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Human subjects' permissions

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Abstract

While risk preference is one of the cornerstones of bureaucratic behavior theories, there is no consensus on its meaning and conceptualization. Only a few studies have incorporated different concepts into the investigation of the differences between the

public and private sectors in risk preference and the association between public service motivation (PSM) and risk preference. Using self-reported and behavioral measures for risk preference, we analyzed the risk aversion of public employees and those with high PSM. The behavioral measures were a multiple price list and lottery choice tasks for higher-order risk preferences (prudence and temperance). A general self-reported measure revealed that public employees were risk-averse, whereas behavioral measures showed that public employees were not risk-averse with the multiple price list but more temperate. Those with high PSM were risk-averse using prudence and temperance measures, while they tended to be risk-taking in self-reports. The opposite results in PSM are partially due to the different sub-dimensions of PSM, yielding risk aversion for those with high commitment to public values and risk-taking for those with high self-sacrifice.
Keywords: public–private comparison; public service motivation; multiple price list; higher-order risk preference

Introduction

When modeling and studying bureaucratic behaviors, many scholars assume that public employees are risk-averse (Downs 1967; Meier and O'Toole 2011; Merton 1940). The continuity and neutrality of public administration contribute to public employees' risk aversion.

These institutional norms require a stable status for public employees (Hur and Perry 2016). An economically stable status attracts risk-averse people; as a result, public administration will be composed of risk-averse people (Norris 2003). Dahl and Lindblom (1953) insist that the dysfunction of market principles leads to an overemphasis on rules and controls in government, resulting in risk aversion among public employees. Risk-averse people apply for public service and are hired (attraction-selection process), and public employees develop risk-averse attitudes through work experience (socialization process) (Choi and Chung 2017). These mechanisms have been expected to produce the systematic difference between public and private employees in terms of risk aversion.

However, despite the prevailing belief, the number of studies directly investigating public employees' risk preference is "surprisingly small" (Nicholson-Crotty et al. 2019). Risk preference is considered one of the cornerstones of behavioral science (Arrow 1965; Knight 1921). Decision-making under uncertainty and evaluation of potential outcomes underlies virtually all the social sciences (LeBoeuf and Shafir 2005). In particular, as public service behaviors often involve risk, how public service employees deal with risk has a major impact on the services (Osborne and Brown 2011; Wise and Freitag 2002; Wilson et al. 2011). More empirical research on risk aversion among public service employees would help build a robust behavioral model of the bureaucracy, aiding an efficient public policy practice. Given the

impact that public employees have on policy formation and implementation (Zacka 2022; Hupe 2019; Pedersen and Pors 2022), it is important to investigate their risk preferences that could affect policy outcomes (Zhang et al. 2018; An and Tang 2022).

Even fewer studies explore the relationship between risk aversion and public service motivation (PSM), considered one of the fundamental characteristics of public service employees (Steijn 2008; Vandenabeele et al. 2017). Becker et al. (2012) suggested that risk preferences and social preferences largely shape people's micro-motivations. Understanding the relationship between PSM as a social preference and risk preference, using a solid behavioral model, is critical to the study of human behavior in micro-level administrative organizations. Investigation of the relationship between PSM and risk preferences could provide practical insights into whether those with high PSM should be employed in workplaces where risk-taking behaviors are required.

Such an investigation should pay attention to the multidimensionality of PSM. Despite possible differences in the correlations of PSM's sub-dimensions with other variables, existing research has not sufficiently considered the different motivations of PSM – instrumental, value-based, and affective (O'Leary 2022; Kim and Vandenabeele 2010). This study shows, for the first time, that PSM's subdimensions have inverse relationships with risk preferences.

In studying risk preferences, the diversity of risk concepts and measures has received little attention in public administration research (except in Tepe and Prokop 2018). The term *risk* is multifaceted, conceptualized differently, for example, in psychology and economics (Mata et al. 2018); in response, previous studies have developed different methodologies: self-reported measures in psychology and behavioral measures in economics (Pedroni et al. 2017). The differences in conceptualization and measurement methods are of growing interest in behavioral science (Frey et al. 2017). Accounting for the multifaceted nature of risk would refine the model of bureaucratic behavior.

By utilizing self-reported and behavioral measures of risk preference, this study aimed to conduct a public–private comparison of risk preferences and explore the association between risk preferences and PSM. The self-reported measures comprise seven domains, including work and drive (German Socio-Economic Panel [GSOEP] 2004). The behavioral measures are the Multiple Price List (MPL) (Holt and Laury 2002) and the higher-order risk preference elicitation method (Deck and Schlesinger 2014). Specifically, we used the higher-order risk preference technique to test for sectoral differences and correlation with PSM for the first time (for a review, see Trautmann and Kuilen 2018).

The remaining paper is organized as follows. First, we discuss the concept of risk preference and how to measure it. The following two sections review the literature on public–

private comparison in terms of risk preference and the relationship between PSM and risk preference. We then explain the measurements and data used and present the results of our analysis with respect to risk preferences. Finally, we present the discussion and the questions to be addressed in the future.

Our results contribute to the expanding body of research on risk preference of public employees and those with high PSM (Buurman et al. 2012; Dong 2017; Aqli et al. 2019; Nicholson-Crotty et al. 2019). The empirical research largely used either self-report measures or behavioral measures (Pfeifer 2011; Norris 2003). One exception is Tepe and Prokop (2018), who compared prospective public and private employees in terms of self-report and behavioral measures. We add to the literature by more comprehensively incorporating both these measures, based on the development of risk research using public and private employees in Japan. Our study also has practical relevance. For example, risk aversion often inhibits innovation, but the type of risk depends upon the innovation issue (Cinar et al. 2019). Identifying which types of risks public employees and people with high PSM are averse to would allow the recruitment of candidates appropriate to the risks of each position.

Concepts of Risk Preference and Measurements

As risk encompasses different concepts, researchers have used various methods for measuring

them (Frey et al. 2017; Pedroni et al. 2017). Two major traditions have evolved in psychology and economics (Mata et al. 2018). In psychology, risk is defined as the tendency to engage in activities that result in potential loss or harm to oneself or others, even if there is a reward (Steinberg 2013). In economics, based on Knight's (1921) definition, risk is considered the unknown probability of a potential outcome (Morrow 1994).

Consistent with these two traditions, two methods of measurement were chosen: self-reported measures and behavioral measures (Hertwig et al. 2019). The first measure people's preferences in response to general questions such as "Would you take a risk even if it meant you might get hurt?" (Zhang et al. 2019), or more domain-specific questions such as "How likely are you to drink heavily at a social event?" (Weber et al. 2002). These self-ratings have been criticized for self-stereotyping and self-serving bias (Ajzen and Fishbein 1977). However, these self-reported measures are not only more accessible to the people but also have desirable properties such as stability and validity (Dohmen et al. 2011; Lönnqvist et al. 2015).

Behavioral measures assess risk preferences by measuring observable decisions about various distributions of possible outcomes. Most economic research assesses risk-taking in hypothetical situations, often through specific actions with tasks to which monetary incentives are added (Appelt et al. 2011). Many measures of behavior move from an abstract framework to a relatively concrete context (Harrison and Rutstroem 2008). For example, Crosetto and

Filippin (2013) invented a time bomb program to elicit risk preferences. Gneezy and Potters (1997) proposed a task in which subjects were asked to decide how to allocate a given amount of money between a safe account and a risky investment.

Holt and Laury (2002) provide a well-established lottery task, the MPL, "to date the most popular risk elicitation mechanism" (Crosetto and Filippin 2016). Risk aversion as measured by MPL is the tendency to choose between alternatives with equal expected values but greater or lesser variance in possible outcomes. In MPL, subjects work to choose between ten pairs of lotteries, and Option A is safer than Option B for all pairs in terms of variance. The expected value increases for Option A and Option B. For the first four pairs, the expected value is higher for Option A, but for the last six pairs, Option B offers a higher expected payoff. The risk-neutral subject switches from Option A to Option B at the fifth pair, but the switch point is earlier for the risk-seeking subject and later for the risk-averse subject. These switch points are used to measure the subjects' risk-aversion level.

While MPL focuses on variance, recent studies have paid more attention to other aspects of the risk perspective: skewness and kurtosis of outcome distributions (Trautmann and Kuilen 2018). Prudence is the preference to avoid negative skewness, indicating the long tail on the left side of the distribution (Eeckhoudt and Schlesinger 2006). Temperance is the preference to avoid a positive kurtosis, that is, the peaked distribution with a thick tail (Ebert 2013;

Kimball 1990, 1993). These preferences are referred to as higher-order risk preferences. In this framework, risk aversion, prudence, and temperance are tendencies to avoid variance, downside risk, and tail risk, respectively (Figure 1). Empirical evidence has shown that these higher-order risk preferences influence decision-making in many ways, including precautionary saving (Harvey and Siddique 2000; Kimball, 1992), tax compliance (Snow and Warren 2005), bargaining (White 2008), and health-related behaviors (Attema et al. 2019).

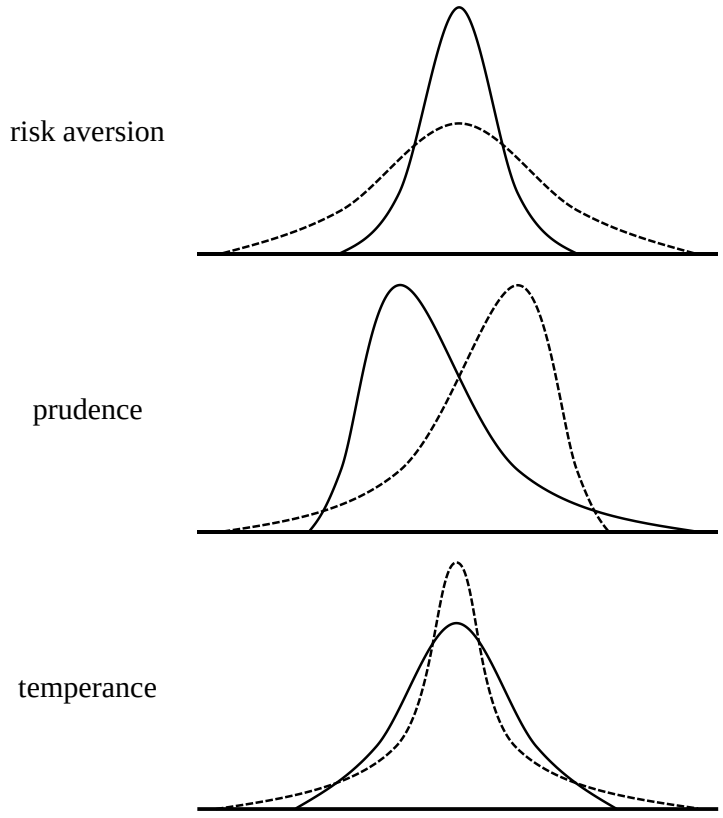

Figure 1. Risk aversion, prudence, and temperance in economics. Solid lines and dotted lines respectively indicate low and high-risk outcomes.

Comparing Public–Private Employees on Risk Preference

A significant body of literature has identified the difference between public and private employees in their attitudes and behaviors: managerial behaviors, work motivation, job performance, and decision-making practices (Johansen et al. 2013; Brewer and Brewer Jr. 2011; Jilke et al. 2018; Mastekaasa 2020; Nutt 2006). Public employees become distinctively risk-averse because of institutional conditions specific to public administration, including absence of market mechanisms, strong central control, strict political oversight, emphasis on rules, and stable employment status (Dahl and Lindblom 1953; Lindblom 1977). Empirical research on the validity of the risk-aversion assumption of public employees has been conducted since about the 1980s (Baarspul and Wilderom 2011; Rainey and Chun 2009). Most of these studies use self-reported measures seeking a qualitative assessment of financial risk related to employment status, risk related to decision-making at work, such as receptivity to change in the workplace, and other risks (Bellante and Link 1981; Bozeman and Kingsley 1998; Tepe and Prokop 2018).

Public sector workers enjoy job security and stable wages (Lewis and Frank 2002). As economic stability attracts risk-averse people, more such people work in the public sector than in the private sector (Bonin et al. 2007; Jurkiewicz et al. 1998; Norris 2003); many studies confirm that public sector employees value stable employment status more than do private

sector employees (Baldwin 1991; Houston 2000; Lewis and Frank 2002; Pfeifer 2011). In contrast, Karl and Sutton (1998) find no significant difference between public and private employees. Newstrom et al. (1976) demonstrate that public employees perceive job security as less important compared with private employees. However, it is possible that public employees accord less value to job security because they already enjoy it.

The literature has also examined differences between the public and private sectors in taking a cautious approach to operational change, including innovation and reform. Barton and Waldron (1978) and Wise (1999) find that managers in the public and private sectors have similar risk aversion in their work. Bozeman and Kingsley (1998) find that at the organizational level, there are no significant differences in risk-taking between public and private enterprises. However, some studies show that public sector employees are more willing to take the risk of reforming their organizations (Boyne et al. 1999; Doyle et al. 2000).

Tepe and Prokop (2018) comprehensively examine the difference between prospective public and private sector employees using the GSOEP (2004) items from general to specific risk preferences related to money, work, driving, etc. They show that prospective public employees are more risk-averse in general attitudes and show significantly greater risk aversion in financial and work-related decisions. This finding is consistent with those of Bellante and Link (1981), who find that public employees exhibit more risk-averse behavior than private

sector ones. The self-reported risk aversion of public employees with respect to financial and work-related matters is also consistent with the assumptions of many other studies (Bonin et al. 2007; Jurkiewicz et al. 1998; Norris 2003).

While self-reported measures are popular, very few studies have used behavioral measures to compare the public–private employee risk preferences. Buurman et al. (2012) find that public employees are risk-averse because they are less likely to choose lottery tickets than private employees. However, Tepe and Prokop (2018) find no difference between prospective public and private sector employees in terms of risk preference as determined by MPL.

However, the literature has several deficiencies. First, relatively fewer studies have used behavioral measures as stated measures, and none other than Tepe and Prokop (2018) use self-reported and behavioral measures simultaneously. As a result, the analyses do not adequately account for the multifaceted nature of risk. Second, previous studies comparing risk between the public and private sectors did not pay attention to higher-order risk preferences, while newer studies do (Trautmann and Kuilen 2018). While Tepe and Prokop (2018) find no difference between public and private employees in risk preferences using MPL, differences in higher-order risk preferences could exist. The third problem relates to sample. Most studies use data from the U.S. and European countries, except for Dong (2017), and some use student samples instead of public employees (Tepe and Prokop 2018; Heine et al. 2022). To generalize

the proposition, we need to utilize data on actual workers in non-Western countries.

In this study, therefore, self-report and behavioral measures are used to address these issues, carefully considering the different aspects of risk. First, to the best of our knowledge, it is the first to introduce higher-order risk preferences into the comparison between the public and private sectors. Using data from non-Western countries and various measures, we test the hypothesis that there is a difference in risk preference between public and private employees.

Public Service Motivation and Risk Preference

Public service motivation is defined as "an individual's tendency to act on motives that are primarily or exclusively grounded in public institutions and organizations" (Perry and Wise 1990). Researchers have proposed PSM as a way to understand the unique motives of public service behaviors that go beyond narrow self-interest (Perry and Hondeghem 2008). Much research has revealed PSM outcomes favorable for public organizations, such as job performance, work involvement, organizational citizenship behaviors (Jensen and Vestergaard 2017; Meyer-Sahling et al. 2019; Andersen et al. 2014). Despite considerable PSM research (Ritz et al. 2016; Vandenabeele et al. 2014), few have analyzed PSM and risk preference.

Tepe and Prokop's (2018) pioneering work examines the relationship between risk preference and PSM based on personality theory. Since agreeableness is associated with risk aversion and altruistic behavior, an important feature of PSM, they predict a positive

correlation between PSM and risk aversion (see also Heine et al. 2022; Stark et al. 2022). Using the German PSM items as a single composite summative index, self-reported measures of risk preference from the GSOEP, and MPL as a behavioral measure of risk preference, Tepe and Prokop (2018) find a positive association between PSM and risk aversion as measured by self-reported measures of driving and MPL, and a negative association between PSM and self-reported measures of trust in others. Aqli et al. (2019) also predict a positive association between PSM and risk aversion, which they consider a form of compliance; they then confirm the positive relationship using PSM items proposed by Perry (1996) and self-reported measures of risk aversion from data on Indian public employees. In contrast, Nicholson-Crotty et al. (2019) hypothesize that PSM characterized by altruism leads to higher risk tolerance when decisions are made to improve the welfare of others. However, Nicholson-Crotty et al. (2019) find no systematic difference between public and private managers in terms of risk aversion.

These rare and valuable studies predict and demonstrate positive and negative associations between PSM and risk aversion, but none pay adequate attention to the multidimensionality of PSM, which can result in different predictions. For example, Perry (1996) proposes "self-sacrifice" (SS) as a component of PSM, in the sense of not prioritizing one's interests. If concern about potential loss produces risk-averse behaviors, self-sacrifice, which tends to be insensitive to one's losses, may lead to more risk-taking behavior.

In contrast, emphasis on public value or public interest may lead to risk-averse tendencies. Kearney et al. (2010) suggest that many characteristics of entrepreneurship may not be a good fit for public organizations. For public employees responsible for preserving public resources and defending public values, the roles of preserver and steward are much more important than the role of innovator (Terry 1995). For public value defenders, trying to avoid dire consequences may be appropriate (Bellone and Goerl 1992; Shefter 1992). As a normative aspect of PSM, Perry (1996) proposes "commitment to the public interest" as a motivation to serve public interest. Similarly, Kim et al. (2013) offer "commitment to public value," which is the extent to which individuals seek and share public value. These tendencies to emphasize public value or interest may be associated with risk aversion.

Despite these putative opposing associations between sub-dimensions of PSM and risk aversion, Aqli et al. (2019), Nicholson-Crotty et al. (2019), and Tepe and Prokop (2018) consider PSM to be unidimensional. In this study, we consider the sub-dimensions of PSM and systematically assess their association with risk preferences measured in different ways.

Measurement and Data

The dependent variables of interest are the three main types of risk preference measures. First, we used self-reported measures from the GSOEP (2004) consisting of one item on a general

attitude toward risk and five items on domain-specific attitudes toward risk: Driving, Money, Leisure, Work, Health, and Trust in Others. These self-assessments are commonly used to assess risk preference (e.g., Crosetto and Filippin 2016). In the GSOEP, subjects are asked about general and domain-specific risk preferences on a scale of 0–10, with 10 representing the highest risk tolerance (Appendix 1). We reversed these scores as a measure of risk aversion.

Second, we used the MPL method for behavioral risk preference. Compared to self-reported measurement methods, which are more influenced by formulation, the techniques used in behavioral economics have the advantage of measuring each person's preferences more objectively. We created 11 option sets based on the work of Holt and Laury (2002). To avoid the problem of double-switching, we asked which combination would switch first to the riskier option (Appendix 2). Participants were rewarded with a randomly selected option from the 11 options. We assigned the minimum number 1 to the case of switching to the first option and the maximum number 12 to the case of not switching. The index was used as a measure of risk aversion induced by MPL.

Third, we used the method proposed by Deck and Schlesinger (2014) to measure higher-order risk preferences. Their method allows for a model-free assessment of higher-order risk preferences using observable risky choices between options. Respondents were asked to select one lottery from a pair of two lotteries with different outcomes. When measuring prudence,

respondents chose between two lotteries with the same mean, variance, and kurtosis of possible outcomes, differing only in skewness. In the temperance measure, respondents chose between two lotteries whose outcomes differed only in the degree of kurtosis. Seven pairs of lotteries were used to measure prudence and temperance (Appendix 3). The reward amount was determined according to one lottery chosen randomly from the lotteries selected by the participants. We measured prudence and temperance by the number of lower-risk lotteries participants selected. The minimum value is 0, and the maximum value is 7.

The independent variables represent whether a participant is a public employee and PSM. As the first independent variable, we used a dummy variable that takes the value of 1 if the respondent is a public sector employee and 0 if the respondent is a private sector employee. We used an international scale proposed by Kim et al. (2013) to measure PSM (Appendix 4). The scale is carefully constructed from a theoretical perspective and has been used in many studies internationally (Breaugh et al. 2018; Hassan et al. 2021; Schott et al. 2019). This version of the PSM consists of four dimensions: Attraction to Public Service (APS), Commitment to Public Values (CPV), Compassion (COM), and Self-Sacrifice (SS). APS is an instrumental dimension that focuses on serving the public, working for the common good, and participating in public policymaking. CPV, a normative motivation, represents the extent to which individuals share public values. While COM captures the extent to which individuals identify

with the needs and suffering of others, SS is how far one is willing to work for the interests of others and society, even at the expense of one's own. COM and SS are the affective dimensions of PSM. We used the sum of four items on a five-point Likert scale to measure each dimension, and measured PSM by the sum of the scores on these sub-dimensions.

We used gender, age, academic background (high school or less, undergraduate, graduate), and marital status as the control variables for demographic characteristics. Being female, getting older, and getting married could be related to career choice and risk aversion (Becker et al. 2012). Academic background should not only control for importance in occupational choice and risk preference, but also for cognitive ability because measuring risk preference requires subjects to perform certain calculations in lottery selection. In addition, we controlled for occupation-related variables: income, job function (back-office, office job, professional job), organizational size, and managerial position. We measured income using self-reported values of gross income, including taxes and bonuses, in 2020. We categorized "less than 4 million yen" as low income, "between 4 million and 6 million yen" as medium income, and "more than 6 million yen" as high income. Organizational size was categorized as small for less than 100 employees, medium for 100 to 999 employees, and large for 1,000 employees or more.

The authors received IRB approval from Fukushima University on December 24, 2020.

Thereafter, the survey was conducted with Cross Marketing Inc, an Internet-based research company in Japan. Data collection took place in Japan from March 17 to 22, 2021. To avoid experimenter bias (Bronstein 1990), we did not inform the research company or the participants about the study's purpose of investigating the difference in risk preference between public and private employees. At the beginning of the survey, we asked participants about their occupation and employment status. The purpose was to verify and determine their social identity as employees in the public or private sector. We then excluded from the sample those who were self-employed or not regularly employed. We continued the survey until we had a sample of 500 public and 500 private sector employees. We collected data to ensure that there were no differences between public and private employees, as basic demographic variables such as gender and age can have a significant impact on risk preferences. As a result, an equal number of males and females were included in each of the public and private employee groups in the sample. The ratio of those aged 40 or more to those below 40 for each group was one to one. We obtained data from actual public and private employees, unlike surveys using student samples (Tepe and Prokop 2018).

We used points that could be exchanged for money to provide financial incentives, converted at the rate of one Japanese yen for 10 points. The average payment was 402.95 points (std. dev. 143.38). Thus, when using behavioral measures, we measured risk preferences more

accurately by adding financial incentives.

Using the data, we tested the difference between public and private employees in terms of risk preferences and the relationship between PSM and risk preferences using OLS regressions with robust standard errors. We used two models for each risk aversion: one using the public employee dummy variable and the overall PSM simultaneously, and one using the public employee dummy variable and the four sub-dimensions of the PSM. All the models controlled for demographic and occupational variables. For ease of comparison of coefficients, we standardized the overall PSM, its four sub-dimensions, and the risk-aversion indexes so that the mean and variance of these variables were zero and one, respectively. We used Stata 17 (Stata Corp. 2021) for all analyses.

Results

Table 1 shows participants' characteristics in terms of all variables, and Table 2, the correlation matrix of all independent and dependent variables. Table 1 also shows the differences in the means of the variables between public and private employees, using t-tests. The overall PSM and its four sub-dimensions showed sufficient internal reliability, based on Cronbach's α. Mean values of self-reported risk aversion were around 7, indicating a general risk-averse tendency, given that a risk-neutral respondent would answer 5 on average. Risk aversion as measured by

the MPL suggests that the sample tends to be risk-averse, as the mean score was 8.4, which is higher than the score of 6.5 that a risk-neutral person would choose. In contrast, the entire sample was not strongly prudent and moderate. The possible mean is 4, the midpoint between the minimum of 1 and the maximum of 7 of the higher-order risk preference index. However, the mean value of prudence is 4.53, while the value of temperance is 3.78, even below 4.

In terms of differences between public and private employees, public employees show higher PSM for all except for COM. While public employees are more risk-averse on all measures, we observed significant differences only in several self-report measures (general attitudes, money, and work) and behavioral measures (prudence and temperance). Table 2 shows that while CPV is positively correlated with risk aversion, SS has negative correlations by and large. Public employees are more educated, more likely to be married, to have higher incomes, to have more clerical and professional positions, and more likely to belong to large organizations. We used OLS to test the differences in risk preferences between public and private employees and the correlation between risk aversion and PSM, after controlling for these demographic variables.

Table 1. Descriptive statistics for all variables, and Cronbach's α for PSM variables.

	Total		Public	Private	Difference

		N = 1000			N = 500	N = 500	
		Mean	SD	Cronbach's α			
PSM	Overall PSM	50.49	9.10	0.91	51.88	49.10	2.78*** [0.00]
	APS	12.57	2.63	0.77	13.05	12.09	0.97*** [0.00]
	CPV	13.98	3.18	0.89	14.45	13.50	0.95*** [0.00]
	COM	13.00	2.67	0.80	13.12	12.88	0.24 [0.15]
	SS	10.95	2.75	0.80	11.26	10.64	0.62*** [0.00]
Self-reported	General	6.98	2.24	-	7.14	6.81	0.32* [0.02]
Risk aversion	driving	7.79	2.21	-	7.92	7.67	0.25 [0.08]
	Money	7.06	2.31	-	7.21	6.90	0.31* [0.03]
	Leisure	6.93	2.32	-	6.96	6.91	0.05 [0.73]
	Work	7.02	2.22	-	7.19	6.84	0.35* [0.01]

	Health	7.31	2.20	-	7.38	7.23	0.15
							[0.28]
	Trusting others	7.15	2.14	-	7.25	7.05	0.20
							[0.14]
Behavioral	Risk aversion by	8.40	3.34	-	8.47	8.33	0.13
	MPL						[0.53]
Risk aversion	Prudence	4.53	2.27	-	4.78	4.28	0.5***
							[0.00]
	Temperance	3.78	1.75	-	4.02	3.54	0.47***
							[0.00]
Demographics	female	0.5	0.50	-	0	0	0.00
							[1.00]
	Age	41.99	10.40	-	42.45	41.52	0.93
							[0.16]
	Undergraduate	0.58	0.49	-	0.66	0.49	0.16***
							[0.00]
	Graduate	0.08	0.27	-	0.10	0.06	0.04*
							[0.01]
	Not married	0.45	0.50	-	0.40	0.50	-0.10***
							[0.00]
Job-related	Middle income	0.30	0.46	-	0.34	0.26	0.08***
							[0.01]
	High income	0.33	0.47	-	0.41	0.24	0.17***
							[0.00]

Back-office	0.16	0.36	-	0.17	0.14	0.03
						[0.23]
clerical	0.29	0.45	-	0.35	0.24	0.11***
						[0.00]
Professional	0.10	0.31	-	0.15	0.06	0.10***
						[0.00]
Middle size	0.28	0.45	-	0.27	0.29	0.02
						[0.48]
Large size	0.40	0.49	-	0.50	0.30	0.20***
						[0.00]
Manager	0.12	0.32	-	0.11	0.13	-0.02
						[0.24]

Note. Standard errors are in brackets. *p <.05; **p <.01; ***p <.001 (two-tailed)

Table 2. Correlation matrix of all independent and dependent variables.

	Public	PSM	APS	CPV	COM	SS	General	Driving
Public	1							
PSM	0.15***	1						
APS	0.18***	0.91***	1					
CPV	0.15***	0.81***	0.69***	1				
COM	0.05	0.87***	0.71***	0.7***	1			
SS	0.11***	0.66***	0.57***	0.2***	0.42***	1		
General	0.07*	-0.04	-0.06	0.03	-0.002	-0.10**	1	
Driving	0.06	0.07*	0.05	0.2***	0.1**	-0.14***	0.62***	1
Money	0.07*	-0.02	-0.02	0.06*	0.03	-0.14***	0.78***	0.59***
Leisure	0.01	-0.04	-0.06	0.04	0.003	-0.12***	0.67***	0.59***
Work	0.08*	-0.03	-0.05	0.05	0.02	-0.13***	0.71***	0.62***

Health	0.03	0.03	0.002	0.11***	0.07*	-0.10**	0.63***	0.67***
Trusting others	0.05	0.02	0.01	0.12***	0.05	-0.13***	0.62***	0.59***
Risk aversion by MPL	0.02	0.08*	0.05	0.15***	0.09**	-0.05	0.03	0.07*
Prudence	0.11***	0.17***	0.15***	0.26***	0.18***	-0.06	0.04	0.11***
Temperance	0.14***	0.09**	0.09**	0.13***	0.05	0.01	0.14***	0.11***

	Money	Leisure	Work	Health	Trust	Risk aversion by MPL	Prudence
Money	1						
Leisure	0.68***	1					
Work	0.66***	0.71***	1				
Health	0.61***	0.66***	0.70***	1			
Trusting others	0.61***	0.63***	0.71***	0.73***	1		

Risk aversion by MPL	0.01	0.03	0.05	0.05	0.07*	1	
Prudence	0.04	0.03	0.07*	0.04	0.07*	0.12***	1
Temperance	0.11***	0.10**	0.12***	0.06	0.08**	0.08**	0.15***

Note. *p <.05; **p <.01; ***p <.001 (two-tailed)

Table 3 and Figure 2 show the results of OLS regressions for self-reported risk aversion as dependent variables. The public employee dummy variable estimates were positively correlated with all risk-aversion measures. Those significant at the 5% level were general risk aversion and domain-specific risk aversion, both related to money and work.

The overall PSM had a significant negative correlation with general risk aversion; at -0.07 it was barely significant at the 5% level. The results for domain-specific risk aversion, though not significant, were inconsistent. For example, the overall PSM was positively correlated with risk aversion for driving, but negatively correlated with money and work-related issues.

Compared with the inconsistent results for the overall PSM, the results for the four sub-dimensions were clear. SS showed a significant negative correlation with all domain-specific risk aversions except general risk aversion. In other words, the higher the SS, the more risk people tend to take. CPV also showed the same correlations with risk aversion, though all estimates of CPV were not significant. Contrarily, CPV tended to correlate positively with risk aversion. All estimates were positive. CPV had a positive correlation at the 5% level with risk aversion for driving and trust in others. Finally, estimates for COM were close to zero and had both positive and negative values; none were significant.

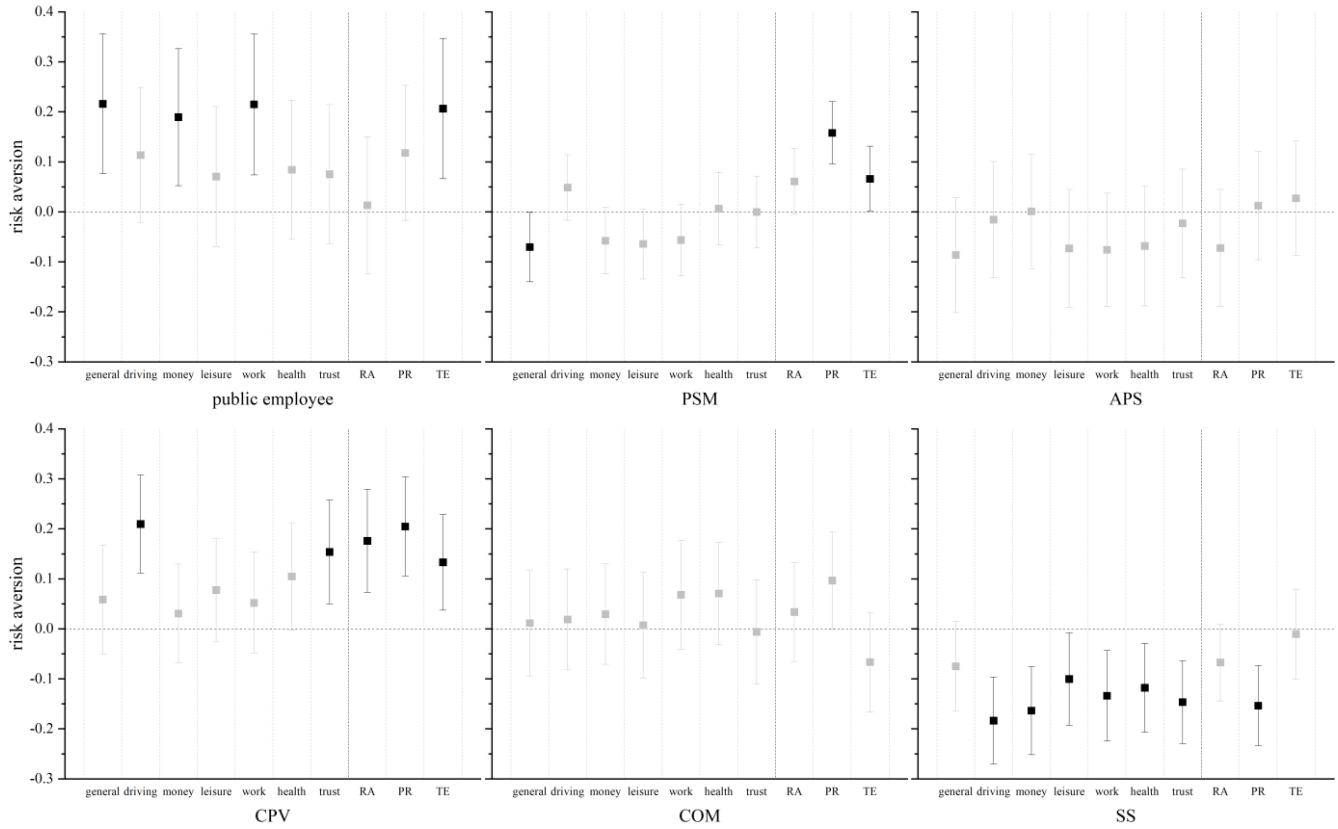

Figure 2. All analyses. The dots denote point estimates, and the vertical bars indicate 95% confidence intervals. Gray symbols and lines are not significant at the 5% level, while black symbols and lines are significant at the 5% level. From "general" to "trust" are self-reported measures, and from "RA" to "TE" are behavioral measures. "RA," "PA," and "TE" stand for risk aversion measured by MPL, prudence, and temperance, respectively. Results of "public employees," "APS," "CPV," "COM," and "SS" are from (2), (4), (6), (8), (10), (12), (14), (16), (18), and (20). Results of "PSM" are from (1), (3), (5), (7), (9), (11), (13), (15), (17), and (19).

Table 3. Self-reported measures.

	General		Driving		Money		Leisure	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Public	0.21**	0.22**	0.12	0.11	0.18**	0.19**	0.07	0.07
	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]
PSM	-0.07*		0.05		-0.06		-0.06	
	[0.04]		[0.03]		[0.03]		[0.04]	
APS		-0.09		-0.02		0.001		-0.07
		[0.06]		[0.06]		[0.06]		[0.06]
CPV		0.06		0.21***		0.03		0.08
		[0.06]		[0.05]		[0.05]		[0.05]
COM		0.01		0.02		0.03		0.01
		[0.05]		[0.05]		[0.05]		[0.05]
SS		-0.08		-0.18***		-0.16***		-0.10*
		[0.05]		[0.04]		[0.04]		[0.05]
Constant	-0.37*	-0.36*	-0.33	-0.28	-0.49**	-0.47**	-0.45*	-0.44*
	[0.18]	[0.18]	[0.19]	[0.19]	[0.18]	[0.17]	[0.19]	[0.19]
Control variables	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.07	0.08	0.05	0.11	0.08	0.10	0.06	0.07
N	1000	1000	1000	1000	1000	1000	1000	1000

	Work		Health		Trusting others	
	(9)	(10)	(11)	(12)	(13)	(14)
Public	0.20*	0.21**	0.07	0.08	0.08	0.08
	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]
PSM	-0.06		0.01		-0.00	
	[0.04]		[0.04]		[0.04]	
APS		-0.08		-0.07		-0.02
		[0.06]		[0.06]		[0.06]
CPV		0.05		0.10		0.15**
		[0.05]		[0.05]		[0.05]
COM		0.07		0.07		-0.01
		[0.06]		[0.05]		[0.05]
SS		-0.13**		-0.12**		-0.15***
		[0.05]		[0.05]		[0.04]
Constant	-0.31	-0.30	-0.30	-0.29	-0.37*	-0.33
	[0.18]	[0.18]	[0.19]	[0.19]	[0.19]	[0.18]
Control variables	YES	YES	YES	YES	YES	YES
R^2	0.05	0.07	0.03	0.05	0.03	0.07
N	1000	1000	1000	1000	1000	1000

Note. Standard errors are in brackets. All dependent variables (PSM, APS, CPV, COM, and SS) are standardized. Control variables include gender, age, academic background, marital status, income, job function, and organizational size. *p <.05; **p <.01; ***p <.001 (two-tailed)

Table 4 and Figure 2 show the results using behavioral measures for risk preference. The estimate of risk aversion measured by MPL was almost zero and insignificant. However, public employees were more temperate than private employees at the 5% level. Public employees sensitively reacted to tail risks to which private employees were neutral.

The overall PSM had a significant positive correlation with prudence and temperance. The higher the overall PSM, the more people avoided downside and tail risks. APS and COM did not significantly correlate with behavioral risk preferences. The CPV and SS results were consistent with those related to self-reported risk aversion. The CPV showed a significant positive correlation with all behavioral risk preferences. People who profess public values pay more attention to variance, skewness, and kurtosis of the distribution of the possible outcome. In contrast, individuals with higher SS are more willing to take some risk. SS and caution are negatively correlated, such that individuals with higher SS are less hesitant to take downside risks. As with the results for the self-reported measures, there were sub-dimensions of overall PSM that had positive and negative correlations with behavioral risk aversion.

Table 4. Behavioral measures.

	Risk aversion by MPL		Prudence		Temperance	
	(15)	(16)	(17)	(18)	(19)	(20)
Public	0.01	0.01	0.11	0.12	0.23***	0.21**
	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]
PSM	0.06		0.16***		0.07*	
	[0.03]		[0.03]		[0.03]	
APS		-0.07		0.01		0.03
		[0.06]		[0.06]		[0.06]
CPV		0.18***		0.20***		0.13**
		[0.05]		[0.05]		[0.05]
COM		0.03		0.10		-0.07
		[0.05]		[0.05]		[0.05]
SS		-0.07		-0.15***		-0.01
		[0.04]		[0.04]		[0.05]
Constant	-0.47***	-0.45***	0.17	0.20	-0.21	-0.18
	[0.19]	[0.19]	[0.18]	[0.17]	[0.18]	[0.18]
Control variables	YES	YES	YES	YES	YES	YES
R^2	0.02	0.05	0.05	0.11	0.05	0.06
N	1000	1000	1000	1000	1000	1000

Note. Standard errors are in brackets. All dependent variables, PSM, APS, CPV, COM, and SS are standardized. Control variables include gender, age, academic background, marital status, income, job function, and organizational size. *p <.05; **p <.01; ***p <.001 (two-tailed).

Discussion and Conclusions

Risk aversion of public employees and the relationship between risk aversion and PSM comprise a core topic of public administration research. Despite its importance, previous

research on risk aversion in public administration is insufficient. In addition, empirical studies have not fully considered the diversity of risk concepts. To address these issues, we examined risk aversion among public employees and the relationship between risk aversion and PSM by extensively using self-reported and behavioral measures of risk preferences. This study is valuable in that it allows for the simultaneous use of self-reported and behavioral measures and is also the first to introduce higher-order risk preferences into public administration.

The study presents three main findings. First, the risk aversion among public employees is more substantial than among private employees regarding the general risk preference and the domain-specific risk preference related to work and money using self-reported measures. This finding is consistent with the existing research (Bellante and Link 1981; Bonin et al., 2007). Indeed, the results of Tepe and Prokop (2018), which used a German student sample, were replicated for this sample of Japanese workers in a very different economic and social environment, suggesting that they have a wide range of validity.

Second, public employees were more temperate to avoid tail risks regarding potential outcomes. However, there was no significant difference between public and private employees in terms of risk aversion measured by MPL, consistent with Tepe and Prokop (2018). While we observed risk aversion among both public and private employees in terms of a tendency to avoid an increase in the variance of the distribution of the potential outcome, public employees

are more hesitant about the increase in the possibility of extreme values. Given the multifaceted nature of risk, we found that a feature of risk aversion among public employees is that they respond to these outliers.

Third, CPV and risk aversion are negatively correlated, whereas SS and risk aversion are positively correlated. Because of these inverse correlations, the PSM as a whole has inconsistencies that may be positively or negatively correlated with the risk-aversion indicators. We could well explain the relationship between CPV and risk aversion using stewardship theory (Terry 1995). To defend public value, people unintentionally put public value at risk by making risky decisions. Those who are highly committed to public value may also be highly risk-averse when making decisions that affect their interests. On the contrary, those with a high SS do not hesitate to risk their own interests for the public good and are more willing to accept various defined risks. Since the overall PSM has these sub-dimensions that have opposite correlations with risk, its association with risk aversion varies both positively and negatively. Previous studies have used total PSM (Aqli et al. 2019; Tepe and Prokop 2018), but if some components of the PSM are inversely associated with risk preferences, future studies need to distinguish between its subcomponents.

The findings have practical implications for the recruitment and deployment of public sector employees, who tend to be more risk-averse in their jobs and especially more averse to

tail risk than their private sector counterparts. To avoid extreme outcomes, public sector employees may play a responsible role toward public goods. At the same time, they are often reluctant to promote major reforms involving tail risks. Of the PSM sub-dimensions, individuals high in CPV tend to be more risk-averse, and they would be well suited to jobs that provide stable services. Because individuals high on SS are risk-averse, they could be employed in departments responsible for promoting proactive, risky reforms.

We need to explore several questions further. First, it is worth examining how decisions involving risk are made in a more realistic situation (Friedman et al. 2014). The survey methods commonly used in behavioral economics often employ a very abstract framework. We need to further explore the implications of public–private sector differences in risk preferences using settings that resemble actual work situations (Linde and Vis 2017). Second, more international studies should be conducted using the comprehensive risk-aversion measures in this study. An international comparison using a common measure will help clarify the scope of the hypotheses in this study. In addition, self-reported measures do not fully inform how respondents understand risk. By combining behavioral measures and self-reports, we could clarify respondents' perceptions of risk. Third, further work needs to be carried out to establish how the attraction-selection process and the socialization process contribute to the difference in risk preferences (Dong 2017; Moyson et al. 2018). Time series data, propensity score matching,

and experimental methods would help identify the extent these mechanisms contribute to the difference. Lastly, it would be important to examine the relationship between risk aversion and job performance for practical reasons. Risk aversion could be beneficial to public service. Strategic staff allocation can be achieved by examining which types of risk-averse people are compatible with which types of tasks. Empirical investigation of the degree of risk aversion of people involved in public affairs could contribute to the elaboration of models of human behavior in public administration and administrative practice.

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APPENDICES

Appendix 1. Self-reported measures for risk preference

How much risk do you take in the following situations? Please select one number from “Never take risk” (0) to “Fully prepared to take risk” (10).

	Never take risk										Fully prepared to take risk
Generally	0	1	2	3	4	5	6	7	8	9	10
While driving	0	1	2	3	4	5	6	7	8	9	10
In monetary matters	0	1	2	3	4	5	6	7	8	9	10
During leisure and sport	0	1	2	3	4	5	6	7	8	9	10
In your work	0	1	2	3	4	5	6	7	8	9	10
With your health	0	1	2	3	4	5	6	7	8	9	10
Trusting other people	0	1	2	3	4	5	6	7	8	9	10

Appendix 2. The multiple price list

Which of the following Options, A or B, is preferable? If you answer in order from combination 1, for which combination would you choose **Option B for the first time?** Note that the answer to this question affects the reward amount. For example, if you answer "combination 5," **your reward will be calculated based on one randomly selected option out of a set of 11 options**: four Options A from "combination 1" to "combination 4," and seven Options B from "combination 5" to "combination 11."

	Option A	Option B
combination 1	0/10 of 200 pts, 10/10 of 160 pts	0/10 of 385 pts, 10/10 of 10 pts
combination 2	1/10 of 200 pts, 9/10 of 160 pts	1/10 of 385 pts, 9/10 of 10 pts
combination 3	2/10 of 200 pts, 8/10 of 160 pts	2/10 of 385 pts, 8/10 of 10 pts
combination 4	3/10 of 200 pts, 7/10 of 160 pts	3/10 of 385 pts, 7/10 of 10 pts
combination 5	4/10 of 200 pts, 6/10 of 160 pts	4/10 of 385 pts, 6/10 of 10 pts
combination 6	5/10 of 200 pts, 5/10 of 160 pts	5/10 of 385 pts, 5/10 of 10 pts
combination 7	6/10 of 200 pts, 4/10 of 160 pts	6/10 of 385 pts, 4/10 of 10 pts
combination 8	7/10 of 200 pts, 3/10 of 160 pts	7/10 of 385 pts, 3/10 of 10 pts
combination 9	8/10 of 200 pts, 2/10 of 160 pts	8/10 of 385 pts, 2/10 of 10 pts
combination 10	9/10 of 200 pts, 1/10 of 160 pts	9/10 of 385 pts, 1/10 of 10 pts

combination 11	10/10 of 200 pts, 0/10 of 160 pts	10/10 of 385 pts, 0/10 of 10 pts

combination 1

combination 2

combination 3

combination 4

combination 5

combination 6

combination 7

combination 8

combination 9

combination 10

combination 11

only choosing Option A

Appendix 3. Higher-order risk preference

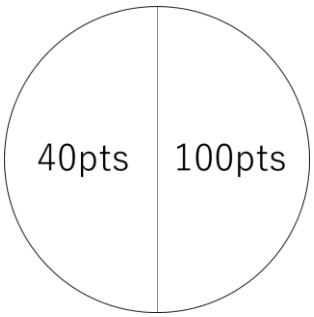
You will be asked a series of questions about decision-making under uncertain circumstances. The amount of your reward will vary depending on the outcome of these decisions, so it is important that you understand how your decisions will affect your reward.

This section consists of 24 questions. For each question, please choose one of two options.

Here, we explain the rules for determining the amount of compensation through three examples.

[Example 1]

Each choice may contain a lottery ticket with a 50/50 chance of realizing one of the amounts. These lotteries are shown as circles with a vertical line drawn through the middle. An example of a lottery is shown below.



Imagine a rotating "⇒"in the center of this lottery. However, this "⇒" is just to make it easier to understand how the lottery works, and there is no such "⇒" in the actual lottery.

Let us rotate this "⇒" You will be paid the points where they stop. For example, if you spin the "⇒" and stop at "40 pts" as shown in the video below, you will be paid 40 points. Because

the areas of “40 pts” and “100 pts” are the same, the probability of stopping at “40 pts” is 50%.

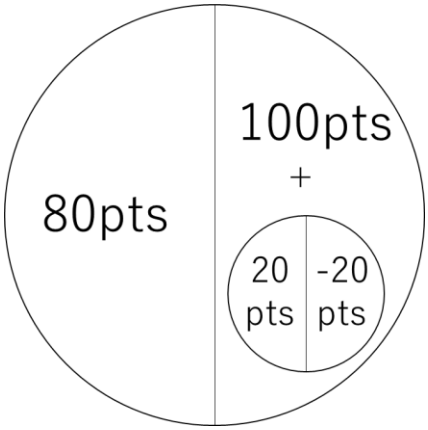
[Instructional video embedded here].

If you stop at “100 pts,” as shown in the video below, you will be paid 100 points. As the areas of “40 pts” and “100 pts” are the same, the probability of stopping at “100 pts” is 50%.

[Instructional video embedded here].

[Example 2]

In some cases, a lottery may have another lottery built into it. See the example below showing another lottery built into the right of the bottom lottery.



First, imagine a “=>” in the center of a large circle. If it stops at “80 pts,” as shown in the video below, you will be paid 80 points. The probability is 50%.

[Instructional video embedded here].

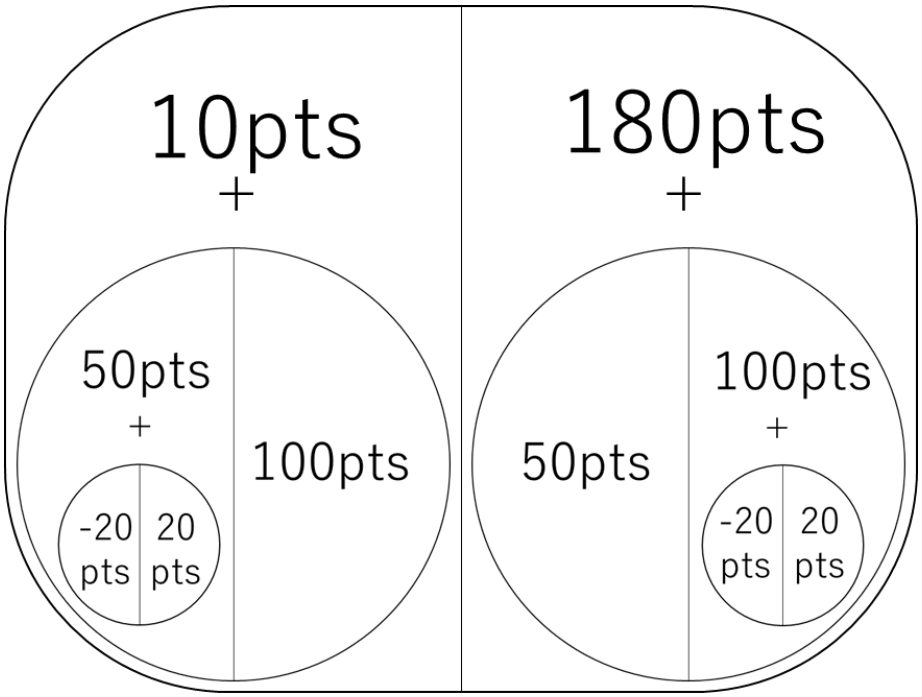
In some cases, “=>” stops at the right half of the circle. In this case, 100 points are first obtained. Then, another lottery consisting of “20 pts” and “-20 pts” will finally determine the points you get. As shown below, if you stop at “-20 pts,” 20 points will be deducted.

[Instructional video embedded here].

In the end, you will receive 100 points–20 points = 80 points, with a possibility of 25%. This is because you have a 50% chance of stopping at “100 pts” first, and then a 50% chance of stopping at “-20 pts,” so 50% x 50% equals 25%.

[Example 3]

We would like to provide some more complex examples. See the following lottery:



Let us explain how this lottery works by using the video below. First, imagine a “=>” in the center of the largest oval. If this “⇒” stops at “10 pts” on the left side, you will get 10 points. Next, let us say the lottery is a medium-sized circle and it stops at the “50 pts” spot on the left. You will get another 50 points.

Finally, let us say that in the smallest circle lottery, you land on the right side with “20 pts.”

You get another 20 points.

In the end, you will receive 10 points + 50 points + 20 points = 80 points. This probability is 50% × 50% × 50% or 12.5%.

[Instructional video embedded here].

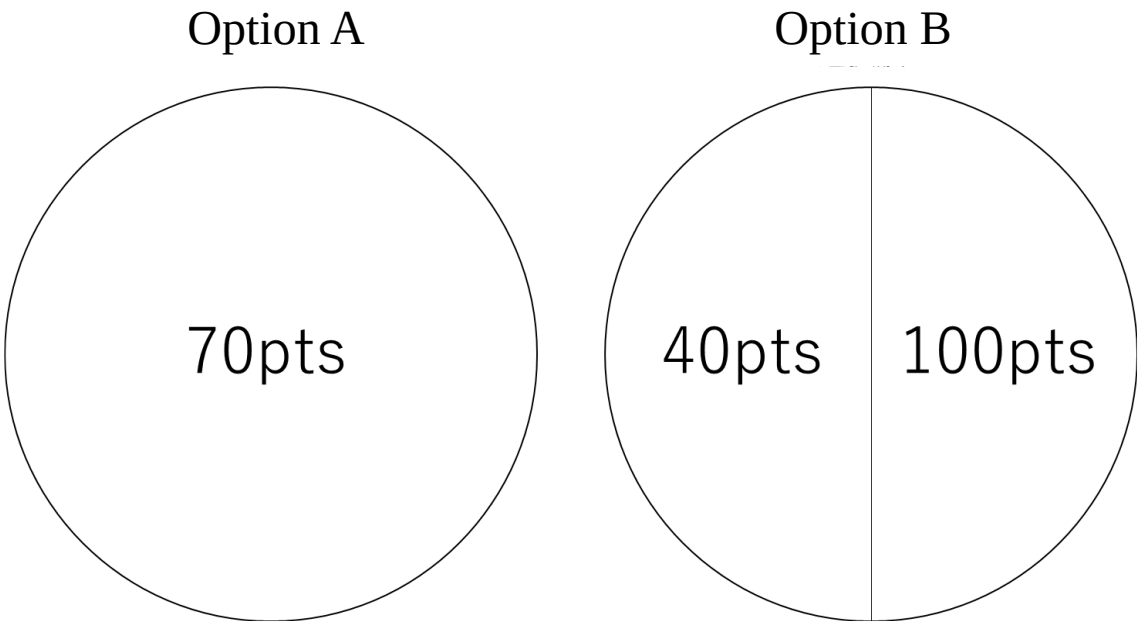
Quiz

Q1: Of the following Options, A and B, if you choose Option A, how much money will you receive?

40 points

70 points

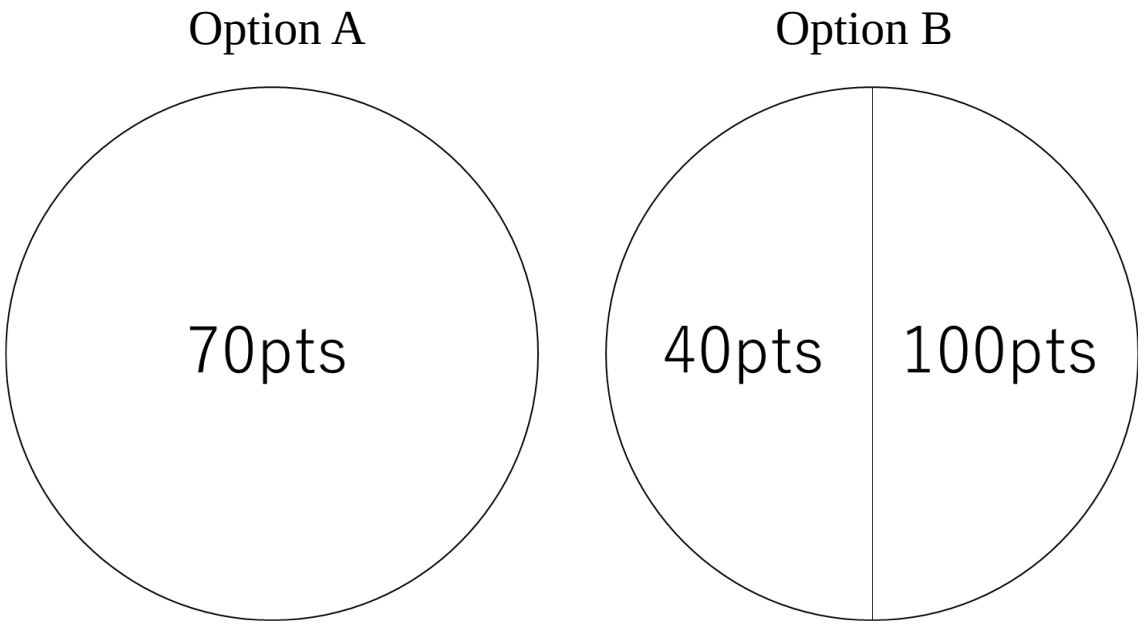
100 points



Q2: Of the options below, how much money will you receive if you choose Option B?

70 points

Equal probability 40 points or 100 points

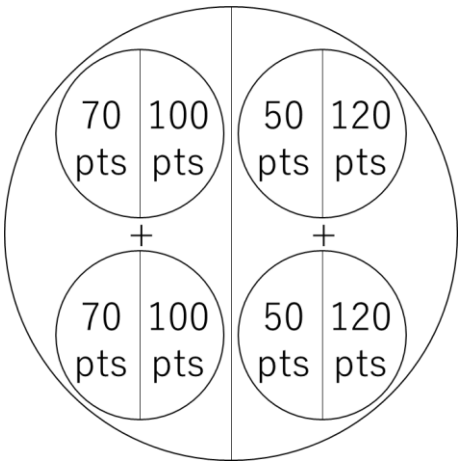


Q3: What is the minimum amount you can receive if you choose the lottery below?

100 points

140 points

200 points

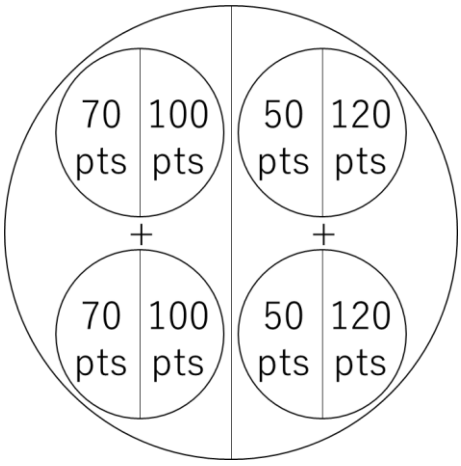


Q4: What is the maximum amount you can receive if you choose the lottery below?

140 points

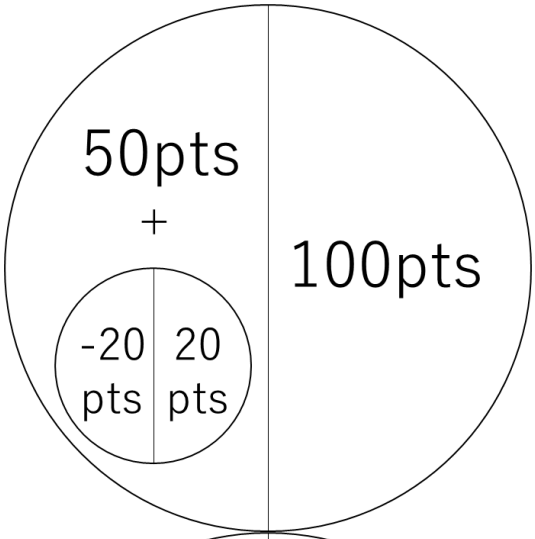
240 points

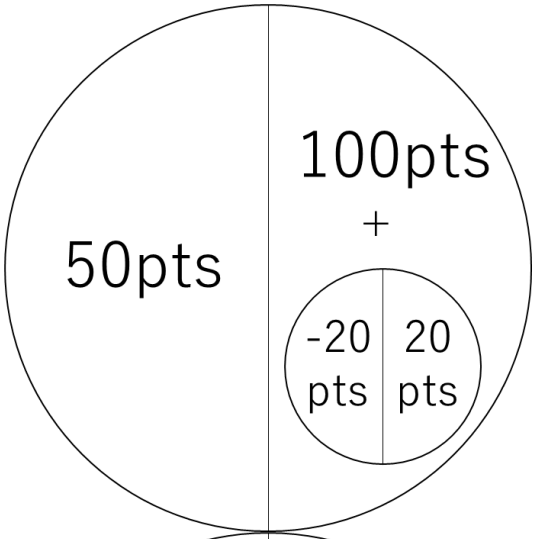
340 points

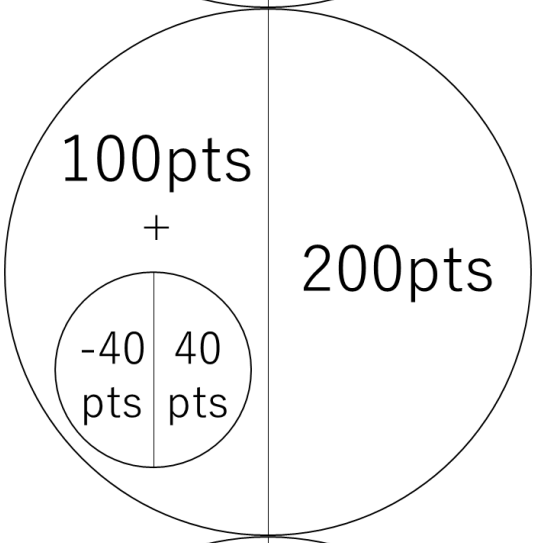


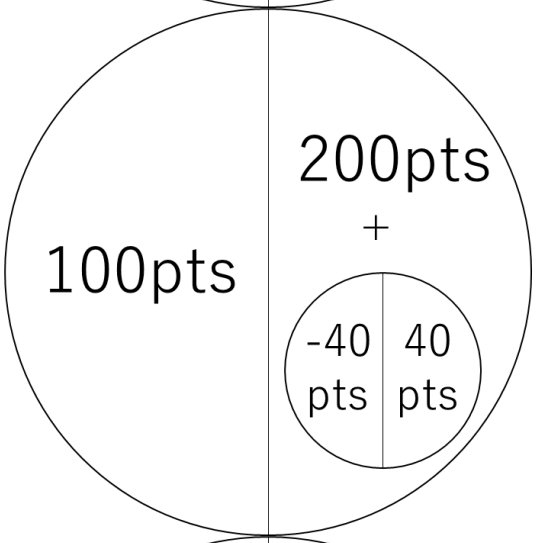
You will need to answer questions based on the rules previously outlined. **The amount of reward received will be determined according to one of the randomly selected questions.**

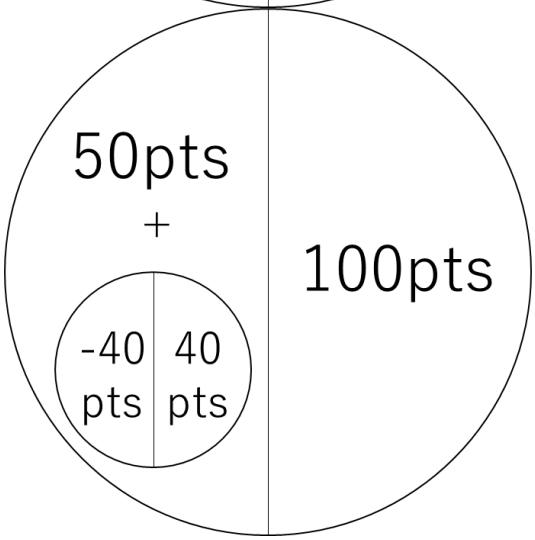
Which of the following options, A or B, would you choose?

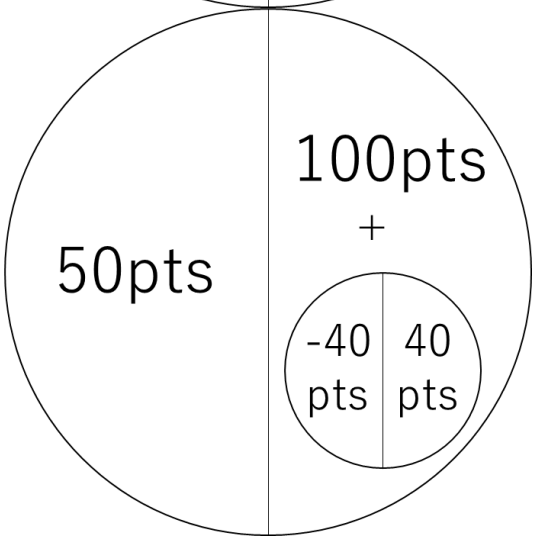

50pts
+
-20 pts
20 pts
100pts

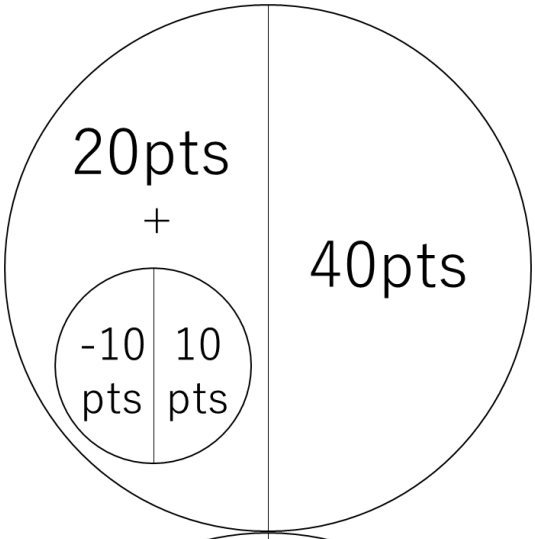

50pts
100pts
+
-20 pts
20 pts

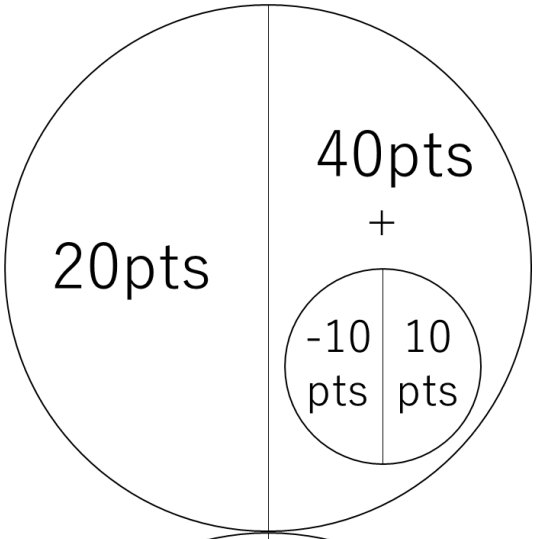

100pts
+
-40 pts
40 pts
200pts

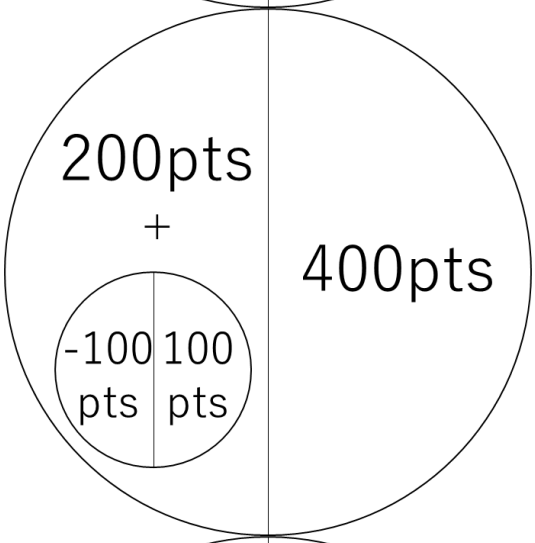

100pts
200pts
+
-40 pts
40 pts

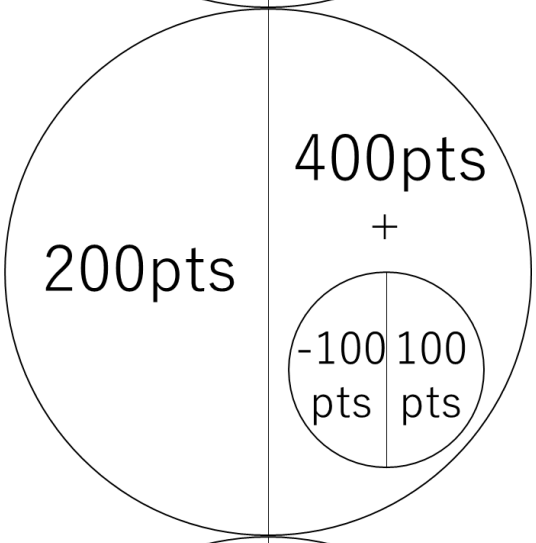

50pts
+
-40 pts
40 pts
100pts

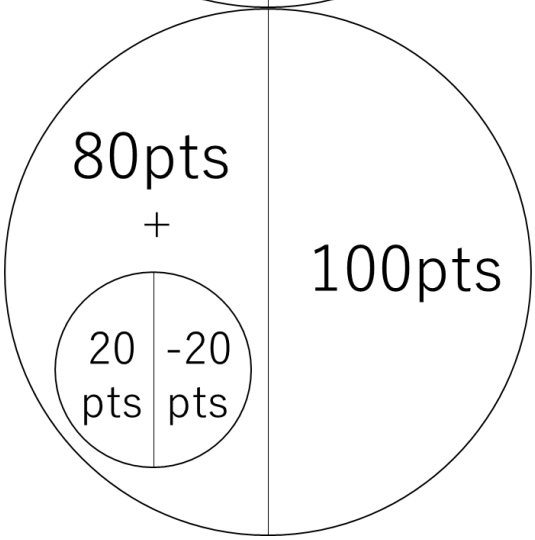

50pts
100pts
+
-40 pts
40 pts

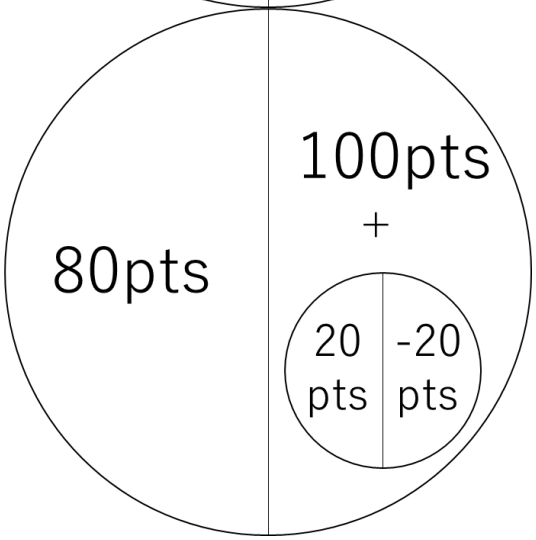

20pts
+
-10 pts
10 pts
40pts

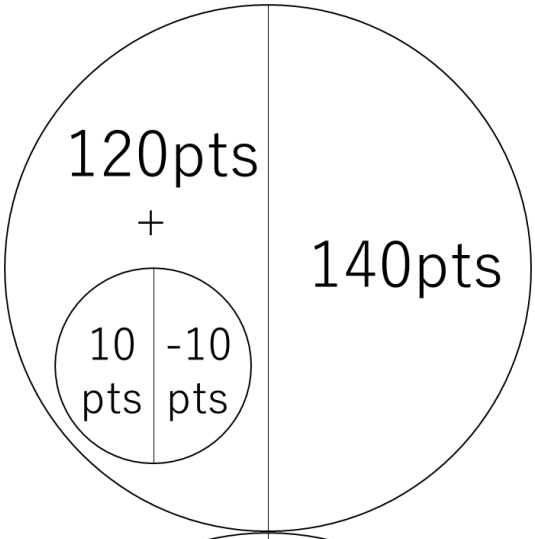

20pts
40pts
+
-10 pts
10 pts

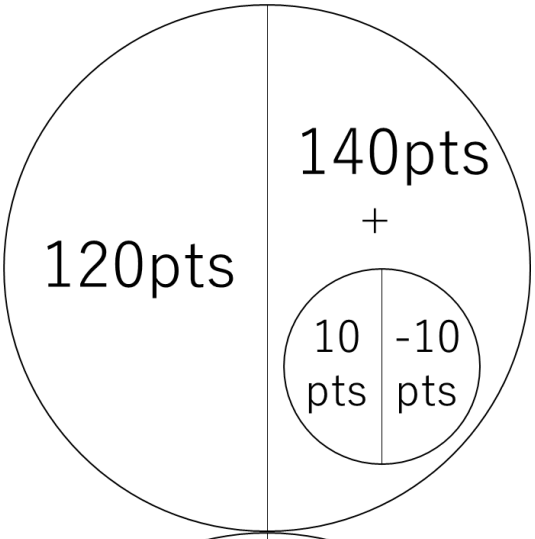

200pts
+
-100 pts
100 pts
400pts

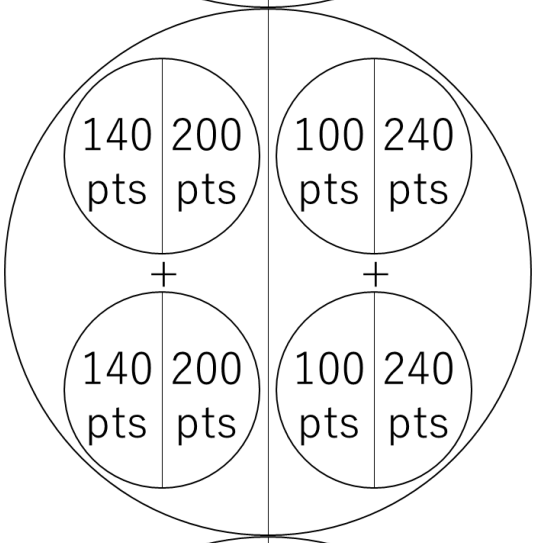

200pts
400pts
+
-100 pts
100 pts

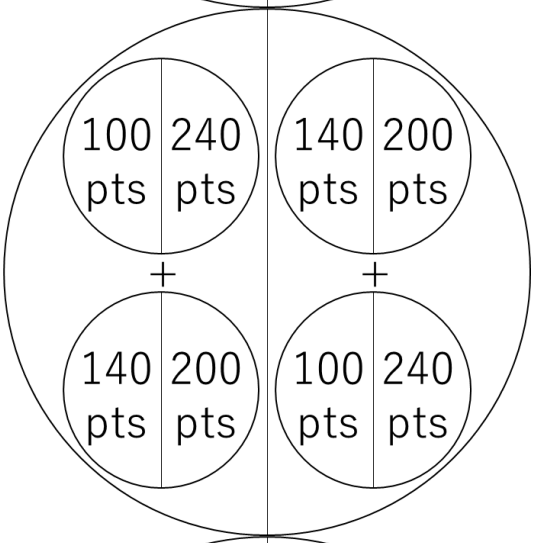

80pts
+
20 pts
-20 pts
100pts

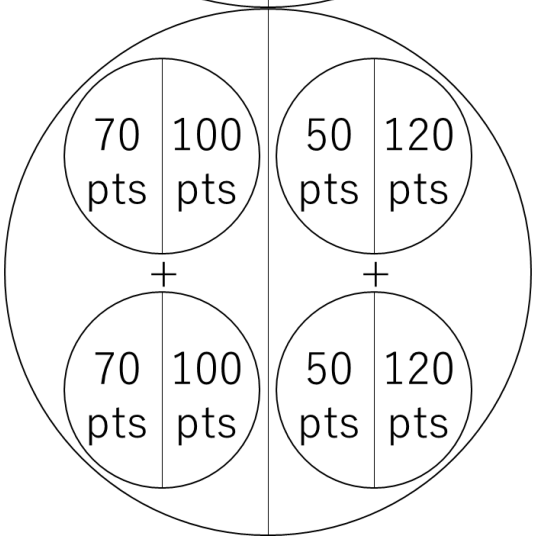

80pts
100pts
+
20 pts
-20 pts

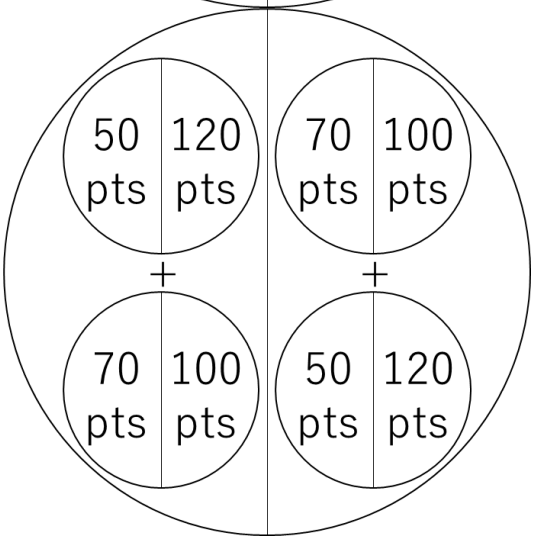

120pts
+
10 pts
-10 pts
140pts

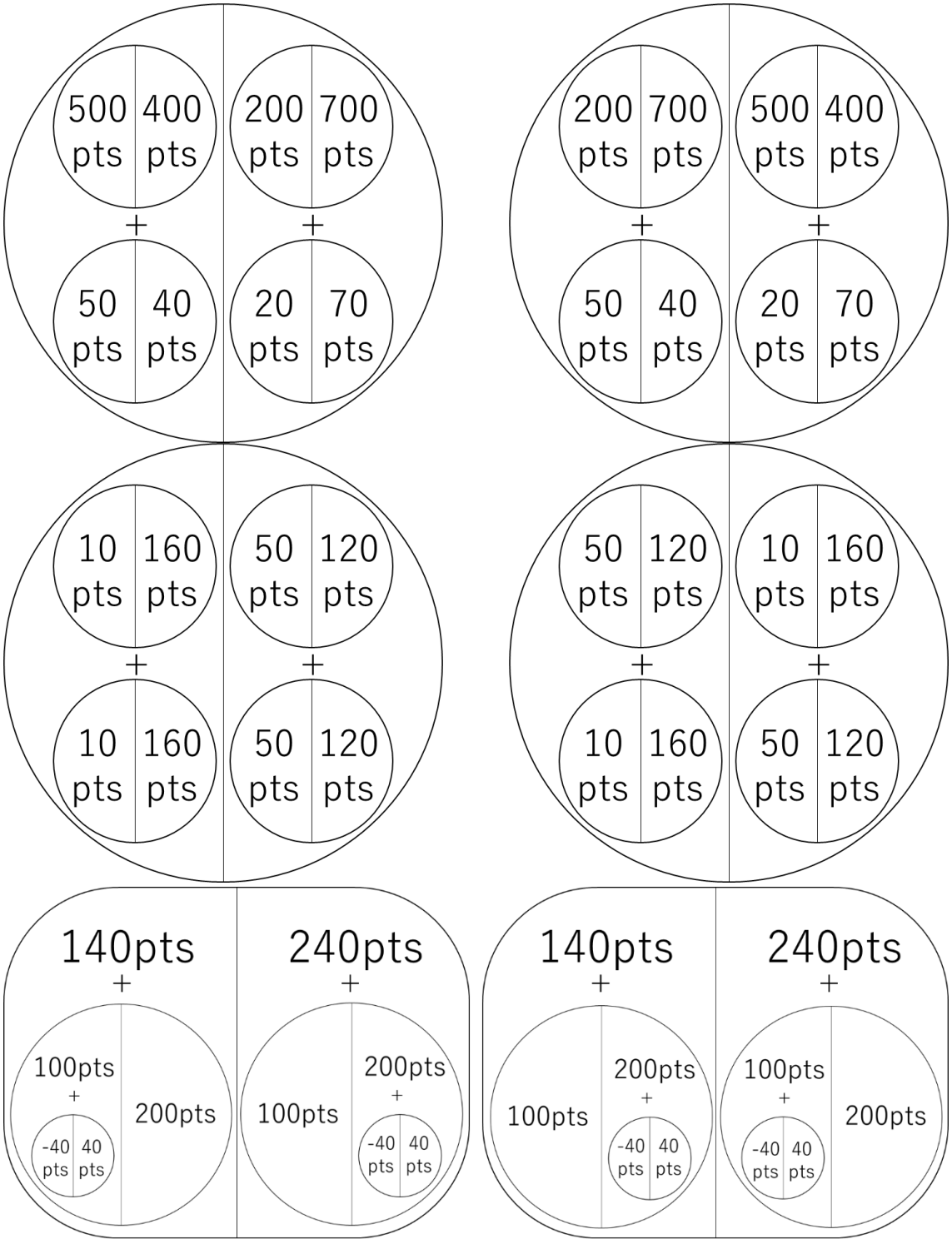

120pts
140pts
+
10 pts
-10 pts


140 pts
200 pts
+
140 pts
200 pts
100 pts
240 pts
+
100 pts
240 pts


100 pts
240 pts
+
140 pts
200 pts
140 pts
200 pts
+
100 pts
240 pts


70 pts
100 pts
+
70 pts
100 pts
50 pts
120 pts
+
50 pts
120 pts


50 pts
120 pts
+
70 pts
100 pts
70 pts
100 pts
+
50 pts
120 pts


500 pts
400 pts
+
50 pts
40 pts
200 pts
700 pts
+
20 pts
70 pts
200 pts
700 pts
+
50 pts
40 pts
500 pts
400 pts
+
20 pts
70 pts
10 pts
160 pts
+
10 pts
160 pts
50 pts
120 pts
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100pts
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-40 pts
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240pts
+
100pts
200pts
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-40 pts
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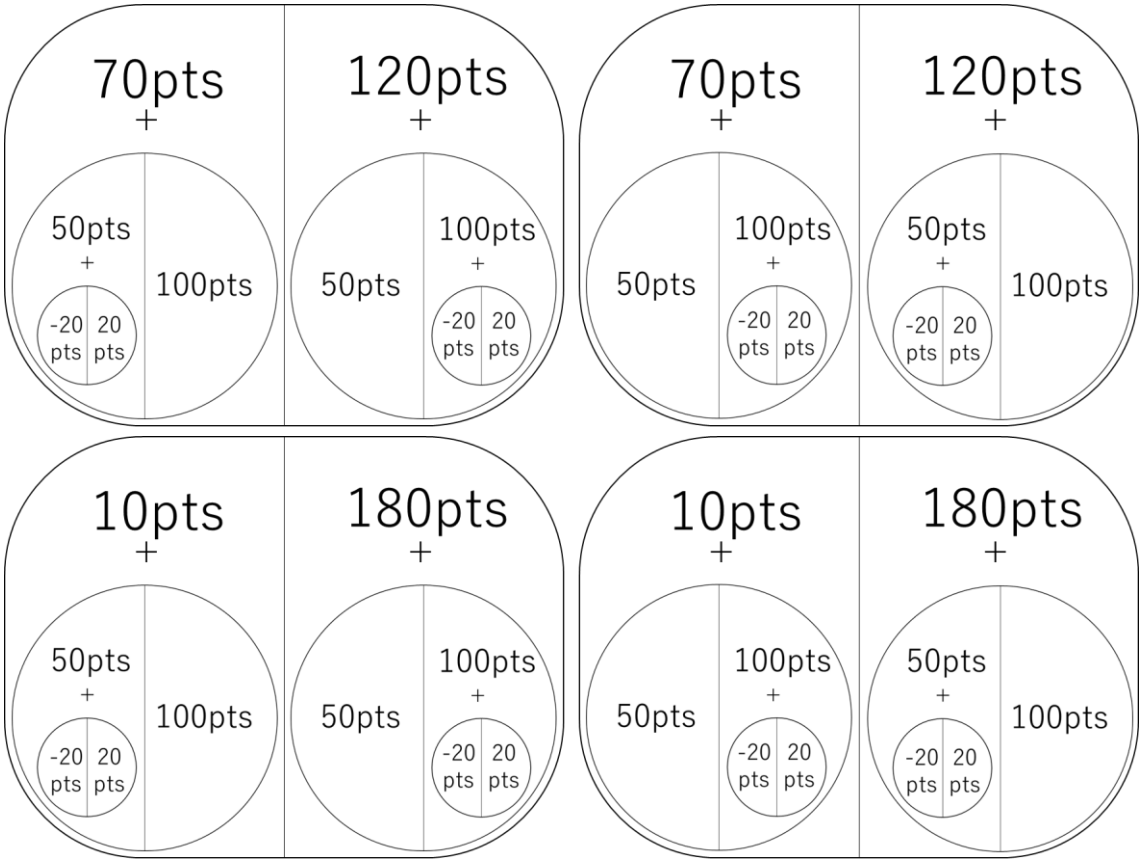
240pts
+
100pts
+
-40 pts
40 pts
200pts



Note: The former seven of the lottery pairs shown above were used to measure prudence. The latter seven were for temperance. The left lotteries have higher risk. The order of these questions and the left and right sides of the choices are displayed randomly.

Appendix 4. Public service motivation

We used an international scale consisting of the four dimensions proposed by Kim et al. (2013).

All items had to be answered on a five-point Likert scale.

Attraction to public services (APS)

1. I admire people who initiate or are involved in activities to aid my community.
2. It is important to contribute to activities that tackle social problems.
3. Meaningful public service is very important to me.
4. It is important for me to contribute to the common good.

Commitment to public values (CPV)

1. I think equal opportunities for citizens are very important.
2. It is important that citizens can rely on the continuous provision of public services.
3. It is fundamental that the interests of future generations are considered when developing public policies.
4. It is essential for public servants to act ethically.

Compassion (COM)

1. I feel sympathetic to the plight of the underprivileged.
2. I empathize with other people who face difficulties.
3. I get very upset when I see other people being treated unfairly.

4. Considering the welfare of others is very important.

Self-sacrifice (SS)

1. I am prepared to make sacrifices for the good of society.

2. I believe in putting civic duty before self.

3. I am willing to risk personal loss to help society.

4. I would agree to a good plan to make a better life for the poor, even if it costs me money.