

ARTICLE

The effects of job characteristics on retirement

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(Received 15 October 2019; revised 8 January 2020; accepted 13 January 2020; first published online 11 February 2020)

Abstract

Along with data about actual, desired, and anticipated job characteristics, this paper uses a novel data element, the subjective conditional probability of working at age 70, to estimate the causal effects of job characteristics on retirement in the United States. Having flexible work hours is the most consistent predictor of retirement preferences and expectations: if all current workers had flexible hours, the fraction working at age 70 would be 0.322, but it would be just 0.172 if none had this option. Job stress, physical, and cognitive job demands, the option to telecommute, and commuting times were additional predictors of retirement expectations.

Key words: Retirement expectations; stated preferences; subjective probabilities; working conditions

JEL codes: J14; J24; J26

The share of older individuals in the population has been increasing because mortality and fertility rates have been declining in recent decades, and this trend is predicted to continue (Mather *et al.*, 2015). Consequently, it has been argued that increases in average life expectancy require increases in the average length of working lives to finance additional years of consumption.

There are, however, barriers that may prevent some people from delaying retirement. For example, physical abilities and critical dimensions of cognitive ability decline with age (Spirduso *et al.*, 2005; Salthouse, 2012) and, depending on the job characteristics of older workers, it may be difficult for some to remain productive at advanced ages (Belbase *et al.*, 2016; Hudomiet *et al.*, 2018a).

For policymakers, employees and employers alike, it is important to find what types of jobs older workers want, which types are available to them, and how the working conditions of those jobs affect retirement decisions. Policymakers could more effectively facilitate longer working lives by encouraging employers to offer working conditions that better match the preferences of older workers (and possibly those of younger workers as well). Employers would benefit from better understanding older workers' preferences in order to retain productive older employees.

In this paper, we present results from a recent survey fielded in the RAND American Life Panel (ALP). The survey queried older workers about their current, desired, and expected job characteristics, and about how certain job characteristics would affect their retirement decisions. Some of the questions are qualitative, while others allow the effect of a certain factor on the timing of retirement to be quantified. With respect to a variety of job attributes, we use a novel method called *subjective conditional probabilities*, which elicits the subjective probability of working after age 70 conditional on different job characteristics and other factors. These measures are discussed in detail in an earlier paper (Hudomiet *et al.*, 2018b). The paper shows that the measures pass a number of internal and external consistency checks and that they offer an alternative to randomized controlled trials (RCTs) or natural experiments to study causality.

Several studies have used the Health and Retirement Study (HRS) and other household surveys to investigate the factors that influence retirement, such as Barnes-Farrell (2003); Beehr and Bennett (2015); Böckerman and Ilmakunnas (*in press*); Bound *et al.* (2004); Bound *et al.* (2010); Feldman and Beehr (2011); Fisher *et al.* (2016); French and Jones (2011); Gruber and Wise (2004); Gustman and Steinmeier (2005); and Maestas *et al.* (2013). However, from the observed retirement trajectories one cannot infer *preferred* trajectories or *desired* job attributes, which are more relevant for policy design. To the extent that individuals' choices are constrained – for example, due to limited availability of the types of jobs they would prefer or due to health shocks or the need to take care of someone else – workers' preferences for retirement pathways and job attributes will differ from observed patterns.

Even though older workers' preferences for job characteristics are of central importance in retirement research, it is very difficult to measure them reliably. First, preferences are not directly observable in surveys or other datasets. Second, RCTs are rarely feasible or ethical in retirement research. Third, observational data about the correlations between working conditions and retirement patterns are unlikely to show causal relationships, because of the sorting of different types of workers into different types of jobs. Even though there is large heterogeneity in job attributes, this heterogeneity is strongly selective: workers in 'good jobs' tend to enjoy more perks than workers in 'bad jobs'.

An alternative avenue is a stated preferences approach using specialized surveys to measure older workers' preferences for job characteristics. Maestas *et al.* (2018), for example, used a vignette methodology to study workers' (both young and old) willingness to pay for various job amenities. They found that older workers would be willing to pay relatively more for better job amenities, and they care most about the availability of paid time off, moderate physical activities, the opportunity to sit, job autonomy, and flexibility over their work hours. Ameriks *et al.* (2020) used strategic survey questions to elicit workers' preferences about working at older ages and found strong willingness to work, even among those long retired, especially in jobs with flexible schedules. Van Soest *et al.* (2007) elicited the preferences of Dutch respondents asking them to rate hypothetical retirement trajectories involving early retirement, late retirement, and gradual retirement, each with its own corresponding income path. They found that many respondents would be willing to work part-time after age 65 in return for a reasonable compensation.

Our survey queried older workers about their work and retirement preferences. We analyzed three sets of outcome variables: first, we asked workers about their current and expected future job characteristics, such as flexible work hours or physical demands of work. Second, we asked individuals about the subjective probabilities that they would work after age 70. Third, we asked individuals about the subjective probabilities of working after age 70 *conditional on* different job characteristics and other factors.

This paper first describes the data and our statistical approach. Our presentation of empirical results starts out with descriptive statistics of how the outcome variables relate to covariates of interest, such as gender and labor force status, and then follows with ordinary least squares (OLS) regressions that include demographics, socio-economic status (SES), health, workers' current job characteristics, a measure of fluid cognitive ability, and the Big 5 personality traits. These psychological variables may be related to workers' preferences for different working conditions and leisure activities (Hudomiet *et al.*, 2018c).

1. Data

1.1. The RAND American Life Panel

The ALP is an ongoing Internet panel survey operated by RAND (Baird and Pollard, 2017). It is a nationally representative, probability-based sample of about 6,000 participants, who are at least 18 years old, speak either English or Spanish, and live in the United States. Respondents receive email invitations to complete questionnaires about twice a month. The ALP has conducted over 500 surveys since its inception in 2003.

The majority of the panel members access the surveys using their own computers, laptops, or cell phones, but RAND provides a laptop or an Internet service subscription or both for panel members who need them. The sample, thus, does not suffer from selection bias related to households' Internet

access. Post-stratification weights are applied to adjust the distribution of age, sex, ethnicity, education, and income to those in the Current Population Survey.

The surveys typically take no more than 30 min to complete, and respondents are paid an incentive of about \$20 for a 30-min survey, or less for shorter surveys. Response rates are typically between 75% and 85% of enrolled panel members, depending on the topic, time of year, and length of time a survey is kept in the field.

1.2. ALP survey on working longer

The survey we used in this project (ALP survey #487) was fielded from December 2017 to February 2018 to the 50–79-year-old English-speaking members of the ALP. Our analytic sample consists of 2,177 people who: (1) finished the survey; (2) answered some of the basic questions in the survey (labor force status, self-assessed health, and personality questions); and (3) had some attachment to the labor force. The latter requirement is due to this study's focus on retirement pathways and working conditions. A person was considered 'attached' to the labor force if any of the following was true:

- (1) He or she worked at the time of the survey.
- (2) He or she worked for at least five of the previous 15 years (if younger than 65).
- (3) He or she worked for at least 5 years after the age of 50 (if older than 65).

Table A1 in the Appendix shows weighted and unweighted descriptive statistics about our sample. About half of the weighted sample is female, two-thirds are non-Hispanic white, 11% are non-Hispanic black, and 16% are Hispanic. The sample is diverse in terms of education, marital status, self-assessed health, labor force status, and income. Regarding the highest level of education achieved, about one-third said high school; one-third said some college; and one-third said at least a college degree. About two-thirds of participants are married, and more than 80% reported 'excellent', 'very good', or 'good' health. At the time of the survey, 29% were not working, 48% were full-time employees, 13% were part-time employees, and 10% were self-employed. We also measured psychological factors that may be relevant for retirement, including a number series score, which is a measure of fluid intelligence (McArdle *et al.*, 2009); and the Big 5 personality traits: neuroticism, extroversion, agreeableness, conscientiousness, and openness to new experiences (see John and Srivastava (1999) for an overview of the measures; and Borghans *et al.* (2008) for their predictive power of economic outcomes). The psychological factors were created using the same items and coding procedure as in the HRS.¹ We then standardized these factors to have 0 means and standard deviations of 1.0 in the unweighted sample.

According to the difference between the weighted and the unweighted means in Table A1, our unweighted ALP analytical sample differs notably from the CPS in average age, education, and the fraction not working.² The weights adjust for that difference.³

¹The number series score is based on an adaptive test, in which each survey participant answers six questions, and the difficulty of the last three items depends on the participant's performance on the first three. Fisher *et al.* (2013) explain the coding procedure in detail. For the Big 5 personality traits respondents rate themselves using a scale from 'not at all' to 'a lot' on 26 adjectives, and the appropriate items are averaged, as explained by Smith *et al.* (2013).

²These differences are in line with earlier findings indicating that Internet survey participants tend to be somewhat more educated and more affluent than the general population (Börsch-Supan and Winter, 2004; Baird and Pollard, 2017).

³To examine the composition of the sample more closely, Table C1 in the online appendix compares weighted means of some variables to corresponding means in the 2016 wave of the HRS and the 2017 American Community Survey (ACS). To maximize comparability, all statistics are estimated among 50–79-year-old workers. Gender, education, marital status, subjective health, self-employment, and work hours are very similar in the ALP, the HRS, and the ACS samples. The ALP sample, however, is slightly younger, and it has more Hispanic workers than the other two surveys, because the raked weights used in the ALP do not adjust the ratio of Hispanics by age, even though the ratio of Hispanics is lower among older workers. The mean subjective probability of working after 70 is also slightly above the HRS mean.

The survey focused on older individuals' attitudes, preferences, and expectations about retirement, and how job characteristics affected them. We concentrate on three sets of measures:

- (1) Workers' current and expected future job characteristics, such as flexible work hours or physical demands of work.
- (2) Subjective probabilities of working after age 70.
- (3) Subjective *conditional* probabilities of working after age 70. These questions asked about the probabilities of working after age 70 conditional on various hypothetical scenarios, such as having flexible working hours or less stressful work environment.

We discuss these measures in detail in Section 2.

2. Results

All statistics shown in this section are weighted by the ALP survey weights.

2.1 Job demands and job characteristics

2.1.1 Availability of job characteristics

We asked about four job characteristics. The first question queried the subjective probability that full-time workers could switch to a part-time position if they wanted to:

Suppose that you wanted to move into a part-time position at your current job. What is the percent chance that your employer would allow you to do that?

The second one asked about the possibility to flexibly choose work hours:

Suppose that at some point you wanted to flexibly choose your work schedule while you still worked the required number of hours. What do you think the chances are that your employer would allow you to do that?

For the third question, which was on telecommuting, the wording depended on job-type. Employees were asked if their employers allowed them to work from home at least occasionally. Self-employed people were simply asked if they could work from home. The fourth question elicited the average total commuting time.

Table 1 shows the averages of these measures by gender and labor market status. The average subjective probability of being allowed to switch to a part-time position is 40.7%,⁴ and it is substantially higher among females (47.0%).

The sample average of the subjective probability of being allowed to flexibly choose work hours is similar, 39.8%, and it is also higher among females compared to males (43.1% vs. 36.8%). We found very large differentials by employees' current work hours: flexibility in work hours is far less likely in full-time jobs (36.0%) compared to part-time jobs (56.2%).

About 43.1% of workers are allowed to telecommute. Telecommuting is far more common among the self-employed. About 87.0% of part-time self-employed workers can telecommute, while only 32.2% of part-time employees report that this option is available to them.

We censored the reported commuting times at 4 hours a day to limit the effects of a few outliers. On average, these workers commute for about an hour a day (57.3 min). Males and females commute for about the same time, but there is some variation by labor market status. Full- and part-time

⁴The HRS includes a related question about whether workers could reduce the number of paid hours in their regular work schedule. In the 2016 survey wave 27.5% of 50–69-year-old full-time employee sample answered yes. The HRS average is, thus, lower than the ALP average, possibly because the HRS question asks about workers' current position, while the ALP question asks about any positions at the employer.

Table 1. Availability of certain job characteristics for older workers

	Probability that the employer would...		At the workers' current job	
	...allow part-time work	...allow flexible work hours	Fraction with possibility to work from home	Daily total commute time in min
All	40.7	39.8	0.431	57.3
Males	35.8	36.8	0.412	57.9
Females	47.0	43.1	0.452	56.8
Full-time employees	40.7	36.0	0.381	58.5
Part-time employees	–	56.2	0.322	59.5
Full-time self-employed	–	–	0.794	54.4
Part-time self-employed	–	–	0.870	40.9
<i>N</i>	647	866	1,158	1,154

Source: Author's calculations derived from the ALP (2017–2018).

Notes: Age 50–69, working for pay. Weighted statistics. The availability of part-time work is only asked of full-time employees. The availability of flexible work hours is only asked of employees.

employees commute the most (58.5 and 59.5 min), and part-time self-employed people commute the least (40.9 min).⁵

Table C3 in the online appendix shows OLS regressions of these four measures. The relationships suggest that high SES individuals have greater access to better working conditions. For example, work hour flexibility is higher among those with more education and higher income; telecommuting is also more prevalent if income is higher; and minorities have longer commutes. Health, job features, and psychological factors also predict the outcome variables.

Overall, we find that favorable working conditions (i.e., the ones that offer more flexibility and are closer to home) are widespread, but not universal, among older workers in the United States.

2.1.2 Current and last job features compared to desired future job features

Respondents were asked about the features and requirements of their current or last jobs along 14 dimensions, such as physical and cognitive demands and the social climate of the workplace (Morgeson and Humphrey, 2006). There were six cognitive items:

- (1) My job requires monitoring a great deal of information.
- (2) My job requires engaging in a large amount of thinking.
- (3) My job requires a variety of skills.
- (4) My job requires using a number of complex or high-level skills.
- (5) At my job the tasks are simple and uncomplicated.
- (6) At my job I solve problems that have no obvious correct answers.

The survey included two items to capture the physical intensity of the jobs:

- (1) My job requires a great deal of muscular strength.
- (2) My job requires a lot of physical effort.

Four items measured social features:

- (1) At my job the people I work with are friendly.
- (2) At my job I have the chance to get to know other people.
- (3) At my job I have the opportunity to develop close friendships.
- (4) At my job the people I work with take a personal interest in me.

⁵Table C2 in the online appendix compares these statistics to the ACS. Average commuting times in the ALP and ACS are similar, but the ACS averages are somewhat lower, with differences concentrated among part-time employees and full-time self-employed.

The survey also measured two other job characteristics:

- (1) At my job the climate is comfortable in terms of temperature and humidity.
- (2) At my job I make my own decisions about how to schedule my work.

Respondents chose from the options: (1) Absolutely yes, (2) Partly yes/partly no, (3) Absolutely no, or (4) It did not matter to me (for some questions). We converted these responses to a 0 to 1 scale: ‘absolutely no’ answers were coded as zero; ‘partly yes/partly no’, ‘it did not matter to me’, and missing answers were coded as 0.5, and ‘absolutely yes’ answers were coded as 1. The one exception was the ‘At my job the tasks are simple and uncomplicated’ feature, which was reversed so that higher values correspond to cognitively more challenging jobs.

We also created three aggregate variables: cognitive, physical, and social job features, by taking the average of the relevant items for each. These aggregate scores are also between 0 and 1, and larger numbers indicate more-cognitive, more-physical, or more-social jobs.

Table A1 in the Appendix shows the mean of these indices in workers’ current or latest jobs. Their jobs have relatively high cognitive requirements: the average is about 0.70 which is almost half way from ‘partly yes/no’ to ‘absolutely yes’. The physical requirements are much lower. Social opportunities appear to be widely available. The means of workers’ current and non-workers’ latest jobs are similar in all three dimensions.

Later in the survey we asked individuals to rate a future job along the same 14 dimensions. The future job would be a job they would try to get after age 60 (for those below age 60), or in the future (for those above 60). The question wording was:

Please continue to assume that you would be looking for a new job sometime [after age 60/in the future]. Do you think the job you would look for at that time would have any of the following [requirements/features]?

The question used a natural wording, but these are the jobs they would look for, so we sometimes interpret the answers as showing individuals’ *desired* future job characteristics.

Table 2 shows the average values, stratified by labor force status, of the 14 individual and three aggregate measures of job features for individuals’ current and future jobs. Because we compare current and desired future job features, the samples used for the tables are restricted to individuals who worked for pay at the time the survey was fielded.

Individuals’ current jobs score relatively high in cognitive and social domains (0.670 and 0.687 respectively on the 0–1 scale) and relatively low in physical domains (0.348). The jobs people would like to get in the future are less cognitive (0.539), and even less physical (0.176) than their current jobs, while they are slightly more social (0.715). People would also like to have a more comfortable temperature at their workplaces and future jobs with flexible schedules. The individual items follow similar patterns to the three aggregate scores with some exceptions. For example, individuals would like to get future jobs with lower cognitive demands in most dimensions, but they desire an increase in ‘solving problems’. The survey did not ask whether workers wanted to move to a different occupation or if they wanted a similar job with reduced job demands.

Cognitive demands are highest among full-time employees (0.712) compared to part-time employees (0.538), and the self-employed (0.636). The desired future jobs have lower average cognitive scores than the current jobs in all three groups, but the difference is largest among full-time employees who have the highest baseline value (a drop of more than 0.15). Physical demands are slightly higher among part-time employees and the self-employed, but the patterns are similar. Social demands do not vary much by labor force status.

Table C4 in the online appendix shows that the patterns are qualitatively similar among males and females, but females tend to be in cognitively and physically less demanding jobs.

Table 2. Current and desired future job features by labor force status

	Total sample		Full-time employees		Part-time employees		Self-employed	
	Current job	Future job	Current job	Future job	Current job	Future job	Current job	Future job
Cognitive job features								
Monitor information	0.746	0.516	0.813	0.543	0.581	0.458	0.641	0.465
Thinking	0.749	0.558	0.795	0.581	0.614	0.477	0.698	0.549
Variety of skills	0.802	0.659	0.841	0.681	0.660	0.575	0.800	0.659
High level skills	0.598	0.503	0.646	0.527	0.446	0.426	0.564	0.486
Not simple tasks	0.585	0.423	0.633	0.435	0.407	0.355	0.581	0.449
Solve problems	0.539	0.577	0.545	0.575	0.523	0.586	0.534	0.576
<i>Average cognitive</i>	0.670	0.539	0.712	0.557	0.538	0.480	0.636	0.531
Physical job features								
Muscular strength	0.307	0.141	0.298	0.138	0.320	0.139	0.332	0.157
Physical effort	0.389	0.211	0.366	0.202	0.449	0.198	0.421	0.269
<i>Average physical</i>	0.348	0.176	0.332	0.170	0.385	0.169	0.377	0.213
Social job features								
Coworkers friendly	0.759	0.854	0.756	0.847	0.763	0.877	0.764	0.859
Can get to know other people	0.801	0.758	0.820	0.745	0.761	0.813	0.763	0.752
Can develop friendships	0.599	0.634	0.611	0.619	0.595	0.683	0.548	0.644
Coworkers take personal interest	0.588	0.615	0.574	0.605	0.604	0.636	0.633	0.640
<i>Average social</i>	0.687	0.715	0.690	0.704	0.681	0.752	0.677	0.723
Other job features								
Comfortable temperature	0.660	0.770	0.660	0.771	0.669	0.779	0.648	0.750
Flexible schedule	0.558	0.687	0.507	0.665	0.499	0.660	0.867	0.817

Source: Author's calculations derived from the ALP (2017–2018).

Notes: Age 50–79, working for pay, $N = 1,288$. Weighted statistics. The wording of the question about workers' current job was 'We would like to learn about your [current/main job]. Does it have any of the following [requirements/features]?' The wording of the question about workers' future job was 'Please continue to assume that you would be looking for a new job sometime [after age 60/in the future]. Do you think the job you would look for at that time would have any of the following [requirements/features]?' The answer options were: (1) Absolutely yes, (2) Partly yes/partly no, (3) Absolutely no, or (4) It did not matter to me (for some questions). These responses were coded into a 0 to 1 scale: 'absolutely no' answers were coded as zero; 'partly yes/partly no', 'it did not matter to me', and missing answers were coded as 0.5, and 'absolutely yes' answers were coded as 1.

Our survey did not ask about whether employment was in the private or public sector, but we were able to link about 2/3 of the sample to prior ALP waves where employment sector was ascertained. Table C5 in the online appendix shows that current and future job demands do not vary much by sectors.⁶

To investigate the role of job demands and other factors on retirement, the survey also queried older employees directly whether various factors would limit their ability to keep their jobs until age 70. The factors asked about were: (1) Health problems, (2) Demands of the job, (3) Having to take care of others, (4) Business conditions, and (5) Employer would not extend contract. Table C6 in the online appendix shows that health problems and job demands were reported to be the most important limiting factors, on average. More than 50% of employees reported that health problems would moderately or greatly affect their ability to keep their jobs until age 70. Almost 50% identified demands of the job as moderately or greatly important factors. An interpretation is that these workers foresaw an increasing mismatch between their ability to perform the job and the demands of the job, which, at some point would not permit them to work until age 70. Fewer workers worried about the continuing availability of their job (labor demand): a little over half of the sample said that they were not at all worried that their employers would not extend their contract. We interpreted this to mean that most thought their employer would allow them to work until age 70. Just 15.2% were greatly

⁶Table C5 is based on information from three other ALP surveys preceding ours by 0–2 years. Even though we condition on employment status being the same, we cannot exclude the possibility that some respondents may have changed jobs between our survey and the prior ALP survey.

worried about it. Business conditions and caretaking obligations in general were somewhat more frequently identified as a potential barrier.

Overall, it appears that health and demands of the job are the factors that older workers most frequently worry about when they plan the length of their working lives, and the average older worker would prefer moving into jobs with lower cognitive and physical demands, but there is large heterogeneity in these preferences.

2.2 Subjective probabilities of working after age 70

In this section, we investigate how job characteristics predict retirement behavior as measured by the reported subjective probabilities of working after age 70, which we call P70. The survey asked the following question:

What are the chances that you will be doing any work for pay after you reach age 70?

We analyze the target age 70 rather than, say, 65 because the labor force participation rate after age 65 has been rapidly increasing and because of discussion about increasing the full Social Security retirement age beyond age 67. At times we will refer to P70 as ‘labor supply’.

Table 3 shows an OLS regression of P70 on the seven job characteristics discussed in the previous section, and an extensive set of control variables: demographics, health, income, labor force status, and psychological factors. The outcome variable (P70), as well as the availability of part-time work, and the availability of flexible hours are reported on a 0–100 scale, while the other five job characteristics are 0–1 categorical variables.

Flexible work hours and commute times were strong and statistically significant predictors of P70, even at the 1% level. Workers who commute less than an hour a day reported 5 percentage point higher probability of working after age 70 compared to those with longer commutes. Workers who could choose their hours flexibly (i.e., reported a 100% probability to be able to do so) reported an 8.3 percentage point higher probability of working after age 70 compared to those with rigid hours. These are quite large differences, as the mean of P70 is 28.6%.

The other five job characteristics are also positive predictors of P70, but their effects are not statistically significant. The results are similar if the job characteristics are added to the model one-by-one, except that telecommuting and physical job demands would become weakly significant predictors of P70 at the 10% level.

The full output in the online appendix shows that gender, age, income, and some psychological factors (mostly openness to new experience) also strongly predict P70. This is in line with results we found in Hudomiet *et al.* (2018c) using HRS panel data.

2.3 Subjective causal effects of job characteristics on retirement

A causal interpretation cannot be put on the results in Table 3 because workers may have sorted into jobs having those characteristics. To quantify the causal effects of specific job characteristics on the timing of retirement we use responses to questions about subjective conditional probabilities. These questions ask individuals about the chance that they would work after age 70 *conditional on various factors*, such as having flexible work hours or less physically demanding jobs. These questions can be used to estimate the subjective causal effect of the factors on retirement by altering the conditioning. The method corresponds to the experiment of altering a characteristic of a job and then observing a change in retirement behavior. The population response would depend on preferences, other job characteristics, economic resources, and constraints. For example, a worker with a defined benefit (DB) pension focused on a particular retirement age would be less responsive than a worker with a defined contribution (DC) plan. The population average would be the average treatment effect. But, our method accommodates analysis of heterogeneity in response because we observed within-person

Table 3. OLS regression of the subjective probability of working past age 70

	Coefficient	Standard error
Availability of job characteristics		
Employer would allow part-time	0.045	[0.033]
Employer would allow flexible hours	0.083	[0.031]***
Can work from home	2.303	[2.113]
Commute less than 60 min a day	4.959	[1.872]***
Current and future job features		
Current job cognitive score	1.924	[4.776]
Current job physical score	1.04	[3.031]
Current job social score	6.209	[4.718]
Other controls		
Constant	YES	
	112.625	[16.964]***
R^2	0.154	
N	1,043	

Source: Author's calculations derived from the ALP (2017–2018).

Notes: Age 50–69, working for pay, $N = 1,043$. Weighted statistics. Control variables include gender, race, age, education, marital status, self-reported health, family income, labor market states, cognition, and personality traits. The full output of the model is available in the online appendix. Missing job characteristics, typically due to unavailability in certain labor market states, were replaced by their respective medians.

responses. Our approach is related to stated preferences, with the important difference that the probability format of subjective conditional probabilities offers individuals the opportunity to express uncertainty.

2.3.1 The measures

Apart from minor wording differences, these questions used the following format, with [X] referring to the condition whose effect on retirement we estimated:

Suppose that [X]. In this case, what are the chances that you would be doing any work for pay after you reach age 70?

The conditions are the following:

- (1) *Flexible hours*: ‘...your employer allowed you to flexibly choose your work schedule as long as you worked the required number of hours’.
- (2) *Less stress*: ‘...there were jobs available to you that involved little or no stress with the same pay and job demands as your current job’.
- (3) *Less physical*: ‘...there were jobs available to you that required little or no physical effort and offered the same pay as your current job’.
- (4) *Self-employed*: ‘...you became self-employed at some point’.
- (5) *Short commute*: ‘...there were jobs available to you that were very close to your home with the same pay and job demands as your current job’.
- (6) *Telecommute*: ‘...you had the opportunity to work from home either at your current job or at a different job’.
- (7) *Less concentration*: ‘...there were jobs available to you that required little concentration and attention with the same pay and job demands as your current job’.
- (8) *Part-time*: ‘...you moved into a part-time position at your current employer at some point’.
- (9) *Good health*: ‘...when you reach age 70 your health is excellent, very good or good’.
- (10) *More wealth*: ‘...you were to inherit \$500,000’.
- (11) *Higher wage*: ‘...Congress changed the tax system in a way that all workers above age 70 would bring home 20% more in wages compared to what they currently make’.
- (12) *Longer life*: ‘...scientists discovered a new medicine that added an extra ten years to your life’.

Some questions did not apply to those workers who were already experiencing the condition described. Therefore, (1) was asked only of employees who reported less than 100% probability that their employer would allow them to flexibly choose their hours (asked earlier in the survey); (4) was only asked of employees who reported less than 100% probability of ever becoming self-employed; (5) was only asked of workers who commuted at least an hour a day; and (8) was asked only of full-time employees who reported less than 100% probability that they would switch to a part-time position at their current employer.

To examine question wording effects, we used randomized formats for (10), (11), and (12). The detailed results are reported in Hudomiet *et al.* (2018b), and here we provide a short summary. We found that the three versions⁷ of question (10/more wealth) were similar, so we used them as if they were the same question. The three alternative versions⁸ of (11/higher wage) yielded different response patterns, so here we only used the one that best approximates a causal interpretation (shown above). Two out of three alternatives⁹ of (12/longer life) were similar, and therefore we used both here.

For some of the questions we asked about counterfactual conditional probabilities, in which the condition is ‘turned off’. For example, we altered (9) to ask about bad as opposed to good future health. And we sometimes also asked about the probability of the condition. For example, we asked the subjective probability that the person’s health would be good at age 70.

2.3.2 Estimation of the subjective causal effects

Let $\Pr_i(W_{70}|X)$ denote the subjective probability of working conditional on random variable X . X takes the value of 1 if the particular condition is satisfied (e.g., health at age 70 is good), and takes the value of 0 if the condition is not satisfied (e.g., health at age 70 is not good). The subjective causal effect of the condition is then:

$$\Delta_i^X = \Pr_i(W_{70}|X = 1) - \Pr_i(W_{70}|X = 0), \quad (1)$$

where Δ_i^X denotes the subjective causal effect of X (e.g., good health) on retirement for individual i . Then the mean of Δ_i^X in the sample is the *average subjective causal effect* of X on retirement. Because Δ_i^X is available at the individual level, we can also use them as left-hand variables of OLS regressions to analyze heterogeneous subjective treatment effects.

The simplest way to estimate Δ_i^X is by asking two conditional probability questions in the survey (conditioning on the two possible values of X) and using formula (1). This approach was used only for condition (9) Good health.

We used a slightly modified version for (11) Higher wage. We asked about two conditional probabilities. $\Pr_i(W_{70}|\Delta y = 20\%)$ is the subjective probability of working after age 70 conditional on a 20% wage increase (see wording above), and $\Pr_i(W_{70}|\Delta y = -20\%)$ is the same probability under the condition that wages go down by 20%. Then the subjective causal effect of a 20% wage change was defined as

$$\Delta_i^{\text{wage}} = \frac{\Pr_i(W_{70}|\Delta y = 20\%) - \Pr_i(W_{70}|\Delta y = -20\%)}{2}. \quad (2)$$

⁷The second version was similar to the wording we listed above but added an introductory sentence: ‘Now please think about your situation today, including your current health and financial situation’. The third version did not mention inheritance: ‘Suppose you had \$500,000 more in financial assets than you do today’.

⁸The second version was similar to (11), but further specified that the person’s health at age 70 would be excellent, very good, or good. The third version used a more compact wording that did not mention the tax system or the timing of the wage change: ‘Now imagine that you earned 20% more than you do now...’.

⁹The second version was similar to what we listed above but added the following clarifying clause: ‘but all other aspects of your life would be unchanged’. The third version, which we ignore in this paper, added that the extra 10 years would be healthy years.

For the rest of the conditions, the counterfactual conditional probabilities (under $X=0$) were not available in the survey. For most cases we approximated them with the unconditional probability of working past age 70, P_{70} . Then the subjective causal effect was approximated as

$$\Delta_i^X \approx \Pr_i(W_{70}|X=1) - \Pr_i(W_{70}). \quad (3)$$

This approximation is valid if the condition (under $X=1$) refers to a change from the status quo. For example, the longer life condition in item (12) proposes the discovery of a new drug that is not available and not even discussed in public, and so it seems reasonable to assume that the counterfactual conditional probability equals the unconditional probability, $\Pr_i(W_{70}|X=0) = \Pr_i(W_{70})$. This approach was used for the following conditions: (2) Less stress, (3) Less physical, (5) Shorter commute, (6) Telecommute, (7) Less concentration, (10) More wealth, and (12) Longer life. We worded these questions to refer to a change from the status quo. But it is possible that some individuals did not interpret the question the way we intended. The subjective causal effects reported by these individuals would be biased toward zero, but we expect this bias to be small in the sample.

For the remaining three conditions, (1) Flexible hours, (4) Self-employment, and (8) Part-time, we used survey data on the probability of the condition, denoted by $\Pr_i(X=1)$ which was available in the survey. For example, we asked employees about the probability that they will ever become self-employed. Then we used the law of total probabilities to estimate the counterfactual conditional probability:

$$\Pr_i(W_{70}|X=0) = \frac{\Pr_i(W_{70}) - \Pr_i(W_{70}|X=1)\Pr_i(X=1)}{1 - \Pr_i(X=1)} \quad (4)$$

The few cases where the estimated probabilities were outside the $[0,1]$ interval were censored at 0 or 1. Then we entered this estimate into (1) to obtain the subjective causal effects.

Subjective conditional probabilities provide a rich framework to evaluate policies and study causal relationships. The value of these data depends on whether survey answers represent beliefs that individuals use to forecast their own future behavior and circumstances, and whether these forecasts are accurate. One concern is the ‘fill-in problem’ (Hudomiet *et al.*, 2018b): when individuals report $\Pr_i(W_{70}|X)$, do they provide *ceteris paribus* answers, or do they fill-in different unspecified future conditions depending on the value of X ? For example, when we ask about retirement probabilities conditional on having a job with flexible work hours, some individuals may infer that their (unspecified) wage rate would be higher and their future health would be better than in the counterfactual state. The fill-in problem can be mitigated by using ‘*ceteris paribus*’ question wording or specifying the future environment more precisely, but these complicate question wording. Using randomized question formats Hudomiet *et al.* (2018b) showed some evidence that the fill-in problem was a relatively minor concern for the retirement expectations conditional on wealth and income.

2.3.3 Results

Panel A of Table 4 shows the average subjective causal effect of job characteristics, and panel B shows the effects of health, wealth, earnings, and longevity. Both panels are based on the sample of 50- to 69-year-old workers; the factors are ordered by effect sizes within the panels. Column 2 shows the average probabilities of working after 70 if the particular condition (e.g., flexible schedule) is not available, and column 3 shows the analogous probability if the condition is available. Then column 4 shows the difference, which is our estimate of the average subjective causal effects of the condition. The values in each row are estimated on the same sample, but the samples across the rows are different due to sample restrictions on some questions, as discussed earlier, and due to item non-response.

Of the 12 factors considered, health has the strongest effect on labor supply. The fraction of those who would work after age 70 would be twice as great if the health of individuals at age 70 were good, very good, or excellent compared to fair or poor (39.5% vs. 18.5%, or an increase of 21.0 percentage

Table 4. Subjective causal effect on P70 of job characteristics and other factors

	N	Probability of working past age 70		Subjective causal effect ([3] – [2])	
		Without condition	With condition	Mean	s.e.
		Mean	Mean	[4]	[5]
	[1]	[2]	[3]		
Panel A: Job characteristics					
A.1. Employer offers flexible schedule	656	17.2	32.2	15.0	1.4
A.2. Job not stressful	990	33.4	44.6	11.2	0.9
A.3. Job requires no physical effort	975	33.3	44.3	11.0	0.9
A.4. Become self-employed	712	27.7	38.5	10.8	1.6
A.5. Short commute	243	29.3	38.3	9.1	1.7
A.6. Work from home	989	30.5	39.3	8.9	0.9
A.7. Job requires no concentration	972	33.4	41.4	8.0	0.9
A.8. Switch to part-time at current emp.	543	31.4	35.6	4.2	1.3
Panel B: Other factors					
B.1. Health: good or better	1,018	18.5	39.5	21.0	0.7
B.2. Wealth: \$500k more	1,007	32.6	16.4	–16.2	0.9
B.3. Wage: 20% change	338	27.1	37.2	10.1	0.7
B.4. Longevity: 10 more years	662	31.2	32.6	1.4	1.0

Source: Author's calculations derived from the ALP (2017–2018).

Notes: Weighted statistics. Each row is restricted to 50–69-year-old workers with non-missing subjective causal effect estimates. Those who answered 'Don't know' or skipped any relevant questions were dropped from the analysis. (A.1) is only available for employees who reported less than 100% probability that their employer would allow them to flexibly choose their hours. (A.4) is only available for employees who reported a less than 100% probability of ever becoming self-employed. (A.5) is only available for workers who commute at least an hour a day. (A.8) is only available for full-time employees who reported less than 100% chance that they will switch to a part-time job at their current employers. (B.3) is only available for a random third of the sample. (B.4) is only available for a random two-thirds of the sample. For (B.3), the 'with condition' case corresponds to the probability of working if wages were 20% higher, and the 'without condition' corresponds to the average probability if wages were 20% higher or 20% lower.

points). Wealth also has a fairly strong effect on labor supply above age 70: inheriting \$500,000 would reduce labor supply by 16.2 percentage points, from 32.6% to 16.4%. These elasticities are large, but they are in line with other findings in the literature showing that labor supply elasticities increase with age as individuals get closer to the margin of leaving the labor force (Blundell *et al.*, 2016). The rest of the factors in panel B have somewhat smaller effects. A 20% wage change would change labor supply by 10.1 percentage points,¹⁰ and an extra 10 years longevity would increase labor supply by only 1.4 percentage points.

With respect to working conditions, we found that working in jobs that permit flexible hours had the largest subjective causal effect. According to our estimates it would increase the subjective probability of working after age 70 by 15 percentage points on a base of 17.2%. This effect is similar to the effect of inheriting \$500,000, and considerably larger than a 20% increase in take-home pay. Flexible hours, thus, seem to be very important to older individuals.

The stress level of the jobs, physical demands, and ability to become self-employed also show large effects, increasing labor supply by more than 10 percentage points, or roughly the same as a 20% change in wages. Short commuting time (estimated on the sample that commutes at least an hour a day), having the option to telecommute, and having a job that does not require concentration had slightly lower effects of about 8–9 percentage points. Switching to a part-time job at an individual's current employer would not affect labor supply by much.

We investigated the heterogeneity in the subjective causal effects of selected conditions by observable factors. To that end we estimated the average subjective causal effects of selected factors by various subgroups. The results are shown in Table 5.¹¹

¹⁰Recall that this effect is computed as the average of the responses to a 20% wage increase and a 20% wage decrease, because the counterfactual of 0% wage change was not elicited in the survey.

¹¹The online Appendix shows tables with the average probabilities of working after 70 if the particular conditions are not available (Table C7), or if they are available (Table C8).

Table 5. Subjective causal effect on P70 of job characteristics and other factors by population subgroups

	N	Flexible schedule	No stress	No physical	Self emp.	Short commute	Health good	\$500k	Wage 20%
By gender									
Male	518	19.0	9.3	10.0	9.8	10.7	20.4	-17.4	8.8
Female	642	10.4	13.4	12.2	12.0	7.3	21.7	-14.9	11.7
By education									
High school or less	157	16.8	8.8	10.3	2.0	-3.2	19.5	-17.9	6.7
Some college	411	11.3	14.2	12.7	11.4	18.7	22.1	-15.3	11.7
College	592	15.7	11.2	10.5	17.1	10.9	21.4	-15.5	10.7
By race and ethnicity									
Non-Hispanic white	924	12.8	9.1	8.5	11.0	7.7	21.0	-18.2	10.3
Non-Hispanic black	94	31.6	10.0	10.3	12.6	-6.5	25.4	-15.8	11.3
Non-Hispanic other	42	25.5	19.4	21.3	14.4	21.9	17.5	-4.6	8.1
Hispanic	100	9.5	18.8	19.5	7.1	20.9	20.1	-12.6	8.8
By health									
Excellent	161	16.2	11.1	10.9	13.0	8.5	24.5	-10.2	8.2
Very good	507	14.3	9.4	8.3	5.9	0.3	19.8	-18.2	9.7
Good	378	16.3	15.2	15.3	16.8	20.0	20.6	-16.1	11.8
Fair	94	12.9	6.2	10.2	9.3	21.2	23.6	-15.6	5.7
Poor	20	-1.4	-1.6	-1.9	16.1	-13.6	23.2	-11.9	14.5
By labor force status									
Full-time employee	731	14.9	11.7	11.5	9.3	9.2	20.0	-17.4	9.7
Part-time employee	227	15.7	15.9	15.5	19.6	4.5	21.6	-12.5	10.4
Full-time self-emp.	97	-	1.3	1.7	-	7.1	25.5	-15.7	10.7
Part-time self-emp.	105	-	7.7	6.8	-	25.0	24.8	-11.7	13.3

Source: Author's calculations derived from the ALP (2017–2018).

Notes: Weighted statistics. See Table 4 for definitions and sample restrictions. Bolded numbers indicate subgroups with the largest causal effects in absolute value.

The subjective causal effects of most factors are similar among males and females, but the labor supply of men appears to be more responsive to flexible work hours. The average effect is 19 ppts (percentage points) among males vs. 10 ppts among females. Males' labor supply also seems to be more responsive to commute times (10.7 ppts vs. 7.3 ppts), while females are more responsive to stress (13.4 ppts vs. 9.3 ppts) and wages (11.7 ppts vs. 8.8 ppts).

The differences by education were more pronounced, suggesting highly educated individuals' labor supply to be more sensitive to stress, physical requirements, becoming self-employed, commuting times, and wages. We found notable differences by race. The labor supply of non-Hispanic whites tends to be less responsive to most job characteristics, and more responsive to wealth and wages. For example, having flexible work hours would increase labor supply among non-Hispanic whites by 12.8 ppts, while the effects among blacks, persons of other race, and Hispanics are 31.6, 25.5, and 9.5 ppts, respectively. Inheriting \$500k would decrease labor supply by 18.2 ppts among non-Hispanic whites, which exceeds the corresponding numbers among minorities.

The labor supply of individuals in bad health (i.e., fair or poor) tends to be less responsive to job characteristics, likely because it is more difficult for them to work in any jobs. Interestingly, their labor supply would be most responsive to health itself. The average subjective causal effects of commute times, as well as wages, are also relatively large in this group.

Current labor market status is a weak predictor of subjective causal effects. Compared to full-time employees, part-time employees care more about stress, physical demands, and being self-employed,

but care less about wealth. The labor supply of self-employed is less responsive to stress, and physical demands, and less responsive to health and wages.

2.3.4 Properties of conditional probabilities

Tables C9 and C10 in the online appendix investigate some methodological properties of conditional subjective probabilities. Table C9 shows the fraction of the sample whose responses reflect a ‘corner solution’ of 0% or 100% limiting the size of the subjective causal effects. We found that a small, but non-negligible fraction of the sample would never work after age 70 ($P_{70} = 0$) independently of the values of the conditions. For example, 14.5% report $P_{70} = 0$ when the job is posited to be not stressful, which is similar to the 19.8% reporting $P_{70} = 0$ if the job involves stress. The fraction expressing certainty to work after age 70 ($P_{70} = 100$) tends to be smaller than the fraction expressing certainty not to work after age 70 ($P_{70} = 0$).

An interesting additional result in Table C9 is that 60.2% of individuals say that they would surely not work after age 70 (i.e., the probability of work would be 0%) if they did not have flexible work hours. This is by far the strongest predictor of this outcome.

In Table C10, we investigated the fraction of the sample with 0% causal effects vs. positive or negative effects. We found that about a third of the sample are not responsive to the conditions, and about 2–31% of the sample (depending on the condition) gave answers that were in the wrong direction; that is, P_{70} decreased when a desirable condition was assumed. People gave the least consistent answers to the longevity question.

3. Conclusion

The decision about when and how to retire can be complex for many workers. Many factors influence this choice such as workers’ health, abilities, and preferences for job characteristics and leisure activities, as well as employers’ demands, government regulations, and other institutional factors.

Using a newly designed survey of over 2,000 individuals aged 50–79, this paper explored the role of workers’ preferences for job characteristics to understand their role in the retirement process. Our survey included questions about three related sets of outcome variables: (1) workers’ current and desired job characteristics; (2) subjective probabilities of working after age 70; and (3) workers’ subjective conditional probabilities of working after age 70 if certain job characteristics were available to them. We presented cross-tabulations between these outcome variables and covariates of interest, such as gender and labor force status, and OLS regressions with a rich set of predictor variables.

We found that less than half of older workers reported that they could flexibly choose their work hours, could switch to a part-time position, or telecommute. These favorable working conditions are far from universal among older workers in the United States.

We found that most workers were worried about health and the demands of their jobs when considering their prospects of working longer. At the same time, relatively few workers were worried that their employers would not allow them to stay at the firm. When looking at older workers’ current and desired job features, we found that most people would like to move to a less cognitively and less physically demanding job compared to their current one, while they would prefer jobs with more social opportunities, with more comfortable temperatures, and with more flexible schedules. We also found large differences in preferences by gender, labor force status, income, and psychological factors.

When we analyzed the subjective probabilities of working after age 70, we found that the strongest predictors were commute times, and whether the worker has flexible work hours. We then analyzed the subjective causal effects of working conditions on working past age 70 using a novel methodology based on subjective conditional probability questions. We found that flexible work hours had the largest effect, which would increase the subjective probability of working after age 70 by 15 percentage points on a base of about 17%, thus having a larger effect than a 20% change in wages. Work stress, the physical demands of jobs, the opportunity to become self-employed, short commuting time, and having the option to telecommute were also relatively important, in this order. The option to take a part-

time job, which is often argued to be more suitable for older workers, however, does not seem to have a large effect on individuals' retirement expectations. These findings suggest that policies that increase older workers' abilities to choose their work hours more flexibly may have the largest impact on delaying their retirement. It is important to note that our analysis does not account for the (potential) costs to employers of offering schedule flexibility. It would be interesting for future research to complement our analysis by examining the costs of various policies to employers. In a recent paper Ameriks *et al.* (2020) argue that 'labor force participation near or after normal retirement age is limited more by a lack of acceptable job opportunities [...] than by unwillingness to work longer'. Though their claim is based on indirect evidence, it suggests that successful policies aiming at increasing the retirement age need to engage employers.

Overall, having flexible work hours and having short commutes were the factors that consistently came out as important determinants of labor supply and retirement across most of our models. Moreover, demands of the jobs, especially the cognitive demands of individuals' future jobs as well as stress, were also strong predictors of retirement.

In interpreting these findings, it is important to keep in mind that they are based on observational data, and that the outcome variables were stated preferences. The external validity of such stated preference measures has not been established. If preferences change with age, stated retirement expectations may not match subsequent retirement behavior, especially if workers cannot accurately forecast such preference changes. Nonetheless, with RCTs on working conditions or policy variables largely unavailable, eliciting subjective conditional probabilities to obtain causal effects – albeit subjective – seems a valuable innovation to complement other approaches.

There are several mechanisms that can explain the observed patterns in P70. For example, we found that many older workers expressed some preference for having flexible work hours. Our survey, however, did not reveal why older workers want such flexibility, what type of jobs they would prefer and how much they would be willing to sacrifice for it. Flexible hours, for example, may help older workers better manage minor health problems, and it may also allow spending more time with friends and family. Our results are based on *ceteris paribus* type questions, but in the labor market flexibility may come at the cost of a reduced wage. If that were the case the overall effect on retirement would be reduced. Flexible hours may also mean different things to different people. Many highly skilled jobs offer hour flexibility to workers as an in-kind benefit. At the same time, an increasing share of lower skilled workers work in an alternative work arrangement (Katz and Krueger, 2016) such as Uber and Lyft. These jobs may offer more flexibility, but at the same time they offer less employment stability and, in some respects, less favorable working conditions than traditional jobs.

We documented large heterogeneity in workers' preferences for job characteristics preceding retirement, and some of this heterogeneity was explained by observable characteristics, such as health, current job characteristics, cognitive ability, or personality traits. These heterogeneities imply that there is no one job type that fits all older workers' desires. The differences between workers' current job attributes and the ones they desire for their jobs preceding retirement suggest that increased flexibility from either adjusting tasks on the job or changing jobs would help workers realize their preferences. In some cases, institutional factors limit that flexibility. For example, workers with a defined benefit pension plan usually cannot transfer those benefits to another job. According to our results, the largest impact on delaying workers' retirement may be achieved by allowing older workers to choose their work hours more flexibly. This is rather starkly brought out by our estimate that 60% of our sample would surely not work at age 70 ($P70 = 0$) if their jobs provided no hours flexibility.

Supplementary material. The supplementary material for this article can be found at <https://doi.org/10.1017/S1474747220000025>.

Acknowledgements. The research and data collection were supported by the Alfred P. Sloan Foundation (G-2014-13537) and by the National Institute on Aging (P01AG008291). Jessica Hayes provided excellent programming assistance.

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Appendix A

Table A1. Descriptive statistics about the analytic sample

		Unweighted		Weighted	
		Mean	s.d.	Mean	s.d.
Female	2,177	0.538	0.499	0.503	0.500
Age	2,177	63.04	7.53	58.36	7.01
Non-Hispanic white	2,177	0.819	0.385	0.673	0.469
Non-Hispanic black	2,177	0.071	0.256	0.108	0.311
Non-Hispanic, other race	2,177	0.033	0.178	0.056	0.230
Hispanic	2,177	0.078	0.268	0.163	0.369
High school or less	2,177	0.146	0.353	0.356	0.479
Some college	2,177	0.356	0.479	0.276	0.447
College or more	2,177	0.497	0.500	0.368	0.483
Married	2,177	0.623	0.485	0.676	0.468
Divorced/separated	2,177	0.200	0.400	0.183	0.387
Widowed	2,177	0.079	0.269	0.048	0.213
Never married	2,177	0.098	0.298	0.093	0.291
Health excellent	2,177	0.115	0.319	0.106	0.308
Health very good	2,177	0.406	0.491	0.393	0.489
Health good	2,177	0.317	0.466	0.341	0.474
Health fair	2,177	0.122	0.328	0.120	0.325
Health poor	2,177	0.040	0.195	0.040	0.195
Log family income	2,177	10.98	0.85	10.99	0.90
Full-time employee	2,177	0.345	0.475	0.477	0.500
Part-time employee	2,177	0.130	0.336	0.128	0.334
Full-time self-employed	2,177	0.051	0.220	0.058	0.234
Part-time self-employed	2,177	0.066	0.248	0.045	0.208
Not working	2,177	0.408	0.492	0.291	0.454
Cognitive job (current job)	1,288	0.679	0.227	0.670	0.225
Cognitive job (last job)	889	0.709	0.230	0.674	0.231
Physical job (current job)	1,288	0.282	0.315	0.348	0.344
Physical job (last job)	889	0.308	0.336	0.400	0.373
Social job (current job)	1,288	0.682	0.207	0.687	0.206
Social job (last job)	889	0.692	0.212	0.679	0.215
Number series score	2,177	0.000	1.000	-0.081	1.032
Neuroticism	2,177	0.000	1.000	0.045	1.005
Extroversion	2,177	0.000	1.000	0.022	0.995
Agreeableness	2,177	0.000	1.000	0.002	1.012
Conscientiousness	2,177	0.000	1.000	-0.047	1.012
Openness	2,177	0.000	1.000	-0.074	1.029

Source: Author's calculations derived from the ALP (2017–2018).