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Age when first employed and retirement wealth of baby boomers

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Abstract

This study examines how age when first employed is related to retirement savings in later years. Using data from the Health and Retirement Study, we investigate two specific questions: Has age when first employed affected the retirement wealth of baby boomers? If so, to what extent? The results show that age when first employed is negatively associated with accumulated retirement wealth in later years. For college graduates (high school graduates), delaying the start of employment cost $35,103 ($7,534) per year in retirement savings after controlling for demographic characteristics, number of working years, and occupation types.

JEL classification: D14; D3; J21

Keywords: Retirement savings; Timing of employment; Baby boomers; Young adults

1. Introduction

The importance of starting early to save for retirement has been emphasized in introductory personal finance textbooks and in everyday life (Garman and Forgue, 2015; Munnell, Webb, and Hou, 2014). The three major determinants of savings outcome at retirement are

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(1) amount of retirement savings contributions every month or year (how much), (2) rate of return from the contributions, and (3) number of years to contribute (how long).

Individuals can increase contribution rates to their retirement savings. However, this may not be easy because of competing needs under limited income. Currently, American workers' average contribution rate including matching contribution from employers for retirement savings is 10.9% of their income (Utkus and Young, 2017). This rate is below the recommended 15% to maintain their living standard before retirement (Garman and Forgue, 2015). Average and median retirement account balances are low. According to a recent survey, in 2016, the mean and median retirement savings are $96,495 and $24,713, respectively. Even near retirees ages 55–64 have only $178,963 (mean) and $66,643 (median) in retirement savings (Utkus and Young, 2017).

Individuals may be able to increase the rate of returns by accepting more risk through investing in stocks and bonds. However, accepting more risk can result in losing money for retirement savings (Markowitz, 1952). Empirical studies report the cost of losing investments from bad outcomes (Bridges, Gesumaria, and Leonesio, 2010) despite the possibility of high returns from a riskier asset allocation (Poterba, Rauh, Venti, and Wise, 2003). In fact, American workers already have substantially higher portions of risky assets (stocks) in their investment portfolio from 87% (younger than age 30) to 56% (near retirees ages 60–64). However, despite this asset allocation with risky assets, their outstanding balances especially in near retirees are considerably low as aforementioned.

Having more years of contribution unambiguously can bring about better retirement savings outcomes compared with the limitations of contribution rate and rate of return. Having more years of saving or investing can further be benefited from amount of time for a compound return that produces additional returns from the returns earned during previous periods in addition to the investment principal. Thus, starting to save early for retirement, as a young adult, is of great importance. If people start saving at younger ages (e.g., early 20s) for retirement, a small amount of money can make a big difference in the accumulation of retirement savings because of the effects of compounding. For example, a worker who starts saving $50 per week at age 22 will have a million dollars given an 8% rate of return by age 66 whereas someone who starts saving at age 30 will have about $540,000 or about half of the age 22 amount (Garman and Forgue, 2015).

Starting early to save for retirement may require individuals to be employed as soon as possible. Americans' age when first employed, however, has increased over time. According to the Current Population Survey, the average age of American men (women) entering the job market has increased by about two full years during the recent 14 year span from age 19.1 (21.9) in 2000, 19.5 (22.5) in 2007 and 21 (22.8) in 2014 (Kamenov, 2016). Temporary economic slowdowns could contribute to this trend. Many people also decide to further their education in hopes of being more competitive in the job market and obtaining higher pay. In fact, college (graduate school) enrollment rates have increased from 45% (18%) in 1990 to 57% (26%) in 2015 (Davis, Kimball, and Gould, 2015).

Despite the importance, empirical research to investigate the actual effect of age when first employed on retirement wealth is limited. This study examines determinants of retirement savings focusing on how age when entering the labor market is related to retirement savings in later years. Two specific questions are investigated: Has age when first employed affected

retirement wealth of baby boomers? If so, to what extent? Answering these questions provides significant implications for retirement savings not only for near retirees but also for young Americans with regards to labor force entry and whether to start saving for retirement at younger ages. The findings from this study also contribute to understanding a new and important determinant of retirement savings.

The remainder of this article is organized as follows. Section 2 describes the retirement savings of baby boomers and timing of first employment. Section 3 introduces the theoretical overview. Section 4 provides an overview of the methods. Section 5 provides details of the results. Finally, Section 6 includes a discussion.

2. Background

2.1. Baby boomers and retirement savings

Baby boomers continue to receive considerable attention from researchers and policy makers regarding retirement savings. Their current status of low retirement savings amounts could contribute to this attention. In fact, 40% of baby boomers have no retirement savings (Insured Retirement Institute, 2015). About 62% of working households ages 55–64 (a core group of baby boomers) have retirement savings amounts less than one times their annual income (Rhee and Boivie, 2015). This is far below the recommendations for retirement savings from experts (11 times annual income), causing individual financial insecurity among this group (Kadlec, 2012). In addition, baby boomers are also on the verge of experiencing a critical change in their financial life stage according to life cycle theory of savings: a shift from the saving domain to the dissaving domain regarding retirement savings.

The majority of baby boomers are also the first generation to experience defined contribution plans such as a 401(k). Before 1978, a defined benefit plan was the dominant employee pension plan provided by employers (Employee Benefit Research Institute, 2007). Under defined benefit plans, retirees receive a fixed portion (e.g., 50%) of their pre-retired salary until their death. From 1978 when baby boomers were 19 to 30 years old, however, employers started to provide defined contribution plans instead of defined benefit plans. In fact, 69% of baby boomers do not have a defined benefit plan (Insured Retirement Institute, 2015). Under defined contribution plans, employees make their own decisions and take sole responsibility for their retirement savings outcomes. The baby boomer experience provides an opportunity to examine the relationship between when to start saving and retirement savings outcomes, but also can provide more meaningful implications for younger generations who share the same types of retirement plans.

2.2. Issues concerned with timing of labor force entry

Age when first employed can also be important in projecting the growth of retirement savings contributions specifically related to the benefits of compound return. For example, let's assume two individuals (person A and person B) work for the same number of years,

(i.e., 30 years). If person A saves $500 each year starting at age 22 for 30 years (age 22 to 52) at a 7% annual rate of return and then allows the balance to grow without further contribution for an additional 10 years, she would have $99,400 in savings at age 62. However, if person B starts saving at age 32 (10 year later) and continues saving $500 each year for 30 years (age 32 to 62), she would have $50,500 at age 62; only half of the amount saved compared with person A who started saving at a younger age.

Many Americans tend to change employers more frequently than prior generations, particularly male workers (Copeland, 2010; U.S. Bureau of Labor Statistics, 2016c). In addition, they may experience underemployment or have unpaid leave for child or elder care (Economic Policy Institute, 2017). During these unemployed periods, savings contributed for retirement in earlier years will keep growing because of compound return, boosting retirement savings in later years.

In recent years the timing of first entry in the job market shows a trend of individuals entering the job market at older ages. Late entry into the job market may have pros and cons for retirement savings through a person's life cycle. For example, obtaining a higher level of education can increase an individual's earning capacity. A worker with a high school diploma can expect to earn $1.3 million over their lifetime, whereas a worker with a Bachelor's or a Master's degree will earn $2.3 million or $2.7 million, respectively (Carnevale, Rose, and Cheah, 2011). At the same time, the pursuit of higher education may decrease the number of working years and benefits of compound return for retirement savings. For example, life transition events may be delayed such as marriage or having children along with economic activities such as first time home or car buying. These sequential delays may make retirement savings more difficult in middle working years. However, the research on age when first employed is limited when examining retirement savings outcomes despite the importance of starting to save at a young age and the benefits of compound return.

2.3. Other issues on accumulated wealth

Many previous studies show that demographic characteristics such as gender, race, and marital status are associated with wealth. Women tend to have lower wealth than men mostly because of lower life time earnings (Ruel and Hauser, 2013). Racial minorities tend to have lower wealth than White adults because they have lower income amounts, have less access to financial services, and lower levels of financial literacy (Employee Benefit Research Institute, 2003; Oliver and Shaprio, 2006). Married couples tend to have higher net worth and larger wealth accumulation than single households because of the well-known marriage benefits including economics of scale (Di, Belsky, and Liu, 2007; Schmidt and Sevak, 2006).

3. Theoretical overview

Life-cycle and permanent income theory, which is a dominant economic theory used to explain savings and consumption, suggests that age (life-cycle) and income are main predictors of accumulated wealth (Friedman, 1957; Modigliani and Brumberg, 1954). The

findings from extensive empirical studies overall have supported the two important determinants of accumulated wealth as this theory predicts (Attanasio and Weber, 2010; Browning and Crossley, 2001; Xiao, Ford, and Kim, 2011).

This theory indicates that individuals maximize their lifetime utility under resource constraint by allocating a certain proportion of their lifetime resources to their consumption and savings at each period of time. This allocation may require individuals to borrow in earlier years of their life, save and pay off debt in middle years, and dis-save for living expenses in later years over their life-cycle (age) (Modigliani and Brumberg, 1954). The resource constraint implies that individuals should consume within the extent of the sum of net worth inherited or carried over from previous years if any and earned income over their working years (lifetime/permanent income) (Friedman 1957; Modigliani and Brumberg, 1954). This is called the standard intertemporal budget constraint from which asset evolution over time is derived (Deaton and Paxson, 2000). The asset evolution equation is used to estimate retirement savings at the current or retirement age after considering the age when first employed. An individual's retirement wealth (RW) can be expressed with a common asset evolution equation (Azar, 2012; Deaton and Paxson, 2000):

$$RW_{t+1} = (1 + r) \times RW_t + (y_t - c_t) \tag{1}$$

where RW_{t+1} is retirement wealth at one year later than year t, r is the real interest rate, y_t is income, c_t is consumption, and $(y_t - c_t)$ indicates savings at year t.

Cumulating this equation to current or retirement age (a) from a starting age (a_0) when first employed, we can express

$$RW_a = (1 + r)^{a-a_0} \times RW_{a_0} + \sum_{k=0}^{a-a_0-1}(1 + r)^k(y_{a-k-1} - c_{a-k-1}) \tag{2}$$

where RW_a is retirement wealth at age a, RW_{a_0} is retirement wealth at age a_0. Let's illustrate the asset evolution equation above. If a person starts working at age 25, retirement wealth at the beginning of age 60 from the asset evolution equation above is the sum of the initial wealth at age 25 and its growth for 35 years ($(1 + r)^{60-25} \times RW_{25}$), and savings each year from age 25 to 59 and its growth during associated numbers of years. For example, the money saved at age 25 is evolved to $(1 + r)^{34}(y_{25} - c_{25})$, and the money saved at age 26 is evolved to $(1 + r)^{33}(y_{26} - c_{26})$. Likewise, the money saved at age 59 is $(1 + r)^0(y_{59} - c_{59})$ at the beginning of age 60. All other things being constant (e.g., current or retirement age (a) and $(y - c)$), their starting age (a_0) at which first employed is a major determinant of retirement wealth, and the levels of retirement savings at current ages are lower as age when first employed is higher.

4. Method

4.1. Empirical model

Based on the Eq. (2), retirement savings are theoretically calculated from the initial wealth (RW_{a_0}), yearly contributions to savings $(y - c)$, current or retirement age (a), age when first

employed (a_0), and investment returns (r). Empirically, however, the initial wealth (RW_{a_0}), yearly contributions to savings ($y - c$) are barely available from general survey data sets including HRS data. Thus, we substitute those theoretical concepts with more tangible measurements using related variables and proxies.

$$RW_a = \alpha + \beta_1 a_0 + \beta_2 L + X\beta + \varepsilon \tag{3}$$

where RW_a is retirement wealth at current age a, a_0 is age when first employed, which is the main interest of this study. L is the number of working years at age a, which also represents the number of years to save for retirement from Eq. (2). For the initial wealth (RW_{a_0}), we may assume most people do not have any retirement savings when they have a first job after high school and college. X is a set of other control variables including demographic characteristics and occupation information, which are assumed to be major influential factors on individual's contributions to savings ($y - c$). In this empirical model, $\beta_1 < 0$ indicates that an older age when first employed is related to lower retirement wealth.

4.2. Data

In this study, the 2014 Health and Retirement Study (HRS) is used. The HRS is a representative sample of middle-aged and older Americans with age 50 or older sponsored by the National Institute on Aging (NIA). The HRS provides comprehensive information about the work history and financial status such as levels of income or current retirement wealth. The 2014 HRS interviewed 18,748 respondents who were born before 1961.

For the study purpose described above, the sample was restricted to respondents who belong to the baby boomer generation (born in 1948 to 1959) based on the HRS classification. Among the 18,748 respondents, identified baby boomers were 8,002 of which 6,772 provided the information about their age when first employed. We further consider two criteria in constructing the final analysis samples: educational attainment and associated age when first employed. Lifetime earnings have significantly differed by high school graduates and college graduates, which are not homogenous. Potential confounding effects also arise from respondents with unconventional life transitions (e.g., first employed at age 16 and graduated college at age 30). To mitigate effects from educational differences and unconventional life transitions, we focus on the respondents who followed relatively normative education to employment transitions. These respondents are characterized into two subgroups: (1) high school graduate and age 18 or older when first employed, (2) college graduate+ and age 22 or older when first employed.

Accordingly, we construct two subsample sets for our analysis. Of the 6,772 respondents who were baby boomers and provided age when first employed, 3,923 had educational attainment with high school or more and were first employed at age 18 or older up to age 35. From the 3,923 respondents, our two final subsamples include: (1) high school graduates and age 18 or older when first employed ($n = 2{,}211$) and (2) college or more and age 22 or older when first employed ($n = 883$). For the college or more graduates, age 22 was based on the average or median age of current and past college graduation according to the U.S. Census Bureau: currently about 60% of college graduates were ages 22 to 23 when graduating

(Spreen, 2013), and the median age when graduating college in 1960 was 22.9 years (U.S. Census Bureau, 1963). In an era when 70% of high school graduates in the U.S. are enrolled in colleges or universities (U.S. Department of Labor, 2016b), focusing on this population who were first employed at age 22 or older can provide more meaningful implications for young college graduates about retirement savings. In our sample, the mean age when first employed was 20.8 years for the high school graduate group and 23.9 years for the college graduate group.

4.3. Measures

4.3.1. Age when first employed

In the HRS, a respondent is asked about past jobs retrospectively at their first interview, including the information about the earliest year worked. The specific question to measure age when first employed is "In what year did you first work for six months or more?" This question is included in each wave of the HRS. We calculated age when first employed by subtracting the birth year from the year at first work.

4.3.2. Dependent variables: Retirement wealth

Household net worth (including secondary residence) is used as a main dependent variable. Net worth is calculated as the sum of all assets less all debt.

4.3.3. Other control variables

The following demographic characteristics are included as control variables; age in 2014, gender, race, marital status in 2014, and the number of people in the household. The number of people in the household includes the respondent, spouse, residents and nonresident children. We also include the respondent's and spouse's total number of years worked. Total number of years worked is the total number of years that the respondents actually worked. This variable is derived from the respondent's retrospective job history and all jobs reported since the first interview and considers all related factors affecting individual's labor force status such as a layoff or voluntary unemployment. For those who are single or have a stay at home spouse, the value of the spouse's total number of years worked is coded as 0. Occupation type or annual salary of the longest tenured job is also included as a variable to control the individual's lifetime income, which is classified into 23 categories based on the 2010 U.S. Census Occupational Classification System.

4.4. Analysis

Descriptive analyses and OLS regressions are used to estimate the impact of age when first employed on retirement wealth. Descriptive analyses explore the overall trend of the relationship between age when first employed and retirement wealth. OLS regressions are used to specify the effect of age when first employed on accumulated retirement wealth in later years. Two separate regressions are conducted with the two different groups of high school graduates and college graduates. Weighted data are used to represent the U.S. middle aged and older population for our analysis.[1] For sensitivity checks, the main model is

Table 1 Characteristics of the sample

	High school (age when first employed 18 to 35)	College+ (age when first employed 22 to 35)	Statistics (p)*
n	2,211	883	
Age (mean, SD)	59.9 (3.5)	60.2 (3.4)	−1.941 (.052)
Female (%)	56.7	50.0	12.877 (.000)
White (%)	79.3	84.9	14.483 (.000)
Married/partnered (%)	63.0	73.5	35.459 (.000)
N of people in the household†	2.3 (1.2)	2.3 (1.1)	−.250 (.802)
Years worked (mean, SD)	30.4 (11.7)	30.5 (10.0)	−1.745 (.081)
Spouse's years worked (mean, SD)	19.9 (18.7)	22.3 (17.7)	−3.239 (.001)
Net worth ($1,000)			
Mean (SD)	241.1 (354.8)	798.7 (907.0)	−15.960 (.000)
Median	116.0	460.0	
Financial wealth ($1,000)			
Mean (SD)	44.1 (135.2)	214.5 (430.5)	−9.817 (.000)
Median	3.0	40.7	
Age when first employed (mean, SD)	20.8 (3.3)	23.9 (2.2)	

* χ^2 for age, female, White, and married, t for the other variables.
† Number of people in the household including the respondent, spouse, and residents and non-resident children.

estimated with several alternative specifications (unweighted regression, natural logarithm transformation of net worth[2] and financial wealth[3] as a dependent variable, or using occupation salary level[4] instead of occupation type as a control variable).

5. Results

Relevant characteristics of the sample based on levels of education are presented in Table 1. The mean age in 2014 is 59.9 years for the high school group and 60.2 years for the college group, respectively. More females are in the high school group (56.7%) than the college group (50.0%), whereas less White and married individuals are in the high school group than the college group. The working years (about 30 years) are similar. Not surprisingly, there are huge gaps of net worth and financial wealth between the two groups. The mean net worth of the college group is $798,700 which is 3.3 times larger than that ($241,100) of the high school group. The gap in financial wealth is 4.9 times ($214,500 college group vs. $44,100 high school group).

Fig. 1 illustrates current accumulated retirement wealth levels in 2014 by age when first employed for each group. Panel A shows accumulated wealth of the high school group. Overall, the level of wealth demonstrates a declining pattern by age when first employed: the older the entry age is, the less the wealth tends to be. In particular, when respondents were first employed at age 18, wealth accumulated by 2014 is more than $200,000. However, if age when first employed was 26 or older wealth on average is about $100,000. Panel B presents accumulated wealth of the college group, showing a similar pattern to the high school group where wealth declines with respect to age when first employed. When first

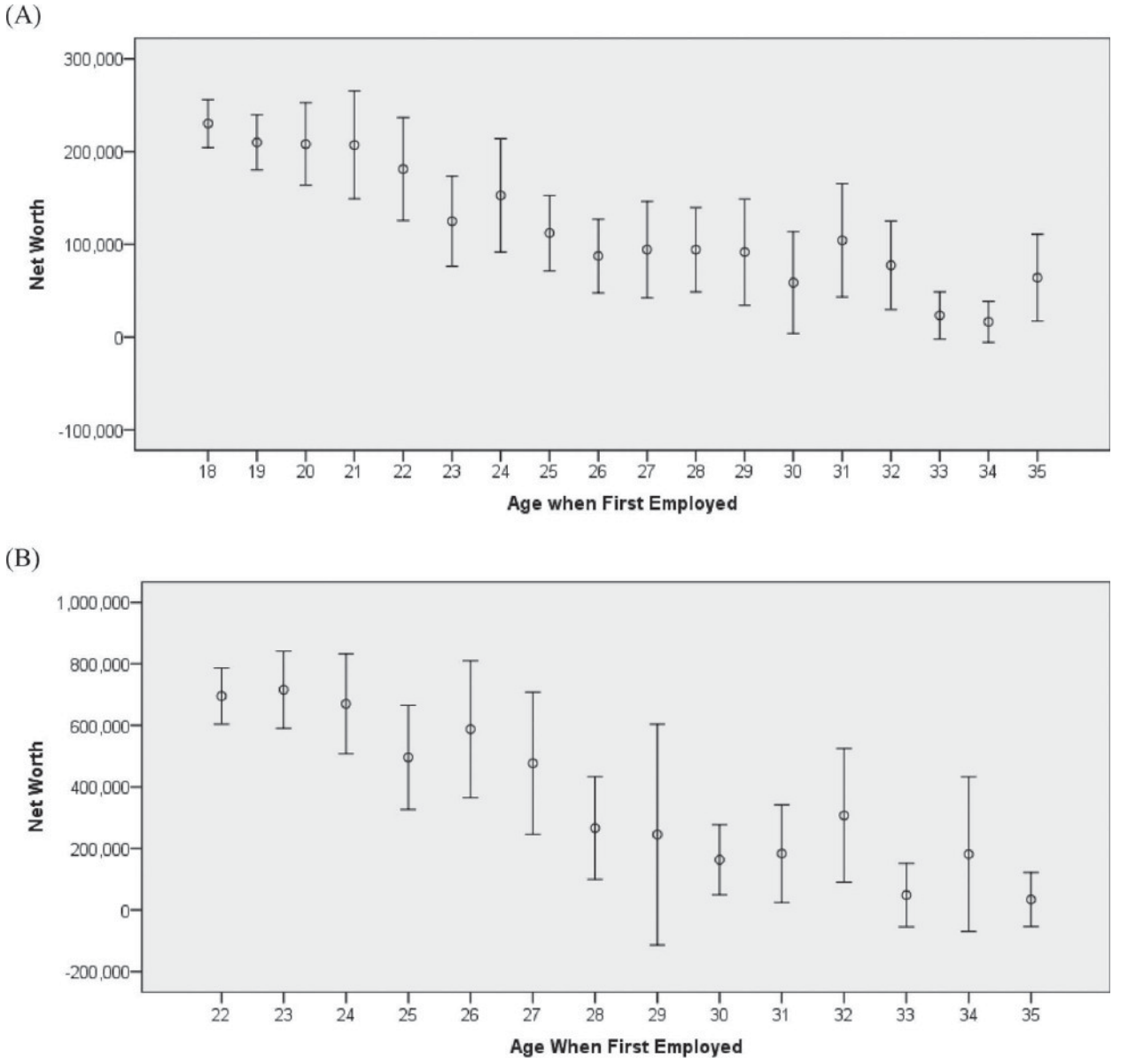

Fig. 1. Accumulated retirement wealth (net worth) distribution by age when first employed. (A) High school (age when first employed 18 to 35). (B) College+ (age when first employed 22 to 35). *Note:* Mean and 95% confidence interval.

employed at age 22, right after college graduation, current accumulated wealth is about $700,000. When age increased to 29 or older, wealth levels are about $300,000.

The results of the regression analyses by each group are presented in Table 2 to estimate the relationship between age when first employed and retirement wealth. Panel A shows the results of the high school group. Model 1 includes a relevant variable of age when first employed only. Model 2 adds the number of working years to Model 1, and Model 3 includes demographic characteristics as well as occupation type to Model 2. The coefficients of age when first employed are statistically significant across all Models and qualitatively consistent. Thus, we present the results of Model 3. Age when first employed is negatively related

Table 2 Regression results
(A) High school (age when first employed 18 to 35)

	Model 1			Model 2			Model 3		
	B (SE)	β	*p*	*B* (SE)	β	*p*	*B* (SE)	β	*p*
Age when first employed	−14,097 (2,393)	−.126	.000	−8,977 (2,414)	−.081	.000	−7,534 (2,517)	−.068	.003
Years worked				5,999 (656)	.198	.000	3,600 (762)	.119	.000
Age							2,192 (2,466)	.022	.374
Gender									
Female							−18,816 (19,251)	−.026	.328
Race									
Non-White							−89,638 (19,772)	−.103	.000
Marital status									
Single/unmarried							−48,784 (24,758)	−.067	.049
N of people in the household							−10,196 (7,147)	−.034	.154
Spouse's years worked							3,953 (646)	.209	.000
Occupation type									
Management							63,928 (33,969)	.046	.060
Business/financial operation							3,541 (45,592)	.002	.938
Computer/mathematical							−80,946 (74,792)	−.024	.279
Architecture/engineering							39,549 (67,917)	.013	.560
Life/physical/social science							−765 (176,534)	.000	.997
Community/social service							−64,743 (95,474)	−.015	.498
Legal							57,259 (218,839)	.006	.794
Education/training/library							−3,486 (52,609)	−.001	.947
Arts/design/sports/media							−30,127 (81,152)	−.008	.711
Healthcare practitioner							46,613 (51,245)	.021	.363
Healthcare support							−86,845 (46,793)	−.042	.064
Protective service							−77,009 (53,989)	−.033	.154
Food preparation/serving							912 (48,800)	.000	.985
Building/ground cleaning							−102,599 (36,148)	−.068	.005
Personal care/service							53,299 (45,046)	.027	.237
Sales							48,056 (29,570)	.041	.104
Farming/fishing/forestry							−37,702 (141,401)	−.006	.790
Construction/extraction							−16,087 (35,069)	−.012	.646
Installation/maintenance/repair							41,134 (43,860)	.023	.348
Production							−98,076 (29,289)	−.089	.001
Transportation/material moving							−31,576 (35,878)	−.023	.379
Military							−136,183 (118,995)	−.025	.253
Intercept	526,592 (49,065)		.000	24,641 (57,400)		.000	160,505 (147,989)		.278
Adjusted R^2	.016			.052			.152		

(continued on next page)

Male, White, married, and occupation type of office/administration support are reference groups. Dependent variable is the dollar amounts of household net worth.

Table 2 (Continued)
(B) College+ (age when first employed 22 to 35)

	Model 1			Model 2			Model 3		
	B (SE)	β	*p*	*B* (SE)	β	*p*	*B* (SE)	β	*p*
Age when first employed	−64,468 (15,711)	−.145	.000	−46,130 (15,968)	−.104	.001	−35,103 (16,892)	−.080	.038
Years worked				15,294 (3,206)	.171	.000	8,158 (3,893)	.091	.036
Age							−6,862 (11,359)	−.026	.546
Gender									
Female							63,272 (74,618)	.035	.397
Race									
Non-White							−223,293 (91,834)	−.091	.015
Marital status									
Single/unmarried							−368,421 (108,170)	−.181	.001
N of people in the household							−88,463 (33,609)	−.107	.009
Spouse's years worked							8,817 (2,645)	.173	.001
Occupation type									
Management							276,116 (143,002)	.122	.054
Business/financial operation							518,514 (167,129)	.158	.002
Computer/mathematical							449,062 (212,360)	.090	.035
Architecture/engineering							348,680 (237,973)	.059	.143
Life/physical/social science							298,952 (247,148)	.048	.227
Community/social service							236,652 (205,111)	.049	.249
Legal							471,805 (200,786)	.104	.019
Education/training/library							79,024 (142,610)	.033	.580
Arts/design/sports/media							−6,935 (238,389)	−.001	.977
Healthcare practitioner							126,627 (159,926)	.040	.429
Healthcare support							−153,405 (559,265)	−.010	.784
Protective service							264,663 (401,228)	.024	.510
Food preparation/serving							−270,172 (408,522)	−.024	.509
Building/ground cleaning							−118,759 (375,228)	−.012	.752
Personal care/service							−134,135 (231,284)	−.024	.562
Sales							281,462 (164,355)	.087	.087
Construction/extraction							183,312 (326,361)	.021	.575
Installation/maintenance/repair							−509,463 (436,572)	−.043	.244
Production							−46,250 (237,910)	−.008	.846
Transportation/material moving							−11,541 (302,259)	−.001	.970
Military							−549,547 (633,195)	−.031	.386
Intercept	2,313,577 (370,563)		.000	1,417,085 (411,010)		.004	1,708,773 (754,463)		.024
Adjusted R^2	.020			.046			.157		

Male, White, married, and occupation type of office/administration support are reference groups. Dependent variable is the dollar amounts of household net worth.

to retirement wealth. This result indicates that as age when first employed increases, accumulated retirement wealth declines after controlling for the number of working years, occupation types, and relevant demographic characteristics. The coefficient of age when first employed is -7,534, indicating that starting employment one year later in their 20s or 30s leads to $7,534 less retirement wealth in later years after controlling for the number of years employed.

Panel B presents the results of the college group. Consistent with the high school group in Models 1, 2 and 3, the results show that accumulated wealth declines with an increase in age when first employed. The coefficient of age when first employed in Model 3 is -35,103, indicating that starting employment one year later in their 20s or 30s leads to $35,103 less retirement wealth in later years after controlling for the number of years employed.

Not surprisingly, non-White and unmarried individuals have lower retirement wealth for both groups. Current age and the number of years employed have a positive relationship with accumulated wealth for the high school group but not for the college group after controlling for other variables. Among occupations, management is related to higher accumulated retirement wealth (reference group: Office and administration support), whereas service and production occupations lead to lower accumulated wealth in the high school group. For the college group, occupations in management, business/finance, and sales show significantly higher accumulated retirement wealth.

Model 3 is also used to conduct several sensitivity analyses with alternative specifications such as unweighted regression, natural logarithm transformation of net worth, financial wealth as a dependent variable, and average salary level of occupation rather than type of occupation. Table 3 shows the regression results of these alternative specifications for high school (Panel A) and college (Panel B) groups, highlighting that age when first employed has a consistent negative impact on accumulated retirement wealth. Sensitivity of the results is further investigated by including lump sum money such as inheritance or life insurance benefits, and replacing the occupation types representing lifetime earnings with current income. The results of these additional analyses are consistent with our main findings (the results are available upon request).

6. Discussion

The extent to which age when first employed is related to accumulated retirement wealth in later years is examined. Using data from the Health and Retirement Study, this study focuses on baby boomers who were first employed at or after the age of 18 (high school graduates) or 22 (college or more graduates). Overall findings reflect that age when first employed has a negative relationship with accumulated retirement wealth in later years. For college or more graduates (high school graduates), delaying employment cost $35,103 ($7,534) per year in retirement savings after controlling for demographic characteristics, the number of working years, and occupation types.

To the extent of our knowledge, this finding is new and a result of the first empirical study to examine the impact of age when first employed on retirement savings in later years. Previous studies primarily considered the number of years worked but ignored age when first

Table 3 Regression results with alternative specifications

(A) High school (age when first employed 18 to 35)

	Unweighted		Ln (net worth)		Occupation salary*		Financial wealth	
	B (SE)	*p*	*B* (SE)	*p*	*B* (SE)	*p*	*B* (SE)	*p*
Age when first employed	−4,594 (1,881)	.015	−.006 (.003)	.020	−7,088 (2,519)	.005	−2,358 (714)	.001
(Demographics included)	Yes		Yes		Yes		Yes	
(Occupation types included)	Yes		Yes		No		Yes	
Intercept	119,820 (129,340)	.354	13.207 (.167)	.000	93,739 (147,645)	.526	12,504 (41,974)	.766
Adjusted R^2	.174		.208		.144		.081	

(B) College+ (age when first employed 22 to 35)

	Unweighted		Ln (net worth)		Occupation salary*		Financial wealth	
	B (SE)	*p*	*B* (SE)	*p*	*B* (SE)	*P*	*B* (SE)	*p*
Age when first employed	−23,932 (12,137)	.049	−.029 (.011)	.012	−37,722 (16,336)	.021	−16,236 (7,927)	.041
(Demographics included)	Yes		Yes		Yes		Yes	
(Occupation types included)	Yes		Yes		No		Yes	
Intercept	1,198,429 (612,245)	.051	14.430 (.511)	.000	1,866,606 (729,144)	.011	634,290 (354,080)	.074
Adjusted R^2	.163		.244		.156		.065	

* Regression result when occupation was controlled by average salary level. Occupation salary level was classified the 23 categories into four groups (quarterly) based on their median annual salary at 2014 (http://www.bls.gov/oes/2014/may/oes_nat.htm).

employed in calculating lifetime earnings and estimating related retirement savings (Dornbusch and Fischer, 1994; Modigliani and Brumberg, 1954; Munnell et al., 2014). This study takes into account age when first employed as well as the number of years worked to estimate retirement savings in later years. Starting employment as a young adult is important for retirement savings because it provides resources that can be saved for retirement thereby providing the benefits of compound return from savings in early years. In particular, the benefit of compound return is more important. In fact, our results imply the importance of compound return for starting early. One year delay of starting work in their younger years cost college graduates $35,103 per year ($7,534 for high school graduates) in retirement savings while one additional year of work only adds $8,158 ($3,600 for high school graduates) to retirement savings.

The findings provide several implications for policy, education, and research about retirement savings. Starting employment as a young adult can be channeled into starting to save for retirement at an early age, leading to better retirement savings outcomes in later years. The results show that the financial losses of entering the job market one year later equates to about $35,103 ($7,534). This finding suggests that a more institutional and systematic effort is needed in the job search process to support students in securing employment as soon as possible after graduation. Several colleges have recently implemented three-year acceleration graduation plans for students. This option would decrease the cost of college by eliminating one year and would have graduates into the labor market a year earlier. However, according to a survey of college students and recent graduates before the financial crisis in 2008, more than half of the respondents reported that they did not expect a job offer by graduation, and 16% went to graduate schools to postpone entry into a tight job market (Kennedy, 2004). Such delays on starting work as a young adult may cause insufficient retirement savings in later years. Furthermore, college education may be one of the important opportunities to help young adults become more financially knowledgeable and confident. However, personal finance education is voluntary for many college students (Harrington and Smith, 2016). Intensive supports to increase student participation may be needed. Especially, for those students who lack financial awareness or literacy, more advertising targeted at these groups and offering more sections should be considered (Beierlein and Neverett, 2013).

Study findings also suggest that a change in the voluntary enrollment option often given to young employees in participating in employer sponsored retirement savings plans might be needed. Currently among young employees who are at or under age 29, only 34% participate in retirement savings plans despite their employers providing retirement savings plans (The Pew Charitable Trusts, 2016). Employers who provide retirement savings plans such as a 401(k) have commonly mandated their employees' contributions for their retirement savings. However, many employers do not require their employees including young employees, aged 30 or less, to contribute savings for retirement. Even some employer sponsored retirement savings plans do not allow employees who are under age 21 or work less than a year to participate in their plan (U.S. Department of Labor, 2016a). This policy discourages young employees to start saving early for retirement even though they start work at a young age, and prevents them from taking advantage of the benefits of compound return. Study findings suggest that this policy may need to be reconsidered or adjusted by employers

or policy makers for young Americans to better prepare for retirement financially at younger ages.

Despite meaningful implications of study findings for individual retirement savings and policy makers, this study has several limitations resulting from the HRS data. A direct measure of savings could not be included in our estimation: whether to save and how much to save for retirement savings each year. The saving amount each period is a relevant factor of retirement savings outcomes in the conceptual model along with how long to work and save. The variable of periodic saving amount is not available in the data set. Instead, education, career job type, or the associated average salary was controlled. Although these proxy variables may not eradicate the impacts, the variables can help to mitigate the bias from missing periodic savings amount. Empirical evidence suggests that higher education and associated higher salary increase the propensity to save for retirement (Lusardi and Mitchell, 2007; Warne, 2013).

As mentioned in the empirical model, we do not estimate a direct effect of compound return on retirement savings. Instead, we approximate the effect with age when first employed. In other words, we assume that an individual will start to save for retirement when they have a first job. In addition, we cannot include existent savings at age when first employed if any because of data unavailability. Although, most American young adults do not have any savings for retirement. Further studies are necessary with related variables to capture compound return and savings for retirement at the age of first employment.

Additionally, further clarifications regarding first employment are needed. The measure of age when first employed is based on the following question: In what year did you first work for six months or more? This question can capture the age when first employed, but does not articulate whether it was full-time or part-time employment and career or temporary job. To mitigate potential bias from this limitation, respondents' occupation type for the longest tenured job is included. Further studies are needed to take into account these issues.

Notes

1 In the HRS sample, racial minorities are oversampled compared with the actual racial composition of all U.S. households. In addition, the sample contains an oversample of Florida residents. The sample weights are constructed in a way to make the HRS weighted sample representative of all U.S. households or of all individuals in the U.S. population in the age eligible range (HRS, 2011).
2 Net worth data tend to have a right-skewed distribution which can lead to biased estimates. Thus, we conduct sensitivity tests using natural logarithm to mitigate bias from the right-skewed distribution.
3 Financial wealth means the net value of non-housing financial wealth, which is calculated as the sum of stocks, bonds, funds, CDs, checking and saving accounts, and other savings less debt.
4 Occupation salary level was classified the 23 categories into four groups (quarterly) based on their median annual salary at 2014 (http://www.bls.gov/oes/2014/may/oes_nat.htm).

Occupation salary is an alternative way to control individuals' lifetime income with less dummy variables.

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