

Adolescents' attitudes to risk and their employment sector choices in adulthood: Evidence from longitudinal data

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ABSTRACT

I investigated the effects of adolescents' attitudes toward risk on their choice of employment sector in adulthood. I employed a joint model of employment sector choice and three-dimensional background characteristics to demonstrate that employment preference is an inverse function of the degree of relative risk aversion. Empirical data was obtained from longitudinal data, and a logit model was applied to estimate the effects of the three-dimensional background characteristics on the risk-taking attitudes and employment choices. I observed that individuals with a higher tendency to engage in risky experiences exhibit low risk aversion, and thus, tend to choose a riskier employment sector.

KEYWORDS

employment sector, personality, risk aversion, logit model

JEL CLASSIFICATION INDICES

J21, I25, C33

1. INTRODUCTION

People face career choices immediately after leaving school. The primary choice is between the public and the private sectors. Working in the private sector is riskier because the returns are

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subject to two types of uncertainty: job matches and future payoffs (Bellante – Link 1981; Pfeifer 2011; Said 2011). In the private sector, high performance is rewarded with a higher potential wage; however, an unsatisfactory performance can result in job loss or a relatively lower salary.

Given that the sector choice is subject to these non-insurable risks, a risk-averse individual tends to choose public sector employment. Theoretical models of human capital investments have long recognised the importance of risk aversion in models of employer change, migration, occupational choice, the selection of hazardous work environments, and incentive contracts (David 1974; Levhari – Weiss 1974; Thaler – Rosen 1975; Johnson 1978; Gibbons – Murphy 1992 and John – Thomsen 2014.) However, although the importance of risk aversion has long been recognised in the theoretical models of human capital investment as well as both in the theoretical and empirical research of financial investment decisions, it has largely been ignored by economists investigating the labour market hypotheses concerning an individual's personality traits, families and schools.¹ Heckman et al. (2006) reported that non-cognitive skills (personality traits) coupled with cognitive skills affect initial personal endowments as well as human capital productivity, thereby influencing achievements, which are related to the choice of occupation. Non-cognitive skills have also been demonstrated to be relatively malleable (Heckman – Kautz 2013).

Empirical models of human capital investment have occasionally estimated parameters of constant relative risk aversion; however, few models have included the interpersonal variations in risk aversion that may drive outcomes. The models proposed in Weiss (1972), Hause (1974), Abowd – Ashenfelter (1981), Hamermesh – Wolfe (1990), Brown – Rosen (1987), Moore (1987), and Murphy – Topel (1987) have incorporated the risk aversion estimates into one parameter to determine the degree of constant relative risk aversion reference. Some studies have investigated heterogeneity in risk aversion, such as the effects of wealth on risk aversion (Schwartz 1976; Viscusi 1979; Johnson 1980; Shaw 1987). The omission of heterogeneity could bias the coefficient estimates of other variables with which it is correlated. Moreover, the inclusion of heterogeneity in empirical models of risk aversion is likely to become more crucial as economists increasingly turn toward structural models of decision-making, wherein the results are generated by differences in taste or technology. Previous empirical studies have fewer analysis of attitude towards risk and its incorporation into empirical hypotheses.²

In Section 2, I give a short description about the researches in this field. The economic model in Section 3 extends a continuous-time allocation model to incorporate workers' decisions to invest in risky human capital assets with their personal, family and school backgrounds. The primary empirical implication is that the individuals who are risk averse are less likely to enter a risky employment sector despite a potential for higher future wages. This study emphasises heterogeneity in personal risk aversion that results in heterogeneity in employment sector choice. These interpersonal differences in risk aversion should explain some of the previously unexplained

¹Although Sutter et al. (2013) considered that risk-taking attitudes are weak predictors of behaviour, and only significant for health and saving behaviours, we cannot rule out the impact of risk-taking attitudes on future life events, especially employment.

²For details, see Section 2.



interpersonal variances in sector choice. In this study, I estimated an empirical model of binominal choice as a function of workers' heterogeneity in risk aversion and sector choices.

Interpersonal differences in risk aversion are measured with the assumption that survey information on personality can infer degrees of individual risk aversion that are also applicable to employment sector choices. This assumption reflects an assumption in economics that each individual possesses one concave utility function. The empirical data were obtained using individual longitudinal data from the *Taiwan Education Panel Survey and Beyond* (TEPS-B) to estimate a nonlinear model as a logit function of heterogeneity in risk aversion and employment sector choices. The empirical results in Section 4 reveal the relationships between employment sector decisions and personal traits. Further results are discussed in Section 5.

2. LITERATURE REVIEW

In economics, an individual's personality traits are denoted as non-cognitive skills and depend on one's attitudes and preferences. The related literature has indicated that *gender* is the main trait affecting individuals' risk-taking attitudes, and men exhibit relatively more risk-seeking behaviour than women (Pettigrew 1958; Zuckerman 1979; Antonides – van der Sar 1990; Kahn 1996; Warneryd 1996; Palsson 1996; Powell – Ansic 1997; Jianakoplos – Bernasek 1998; Ekeland et al. 2005). Weber et al. (2002) and Harris et al. (2006) have also suggested that women's acceptable levels of risk are lower than those of men. Age is another critical factor that affects personal risk-taking attitudes. Studies have also found that younger people are less fearful of risks and older people are more likely to avoid risks (Calhoun – Hutchison 1981; Okun 1976; Wang – Hanna 1997). Additionally, *income* affects an individual's risk-taking attitude (Donkers et al. 2001).

I observed that *unmarried* people preferred risks over *married* people. Moreover, people with high *educational* attainments exhibited a low level of risk aversion (Shaw 1996; Donkers et al. 2001). Bonin et al. (2007) used adult self-report data to examine the relationship between attitude towards risk and wage variations and reported that the higher the risk-taking attitude, the higher is the earning risk.

Personality traits (non-cognitive skills) can foster cognitive ability (Cunha – Heckman 2007), and therefore, constitute a portion of human capital relevant to labour market outcomes.³ Occupation choice is influenced by differences in an individual's level of risk aversion. People who decide to work in the public sector are perceived as being attracted by the job security and stability offered by this sector (Bellante – Link 1981; Pfeifer 2011; Said 2011). Bellante – Link (1981) revealed that the individuals who are highly risk-averse prefer working in the public sector. Pfeifer (2011) adopted employee data from the German Socio-economic Panel to analyse the effect of an individual's risk aversion levels on their decision to work in the public sector. The results revealed that public sector attracted risk-averse job seekers by offering high job security, and most of these job seekers were women. Burman et al. (2012) conducted a survey using a questionnaire of employees in the Netherlands, offering the participants a choice of receiving a payment after completing the questionnaire. The results indicated that compared with the private sector participants, the public sector participants tended to donate their received payment after completing

³Sciulli (2016) demonstrated that adult employment outcomes are related to childhood behaviours.



the questionnaire, suggesting that public sector workers are more altruistic and exhibit a stronger risk-averse attitude compare with their private sector counterparts. [Tonin – Vlassopoulos \(2015\)](#) investigated the public service motivations among the private and public sector employees aged 55 years or older and retirees in 19 European countries. The results showed no significant differences between the risk-averse attitudes of the two groups because the participants were more elderly in age; moreover, the risk aversion levels in the public-sector retirees were low.

The aforementioned studies have some research limitations. First, the lack of longitudinal data prevents an analysis of the association between the process of attitude formation towards risk and job selection. Second, these studies have examined the risk-taking attitudes of the participants who are employed or retired. Because these participants had already been engaged in their occupations for certain periods, their risk-taking attitudes were affected accordingly. This resulted in an estimation bias in attitude assessment. Third, the previous studies regarding the formation of attitude towards risk have predominantly assessed personal characteristics instead of the effects of family members and schools, which have critical roles in influencing the formation of individuals' risk-taking attitudes.

This study used longitudinal data to serialise the risk-taking attitudes and behaviours of the sample during adolescence and its employment sector selection in adulthood. It is different from other literature that observe the risk-taking attitudes with the self-risk report of the employees. It was also considered that using the self-risk report of an employed person to perform the assessment would miss the observation of risk-taking attitude before entering the workplace, thus the obtained risk-taking attitude is not particularly the attitude towards risk that was originally faced with the employment choice.

[Chetty et al. \(2014a, 2014b\)](#) presented an example of the critical role of schools by tracking one million urban students to examine the long-term effects of teachers on their students. In particular, the conditions of these students were tracked for 20 years from entering the fourth grade. The study revealed that the effect of an excellent teacher on students' grades lasted only for 3–4 years; however, this effect markedly influenced students' subsequent employment and salaries in the long term. Moreover, it was revealed that an exceptional teacher can prevent students from engaging in deviant behaviour. Teachers can elicit favourable learning attitudes in students and provide timely physical and mental watchfulness to encourage them to pursue academic excellence and build confidence in everyday life. Accordingly, students can demonstrate courage and proactivity when managing subsequent life events and employment, thus exhibiting favourable job performance. Therefore, education can reduce risk-averse attitudes instead of causing people to fear or evade risks.

3. EMPIRICAL STRATEGY

3.1. Empirical model

In this research, the employment sector choice is combined with the utility of personal experiences in a continuous-time model that extends [Shaw \(1996: 649\)](#) to the application in the labour market. The first-order conditions for this model can be applied to derive an intuitively appealing analogy between employment sector choice and utility of personal experiences. I define $s(t)$ as the shares of labour preferences for a risky sector versus that for a low-risk sector and $\alpha(t)$ as the shares of personal utility to risky personal experiences versus that of risk-free personal experiences. I simplify the optimal allocation equations as



$$s(t) = \frac{u_s}{\sigma_s^2 R} \quad (1)$$

and

$$\alpha(t) = \frac{u_a}{\sigma_a^2 R} \quad (2)$$

where u_s is the net return of a risky sector, and u_a is the net return of risky personal experiences in family and school. σ_s^2 and σ_a^2 are the variances of risky returns, and R is the Pratt-Arrow index of constant relative risk aversion. Equations (1) and (2) are specified for sector choices and personnel risk-taking attitude, respectively, and they are positively related. Equation (1) indicates that when the net return to a risky sector is higher, the likelihood of choosing a high-risk sector for employment is higher. Moreover, when the degree of risk-aversion (R) is higher, the possibility of being employed in the high-risk sectors is lower. Equation (2) indicates that when the net return to risky personal experiences is higher, $\alpha(t)$ will be larger, and risky behaviour is more likely to occur. In addition, the higher the degree of risk aversion (R) is, the lower is the likelihood of risky behaviour.

By focussing on the employment sector choice and assuming a cross-individual heterogeneity in the degree of constant relative risk aversion R , Eq. (1) indicates that the risk-averse individuals prefer working in the low-risk sectors.

In addition, the greater the uncertainty surrounding the returns, σ_s^2 is, the more risk-averse individuals avoid them: as $\sigma_s^2 R$ increases, preference 's' decreases, unless the individual is compensated by a higher expected return, $u_s - e$.

The share, $s(t)$, in Eq. (1), is inherently unobservable; however, it can be embedded in a sector choice equation to develop the observable implications, y^* as follows:

$$\begin{cases} y^* = 1, & \text{if } y < s(t) \\ y^* = 0, & \text{otherwise,} \end{cases}$$

where $y^* = 1$ indicates that an individual works in the public sector and y is the real share of labour preference for a riskier sector (private sector). Therefore, the probability for sector choice is given by

$$F(y|p_0) = \Pr(Y = y) = p_0^y (1 - p_0)^{1-y}. \quad (3)$$

The probability of choosing the public sector is p_0 (i.e., $y^* = 1$). The probability of choosing the private sector is $1 - p_0$ (i.e., $y^* = 0$). Let be a proportion of $s(t)$: $y = \gamma s(t)$, $0 < \gamma < 1$; therefore y can be presented as

$$y = \gamma s(t) = \gamma \frac{u_s}{\sigma_s^2 R} \quad (4)$$

The key variable, risk aversion R , can be identified using the risky personal experiences in Eq. (2). Thus, the share of net worth involved in risky behaviours, α , is an inverse function of an individual's degree of constant relative risk aversion. Equivalently, the only reason the risky personal experience shares differ across individuals is that individuals have different degrees of risk aversion; accordingly, Eq. (2) states that α is a simple inverse function of R . Eq. (2) can be rewritten as $\alpha = 1/\theta R$, where $\theta \equiv \sigma_a^2/(u_a)$. Substituting R in Eq. (4),



$$y = \theta \alpha \left(\frac{\gamma u_s}{\sigma_s^2} \right). \quad (5)$$

The term, γu_s , is the productivity of skill, γ , multiplied by its expected return, u_s , and is a function of the variables that are typically included in the sector choice equations to represent these effects. Adding i subscripts for individuals, assuming there is an observed vector \mathbf{X} , it gives

$$\gamma_i u_{si} = \mathbf{X}_i \boldsymbol{\beta} + \varepsilon_i, \quad (6)$$

where ε_i is independently and identically distributed and represents a measurement error in the expected gains. Replacing Eq. (6) by Eq. (5), the sector choice equation can be estimated as:

$$y_i = \frac{\theta \alpha_i}{\sigma_{si}^2} (\mathbf{X}_i \boldsymbol{\beta}) + \varepsilon_i, \quad (7)$$

where the error term ε_i is $\varepsilon_i = (\theta \alpha_i / \sigma_{si}^2) \mu_i$.

The intuition underlying Eq. (7) is that the individuals with a higher share of risky personal experiences, α_i , have low risk aversion, and therefore, choose the private sector's riskier labour market. Thus, the risk-taking (as measured by α_i) increases all estimated returns to the vector \mathbf{X}_i by θ / σ_{si}^2 .

3.2. Data

The joint analysis of employment sector choices and personal risky experiences are enabled by a longitudinal data set, the Taiwan Education Panel Survey (TEPS). The TEPS developed by Academia Sinica, the Ministry of Education and the Ministry of Science and Technology, Taiwan has surveyed 20,000 senior and 20,000 junior high school students since 2001, asking them comprehensive questions about personal characteristics, parents, and school life (including classmates and teachers). All of these individuals were resurveyed in 2003, and 4,000 of them were further resurveyed in 2009 regarding their employment status (for TEPS-B). In the empirical analysis, the sample is limited to employed individuals surveyed in 2009 and linked them with their personal characteristics, parents and school teachers when they were junior and senior high-school students in the 2001 and 2003 surveys.

Equation (7) models the employment sector choices over the effects of the past and the present. The dependent variable is the employment sector and is evaluated using the responses to the question, 'Do you work in a public or private organisation?' The right-hand-side variables contain personal, family and school information. Individual differences between risk aversion R capture individual differences in unobserved employment decisions relative to those predicted by the given vector \mathbf{X} . The model developed in Section 3.1 suggests that the risk-averse workers are less likely to choose private-sector work, which has a high variance of returns and uncertain employment possibilities. These relationships translate into empirical hypotheses, which state that individuals who are more risk averse have a higher probability of choosing work in the public sector. The variable definitions are presented in Table 1.⁴

⁴I consider all the possible variables that may affect an individual's risk-taking attitude, for example, an individual's height (Persico et al. 2004). Due to the length of the article, some variables' detail definitions are available directly from the author.



Table 1. Definitions of variables

Variables	Definitions
<i>Personal characteristics</i>	
Male	= 1, otherwise = 0.
Urban	= 1 if living in urban, otherwise = 0.
Height	Teenager's height measured by cm.
Weight	Teenager's weight measured by kg.
Last summer_studing/camping	if joined any cramming school or camping activity in last summer vacation;
Last summer_games	if played any online games in last summer vacation;
Last summer_working	if worked in last summer vacation;
<i>Family characteristics</i>	
Father's education	if education years ≥ 16 ;
Mother's education	if education years ≥ 16 ;
Father is working	if yes;
Mother is working	if yes;
Father accompany child	by hours;
Mother accompany child	by hours;
Only live with Father	if yes;
Only live with Mother	if yes;
Live with Parents	if yes;
Only live with Grandparents	if yes;
Number of Sibling	the number of siblings
Family Impact	family have ever suffered tragedies
Relationship with Father	Always = 3, usually = 2, seldom = 1, never = 0
Relationship with Mother	Always = 3, usually = 2, seldom = 1, never = 0
Father is serious	Always = 3, usually = 2, seldom = 1, never = 0
Mother is serious	Always = 3, usually = 2, seldom = 1, never = 0
Family members discuss everything together	always = 3, usually = 2, seldom = 1, never = 0
Good relationship with siblings	always = 3, usually = 2, seldom = 1, never = 0
Parents compare me with other children	if yes;
Parents compare me with my siblings	if yes;

(continued)



Table 1. Continued

Variables	Definitions
Parents' education expectation on me	= 4, if graduate school; = 3, if university; = 2, if college; = 1, if senior high school; = 0, if no expectation.
<i>School characteristics</i>	
Happy/learn in school	strongly agree = 2, agree = 1, disagree = 0
Good teacher	strongly agree = 2, agree = 1, disagree = 0
Sociable/Popular in school	if yes;
Join extracurricular activities	if yes;
Have good friends	if yes;
Risk 1	Measured by teenager's active attitude, including: <ul style="list-style-type: none"> • I like to join many new events or activities. • I like to make new friends.
Risk 2	Measured by teenager's risky behaviours in school, including cutting class and cheating.
<i>Employment variables in 2009</i>	
Work	if yes;
Education	Education years;
Marital Status	if yes;
National University Graduation	if yes;
Humanities and Social Sciences Fields	if yes;
Public sector	if yes;

Note: Considering the length of the article, some variables detail definitions are available directly from the author.

The measure for risk aversion was developed from the data-set. According to the definition of risk, 'exposed to the *unknown* and *danger* (excited),' personal attitudes towards risk are observed by the degree of participation in dangerous and unknown situations. This study used two variables to capture personal risk-taking attitudes, *R1* and *R2* among teenagers. *R1* captures adolescents' characteristics of unknown-seeking preferences and *R2* captures adolescents' characteristics of danger-seeking preferences. *R1* describes individuals' attitudes toward the unknown-seeking; it can be observed from a student's learning attitude and social confidence (being eager to learn new things and make new friends). *R1* captures potential risk-accepting attitudes, and individuals' responses to the

preceding statements are likely to be relevant to an individual's desire to take risks in decision-making.⁵

$R2$ is a combined variable from 'skip class' and 'play petty tricks,' the proxy for α , to be the share of 'dangerous/risky experiences' used in Eq. (7). Both are risky behaviours during teenage student life.⁶ Moreover, it is defined as $R2 \equiv \text{skip class} + \text{play petty tricks}$. Assuming that individuals possess a single concave utility function, inferences can be made about their degree of risk aversion from their behaviour.

For the estimation of Eq. (7), risk is separated into two variables, $R1$ and $R2$, to capture the different aspects of personal risk-taking attitudes. For individuals, these two traits are not mutually exclusive and may exist simultaneously in the personal characteristics.

Variable specifications are listed in Table 1 while Table 2 present descriptive statistics. With respect to the personal variables surveyed in 2003, the average height for adolescents was 166 cm and the average weight was 58 kg. Moreover, 80% of all observations joined summer classes or camping activities in their last summer vacation (last_summer_studing/camping), 10% of all surveyed people worked (last_summer_working), and 54% of the participants played online games in their last summer vacation (last_summer_games). With respect to their parents, the ratios of fathers having higher education level and having jobs are more than their mothers, thus, mothers can spend more time with their children than fathers. Most adolescents lived together with parents and only a few lived with either father or mother. Moreover, 4% of the participants lived with grandparents – a type of intergenerational parenting. The average number of siblings of the participants is 1.7.

The 2009 panel survey revealed that the average education year is 16.0256 and only 2% of the participants are married. In addition, 26% of people graduated from public universities. More than 50% of the participants graduated in humanities and social studies related courses. The percentage of people that were employed was 80% (3,664/4,533) and 16.32% were public sector employees.

4. EMPIRICAL RESULTS

Replacing Eq. (7) with variables of risk aversion gives,

$$y_i = (1 + a_1 R1 + a_2 R2) X_i \beta + \varepsilon_i, \quad (8)$$

where 1 represents situations without a risk-taking attitude and $\sigma_{\varepsilon_i}^2$ is assumed to be a constant across individuals.

Before estimating Eq. (8), I considered one 'effect' and one 'bias.' The 'effect' denotes the chaos effect. The personal attitude towards risk is based on the characteristics of individuals, their families, and their schools, and these characteristics may have originated in recent years or a long time ago. Consequently, the current risk-taking attitude is formed with chaos. The attitude towards risk should be predicted using those characteristics and the predicted value should be used to represent their risk-taking attitude.

⁵Graham et al. (1991) reported that risk-taking attitudes are a cognitive process and social relationships affect individual risk-taking attitudes.

⁶Zuckerman (1979) found that people who seek high excitement like to pursue adventurous behaviour.



Table 2. Descriptive statistics

Variables	Mean	Std. Dev.	Min.	Max.
In 2003				
Male	0.4836	0.4993	0	1
Urban	0.5206	0.4996	0	1
Height	165.71	7.6758	153	178
Weight	57.93	10.1688	43	79
Last summer_studing/camping	0.8233	0.3815	0	1
Last summer_games	0.5443	0.4981	0	1
Last summer_working	0.0954	0.2837	0	1
Father's education	0.2585	0.4378	0	1
Mother's education	0.1520	0.3590	0	1
Father is working	0.8363	0.3700	0	1
Mother is working	0.6963	0.4599	0	1
Father accompany child	3.1665	1.5779	0	5
Mother accompany child	3.7536	1.4350	0	5
Only live with Father	0.0352	0.1844	0	1
Only live with Mother	0.0739	0.2615	0	1
Live with Parents	0.8592	0.3478	0	1
Only live with Grandparents	0.0421	0.2008	0	1
Number of Sibling	1.7231	0.9439	0	13
Family impact	2.4502	0.8720	1	8
Relationship with Father	4.4682	2.7178	0	12
Relationship with Mother	6.2695	2.8107	0	12
Father is serious	1.4279	0.8714	0	3
Mother is serious	1.5529	0.8267	0	3
Family members discuss everything together	3.6845	1.4368	0	6
Good relationship with siblings	5.4104	3.3284	0	12
Parents compare me with other children	0.7653	0.4238	0	1
Parents compare me with my siblings	0.7229	0.4476	0	1
Parents' education expectation on me	2.5973	1.1962	0	4
Happy/learn in school	3.5559	1.3445	0	6
Good teacher	6.5962	2.9164	0	12

(continued)

Table 2. Continued

Variables	Mean	Std. Dev.	Min.	Max.
Sociable/Popular in school	1.6306	0.9593	0	3
Join extracurricular activities	2.1635	0.7163	0	4
Have good friends	2.3089	0.9075	0	3
Risk 1	5.9173	1.2332	2	8
Risk 2	2.7853	0.9788	2	8
Observations	12,630			
In 2009				
Work	0.8083	0.3937	0	1
Education	16.0256	0.7190	14	23
Marital Status	0.0205	0.1418	0	1
National University Graduation	0.2630	0.4403	0	1
Humanities and Social Sciences Fields	0.5206	0.4996	0	1
Public sector	0.1487	0.3558	0	1
Observations	4,533			
In 2009 & have job (Work = 1)				
Education	15.9828	0.6597	14	23
Marital status	0.0186	0.1350	0	1
National University Graduation	0.2666	0.4422	0	1
Humanities and Social Sciences Fields	0.5259	0.4994	0	1
Public sector	0.1632	0.3696	0	1
Observations	3,664			

Second, the ‘bias’ denotes the self-selection bias. Because self-selection biases exist in employment choices, in this paper I adopted a multinomial logit model to identify individuals’ employment choices. I define f_i as the determining variable for employment status. An individual selects an employment status if $f_i^j > f_i^q$ ($q \neq j$), where f_i^j is endogenous and unobservable ($j = 0$ indicates unemployed, 1 represents public sector employees and 2 represents private sector employees and others). I estimated \hat{f}_i^j by examining the observable characteristic variable Z_i^j , which includes all the individual characteristics related to employment selection (including, gender, education, location, marital status, university and department; Table 3).⁷

⁷Due to the length of the article, Table 3 is not displayed. It is available directly from the author.



$$f_i^j = Z_i^j \beta_j + \mu_i^j, \text{ and } j = 0, 1, 2. \quad (9)$$

By solving Eq. (9), I obtained the probabilities of securing each employment status. Next, the inverse Mill's ratios $\lambda = \frac{\varphi}{\Phi}$ was estimated, where φ is the standard normal density function and Φ is the cumulative bivariate normal probability of the probabilities in each employment status.

4.1. Results for risk-taking attitude

Table 3 lists the estimation results for *R1* and *R2*. The main purpose of this estimation was to obtain the prediction value of each individual's risk-taking attitude from the individual, family and school characteristics. The estimates in Table 3 indicate that young women have a higher desire for new things and new friends than men. Men also exhibited higher attitudes on *R2* ('skip class' and 'play petty tricks') than women; however, statistical significance was not found. Body height was positively related to risk-taking attitude, but individuals with higher body weight exhibited less risky-behaviour. It was revealed that summer vacation activities have a considerable effect on young people. Summer courses or camps had a positive influence on the pursuit of unknown risk-taking attitudes and a diminishing effect on dangerous behaviour, while both online games and work boost these attitudes. Regarding family variables, a mother's companionship reduced young people's pursuit of danger. If a family ever suffered from any shocks and the mother's education methods were stricter, then children may have a higher desire for new things and new friends. A close parent-child relationship (Family members discussing everything together) had a positive influence on the pursuit of the unknown and had a reduced pursuit of dangerous risks. In addition, parents who have higher expectations from adolescents have relatively less risky behaviours. In terms of the school's influence, a positive learning atmosphere, teachers and friends, as well as active participation in the community, all have a positive effect on the pursuit of unknown risks. Moreover, a favourable learning environment and teachers can reduce students' risky behaviour. However, young people who are popular in school have a considerably positive outcome in terms of their pursuit of the unknown and dangerous behaviour. This indicates that during youth, students may be popular in a school irrespective of whether they are good students or have a disorder.

4.2. Results for employment status

Table 4⁸ presents the employment status estimation for the panel data from 2003 to 2009, as obtained through a logit model. I estimated the self-selection correction term λ . Because all surveyed people were recent graduates from universities, some individuals may choose to study further (i.e. graduated school); therefore, the estimated results were different from the general samples of those who had completed education in the past. For example, the probability of men choosing employment is lower than that of women; thus, less men chose employment than women. In addition, the higher the level of education, the lower is the probability of employment. This result may also have been caused by the age of the participants in the stage of continuous education. However, the married participants exhibited a higher employment rate. This is consistent with the general results. In Taiwan, because the national university graduates

⁸Due to the length of the article, Table 4 is not displayed. It is available directly from the author.



Table 5. Logit model for employment choice: After considering sample selection bias^a

Variables	Public Sector	
	(1)	(2)
$\widehat{R1}$	−0.1123*** (0.0417)	
$\widehat{R1}$ _personal characteristics		−0.0547 (0.0825)
$\widehat{R1}$ _family characteristics		−0.1193 (0.1907)
$\widehat{R1}$ _school characteristics		−0.2123* (0.1178)
$\widehat{R2}$	−0.1325** (0.0648)	
$\widehat{R2}$ _personal characteristics		−0.0347 (0.0724)
$\widehat{R2}$ _family characteristics		0.1912 (0.4282)
$\widehat{R2}$ _school characteristics		−0.4882* (0.2694)
Log pseudo-likelihood	−1,399.3825	−1,385.7389
Observations	3,664	3,664

Note: ^aStandard errors are in parentheses, *** represents significance at 1%, ** 5%, * 10% levels, respectively. Due to the length of the article, some characteristic variables are not displayed. They are available directly from the author.

have more favourable employment opportunities, the proportion of employment for these graduates is also considerably higher.

4.3. Results for sector choices

According to the predicted value of risk-taking attitude from *Table 4*, I can substitute the predicted risk-taking attitude variables in Eq. (8). The results are provided below and the details are presented in *Table 5*.⁹

$$\text{Public sector} = (1 - 0.1123^{***} \times R1 - 0.1325^{**} \times R2) \mathbf{X}\hat{\beta}$$

The coefficients for both risk-taking attitude variables in column (1) of *Table 5* are statistically significant, −0.1123 and −0.1325. These results are consistent with the hypothesis that individuals who are risk averse prefer to enter the public sector because of unobserved risks in the private sector.

To assess the empirical magnitude of the effects of personality, family and school on the attitude towards risk in terms of employment sector choice, I divided the predicted $\widehat{R1}$ and $\widehat{R2}$ into three dimensions: individual, family and school. The results are listed in column (2) of *Table 5* and they indicate that the attitudes toward risk formed from personality, family and school characteristics influence employment sector choice.

⁹Due to the length of the article, some characteristic variables are not displayed in *Table 5*. They are available directly from the author.



$$\text{Public sector} = (1 - 0.0547 \times R1_{\text{personel}} - 0.1193 \times R1_{\text{family}} - 0.2123^* \times R1_{\text{school}} - 0.0347 \times R2_{\text{personel}} + 0.1912 \times R2_{\text{family}} - 0.4882^* \times R2_{\text{school}}) \mathbf{X} \hat{\beta}$$

School characteristics have a greater effect on adolescents, irrespective of whether the variable for unknown risk $\widehat{R1}$ (-0.2123 , marginal effect = -19.13%) or the variable for risky behaviours $\widehat{R2}$ (-0.4882 , marginal effect = -38.63%) were employed. The marginal effect is derived using

$$\frac{\partial P(\text{Public} = 1)}{\partial x_i} = F'((1 + a_1 R1 + a_2 R2) \mathbf{X}_i \beta) \beta_i = \frac{e^{(1+a_1 R1+a_2 R2) \mathbf{X}_i \beta}}{(1 + e^{(1+a_1 R1+a_2 R2) \mathbf{X}_i \beta})^2} \beta_i. \quad (10)$$

The regression results of Table 5 suggest that risk takers who hold positive attitudes toward the unknown or engage in risky behaviours in adolescence may exhibit a greater preference to enter the private sector when they become adults. According to Table 3, it reveals that the risk takers, especially for unknown-seeking, are more likely to have a confident appearance (height and weight), a closer family relationship, and satisfactory teacher-student and peer relationships. These results suggest that the public sector employees have relatively poor self-confidence and social relations. Most were generally considered to be ‘obedient,’ ‘submissive,’ or ‘plain’ children. This may be because they are more willing to dedicate the effort necessary to prepare for an entrance exam in order to achieve a stable income in the future.

Related studies often use employment surveys to observe risk-taking attitudes in different sectors. In addition to the sample selection bias problem, an individual’s attitudes are affected by their workplace. This study used past life experiences as a background for predicting risk-taking attitudes to observe the effect of such attitude on the choice of employment sector and to determine the trajectory in the formation of individual attitudes.

5. CONCLUSION

In this study, a joint model of choice of employment sector and attitudes towards risk was estimated using information about risky personal behaviours to make inferences about individual heterogeneity in risk aversion. It suggests that risk averters tend to choose the public sector jobs to avoid the possible risk variations in the private sector. The empirical results obtained using the TEPS-B imply that the risk takers tend to select employment opportunities in the private sector rather than in the public sector. Adolescents with a confident appearance (height and weight) and satisfactory teacher – student and peer relationships may be more likely to seek unknown and risky situations (especially the unknown-seeking), particularly for people who are social and have active friendships in their adolescence.

The empirical results facilitate further deliberation on current education and the labour market. For example, according to the statistics released by the Taiwanese Ministry of Examination, the number of participants taking civil service examination in Taiwan exponentially increased in the past decade, from 258,848 in 2003 to the highest, 518,349 participants in 2012, followed by 305,498 in 2016. The increased number of examination participants decreased the admission rate, thus increasing the difficulty of qualifying as a civil servant. Accordingly, the



average age of admitted applicants increased from 28 year in 2003 to 30.25 in 2016.¹⁰ In addition to some possible economic factors, the rapid expansion of higher education might have also increased the number of the examination participants. The education expansion policy implemented since 1994 has rapidly increased the number of highly educated people, leading to an oversupply in the labour market. This policy also increased the number of people who fulfilled the requirements for participating in civil service examinations.

With this continuous increase in the participation in civil service examination, these participants must devote extensive time to prepare for the examinations. This delays the available workforce from entering the labour market, and the proportion of the workforce that is idle continually increases. As these students are preoccupied with preparations for examination, this may impede the nation's development. Therefore, in addition to providing care in daily life and teaching knowledge, families and schools should cultivate the attitudes of the younger generation as it faces challenges and failures, and encourage them to build a favourable future through creativity. Otherwise, the continually expanding education services and the training risk-averse students lead to a social atmosphere in which people only pursue mediocrity or minimal happiness. Therefore, it is crucial to consider how to encourage children to bravely face risks or failures and grow strongly from frustrations. If job seekers make only safe, ordinary, and unambitious choices, a nation's development and progress would be limited.

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¹⁰Refer to 2003 and 2016 Examination Statistics: http://wwwc.moex.gov.tw/main/content/wfrmContentLink.aspx?menu_id=268.



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