplement to this article provides an algorithm for the statistical software Stata to calculate the *h* and *k* parameters automatically in order to facilitate future replications of the current study.

probabilistic choice options. This is because risk-averse agents will ascribe less value to probabilistic choice options compared to secure choice options, even if the expected value of both options is identical (as in the example above). This relative devaluation can be modelled as a hyperbolic discounting function (equation 1),

$$V = \frac{A}{1+h\cdot\Theta} \qquad (1),$$

where *V* represents the subjective expected value of the choice option under conditions of risk as a function of the prospected amount of reward *A* (e.g. €80), and the odds against receiving the reward Θ, with $\Theta=(1-p)/p$, where *p* refers to the probability of obtaining the reward (e.g. 25%). Consequently, the relative value ascribed to a probabilistic choice option should become smaller if the chance of winning the prospective amount is small. In contrast, individuals who (implicitly) embrace risk taking, are expected to being willing to pay extra for the chance of winning the probabilistic higher reward, while risk-averse individuals excessively devalue the utility of a risky choice option even if the expected value of these prospects exceeded the expected value of the secure choice option. These individual differences in PD are represented by the parameter *h* in equation (1): Risk-averse individuals attribute additional relative weight to the odds against winning ($h>1$), which will further reduce the perceived, subjective value of a given probabilistic choice option, while risk-affine individuals will welcome the prospect of risk ($h<1$), increasing the relative value of the probabilistic choice option. Consequently, *h* equals 1 for agents who are completely indifferent to risk.

Since utility discounting is an implicit process of decision making, individuals are unable to express their discounting parameter explicitly. Yet, if individuals are asked to perform a series of such trade-off tasks between probabilistic and secure rewards in which the prospective amounts A_i and the probability of winning p_i are varied systematically, *h* is revealed mathematically by the pattern of preference reversals across these tasks. The aim of conducting

a series of systematically varied trade-off tasks is to find the specific point of subjective utility-based indifference between the probabilistic and the secure choice option, because if we model the choice problem as a decision between the probabilistic choice option

$$V_{Pi} = \frac{A_{Pi}}{1+h\cdot\theta_{Pi}};\ \forall\ \theta_{Pi} = \frac{1-p_{Pi}}{p_{Pi}}, p \in [0; 1.0] \quad (2)$$

and the secure choice option

$$V_{Si} = \frac{A_{Si}}{1+h\cdot\theta_{Si}} = A_{Si}\ ;\ \forall\ \theta_{Si} = \frac{1-p_{Si}}{p_{Si}}, p_{Si} \in [1.0] \quad (3),$$

the choice problem amounts to a trade-off between V_{Pi} and V_{Si}. At the point of indifference, the laws of transitivity and invariance suggest that $V_{Pi} = V_{Si}$, which reveals *h* with respect to the relative magnitude of rewards M_i offered as

$$h = \frac{A_{Pi}-A_{Si}}{A_{Si}} \cdot \frac{1}{\theta_{Pi}} = \frac{A_{Pi}-A_{Si}}{A_{Si}} \cdot \frac{p_{Pi}}{1-p_{Pi}} = M_i \cdot \frac{p_{Pi}}{1-p_{Pi}} \quad (4).$$

It follows that if a decision maker was indifferent to the two options offered in the choice problem example mentioned above (€20 secure vs. a 25% chance of winning €80), his/her PD parameter *h* amounts to

$$h = \frac{€80-€20}{€20} \cdot \frac{0.25}{1-0.25} = 3 \cdot \frac{1}{3} = 1 \quad (5).$$

Moreover, this allows the direct interpretation that this specific decision maker would be risk-neutral (*h*=1), and we would be able to objectively compare his or her discounting behaviour in this choice situation with the risk preference of other individuals. Table A.3 in the Appendix shows the total of 30 choice tasks of the set. Since A_{Pi}, A_{Si}, and p_{Pi} are known, *h* can be

calculated at the respective point of indifference for each task and it is possible to collate this specific parameter value to each study respondent.[5]

In value configuration chosen in the present study, the endpoint values of *h* range from 0.33 to 16.17, where higher *h*-values indicate a stronger devaluation of the perceived value of the larger but probabilistic choice option against the secure choice option. This means that respondents with high *h* parameter values act in a way that is more risk averse.

Delay discounting. Similarly to the estimation procedure of *h*, Kirby *et al.*'s (1999) DD questionnaire allows for the estimation of a characteristic discounting parameter for the effect of temporal delay of rewards by using a systematic battery of 27 trade-off tasks in which participants have to choose between €31 million *today* and €85 million *seven days from now*. In each task of Kirby *et al.*'s (1999) measure, both alternatives offer secure pay-outs without chance. One choice option offers an immediate but smaller pay-out while the other choice option offers a higher but delayed reward. In order to estimate *k* with maximal predictive validity, the 27 tasks are randomized within the questionnaire and they vary systematically across all questionnaire items with respect to the amount of immediate (A_{Ii}) and delayed rewards (A_{Di}) and the time delay in days (D_i). The expected value (V_{Di}) of the delayed choice option is modelled as

$$V_{Di} = \frac{A_{Di}}{1+k*D_i}; \forall\, D_i \in]1.0;\, \infty] \qquad (6),$$

which, at the point of indifference, will be equal to the individual expected value (V_{Ii}) of the immediate choice option ($\forall\, D_i=0 \rightarrow V_{Ii} = A_{Ii}$). Thus, for each choice task *i*, *k* can be modelled as the relation between reward sizes divided by the amount of delay:

[5] If participants exhibited inconsistent choice behaviour (e.g. if they switched back and forth between probabilistic and secure choice options or between delayed and immediate choice options), they were assigned the one parameter that predicted their actual pattern of choice behaviour across the whole set of trade-off tasks with the highest consistency and most precision.

$$k_i = \frac{A_{Di} - A_{Ii}}{A_{Ii}} \cdot \frac{1}{D_i} = \frac{M_i}{D_i} \quad (7).$$

In the setup of the current experiment (see Table A.4 for more detail), respondents' DD rates at indifference (*k*) range from 0.00016 to 0.25 on a logarithmic scale, where high *k* values indicate a strong devaluation of the amount of delayed reward (A_{Di}) based on its remoteness in time, i.e. high DD: For example, assume that two (rational) individuals were offered €100 but would have to wait 100 days for the pay-out, equation 6 suggests that a very patient person on the one extreme of the scale – with a *k*-value of 0.00016 – would be willing to trade this offer for €98.43 of immediate reward, while a person who perceives waiting for the delayed reward as more burdensome (i.e. discounts delayed rewards more steeply) would be willing to forgo the offer for an immediate, secure pay-out of any amount higher than €3.85.

Magnitude Effects. Prior empirical research on discounting behaviour – e.g. by Kirby and Herrnstein (1995), Kirby and Maraković (1996), Green and Myerson (2004), Green *et al.* (2013), and Weatherly and Terrell (2014) – shows that the steepness of the discounting function decreases with an increase in the relative magnitude of rewards under probability and delay because risk behaviour is a function of scale (Thaler, 1981). This means that respondents are expected to discount higher prospected amounts less steeply compared with lower prospected amounts. The experimental tasks of the current study are designed to incorporate three ranges of relative reward magnitudes M_i (see Tables A.3 and A.4 in the appendix for more detail), resulting in three free, transitive discounting parameters for PD ($h_{small} < h_{medium} < h_{large}$) and for DD ($k_{small} < k_{medium} < k_{large}$), respectively. Controlling for the transitivity of discounting parameters by magnitude serves as a reliability check.

Control variables

Prior research shows that risk behaviour in context is influenced by individual character traits, most predominantly individuals' *explicit risk propensity* (Sitkin & Weingart, 1995; Anderhub

et al., 2001; Dohmen *et al.*, 2011; Rohde & Rohde, 2011), *impulsiveness* (Kirby & Maraković, 1996; Frederick *et al.*, 2002), and *socio-economic covariates* such as age and individuals' level of education (Gerbing *et al.*, 1987; Sitkin & Weingart, 1995; Kirby & Maraković, 1996).

Explicit risk preference. Respondents' explicit attitude towards risk was assessed with Nicholson *et al.*'s (2005) seven-item Likert-type scale on personality and domain-specific risk preferences (ERP) in its validated German translation by Meyer *et al.* (2015). Opposite value labels range from 1='strongly disagree' to 9='strongly agree'. All items were geometrically sum-scored, with higher scores of the composite measure indicating higher explicit risk-affinity.

Impulsiveness. Impulsiveness was measured with the 34-item version of Barratt's Impulsiveness Scale (BIS) in its validated four-point Likert-type form (Patton et al., 1995). Opposite value labels range from 1='hardly ever/never' to 4='very often/always'. Higher geometric sum-scores indicate higher impulsivity.

Sample

The experiment was conducted with an original, non-nested sample of N=400 German citizens recruited in January 2016 by a professional online panel provider (Respondi AG). [6] Respondents received a fixed monetary incentive for participation in this study. The sample is representative for the German working population aged 18 to 69 with respect to *gender* (female=50%), *age*, *level of education*, and *professional training* (see Appendix A.2). With 20.5% (n=82), public sector employees are slightly over-represented in the sample compared with 11.5% in the general population (Statistisches Bundesamt, 2016). All public sector employees are civil servants with tenure. Respondents are characterised by a slight tendency

[6] The minimum sample size for reliable two-tailed comparisons of means amounts to N = 352 participants and was estimated conservatively with Cohen's d-score in the assumption of a small to medium-size treatment effect; $d \leq |0.30|$; $\alpha = 0.05$, power = 0.8 (Ellis, 2010).

toward risk aversion when asked explicitly about their risk preferences (ERP: *M*=5.04, *SD*=0.89) and are below average impulsive (BIS: *M*=1.85, *SD*=0.40). Respondents were randomly assigned to either the public or the private treatments group (balance confirmed by multiple Wilcoxon two-sample rank-sum tests (all $p \geq 0.138$); see A.2).

Model specification

In the expectation of a linear treatment effect, hypotheses were tested by estimating in total four – two for PD and two for DD – multi-level mixed effects regression models clustered at the level of the individual and estimated with heteroscedasticity-robust standard errors. The main effects models (I_i) are specified as:

$$h_I = \beta_1 Treatment + \beta_{2;3;4} Magnitude + \beta_5 Employment\ Sector + \beta_6 ERP + \beta_7 Impulsivity + \beta_8 Age + \beta_9 Female + \varepsilon_i.$$

and

$$k_I = \beta_1 Treatment + \beta_{2;3;4} Magnitude + \beta_5 Employment\ Sector + \beta_6 ERP + \beta_7 Impulsivity + \beta_8 Age + \beta_9 Female + \varepsilon_i.$$

respectively. Relative magnitudes of rewards are modelled as binary indicators with small magnitudes arbitrarily serving as reference categories. In the second models (II_i), interaction terms between framing treatment and employment sector as well as between employment sector and magnitude of reward are added as post-hoc analysis on prior work experience.

RESULTS

Descriptive analysis

Prior to hypotheses testing, all discounting parameters h_i and k_i were log-transformed for normalization from their originally logarithmic scales and additional reliability checks for the

dependent variables regarding magnitude effects and item transitivity were conducted. Participants across both framing treatments follow hyperbolic discounting strategies as predicted by discounted utility theory when faced with different magnitude-levels of prospect rewards; they discount probabilistic rewards more steeply if relative magnitudes of rewards are higher in a strictly transitive way ($h_{small} < h_{medium} < h_{large}$). Confirmatory factor analysis shows that the three PD parameters are indeed interrelated (*KMO*=0.683; Bartlett's Chi^2=432.48, *p*=0.000; *AIC*=0.963) and load onto one single underlying construct (Cronbach's α=0.812). The three DD parameters are also reliably related to a single underlying construct (*KMO*=0.711; Bartlett's Chi^2=560.97, *p*=0.000; *AIC*=4.905; Cronbach's α=0.849), but respondents in both treatment groups and across professional sector affiliations (public or private) discount delayed rewards intransitively ($k_{large} < k_{small} < k_{medium}$) resulting in overall higher discounting rates for medium-size magnitudes of delayed rewards (see Table 1). This response pattern is stable across treatment groups and employment sector-based subsamples (see Table 2) pointing toward a general pattern cognition instead of being indicative of a specific magnitude-related treatment effect.

*** Please insert **TABLE 1** about here ***

Table 1 displays the descriptive results of the PD and DD choice tasks split by magnitudes of reward and experimental treatment. Contrary to *H1* and *H2*, *t*-testing does not reveal a publicness-related treatment effect on PD or DD (all two-tailed between-group *t*-tests statistically non-significant; *t*=|0.101 to 1.104|, *p*=0.270 to 0.919; *d*=|0.010| to |0.109|).

In contrast, comparing the results of the PD and DD choice tasks by respondents' employment sector (Table 2) reveals that – across all three magnitude levels of reward – public sector employees discount probabilistic rewards more steeply than private sector employees. This effect is especially strong for large probabilistic rewards (h_{large}), where public sector employees (M=1.12, SD=1.29) discounted risky choice options almost 44.3% more steeply than private sector employees (M=0.62, SD=1.16); t=-3.156, p=0.002; d=-0.416. The absolute size of this effect decreases with smaller magnitudes of probabilistic reward (h_{medium}: t=-1.732, p=0.086; d=-0.219; h_{small}: t=-2.222, p=0.028; d=-0.267) but the effect is robust in its direction and considerable in its absolute effect size.[7]

*** Please insert **TABLE 2** about here ***

Regarding DD, descriptive analysis shows that public and private sector employees differ regarding their willingness to wait for relatively larger but delayed rewards, but this is only the case for small amounts (k_{small}). Public sector employees discount small delayed rewards less steeply (M=-5.93, SD=2.49) compared with private sector employees (M=-5.11, SD=2.52); k_{small}: t=2.663, p=0.009; d=0.328. Although the absolute difference of the mean discounting scores seems small, a short example calculated with Equation 6 illustrates the considerable size of this effect: If a public sector employee randomly drawn from the current sample was offered

[7] As an illustration, assume that someone would offer a randomly drawn respondent from the current sample a risky venture with a probability of 50% for winning €100 and a 50% chance of winning nothing. Using Equation 2, we can calculate that they would trade this offer for €24.69 if they actually worked in the public sector and that they would trade the very same offer for €34.96 if they were drawn from the group of private sector employees. This indicates that the average public sector employee in our sample discounts probabilistic rewards more steeply than the average private sector employee revealing that, *ceteris paribus*, public sector employees behave more risk averse.

the prospect of receiving €100 after waiting 100 days, they would be happy to trade this offer for €78.98 of immediate reward. In contrast, a randomly drawn private sector employee from the same sample would be content to trade the very same offer for €62.24 of immediate reward. This means that public sector employees are more tolerable toward delayed gratification.

*** Please insert **TABLE 3** about here ***

The results of pair-wise correlation analysis (Table 3) amplify these results. As expected, explicit (stated) risk preferences (ERP) correlate with revealed PD behaviour (ρ=-0.177 to -0.142, p=0.004 to 0.019). ERP is also significantly related to impulsiveness (ρ=-0.410, p=0.000). Higher age is positively correlated with a higher explicit preference for risk (ρ=0.245, p=0.000) but a lower implicit tolerance for risk (h_{large}: ρ=-0.115, p=0.021; h_{medium}: ρ=-0.150, p=0.002; h_{small}: ρ=-0.114, p=0.022) and lower impulsiveness (ρ=-0.355, p=0.000).

Main Analysis

The results of multi-level mixed-effects regression analyses are presented in Table 4. Since each study participant responded to 57 choice tasks nested in three magnitudes, the model estimates are clustered at the individual level (N=400) for conditional contribution and at the task level (N=1,200) in order to achieve heteroscedasticity-robust standard error terms. All four models are well specified (Wald Chi^2=224.11 to 320.20; p=0.000) and rely on in total *Obs*.=12,000 for the PD choice task and on *Obs*.=10,800 for the DD task.

*** Please insert **TABLE 4** about here ***

The regression models provide further evidence that *H1* has to be rejected: Changing the context of choice from a public to a private sector organization does not significantly affect respondents' discounting behaviour (*h*: b_I=0.027, p=0.800; *k*: b_I=-0.049, p =0.847). Intriguingly, the models reveal a substantial positive effect of public sector affiliation on PD (*h*: b_I=0.411, p=0.002): *ceteris paribus*, public sector employees discount probabilistic rewards much more steeply than their socio-demographically equivalent peers actually working in the private sector. Since *h* was log-transformed, the estimated coefficients have to be interpreted in their exponentiated form ($e^b=e^{0.703}$=1.509, p=0.004), which means that – under the exact same circumstances and given the exact same information – public sector employees discount risky amounts more than 1,5 times as steeply as private sector employees.[8]

Adding the interaction terms reveals that this effect is not moderated by the magnitude of reward (b_{II}=-0.067, p=0.351), which exerts a strong direct effect on PD behaviour (b_{II}=-0.839 to -0.381, p=0.000). As revealed by the correlation matrix (Table 4), age and explicit (i.e. stated) risk preference exert small but statistically significant effects on PD behaviour with older (b_I=-0.010, p=0.004) and risk-averse respondents (ERP: b_I=-0.133, p=0.045) discounting probabilistic rewards less steeply (see Figure 2).

*** Please insert **FIGURE 2** about here ***

[8] To investigate potential distortions based on the unequal sample sizes, regression analyses were re-run 500 times with equal-sized samples randomly drawn from the pool of public and private sector employees. None of these robustness checks altered any of the substantive findings.

Regression analysis does not reveal a similar direct effect of real-life public sector affiliation on DD behaviour (b_{II}=-0.443, p=0.138). Intriguing, respondents discount delayed rewards asymmetrically and intransitively in the sense that they are more likely to accept waiting for numerically *larger* amounts of reward (b_{II}=-1.564, p=0.000) while they perceive waiting for *medium*-sized delayed rewards as more burdensome and discount these prospects to an even higher degree than in the case of waiting for smaller amounts (medium-sized rewards: b_{II}=0.456, p=0.000). Interaction terms reveal that this effect is related to public sector employees reacting much more strongly toward the magnitude of delayed reward (b_{II}=-0.419, p=0.003) compared with private sector employees. This means that, *ceteris paribus*, public sector employees are more willing to accept delay in rewards than private sector employees.

DISCUSSION

The experimental findings reveal that public sector employees systematically overestimate economic risks and that they are more likely to tolerate delay in rewards compared with the general population. This effect is independent from '*publicness*' as a mere *choice context* because a public sector treatment does not automatically lead to deviances in economic discounting behaviour.

Intriguingly, the experiment reveals that the public sector employees in this sample *do* exhibit dissimilar discounting behaviour compared with public sector employees. This points toward a link between public sector affiliation and biases when faced with choice problems under risk. These findings are the first to substantiate prior research based on self-report measures by Bozeman *et al.* (1992), Bozeman and Bretschneider (1994), Nutt (2005), Eshuis and Van Buuren (2014), and Tepe and Prokop (2018) with evidence on *revealed* economic risk discounting behaviour. The experimental evidence of the current study is based on a balanced

randomly controlled trials to warrant high internal validity and to eradicate the influence of socio-demographic factors that might differentiate public and private sector employees (James *et al.*, 2017). Yet, sector specific differences in discounting behaviour persist.

The results have important practical implications for PM, especially regarding organizational performance and employee decision-making (Brewer & Brewer, 2011). Essentially, the "behaviour of the individual[s] is a tool with which [an] organization achieves its targets" (Simon, 1945: 108). Consequently, the finding that individuals who work for the public sector evaluate economic risks differently is an important contribution to the core of the PA and PM discourse. It relates to the perennial question of whether certain tasks such as performance evaluation and strategic planning should rather be assigned to public or private sector agents (Rainey *et al.*, 1976; Rainey & Bozeman, 2000; Brewer & Brewer, 2011) and to whether these tasks can be efficiently organized in complex cross-sectoral environments such as public-private partnerships (PPPs) (Klijn & Teisman, 2003; Alford & Greve, 2017). As cooperative institutional arrangements, PPPs are particularly valuable for their capacity for bundling and sharing venture-related risks among partners. Consequently, PPPs gained considerable popularity with policy makers in the last two decades (Hodge & Greve, 2007; Wang *et al.*, 2018). PPPs are often created to conduct large-scale projects that are governed by traditional approaches to risk management generally following control-and-order logics – *time, budget, and scope* – to account for the complex challenges that emerge during the lifetime of such projects. The typical way of incorporating such uncertainty in PPP management is by estimating the likelihood of potential threats that might hinder collaboration efficiency – and, hence, partnership success – by means of stochastic evaluations (Acebes *et al.*, 2014). This means that individuals engaged in these partnerships are challenged with estimating probabilities and potential delays of processes on a regular basis both in their roles as partners within the PPP but also from the perspective of their own organization – be it public or private.

The manifest asymmetries between public and private sector agents revealed by the current study might lead to considerable fraction within the partnership if differences in the perception of risk and delay are not accounted for and aligned accordingly. This is a challenging task for the members of both sides of the partnership especially individuals' discounting behaviour is the result of implicit and often subconscious cognitive process (Ajzen, 2001).

The absence of a significant public sector treatment effect has important implications for PM and PA scholarship: By revealing that '*publicness*' might function as a much weaker and potentially asymmetric behavioural cue stimulating individuals' evaluation and choice behaviour than previously anticipated. In contrast to prior studies by Marvel (2015; 2016), and Hvidman and Andersen (2016), the findings of the current experiment show that although people might be influenced by information cues related to the public sector in case of evaluating organizations' performance, their *own behaviour* is not as easily manipulated by a contextual public-sector cue, calling for more research.

Sector affiliation

This study shows that revealed behavioural risk aversion is associated with working in the public sector. It is important to recognize the possibility that *risk* may have different meanings in different sectors (Bozeman & Kingsley, 1994). On the one hand, daring to take risks is essential for organizational innovation and the creative generation of new ideas and policies to tackle complex issues idiosyncratic to the public sector (Brown & Osborne, 2013). On the other hand, taking risks always incorporates the chance of failure, which – in the case of public organizations providing essential goods and services to the general public – can have devastating consequences for the life of many people who rely on these services. Risk aversion might actually be the implicit *cognitive benchmark* for individuals' professional behaviour in public organizations because the anticipated cost of failure is much higher than the potential

gain from taking risks (Sarin & Weber, 1993). This could be the case particularly with people who are especially interested in and considerate of issues of public values, pro-social behaviour, and societal welfare, i.e. people with high levels of public service motivation (PSM) (Giauque *et al.*, 2015; Van de Walle *et al.*, 2015; Homberg & Vogel, 2016). People who actively seek public sector employment are more likely to being motivated by pro-social values and exhibit higher levels of PSM (Buurman *et al.*, 2012; Esteve *et al.*, 2015; Esteve *et al.*, 2016; Vogel & Kroll, 2016) and prior experimental research by Tepe and Prokop (2018) reveals that PSM is positively associated with risk-averse behaviour. In this context, the result that public employees discount probabilistic rewards more steeply makes a lot of sense because this specific group of respondents should be relatively more aware that taking risks in public organizations may result in severe negative consequences for societal welfare.

These macro-level threats of risk-affine behaviour are complemented by both explicit and intangible incentive structures designed to attract micro-level risk-aversion: societies that organize large parts of their public sector workforce in the form of a career-based employment system (such as Germany) often unwillingly create traditionally risk-averse administrative cultures within their public organizations because engaging in risky and innovative ventures will not materialize in individual benefits (e.g. higher wages or earlier promotion) for motivated employees but still offers the potential of failure and, consequently, the individual threat of not being promoted as scheduled (Rainey *et al.* 1976; Roessner, 1977; Bozeman & Kingsley, 1998; Parker & Bradley, 2000; Boyne, 2002). Since individuals' ability to make good – i.e. goal-oriented and adequate in context – decisions under risk is the outcome of a socially informed learning process (Oltedal *et al.*, 2004; Gigerenzer, 2015), this micro-level dynamic of incentive structures implies that even initially risk-neutral or risk-affine individuals might gradually adapt their risk behaviour when working in an organizational culture of explicit or implicit risk aversion if engaged in long-term public sector employment (like the

sample of public sector employees in the current study). Brewer and Brewer (2011) point out that micro-level differences in (risk) behaviour could be the core factors that – over time – accumulate into observable organizational differences between the sectors, especially regarding performance and effectivity. For instance, individuals' micro-level tendency to tolerate delays might manifest in very mundane phenomena often associated with public organizations such as higher red tape and lower organizational efficiency (Bozeman *et al.*, 1992). This idea is in-line with prior research by Bozeman and Kingsley (1998) who report that managers working in public organizations with high red tape and weak links between performance and promotion – such as many public organizations in the continental European tradition of PA – acted comparatively more risk averse and that they were more likely to adapt to and promote a risk-averse organizational culture. Consequently, the experimental finding that public employees were more tolerant to delay and discounted delayed rewards significantly less steeply than private employees might indeed be the result of a latent adaptation process due to their long-term service within a risk-averse culture.

Practitioners might want to counteract these latent and adverse learning processes by, first, providing opportunities for their co-workers to develop their skills of handling economic risks, i.e. training to become *risk savvy* (Gigerenzer, 2015). Second, they are encouraged to work towards increasing their organization's capability to being open to pro-active risk-taking for innovation by fostering active awareness of the issue and by establishing procedural capacities that allow for trial-and-error without punishing individual employees daring to take reasonable risks. Third, this awareness for both the positive and negative effects of risk and delay could have very positive effects on behavioural and procedural efficiency in cross-sectoral collaboration by decreasing the cost of coordinating with private sector partners, who are often more open to embrace economic risks (Brown & Osborne, 2013).

Limitations & future research

Like any empirical research, the results presented in the current study are associated with limitations and encourage future research. First, the empirical evidence is based on choice data from an online experiment to measure behavioural intent as a proxy for actual risk behaviour. Following the logic of classic experiments in behavioural economics, this high level of abstraction and control allows for the direct identification of causal mechanisms between '*publicness*' and the perception of risk (Brewer & Brewer, 2011; James *et al.*, 2017). While this hypothetical scenario comes at the cost of limited ecological validity, prior experimental research shows that individuals exhibited no substantial difference in discounting behaviour when asked to evaluate real vs. hypothetical rewards (Johnson & Bickel, 2002; Madden *et al.*, 2003; Logorio & Madden, 2005; Odum, 2011). Second, the discounting tasks employed in the experiment only comprise the domain of gains. Prospect theory suggests that individuals follow dissimilar discounting strategies in the domain of gains compared with the domain of losses (Kahneman & Tversky, 1979; Thaler, 1981) and a recent study by Baekgaard (2017) indicates that '*publicness*' might influence this effect. Future studies could replicate the experiment in the domain of loss.

Third, the experimental logic and treatment design of this study is based on a strict cognitive distinctiveness between the public and the private sphere, and assumes that this distinction is salient in respondents' minds. This premise has two consequences for the reliability and generalizability of the findings: First, it excludes the theoretical perspective of hybrid organizations. Second, under the premise of an absolute public/private dichotomy, the results of the current study can only be interpreted as *relative* effects – in contrast to *absolute* effects – i.e. comparing public and private sector agents' discounting behaviour in relation to each other, with the absence of the true control group. While this assumption is realistic for countries

associated with the continental European tradition of PA – such as Germany – future replication studies conducted in countries with other administrative traditions might find dissimilar effects of publicness and sector-affiliation on discounting behaviour under risk. Replication studies using samples with a similar tradition will test whether the finding that public sector professionals react differently to the prospect of economic risks is idiosyncratic to the specific characteristics of public sector employees in Germany. Public employees in Germany often enjoy the privilege of a career-based system of employment with the prospect of lifetime tenure, which might attract especially risk-averse individuals (Bellante & Link, 1981; Hartog *et al.*, 2002). Second, follow-up studies using samples from countries with a less pronounced public-private distinction – e.g. in the Anglo-Saxon administrative tradition – will help evaluate whether or not the experimental results still hold if the psychological lines between the sectors is less precise so that risk-averse individuals find no special incentive to self-select into one sector or the other.

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TABLE 1: Descriptive results of discounting tasks by treatment

Dependent variable	Experimental Treatment	N	M	SD	[95% CI]		*t*-test		*d*
							t	*p*	
Probability discounting (PD)									
h_{large}: €20 vs. €80	public	200	1.553	1.38	1.361	1.746	-.281	.779	.028
	private	200	1.515	1.34	1.328	1.702			
h_{medium}: €40 vs. €100	public	200	1.126	1.25	.952	1.300	.653	.514	-.065
	private	200	1.209	1.29	1.029	1.388			
h_{small}: €40 vs. €60	public	200	.789	1.27	.612	.966	-1.104	.270	.110
	private	200	.656	1.13	.498	.814			
Delay discounting (DD)									
k_{large}: €75 to €85	public	200	-5.412	2.51	-5.762	-5.062	1.092	.276	-.109
	private	200	-5.136	2.55	-5.491	-4.780			
k_{medium}: €50 to €60	public	200	-4.712	3.15	-5.151	-4.273	-.131	.896	.013
	private	200	-4.753	3.18	-5.197	-4.310			
k_{small}: €25 to €35	public	200	-6.651	2.51	-7.000	-6.302	-.101	.919	.010
	private	200	-6.676	2.47	-7.021	-6.332			

Notes: Normalized discounting parameters; amounts in millions; *t*-testing Welch-adjusted.

TABLE 2: Descriptive results of discounting tasks by respondents' employment sector

Dependent variable	Employment Sector	N	M	SD	[95% CI]		*t*-test		*d*
							t	*p*	
Probability discounting (PD)									
h_{large}: €20 vs. €80	public	82	1.115	1.29	.832	1.399	-3.156	.002	**-.416**
	private	318	.621	1.16	.493	.749			
h_{medium}: €40 vs. €100	public	82	1.387	1.30	1.102	1.673	-1.732	.086	**-.219**
	private	318	1.110	1.25	.972	1.249			
h_{small}: €40 vs. €60	public	82	1.821	1.30	1.536	2.105	-2.222	.028	**-.267**
	private	318	1.460	1.37	1.310	1.611			
Delay discounting (DD)									
k_{large}: €75 to €85	public	82	-6.652	2.48	-7.196	-6.108	-.047	.963	-.006
	private	318	-6.667	2.49	-6.942	-6.392			
k_{medium}: €50 to €60	public	82	-5.158	3.21	-5.863	-4.454	1.355	.178	.170
	private	318	-4.623	3.14	-4.970	-4.276			
k_{small}: €25 to €35	public	82	-5.929	2.49	-5.383	-4.828	2.663	.009	**.328**
	private	318	-5.105	2.52	-5.383	-4.828			

Notes: Normalized discounting parameters; amounts in millions; *t*-testing Welch-adjusted.

TABLE 3: Correlations and reliabilities

		Range (min. – max.)		1	2	3	4	5	6	7	8	9	10	11
Treatment variables [a]														
1	h_{large}	-1.11	2.68	–										
2	h_{medium}	-1.11	2.72	.659***	–									
3	h_{small}	-1.11	2.78	.494***	.626***	–								
4	k_{large}	-8.74	-1.39	-.116*	-.096	-.248***	–							
5	k_{medium}	-8.74	-1.39	-.014	.047	-.103*	.594***	–						
6	k_{small}	-8.74	-1.39	-.059	-.006	-.121*	.651***	.745***	–					
7	Public sector treatment	0	1	.055	-.033	.014	.005	.007	-.055	–				
Control variables														
8	Explicit risk propensity	1	9	-.132**	-.117*	-.142**	-.012	-.024	-.039	.025	–			
9	Impulsiveness	1	4	.027	.041	.080	.022	.017	-.008	.087	-.410***	–		
10	Public sector employee	0	1	.166***	.088	.107*	.002	-.069	-.132**	.074	.058	-.022	–	
11	Age in years	18	69	-.115*	-.150**	-.114*	.023	.030	.006	.012	.245***	-.355***	.011	–
12	Female	0	1	-.000	.014	.019	-.010	-.023	-.002	.000	.171***	.032	-.074	.000

Note: [a] Normalized discounting parameters; * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

TABLE 4: Results of multi-level analysis

	Probability discounting		*Delay discounting*	
	I	*II*	*I*	*II*
Level 1 (framing treatment)				
Public sector treatment	.027	.085	-.049	-.147
	(.11)	(.12)	(.24)	(.27)
Large rewards	-.812***	-.839***	-1.390***	-1.564***
	(.06)	(.07)	(.11)	(.13)
Medium rewards	-.367***	-.381***	-.541***	.456***
	(.06)	(.06)	(.11)	(.12)
Small reward	*– reference category for magnitude –*			
Level 2 (individual)				
Cross-level two-way interactions				
Public sector employee x Public context		-.285		.484
		(.26)		(.60)
Public sector employee x Magnitude of reward		-.067		-.419**
		(.07)		(.14)
Control variables				
Public sector employee	.411**	.703**	-.443	.126
	(.13)	(.24)	(.30)	(.53)
Explicit risk propensity	-.133**	-.137**	-.044	-.039
	(.05)	(.05)	(.10)	(.10)
Impulsivity	-.177	-.181	.111	.118
	(.19)	(.19)	(.43)	(.43)
Age	-.010*	-.010*	.006	.006
	(.00)	(.00)	(.01)	(.01)
Female	.116	.117	-.076	-.078
	(.11)	(.11)	(.25)	(.25)
Intercept	3.037***	3.057***	-5.337***	-5.262***
	(.61)	(.61)	(1.38)	(1.38)
N (Level 1/Level 2)	1,200/400	1,200/400	1,200/400	1,200/400
Observations	12,000	12,000	10,800	10,800
Wald Chi^2 (df)	224.78***	227.11***	307.31***	320.20***
var(Intercept)	.886	.883	4.849	4.849
var(Residual)	.667	.667	2.609	2.580
ICC	.570	.570	.650	.653
AIC	3,584.93	3,586.90	5,331.50	5,326.03
BIC	3,640.92	3,653.07	5,387.49	5,392.20
*-2*Log Likelihood*	3,562.93	3,560.90	5,309.50	5,300.03

Notes: Multi-level regression estimates clustered at the individual level for conditional contribution, heteroscedasticity-robust standard errors in parentheses; Model I: main effects; Model II: with interaction effects; * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

APPENDICES

A.1 EXPERIMENTAL TREATMENT

English translation; extensive original codebook in German upon request.

1. **PUBLIC SECTOR TREATMENT:**

[Introduction & public sector vignette]

'Please imagine that you work for a public service agency, which means working in the public sector. Imagine that, on a regular daily basis, it was your job to make decisions about different alternatives for investments, which will result in different outcomes, respectively. Each time, you can choose between two alternatives. These two options are independent of each other. Your salary is absolutely independent of the decisions you make and, from a long-term perspective, it is secure. You do not have to worry since both your supervisors and your colleagues fully trust in your judgement on these investment decisions.

For example:

For this investment, you have these two alternatives to choose from:

- **Alternative A**: will yield a return on investment of € 40m in 50% of all cases, and will yield a return an investment of € 0 in 50% of all cases.
- **Alternative B**: will yield a risk-free return on investment of € 20m.

Please make sure to take a close look at the two alternatives offered in each task and please select the one alternative that you think is the best choice for your public service agency:'

[… followed by 57 choice tasks based on Madden's (2009) and Kirby et al.'s (1999) questionnaires. Each choice task was presented independently on a new page to inhibit carry-over effects. Participants were constantly reminded of their role as a decision maker in the public sector, for instance, test-item 1 of Madden et al.'s (2009) read:

[Probability discounting item 1]

'Please select the one alternative that you think is the best choice for your public service agency:

For this investment, you have these two alternatives to choose from:

- **Alternative A**: will yield a return on investment of € 80m in 10% of all cases, and will yield a return an investment of € 0 in 90% of all cases.
- **Alternative B**: will yield a risk-free return on investment of € 20m.

Please select one alternative now:'

2. PRIVATE SECTOR TREATMENT:

[Introduction & private sector vignette]

'Please imagine that you work for a business company, which means working for a profit-oriented, private-sector organization. Imagine that, on a regular daily basis, it was your job to make decisions about different alternatives for investments, which will result in different outcomes, respectively. Each time, you can chose between two alternatives. These two options are independent of each other. Your salary is absolutely independent of the decisions you make and, from a long-term perspective, it is secure. You do not have to worry since both your supervisors and your colleagues fully trust in your judgement on these investment decisions.

For example:

For this investment, you have these two alternatives to choose from:

- **Alternative A**: will yield a return on investment of € 40m in 50% of all cases, and will yield a return an investment of € 0 in 50% of all cases.
- **Alternative B**: will yield a risk-free return on investment of € 20m.

Please make sure to take a close look at the two alternatives offered in each task and please select the one alternative that you think is the best choice for your business company:'

[… followed by 57 choice tasks based on Madden's (2009) and Kirby et al.'s (1999) questionnaires. Each choice task was presented independently on a new page to inhibit carry-over effects. Participants were constantly reminded of their role as a decision maker in the private sector, for instance, test-item 1 of Madden et al.'s (2009) read:

[Probability discounting item 1]

'Please select the one alternative that you think is the best choice for your for-profit company:

For this investment, you have these two alternatives to choose from:

- **Alternative A**: will yield a return on investment of € 80m in 10% of all cases, and will yield a return an investment of € 0 in 90% of all cases.
- **Alternative B**: will yield a risk-free return on investment of € 20m.

Please select one alternative now:'

A.2 DESCRIPTIVE SAMPLE STATISTICS

Variable	Full sample	General population	Treatment group balance				
			Public	Private	*z*	*p*	*Sign.*
N	400	82.5m	200	200			
Gender (default = male)	50.0%	49.1%	50.0%	50.0%	.000	1.000	n.s.
Age in years							n.s.
18-24	9.3%	11.3%	9.0%	9.5%	.786	.432	
25-39	29.8%	27.3%	30.0%	29.5%	.661	.509	
40-59	45.0%	44.8%	45.0%	45.0%	.066	.948	
60-64	10.3%	9.4%	9.5%	11.0%	-1.110	.267	
65-69	5.8%	7.3%	6.5%	5.0%	.840	.401	
School-based education							n.s.
No formal education (yet)	1.0%	7.3%	1.0%	1.0%	.000	1.000	
High school diploma	32.0%	33.0%	32.0%	32.0%	.000	1.000	
General secondary education	34.0%	29.5%	34.0%	34.0%	.000	1.000	
Higher education qualification	33.0%	29.5%	33.0%	33.0%	.000	1.000	
Higher education & professional training							n.s.
No post-secondary education	12.8%	25.8%	11.0%	14.5%	-1.048	.295	
Vocational training	66.5%	57.1%	68.5%	64.5%	.846	.397	
First stage of tertiary education[a]	6.3%	1.5%	7.5%	5.0%	1.032	.302	
Second stage of tertiary education[b]	10.3%	13.7%	10.0%	11.5%	-.484	.629	
Third stage of tertiary education[c]	3.3%	1.1%	3.0%	4.5%	-.788	.430	
Public sector employee	20.5%	11.5%	23.5%	17.5%	-1.484	.138	n.s.
Explicit risk propensity: M ± SD	5.04 ± .80	.	5.01 ± .89	5.08 ± .90	-.776	.438	n.s.
Impulsiveness: M ± SD	1.85 ± .40	.	1.87 ± .37	1.83 ± .43	1.070	.285	n.s.

Notes: Balance tested with Wilcoxon two-sample rank-sum test. [a] Bachelor's degree or equivalent. [b] Master's degree or equivalent. [c] Ph.D. or equivalent.

A.3 PROBABILITY DISCOUNTING QUESTIONNAIRE

Based on Madden *et al.* (2009)

Item No.	Questionnaire Part	Secure Option	Probabilistic Option			h_M at indiff.
		Reward A_{Si}	Probability p_{Pi}	Reward A_{Pi}	Expected Value	
1	Part 1: Large magnitude of rewards	€20	10%	€80	€8	.33
2		€20	13%	€80	€10	.45
3		€20	17%	€80	€14	.61
4	$M_{Large} = \frac{80-20}{20} = 3$	€20	20%	€80	€16	.75
5		€20	25%	€80	€20	1.00
6		€20	33%	€80	€26	1.48
7		€20	50%	€80	€40	3.00
8		€20	67%	€80	€54	6.09
9		€20	75%	€80	€60	9.00
10		€20	83%	€80	€66	14.65
11	Part 2: Medium magnitude of rewards	€40	18%	€100	€18	.33
12		€40	22%	€100	€22	.42
13		€40	29%	€100	€29	.62
14	$M_{Medium} = \frac{100-40}{40} = 1.5$	€40	33%	€100	€33	.74
15		€40	40%	€100	€40	1.00
16		€40	50%	€100	€50	1.50
17		€40	67%	€100	€67	3.04
18		€40	80%	€100	€80	6.00
19		€40	86%	€100	€86	9.21
20		€40	91%	€100	€91	15.17
21	Part 3: Small magnitude of reward	€40	40%	€60	€24	.33
22		€40	46%	€60	€28	.43
23		€40	55%	€60	€33	.61
24	$M_{Small} = \frac{60-40}{40} = 0.5$	€40	60%	€60	€36	.75
25		€40	67%	€60	€40	1.01
26		€40	75%	€60	€45	1.50
27		€40	86%	€60	€52	3.07
28		€40	92%	€60	€55	5.75
29		€40	95%	€60	€57	9.50
30		€40	97%	€60	€58	16.17

Note: Amount in million €.

A.4 DELAY DISCOUNTING QUESTIONNAIRE

Based on Kirby *et al.* (1999)

Item No.	Questionnaire Part	*k* rank	Immediate Reward A_{Ii}	Delayed Option		Magnitude *M*	k_M at indiff.
				Delay	Reward A_{Di}		
9	Part 1: Size of	1	€78	162	€80	.026	.00016
17	delayed reward A_{Di}	2	€80	157	€85	.063	.00040
12	= large	3	€67	119	€75	.119	.0010
15		4	€69	91	€85	.232	.0025
2		5	€55	61	€75	.364	.0060
25		6	€54	30	€80	.481	.016
23		7	€41	20	€75	.829	.041
19		8	€33	14	€80	1.424	.10
4		9	€31	7	€85	1.742	.25
1	Part 2: Size of	1	€54	177	€55	.019	.00016
6	delayed reward A_{Di}	2	€47	160	€50	.064	.00040
24	= medium	3	€54	111	€60	.111	.0010
16		4	€49	89	€60	.224	.0025
10		5	€40	62	€55	.375	.0060
21		6	€34	30	€50	.471	.016
14		7	€27	21	€50	.852	.041
8		8	€25	14	€60	1.4	.10
27		9	€20	7	€55	1.75	.25
13	Part 3: Size of	1	€34	186	€35	.029	.00016
20	delayed reward A_{Di}	2	€28	179	€30	.071	.00040
26	= small	3	€22	136	€25	.136	.0010
22		4	€25	80	€30	.2	.0025
3		5	€19	53	€25	.316	.0060
18		6	€24	29	€35	.458	.016
5		7	€14	19	€25	.786	.041
7		8	€15	13	€35	1.333	.10
11		9	€11	7	€30	1.727	.25

Notes: Amounts in million €. Delay in days.

FIGURE 1: Conceptual model

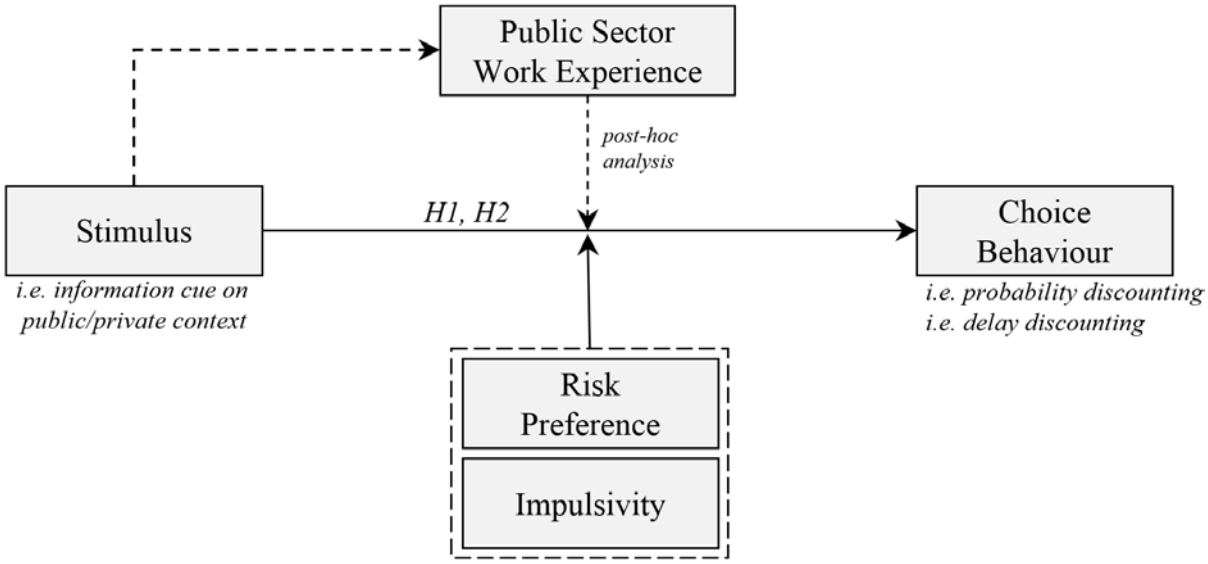
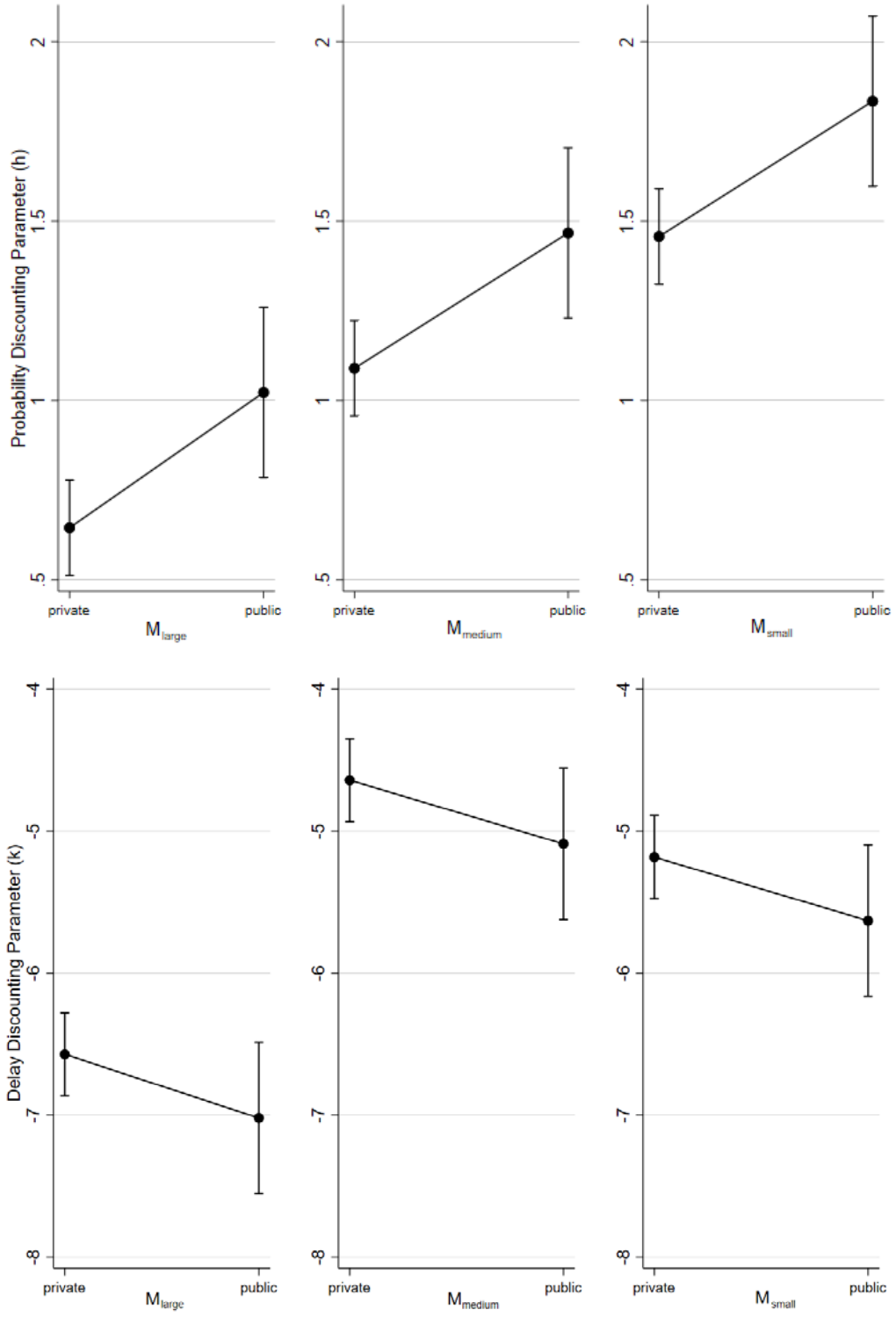


FIGURE 2: Discounting parameters by employment sector



Note: Linear predictions with 95%-CIs by magnitude of reward; upper panel: probability discounting (*h*); lower panel: delay discounting (*k*).

ONLINE SUPPLEMENTARY MATERIAL

Stata .do-file with algorithm to calculate probability and delay discounting scores.

<<< discounting.do >>>