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Risk aversion and public sector employment

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Abstract

This study examines whether public sector workers are more risk averse than those in the private sector and, if so, whether risk-averse individuals self-select themselves into the public sector or public employees become more risk averse during their career. Drawing on portfolio theory that individuals assemble their asset portfolio that maximizes expected return within an acceptable level of risk, this study analyzes 6276 South Korean employees' portfolio selection behaviors from 2000 to 2017. Findings show that public employees are likely to hold safer assets while those in the private sector tend to own riskier assets. Such behavioral heterogeneity is witnessed at the time of their first entrance into each sector and remains constant over their career. These results indicate that public employees' risk aversion is primarily a consequence of their self-selection, but their sector affiliation also plays a role in sustaining their risk aversion.

Evidence for practice

- Risk aversion is more pervasive among public sector workers than their private sector counterparts and there are strong self-selection mechanisms over within-sector socialization in public employees' risk aversion.
- To better manage the public workforce, it is important for public organizations to develop recruitment, retention, and motivational strategies that fit those risk averse.
- Albeit not strong, the role of sector affiliation in public employees' risk aversion suggests that sector matters in designing and implementing cross-sector collaborations.

INTRODUCTION

Public employees increasingly interact with people from various settings, which results in complex interplay with those employed in business enterprises and voluntary associations. Such connections, coupled with scholarly interest in sectoral difference, once again illuminate an implicit assumption that those working in the public sector are more risk averse than their private sector counterparts. Public employees' risk aversion deserves extra attention for several reasons. First, public employees' risk propensity affects the ways they interpret rules and whether and how much they adopt creative and innovative ideas from other domains (Rogers, 2003). Second, the level of risk that public employees afford to tolerate is useful for examining whether and how much they would engage in personally risky behaviors in the workplace such as whistleblowing. Evidence suggests that risk aversion weakens the relationship between individuals' organizational identification and their whistleblowing intention (Zhou et al., 2018). Third, public employees' risk aversion provides implications for motivating and incentivizing the public workforce. A series of experiments reveal that risk-averse individuals are less responsive to both psychological and financial incentives than those less risk averse (Cadsby et al., 2007, 2016). Therefore, probing public employees' risk aversion is important for predicting their work-related behaviors and designing government incentive schemes that align with employees' reward preferences, which induces them to perform well and sustains organizational growth.

Notwithstanding the promise of the topic, only a few studies have directly examined public sector workers' risk aversion compared to those in the private sector and their findings are mixed. While some scholars report heterogeneous risk aversion between public and private sector workers (e.g., Roszkowski & Grable, 2009), others find little difference in risk orientation across the sectors (e.g., Bozeman & Kingsley, 1998). In experiments to assess

framing effects and status quo bias, public managers do not appear to be more risk averse than their private sector counterparts (Nicholson-Crotty et al., 2019).

Several explanations can be made for these mixed findings. First, many existing studies rely on cross-sectional data in their analysis of employees' risk aversion. This approach observes individuals' behavior at one point in time, which potentially leaves out variables that may have significant relationships with the outcomes in question or fails to account for the details of behavioral sequence or consistency. More importantly, it is difficult to make causal inferences using cross-sectional research design because it compares the risk aversion among employees at a single moment. Individuals' risk aversion reflects the combination of their inherent characteristics of avoiding risks, on-the-job needs, and sector-specific socialization. Such aspects elicit the questions on whether risk-averse individuals choose to work in the public sector or public employees become more risk averse after entering the sector. These questions have been repeatedly brought up (e.g., Bozeman & Kingsley, 1998; Nicholson-Crotty et al., 2019) and the former question was separately tested (e.g., Dong, 2017). However, to date, no study has examined the link between risk aversion and public sector employment by simultaneously considering the role of self-selection and socialization in a longitudinal context.

Furthermore, studies have assessed public employees' risk aversion using their attitudes toward risk (e.g., Bozeman & Kingsley, 1998) or behaviors in hypothetical settings (e.g., Buurman et al., 2012; Nicholson-Crotty et al., 2019). Clearly, previous studies have advanced our understanding of cross-sectoral risk aversion by using a variety of stated and revealed risk preferences. However, experiments reveal that subjects' perceptual risk aversion is not consistent with their risk-averse behavior (Tepe & Prokop, 2018). That is, stated preference may not precisely predict revealed preference.

What is more, revealed preference in experimental settings needs to be cautiously interpreted since participants are prone to behave differently under hypothetical scenarios. Early experimental economists explain that this incongruence stems from individuals' decision cost, which leads them to behave less optimally (Smith & Walker, 1993). In the context of risky decisions in experimental settings, participants may alter their behavioral responses depending on the size of financial rewards (i.e., lottery choices that involve some dollars) or the number of trials (Kahneman & Tversky, 1979; Smith, 1976). Therefore, relying on stated preference or revealed behavior in hypothetical settings, albeit their substantial merits and rich insights, may disguise one's true choice in a naturally occurring environment.

To fill these voids, this study conducts a longitudinal examination of whether public sector workers are more risk averse than their private sector counterparts and, if so, whether they self-select themselves into the public sector or become risk averse during their career, using a behavioral measure in a real setting. This study offers several additions to the extant literature. First, using longitudinal data enables us to investigate whether and how employees' risk aversion changes over time and to disentangle the impact of self-selection and socialization on public employees' risk aversion. This allows us to identify the causality between risk aversion and public sector employment. Second, employing behavioral measures in real settings mitigate potential bias embedded in stated preferences or revealed behaviors in hypothetical settings. Drawing on portfolio theory that individuals assemble their asset portfolios that maximize the expected return based on a given level of risks, this study tracks 6276 South Korean employees' portfolio selection behaviors from 2000 to 2017 where their whole fortune is at stake.

The rest of the study reviews the basic assumption of portfolio theory and relevant literature on public sector workers' risk aversion, describes empirical strategies and findings, and concludes with a discussion of implications, contributions, and limitations for research and practice.

PORTFOLIO THEORY: RISK AVERSION AND ASSET CHOICE

One prominent theory on the relationship between risk and human behavior is portfolio theory. By formulating portfolio problems as a choice of the mean and variance of the assets, Markowitz (1952) suggests that individuals are subject to maximize expected portfolio return while minimize its variance of return. The theory assumes that individuals' risk–return preferences influence their selection of preferred portfolios. Grounded in classic risk–return tradeoffs, portfolio management seeks to minimize unpredictable financial risks for a given level of expected revenues. Later, Markowitz suggests Modern Portfolio Theory as an approach to stratify risks across diversified asset portfolios.

Portfolio theory is based on several assumptions. First, individuals prefer higher returns to lower ones. Second, individuals base their decisions on the expected return and risk. The theory suggests that the level of risk associated with each portfolio is measured by standard deviation or the variance of its return. Much of scholarship in finance theory supports positive correlations between risk and return despite some variances[1] (Maneemaroj et al., 2021). That is, the greater the risk, the higher the potential for return (either gains or losses). Hence, greater expected returns result in more utility for individuals, whereas more fluctuation in returns declines their utility. Formally, individuals' utility function is expressed as:

$$U = E(r) - A\sigma^2, \quad (1)$$

where U is the utility value, A is an index of one's risk aversion, r is the expected return, and σ^2 denotes the

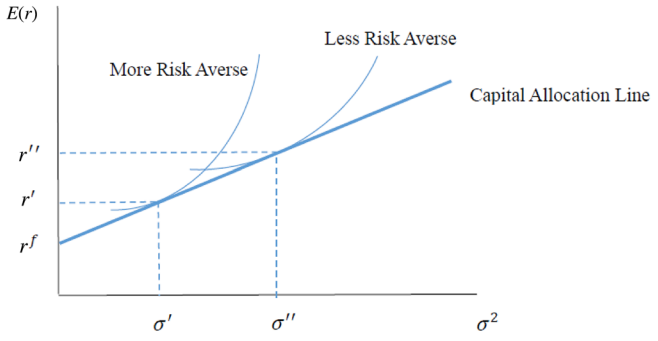

FIGURE 1 Risk aversion and optimal portfolio choice.

variance of each portfolio. Figure 1 displays that a more risk-averter has a steeper indifference curve than less risk-averter. A risk–return relationship is illustrated with capital allocation line; it shows that expected return increases with a greater risk and has a *y*-intercept of r^f, which represents risk-free asset such as government-guaranteed bonds. Given the indifference curves and the capital allocation line, individuals' optimal choice of portfolio is determined where the curves are tangent to the capital allocation line.

PUBLIC AND PRIVATE SECTOR WORKERS' RISK AVERSION

Risk is often thought to be negative due to their likely losses, but most decisions and behaviors involve a trade-off between risk and expected return. In classic decision theories, risk has been conceived as a variation of the distribution of possible gains and losses associated with a particular alternative and has been included in a von Neumann-Morgenstern utility function (Von Neumann & Morgenstern, 2004). Given that people prefer alternatives with higher expected values to those with lower ones, risk delineates the state where people attach probabilities of occurrence to future events (Knight, 1921). An idea of risk has also appeared in management literature as a common aspect of managerial work. In these streams, risk is considered as exposure to the chance for loss from one's decisions (MacCrimmmon & Wehrung, 1988).

Following the long scholarly interests on the topic, extant literature has explored whether public employees are more risk averse than their private sector counterparts using various measurements. While some scholars show that public sector workers differ little from private sector workers in their risk orientation (Bozeman & Kingsley, 1998), other scholars find that public employees score lower than those employed in the business enterprises in their self-reported risk tolerance (Roszkowski & Grable, 2009). Buurman et al. (2012) observe a type of rewards that respondent chose as a reward for their survey participation. They find that public employees are less likely to select risky options (lottery) but more likely to choose prosocial options (the donation) at the beginning of their career, although these patterns alter in later stages. Also, one experiment finds that public managers are not consistently risk averse than those in the private sector and even exhibit a reverse pattern under certain conditions (Nicholson-Crotty et al., 2019).

Taken together, previous studies provide mixed evidence on cross-sectoral risk preferences, which opens the question of whether risk-averse individuals self-select themselves into the public sector or employees become more risk averse after entering the public sector. The next section explores the first case where risk-averse individuals are attracted to professions in the public sector.

Self-selection or attraction

Theoretically, the attraction component of Schneider et al.' (1995) attraction-selection-attrition model[2] predicts that individuals make their job choices based on their perceptions on organizational attributes. That is, people self-select themselves in a work environment where their career needs are fulfilled, and their personal characteristics are aligned with those of organizations. Such self-selection mechanisms allow employees to express their values and exercise their skills, which results in person-environment fit (Pervin, 1989).

Following this logic, public employees' risk aversion is recognized as a predictor of their self-selection into public service (e.g., Dong, 2017; Pfeifer, 2011). It rests on the assumption that job security, wages, and other values are heterogeneously weighted by individuals, and thus self-selection is associated with one's utility maximization. It is an uncontroversial proposition in the labor market that public employees have higher job security than those in the business world. Since risk-averse individuals tend to weigh job security higher, they are likely to sort themselves into the public sector (Bellante & Link, 1981). Moreover, public employees earn a riskless wage compared to those with more volatile wages in the private sector. Since risk-averse jobseekers tend to have lower reservation wages, they are likely to accept lower wage offers in the public sector (Feinberg, 1977). However, risk-tolerant jobseekers tend to have higher reservation wages and spend more time in job search, which leads them to find highly paid jobs (Pannenberg, 2007). Compared to for-profit employees, public employees tend to place less emphasis on higher pay but more value on intrinsic rewards such as helping others and doing something meaningful to society (Houston, 2006).

Furthermore, prior research shows that more risk-averse individuals tend to sort into public sector employment and this inclination is influenced by various heterogeneous returns for risk-taking behaviors across sectors (Pfeifer, 2011). Of course, some studies have challenged the link between risk aversion and self-employment (e.g., Findeisen, 2013). Given that risk aversion is one of personal characteristics that may account for one's career

choice, a causal link between risk aversion and sector choice remains elusive. In their analysis of nascent entrepreneurs, Rosen and Willen (2002) argue that willingness to accept risks is not a significant factor that determines their occupational choice. They contend that the wage premium associated with self-employment is too large to explain only with risk.

Compared to variances on the link between risk aversion and private sector employment, the weight of evidence has consistently supported a positive association between risk aversion and public sector employment in terms of job security, wage, and intrinsic rewards. Therefore, we reason that those averse to risks are more likely to choose to work in the public sector than in the business sector. When we combine this logic with portfolio theory, it is highly likely that risk-averse jobseekers invested and possessed safer assets before their entry into the labor market and choose to work in the public sector. Therefore, when we compare the asset portfolios of both public and private sector workers at their first entrance into each sector, heterogeneous risk preference will be detected in their portfolio composition.

Sector entry and within-sector socialization

In addition to the self-selection mechanism, we can think of the second case that the public sector trains and socializes its employees to comply with professional norms and values, which makes them more risk averse during their career. To increase the person-organization fit, individuals tend to adapt their personality to their organization. How individuals develop and prioritize their values at work is described by attraction-selection-attrition-socialization framework (Chatman, 1991). Different from the aforementioned attraction-selection-attrition model, the attraction-selection-attrition-socialization model further explains how socialization reinforces and sometimes modifies employees' values, attitudes, and behaviors to fit better with those prevalent in their occupations. Socialization is designed to encourage newcomers to learn occupational norms and values as a part of the process of fitting them into their profession. Thus, how long individuals are exposed to their organizational norms is worth considering.

To test whether public employees are socialized to become more risk averse, this study uses individuals' tenure as a proxy variable. Selden (1997) suggests that the length of training or employment either in the position or in government reflect bureaucrats' socialization. Considering that employees gain new experience and skills in their interactions with peers and supervisors, years of work experience capture their accumulated job-related experiences and events during their career (Jensen & Vestergaard, 2017). By meeting supportive peers and supervisors, newcomers can feel more accepted in new environment and create a common set of in-group values as insiders.

Nevertheless, the first entrance into new environment appears challenging for newcomers since they do not have routines or skills to effectively deal with interactions with others Jones (1986). Thus, new employees may experience some stress while they try to make sense of their new environment. Blau (1960) describes this early entry experiences as a reality shock, showing that most employees were motivated to help poor clients when they just joined welfare agencies, but a series of disillusioning experiences produced a distrustful orientation toward their clients. Adkins (1995) also finds that more work experience has little effect on organizational adjustment, which inhibits socialization. In the context of risk aversion, a study on self-employed workers finds that risk aversion is not correlated with their tenure on the current job (Ekelund et al., 2005).

Taken together, we can surmise that public employees' sector-specific socialization may not clearly appear during their employment. On the one hand, it suggests that the public sector fails to strengthen its employees' risk aversion, so they can only sustain their initial level of risk propensity as it appeared at the outset of their career. On the other hand, it implies that public employees' risk aversion is not influenced by socialization since newcomers may experience the reality shock, which cancels out the effect of sector-specific socialization.

EMPIRICAL STRATEGY

Data and variables

This study utilizes data from the Korean Labor and Income Panel Study (KLIPS) from 2000 through 2017. KLIPS contains a nationally representative sample from seven metropolitan cities and urban areas in eight provinces across the country. From 2000 to 2017, this database provides annual measures of more than 6000 households and has an average response rate of approximately 80 percent. The survey was conducted by face-to-face interviews by trained professionals, but phone interviews or surveys were performed for those unavailable for face-to-face interviews.

Grounded in portfolio theory, we have two dependent variables. The first dependent variable, *a proportion of real assets*, comes from the absolute amount of an employee's real asset divided by their total asset. Here, the real asset indicates the market value of total real estates, which includes rental and security deposits charged from the real estate properties. The second dependent variable, *the proportion of financial assets*, is the amount of an individual's financial asset divided by the total asset. The financial asset is a liquid asset that derives its value from various contractual rights or ownership claims. In this study, financial assets include bank deposit, stock, bond, trust fund, savings insurance, private fund, personal lend, and the other financial assets.

The primary independent variable is the *sector* where employees work. This is a dichotomous variable which indicates whether employees work either in the public or private sector. The public sector includes three branches of all government agencies at all levels and other types of public organizations such as governmental investment facilities and governmental financing facilities whereas the private sector includes private firms and self-employed business.

We also include control variables that are grouped into three broad categories. The first category indicates individuals' financial conditions such as their *total income* and *total assets*. Prior evidence suggests that wage growth is positively associated with risk taking (Shaw, 1996). We measure the *total income* by the sum of the net value of wage and salary income, financial income, real estate income, social insurance, transfer income, and other income while individual's absolute amount of *total asset* comes from combining their real asset and financial asset. In addition, employees' *total debt* is included and is measured as the summation of both secured and unsecured debts borrowing from financial and nonfinancial institutions.

The second category captures socio-demographic characteristics such as *age, gender*, and *education years* of employees. Prior research provides mixed evidence on the link between age and risk aversion, but low risk aversion is found among men (Roszkowski & Grable, 2009) and more educated population (Dong, 2017; Shaw, 1996). Also, two neighborhood variables—*Seoul* and *metropolitan*—are included to control the regional variance. In South Korea, there are regional disparities among Seoul, six metropolitan areas (including Sejong city as administrative-capital city), and the rest of suburban areas, which reflects socioeconomic segregations in housing, infrastructure, or income. Furthermore, these neighborhood variables control the level of experienced natural disasters in the region that affects residents' risk aversion (Cameron & Shah, 2015).

The third category indicates employees' sector switch experience during their career. Our sample shows that 697 individuals started their career in the public sector but switched into the private sector, whereas 683 employees started their jobs in the private sector but switched into the public sector. A dichotomous variable, *Public to Private* indicates whether public employees switch into the private sector while another dichotomous variable, *Private to Public* is considered to control whether employees switched from the private to the public sector. Summary statistics and correlations for all variables are illustrated in Tables A1 and A2.

Model specification

To examine individuals' risk aversion, we develop the first model:

$$Y_{it} = \alpha + \beta T_t + \delta X_t + \upsilon_t + \varepsilon_t, \quad (2)$$

where Y_{it} denotes the proportion of safer assets among total assets owned by employee i at year t, T_t refers to the sector where employee i works, X_t is a vector of the other explanatory variables, α is the constant, β and δ are coefficients of variables, υ_t is a time-specific fixed effect (or time trend), and ε_t is an error term. In the second model, we add an interaction term, $T_t \times W_t$ to Equation (2) to test to what extent employees' risk aversion changes as they are more exposed to norms and values of the sector they work for. The second model specification is as follows:

$$Y_{it} = \alpha + \beta T_t + \gamma (T_t \times W_t) + \delta X_t + \upsilon_t + \varepsilon_t, \quad (3)$$

where W_t is the years of service of an employee i in that sector by a year of t. For notational convenience, the other terms and coefficients stay the same as in Equation (2). If we take the derivative of Equation (3) in terms of T_t, we get the following term:

$$\frac{\partial Y_{it}}{\partial T_t} = \beta + \gamma W_t. \quad (4)$$

Here, whether β and γ are, respectively, statistically significant and whether the sign of γ is either positive or negative provide six different scenarios that, respectively, represent different underlying mechanism of heterogeneous risk aversion between public and private sector workers (see Table 1). To better explain these six possible cases, we illustrate them in Figure A1. Case 1 (a horizontal line on the *x*-axis) presents the case in which public sector workers are not different from their private sector counterparts at the beginning of their career. This case assumes that there is no change in risk aversion of employees in both sectors as their tenure increases. Case 2 and 3, however, show two different situations when public employees' risk aversion changes as their tenure increases. In the former, they increase the proportion of safer assets as their work experience increases; the latter describes an opposite scenario where the proportion of safer assets decreases with more years of work. Case 2 and 3 indicate that employees in different sectors are heterogeneous in their portfolio selection as their tenure increases, even if they started their jobs with no difference in the ownership of assets. If public and private sector employees' risk heterogeneity is affected by sector-specific socialization, the difference in asset types will change as their tenure increases. However, case 4, 5 and 6 suggest that the amount of safer assets owned by public sector workers is different from that of private sector workers at the beginning of their jobs. In this case, both public and private sector workers are extrinsically different, but their difference either broadens (case 5) or narrows (case 6) as their tenure increases.

To test which case is supported, we check statistical significances of β and γ and the sign of γ. Suppose that

TABLE 1 Statistical significances and signs of β and γ, and their implication for the risk.

β	γ		
Statistical significance	**Statistical significance**	**Sign**	**Case**
No	No		Case 1
	Yes	Positive	Case 2
		Negative	Case 3
Yes	No		Case 4
	Yes	Positive	Case 5
		Negative	Case 6

TABLE 2 Return and risk of various assets.

Asset	Average monthly return	SD
Real estate (the real estate index)	.187%	.215
Stock (the KOSPI index)	.469%	3.524
3-year national bond	.345%	.561
Average of stock, CD, and bond	.338%	1.380
Average of stock and bond	.407%	2.403

Note: The real estate index is obtained from the Korea Real Estate Board. Both the Korean Composite Stock Price Index (KOSPI) and 3-year national bond index are provided by the Korea Exchange (LMX). Here, the KOSPI is the major stock market index of South Korea, which represents all-traded common stocks on the Korea Exchange. The CD return is calculated from the data drawn from Korean Financial Investment Association (KOFIA).

the β is positive and γ is negative in Equation (4); if the asset Y_{it} is less risky and T_t is a dummy for the public sector, the marginal effect of the T_t (public in this case) on possessing less risky asset is dependent on the years of work, W_t. Since β and γ are in opposite directions, the marginal effect cancels out as the years of service increases; if so, we can say that tenure has a moderating effect.

Method

Using households as the units of analysis, we employ a censored regression model since our dependent variables have a number of their values at some limiting values (see Figure A2). In our data, some workers appear to have no real or financial assets and a number of them only possess either of the assets. In South Korea, many of college students apply for civil service exams or internship positions ahead of their graduations. Thus, many of newly employed individuals need to carry their student loans for college after they get a job, and this may affect their financial condition. Moreover, skyrocketed housing prices influence college graduates wait long until they buy a house in their own name. Due to these reasons, our dependent variables have double-censored observations.

FINDINGS

Before reporting tobit results, we estimate the risk associated with each asset. Following the assumption of portfolio theory, we calculate standard deviation and average return of real estate, stock, certificate of deposit (CD) (91 days), and 3-year national bonds for 2000 to 2017. In our dataset, financial assets consist of bank deposit, stock, bond, trust fund, savings insurance, private fund, personal lend, and other financial assets. Our data provides stock, bond, and trust fund as one item, so we compute the average standard deviation for stock, CD, and bond as well as that for stock and bond. Table 2 shows that stock is the riskiest asset, bond is the second, and the real estate is less risky asset. In the meantime, the weighted averages come between stock and bond.

Table 3 provides the tobit estimates for employees' portfolio selection behavior, focusing on their real assets. Since the proportion of financial assets is calculated by deducting the proportion of real assets from one, we report when the dependent variable is the real asset in Table 3[3] (see Table A3 as well). Model 1 shows that public sector workers are more likely to hold safer assets than their private sector counterparts and this result stays constant when we consider employees' sector switch experience in model 2. Interestingly, individuals who started their career in the public sector but switched into the private sector still exhibit risk aversion. However, risk aversion of those who moved from private sector to the public sector does not appear statistically significant. As a robustness check, we further examine our model using an alternative dependent variable—the proportion of stock in the asset, the riskiest asset in our sample. Table A4 shows that public employees are less likely to hold stock, which further supports their risk avoidance compared to private sector employees. In this case, we find that those who switched from the private sector to the public sector exhibit their risk-seeking behavior by increasing the proportion of stock bond in their asset portfolios.

Model 3 shows that the interaction term between the public sector and individual employees' work years is not statistically significant. Such results stay constant if we consider those with sector switch experience in model 4. By applying these findings to our six cases in Table 1 and Figure A1, we check both statistical significance and signs of coefficients. It turns out that our findings support case 4, suggesting that although those who accumulated more safer assets are more likely to start their career in the public sector, the gap of risk aversion among public and private sector workers stays constant. There are two implications. First, employees' portfolio composition at the very moment of their first entrance into each sector allows us to reason their portfolio selection behavior before they enter the labor market. That is, how individuals allocate their assets at their first entry into each

TABLE 3 Tobit estimates for real asset allocation.

	DV: Proportion of real assets			
	(1)	(2)	(3)	(4)
Public sector	.047** (.015)	.065*** (.017)	.045* (.021)	.061** (.022)
Public sector × work years			.000 (.001)	.000 (.001)
Work years	.002*** (.001)	.002** (.000)	.002** (.001)	.002** (.001)
Income	−7.651*** (1.203)	−7.668*** (1.203)	−7.656*** (1.204)	−7.678*** (1.204)
Asset	5.466*** (.155)	5.468*** (.155)	5.465*** (.155)	5.468*** (.155)
Debt	−1.430*** (.341)	−1.430*** (.341)	−1.429*** (.341)	−1.429*** (.341)
Age	.025*** (.001)	.025*** (.001)	.025*** (.001)	.025*** (.001)
Female	.264*** (.020)	.265*** (.020)	.264*** (.020)	.265*** (.020)
Education	.015*** (.003)	.015*** (.003)	.015*** (.003)	.015*** (.003)
Seoul	−.218*** (.017)	−.217*** (.017)	−.218*** (.017)	−.217*** (.017)
Metropolitan	.069*** (.017)	.069*** (.017)	.069*** (.017)	.069*** (.017)
Public to private		.047† (.024)		.047† (.024)
Private to public		−.029 (.025)		−.029 (.025)
Year (time trend)	−.012*** (.001)	−.012*** (.001)	−.012*** (.000)	−.012*** (.001)
N	40,663	40,663	40,663	40,663
sigma_u	.669	.669	.669	669
sigma_e	.454	.454	.454	.454
ρ	.684	.684	.684	.684

Note: †$\rho < .1$; ∗$\rho < .05$; ∗∗$\rho < .01$; ∗∗∗$\rho < .001$. The sample has 12,285 left-censored, 19,268 uncensored, and 9110 right-censored observations; When we include year dummies instead of year variable, the result stays constant (see Table A5).

sector captures how they had accumulated and assembled their asset portfolios before they entered either sector. For example, those who allocated a higher proportion of assets into safer assets tend to start their career in the public sector. Specifically, our calculation suggests that on average those who start their career in the public sector allocate around 68 percent of their total assets into safer assets. However, in the case of those who started their career in the private sector, around 63 percent of their total assets are safer assets. Thus, we can reason that the more people are risk averse, the more they start their career in the public sector. Second, after entering the sector, the gap between the proportion of safer assets of public employees and that of private sector employees stays constant. Although overall employees' safer assets increase by 0.2 percent on average, interaction terms in models 3 and 4 suggest that within-sector socialization for public employees' risk aversion is not statistically significant.[4] Hence, the primary source that explains public employees' risk aversion is their self-selection, but the sector affiliation also makes public employees sustain their risk aversion over their career.

Another notable finding is that higher risk aversion is found among female, older people, and those with a longer year of education. In terms of personal financial condition, employees with a higher level of assets tend to invest more on safer asset. Also, individuals with higher income are more likely to take risks by allocating their assets more in financial assets (see Table A3). Consistent with the previous literature, more income makes individuals increase the portion of riskier assets in their portfolios (e.g., Shaw, 1996). Finally, those working in Seoul appear to rely more on financial assets than real assets while those in other metropolitan areas exhibit the opposite pattern.

DISCUSSION AND CONCLUSION

This study provides a number of implications for understanding public employees' risk aversion. First, our result that public sector workers are more risk averse than those in the private sector provides some takeaways on modern management reform efforts. Given the distinctive behavioral patterns among public and private sector workers, it would be useful for practitioners to develop managerial tools for those risk averse and predict their future decisions and behaviors during cross-sectoral collaborations.

Second, our findings support the self-selection mechanism in public employees' risk aversion. By detecting how individuals assemble their asset portfolio at the very beginning of their career, we find that those who invested more in safer assets tend to start their career in the public sector. Specifically, public employees who switch into the private sector during their career still exhibit risk aversion. These findings imply that risk aversion can be predictive of individuals' greater propensity of starting their career in the public sector. Given the

human capital crisis in the public sector such as declining interests in government jobs, the self-selection mechanism leads us to think about recruitment and retention strategies. On the one hand, the public sector can alter the status quo and bring about changes by recruiting more risk-seeking employees through contracting out. On the other hand, the public sector can develop retention strategies that enhance job security or employment stability for those risk averse.

Third, we find little support for the role of within-sector socialization on strengthening public employees' risk aversion. This is consistent with an argument that newcomers may experience unexpected dissonance when their expected value does not match that of organization after they entered the organizations (Cable & Parsons, 2001). Also, certain persistent values for individuals or other occupational conditions may cancel out the effect of socialization on employees' risk aversion. However, our findings do not contend that within-socialization cannot elicit any risk-related value change or influence within individuals' risk aversion. Considering that the gap between public and private sector workers' risk aversion stays constant, we can interpret that sector affiliation plays a role in sustaining public sector workers' risk aversion.[5]

This study makes several contributions. First, it examines how public sector workers' risk aversion has changed during their career. Although there is an extensive literature on cross-sectoral risk propensity, much literature has relied on a cross-sectional research design, which may overlook the fact that individuals' risk propensity would evolve during their career. The present study fills this gap by using 18-year panel data.

Second, this study is the first attempt to peer into the "blackbox" of public employees' risk aversion by disentangling the role of self-selection and socialization mechanisms simultaneously. With statistical significance and signs of coefficients, our model allows us to detect heterogeneous risk-related behaviors between public and private sector employees over their career. In particular, portfolio compositions at the moment they entered each sector is critical information, which shows how employees had accumulated and allocated their assets before they entered the sector. This approach may be relatively indirect compared to other research that compares risk-averse behavior both in pre- and post-employment stages. However, with using panel data, our approach contributes to expanding the scope of research in the attraction-selection-attrition-socialization process without generating endogeneity issues.

Third, this study measures public employees' risk aversion by analyzing their actual behaviors in real settings rather than their stated risk preference or risk-related behavior in hypothetical settings. Although the notion of risk aversion implicates the perceived risk which plays an important role in individuals' decision-making, people's stated preference is not always the same as their revealed preference (Tepe & Prokop, 2018). Since portfolio selection is the case where all types of assets are at stake, this measurement effectively minimizes the decision cost (Smith, 1976) and other potential bias such as self-stereotyping or self-serving biases. When people are asked about their financial decisions in the hypothetical setting, their answers tend to be overstated than their actual choices (Morwitz et al., 2007). Hausman (2012) explains this as a hypothetical bias. Similarly, subjects in hypothetical experiments appear to be more risk-taking in their spending than when their real money is at stake (Camerer & Hogarth, 1999). Of course, we do not negate the promise of studies using laboratory experiments or hypothetical scenarios. When probing people's risk averse behavior, it is worth considering how to bridge the gap between subjects' behavior in hypothetical settings and real settings.

In addition, portfolio selection has been widely used to estimate people's risk aversion (e.g., Biglova et al., 2004). In economics and finance, individuals' money-related choices (e.g., investment, bidding, or gambling) have been used in classic risk aversion models (e.g., Knight, 1921; Pratt, 1964) and in experimental studies (e.g., Smith & Walker, 1993). In particular, Markowitz's (1952) portfolio theory first attempts to quantify individuals' risk aversion and provides rich insights but has received rare attention to estimate employees' risk aversion in the field of public administration. More importantly, portfolio selection matters to all employees. That is, once people choose their career and start their work, they get paid and assembling asset portfolios becomes a matter for all workers regardless of the levels and types of their sector, organizations, occupations, specialties, positions, or work conditions. Such a comprehensive aspect of this parameter benefits us to estimate the risk aversion of overall employees without using any sampling techniques or interventions to the original job settings.

Nevertheless, this study is not without limitations. First, portfolio theory may not fully capture the coexistence of risk-averse and risk-seeking aspects of individuals. People can divide their present and future assets into nontransferable portions and handle them separately (Thaler, 1999). Scholars alternatively develop behavioral portfolio theory, acknowledging the coexistence of insurance preferences and gambling (Shefrin & Statman, 2000). This implicates that those risk averse in assembling their asset portfolios can become risk-seeking in other decision-making depending on the characteristics of their tasks or whom they collaborate with. Evidence suggests that people's career risk attitudes and general risk attitudes may be different (Pfeifer, 2011). Defining what will be the general risk aversion and developing its comprehensive measure can provide a fuller understanding of the link between risk aversion and public sector employment.

Relatedly, it is worth considering whether there is any gap between people's subject perceptions on the riskiness of financial asset and the objective assessments of

the financial asset. Evidence suggests that people's perceived risk and expected returns predict their portfolio decisions (Weber et al., 2005). This implies that the conventional portfolio theory needs to be extended to better reflect the realities of investment choice. It is also important to identify the case when people's investment choices do not stem from their risk preference but different perceptions of the riskiness of their assets. A recent study also suggests public value consideration when measuring risks and placing portfolio management into public administration contexts (Roberts & Edwards, 2023).

Another limitation is that this study did not include all potential variables due to data limitation. Portfolio management is influenced by individuals' financial literacy, retirement plan, the presence of financial advisors, and financial goals. Similarly, we cannot specify the specialization of their tasks and levels of government, which influences both quality (accuracy) and quantity of information and knowledge on markets and financial products that individuals can get, which influences their investment choices. With those factors, all individuals have access to the same information. Likewise, this study is unable to control individuals' family-life cycles or events such as birth or death of family members, number of kids and their college entrance. The presence of parental investment or automatic inheritance of money from parents is also worth considering. In managerial contexts, organizational support for entrepreneurship or exposure to pay-for-performance system can affect public employees' risk preferences.

Finally, our focus on South Korean workers' portfolio selection limits the generalizability of current findings into different cultural and national settings. Differences of long-standing cultural values and socio-economic environment may lead to cross-cultural and cross-national heterogeneity in risk aversion. Evidence shows that a culture's position on the individualism–collectivism continuum influences people's perception of risks; that is, citizens in collectivist cultures are likely to perceive fewer risks than those in individualist cultures (Weber & Hsee, 1998). In multi-country studies, prevalent religion and the size of welfare state are worth considering. Research suggests that those with church membership are more risk averse than those without it and Protestants are more risk averse than Catholics regarding financial risks (Noussair et al., 2013). Also, given his finding that income risk is higher in countries with larger share of social spending in GDP, Bird (2001) suggests that welfare states are more likely to induce risk-taking for their economic growth.

This study provides a number of implications for future research. First, it encourages scholars to extend the assumptions of portfolio theory to better explain people's portfolio choices in practice. Also, scholars can develop novel measurements for one's risk propensity in real-life settings, using different methods such as cohort observations. Second, future research can consider employees' personal characteristics, life events, and family conditions when analyzing their risk propensity. It has been suggested that within-individual variations in risk-taking are seven times larger than those of between-individuals (Blais & Weber, 2006). Also, it is worth exploring how childhood socialization or macroeconomic experience early in people's life influences their fear of risky outcomes (see Malmendier & Nagel, 2011). Relatedly, future research can dissect employees' within-sector socialization with different measurement and analytical approaches. Our finding suggests that although overall employees slightly increase their safer assets regardless of their sector, there is little support for sector-specific socialization that alters one's risk aversion. Given that there must be certain values that would persist at an individual level, scholars can examine how much individuals' risk aversion realistically can change during their career. Further, organizations in the same sector do not have monolithic culture. Future research can examine employees' socialization by separately using the number of years they have worked for the same organization and that of the same industry. Finally, scholars can investigate how for-profit worker's socialization influences public employees' risk aversion. It would also be interesting to extend its scope of study to nonprofit workers for a more complete understanding of public employees' risk aversion.

Overall, this study represents a small but important step toward understanding public employees' risk aversion by disentangling the effect of self-selection and socialization. Probing underlying mechanisms of public employees' risk aversion provides insights not only for enhancing recruitment and retention strategies in the public sector but also for predicting what distinctive behaviors will be drawn from various managerial tools during cross-sector collaborations. As public employees are intricately bound with people from other settings, the topic of risk aversion needs more scholarly attention.

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ENDNOTES

[1] Different from financial theory, some report no relationship between expected return and risk (Fama & French, 1992) or a negative relationship between the two. This may stem from inherent limitations of financial theory, analyzing high-frequency data or relying on small size of data.

[2] According to De Cooman et al. (2009, p. 103), attraction-selection-attrition framework "assumes an influence of P–O fit on the applicants' job choice (self-selection) as well as on the organizations hiring decision (selection). People are attracted to organizations that have values similar to their own (attraction), and organizations select people who share their values (selection). Finally, individuals who do not the organization will leave voluntarily or be asked to leave (attrition)."

[3] Table A3 reports tobit estimates for financial asset selections. When we compare Tables 3 and A3, their coefficients have the exact opposite signs and their statistical significance and magnitude stay the same.

[4] Based on the coefficient of "work years" in Table 3, we can reason that work experience makes overall employees increase their safer assets in

their asset portfolio. However, our interaction term in Table 3 shows that there is no sector-specific socialization on public employees' risk aversion.

[5] Similarly, PSM studies show that within-sector socialization is complicated. Kjeldsen and Jacobsen (2013) show that people's PSM fades out after their job entry, but sector affiliation prevents their PSM from declining.

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APPENDIX A

TABLE A1 Summary statistics.

Variables	*N*	Mean	SD	Min	Max	Item
Real asset (%)	87,185	.725	.392	0	1	Real estate asset ÷ Total asset
Financial asset (%)	87,185	.275	.392	0	1	Total financial asset ÷ Total asset
Stock (%)	5723	.537	.333	0	1	Stock asset ÷ Total financial asset
Public sector	48,674	.138	.344	0	1	Public sector = 1, Private sector = 0
Work years (or tenure)	73,075	10.662	10.880	1	78	Years of work in the current sector
Public sector × work years (or tenure)	48,491	1.938	6.036	0	42	Interaction term between variable 4 and 5
Income	109,688	.003	.004	0	.113	Unit: 1,000,000 (won)
Asset	109.688	.018	.035	0	1.72	Unit: 1,000,000 (won)
Debt	109,688	.003	.011	0	.75	Unit: 1,000,000 (won)
Age	101,014	52.260	15.275	15	100	Age
Female	101,014	.782	.412	0	1	Male = 0
Education	101,008	11.093	4.488	0	22	Education years
Seoul	101,014	.203	.402	0	1	Where is the location of your workplace?
Metropolitan	101,014	.276	.447	0	1	Where is the location of your workplace?
Public to private	109,688	.0064	.079	0	1	Public employees who switched to the private sector
Private to public	109,688	.0062	.078	0	1	Private employees who switched to the public sector
Year (time trend)	109,688	10.615	5.045	1	18	Y2000 = 1 through Y2017 = 18

TABLE A2 Correlation of variables.

		1	2	3	4	5	6	7	8	9
1	Real asset	1								
2	Financial asset	−1	1							
3	Stock	.08	−.08	1						
4	Public sector	.05	−.05	−.09	1					
5	Work years	.23	−.24	−.02	.27	1				
6	Income	.16	−.16	−.04	.04	.28	1			
7	Asset	.35	−.35	.01	.02	.17	.47	1		
8	Debt	.30	−.30	.08	.03	.09	.25	.45	1	
9	Age	.30	−.30	.02	.06	.42	.24	.31	.11	1
10	Female	.09	−.09	.05	−.04	.13	.08	.04	−.03	.14
11	Education	−.01	.01	−.01	.12	−.00	.27	.14	.13	−.25
12	Seoul	−.03	.03	−.04	−.06	−.10	.05	.12	.09	−.00
13	Metropolitan	.02	−.02	−.02	.00	.12	.01	−.05	−.08	.04
14	Public to private	.01	−.01	.00	−.07	.04	.05	.02	.02	.02
15	Private to public	.00	−.01	.02	.31	.08	.04	.02	.03	.01
16	Year (time trend)	.02	−.02	.07	−.03	.08	.31	.13	.14	.14

	10	11	12	13	14	15	16
10	1						
11	.06	1					
12	−.08	.09	1				
13	.03	−.08	−.35	1			
14	−.02	.05	−.04	−.00	1		
15	−.03	.06	−.01	−.01	−.02	1	
16	−.08	.10	−.00	−.00	.01	.02	1

TABLE A3 Tobit estimates for financial asset allocation.

	DV: Proportion of financial assets			
	(1)	(2)	(3)	(4)
Public sector	−.047** (.015)	−.065*** (.017)	−.045* (.021)	−.061** (.022)
Public sector × work years			−.000 (.001)	−.000 (.001)
Work years	.002*** (.001)	−.002** (.000)	−.002** (.001)	−.002** (.001)
Income	7.651*** (1.203)	7.668*** (1.203)	7.656*** (1.204)	7.678*** (1.204)
Asset	−5.466*** (.155)	−5.468*** (.155)	−5.465*** (.155)	−5.468*** (.155)
Debt	1.430*** (.341)	1.430*** (.341)	1.429*** (.341)	1.429*** (.341)
Age	−.025*** (.001)	−.025*** (.001)	−.025*** (.001)	−.025*** (.001)
Female	−.264*** (.020)	−.265*** (.020)	−.264*** (.020)	−.265*** (.020)
Education	−.015*** (.003)	−.015*** (.003)	−.015*** (.003)	−.015*** (.003)
Seoul	.218*** (.017)	.217*** (.017)	.218*** (.017)	.217*** (.017)
Metropolitan	−.069*** (.017)	−.069*** (.017)	−.069*** (.017)	−.069*** (.017)
Public to private		−.047† (.024)		−.047† (.024)
Private to public		.029 (.025)		.029 (.025)
Year (time trend)	.012*** (.001)	.012*** (.001)	.012*** (.000)	.012*** (.001)
N	40,663	40,663	40,663	40,663
sigma_u	.669	.669	.669	669
sigma_e	.454	.454	.454	.454
ρ	.684	.684	.684	.684

Note: †$\rho < .1$; ∗$\rho < .05$; ∗∗$\rho < .01$; ∗∗∗$\rho < .001$. The sample has 12,285 right-censored, 19,268 uncensored, and 9110 left-censored observations.

TABLE A4 Tobit estimates for stock allocation.

DV = proportion of stock	
Public sector	−.086*** (.023)
Work years	−.000 (.071)
Income	−6.395*** (1.735)
Asset	−.092 (.175)
Debt	2.800*** (.725)
Age	.001 (.001)
Female	.073* (.029)
Education	−.000 (.003)
Seoul	−.034† (.020)
Metropolitan	−.009 (.021)
Public to private	−.003 (.045)
Private to public	.138** (.044)
Year	.009*** (.002)
N	3816
Sigma_u	.225
Sigma_e	.320
ρ	.330

Note: †$\rho < .1$; ∗$\rho < .05$; ∗∗$\rho < .01$; ∗∗∗$\rho < .001$.

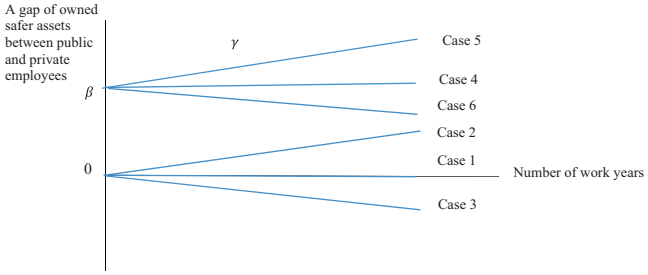

FIGURE A1 Six different cases of asset ownership during one's career. From Equation (4), we can draw six scenarios depending on the statistical significance of β and γ, and the sign of γ (either positive or negative). These scenarios show whether and how public and private employees differently own safer assets (out of their total assets) during their career. The first case (a horizontal line on the *x*-axis) presents the situation when public sector workers are not different from their private sector counterparts at the beginning of their career, and this stays constant as their tenure increases. Both the second and the third case show that public and private employees are heterogeneous in their portfolio selection as their tenure increases, even if there was no difference at the beginning of their career. The rest of case 4, 5 and 6 suggest that the amount of safer assets owned by public employees is different from that of private sector workers at the beginning of their jobs, but their difference can stay constant (case 4), broaden (case 5), or narrow (case 6) as their tenure increases.

TABLE A5 Tobit estimates for real asset allocation including year dummies.

	DV: Proportion of real assets			
	(1)	(2)	(3)	(4)
Public sector	.049** (.015)	.068*** (.017)	.048* (.021)	.064** (.022)
Public sector × work years			.000 (.001)	.000 (.001)
Work years	.002*** (.001)	.002*** (.001)	.002** (.001)	.002** (.001)
Income	−7.694*** (.1.203)	−7.708*** (1.203)	−7.695*** (1.203)	−7.715*** (1.203)
Asset	5.414*** (.155)	5.417*** (.155)	5.414*** (.155)	5.416*** (.155)
Debt	−1.365*** (.341)	−1.363*** (.341)	−1.365*** (.341)	−1.363*** (.341)
Age	.025*** (.001)	.025*** (.001)	.025*** (.001)	−.025*** (.001)
Female	.267*** (.020)	.268*** (.020)	.267*** (.020)	.268*** (.020)
Education	.015*** (.003)	.015*** (.003)	.015*** (.003)	.015*** (.003)
Seoul	−.216*** (.017)	−.216*** (.017)	−.216*** (.017)	−.216*** (.017)
Metropolitan	.070*** (.016)	.070*** (.016)	−.070*** (.016)	−.070*** (.016)
Public to private		.046† (.024)		.046† (.024)
Private to public		−.033 (.025)		−.033 (.025)
N	40,663	40,663	40,663	40,663
Sigma_u	.668	.668	.668	.668
Sigma_e	.454	.454	.454	.454
ρ	.684	.684	.684	.684

Note: †$\rho < .1$; ∗$\rho < .05$; ∗∗$\rho < .01$; ∗∗∗$\rho < .001$.

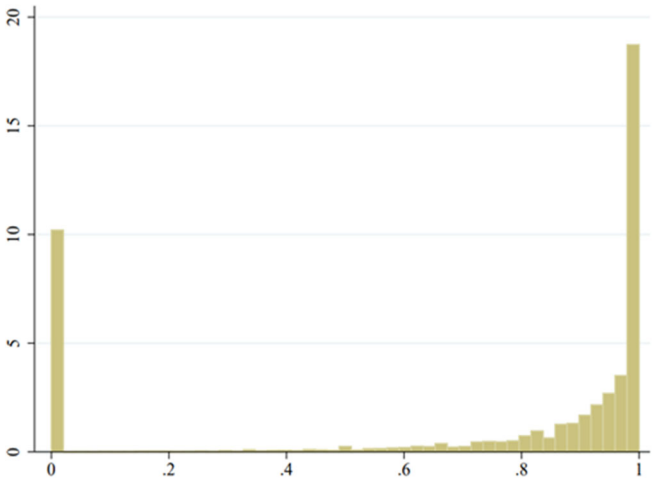

FIGURE A2 Distribution of the percentage of real assets.