

RESEARCH ARTICLE



Between nature and nurture: The genetic overlap between psychological attributes and selection into public service employment

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Abstract

Public administration scholars have had a long-lasting interest in examining individual differences relevant to the attractiveness of public service employment. However, very few studies have explored the genetic underpinnings of these variations. This article builds upon recent behavioral genetics literature and explores whether there are genetic overlaps between psychological attributes and selection into public service employment. We construct the polygenic risk scores (PRSs) on two psychological attributes—neuroticism and positive affect—to model the genetic influence on public service employment in a nationwide UK dataset with 262,795 participants. The results suggest that the PRS of positive affect is a significant predictor of individuals' selection into public service employment, implying that individuals with high innate happiness are more likely to self-select into service work. Taking the existing socialization literature and this result into consideration, our findings support that both nature and nurture factors shape individuals' selection into public service employment.

Evidence for practice

- Individuals with high innate happiness are more likely to self-select into public service employment.
- Public administration managers should be aware that most individual behaviors and traits are determined by both genetic dispositions and environmental influences.
- The research on the heritability of vocational choice does not advocate genomic selection or bio-determinism but highlights the need to discover and recognize natural facts.

INTRODUCTION

The intriguing question of why some individuals are more likely to join the public service workforce than others has intrigued public administration scholars for decades (e.g., Bright & Jr, 2015; Lewis & Frank, 2002; Perry & Wise, 1990). Based on the person-environment (P-E) fit (Kristof, 1996) framework, previous studies have extensively examined individual characteristics, including the Big Five personality traits, public service motivation (PSM), value preference, and socio-demographic factors (Korac et al., 2019). Although these studies offer valuable insights into how individual differences shape public sector preference, most of

them fall short in considering possible natural factors as critical individual characteristics that influence the choice of public employment.

Decades of behavioral genetics and twin research have indicated that nearly all aspects of human individual differences are determined by both genetic endowments and environmental influences (Ebstein et al., 2010; Polderman et al., 2015; Turkheimer, 2000). Genetic factors generally explain approximately 37 percent–61 percent of the variation in vocational interests, with the remaining being attributed to environmental influences (Schermer & Vernon, 2008). Studies based only on nurture factors may bias the estimation of the influence of environmental factors on job selection, as differences in vocational interests

already exist before individuals are influenced by socialization.

However, although generally featured as being multidisciplinary (Hall & Paul Battaglio, 2018; McDonald et al., 2022), public administration seems slow to incorporate biological insights into its research agenda compared to other related disciplines, such as political science (Dawes et al., 2014; Dawes et al., 2021; Fowler et al., 2008), business management (Nofal et al., 2018; Patel et al., 2021), and economics (Barth et al., 2020; Beauchamp et al., 2011). Scholars thus call for more interdisciplinary efforts in understanding the heritability of administration behaviors (Caldwell, 1980; Christensen et al., 2021; Florczak et al., 2022; White, 1991). To fill this void, this study tests whether individuals' public service employment choice is influenced by genetic variants.

Specifically, this study captures the genetic impact on public-sector employment of the genetic makeup of two psychological attributes—neuroticism and positive affect—as current research has well established their genetic underpinnings (Nagel et al., 2018; Okbay et al., 2016; Wingo et al., 2017). Neuroticism is one of the Big Five personality traits that has been examined in current public administration research (e.g., Aarøe, Baekgaard, et al., 2021; Cooper et al., 2013). Positive affect is a less studied the emotional state within the public administration scholarship but shares a considerable similarity with extraversion and has been studied by psychologists for decades (Lyubomirsky et al., 2005; Watson & Tellegen, 1985).

Based on the two streams of studies that genes influence the development of psychological attributes, and that attributes affect the likelihood of being a public service employer (e.g., Costa et al., 1984; Khurshid, 2011; Mullola et al., 2018), it is thus reasonable that the genetic predictors of attributes could also predict individuals' selection into public service employment. Departing from the previous twin studies, we calculated polygenic risk scores (PRSs)¹ for these two attributes and tested whether PRSs could effectively predict individuals' selection into public service employment. For the empirical analysis, this study makes use of 262,795 samples with genetic information from a nationwide dataset, UK Biobank.

This study contributes to public administration research in several ways. First, to our knowledge, this is the first study to examine whether individuals' genetic underpinnings of personality and emotional state is related to public service employment. Second, it extends the existing P-E fit framework by showing that genetic makeup should also be considered as a critical personal factor that makes individuals fit for public service employment. Third, practically, the heritability of individuals' selection into public service employment informs policymakers that ignoring this kind of natural fact may lead to misunderstanding the true effects of socialization efforts and yield another type of inequality that originates from the way we deal with natural inclinations. Lastly, methodologically, the PRS approach could be a supplementary tool for public administration

academics, particularly for behavioral public administration scholars (Grimmelikhuisen et al., 2017).

The next section illustrates the theoretical framework and hypotheses regarding genes, psychological attributes, and public service employment. This is followed by a description of the data source, measurement of variables, and analytical approach. Finally, we present the main findings and discuss their theoretical and practical implications.

THEORETICAL FRAMEWORK AND HYPOTHESIS MAKING

Biological approach to public administration research

The development of biology has vastly expanded the knowledge about humans that social behaviors and individual traits are not only shaped by nurture factors but also by natural influences (Ebstein et al., 2010; Polderman et al., 2015; Turkheimer, 2000). However, much of our knowledge about public administrative traits and behaviors comes from nurture factors. For example, the existing PSM, leadership, and job satisfaction literature has extensively examined the antecedents of various socialization agents, organizational environments, and management practices (e.g., Currie et al., 2011; Perry et al., 2008; Wright & Davis, 2003). Christensen et al. (2021) characterized this line of research as a management approach in which administrative behaviors and traits are primarily explained by nurture-based managerial factors. A common assumption is that socialization mechanisms dominate the cultivation process of these traits. However, the socialization explanation does not necessarily exclude the possibility that natural factors have a considerable influence on them (Betsworth et al., 1994; Christensen et al., 2021). For example, Riccucci (2018) posited that, based on genetics, women would exhibit higher PSM and be more likely to be socialized to develop PSM than men. This indicates that public administration scholars have already realized the importance of natural factors in developing administrative behaviors and traits.

The recent development of the behavioral genetics approach provides the feasibility of examining the influences beyond the traditional nurture-based factors (Harden & Koellinger, 2020). The behavioral genetics approach examines how genetic makeup and environments simultaneously influence an individual's attributes and behaviors (Plomin et al., 2008). This approach assumes that most human traits and behaviors are explained by both genetic makeup and social environment. Other related social science disciplines, such as political science, economics, and generic management have already incorporated biological insights into their research (Barth et al., 2020; Beauchamp et al., 2011; Dawes et al., 2014; Dawes et al., 2021; Fowler et al., 2008;

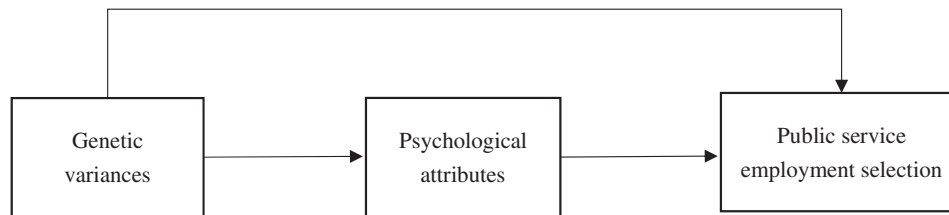


FIGURE 1 Theoretical framework, adapted from Arvey and Bouchard (1994)

Nofal et al., 2018). For example, within political science, a new subfield, “biopolitics” has been developed to study political behaviors and attitudes, such as voting, political ideology, and participation (Dawes et al., 2014; Dawes et al., 2021; Fowler et al., 2008). In the field of economics, neuroeconomics merges methods from neuroscience and economics to better understand individuals’ decisions and choices (Beauchamp et al., 2011). Similarly, business management scholars have also investigated whether entrepreneurship and innovative behaviors have genetic roots (Nofal et al., 2018).

These related studies provide an example of how public administration scholars could benefit from a biological perspective to develop theories in our field. However, although early public administration scholars have repeatedly stressed the importance of biological insights (Caldwell, 1980; White, 1991), empirical research has rarely incorporated genetic insights into public administration research, except for two recent studies exploring genetics and public sector choice (Christensen et al., 2021) and PSM (Florczak et al., 2022). However, the twin design of both studies makes it difficult to detect the genes that contribute to administration-related behaviors and traits. Based on the work of Christensen et al. (2021), we take a further step to combine the newest methods of PRS with the existing P-E fit framework to examine whether the genetic predisposition of psychological attributes can influence individuals’ self-selection into public service employment. The next section presents the research framework and hypotheses.

Theoretical model and hypothesis making

Arvey and Bouchard (1994) presented a model in which individuals’ general vocational choices are influenced by both genetic variants and socialization influence. We expanded their original model to predict public service employment, where genetic variations significantly influence individuals’ selection into public service employment (see Figure 1). This expanded model is based on two theoretical perspectives: the P-E fit theory and the lens of behavioral genetics.

Specifically, the P-E fit theory (Kristof, 1996) posits that individuals’ behavior is a result of the fit between personal and environmental attributes. Individuals with

certain attributes are more likely to choose public sectors, as these characteristics fit well with the nature of service work. This theory has been widely applied to explain individuals’ self-selection in public employment (Korac et al., 2019). However, individual traits may not be limited to visible characteristics. Recent behavioral genetics research suggests that most individual attributes, such as personality and emotional state, have genetic roots (Polderman et al., 2015). This kind of genetic makeup is highly related to the development of human behaviors and attitudes. Thus, the genetic predisposition of individual traits could reasonably serve as personal factors in the P-E fit framework to sort individuals into public service employment.

Based on the P-E fit framework, we first explain the relationship between psychological attributes and service employment selection. Then, we develop hypotheses about the genetic makeup of psychological attributes and job selection through the lens of behavioral genetics.

The genetic overlap between personality and selection into public service employment

The Big Five personality traits model is a comprehensive framework used to capture the whole domain of personality (McCrae & Costa, 1987). Public administration scholars have linked the Big Five personality model and its associated six-dimension HEXACO model with PSM and administrative attitudes (Aarøe, Baekgaard, et al., 2021; Van Witteloostuijn et al., 2017). Among the various personality dimensions, neuroticism captures individuals’ tendency to be under psychological stress (McCrae & Costa, 1985). It is closely connected to the concept of emotionality, which is associated with empathy, stress avoidance, preference for stability, and close attachment to others (Ashton & Lee, 2007). Indeed, existing studies have found that neuroticism serves as a predictor of vocational interests for service-related work, such as teachers, nurses, and social workers (Costa et al., 1984; Khurshid, 2011; Mullola et al., 2018). For example, using an adult sample in the US, Costa et al. (1984) found that neuroticism was significantly related to the preference for social occupations, such as social workers. Another study (Khurshid, 2011) suggested that teachers in the public sector have a higher level of neuroticism scores than their counterparts in the private sector.

The relationship between personality traits and the attractiveness of public employment is explained by the P-E fit framework (Kristof, 1996). P-E fit theory assumes that people select professions that fit their personal characteristics, such as personality. Empirical research has supported that P-E fit is a critical link that influences the attractiveness of public sectors and personality as an essential trait sorting individuals into the public sector (Korac et al., 2019). The existing literature suggests that neuroticism is positively related to altruism and helping behavior (Ben-Ner & Kramer, 2011; Pinazo et al., 2016). This is because individuals with high levels of neuroticism are more sensitive to others' negative emotions, which leads them to experience more stress than average (Guo et al., 2018). As a result, they seek to help others to reduce their psychological stress. It should be noted that the highly neurotic individuals' altruistic behavior is not motivated by empathetic concern for others' distress, but by the aim of reducing their own personal distress (Guo et al., 2018; Habashi et al., 2016). Therefore, people who are high in neuroticism are preferable for public service as the work fits their need to reduce distress by helping others.

The genetic basis of personality has been well explored in biological psychology research. Early studies have confirmed that all Big Five personality traits are heritable (Jang et al., 1996; Shane et al., 2010). For example, Jang et al. (1996) found that the genetic influence on the development of neuroticism was about 41 percent when using American twin samples. Another study based on UK samples also confirmed that approximately 27 percent of variations in neuroticism could be attributed to heritability (Shane et al., 2010). In addition, the recent development of molecular and behavioral genetic research provides more robust evidence regarding the specific genetic variants that contribute to personality. For example, Nagel et al. (2018) conducted a meta-analysis based on the existing genome-wide association studies (GWAS) of neuroticism and identified 136 single-nucleotide polymorphisms (SNPs).

Taken together, the two lines of research suggest that, on the one hand, neuroticism is related to public service employment; on the other hand, genetic influences explain significant variations in neuroticism. This indicates that part of the covariation between neuroticism and the tendency to engage in public service may be accounted for by common genetic factors. Indeed, vocational studies have confirmed the genetic overlap between individual psychological traits and certain types of vocational interests (Shane et al., 2010).

Therefore, it is reasonable to expect that the genetic predisposition to neuroticism is related to individuals' public service employment selection. Thus, we formulate the following hypothesis:

Hypothesis 1. *The genetic predisposition to neuroticism is related to public service employment selection.*

The genetic overlap between emotional state and selection into public service employment

In addition to the five-factor personality model, another parallel stream of psychological thought focuses on the basic emotional state of humans. Like personality factors, emotional state has been long recognized as a central factor that regulates an individual's cognition, motivation, and behavioral intentions (Isen, 2000; Lyubomirsky et al., 2005). Although studies have found an overlap between emotional affect and individual personality, most scholars treat emotional state and personality structure as related but different concepts (Burger & Caldwell, 2000). Conceptually, emotional state serves as a subordinate construct to personality because emotional temperament consists of fundamental elements of personality attributes (Watson et al., 1992). Empirically, studies have found that positive affect is related to different psychological outcomes and behaviors than the Big Five personality traits (Burger & Caldwell, 2000; Watson et al., 1992). Therefore, scholars have suggested that beyond the traditional Big Five personality traits, emotional affect should be incorporated as a predictor into psychology research for greater explanatory power (Shiota et al., 2017).

The existing studies identify two basic dimensions of emotional state, negative and positive affect, which account for most of the variance in the emotion-related state (Watson & Tellegen, 1985). This study focuses on positive affect, defined as an individual's positive emotionality and mood (Peterson, 2006). Individuals with high levels of positive affect generally have a happy and optimistic outlook. The existing literature on emotion labor suggests that emotional state is vital for public service as most service work requires emotional exchange between workers and clients (e.g., Guy et al., 2008). Thus, it is possible that relational nature of public service employment attracts those who have a greater positive affect. In addition, previous psychological studies have consistently found that positive affect is positively related to prosocial behaviors, altruistic organizational citizenship, and customer orientation (e.g., Kelley & Douglas Hoffman, 1997), labeled as the "feeling good, doing good" effect (George & Brief, 1992). This is because that positive affect can serve as a self-perpetuating system that activates helping behaviors to maintain an individual's current emotional state (Garland et al., 2010). In a similar vein, empirical evidence shows that positive affect significantly correlates with individuals' selection into self-employment and service-related work (Emmerling & Cherniss, 2003; Nikolaev et al., 2020; Puffer, 2011; Schermer et al., 2015). Thus, it is likely that positive affect plays a role in the decision to pursue public service employment, because public service, as other-oriented work, has the potential to sustain long-term happiness and subjective well-being.

Regarding heritability, existing evidence suggests that around 60 percent of the variation in positive affect can be attributed to genetic factors (Boardman et al., 2008). Recent behavioral genetics has found that an SNP, rs322931, is significantly associated with positive affect (Wingo et al., 2017). These studies provide the genetic basis of positive affect. In addition, the recent genetic-informed research confirms the genetic overlap between positive affect and vocational interests (Patel et al., 2021; Schermer et al., 2015; Shane et al., 2010). For example, Patel et al. (2021) confirm that the genetic predictors of subjective well-being are positively associated with self-employment. Similarly, Schermer et al. (2015) confirm that common genes of positive emotionality and shared environment significantly explain an individual's interests in service and teaching-related jobs.

Therefore, it is reasonable to expect that the genetic predisposition to positive affect is related to individuals' public service employment selection. Thus, we formulate the following hypothesis:

Hypothesis 2. *The genetic predisposition to positive affect is related to public service employment selection.*

DATA AND METHOD

Previous studies primarily relied on twin design to examine whether the phenotypes (e.g., personality, behavior, or other traits) are heritable (Polderman et al., 2015). A typical twin design compares the phenotypic differences between monozygotic and dizygotic twin pairs. If significant variances are found, genetic factors play a role in the phenotype. Although twin design studies are useful in identifying multiple genetic influences simultaneously, they fall short in identifying the specific genetic makeup that contributes to the variations (Friedman et al., 2021; Nofal et al., 2018; Verhulst & Hatemi, 2013). Recent developments in molecular genetics provide a feasible method, the PRS approach, which can build upon the genetic findings of twin studies to further investigate the relationship between a set of specific genes and phenotypes (Harden & Koellinger, 2020; Palla & Dudbridge, 2015; Plomin & Von Stumm, 2022; Sugrue & Desikan, 2019).

PRS is a quantitative measure of genetic predisposition to human traits and behaviors by calculating the aggregated effects of multiple genetic variants (Belsky & Israel, 2014; Wray et al., 2021). This is different from the single-gene research that examines the independent effects of one genetic variant on a specific type of phenotype. PRS assumes that a set of genetic variants contributes to one phenotype. Given that most social traits and behaviors are highly polygenic, scholars advocate that the PRS approach is a suitable and feasible tool for social science research (Belsky & Israel, 2014; Harden & Koellinger, 2020). Related disciplines, such as business

management, political science, and psychology have already successfully applied the PRS approach to their research and investigated the genetic roots of traits and behaviors such as entrepreneurship (Patel et al., 2021), job satisfaction (Rukh et al., 2020), and political participation (Aarøe, Appadurai, et al., 2021).

The use of the PRS in this study provides three distinctive advantages. First, PRS is calculated by genetic variants that are fixed before the individual is affected by socialization. In other words, if we treat PRS as an independent variable and public service employment as a dependent variable, we can safely exclude the possibility of reverse causality because it is impossible for the job decision to be developed before the genetic makeup. Second, genetic variants are stable with rare exceptions, meaning that they would be the same regardless of when and how the genetic information is extracted (Belsky & Israel, 2014). This helps overcome the reliability problem of self-reported data. Third, PRS accumulates the influence of many different genes. Thus, it provides a powerful predictive tool for studying human behavior compared to the traditional single-gene approach (Belsky & Israel, 2014; Palla & Dudbridge, 2015).

This study calculates the PRS of neuroticism and positive affect to investigate whether the PRS could predict individuals' selection into public service employment.

Data source and samples

This study uses a nationally representative dataset, the UK Biobank, which comprises more than 500,000 participants across the UK between 2006 and 2010. Although the UK Biobank primarily focuses on examining genetic and environmental determinants of disease, its rich data about individuals' social traits and behaviors make it a valuable resource for social science researchers. Participants in the baseline questionnaires were asked questions regarding their occupations, lifestyle, and personality. The corresponding genome-wide genotype data were collected from blood, urine, and saliva.² Thus, the UK Biobank provides a unique dataset to construct PRSs of individual attributes and investigate the impacts of those PRSs on individuals' public service employment selection.

This study uses the baseline data from 2006 as follow-up data only to trace individuals' health-related outcomes. We restricted the analysis to individuals of British ethnicity because different ancestral origins would result in biased genetic associations (Marchini et al., 2004). Thus, individuals who reported non-British ethnicity or did not report any ethnicity were excluded from the analysis ($n = 60,035$). Following a previous study, we utilized the listwise deletion strategy to drop cases with missing information on genetic data ($n = 12,387$) and employment status ($n = 167,422$). Based on these exclusion criteria, the final sample comprised 262,795 individuals.

TABLE 1 Job categories belong to public service employment in the UK biobank

Public service employment
Officials in governments (1111, 1113)
Protective service officers, such as police and officers in armed forces (1171, 1172, 1173)
Workers in social services, such as social services managers (1184, 1185)
Workers in charitable organizations (1114001, 1114002, 1114003, 1114008, 1163008, 1163049)
Teaching profession (2311, 2312, 2314, 2315, 2316, 2319)
Public service professionals, such as probation officers, social workers (2441, 2442, 2443)
Librarians and related professionals (245)
Social welfare associate professionals (323)
Protective service occupations (331)
Public service associate professionals (3561)
Administrative occupations: Government and related organizations (411)
Library assistants/clerks (4135)
Postal workers, mail sorters, messengers, couriers (9211)

Note: The numbers in parentheses refer to the coding ID in the UK Biobank dataset.

Measures

Dependent variable: Public service employment

The public service employment status of an individual was the dependent variable in this study. We identified public service employment based on individuals' occupations, rather than the sector they work for. Although research typically classifies individuals working in government as public service employees, scholars also emphasize the importance of separating public service employees from government employees, as some types of governmental work do not necessarily involve service delivery (Houston, 2011). In addition, studies have also discovered that job characteristics, rather than the nature of the organization, motivate individuals to join the public service workforce (e.g., Christensen & Wright, 2011). Many employees have a "public service" mindset, even though they work for private organizations (Christensen & Wright, 2011). Therefore, individuals with a public service occupation, whether in government or not, were identified as having a public service employment status.

The UK Biobank contains participants' information on employment status at the time they were recruited. Each participant's employment status and its specific characteristics were obtained through an interview conducted by trained operators. The UK Biobank codes job descriptions according to the Standard Occupational Classification (SOC) 2000, an official occupational classification implemented by the UK government. SOC 2000 classifies

employment based on job and required skills, rather than sectors. Thus, it provided us with an opportunity to identify public service employees through occupational information. Based on the work of Christensen et al. (2021), we determined 13 subcategories of public service employment, including teachers, postal workers, librarians and related professionals, workers in social services, general governmental employees, protective service occupations, administrative occupations, and so on. By coding these categories as 1 and other categories as 0, we created a dummy variable for public service employment (for the specific categories, see Table 1).

Independent variables: PRSs of neuroticism and positive affect

We constructed PRS based on summary statistics from genome-wide association studies, a common approach in current behavioral genetics research (Belsky & Israel, 2014; Harden & Koellinger, 2020). The genome-wide association studies identify genetic variants for particular traits and behaviors by assaying hundreds of SNPs to measure the most common variations throughout the genome (Pearson & Manolio, 2008). It is assumed that genetic influences on observable phenotypes (e.g., disease, behavior, or personality) can be satisfactorily explained by a limited number of allelic variants rather than millions of SNPs. To date, the genome-wide association studies have identified many observable traits that are relevant for management, psychology, and political science researchers, including entrepreneurship (Patel et al., 2021), job satisfaction (Rukh et al., 2020), and political participation (Aarøe, Appadurai, et al., 2021).

The SNPs used to construct the PRS of neuroticism in this study are based on Nagel et al. (2018), which conducted a large meta-analysis of current genome-wide association studies. The SNPs for calculating PRS of positive affect are based on Okbay et al. (2016) and Wingo et al. (2017). Following the standard procedures of creating PRS (Choi et al., 2020), we utilized pairwise linkage disequilibrium and Hardy-Weinberg equilibrium tests as control measures to further select SNPs. Pairwise linkage disequilibrium was evaluated using the SNIIP function (Arnold et al., 2015) and the Hardy-Weinberg equilibrium test was conducted in Stata 14.

All SNPs passed the pairwise linkage disequilibrium tests with $r^2 > .8$. The rule of thumb for the deviation of the Hardy-Weinberg equilibrium test is $p < 1 \times 10^{-6}$. The results indicated that 64 SNPs of neuroticism should be excluded (Supporting information Appendix 1). Finally, we retained 71 SNPs for neuroticism and 2 SNPs for positive affect to calculate the PRSs (the final SNPs are specified in Supporting information Appendix 2). Each SNP was coded as 0, 1, or 2, depending on the variations of alleles. The PRSs for neuroticism and positive affect were calculated as the sum of all respective SNPs.

TABLE 2 Descriptive statistics of variables

	Mean	SD	Min	Max
Public service employment (1 = Yes)	0.19	0.39	0	1
Polygenic risk score of positive affect	2.04	0.85	0	4
Polygenic risk score of neuroticism	73.86	5.20	51	98
Age	54.32	7.66	38	71
Gender (Male = 1)	0.48	0.50	0	1
Townsend deprivation index (TDI)	-1.57	2.85	-6.26	10.78

Abbreviations: Min, Minimum; Max, Maximum; N, 262,795; SD, standard deviation.

The PRSs were standardized to have a mean of 0 and standard deviation of 1.

Control variables

Following the standard procedures and recommendations (Haworth et al., 2019; Price et al., 2006), we controlled the top 10 principal components (PCs) of ancestry and UKB assessment centers to avoid population stratification effects. In addition, we adjusted for gender and age to control for age- and gender-related inclinations that influence individuals' selection into public service employment. Furthermore, the Townsend Deprivation Index (TDI) was included to control for endowment effects.

RESULTS

Table 2 presents the descriptive statistics for the variables. In total, 19% of the participants were engaged in public service employment. This pattern is consistent with the national statistics in the UK: Around 20.8 percent of people in employment were public service workers in 2006 (Office for National Statistics, 2006). The PRS for positive affect ranged from 0 to 4, and neuroticism ranged from 51 to 98. The mean age of the study participants was 54.32 years, as the UK Biobank targets the middle-aged population. The TDI was transformed to Z-scores with a score below 0 indicating affluence and a score above 0 indicating deprivation. The TDI score in our samples is -1.57, indicating that they are less deprived.

We first investigated whether the PRSs of neuroticism and positive affect have sufficient explanatory power for neuroticism and positive affect measured by self-reported items. Self-reported neuroticism was measured using the 12-item scale of the Eysenck Personality Questionnaire-Revised (EPQ-R) Short Form (Eysenck et al., 1985).³ The responses for each item are "true," "false," "do not know," and "prefer not to answer." We coded "true" as 1, "false" as 0, and "do not know" and "prefer not to answer" as missing data. The composite reliability of the scale was 0.70. Thus, we used the summed scores of these 12 items

to measure self-reported neuroticism. Self-reported positive affect was based on four items capturing various aspects of life satisfaction, including family, health, friends, and financial situation. The participants answered these questions on a 6-point Likert scale (1 = extremely satisfied, 6 = extremely unsatisfied). Items were reverse-coded and then summed. The composite reliability of the scale was 0.68. The specific measurement items are presented in Supporting information Appendix 3.

Each PRS was regressed on its respective self-measured phenotype, controlling for gender, age, TDI, UKB assessment centers, and 10 PCs. The correlation results are presented in Table 3. The correlation between PRS and self-reported neuroticism was 0.008 ($p = .000$; $r^2 = .035$), and self-reported positive affect was -0.023 ($p = .005$; $r^2 = .027$). This suggested that each PRS was strongly and significantly correlated with its respective phenotypes.

Next, logistic regression models were applied to test whether the PRSs of neuroticism and positive affect could predict individuals' selection into public service employment. Models 1-3 in Table 4 present the results for the relationship between the self-measured individual attributes and the selection into public service employment. The results suggested that both self-measured neuroticism and positive affect were significantly associated with individuals' selection into public service employment. Models 4-6 in Table 4 present the results for the relationship between the PRSs of neuroticism and positive affect and the selection into public service employment. The results showed that the relationship between the PRS of neuroticism and public service employment was not statistically significant. However, the PRS of positive affect was significantly and positively correlated with public service employment ($b = .012$, $p < .05$). This suggested that individuals exhibiting innate happiness were more likely to choose public service employment. An increase of one standard deviation of the PRS of positive affect corresponded with a statistically significant 1.2 percentage point increase in the likelihood of being a public service worker. In sum, Hypothesis 1 was not supported, while Hypothesis 2 was supported.

We conducted the following robustness checks. First, education was regarded as a vital socialization factor that influenced individuals' job selection (Lewis & Frank, 2002).

TABLE 3 Association between PRSs and their respective phenotypes

	Beta	SE	p-value	R ²
Polygenic risk score of neuroticism	0.008	0.001	.000	.035
Polygenic risk score of positive affect	−0.023	0.008	.005	.027

Note: All estimates are adjusted for age, sex, TDI, UKB assessment center, and 10 PCs.

TABLE 4 The effects of neuroticism and positive affect with their PRSs on selection into public service employment

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Neuroticism	−0.011*** (0.002)		−0.008*** (0.003)			
Positive affect		0.012*** (0.003)	0.008** (0.004)			
Polygenic risk score of neuroticism				0.000 (0.001)		0.000 (0.001)
Polygenic risk score of positive affect					0.012** (0.006)	0.012** (0.006)
Constant	−1.942	−166.82***	−161.421***	−2.688	−2.684**	−2.686
Pseudo R ²	0.014	0.013	0.013	0.016	0.016	0.016
Observations	262,795	262,795	262,795	262,795	262,795	262,795

Note: Models 1–3 provide the estimates of self-measured neuroticism and positive affect on individuals' selection into public service employment when age, sex, TDI, and UKB assessment center are controlled. Models 4–6 provide the estimates of PRS of neuroticism and positive affect on individuals' selection into public service employment when age, sex, TDI, UKB assessment center, and 10 PCs are controlled; robust standard errors in parentheses.

** $p < .05$; *** $p < .01$.

Therefore, we repeated all analyses by controlling for educational attainment (Supporting information Appendix 4). The estimates for Hypotheses 1 and 2 remained substantially unchanged. Second, we assessed whether our findings would be sensitive to SNPs that were used to create the PRSs (Supporting information Appendix 5). In all additional analyses that used sensitive PRSs, the results were consistent with the main findings (Supporting information Appendix 6). Third, given that our categorization of public service employment was rather broad, we tested the robustness of our findings by using a narrower operationalization of public service employment, consisting of only three subcategories of employment in the government and related organizations. The results remained unchanged (Supporting information Appendix 7). Finally, we repeated the analysis by excluding samples beyond the retirement age of 65 years to ensure that our results were not biased by preferences to continue working after retirement age (Supporting information Appendix 8). The results suggested that our findings regarding the hypotheses did not change.

DISCUSSION

It is essential to the functioning of the government to attract the most talent as staff in the public service workforce. Decades of twin-based studies have illustrated that both genetic makeup and environmental factors shape the variability in individuals' vocational interests (e.g., Betsworth et al., 1994; Christensen et al., 2021;

Schermer & Vernon, 2008). Based on recent behavioral genetics literature, this study examines whether the PRS of neuroticism and positive affect can predict individuals' selection into public service employment.

This study makes several important theoretical contributions to the literature. First, it extends the current P-E fit framework, a commonly utilized theory for explaining individuals' preference for public employment, by adding genetic makeup as an important personal factor that makes individuals fit the public service profession. Our findings verify that individuals' genetic inclinations help explain the variations in the choice of public service employment. This is consistent with a recent twin study in the public administration field (Christensen et al., 2021), and broad vocational literature that supports the idea that individuals' vocational interests are inherited (Betsworth et al., 1994; Schermer & Vernon, 2008). The inheritability of public service employment selection suggests that differences in vocational interests may already exist before individuals are formally influenced by various socialization agents. In other words, overlooking individuals' genetic underpinnings can potentially bias the estimated effects of environmental variables on public service employment selection. This would help explain the inconsistent findings or poor predictive power of existing studies that are exclusively based on nurture factors.

Second, we find that the PRS of positive affect can significantly predict individuals' selection into public service employment. This adds to the literature stream in addition to the results of Christensen et al. (2021) by showing what genes contribute to the heritability of

public service employment and through what mechanisms. The findings also complement the recent behavioral genetics study on PSM that suggest that the heritability of sector preference is mediated by factors other than PSM (Florczak et al., 2022). Our results support the view that emotional state serves as the possible mediator between genetic makeup and public service employment. This also aligns with the existing Big Five personality traits literature suggesting that extraversion, a trait that is highly related to positive affect (Lucas et al., 2008), is positively related to individuals' selection into public service employment (Korac et al., 2020). In addition, our results add to the existing emotional labor literature (e.g., Guy et al., 2008), suggesting that emotion is not only important for the successful delivery of public service but also critical in prompting individuals to join public service employment. This also contains implications for further theorizing the role of emotion in administration-related behavior (Nørgaard, 2018). Furthermore, research has illustrated that participating in service or volunteer activities results in high levels of happiness (Moynihan et al., 2015). Our findings demonstrate that these observational studies may have possible reverse causality problems, as individuals with innate happiness are more likely to self-select into service work. Recent experimental work also reveals that more service work does not necessarily increase life satisfaction (Bjälkebring et al., 2021), implying that the causal relationship between service work and happiness should be cautiously interpreted.

Contrary to expectations, our results do not support the hypothesis that the PRS of neuroticism, an essential component of the Big Five personality traits, can predict individuals' selection into public service employment. This null finding suggests that the relationship between neuroticism and job selection is more complex than expected. Although one line of research found that neuroticism was positively related to altruism and helping behavior (Ben-Ner & Kramer, 2011; Pinazo et al., 2016), other scholars also found that neuroticism was negatively or even non-significantly related to individuals' other-regarding behavior (e.g., Habashi et al., 2016; Lönnqvist et al., 2011) and public-sector employment (Korac et al., 2020). A possible explanation for the mixed results may be attributed to other mediation mechanisms. For example, Guo et al. (2018) found that personal distress mediates the relationship between neuroticism and altruism-related behaviors. Individuals with higher neuroticism are more susceptible to others' negative emotions, thus experiencing more personal stress than common individuals. These negative stressors serve as the critical mechanisms that cause highly neurotic individuals to elicit more compassion and concern toward others' suffering. Thus, the direct link between neuroticism and the attractiveness of public-sector employment is less apparent. On this note, the underlying mediation mechanisms ought to be further investigated.

Third, methodologically, we depart from the existing twin studies by computing the PRS of individual attributes

to investigate the genetic impacts on public service employment selection. Twin studies, although successful in estimating the heritability of the social traits and exploring the potential interplay between genetic factors and environment, have limited capacity to identify the specific genetic makeup that contributes to the variations (Friedman et al., 2021; Nofal et al., 2018; Verhulst & Hatemi, 2013). Recent developments in molecular and behavioral genetics advocate the use of the PRS approach to investigate the relationship between a set of specific genes and human behaviors (Belsky & Israel, 2014; Harden & Koellinger, 2020). Related disciplines such as business management and psychology have already successfully applied PRS to their research and investigated the genetic roots of many management traits, such as entrepreneurship (Patel et al., 2021) and job satisfaction (Rukh et al., 2020). However, the public administration scholarship seems slow to develop knowledge in this vein.

To our knowledge, this is the first study to apply the PRS approach in the field of public administration. This approach could be a supplementary method for public administration scholars to overcome endogeneity problems and investigate the genetic makeup of other administrative behaviors and attitudes. In addition, the recent trend of behavioral public administration aims to develop the micro-foundation of public administration through multidisciplinary insights, particularly from psychology. However, most of the BPA research has only utilized theories and methods from social and management psychology, with few linking public administration with biological and evolutionary psychology (Grimmelikhuijsen et al., 2017). Biological and evolutionary psychology aims to develop the scientific foundation and evolutionary path of human behaviors and attitudes (Kalat, 2015; Tybur & Griskevicius, 2013). Incorporating this line of hard scientific knowledge may help public administration scholars establish more robust links between human traits and administrative behaviors.

Practically, behavioral genetics inform decision makers that most of the individual traits and behaviors are determined by both genetic predispositions and environmental influences. This perspective is particularly valuable for public managers as it may inform which type of social intervention strategy is most likely to be (in)effective. The effects of social practice would be stronger for those with less heritability than highly heritable traits. Public managers could thus consider exerting their influence on traits and behaviors that have been currently proven to be primarily shaped by environment rather than genetics. For example, although our study did not directly investigate the extent to which and the directions in which socialization practices could intervene in the consequences of a natural tendency, previous studies have shown that 36 percent of variations in vocational interests could be attributed to genetic factors and the remaining 64 percent to environmental influences (Betsworth et al., 1994). This suggests that social forces still take a dominant role in shaping individuals' occupational preferences, leaving room for the further design of effective policies to increase the

attractiveness of the public sector in the eyes of job hunters. Similarly, a more recent study on exploring the genetic foundation of PSM suggested that environments serve as more important factors in shaping individuals' PSM than genes (Florczak et al., 2022). Therefore, public managers and educational practitioners should be confident in their ability to use socialization methods to enhance individuals' PSM.

Our findings also have implications for individuals. The best practices for them can be illustrated by the example of disease management. It is acknowledged that some types of diseases are heritable, and thus some individuals have a higher risk of getting them than others. The best practice for high-risk individuals is to embrace healthy lifestyles and develop a positive outlook to reduce the genetic risks of diseases rather than simply ignoring them or doing nothing. This logic also applies to those interested in public service employment but with disadvantageous genetic makeup. Individuals may consider engaging in more intensified socialization activities to cultivate prosocial values and achieve optimal person-public job fit.

This study inevitably suffers from limitations that future research should address. First, as we work with cross-sectional data, we are unable to draw an interpretation of the long-term effects. Although our analysis suggests a positive relationship between PRS of positive affect and public service employment selection, we are cautious about making a solid causal inference, as we cannot preclude other possible mechanisms. It is thus possible that part of the relationship between genetic dispositions of positive affect and public service employment selection could be mediated by other types of genes. In addition, individuals get genetic endowments from their parents. Previous studies have illustrated a positive association between people's parents' occupations and their career choices (Korac et al., 2019; Lewis & Frank, 2002). Although past scholars generally attributed this to family socialization and environmental influences, it is likely that parents may transfer their career preferences. For example, economists found that the PRS of wealth inequalities was positively related to parental education, suggesting the existence of intergenerational transfers (Barth et al., 2020). As we lack data from parents, we were unable to examine whether differences in parents' vocations would result in variations in the next generations' public service employment selection.

Second, this study uses only one independent sample from the UK Biobank to test the genetic effects on public service employment selection. We were limited to testing the external validity of the findings using another sample. Indeed, genetic variations across ethnicities may systematically lead to different behavioral patterns (Marchini et al., 2004). In this regard, we remind readers that our results may not be generalizable to Europe or other ancestries. Further research is required to verify our findings using different subjects.

Last, the limits of utilizing a secondary dataset should be acknowledged. The data were taken from a large UK Biobank project and used in an explorative way to study the genetic overlap between personality traits and public service employment. It is therefore a limitation that many theoretical relevant variables were not available and thus not included in this study. For example, the identification of public service employment was based on individuals' occupations rather than the sector they worked for. As a result, some management positions may not be as well coded as working in the public sector. The recent evidence on management literature suggests that there is significant genetic overlap between intelligence and leadership, implying possible heritability in becoming managers (Song et al., 2022). Thus, it is possible that the magnitude of association between genetic impacts and selection into public sector may be underestimated.

In addition, because of the secondary nature of the dataset, we were unable to test the impacts of PRSs of the full Big Five personality attributes. It is reasonable to expect that different types of personalities may have various effects on sorting individuals into public service employment. For example, agreeableness, characterized by being easy-going, calm, and cooperative with others (Shepherd & Belicki, 2008), is theoretically related to individuals' self-selection into service work. Further research could empirically test whether the genetic makeup of agreeableness and other related personalities could predict the attractiveness of the public sector with more appropriate data. The advent of low-cost and widely accessible genetic testing provides the feasibility for public administration scholars to generate first-hand data to fuel this kind of research. For example, any tissue collected from a subject can be transformed into genetic data. Thus, we encourage further study to utilize first-hand data to investigate individual differences in public administration behaviors and traits, such as transformational leadership, representative bureaucracy, PSM, and job satisfaction.

CONCLUSION

Scientific knowledge about genetics and biology has increased explosively during the past decades. However, public administration scholarship seems slow to incorporate the newly developed biological insights about human traits and behaviors into their research agenda. This study advances our understanding of individuals' natural tendency toward public service employment through the lens of behavioral genetics. This shows that the PRS of positive affect can predict individuals' selection into public service work. We want to convey the idea that investigating the genetic roots of job selection does not advocate genomic selection or bio-determinism but to highlight that recognizing the natural state would help us better understand our natural facts. In the seminal work *A Theory of Justice*, Rawls (1999) mentioned that "The natural distribution is

neither just nor unjust; nor is it unjust that persons are born into society at some particular position. These are simply natural facts. What is just and unjust is the way that institutions deal with these facts” (p. 87). Indeed, the environments would interact with the genetic predisposition to jointly influence human behaviors. Understanding the extent to which socialization efforts influence genetics is extremely important for public administration scholars and practitioners. Therefore, we hope future research could take a step further in examining how genetic variations and the environment jointly shape other public administrative behaviors and traits.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

Data are available in a public, open access repository. This research has been conducted using the UK Biobank Resource under Application Number 44430. The UK Biobank data are available on application to the UK Biobank (www.ukbiobank.ac.uk/).

ENDNOTES

¹ In addition to the polygenic risk score, this includes other disciplines, such as polygenic score, genetic risk score, genetic prediction score, and multi-locus genetic profile, among others (Belsky & Israel, 2014).

² Details about the UK Biobank can be found online <https://Biobank.ndph.ox.ac.uk/>.

³ The Eysenck Personality Questionnaire-Revised (EPQ-R) Short Form is derived from the Giant Three model developed by Eysenck (1994). Theoretically, both the Big Five model (McCrae & Costa, 1987) and Giant Three model (Eysenck, 1994) include neuroticism as the basic personality dimension in their model. Empirically, studies have consistently found that the Eysenck et al. (1985) scale and the Big Five personality scale developed by McCrae and Costa (1987) measure the same neuroticism construct (Scholte & De Bruyn, 2004; Zuckerman et al., 1993), suggesting that they are interchangeable in this dimension.

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