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HOW DO JOB SKILLS THAT DECLINE WITH AGE AFFECT WHITE-COLLAR WORKERS?

By Anek Belbase, Geoffrey T. Sanzenbacher, and Christopher M. Gillis*

Introduction

As people age, their reaction times slow, flexibility diminishes, and strength declines. These changes in physical and sensory abilities are easy to spot. Thus, research on retirement timing assumes that people in blue-collar jobs, which often rely on these abilities, will retire relatively early. Conversely, researchers often assume that white-collar workers can retire later. But the cognitive abilities needed for many white-collar jobs, like memory and mental speed, also decline with age. And some white-collar jobs also rely on physical or sensory abilities – for example, oral surgeons must have dexterous fingers, steady hands, and excellent eyesight. These observations raise an obvious question: can all white-collar workers remain productive well into their sixties and, if not, which jobs are most vulnerable to age-related decline?

To answer these questions, this *brief* presents a "Susceptibility Index," which measures how likely the physical and cognitive abilities required by an occupation are to decline during the working years.[1] Using the Index, this *brief* identifies white-collar jobs in which older workers could have a hard time remaining productive, ultimately leading to earlier retirements. This analysis has implications for policymakers and researchers, who often suggest working longer as a way to boost retirement income security and who may implicitly assume that it will be easier for white-collar workers.

This *brief* proceeds as follows. The first section describes the Susceptibility Index. The second section illustrates that even though blue-collar jobs are more likely than white-collar jobs to rely on abilities that decline relatively quickly, some white-collar jobs may be quite hard to continue for those in their sixties. The third section describes how the Index affects the retirement timing of white-collar workers, using the *Health and Retirement Study* (HRS). The fourth section concludes that white-collar workers with jobs that rely on abilities that decline early will face similar difficulties as blue-collar workers in extending their worklives.

The Susceptibility Index

Constructing the Susceptibility Index for a given occupation involves three steps: 1) determining which abilities the occupation relies on; 2) identifying which of the abilities decline early; and 3) combining this information into a single number.

* All of the authors are with the Center for Retirement Research at Boston College (CRR). Anek Belbase is a senior research project manager, Geoffrey T. Sanzenbacher is a research economist, and Christopher M. Gillis is a research assistant.

For the first step, this study uses the *Occupational Information Network* (*O*NET*) database to measure ability requirements for over 900 occuptions. The *O*NET* surveys job-holders, occupational analysts, and occupational experts to measure the importance of each ability for each occupation. The *O*NET Content Model* identifies the importance of 52 abilities that contribute to a worker's capacity to do the job, using a scale from 1 (not important) to 5 (very important). It covers both cognitive abilities (e.g., deductive reasoning, memorization), physical abilities (e.g., explosive strength, manual dexterity), and sensory abilities (e.g., night vision, sound localization).

The second step identifies which of the 52 abilities decline during the working years by relying on the literature from a wide range of fields, including gerontology, psychology, medicine, and occupational studies. The initial focus is on cognitive abilities, which are most commonly associated with white-collar jobs. This review indicates that "crystallized" cognitive abilities, such as vocabulary, tend to accumulate well into an individual's sixties and even seventies.[2] Thus, skills like oral and written comprehension and mathematical reasoning are often maintained throughout a career. Workers in white-collar occupations that rely on these abilities – like college professors or bookkeepers – may be able to work longer without noticeable declines. On the other hand, "fluid" cognitive abilities, such as episodic memory, working memory, and inductive and deductive reasoning – which people need to acquire new information and make decisions – steadily decline with age starting in a worker's twenties or thirties.[3] Chief Executive Officers, for example, frequently rely on these abilities to make decisions based on new information.

Of course, white-collar jobs do not just rely on cognitive abilities. Many also rely on a class of "psychomotor" abilities that involve a mix of both the cognitive and the physical to coordinate fine movements. For example, nurse practitioners must possess arm-hand steadiness to carry out duties like performing a suture, while airline pilots must be able to react quickly with their hands or feet to a signal, like a sound or light. Indeed, the research shows that fine manipulative abilities and reaction time do decline early in workers' careers because they require coordination between different parts of the body, which in turn requires a combination of balance, flexibility, depth perception, and the sense of touch, all of which decline somewhat early in life.[4]

Once we know, for each occupation, which abilities are important and which are likely to decline, the final step is to combine this information into a single number, a Susceptibility Index score. The computation involves simply adding the importance levels of abilities that decline for a given occupation and dividing by the sum of the importance levels for all of the relevant abilities for the occupation. Table 1 walks through this three-step process in more detail for the job of "budget analyst."

Table 1. Constructing the Index Using the Example of Budget Analysts

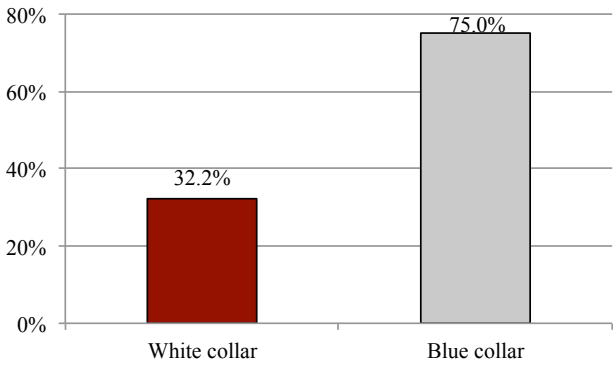
Description of Steps	Example for "Budget Analysts"
Step 1: Identify abilities important to the occupation using the O*Net importance score and sum to get the aggregate importance score for all 52 abilities.	The aggregate importance score for all 52 O*Net abilities is 110, with the abilities of "deductive reasoning," "oral comprehension," and "information ordering" holding scores over 3, indicating high importance.
Step 2: Identify the importance of abilities that decline early in a worker's career and sum to get the aggregate importance score for only those abilities.	The aggregate importance scores for only the abilities that decline, including "deductive reasoning" and "information ordering," is 45.
Step 3: Calculate the Susceptibility Index as the ratio of the sum calculated in Step 2 to the sum calculated in Step 1.	The Susceptibility Index is 45/110 or 41 percent.

Source: Authors' literature review and Susceptibility Index calculations (see Belbase, Sanzenbacher, and Gillis, 2015).

Susceptibility by Occupation

The Index can be used to answer a number of questions. For example, are blue-collar jobs really harder to do with age relative to white-collar jobs? And do any white-collar jobs have high Index values? Figure 1 answers the first question by dividing occupations into white- and blue-collar jobs and then ranking them by their Index values (a percentile value of 70 would indicate the occupation has a higher Index than 70 percent of all occupations). The higher the percentile, the harder the job is to do with age. Figure 1 illustrates that blue-collar jobs really do become more difficult to perform with age.

Figure 1. Average Susceptibility Index Percentile by Occupation Type



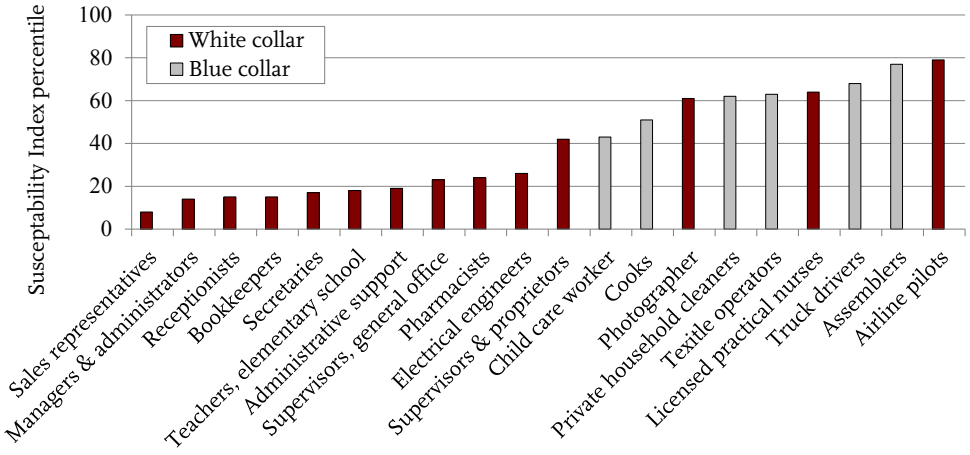
Source: Authors' literature review and Susceptibility Index calculations (see Belbase, Sanzenbacher, and Gillis, 2015).

Figure 2 answers the second question by showing that indeed some white-collar jobs are harder to do with age than some blue-collar jobs. For example, photographers have a higher Index percentile than either cooks or private household cleaners. The reason is that both cooks and cleaners use little physical strength in their work and rely on cognitive abilities that generally do not show early decline. On the other hand, photographers rely on fluid cognitive skills like inductive and deductive reasoning that, on average, start to decline early in life and decline significantly by the time most workers plan to retire. Intuitively, the finding that some white-collar occupations are highly susceptible to age-related decline suggests that workers in these occupations would be expected to retire earlier than workers in other white-collar occupations.

Retirement Timing of White-Collar Workers

To determine how many workers are in each occupation and how the higher Index values translate to retirement timing, we turn to a sample of older workers in the *Health and Retirement Study* (HRS). Specifically, the analysis uses data from waves 1-11 of the HRS, collected between 1992 and 2012. Early retirement is defined variously as: 1) retirement before age 63; 2) retirement before age 65; and 3) retirement before age 67. These ages are important due to their relation to Social Security. By looking at individuals who retire

Figure 2. Susceptibility Index Percentiles for Selected Occupations by Type of Worker



Source: Authors' literature review and Susceptibility Index calculations (see Belbase, Sanzenbacher, and Gillis, 2015).

before 63, everyone in the sample is allowed to work until their first year of Social Security eligibility. The later ages – 65 and 67 – represent past and future "Full Retirement Ages." Our definition of early retirement looks at individuals who come up short of each of these dates.

The sample consists of all individuals working at the interview closest to their 58th birthday (the "age-58 interview") in a white-collar occupation and who reach the age of early retirement by 2012.[5] We assign an individual the percentile-ranking of the Index for their age-58 occupation.[6] Table 2 contains information on the share of workers in each occupational group as well as the share of workers in each occupational group above and below the median Susceptibility Index for the full sample. Table 2 is consistent with information provided in Figures 1 and 2: blue-collar workers are in jobs that are harder to do with age, but some white-collar workers are in a similar situation.

Table 2. Variation in Susceptibility Index Percentiles by Occupation Type

	White collar	Blue collar
Share of workers in occupation	59.4%	40.6%
Share above 50%	21.4	91.4
Share at or below 50%	78.6	8.6

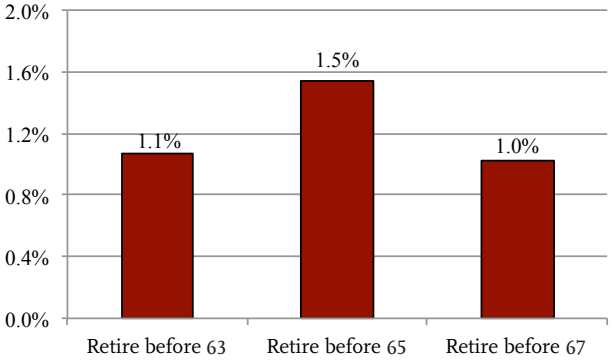
Source: Authors' calculations from University of Michigan, *Health and Retirement Study* (HRS) (1992-2012).

Aside from the Index, our model also includes controls for individual-level demographic and job characteristics that may alter the retirement date. The demographic variables include an individual's education, race, gender, and region. Variables related to the individual's employment status include self-employment and indicators for the presence of a defined benefit or defined contribution pension at a prior job. A particularly important control variable is an individual's health, which has an obvious impact on his retirement date. To gauge health, we create indicator variables for 13 health conditions that are asked in each wave of the HRS and add them up at the individual's age-58 or age-55 interview to create a health index taking on a value of 0 (best health) to 13 (worst health).[7]

To control for the possibility that certain aspects of a worker's life unrelated to their occupation change between age 58 (when their occupation is identified) and the early retirement date, the empirical approach also controls for certain "shocks." These shocks include changes in the health index, a layoff or business closing, or a spouse's illness or retirement. Controlling for these events, which may lead to early retirement and also may be correlated with occupation, ensures that the effect of the Index is limited to the effect of occupation on retirement and does not include changes that workers in those occupations are more likely to experience relative to other workers.

The results of incorporating the Index in this model of retirement timing show that for each 10-percentile increase in the Index, the probability of retiring before 63, 65, and 67 increases by 1.1, 1.5, and 1.0 percent, respectively, for white-collar workers (see Figure 3).[8] For example, a white-collar worker in the 75th percentile of the Index is 7.5 percent more likely to retire before age 65 than a worker in the 25th percentile (1.5 x 5), even controlling for other characteristics of the worker. Simply put, even for some white-collar workers, working longer is made more difficult by the abilities required by their job.

Figure 3. Marginal Effect of 10-Percentile Increase in Susceptibility Index on Probability of Retirement for White-Collar Workers



Note: All results are statistically significantly different from the base case at least at the 5-percent level.
Source: Authors' calculations from the 1992-2010 HRS.

Conclusion

Researchers and policymakers frequently suggest that individuals should work longer to boost their retirement preparedness. Often it is assumed that while this advice may be difficult for blue-collar workers to follow, white-collar workers can more easily extend their careers. This *brief* offers an important qualification. While it is true that blue-collar workers are more likely to rely on abilities that decline early, workers in some white-collar occupations face similar challenges. Indeed, for white-collar workers that rely on fluid cognitive abilities, quick reaction times, and fine motor skills, retirement tends to occur relatively early. Thus, the notion that all white-collar workers can work longer or that all blue-collar workers cannot is too simplistic. Instead, it is important to consider the particular abilities required by an occupation and whether these abilities decline significantly by the time workers reach typical retirement ages.

Endnotes

1 This *brief* is based on Belbase, Sanzenbacher, and Gillis (2015). For more information on methodology, please see the full study.

2 Schaie and Willis (2010); Salthouse (2010).

3 Singh-Manoux et al. (2012); Salthouse (2012); and Gross et al. (2011). All workers do not experience declines in fluid cognitive ability, as considerable variance exists between workers (see Ylikoski et al. 1999).

4 For literature on fine manipulative abilities and reaction time, see Verhaeghen (2013); and Czaja and Sharit (1998). For declines in balance, see Rosenhall and Rubin (1975); on flexibility, Golding and Lindsay (1989); on depth perception, Bell, Wolf, and Bernholz (1972) and Fozard (1990), and on touch Bruce (1980). For more detail on the literature review and on the full list of abilities considered and their final categorization, see Belbase, Sanzenbacher, and Gillis (2015).

5 If an individual is not working at their age-58 interview, they are excluded from the analysis to maintain the distance between the time an individual is observed in an occupation and the various measures of early retirement.

6 In contrast, Figures 1 and 2 use the percentile relative to other occupations, not other workers.

7 These 13 conditions include eight health conditions and five limitations to activity of daily living. The health conditions included are: 1) "high blood pressure with medication;" 2) "diabetes with insulin;" 3) "cancer of any kind, seeing doctor;" 4) "activity limiting lung disease;" 5) "heart condition, taking medication;" 6) "emotional/psychological problems;" 7) "stroke with problems afterward;" and 8) "arthritis with medication." The limitations to activities of daily living are: 1) "needs help bathing;" 2) "needs help getting dressed;" 3) "needs help eating;" 4) "needs help using a map;" and 5) "needs help walking." A similar index, albeit using a slightly different set of health indicators, was used by Dwyer and Mitchell (1999).

8 For full regression results, see Appendix. In Belbase, Sanzenbacher, and Gillis (2015), we find that the Index is less predictive of early retirement for blue-collar workers, especially once controls are introduced. This result may follow from the fact that health is a more important driver of retirement for blue-collar workers than the actual nature of their occupation.

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APPENDIX

Table A1. Probit Regression Results Estimating Retirement by Various Ages

Variables	Retire by 63		Retire by 65		Retire by 67	
Job-Related Initial Conditions						
Susceptibility Index Percentile (in 10s)	0.0107	**	0.0154	***	0.0103	***
	(0.001)		(0.000)		(0.000)	
Self employed	-0.08252	**	-0.02895		-0.02817	
	(0.038)		(0.036)		(0.029)	
Employer-covered health insurance	-0.15355	***	-0.11245	***	-0.04674	**
	(0.030)		(0.027)		(0.020)	
Retiree health insurance	0.25016	***	0.27311	***	0.15304	***
	(0.025)		(0.024)		(0.020)	
Previous defined benefit plan	-0.01334		0.01610		0.02430	
	(0.027)		(0.026)		(0.020)	
Defined benefit plan	-0.06127		-0.07520	*	-0.03837	
	(0.041)		(0.038)		(0.030)	
Defined contribution plan	-0.00700		0.01317		0.01384	
	(0.023)		(0.022)		(0.016)	
Job tenure	-0.00002		-0.00044		-0.00052	
	(0.001)		(0.001)		(0.001)	
Job tenure x defined benefit plan	0.00575	***	0.00513	***	0.00271	*
	(0.002)		(0.002)		(0.001)	
Wealth-Related Initial Conditions						
Current earnings	-0.00033		-0.00023		-0.00015	
	(0.000)		(0.000)		(0.000)	
Pension income	0.00201		-0.00000		-0.00032	
	(0.002)		(0.001)		(0.000)	
Financial wealth	-0.00002		-0.00005	***	-0.00003	**
	(0.000)		(0.000)		(0.000)	
Health-Related Initial Conditions						
Health index	0.02881	***	0.02553	***	0.00962	
	(0.010)		(0.010)		(0.008)	
Family-Related Initial Conditions						
Married	0.13671	***	0.09404	***	0.03015	
	(0.033)		(0.034)		(0.027)	
Presence of resident child	0.04306		0.01532		0.03179	
	(0.030)		(0.030)		(0.024)	
Spouse's current earnings	0.00140	***	0.00104	***	0.00033	
	(0.000)		(0.000)		(0.000)	
Spouse covers health insurance	-0.00303		0.00769		0.00913	
	(0.033)		(0.031)		(0.023)	

Variables	Retire by 63		Retire by 65		Retire by 67	
Spouse works	0.02659		0.01237		0.04008	
	(0.036)		(0.034)		(0.026)	
Spouse is in fair or poor health	-0.05970	*	-0.04754		-0.00176	
	(0.035)		(0.034)		(0.026)	
Job-Related Shocks						
Different employer	-0.06648		-0.06605	*	-0.04841	
	(0.043)		(0.039)		(0.030)	
Involuntary job loss	0.26033	***	0.20670	***	0.14570	***
	(0.034)		(0.027)		(0.016)	
New job after involuntary job loss	-0.29294	***	-0.28369	***	-0.30764	***
	(0.057)		(0.072)		(0.079)	
Partially retires	-0.01594		-0.05740	**	-0.11737	***
	(0.029)		(0.025)		(0.020)	
Wealth-Related Shocks						
Financial gain of at least 40%	-0.07308	***	-0.09510	***	-0.03952	**
	(0.025)		(0.023)		(0.018)	
Financial loss of at least 40%	-0.04151		0.02152		0.01728	
	(0.029)		(0.030)		(0.024)	
Health-Related Shocks						
Health index difference	0.05076	***	0.02214	*	-0.00219	
	(0.015)		(0.012)		(0.008)	
Retiree health insurance x health index difference	-0.06470	***	-0.05115	***	-0.02265	*
	(0.021)		(0.019)		(0.014)	
Family-Related Shocks						
Marital status change	-0.06571	**	-0.10704	***	-0.07160	***
	(0.031)		(0.028)		(0.022)	
Resident child leaves home	-0.05364		-0.06903	*	-0.06415	**
	(0.037)		(0.038)		(0.033)	
Spouse retires	0.01121		0.03051		0.02407	
	(0.029)		(0.025)		(0.018)	
Spouse continues work	-0.20670	***	-0.16017	***	-0.09770	***
	(0.032)		(0.031)		(0.024)	
Number of observations	2,671		2,736		2,766	

Notes: Statistically significant at 10-percent (*), 5-percent (**), or 1-percent level (***). Robust standard errors in parentheses.
Source: Authors' calculations from the 1992-2010 HRS.

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Contact Information

Center for Retirement Research
Boston College
Hovey House
140 Commonwealth Avenue
Chestnut Hill, MA 02467-3808
Phone: (617) 552-1762
Fax: (617) 552-0191
E-mail: crr@bc.edu
Website: http://crr.bc.edu

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