"Aging in a Changing Economy: Skills in Adolescence and Employment Status at Midlife"

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Abstract

The ability to hold a job is crucial to economic success and overall wellbeing, and it may be particularly important at midlife when people accumulate the majority of their retirement savings. Studies that focus only on the contemporaneous correlates of employment status ignore the pre-labor market factors that prepare people for work across the life course. Using High School & Beyond sophomore cohort (HS&B:SO), we find that individuals' math-related skills and locus of control at the end of high school are related to their employment status at midlife. People with higher math achievement test scores are more likely to be working and less likely to be out of the labor force due to disability at midlife. Further, individuals who did not advance beyond basic math courses are least likely to be working at midlife. In addition, having a greater sense of personal control in adolescence protects individuals against being out of the labor force due to disability at midlife. The connections between skills in adolescence and employment at midlife operate partially through educational attainment and employment experiences but maintain an independent relationship, as well. These findings suggest that pre-labor market skills not only sort individuals into higher education and occupations but also may enable them to adapt to their circumstances to maintain an attachment to the workforce as they age.

It is well established that workers' pre-labor market skills and education play an important role in determining the kinds of jobs they get. These skills may also help people get promoted, learn on the job, and even manage and adapt to workforce challenges. The skill-biased technological change in the U.S. economy over the past few decades has created many such challenges for workers whose pre-labor market skills were developed before increased computerization had a widespread impact on work environments and employer demands. For these individuals, skills may have been especially important in determining how they fared in the workforce (Cortes 2016). Understanding how workers have endured this economic transformation sheds light on the kinds of skills that help people adapt and remain in the labor force.

People who completed high school near the beginning of the technological change are still of working age today but are now entering middle age, and how they navigated the changing economy has contributed to their employment situation at midlife. Work during these preretirement years is a vital component of long-term wellbeing, especially with life expectancy increasing and the burden of saving for retirement shifting heavily toward workers. At midlife, people are accumulating the majority of their retirement savings and are more susceptible to the economic and psychological effects of job loss (Gallo et al. 2000; Mitchell & Moore 1998; Virick 2011). Employment experiences at midlife set the stage for the quality of transitions into old age and retirement. Middle-aged individuals without a strong attachment to the workforce face a future of economic vulnerability, and the stakes at this point in the life course are especially high.

Though researchers have often focused on contemporaneous correlates of employment status, such studies ignore the potential importance of the skills that individuals develop earlier in life that prepare them for work across the life course. The skills that individuals possess in high school help shape their educational and occupational pathways, and these skills may differentially enable them to manage and adapt to their circumstances in the future. We take advantage of the recent midlife follow-up of the High School and Beyond sophomore cohort (HS&B:SO) (Muller et al. 2016) to examine how the pre-labor market skills of a cohort who transitioned to adulthood in the midst of the technological change are related to their employment status over thirty years later, at midlife. Although people may not be employed for a number of reasons, the emergence of health conditions may make it particularly difficult for some individuals to maintain an attachment to the labor force as they age (Burr et al. 1996; Hayward et al. 1989; Jenkins 1991). This is a cohort that has begun to encounter these health

conditions at midlife, after having experienced vast technological transformation in the workforce and the Great Recession. Their pre-labor market skills may have helped determine who was well-equipped and positioned to endure these challenges.

We focus, in particular, on individuals' math-related skills and locus of control in high school. Having better math-related skills may enable people to maintain an attachment to the workforce as occupational skill demands have increasingly concentrated on analytic and STEM-related skills, especially for the best jobs. Better math-related skills and a greater sense of personal control could contribute to more favorable employment experiences, better health management, or greater ability to adapt in the face of adversity. By concentrating on individuals' skills at the end of high school, we can better understand the early determinants of barriers to work during the crucial pre-retirement years. In this study, we seek to identify protective factors at a time that is particularly amenable to intervention, as high schools are well-situated to help students gain the skills that can promote working across the life course. This research can enrich our knowledge of how skills in adolescence might be placing individuals on trajectories of work and wellbeing as they age.

Working at Midlife

A job is more than just a source of income; it is a fundamental social role and source of identity (Brand 2015; Lachman 2004). Having a career and stable employment have been repeatedly espoused as critical sources of social integration (Durkheim 1933; Wilensky 1961; Wilson and Musick 1997). Given the societal importance of work, employment status is a powerful signal of social status for people of working age (Young 2012). Further, employed individuals experience significantly slower declines in perceived health and physical functioning

compared to the non-employed, even after adjusting for differences in economic wellbeing (Ross and Mirowsky 1995).

Work is particularly important at midlife, when individuals may experience their peak in occupational position and earnings (Lachman 2004; Mendenhall et al. 2008) and also may bear financial and time burdens of caring for their children and aging parents. Separation from the workforce in the pre-retirement years can have severe financial consequences because that is the period in which people accumulate most of the wealth that will finance their retirements (Mitchell & Moore 1998). This is especially important considering that people are now working longer than they did twenty years ago due to declines in pensions and retiree health benefits, as well as increased concerns about the ability to afford retirement in the face of increased life expectancy (Mermin et al. 2007; O'Rand 2011; Virick 2011). In addition, changes to Social Security since the 1980s have led to increases in labor force participation among older workers because working longer is incentivized for eligibility to obtain full benefits (Blau & Goodstein 2009; O'Rand 2011). Considering the financial, social, and health benefits of employment, people who are not working at midlife face significant adversity.

As people age, their health plays an increasingly important role in their ability to remain in the workforce. An individual exits the workforce due to disability when they have a health limitation that prevents them from being able to work; thus, the disability depends both on their health status and their working conditions (Crimmins et al. 1999; Jenkins 1991; Nagi 1965; Verbrugge & Jette 1994). Because work disability depends on the relationship between a person's abilities and their work environment, it may be avoided by either improving someone's capabilities or by reducing the demands of their work environment (Brandt et al. 2011; Crimmins et al. 1999; Nagi 1965; Verbrugge & Jette 1994).

Higher-skilled workers may be able to avoid disability through preventative health practices or adapt to limiting conditions by changing to a different job; whereas, lower-skilled workers may have less access to health care and fewer occupational options due to a lack of qualifications for higher-paying and less physically-demanding jobs (Hayward et al. 1989). Further, the unemployed face lower opportunity costs of exiting the labor force due to disability; thus low-skilled and low-wage workers who could qualify for disability benefits may be induced to exit the labor force when faced with the prospect of prolonged unemployment (Autor and Duggan 2003). Regardless of the circumstances that precipitate it, exiting the workforce due to disability can lead not only to economic hardship but also to professional and social marginalization (Jenkins 1991; O'Brien 2013). Unable to work, people who exit the labor force due to disability are detached from one of the most economically and socially important institutions of modern life.

Though generally a less permanent status than work disability, unemployment negatively impacts people's financial and emotional wellbeing, and the effects of unemployment may last for years even after re-employment (Young 2012). When the unemployed eventually find new jobs, these new jobs generally pay lower wages and have poorer working conditions (Brand 2006; Fuller 2008; Gangl 2006; Roscigno et al. 2007). Beyond financial losses, being unemployed decreases one's health over time relative to being employed (Ross & Mirowsky 1995). Older workers may be more vulnerable to physical and mental health consequences of job loss (Gallo et al. 2000). They are less able to psychologically, financially, and socially deal with job loss than their younger counterparts (Virick 2011). Further, at midlife, workers face a particular risk of unemployment and barrier to reemployment due to age discrimination (Burr et al. 1996; Phillips Lassus et al. 2015; Mendenhall et al. 2008; O'Rand 2011; Roscigno et al.

2007). Employers may value younger and less senior workers because they can pay them less and perceive them as having more updated skills (Mendenhall et al. 2008; Phillips Lassus et al. 2015; Roscigno et al. 2007; Virick 2011). A study by Roscigno and colleagues (2007) found that workers nearing 50 years old and those close to retirement are the most vulnerable to age discrimination in employment and that the discrimination is most likely to entail termination from the workplace. Thus, age discrimination may serve as the source of unemployment, a barrier to re-employment, or both.

As with the unemployed, retirees and homemakers looking to (re-)enter the labor force would undoubtedly face obstacles due to age discrimination and skill obsolescence (Burr et al. 1996; Mendenhall et al. 2008; O'Rand 2011; Roscigno et al. 2007; Virick 2011). Further, Ross and Mirowsky (1995) found that the detrimental health effects of retirement or homemaking were as bad as or worse than the effects associated with unemployment. Though retirement may be seen as a more voluntary exit than work disability, some retirements follow periods of protracted illness or disability or are due to worker discouragement, leaving retirees financially unprepared and/or in poor health (Burr et al. 1996; Hayward et al. 1989; O'Rand 2011). Indeed, many people who retire early have to re-enter the workforce to maintain household income due to insufficient retirement funds (O'Rand 2011).

People who are currently middle-aged transitioned to adulthood at a time when the economy was on the brink of a major shift. Over the past three decades, the U.S. labor market has polarized, with the employment share for mid-skill jobs markedly decreasing (Acemoglu and Autor 2011). A common explanation is that mid-skill jobs were susceptible to automation, and computerization then increased the demands for high-skilled workers, hollowing out the middle of the workforce (Acemoglu and Autor 2011; Goldin and Katz 2008). Middle-aged individuals

gained their pre-labor market skills prior to the polarization, and their skills may have played a large role in determining how well they adapted in the workforce (see Cortes 2016). In addition, midlife is a time when the socioeconomic gradient in disability may be the strongest (House et al. 1994), so it is a time when skills may play a particularly important role in the ability to hold a job.

High School and the Transition to Adulthood

Though individuals' employment later in life is a product of their circumstances at that time, it is important to also look back to the earlier skills that have structured occupational pathways and imbued individuals with the means necessary to maintain a strong attachment to the labor force (see Halpern-Manners et al. 2015; Schafer et al. 2013; Raymo et al. 2011). After all, adolescents do not transition to adulthood as blank slates; they carry attributes with them that lead to different decision-making processes, behaviors, and experiences across the life course that can have very real consequences in their adult lives. For students in the United States, high school serves as the early bookend to their transition to adulthood and the highest level of compulsory education. In fact, one vital function of high schools is preparing students to transition to their adult roles in society. The transition to adulthood is important in understanding the adult life pathway – it connects individuals' origins with subsequent adult attainments (Hogan and Astone 1986).

The end of high school represents a critical period in the life course, which sets individuals on different trajectories (Schafer et al. 2013). Whether students continue on to postsecondary education or enter the workforce, the completion of high school is the starting point from which students will commence their future adult lives and careers. Though all students technically share the same starting point upon completion of high school, they are not

similarly equipped to navigate their futures. Students leave high school with the same credential but not the same skills (Bills 2003). People's skills at the completion of high school may have a particularly important relationship to outcomes at midlife because attributes at this juncture influence subsequent pathways and choices across the life course, and returns to skills increase with labor market experience (see Altonji 1995; Murnane et al. 1995; Rosenbaum et al. 1999). A strength of our study is that we have contemporaneous measures of pre-labor market skills for middle-aged individuals. Thus, we can investigate how these early skills shape their employment at midlife by setting them on divergent trajectories and providing them with differential resources for managing their health and careers.

Educational Attainment and Occupational Characteristics

Skills play a role in sorting individuals into higher education and occupations that influence their labor force participation and position them for maintaining health over the life course (Cutler & Lleras-Muney 2010; McDonough et al. 2001; Yelin et al. 1980). In general, people with higher cognitive and non-cognitive skills complete more education (Lleras 2008), enter better occupations, and enjoy higher earnings (Cawley et al. 2001; Conti et al. 2010; Farkas 2003; Hall & Farkas 2011; Kerckhoff et al. 2001). Further, previous research has found that higher cognitive skills translate into higher status occupations and higher earnings, irrespective of people's educational attainment (Kerckhoff et al. 2001). Because many of today's best-paying and least physically-demanding jobs involve technology or analytic tasks, better skills may enable individuals to obtain these desirable jobs either directly or through higher education (Rose & Betts 2001).

Considering that people with better skills are more likely to complete higher education (Adelman 2006; Aughinbaugh 2012; Joensen and Nielsen 2009; Karlson 2015; Lleras 2008),

part of the relationship between skills in adolescence and employment status at midlife may operate through educational attainment. A bachelor's degree is required for most good jobs today (e.g., Carnevale and Desrochers 2002; Hout 2012; Kalleberg 2011), and to the extent educational attainment sorts workers into occupations, our measures of occupational characteristics may capture a portion of those advantages. Yet, educational attainment may also be related to employment status due to its association with workers' health. It is well established that more education leads to better health (Lynch 2006; Freedman and Martin 1999; Walsemann et al. 2008; Ross and Wu 1995), and better health may allow individuals to maintain a stronger and longer attachment to the workforce. People with more education engage in healthier behaviors, have stronger social relationships and support, and experience less personal and financial stress (House et al. 1994). In addition, a recent study found that people's education alone predicted better health behaviors at midlife, even independent of early-life cognitive selection into education (Clouston et al. 2015). Considering the link between pre-labor market skills, educational attainment, and midlife employment status, we explore educational attainment as a possible mechanism in the link between skills in adolescence and midlife employment status.

Occupational characteristics are likewise inherently tied to labor force attachment, as people with less physical jobs may be able to work longer, especially in the face of declining health as they age (Burr et al. 1996; Hayward et al. 1989; Jenkins 1991). The physical characteristics of work are particularly important in determining labor force exit due to disability (McDonough et al. 2001; Yelin et al. 1980). In addition, people with higher-paying occupations may be more likely to be working at midlife, as they may be motivated to maintain longer attachment to the labor force because the opportunity costs of workforce exit are higher (Autor

and Duggan 2003; Burr et al. 1996). To account for the importance of occupational characteristics, we investigate whether the relationship between people's pre-labor market skills and their midlife employment status may operate, in part, through the physical demands and wages associated with their occupations.

Research suggests that occupational experiences at different points in the life course may influence employment status at midlife. Older workers experience a great deal of occupational mobility; on average, 42% of exposure in the late career is spent in occupations other than the longest occupation (Hayward et al. 1998). Moore and Hayward (1990) found that the effects of older men's current or last occupation on mortality differ from the effects of their longest-held occupation. Likewise, people's occupations earlier in life may influence their midlife employment status through the heavier physical demands, wages, and job security. However, differences between occupations may be more meaningful at midlife, as some workers will have had a chance to experience upward occupational mobility while others remained stagnant across their careers. We hypothesize that people's pre-labor market characteristics matter not only because they sort them into jobs in early adulthood but also because better skills may enable people to adapt to changing health and economic conditions by switching occupations later in life. Therefore, we look at respondents' occupational characteristics in early adulthood and at midlife to better understand how the relationship between people's pre-labor market characteristics and midlife employment status may be operating through occupational advantages.

Skills in Adolescence

In an increasingly polarized and knowledge-based economy, individuals' skills may be vital to maintaining a strong attachment to the workforce. Math-related skills are a specific set

of cognitive skills that may be particularly important to maintaining labor force attachment in today's economy. Farkas and colleagues (1997) found that people with higher cognitive skills had more cognitively demanding jobs and higher wages, even controlling for the effects of schooling, work experience, and social class background. More specifically, a study by Bishop (1991) found that individuals with higher math skills enjoyed higher predicted job performance, lower rates of unemployment, and higher earnings. People's math test scores represent their grasp of math content, which may pertain to particular jobs, but that only encapsulates one dimension of math-related skills (Rose & Betts 2001).

When students take advanced math courses, they also gain logic and reasoning skills that are conducive to productivity in general (Gaertner et al. 2013; Rose & Betts 2001). Skills gained through learning advanced math may also teach students how to learn, which enables them to move up and obtain higher status positions within occupations (Rose & Betts 2001). In fact, one of the most popular explanations for a link between math and labor market outcomes is that students with better math skills might enjoy higher earnings (Bishop 1991; Joensen and Nielsen 2009; Rose & Betts 2004). Advanced math coursework prepares students for the labor market, but it also prepares them for success in higher education (Gaertner et al. 2013) and makes them more likely to go to college (Adelman 2006; Aughinbaugh 2012; Joensen and Nielsen 2009; Karlson 2015). Thus, math coursework may capture individuals' math-related preparation and learning beyond what a math achievement score alone can provide.

Considering that the majority of people are still working at midlife, people's math coursework may be related to their employment status in a few different ways. The relationship may simply be linear, with each higher math course increasing a person's odds of working. However, we may instead see a cutoff where only math courses above a certain level increase a

person's odds of working. This cutoff may be Algebra 2 if the relationship between math courses and employment status largely operates through educational attainment, as taking Algebra 2 or higher is a good indicator of college preparedness (Adelman 2006). On the other hand, in light of the polarizing labor market, it may be that the very lowest levels of math relegate people to the worst jobs and constrain their opportunities to pursue higher education or obtain higher-skill jobs. A low math cut-off would be in line with previous research on course-taking that found the largest gap in the probability of graduating high school between students who took no rigorous courses and students who took just one rigorous course (Long et al. 2012).

Math skills may play an important role in determining who has access to the types of jobs in later life that may foster employment, especially considering the skill demands of higher-paying and less physically-demanding jobs (Rose & Betts 2001). Math-related skills may especially benefit older workers, who are more vulnerable to skill obsolescence and less likely to be retrained (Mendenhall et al. 2008; Roscigno et al. 2007; Virick 2011). Accordingly, individuals with skills that employers need may be in a better position to avoid unemployment during economic downturns. In particular, people with better math skills may possess the types of skills that promote learning and adaptability in the face of changing occupational demands later in life.

Likewise, math skills in adolescence may protect against health-related workforce exits later in life. Previous research shows that individuals with higher cognitive skills enjoy better health (Conti et al. 2010) and are less likely to have a health limitation (Auld and Sidhu 2005). People with better math skills may hold better jobs in early adulthood and therefore develop fewer health conditions because of favorable working conditions and greater financial resources, or they may be well-situated to adapt in the face of potentially disabling conditions and remain in

the workforce at midlife. Though we cannot completely ascertain if math skills behave in this manner, we investigate whether part of their relationship to people's employment status at midlife operates through the physical demands and wages of their jobs both in early adulthood and at midlife.

Along with math-related skills, a greater sense of personal control in adolescence may be protective of working at midlife due to the attendant health- and work-related advantages and a greater ability to adapt in the face of adversity. A person's locus of control indicates the extent to which a person feels they have control over what happens to them in their lives. Research shows that people with an internal locus of control engage in positive health behaviors such as seeking health information, taking medication, making and keeping physician appointments, maintaining a diet, and giving up smoking (Wallston & Wallston 1978). People with an internal locus of control also experience better mental well-being, life satisfaction, and self-reported physical health (Ng et al. 2006), and they experience slower rates of decline in physical function over time (Kempen et al. 2006; Milaneschi et al. 2009). If people with an internal locus of control in adolescence engage in healthier behaviors over the course of their lives, they may be less likely to be out of the workforce due to disability at midlife because they may be in better health or able to manage any health conditions more effectively.

In addition, people with an internal locus of control enjoy a host of work-related advantages such as greater autonomy, variety, and challenge in their work tasks and higher job satisfaction, commitment, and motivation (Ng et al. 2006). Further, individuals with an internal locus of control feel more self-efficacious and empowered (Ng et al. 2006); they take a more active role in their career management and have more positive career experiences, including more promotions (Hammer & Vardi 1981). These work-related advantages may lead people

with an internal locus of control to develop a stronger attachment to the labor force, as they may have better jobs or job performance than people with a more external locus of control. In addition, a feeling of control over their lives may enable individuals to adapt in the face of adverse employment circumstances such as potentially disabling health conditions or job loss (Clarke & Smith 2011), and they may be better situated to continue working by seeking out workplace accommodations or re-employment.

Research Questions

In sum, this paper investigates two main research questions:

(1) Do individuals' cognitive and non-cognitive skills in adolescence predict their employment status (whether they are working, unemployed, out of the labor force due to disability, or otherwise out of the labor force) at midlife?

(2) Is this association between skills in adolescence and midlife employment status explained by educational attainment during early adulthood, and/or by occupational characteristics in early adulthood or at midlife? Alternatively, are adolescents' skills independently related to employment status at midlife?

DATA AND METHODS

Data and Sample

This study uses data from the sophomore cohort of High School and Beyond (HS&B:SO). HS&B:SO began as a nationally-representative sample of about 30,000 high school sophomores in the United States in 1980. A representative subsample of this cohort (N=14,825) was drawn for a longitudinal panel followed up with surveys in 1982 (First Follow-Up), 1984 (Second Follow-Up), 1986 (Third Follow-Up), 1992 (Fourth Follow-Up), and 2014 (Fifth Follow-Up). This dataset is particularly well-suited to investigate the relationship between

adolescent skills and employment status at midlife, as it includes a range of adolescent skill measures and labor market, education, and demographic characteristics in early adulthood and at midlife. In addition, the cohort transitioned to adulthood in the midst of a major technological change in the economy. Further, the Fifth Follow-Up focuses on persons of current working age and gives insight into processes affecting the present workforce.

For this study, we use data from the First Follow-Up when respondents were in their senior year of high school, the Fourth Follow-Up when respondents were approximately 28 years old, and the Fifth Follow-Up when respondents were approximately 50 years old. We only include respondents who responded to the Fifth Follow-Up (N=8,790[1]) (Muller et al. 2016). Because our models include occupational measures from sources that do not supply measures for military specific occupations, we also exclude all respondents who have a military specific occupation in the Fourth or Fifth Follow-Up, which we define as having an occupation with a Standard Occupational Classification (SOC) code that falls in the major group "Military Specific Occupations." This drops approximately 100 respondents from our sample, and ancillary analyses including the military respondents with imputed values on these measures produce substantively identical results. Applying these filters results in a final sample of about 8,620 respondents.

Measures

Employment Status at Midlife. The dependent variable is a categorical measure that indicates a respondent's self-reported employment status as of the Fifth Follow-Up in 2014 (0=currently working, 1=exited labor force due to disability, 2=unemployed, 3=retired/homemaker). Due to small cell sizes, we collapse response categories, but we do so in

[1] Sample sizes for restricted-use data are rounded to the nearest ten per NCES guidelines.

such a way that labor force attachment is reflected in the groupings. We combine "unemployed" and "temporarily laid off, on sick or other leave" into one category to represent persons still in the labor force but not currently working; in addition, we combine retired and homemaker into one category to reflect persons who may be considered as having voluntarily exited the labor force. We count respondents as missing if they indicated an employment status of "other," which removes about 100 people from our sample.

Independent Variables of Interest

Math Achievement Score. The math achievement score comes from the First Follow-Up, when most respondents were in their senior year of high school. It is scaled according to Item Response Theory (IRT) and indicates the estimated number of correct answers had the student answered each test item. The standardized math IRT is respondent's math IRT score, standardized to a mean of 0 and standard deviation of 1 for the entire First Follow-Up sample. Using measures from the senior year of high school captures the skills that a respondent possessed at the end of their high school education and prior to entering postsecondary education and/or the workforce.

Math Coursework. Respondents' highest math course is determined using the Classification of Secondary School Courses (CSSC) codes from student transcripts, We create a categorical measure to indicate the highest math course that a respondent completed during high school (0=general math/Pre-Algebra, 1=Algebra 1, 2=geometry, 3=Algebra 2, 4=advanced math or above). We include a measure for math coursework to capture dimensions of math-related skills beyond math ability, which is measured by the math achievement score.

Locus of Control. The locus of control measure is based on a scale that is constructed from respondents' answers to a series of questions on the First Follow-Up, during their senior

year of high school. The scaled score is standardized to a mean of 0 and standard deviation of 1 for the entire First Follow-Up sample. The variable is coded such that a lower score indicates a more external locus of control and a higher score indicates a more internal locus of control.

Possible Mechanisms

Educational Attainment. The educational attainment variable indicates a respondent's highest academic degree as of the Fourth Follow-Up in 1992, at approximately age 28 (0=no postsecondary degree, 1=Associate's degree, 2=Bachelor's degree or higher). This variable is constructed using self-reported educational attainment, in addition to degrees reported on secondary and postsecondary transcripts.

Physical Demands and Average Wage of Occupation in Young Adulthood. Respondents' verbatim responses describing their occupations in the Fourth (1992) Follow-Up were coded into 2010 SOC 6-digit codes. We used a crosswalk to convert the 2010 SOC codes of respondents' most recent occupations as of the Fourth Follow-Up to 1990 Census codes, which we could match to 1991 occupation-level data. We construct a variable for the logged average occupational wages using data from the 1991 Current Population Survey. To measure the physical demands of occupations, we use the "Strength" measure from the 1991 Dictionary of Occupational Tasks (DOT), which ranges from 1-5 (sedentary to heavy demand) and indicates the general level of physical demand in the occupation.

Physical Demands and Average Wage of Occupation at Midlife. Respondents' verbatim responses describing their occupations in the Fifth (2014) Follow-Up were coded into 2010 SOC 6-digit codes. We then matched the SOC codes of respondents' most recent occupations as of the Fifth Follow-Up to occupation-level data to create occupational characteristics. We construct a variable for logged average occupational wages using 2013 Bureau of Labor Statistics data. We

used Occupational Information Network (O*NET) version 18.0 (2013) to construct measures of the physical demands of respondents' occupations. The physical demands measure is based on a scale that is constructed from O*NET items that provide information on the physical components of occupations. The scale is derived from a combination of two constructs, "physical tasks" and "repetitive physical tasks", used by Autor and Handel (2009) to capture the physical demands of a job. Table A3 details the O*NET items used in constructing the scale and provides the Cronbach's alpha for the scale. The scale is standardized to a mean of 0 and standard deviation of 1 for the entire O*NET version 18.0 occupational database.

Additional Covariates

Sociodemographic and School Covariates. All models include a host of sociodemographic and school covariates for respondents as of the First Follow-Up. The sociodemographic covariates include respondents' race, sex, family structure (1=lives with both biological parents, 0=other family structure), and two indicators of family SES – parent education (highest of 1980 and 1982 responses) and household income (continuous, using the averaged value of the midpoints of categorical responses in 1980 and 1982). Measures for high school sector (0=public, 1=Catholic, 2=other private) and urbanicity (0=urban, 1=suburban, 2=rural) are also included in all models.

Disability in 1982. All models include a control for respondent's disability status at the First Follow-Up in an attempt to account for existing disabilities in high school, as pre-existing disabilities may be correlated with skill development and course-taking and may impact later employment. The measure for disability in 1982 is a self-report of whether the respondent has a specific disabling condition.

Early Labor Force Attachment. In models that include occupational characteristics, we also include measures of respondents' labor force attachment in early adulthood (Fourth Follow-Up) to more fully account for the influence of early employment experiences and worker discouragement, considering the health declines associated with non-employment in general and the financially scarring effects of unemployment in particular (Brand 2006; Fuller 2008; Gangl 2006; Roscigno et al. 2007; Ross & Mirowsky 1995). Respondents reported employment status for each month of the year, so we include measures that indicate whether a respondent was unemployed for at least one month (0/1) or out of the labor force for at least one month (0/1) during 1991.

Analytic Plan

Our first research question investigates whether skills in adolescence are protective of working at midlife. We employ multinomial logistic regression to predict employment status at approximately age 50. Coefficients are reported as average marginal effects (AME), which are unsusceptible to changes in unobserved heterogeneity across logistic regression models (Mood 2010). To address our second research question, we employ nested models to assess the extent to which educational attainment, early adult occupational characteristics, and midlife occupational characteristics attenuate the associations between skills in adolescence and employment status at midlife. We use the survey command ("svy") in Stata 13 to incorporate appropriate student sample weights and adjust for clustering within schools. We use multiple imputation to handle missing data on independent variables.

RESULTS

Table 1 presents weighted descriptive statistics for all variables in the analytic sample, by employment status. On average, people who are working at midlife have higher math skills, a

more internal locus of control, and take higher levels of math compared to people who are unemployed or out of the labor force due to disability. For instance, over half of those not working due to disability and forty percent of the unemployed never took a math class at the level of Algebra 1 or above. People who are out of the labor force due to disability appear to have the lowest levels of education by 1992, with only 3% having a bachelor's degree or higher and 16% not finishing high school. Working individuals have the highest overall educational attainment, with 28% having a bachelor's degree or higher and only 4% not finishing high school. Though the unemployed fall between working individuals and those out of the labor force due to disability on these academic and skill measures, people who are retired or homemakers look quite similar to people who are working. Midlife occupational characteristics appear to vary more than early adulthood occupational characteristics across employment statuses. People who are working at midlife report higher-paying and less physically-demanding occupations, with people out of the labor force due to disability suffering a distinct disadvantage compared to working persons on both measures. Early adult labor force attachment seems to foreshadow midlife employment status, indicating patterns of weak attachment or detachment for the unemployed and retired/homemakers, respectively. Interestingly, people out of the labor force due to disability were about equally likely to have experienced periods of unemployment or labor force detachment in early adulthood. People out of the labor force due to disability also appear to come from particularly disadvantaged backgrounds, and only about 17% reported a disability at the end of high school.

[Table 1 about here]

Our first research question focuses on how math-related skills and locus of control at the end of high school are related to employment status at midlife. Table 2 presents average

marginal effects (AMEs) from multinomial logistic regressions predicting respondents' employment statuses in 2014. Model 1 presents the relationship between skills in adolescence and employment status at midlife, net of sociodemographic background and school controls. Respondents' math achievement test score in adolescence is significantly related to all employment statuses except being retired or a homemaker. Specifically, a one standard deviation increase in a respondent's math IRT score at the end of high school is associated with a 5 percentage point higher probability of working, a 3 percentage point lower probability of being out of the labor force due to disability, and a 1.4 percentage point lower probability of being unemployed at midlife. Having a higher (more internal) locus of control in adolescence significantly lowers the probability of work disability at midlife, but it is not related to any other category.

Independent of math achievement, taking a math course at the level of Algebra 1 or higher sizably increases a respondent's probability of working. This means that, regardless of an individual's math ability, taking intermediate or higher-level math courses increases one's chances of working at midlife relative to taking only low-level math courses. We proposed a few possible relationships between math courses and working at midlife. These results suggest that it is avoiding being in the *lowest* levels of math that matters. Taking higher-level math courses also seems to particularly lower the probability of being out of the labor force due to disability, though only coefficients for geometry and advanced math reach statistical significance. In addition, taking Algebra 1 slightly lowers a student's probability of being unemployed at midlife relative to students whose highest math course was below Algebra 1. Although having a highest math course at the level of Algebra 1 or higher seems to generally

support working at midlife, protection specifically against unemployment or exiting the workforce due to disability is less consistent.

Though the magnitude of some of these relationships may appear small, only about 7% of the weighted sample is out of the workforce due to disability and 5% unemployed at midlife, so a reduction in probability of 2-3 percentage points is a relatively strong protective effect. The coefficients in Model 1 indicate that the skills that people have at the end of high school matter for their labor force attachment over 30 years later. In particular, math skills are strongly protective of working, with both math achievement and math coursework providing independent advantages. Having a sense of more control over one's life in adolescence is only significantly protective against disability, which is consistent with previous literature showing the importance of attitudinal and psychosocial factors in shaping subsequent disability.

[Table 2 about here]

Our second research question investigates the role of educational attainment and occupational characteristics as possible mechanisms through which early skills influence employment status at midlife. Model 2 introduces occupational characteristics, educational attainment, and labor force attachment in early adulthood. Including these early adult measures attenuates the relationship between math achievement and employment status. The early adult measures account for about 28% of the relationship between people's math achievement and their probability of working and about 37% of the relationship to their probability of being out of the workforce due to disability. Educational attainment and occupational characteristics in early adulthood also account for a nominal portion of the association between math coursework and employment status, with the strongest attenuation occurring for advanced math or above (28% for working and 45% for disability).

Neither the average wages nor physical demands of respondents' occupations in early adulthood are significantly related to midlife employment status. However, early employment experiences do appear to be associated with later employment status, in that early labor force attachment seems to matter quite a bit. Being unemployed or out of the labor force for at least a month during 1991 significantly decreases a respondent's probability of working at midlife – by about 6 and 9 percentage points, respectively. Respondents who experienced unemployment or labor force separation in 1991 are more likely to have these statuses at midlife, as well. Due to data limitations, we cannot discern why individuals were out of the labor force in 1991 or whether the reasons people were out of the labor force in early adulthood are the same as they are at midlife. Interestingly, if someone was unemployed in young adulthood, they are also more likely to be out of the labor force due to disability at midlife. People's educational attainment operates in the expected direction – people with bachelor's degrees are most likely to be working, and high school dropouts are least likely. As with math coursework, being in the bottom of the educational distribution presents a major risk. Compared to high school graduates, lacking a high school diploma lowers one's probability of working almost twice as much as gaining a college degree raises it. Further, educational attainment seems to be uniquely protective against disability but has no specific relationship to unemployment or being otherwise out of the labor force.

The findings from Model 2 suggest that early adult educational attainment and occupational experiences account for part of the relationship between early skills and midlife employment status. The primary mechanisms from early adulthood appear to be educational attainment and spells of unemployment or labor force detachment during young adulthood. However, skills in high school remain significantly protective of working at midlife, even net of

postsecondary education and early occupational experiences. Thus, individuals' skills in high school are not related to employment status at midlife simply because they sort people into postsecondary education and occupations; these findings suggest that they also play a role beyond these early (dis)advantages.

Though educational attainment and early occupational experiences do not completely explain the relationship between skills in high school and midlife employment status, it may be that skills matter more as individuals accumulate labor market experience, allowing people to move into better occupations later in life. In Model 3, we introduce occupational characteristics from respondents' most recent occupation at midlife. Including midlife measures in the model results in a slight further reduction in the skills coefficients, but the same basic relationships between skills and employment status persist. People with higher math achievement still have a higher probability of working and a lower probability of being out of the labor force due to disability, net of educational attainment and both early adult and midlife occupational characteristics. In addition, mid-level math coursework in high school still increases one's probability of working at midlife and having an internal locus of control remains protective against disability, independent of all mechanisms. People's math achievement at the end of high school, in particular, shows a consistent independent relationship to midlife employment status, increasing their probability of working by about 3 percentage points and decreasing their probability of being out of the labor force due to disability by about 1.6 percentage points.

The physical demands of individuals' early adult occupations were not significantly related to midlife employment status, but people who held more physically demanding occupations at midlife are slightly more likely to be out of the labor force due to disability. People in occupations with higher average wages have a higher probability of working and a

lower probability of being retired or a homemaker. In addition, the same patterns persist for educational attainment, though midlife occupational characteristics do attenuate the relationships. Part of the reason people with bachelor's degrees are more likely to be working at midlife may be that they end up in occupations with higher average wages.

In sum, our results suggest that individuals' math-related skills and locus of control in adolescence are related to their employment status at midlife partially through educational attainment and occupational characteristics, but these mediators do not fully explain the association. This suggests that cognitive and non-cognitive resources in adolescence serve a function beyond sorting individuals into higher education and occupations; they may also influence decision-making processes or adaptive behaviors that shape labor force attachment far later in life.

DISCUSSION

The ability to hold a job is crucial at midlife, when people accumulate the majority of their retirement savings and are particularly vulnerable to the effects of job loss. However, individuals may face obstacles to work at midlife due to skill obsolescence or deteriorating health, and their susceptibility to and ability to weather these challenges influences their labor force attachment. Though previous research on employment has often focused on individuals' contemporaneous circumstances, this ignores the role that pre-labor market skills may play in preparing people for work across the life course. In this study, we investigated how the skills that students have at the end of high school are related to their employment status at midlife by setting them on divergent occupational trajectories and imbuing them with differential resources for managing their careers and health as adults. Educational and occupational pathways accounted for part of the relationship between skills in adolescence and employment status at

midlife, particularly occupational characteristics at midlife. However, our analyses showed that these attributes in adolescence were associated with employment status at midlife, even independent of educational and occupational pathways. Math-related skills remained independently protective of working, and math achievement and locus of control were independently protective against work disability. These results suggest that early life skills do not operate solely through educational and occupational advantages but that they may imbue individuals with the resources necessary to adapt in the face of adversity or changing circumstances.

While we cannot be certain that the associations observed in this study are causal, several explanations exist as to why skills may operate as protective resources and allow people to adapt in the labor force. As for math, it may be that persons with better math-related skills obtain more advantageous positions *within* their occupations through promotions or raises (Bishop 1991; Joensen and Nielsen 2009; Gaertner et al. 2013; Rose & Betts 2001); our occupation-level measures cannot account for individual variation in wages. It may also be that people with better math-related skills are in better health due to different decision-making processes across the life course (Clouston et al. 2015; House et al. 1994) or that they are more attuned to the costs and benefits of participating in the labor force. Because older workers are more vulnerable to skill obsolescence (Mendenhall et al. 2008; Roscigno et al. 2007; Virick 2011), we may also be observing a time when math-related skills are particularly important resources in the labor force.

We found that the math courses people took in high school were related to their employment status at midlife, even independent of their math achievement test scores. We proposed a few ways in which math courses may relate to employment status, and our findings supported the interpretation that it is people who only took the *lowest* levels of math in high

schools that were significantly less likely to be working at midlife. This may be because individuals who did not advance beyond the lowest math courses were relegated to the lowest status jobs and did not have the academic preparation necessary to to pursue higher education or transition to better occupations later in life. However, this relationship persisted even when accounting for differences in educational attainment and occupational characteristics, indicating that math courses do not merely sort students into higher education and occupations. Math courses teach students math content, but they also provide logic, reasoning, and learning skills that may support employment even thirty years later (Gaertner et al. 2013; Rose & Betts 2001). Yet, we cannot rule out that taking only lower-level math courses may simply reflect lower stocks of non-cognitive skills like motivation or persistence that also predict labor force attachment. Regardless of the exact explanation, our results show that students who fail to advance beyond the lowest levels of math are at greatest risk of not working later in life. This implies that math preparation matters not only for what kind of job a person has but also whether they have a job at all.

We found that math achievement did not offer much protection against unemployment and that having a highest math course at the level of Algebra 1 was the only factor that we measures that predicted midlife unemployment. The fact that few factors were associated with unemployment suggests that age discrimination might play a role in unemployment at midlife. Previous research suggests that age discrimination at midlife is likely to impact higher-status workers and those in skilled or semi-skilled occupations (Mendenhall et al. 2008; Roscigno et al. 2007), resulting in a possibly heterogeneous group of individuals who are unemployed at midlife. Lower-skilled workers may be underqualified or not in good enough physical condition for available jobs, and higher-skilled workers may be particularly vulnerable to age

discrimination because they command too high of a salary or can be replaced by recent graduates already trained in new technologies.

Having an internal locus of control in adolescence decreases a person's probability of being out of the labor force due to disability at midlife but is not otherwise related to employment status, implying a unique association with issues related to disability. Having a more internal locus of control may empower people to obtain better medical management of their health conditions (Wallston and Wallston 1978) or to take a more proactive role in adapting their work environment to their conditions through requesting accommodations or seeking different employment (see, e.g., Ng et al. 2006; Hammer and Vardi 1981). Having a greater sense of personal control may prevent individuals from developing health conditions in the first place; but, it likely also plays a role in shaping how people react in the face of potentially disabling conditions, allowing them to adapt instead of having to leave the workforce (Clarke & Smith 2011).

We did not find a significant relationship between early adult occupational wage or physical demands and midlife employment status. However, having educational credentials significantly predicted employment status, consistent with the changing skill demands of the economy. People with bachelor's degrees are more likely to be working at midlife than people with high school diplomas, and high school dropouts are significantly disadvantaged. Further, relative to finishing high school, completing a bachelor's degree provides significant protection against being out of the labor force due to disability at midlife, whereas failing to finish high school puts people at greater risk. This may be, in part, because people's level of education largely determines the kinds of jobs that are available to them (Brandt et al. 2011). For instance, if two people have the same physical limitation, and one has a bachelor's degree and the other is

a high school dropout, jobs may exist that either person could *physically* do but that only the bachelor's degree holder is qualified for. In that case, the high school dropout would have to exit the labor force due to disability, but the bachelor's degree holder could remain working. This highlights that disability is not inherent in a person but rather must be defined in terms of a context (Nagi 1965; Verbrugge & Jette 1994).

Though the physical demands and wages of early adult occupations were not associated with midlife employment status, people who experienced unemployment or labor force separation in early adulthood were also more likely to be unemployed or out of the labor force, respectively, at midlife. People who were not working in early adulthood – whether unemployed or out of the labor force – had a lower probability of being employed and a higher probability of being out of the labor force due to disability at midlife. This is consistent with Ross & Mirowsky's (1995) assertion that non-employment may be detrimental to individuals' health over time, and shows how these early employment experiences resonate over twenty years later.

Better skills in adolescence may give individuals the ability to adapt in the workforce later in life rather than simply sort them into early occupations, such that it is not a person's early occupation that matters for later employment status but rather how well one is equipped to transition to more favorable employment conditions. We found that midlife occupational characteristics were significantly related to employment status, while early adult occupational characteristics were not likely mechanisms connecting adolescent skills to midlife employment status. This stronger link to midlife occupation may be because the measures are more temporally proximate to respondent's current employment status. The more physically demanding someone's most recent occupation at midlife, the more likely they were to be out of the labor force due to disability. Likewise, as average occupational wages increased, people

were more likely to be working and less likely to be retired or a homemaker. This may support the argument that workers in higher-paying occupations face greater opportunity costs of leaving the labor force (Autor and Duggan 2003; Burr et al. 1996). However, it also may be that workers in higher-paying jobs have better access to healthcare or are in a higher status position that affords them greater flexibility to remain working in the face of health limitations, instead of possibly being pushed out of the labor force into what may be an involuntary health-related retirement (Hayward et al. 1989).

Our study employed rich longitudinal data that allowed us to look at the relationship between people's skills in high school and their midlife employment status by exploring educational attainment and employment experiences in young adulthood and at midlife as possible mechanisms. However, one limitation is that we cannot observe most of respondents' adult experiences, as our last two waves of data were collected around ages 28 and 50. Therefore, it is impossible for us to decipher what exactly explains the independent relationship between the adolescent skills and midlife employment status. Though employment status is an important general indicator of economic wellbeing at midlife, more specific outcomes could give better insight into the variation within each category of employment status and how well-situated individuals are to continue working or eventually retire. Researchers could investigate how skills in adolescence relate to more individualized measures of economic or occupational inequality at midlife to better understand the heterogeneity in circumstances, especially among those who are working. In addition, future research should focus on both economic and non-economic outcomes to capture multiple dimensions of wellbeing at midlife that may support healthy aging and economic security as people move toward retirement.

CONCLUSION

Being out of the labor force as early as age 50 represents a significant disadvantage for many people, especially when people are living and working longer than ever before (Mermin et al. 2007; Virick 2011). This study's results point to the importance of individuals' pre-labor market skills in helping them maintain an attachment to the labor force later in life and adapt to challenging circumstances that may threaten their livelihood and wellbeing. Higher education and occupational experiences can help people remain working, as well, but this study shows that the skills that students develop by the end of high school predict employment status over thirty years later. Considering the higher costs of retirement that are increasingly borne by workers, people need to be able to work longer and save more for retirement, rendering employment status during the preretirement years important. Our findings suggest that pre-workforce skills sort people into higher education and occupations and may enable people to adapt to their circumstances as they age in a changing economy, allowing them to maintain an attachment to the workforce during the crucial midlife years.

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Table 1: Weighted Means and Proportions of Independent Variables, by Employment Status

	Working	Disability	Unemp	Retired or Homemaker
Sample (N=8,620)	.82	.07	.05	.06
Skills				
Highest math course				
< Algebra 1	.23	.52	.40	.28
Algebra 1	.20	.22	.18	.20
Geometry	.15	.09	.11	.16
Algebra 2	.16	.09	.15	.14
Advanced Math +	.26	.08	.16	.22
Math achievement score (SD)	.08 (.98)	-.65 (.72)	-.32 (.92)	-.07 (.99)
Locus of control (SD)	.04 (.98)	-.49 (.96)	-.13 (.99)	.10 (.98)
Educational Attainment				
Less than high school	.04	.16	.07	.10
High school	.49	.59	.57	.45
Sub-baccalaureate credential	.19	.22	.22	.17
Bachelor's degree or higher	.28	.03	.15	.29
Early Adult Occupational Characteristics				
Average Logged Occupational Wage (SD)	2.43 (.35)	2.28 (.30)	2.34 (.33)	2.36 (.38)
Physical Demands: DOT Strength (SD)	2.00 (.82)	2.29 (.74)	2.06 (.83)	1.88 (.78)
Midlife Occupational Characteristics				
Average Logged Occupational Wage (SD)	3.25 (.54)	2.92 (.43)	3.06 (.49)	3.06 (.55)
Physical Demands: O*NET Scale (SD)	-.24 (.72)	.22 (.70)	-.01 (.77)	-.25 (.65)
Early Adult Labor Force Attachment				
Any month unemployed in 1991	.09	.19	.16	.11
Any month out of labor force in 1991	.09	.17	.11	.26
Background characteristics (1982)				
Reported a disability	.08	.17	.11	.09
Female	.49	.50	.50	.82
Race				
White	.75	.58	.63	.75
Black	.11	.22	.17	.05
Hispanic	.11	.18	.15	.14
Asian	.01	.00	.01	.03
Other race	.02	.02	.04	.03
Family income (tertiles)				
Lower tertile	.34	.51	.41	.38
Middle tertile	.36	.26	.33	.34
Upper tertile	.30	.23	.26	.28
Lived with both parents	.71	.65	.65	.69
Parent Education				
Less than high school	.11	.21	.12	.12
High school	.32	.34	.30	.27
Vocational/Technical school	.14	.14	.17	.14
Some college	.17	.15	.16	.17
Bachelor's degree or higher	.27	.15	.25	.30
High school type				
Public	.90	.96	.92	.89
Catholic	.06	.02	.05	.08
Private (non-Catholic)	.03	.01	.03	.04
High school urbanicity				
Urban	.20	.30	.28	.23
Suburban	.49	.40	.50	.43
Rural	.31	.30	.22	.34

Table 2: Average Marginal Effects (AMEs) from Multinomial Logistic Regressions Predicting Employment Status at Midlife

	Model 1 - Background				Model 2 - Early Adulthood				Model 3 - Midlife			
	Working	Disability	Unemp	Retired or Homemaker	Working	Disability	Unemp	Retired or Homemaker	Working	Disability	Unemp	Retired or Homemaker
Locus of control (std)	0.006	-0.012**	0.001	0.005	0.004	-0.010*	0.001	0.005	0.001	-0.009*	0.002	0.006
	(0.007)	(0.004)	(0.004)	(0.004)	(0.007)	(0.004)	(0.004)	(0.004)	(0.007)	(0.004)	(0.004)	(0.004)
Math achievement score (std)	0.050***	-0.030***	-0.014*	-0.006	0.036***	-0.019*	-0.011	-0.007	0.030**	-0.016*	-0.010	-0.005
	(0.011)	(0.008)	(0.006)	(0.005)	(0.011)	(0.008)	(0.006)	(0.006)	(0.010)	(0.008)	(0.006)	(0.006)
Highest math course (ref: <Algebra 1)												
Algebra 1	0.057**	-0.020	-0.026*	-0.011	0.048*	-0.015	-0.025*	-0.007	0.043*	-0.013	-0.024*	-0.006
	(0.021)	(0.014)	(0.012)	(0.014)	(0.020)	(0.014)	(0.012)	(0.014)	(0.020)	(0.013)	(0.012)	(0.014)
Geometry	0.071**	-0.037*	-0.027	-0.008	0.058*	-0.029	-0.025	-0.003	0.051*	-0.026	-0.024	-0.001
	(0.025)	(0.016)	(0.014)	(0.017)	(0.024)	(0.015)	(0.014)	(0.017)	(0.024)	(0.015)	(0.014)	(0.017)
Algebra 2	0.061*	-0.030	-0.013	-0.018	0.045	-0.019	-0.011	-0.015	0.038	-0.016	-0.009	-0.013
	(0.026)	(0.017)	(0.016)	(0.015)	(0.025)	(0.017)	(0.015)	(0.015)	(0.025)	(0.017)	(0.015)	(0.015)
Advanced Math +	0.078**	-0.040*	-0.024	-0.015	0.056*	-0.022	-0.018	-0.015	0.047	-0.019	-0.016	-0.012
	(0.027)	(0.017)	(0.016)	(0.017)	(0.026)	(0.016)	(0.016)	(0.017)	(0.027)	(0.016)	(0.016)	(0.017)
Educational Attainment (1992) (ref: high school)												
Less than high school					-0.105**	0.051*	-0.004	0.058	-0.090*	0.042*	-0.007	0.054
					(0.036)	(0.023)	(0.014)	(0.031)	(0.035)	(0.021)	(0.014)	(0.030)
Sub-baccalaureate credential					-0.004	0.005	0.002	-0.003	-0.005	0.006	0.002	-0.003
					(0.017)	(0.012)	(0.011)	(0.008)	(0.017)	(0.012)	(0.011)	(0.008)
Bachelor's degree or above					0.054***	-0.054***	-0.017	0.017	0.044**	-0.051***	-0.013	0.020*
					(0.016)	(0.010)	(0.010)	(0.010)	(0.017)	(0.010)	(0.011)	(0.010)
Early Adult Occupational Characteristics												
Average occupational wage (logged)					0.019	-0.011	-0.018	0.009	0.002	-0.004	-0.014	0.015
					(0.022)	(0.016)	(0.014)	(0.012)	(0.023)	(0.016)	(0.014)	(0.012)
Physical demands: DOT Strength					-0.001	0.005	-0.005	0.001	0.006	0.000	-0.008	0.002
					(0.009)	(0.007)	(0.005)	(0.006)	(0.010)	(0.007)	(0.006)	(0.006)
Early Adult Labor Force Attachment												
Any month unemployed in 1991					-0.064***	0.033**	0.023*	0.008	-0.059**	0.030*	0.022	0.007
					(0.019)	(0.013)	(0.011)	(0.013)	(0.019)	(0.013)	(0.011)	(0.013)
Any month out of labor force in 1991					-0.093***	0.045***	0.003	0.045***	-0.092***	0.045***	0.003	0.045***
					(0.017)	(0.012)	(0.012)	(0.009)	(0.018)	(0.012)	(0.012)	(0.009)
Midlife Occupational Characteristics												
Average occupational wage (logged)									0.053***	-0.018	-0.011	-0.023**
									(0.014)	(0.010)	(0.009)	(0.008)
Physical demands: O*NET scale (std)									-0.023*	0.018*	0.009	-0.004
									(0.012)	(0.009)	(0.007)	(0.007)
Observations	8,520											

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

All models control for race, sex, family income, parental education, family structure, high school type, high school urbanicity, and respondent's disability status in high school.

Table A2: Average Marginal Effects (AMEs) from Multinomial Logistic Regressions Predicting Employment Status at Midlife

	Model 1 - Background				Model 2 - Early Adulthood				Model 3 - Midlife			
	Working	Disability	Unemp	Retired or Homemaker	Working	Disability	Unemp	Retired or Homemaker	Working	Disability	Unemp	Retired or Homemaker
Locus of control (std)	0.006	-0.012**	0.001	0.005	0.004	-0.010*	0.001	0.005	0.001	-0.009*	0.002	0.006
	(0.007)	(0.004)	(0.004)	(0.004)	(0.007)	(0.004)	(0.004)	(0.004)	(0.007)	(0.004)	(0.004)	(0.004)
Math achievement score (std)	0.050***	-0.030***	-0.014*	-0.006	0.036***	-0.019*	-0.011	-0.007	0.030**	-0.016*	-0.010	-0.005
	(0.011)	(0.008)	(0.006)	(0.005)	(0.011)	(0.008)	(0.006)	(0.006)	(0.010)	(0.008)	(0.006)	(0.006)
Highest math course (ref: <Algebra 1)												
Algebra 1	0.057**	-0.020	-0.026*	-0.011	0.048*	-0.015	-0.025*	-0.007	0.043*	-0.013	-0.024*	-0.006
	(0.021)	(0.014)	(0.012)	(0.014)	(0.020)	(0.014)	(0.012)	(0.014)	(0.020)	(0.013)	(0.012)	(0.014)
Geometry	0.071**	-0.037*	-0.027	-0.008	0.058*	-0.029	-0.025	-0.003	0.051*	-0.026	-0.024	-0.001
	(0.025)	(0.016)	(0.014)	(0.017)	(0.024)	(0.015)	(0.014)	(0.017)	(0.024)	(0.015)	(0.014)	(0.017)
Algebra 2	0.061*	-0.030	-0.013	-0.018	0.045	-0.019	-0.011	-0.015	0.038	-0.016	-0.009	-0.013
	(0.026)	(0.017)	(0.016)	(0.015)	(0.025)	(0.017)	(0.015)	(0.015)	(0.025)	(0.017)	(0.015)	(0.015)
Advanced Math +	0.078**	-0.040*	-0.024	-0.015	0.056*	-0.022	-0.018	-0.015	0.047	-0.019	-0.016	-0.012
	(0.027)	(0.017)	(0.016)	(0.017)	(0.026)	(0.016)	(0.016)	(0.017)	(0.027)	(0.016)	(0.016)	(0.017)
Educational Attainment (1992) (ref: high school)												
Less than high school					-0.105**	0.051*	-0.004	0.058	-0.090*	0.042*	-0.007	0.054
					(0.036)	(0.023)	(0.014)	(0.031)	(0.035)	(0.021)	(0.014)	(0.030)
Sub-baccalaureate credential					-0.004	0.005	0.002	-0.003	-0.005	0.006	0.002	-0.003
					(0.017)	(0.012)	(0.011)	(0.008)	(0.017)	(0.012)	(0.011)	(0.008)
Bachelor's degree or above					0.054***	-0.054***	-0.017	0.017	0.044**	-0.051***	-0.013	0.020*
					(0.016)	(0.010)	(0.010)	(0.010)	(0.017)	(0.010)	(0.011)	(0.010)
Early Adult Occupational Characteristics												
Average occupational wage (logged)					0.019	-0.011	-0.018	0.009	0.002	-0.004	-0.014	0.015
					(0.022)	(0.016)	(0.014)	(0.012)	(0.023)	(0.016)	(0.014)	(0.012)
Physical demands: DOT Strength					-0.001	0.005	-0.005	0.001	0.006	0.000	-0.008	0.002
					(0.009)	(0.007)	(0.005)	(0.006)	(0.010)	(0.007)	(0.006)	(0.006)
Early Adult Labor Force Attachment												
Any month unemployed in 1991					-0.064***	0.033**	0.023*	0.008	-0.059**	0.030*	0.022	0.007
					(0.019)	(0.013)	(0.011)	(0.013)	(0.019)	(0.013)	(0.011)	(0.013)
Any month out of labor force in 1991					-0.093***	0.045***	0.003	0.045***	-0.092***	0.045***	0.003	0.045***
					(0.017)	(0.012)	(0.012)	(0.009)	(0.018)	(0.012)	(0.012)	(0.009)
Midlife Occupational Characteristics												
Average occupational wage (logged)									0.053***	-0.018	-0.011	-0.023**
									(0.014)	(0.010)	(0.009)	(0.008)
Physical demands: O*NET scale (std)									-0.023*	0.018*	0.009	-0.004
									(0.012)	(0.009)	(0.007)	(0.007)

Table A2, continued

	Model 1 - Background				Model 2 - Occupational Characteristics				Model 3 - Educational Attainment			
	Working	Disability	Unemp	Retired or Homemaker	Working	Disability	Unemp	Retired or Homemaker	Working	Disability	Unemp	Retired or Homemaker
Disability 1982	-0.055*	0.038**	0.009	0.008	-0.042	0.031*	0.007	0.004	-0.040	0.030*	0.007	0.003
	(0.023)	(0.013)	(0.012)	(0.015)	(0.022)	(0.012)	(0.012)	(0.015)	(0.023)	(0.012)	(0.012)	(0.015)
Female	-0.073***	-0.003	-0.003	0.079***	-0.056***	-0.010	-0.009	0.075***	-0.054***	-0.008	-0.009	0.070***
	(0.013)	(0.008)	(0.007)	(0.010)	(0.015)	(0.010)	(0.008)	(0.011)	(0.016)	(0.011)	(0.009)	(0.011)
Race (ref: white)												
Black	0.024	0.022	0.008	-0.055***	0.018	0.026*	0.007	-0.051***	0.017	0.026*	0.007	-0.051***
	(0.021)	(0.012)	(0.013)	(0.015)	(0.020)	(0.012)	(0.013)	(0.015)	(0.020)	(0.012)	(0.013)	(0.015)
Asian	0.058	-0.136*	0.022	0.056*	0.055	-0.130*	0.022	0.053*	0.046	-0.126*	0.023	0.057*
	(0.063)	(0.064)	(0.016)	(0.026)	(0.060)	(0.063)	(0.016)	(0.023)	(0.060)	(0.062)	(0.016)	(0.023)
Hispanic	-0.012	0.001	0.006	0.004	-0.017	0.005	0.006	0.006	-0.019	0.006	0.006	0.007
	(0.017)	(0.011)	(0.011)	(0.009)	(0.016)	(0.011)	(0.011)	(0.009)	(0.016)	(0.011)	(0.011)	(0.009)
Other	-0.003	-0.025	0.014	0.014	0.002	-0.027	0.015	0.011	-0.007	-0.022	0.016	0.013
	(0.038)	(0.022)	(0.017)	(0.031)	(0.038)	(0.024)	(0.017)	(0.029)	(0.037)	(0.023)	(0.017)	(0.028)
Family income (ref: middle tertile)												
Lower tertile	-0.027	0.020	0.003	0.004	-0.024	0.019	0.002	0.003	-0.023	0.018	0.002	0.002
	(0.016)	(0.011)	(0.010)	(0.009)	(0.016)	(0.011)	(0.010)	(0.009)	(0.016)	(0.011)	(0.010)	(0.009)
Upper tertile	-0.008	0.011	-0.005	0.001	-0.008	0.013	-0.004	-0.000	-0.012	0.015	-0.004	0.000
	(0.018)	(0.013)	(0.011)	(0.009)	(0.018)	(0.013)	(0.011)	(0.009)	(0.018)	(0.013)	(0.011)	(0.009)
Parent Education (ref: high school)												
Less than high school	-0.021	0.021	-0.004	0.004	-0.012	0.016	-0.003	-0.000	-0.015	0.017	-0.003	0.000
	(0.021)	(0.014)	(0.012)	(0.011)	(0.019)	(0.013)	(0.012)	(0.010)	(0.019)	(0.013)	(0.011)	(0.010)
Vocational/Technical school	-0.031	0.005	0.018	0.009	-0.033	0.006	0.019	0.008	-0.037	0.008	0.020	0.009
	(0.020)	(0.013)	(0.014)	(0.012)	(0.020)	(0.013)	(0.014)	(0.012)	(0.020)	(0.013)	(0.014)	(0.012)
Some college	-0.026	0.008	0.007	0.011	-0.029	0.011	0.009	0.010	-0.033	0.013	0.010	0.010
	(0.019)	(0.014)	(0.011)	(0.011)	(0.018)	(0.013)	(0.011)	(0.011)	(0.018)	(0.013)	(0.011)	(0.011)
Bachelor's degree or higher	-0.045**	0.002	0.017	0.026**	-0.054**	0.012	0.020	0.022*	-0.057**	0.014	0.021*	0.022*
	(0.017)	(0.014)	(0.010)	(0.009)	(0.018)	(0.015)	(0.010)	(0.009)	(0.018)	(0.015)	(0.010)	(0.009)
Lived with both parents	-0.006	0.011	-0.003	-0.002	-0.011	0.014	-0.003	-0.001	-0.009	0.013	-0.003	-0.001
	(0.016)	(0.011)	(0.010)	(0.010)	(0.016)	(0.011)	(0.010)	(0.010)	(0.016)	(0.011)	(0.010)	(0.010)
High school type (ref: Public)												
Catholic	0.006	-0.021	-0.002	0.016	-0.002	-0.015	-0.001	0.018*	-0.001	-0.015	-0.001	0.018*
	(0.016)	(0.012)	(0.009)	(0.009)	(0.017)	(0.013)	(0.009)	(0.009)	(0.016)	(0.013)	(0.009)	(0.009)
Private (non-Catholic)	-0.001	-0.019	0.018	0.002	-0.005	-0.012	0.020	-0.002	-0.005	-0.012	0.019	-0.002
	(0.032)	(0.020)	(0.022)	(0.015)	(0.033)	(0.023)	(0.022)	(0.014)	(0.032)	(0.022)	(0.022)	(0.014)
High school urbanicity (ref: Urban)												
Suburban	0.039*	-0.016	-0.005	-0.018	0.036*	-0.014	-0.003	-0.019	0.032	-0.011	-0.002	-0.019
	(0.018)	(0.012)	(0.012)	(0.010)	(0.017)	(0.011)	(0.011)	(0.010)	(0.017)	(0.011)	(0.011)	(0.010)
Rural	0.043*	-0.015	-0.027*	-0.002	0.039*	-0.013	-0.024*	-0.003	0.037*	-0.010	-0.023*	-0.003
	(0.019)	(0.012)	(0.011)	(0.012)	(0.018)	(0.012)	(0.011)	(0.011)	(0.018)	(0.012)	(0.011)	(0.011)
Observations	8,520											

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

Table A3: O*NET Physical Demands Measure – Items and Cronbach's Alpha

2014 (Cronbach's alpha = .94)
Handling and moving objects
Performing general physical activities
Time spent bending or twisting body
Time spent climbing ladders, scaffolds, poles, etc.
Time spent keeping or regaining balance
Time spent kneeling, crouching, stooping, or crawling
Time spent standing
Time spent using hands to handle, control, or feel objects, tools, or controls
Time spent walking or running
Keeping a pace set by machinery or equipment
Time spent making repetitive motions