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How does mid-age individual's investment in tertiary education affect the probability to remain in the labor market after 65?



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How does mid-age individual's investment in tertiary education affect the probability to remain in the labor market after 65?

by

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Abstract

This essay examines whether an investment in tertiary education in mid-age increase the probability to remain in the labor market after age 65 in Sweden. In addition, we analyze whether there is any difference in the probability to continue work after 65 if individuals choose to invest in tertiary education in mid-age or in any other age. This study utilizes already existing data that is a combination of a questionnaire survey and Swedish register data. In the sample there are 5235 individuals who are retired and 881 who are still in the labor market, born between 1938 and 1949. The implemented method is a linear probability model to obtain mean marginal effect. The results indicate that individuals who invested in tertiary education in mid-age have a higher probability to remain in the labor market after 65 than individuals with no tertiary education. There is, however, no statistically significant difference in probability depending on when they decide to invest in tertiary education.

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Introduction

There is an increasing share of retired in Sweden. The normal retirement age is 65 and is expected to increase in the coming years. If individuals continue to retire at the normal retirement age, the premium pension need to cover a longer period as life expectancy increases. Hence, there are financial incentives, from the government's perspective, to prolong individuals working life. The policy shall not only encourage workers to continue work but also to protect them from unemployment before retirement. This is because many employers have incentives to replace older workers with younger and cheaper labor force.

The Swedish educational system and pension system differ substantially from other countries. Most significantly, the public education is free for all citizens and the pension system is very flexible were individuals can customize their retirement best suited to them. Sweden is therefore an interesting country to apply our study on.

The focus in this study will be the normal retirement age, 65, and whether educational attainment in mid-age will increase the probability for individuals to work after 65. Individuals in mid-age are defined to be individuals in ages between 40-50. This study will analysis whether participating in tertiary education in mid-age would affect individual's actual retirement age. In addition, we also test whether receiving tertiary education in mid-age would affect the preferred retirement age among those elderly workers who are still in the labor market after age 65.

Previous research has focused on the phenomenon of early retirement and less so on individuals who continue working after normal retirement age (Forma et al., 2005). The contribution of this study would extend this research area by providing new information of the correlation between tertiary level of education in mid-age and retirement age. Furthermore, we analyze the difference in retirement behavior between men and women, which previous studies have stated that further research is needed within this area (Forma et al., 2005). This study departs from other studies by additionally analyze if there is any difference between individuals that invested in educational attainment in mid-age and individuals who invested in education in any other age.

There have been research that individuals do not work longer than necessary (Barr, 2013). Previous research has found that tertiary education prolongs working life (Forma et al., 2005; Stenberg and Westerlund, 2013). This study will test the hypothesis if attaining tertiary level of education in mid-age extend working life, using self-assessed cross sectional data that

have not been done before from what we are aware of. A second hypothesis is that individuals who invest in tertiary education in mid-age have a higher probability to remain in the labor market after 65 than other individuals with tertiary education. This is because high-skilled individuals in mid-age need to remain in the labor market a longer period to collect the payoff of their investment than individuals that educated themselves in younger years. Individuals who invested in education early in life are more likely to collected higher pension benefits from the return to education and have therefore the opportunity to retire at the normal retirement age.

The paper is organized as following: In the next section we present the institutional background regarding the Swedish education and pension system. In Section 2 we will present the treatment of previous research. Presentation of the theoretical framework is specified in Section 3. In Section 4 we will describe the data and Section 5 presents our methodology. The results are presented in Section 6 and analyzed in Section 7, before some concluding remarks in Section 8.

Background

Adult education is a new area of research that has been introduced as a result from newer policy reforms from the last decades. It is important to get an idea of why there were an increase in adult education in the 1970s to understand the intuition behind the phenomenon. Rubenson (1994) describe the development of adult education through the 1970s to 1990s as a result of different policy strategies implemented by the government.

The government expanded the education system in the early 1960s. Before the expansion, individuals had only the opportunity to educate themselves six or seven years. After the expansion, the newer generation had nine years of compulsory education and there was a high share of them that continued to upper secondary education. The new expansion of the education system lead to a gap in skill composition between the two generations. Human capital theories had emerged that advocated an efficient society by increasing the intellectual reserve, that is individuals understanding and rationality. Researches had additionally found that the older generation, before the expansion, had the intellect required to further educate themselves. This led to the adult education reform introduced by the government in 1967. The government's intention with the reform were to correct an inadequate system and to increase the intellectual reserve. There was an expansion in adult education in early 1970's that were

due to the adult education reform introduced 1967 by the Swedish government (Rubenson, 1994).

The government continued to develop reforms to help individuals overcome the possible obstacles that occur when deciding to go back to school. The Swedish government introduced 1974 the act on educational leave. It is protective legislation so that adults could leave the labor market to study and then return to the same employment and wage setting (Rubenson, 1994).

Rubenson's (1994) reform study could introduce one explanation to why there is a high share of individuals that have participate in adult education as they have clearly been developed to promote educational attainment in adult life. The study also clearly states that adult education is something that the government priorities. The advantage of keeping the policies generous is also to provide the population with the skills needed when the labor demand changes. For instance, technological changes can lead to a higher labor demand for high-skilled and decrease the demand for low-skilled (Stenberg, 2012).

Regarding the retirement age, the normal retirement age in Sweden is 65. The pension system in Sweden has three components; income pension, premium pension and guarantee pension. The statutory income pension is payable from the age of 61 but there are financial incentives for postponing retirement, e.g. the pension will increase the longer time spend on the labor market (Anxo et al., 2017a). Individuals who completely leave the labor market before the age of 66 are not entitled to Earned Income Tax Credit, which result in higher taxes on the pensions than if these individuals had postponed retirement (minPension, 2018). Individuals who leave the labor market earlier than the normal retirement age will therefore not only have lower pension amount but also a higher tax on the pension until the year the individual turns 66. Employers in Sweden are obliged to pay their workers occupational pension until they turn 65 if they are employed with collective agreement. (Pensionsmyndigheten, 2019)

The Swedish pension system was reformed in the late 1990s and is built on a flexible retirement age and the life-time earnings principle. The aim of the new reform was to achieve sustainable pensions, not only for the employees but also for the self-employed and it provided the possibility to combine work with retirement (Anxo et al., 2017a).

The old pension system included the earnings-related ATP pension that were based on a worker best 15 years and were provided after 30 years of contribution. ATP was a system that favored high income earners and rose politicians' interest to reform it to a more efficient

system. The new reform legislation passed in 1998 and implemented 1999. It included most significantly new determinants of the occupational pension that are now determined on an indexed long run average income with adjustment for life expectancy. The survey data in this study is based on individuals that were born between 1938 to 1949. Those individuals are included in both the old and the new pension system and receive ATP as a part of their income-related pension and the rest in occupational and premium pension. The younger individuals are, born between this period, the smaller is the proportion of the ATP. (Barr, 2013). Individuals in the earliest cohort, cohort 1938-1941, receives therefore a larger proportion of the ATP related pensions than individuals in the later cohort, 1946-1949.

Literature review

The study of educational attainment in mid-age and its effect on the retirement decision have not been previously investigated. Luna et al. (2012) study if investment in upper secondary school in mid-age would delay the retirement. The treatment group were individuals that for the first time enrolled in adult education and the control group were individuals who had no enrollment in adult education. Luna et al. (2012) compared individuals with similar observable characteristics and assumed they had similar unobservable characteristics. The treatment group had lower earnings and higher probability to receive unemployment benefits before the enrolment in adult education. This indicates that these individuals had to enroll in adult education to get a better labor market position, which may lead to higher earnings and less unemployment benefits. Luna et al. (2012) found no effect on the timing of retirement as a result of adult education, at the upper secondary level.

Stenberg and Westerlund (2013) analyzed the effect of tertiary education in mid-age on the timing of retirement. They applied a similar empirical method as Luna et al. (2012) using propensity score matching to compare the timing of retirement of the treated and their matched comparison. Stenberg and Westerlund (2013) found that educational attainment in mid-age improved individual's labor market situation between the ages of 61-66 and that educational attainment in mid-age delay retirement. This result support our hypothesis that investment in tertiary education in mid-age extend working life.

Forma et al. (2005) examine individuals who plan to work after the normal retirement age in Finland. Using cross-sectional data collected by Statistics Finland in 2003 they were able to select individuals who planed to work past the normal retirement age (65 in Finland).

The aim of their study was to examine the average planned retirement age for older Finnish workers, and which factors they valued as important if they were to continue working and postpone their retirement decision. The results were consistent with previous research that was earlier mentioned, where they found a clear link between tertiary education and prolonging working life. They additionally found that women are less likely to work after the standard age of retirement and especially due to economic reasons in contrast to men. The difference in retirement behavior between men and women have been partly contradictory according to Forma et al (2005) and need to be further analyzed. Forma et al. (2005) did not analyze specifically tertiary education in mid-age but their study can still apply on our research as it provides interesting results to why individuals choose to continue working after the normal retirement age.

Gough (2003) examined which factors that influence individual's decision to retire in UK. The timing of retirement could be dependent of many factors other than the individual skill level. Similar to earlier findings, the study found that the timing of retirement was distinctly different between men and woman and concluded that the most important factor in the decision to retire or not is the individual's health, following by the benefit package offered by the firm. It is known that good health is one of the most salient factors for an individual to be able to continue work. It is both the health of the individual and their family that affect individual's decision to continue work or retire (Shacklock et al., 2009).

Montizaan et al. (2013) analyzed how retirement age differed, depending if individuals have had firm-specific training in their early career or general training. Montizaan et al. (2013) found that it was more common that individuals with general training background continue work after 65 than those with firm-specific training background. Further, that a larger share of those with firm-specific training retire at 65. These findings are highly relevant for public policies in European countries according to the authors of the article. It is relevant if the country wants to increase the labor force participation of older workers because of an aging population (Montizaan el. al., 2013).

Table 1: Summary of empirical studies

Studies	Data	Empirical Method	Contribution	Main Results
Luna et al. (2012)	Register data administrated by Statistics Sweden, panel database	Differences in difference estimation, propensity score matching	Adult education and retirement age, secondary level	Investment in upper secondary level of education in mid-age do not affect the timing of retirement
Stenberg & Westerlund (2013)	Register data administrated by Statistics Sweden, panel database	Differences in difference estimation, propensity score matching	Adult education and retirement age, tertiary level	Investment in tertiary level of education in mid-age extend working life
Forma et al. (2005)	“Working Conditions 2003”, Statistics Finland, cross-sectional survey	Multivariate analyses, logistic regression, cross-tabulation	Who continue work past standard age of retirement?	Investment in tertiary level of education extend working life
Gough (2003)	LFS & ILO surveys	Procedure factor in SPSS, factors derivation, varimax rotation	Factors that influence the retirement decision	Good health is one of the most important factors in the decision to retire or not
Montizaan et al. (2013)	NLSOM survey	Pooled linear probability model, Cox & proportional hazard models	Training and retirement patterns	It is more common that individuals with general training background continue work after 65 than those with firm-specific training background

Theory

An individual's retirement decision is complex and there exist no exhaustive economic model explaining the timing of retirement. This theoretical framework will therefore have to rely on findings in previous research on which factors that is important in individual's decision to retire and/or continue work. This will then be incorporated in basic economic behavior to obtain the theoretical framework.

There is a relationship between annual salary and years of schooling. Education are assumed to increase wages because education often reflect individual's productivity. An individual should choose the level of schooling that maximizes the present value of earnings (Borjas, 2016). Returns on an additional year of schooling decreases with individuals age because they have fewer years left in the labor market and because of higher opportunity costs. Individuals in mid-age are in their point in life when they earn the most according to life-cycle theory. The opportunity cost to enter adult education may therefore be large at this point in life. This does not mean that the returns will be negative for older workers. Several empirical studies have found that the earning returns of education for individuals in mid-age are similar to younger individuals (Stenberg et al., 2010).

There is both monetary and non-monetary returns to education. In the process when countries become more developed, the labor demand on highly educated individuals increases. High-skilled have a lower risk of poverty and to be left behind in societal development. This means that there are more employment opportunities for educated workers. The duration of unemployment is therefore lower among high-skilled individuals which makes these people less dependent on income transfers from the government and other subsidies. High-skilled do not only have high labor income, they are also more likely to make rational decisions regarding consumption and savings than low-skilled. Educational attainment has a positive effect on individuals health. There is also evidence of the effect of parents' education on children's health, cognitive development and social behavior. There have also been found that it is a link between education and fertility control. (Vila, 2005).

Individuals in mid-age choose to stay in the labor market instead of enrolling in education if it maximizes their present value of earnings. While for some individuals it will be more beneficial to invest in tertiary education in mid-age due to e.g. higher salary after educational attainment (Borjas, 2016). The decision to enroll in adult education stands in conflict with Becker's human capital model. The present value to invest in education would be highest for younger individuals. They can collect their return to education and increase in pensions over a longer time period than those who choose to invest in education later in life. This suggest that it must have been changes in labor demand that explains why some individuals choose to enroll in adult education (Stenberg, 2012).

Stenberg and Westerlund (2013) conclude that education may increase earnings and so the pensions, which creates an opportunity to retire at the normal retirement age. Educational attainment may also improve individuals labor market position later in life that create incentives to continue working after 65. What it comes down to is that the decision to retire depends on individuals' preferences and attitudes towards retirement (Stenberg and Westerlund, 2013). Attitude towards work and retirement have in previous research found to be a relevant factor in individuals' decision to continue working. A negative attitude towards retirement would most likely increase the propensity for an individual to delay retirement (Gough, 2003). Attitudes and norms are significant factors in the decision to continue work rather than in the decision to retire (Anxo et al., 2017b).

Education may indirectly decrease number of unemployment days because educated workers are more attractive to employers and more likely to receive on the job training (Borjas, 2016). Low number of unemployment days is another factor that would increase the

likelihood to enter early retirement considering that these workers have had the opportunity to collect higher pensions benefits. However, long-term unemployment may likewise lead to early retirement. This could be due to the guarantee pension that offers poverty relief to low-income earners. (Barr, 2013)

Education may improve workers labor market position later in life but also working conditions. It is known that good working conditions is a necessity for individuals to want to continue work after the normal retirement age. This includes convenient working time, good physical- and mental work environment with possibility to skill develop (Nilsson et al., 2011; Shacklock et al, 2009). Human capital theory says that longer investment in education result in more costs. Individuals then have to work a longer period to obtain the payoff from that investment. This may be one explanation why high-skilled tend to continue work after 65 (Anxo et al., 2017a). Previous studies have emphasized financial incentives as one of the most important factors involved in individual's retirement decision. This factor could both push or pull older workers into retirement or extend working life (Nilsson et al., 2011). If economic incentives are less relevant in the decision to retire, research have emphasized the role of the family. The decision to continue work is then not only on the basis of personal gains but also for the benefit of the family (Shultz et al., 1998; Nilsson et al., 2011).

There have been predictions in previous theoretical frameworks that early retirement is more common for low-skilled than for high-skilled (Stenberg et al., 2010). Stenberg and Westerlund (2013) identify four underlying factors that explain this higher labor force participation rate among high-skilled. Firstly, high-skilled are more in line with the market demand for skills. High-skilled are more adapted to technological changes and more likely to receive OJT. Lastly that high-skilled tend to have a better state of health that allows them to stay longer in the labor market (Stenberg and Westerlund, 2013).

There are evidence showing that investment in education have several positive effects on individual's health. Anxo et al. (2019) found a positive correlation between education and individuals health. High-skilled tend to invest more in their health but could also more easily obtain information of better health prospects within a network of other high-skilled. An investment in education is therefore an investment in health that could prolong an individual's working life (Anxo et al., 2019).

Education often change an individual's wage prospects that could impact decisions later in life as the transition into retirement. Borjas (2016) describe the predicted age-earnings profile in the life-cycle model. The life-cycle theory demonstrates individual's earnings and

work path throughout individual's lifetime. Wages tends to be low for younger individuals and gradually increase until the peak at the age 50. After the peak, the wages gradually decrease until retirement. This wage change is partly due to that individuals accumulate knowledge throughout the lifetime but also how many hours of work they choose to supply. This alter the price of leisure throughout an individual's lifetime and at the end, the life cycle model reflects the labor supply decision of a particular worker. The life-cycle model assumes that workers predict a wage rate through the life course and plan accordingly. This would entail that a worker would supply more hours of work when the wages are high and substitute work to leisure when the wages are low (Borjas, 2016).

There have been found that individuals have lower probability to continue working after the normal retirement age if they have more interest in activities outside work (Shacklock et al., 2009). This entail that some individuals prefer leisure more than others. There exist some individuals that view leisure as an inferior good. It is important to acknowledge their existence because this could be the case for some individual that decide to remain in the labor market after the normal retirement age (Borjas, 2016).

Previous research found several factors that could explain why some individuals tend to continue work after 65 and why some choose not to. Most well-known factor is the state of health. Other factors that have been addressed in this theoretical framework is individuals' attitudes towards retirement, working conditions, skill level, financial incentives and the retirement decisions made by life partner and close friends.

Data

The data set in this study is a combination of a cross-sectional survey with Swedish register data from *Longitudinal database for health insurance and labor market studies* (LISA). The data are collected from a previous research that study the retirement decision (Anxo et al., 2017a). The data comes from a survey that was designed by Anxo et.al. (2017a) and conducted by Statistics Sweden (SCB). Our research has been granted permission to use this unique set of data. The postal survey was collected between November 2014 and January 2015 and included two questionnaires' that were sent to individuals who were all born between 1938 and 1949, either retired or not. Those individuals who were still in the labor market at the time of the survey answered questionnaire A and those who were already retired and had completely left the labor market answered questionnaire B. The survey sampled 20 000 individuals that were all above 65 years old with a response rate of 12 140 individuals.

This resulted in 4118 individuals who answered questionnaire A and 8022 individuals who answered questionnaire B. Individuals in the survey were asked “Which year did you finished your highest educational level?”. Those individuals were then matched with the year they were born. We were then able to sample individuals with at least 2 years of tertiary education that finished their educational attainment between the ages of 40-50. This generated the main variable of interest, EducUni.

To analyze the difference in the probability to remain in the labor market after 65 between individuals who invested in tertiary education, for the first time, in mid-age with individuals without any tertiary education, several individuals in the sample have been rejected. We only want to include individuals who either invested in tertiary education in mid-age or have no tertiary education, which is the reason why individuals who started their first full time employment after age 24 have been rejected. By making this exclusion we assume that these individuals did not enter their first full time job earlier because of educational attainment. This eliminate the risk that the sample could possible include individuals that invested in university in young age and then again at mid-age. It may be possible that we exclude individuals who should be included in the sample. E.g. individuals who for some other reason than education attainment did not enter a full-time job before the age of 24. This may result in bias estimates. Individuals who invested in tertiary education at any other age than between 40-50 have also been rejected to, again, compare individuals who invested in education in mid-age with individuals with no tertiary education.

After carefully constructing a selection of individuals, the sample include 5235 who was retired at the time of the survey (leavers) and 881 individuals who was still in the labor market at the time of the survey (stayers). Previously, those who are still in the labor market at the time of the survey has been identified as “stayers” and those who completely left the labor market as “leavers” (Anxo et al., 2017a). This study will follow the same identification. The two questionnaires contained a set of 90 questions, where approximately half were the same for both questionnaires and the other half were designed for specifically that group. The objective with the survey was to complement the already existing individual register data in LISA with socioeconomic and individual characteristics that could influence individual’s decision to retire or not.

Number of observations, means and standard deviations of selected variables are reported in table 2. The variables means and standard deviations are collected from leavers in the first column while the same values are stated for stayers in the second column. The table

shows that over 4 percent of leavers and almost 8 percent of stayers invested in tertiary education in mid-age. The information regarding the actual retirement age is only collected from leavers because all other individuals are still in the labor market. Planned retirement age is, however, asked to stayers. The mean of the actual retirement age is 64,4 with a standard deviation of 3 years. Planned retirement age among stayers is 69,2 with a standard deviation of 4 year. There is a larger share of men in the group of stayers (65,6 percent) than in the group of leavers (55,3 percent). This also indicates that it is a smaller share of women who continue work after 65. It is more common that stayers have a better health than leavers. Individuals who are born at the late 40's have a higher proportion of participants in the group of stayers than in the group of leavers. It is the opposite for individuals born between 1938 and 1945.

One limitation with our cross-sectional data is that even though leavers had left the labor market at the time of the survey we do not know if these individuals will enter the labor market again in coming years. We then must assume that all individual who have left the labor market at the time of the survey do not enter the labor market again.

Table 2: Descriptive statistics

	(1)	(2)
	Leavers	Stayers
EducUni	0.0426 (0.202)	0.0795 (0.271)
RetirementAge	64.39 (3.032)	
PlannedRetirement		69.20 (4.159)
Male	0.553 (0.497)	0.656 (0.475)
Partner	0.758 (0.428)	0.726 (0.446)
GoodHealth	0.471 (0.499)	0.615 (0.487)
WorkExperience	42.90 (7.022)	44.98 (5.826)
Immigrant	0.0640 (0.245)	0.0795 (0.271)
AverageIncome	2.549 (1.283)	2.988 (1.493)
TotUnemployment	2.663 (6.003)	2.593 (6.166)
Cohort1938_1941	0.201 (0.401)	0.0511 (0.220)
Cohort1942_1945	0.308 (0.462)	0.163 (0.370)
Cohort1946_1949	0.491 (0.500)	0.785 (0.411)
Observations	5235	881

mean coefficients; sd in parentheses

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

Source: Anxo et al. (2017a) and own calculations

Method

To study if an investment in tertiary education in mid-age will affect retirement age and planned retirement, we will run two OLS regressions, model specification 1 and 2. Individuals who had left the labor market at the time of the survey answer the question asking at what age he/she retired. The dependent variable “RetirementAge” is continuous and define individuals actual age of retirement, collected from respondents that had completely left the labor market at the time of the survey. Individuals who still worked at the time of the survey were asked when they plan to retire. The second dependent variable “PlannedRetirement” is a continuous variable, capture at what age individuals plan to retire. The independent variable we will focus on the most in this study is the dummy variable EducUni. EducUni is equals to

1 if the individual finished tertiary education of at least two years of studies between the ages of 40-50 and equal to 0 otherwise.

Model specification 1:

$$\begin{aligned} \text{RetirementAge}_i = & \beta_0 + \beta_1 \text{EducUni} + \beta_2 \text{Male} + \beta_3 \text{Partner} + \beta_4 \text{GoodHealth} + \\ & \beta_5 \text{WorkExperience} + \beta_6 \text{Immigrant} + \beta_7 \text{AverageIncome} + \\ & \beta_8 \text{TotUnemployment} + \beta_9 \text{Cohort1942_1945} + \beta_{10} \text{Cohort1946_1949} + \varepsilon_i \end{aligned}$$

Model specification 2:

$$\begin{aligned} \text{PlannedRetirement}_i = & \beta_0 + \beta_1 \text{EducUni} + \beta_2 \text{Male} + \beta_3 \text{Partner} + \beta_4 \text{Good Health} + \\ & \beta_5 \text{WorkExperience} + \beta_6 \text{Immigrant} + \beta_7 \text{AverageIncome} + \\ & \beta_8 \text{TotUnemployment} + \beta_9 \text{Cohort1942_1945} + \beta_{10} \text{Cohort1946_1949} + \varepsilon_i \end{aligned}$$

Model specification 1 and 2 allows us to analyze if an investment in tertiary education in mid-age increase or decrease the retirement age and planned retirement compared to individuals with no tertiary education. In addition to that, we also perform the regression analysis conditional on individuals with the tertiary education. This enables us to estimate if the effect on retirement age and planned retirement are different depending if individuals invest in tertiary education in mid-age or at any other time in life.

In the regressions, "Male" is a dummy variable equals to 1 if the individual identifies as male and equal to 0 if the individual identify as female. Another demographic variable we control for is immigrant status. One relevant factor in the decision to retire is family consideration. The decision to retire or not may partly be influenced by the retirement decision made by their partner. Previous research (Shultz et al., 1998; Nilsson et al., 2011) have found that individuals' decision to retire or not may not only be as a result of personal gains but to what benefit the family the most. E.g. an individual may be pushed into work after retirement as a result of their partner's involuntary retirement that were due to illness. This explains why the independent variable "Partner" is included in the OLS regressions. Partner is a dummy variable equal to 1 if the individual is either married or cohabitee and equal to 0 otherwise. Leavers assessed their state of health when they completely left the labor market and stayers reported their state of health at the age of 64 using a five-level Likert scale: excellent, very good, fair, poor and very poor. The variable "GoodHealth" is a dummy variable equals to 1 if the respondents answered excellent or very good and equal to 0 otherwise. This health variable control for the most relevant factor in the decision to retire

according to previous research (Gough, 2003; Shacklock et al., 2009; Stenberg and Westerlund, 2013, Anxo et al., 2019). By controlling for individual's health, we remove the channel that education affects the retirement behavior through the health factor.

The variable "WorkExperience" is a continuous variable and it is defined as the duration of employment up to retirement for leavers and to age 65 for stayers, estimated in years. Work experience is relevant in the retirement decision as it can both explain individuals pension situation and working conditions.

The financial incentives can both push and pull workers into retirement or extend working life (Nilsson et al., 2011). To control for this factor, we include variable "AverageIncome" in the model. AverageIncome is continuous and define how much money the individual has earned in the labor market between age 59 and 64, in 1000 SEK.

A higher number of unemployment days is another factor that will affect the decision to retire or continue working. To control for the fact that education may indirectly decrease number of unemployment days (Borjas, 2016) that could then affect the timing of retirement, we use the independent variable "TotUnemployment". This is a continuous variable defined as the amount of unemployment days between age 59 and 64, in 100 days.

When we control for cohorts, we use individuals who was born between 1938 and 1941 as a reference group. Individuals born between 1942 and 1945 are included in variable Cohort1942_1945 and individuals born between 1946 and 1949 are included in variable Cohort1946_1949. The coefficients of the two cohorts last mentioned are in relation to the reference group.

It could be unobservable characteristics that affect individual's decision to continue work e.g. motivation, ability and effort, which we cannot control for. If individuals who invest in tertiary education in mid-age are more motivated, have a higher ability or put more effort in work than individuals with no tertiary education and we cannot control for these factors, our estimates on the variable EducUni will be upward biased.

To test for multicollinearity a Variance Inflation Factor (VIF) test will be implemented. We will follow the rule of thumb indicating that if the VIF value is smaller than 4 then there is no multicollinearity in the regression.

To study if mid-age individual's investment in tertiary education affect the probability to stay in the labor market after 65, we will use a linear probability model (LPM), see model specification 3. That is OLS estimated probabilities and is used because it provides a simple expression with mean marginal effects (Horrace and Oaxaca, 2006). The binary dependent

variable in LPM is equals to 1 if the individual worked after 65 and equals to 0 if they left the labor market at or before age 65.

We will run the regression twice. The whole survey sample will be analyzed the first time when running the regression. When using this sample, it is possible to see how investment in tertiary education in mid-age will affect the probability to continue working after 65 compared to individuals who have never invested in tertiary education. The second time when running the regression only individuals who have invested in tertiary education will be included in the sample. This will make it possible to see if there is any difference in probability depending if individuals invest in tertiary education in mid-age or invest in tertiary education another time during their life. These two analyzes will be done by estimating the following equation:

Model specification 3:

$$\begin{aligned} \text{ProbitWorkAfter65}_i = & \beta_0 + \beta_1 \text{EducUni} + \beta_2 \text{Male} + \beta_3 \text{Partner} + \beta_4 \text{Goodhealth} + \\ & \beta_5 \text{WorkExperience} + \beta_6 \text{Immigrant} + \beta_7 \text{AverageIncome} + \\ & \beta_8 \text{TotUnemployment} + \beta_9 \text{Cohort1942_1945} + \beta_{10} \text{Cohort1946_1949} + \varepsilon_i \end{aligned}$$

where probability to continue work after 65 is our dependent variable. We will have the same independent variables in this model as model specification 1 and 2. The LPM will then be analyzed separately on men and women because previous studies have found that it is a difference in retirement behavior between the two (Forma et al., 2005).

Result

OLS regression on actual- and planned retirement age

Table 3 display the regression results from model specification 1 and 2. Notice that RetirementAge and PlannedRetirement are both separated into two columns that firstly analyze the effects on the sample as a whole and secondly on only individuals with tertiary level of education. Column 1 and 3 exhibit the results specifically for the group of leavers who had exit the labor market, and column 2 and 4 for the stayers who was still in the labor market at the time of the survey. After carefully controlling for multicollinearity and eliminating extreme values the results can be presented.

EducUni is positive and statistically significant at 10 % significance level for the actual retirement age in column 1. The estimated coefficient associated with the variable EducUni suggests that if an individual have invested in tertiary education in mid-age, the actual retirement age increases by an average of 6,8 month (0,574 years). Health plays an important role in extending working life. The variable GoodHealth in column 1 is statistically significant at 1 % level. If an individual has “very good” or “excellent” health status the actual retirement age would increase with an average of 7,5 month (0,628 years). If individuals work experience increases by one year, the actual retirement age would on average increase by 1,1 months (0,095 years). Individuals born between 1946 and 1949 retire earlier than individuals born between 1938 and 1941 (the reference cohort).

In column 2, the coefficients estimate how much the independent variables affect stayers planned retirement age. Only individuals who are still in the labor market at the time of the survey are included in this regression. EducUni is statistically significant at 5 % level. The mid-age tertiary education would increase the planned retirement age by 9,1 months (0,761 years). This suggest that there is a positive relationship between retirement age and whether the individual has obtained university degree in mid-age, which is shown in column 1 and 2 respectively. Variable Male is statistically significant at 1 % level and increases the planned retirement age with 1 year compared with women, see column 2. Individuals with good health plan to retire later than individuals not having a good health and an increase in years of work experience will postpone the planned retirement age. Individuals born between 1942 and 1949 plan to retire later than individuals born between 1938 and 1941 (the reference cohort).

Continuing with the results in column 3 and 4 that only include individuals with tertiary level of education. The variable EducUni have insignificant effect on both the actual- and planned retirement age. It suggests that there is no significant difference on the timing of retirement between individuals who obtained their university degree in mid-age or those who obtained it in any other age.

Table 3: Cross-section regression on the effect of University education on Actual Retirement and Planned Retirement age

VARIABLES	Retirement age			
	(1) RetirementAge Pop.	(2) PlannedRetirement Pop.	(3) RetirementAge Uni.	(4) PlannedRetirement Uni.
EducUni	0.574* (0.316)	0.761** (0.373)	-0.240 (0.273)	0.0271 (0.246)
Male	0.222 (0.145)	1.010*** (0.355)	0.0934 (0.220)	1.259*** (0.224)
Partner	-0.169 (0.143)	0.0686 (0.399)	-0.447* (0.230)	-0.164 (0.201)
GoodHealth	0.628*** (0.115)	0.850** (0.366)	0.486** (0.195)	0.620** (0.254)
WorkExperience	0.0950*** (0.0115)	0.135*** (0.0368)	0.0489*** (0.0167)	-0.0192 (0.0205)
Immigrant	0.240 (0.273)	-1.397 (0.961)	0.274 (0.411)	0.254 (0.343)
AverageIncome	0.0322 (0.0576)	-0.0597 (0.101)	0.0160 (0.0568)	-0.00126 (0.0621)
TotUnemployment	0.0521*** (0.00908)	-0.0360* (0.0212)	0.0322 (0.0208)	-0.0302 (0.0212)
Cohort1942_1945	-0.0452 (0.146)	-3.023* (1.722)	0.0715 (0.253)	-3.254*** (0.631)
Cohort1946_1949	-0.460*** (0.158)	-7.404*** (1.657)	-0.477* (0.250)	-8.298*** (0.538)
Constant	59.05*** (0.540)	68.38*** (2.325)	62.21*** (0.762)	76.36*** (1.022)
Observations	5,235	881	2,331	756
R-squared	0.081	0.372	0.031	0.505

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Linear probability model on the population sample

Table 4 displays how mid-age university education affects the probability to remain in the labor market after 65, where we use the whole survey sample, defined in section 4. Men and women are separately analyzed in the second and the third column. The coefficients are estimated under linear probability model.

It is on average 16,6 percentage points higher probability to remain in the labor market after 65 for individuals who invested in tertiary education in mid-age than individuals with no tertiary education, as column 1 display. Looking at the effect among the male sample in column 2, men who invest in tertiary education in mid-age have on average 14,1 percentage points higher probability to continue work after 65 than men with no tertiary education. This coefficient is statistically significant at 10 % level. In column 3, among the female subsample,

women who invested in tertiary education in mid-age have 17,4 percentage points higher probability to work after 65 than women with no tertiary education. The estimated coefficient is significant at 1 % level. To sum up, we find that the effect is stronger among female than males.

Table 4: Probability of staying in the labor market after 65 based on the whole survey sample, linear probability model

VARIABLES	(1) ProbitWorkAfter65 Pop.	(2) ProbitWorkAfter65 Men	(3) ProbitWorkAfter65 Women
EducUni	0.166*** (0.0358)	0.141* (0.0848)	0.174*** (0.0400)
Male	0.122*** (0.0139)		
Partner	-0.0456*** (0.0148)	-0.0166 (0.0241)	-0.0720*** (0.0185)
GoodHealth	0.0858*** (0.0129)	0.0943*** (0.0190)	0.0736*** (0.0170)
WorkExperience	0.00147 (0.00102)	0.00362* (0.00194)	-8.21e-05 (0.00119)
Immigrant	0.00796 (0.0255)	0.00666 (0.0371)	0.0205 (0.0351)
AverageIncome	-0.0123* (0.00633)	-0.0160** (0.00783)	-0.00831 (0.0111)
TotUnemployment	-0.000589 (0.00111)	-0.00236 (0.00181)	0.000698 (0.00141)
Cohort1942_1945	0.0163 (0.0164)	0.0165 (0.0250)	0.0185 (0.0214)
Cohort1946_1949	0.0841*** (0.0162)	0.0819*** (0.0244)	0.0917*** (0.0212)
Constant	0.102** (0.0465)	0.118 (0.0911)	0.170*** (0.0576)
Observations	7,587	4,430	3,157
R-squared	0.040	0.021	0.037

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Linear probability model on individuals with tertiary level of education

Table 5 display the results from model specification 3 but now only include individuals with at least a university degree. EducUni will indicate if there is any difference between those individuals who choose to invest in tertiary education in mid-age and those who invest in tertiary education in any other time in their life. University education in mid-age, in column 1, is insignificant which indicates that there is no difference between individuals that finished their university degree in mid-age or other individuals with university degree. There is, however, a positive correlation for woman who educate themselves in mid-age. Woman who invested in tertiary education in mid-age have 6,25 percentage points higher probability to continue work after 65 than women who educated themselves in any other age. This coefficient is significant at 10 % level.

Table 5: Probability of staying in the labor market after 65 only for tertiary education: Average effect

VARIABLES	(1)	(2)	(3)
	ProbitWorkAfter65 Uni.	ProbitWorkAfter65 Men	ProbitWorkAfter65 Women
EducUni	0.0482 (0.0323)	0.0485 (0.0643)	0.0625* (0.0367)
Male	0.118*** (0.0248)		
Partner	-0.117*** (0.0280)	0.00851 (0.0474)	-0.176*** (0.0331)
GoodHealth	0.101*** (0.0227)	0.110*** (0.0358)	0.0922*** (0.0290)
WorkExperience	-0.000593 (0.00182)	-0.00267 (0.00304)	-0.000237 (0.00227)
Immigrant	0.0439 (0.0476)	0.0632 (0.0713)	0.0252 (0.0643)
AverageIncome	0.0201*** (0.00682)	0.00729 (0.00694)	0.0692*** (0.0135)
TotUnemployment	-2.06e-05 (0.00275)	0.00216 (0.00519)	0.000932 (0.00323)
Cohort1942_1945	0.0548* (0.0309)	0.0531 (0.0467)	0.0595 (0.0401)
Cohort1946_1949	0.144*** (0.0291)	0.146*** (0.0451)	0.132*** (0.0373)
Constant	0.221*** (0.0796)	0.359*** (0.138)	0.117 (0.0949)
Observations	3,958	1,982	1,976
R-squared	0.060	0.031	0.085

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Discussion

This section will now return to the stated hypothesis in the introduction and discuss what the results indicate. The hypothesis was to test whether tertiary level of education in mid-age extend working life. If individuals who invest in tertiary education in mid-age have a higher probability to remain in the labor market after 65 than other individuals with tertiary education.

EducUni is the variable of interest in this study and have generated some interesting results in the previous section. Table 3 display a positive relationship between those with tertiary education in mid-age on the actual retirement and the planned retirement in the population sample. The postponement in actual- and planned retirement do not only apply for individuals in mid-age but for all individuals with tertiary level of education. This can be seen in table 3, column 3 and 4, that display an insignificant effect of EducUni variable.

The positive correlation between education at tertiary level and retirement age are in line with previous research (Stenberg and Westerlund, 2013; Forma et al., 2005). Stenberg and Westerlund (2013) concluded a delay in retirement as a result of adult education at tertiary level and Forma et al. (2005) concluded that there is a positive correlation between tertiary education and an extension of working life. The results in table 4 indicated that individuals who invested in tertiary education in mid-age have a higher probability to continue working after the standard retirement age than other individuals with no tertiary education. If an individual enters tertiary education, this would be a strong indicator that the individual would remain in the labor market for a longer period than those without tertiary education. This confirms the stated hypothesis that individuals who invested in tertiary education in mid-age extend working life.

This result could be explained by several theories. Stenberg's and Westerlund's (2013) four different factors that could explain why high-skilled tend to remain in the labor market longer than low skilled. The results could also indicate that high-skilled workers have to work a longer period to obtain the payoff of the educational investment. Another perspective is that educational investment could increase employment opportunities and make it easier for the worker to find employments with better working conditions. Previous research has found that good working conditions is essential for the prospect of a long labor market participation (Nilsson et al., 2011; Shacklock et al, 2009).

The findings from table 3 and 5 indicate that there is no difference in the timing of retirement between individuals who obtained their university degree in mid-age and individuals who obtained it in any other age. This means that we cannot reject our hypothesis that individuals in mid-age would have a higher probability to remain in the labor market after 65 than individuals who attained tertiary level of education in any other age.

The results from column 3 in table 5 indicate that women with tertiary level of education in mid-age have higher probability to continue work after 65 than other women with tertiary level of education. There were no significant difference in the probability to continue working after 65 for men that invested in tertiary education in mid-age and men that invested in educational attainment in any other age. This result contradicts the findings in Form et al (2005) that women are less likely to continue working after the normal retirement age than men. However, Forma et al. (2005) found that men and women differ in their retirement behavior and are in line with the results in this essay. This suggest that men and women differ in their retirement behavior and high skilled women are more likely to work after the normal retirement age than high skilled men. It was clearly stated in the theoretical framework in section 3 that individuals in younger ages would have the most to gain from entering tertiary level of education than individuals in mid-age. Individuals in mid-age do not only educate themselves when leisure is as most expensive, according to life-cycle theory, but also have fewer years to collect the returns from the education. The expansion of the educational system in the 1960s could be an explanation for why the individuals in this sample did not educated themselves in young age. The expansion gave rise to a skill gap between the generations in the old and the new educational system. The selected individuals in this study belong to the generation who were included in the old educational system and it was of great importance that those individuals educate themselves to match the new labor market demand for skills. Highly motivated young individuals saw this as an opportunity to distinguish themselves in their skill composition and enter tertiary education at young age. This suggest that the two generations are similar in their motivation to strive for good labor market position and may therefore be similar in their attitudes towards retirement. It would then come to no surprise that individuals with tertiary level of education have a high probability to continue work past the normal retirement age, independent of the age they obtained their education.

According to Borjas (2016) it is common for individuals to view leisure activities as a normal good, which mean that the demand for leisure increase when income increase. The

results in previous section indicate that investment in tertiary education in mid-age and those who invested in education in young age may be alike in their preferences for leisure because they are insignificant in their retirement age. The results indicate that individuals who invest in tertiary education have a higher probability to remain in the labor market after 65. Leisure may therefore be an inferior good for these individuals, indicating that when income rises their demand for leisure decreases. In the decision to continue work after 65 and have a labor income or leave the labor market at the normal retirement age with lower income in terms of pension, it is a higher probability for high-skilled to go with the first alternative. One explanation for this may therefore be that high-skilled prefer leisure activities less than individuals with no tertiary education. This conclusion can also be confirmed by the study made by Shacklock et al., (2009) who found that individuals who have more interest in leisure activities outside work have a lower probability to continue working after the normal retirement age.

Montizaan (2013) found that individuals with general training tend to continue work after 65 more so than individuals with firm-specific training background. On the other hand, Stenberg and Westerlund (2013) described that OJT possibly strengthen the bond between the firm and the worker and high-skilled tend to receive OJT training more so than low skilled. High-skilled have therefore a human capital that have increased both from firm-specific training and general training that have both been proven to extend working life.

Conclusion

This research has contributed with new and relevant findings about the effect of adult university education on individual's retirement decision. An investment in tertiary education in mid-age increase the probability to remain in the labor market after 65. Individuals who invest in tertiary education, between the ages of 40-50, do not have higher probability to remain in the labor market than individuals who invest in tertiary education in any other age. This suggest that one way to encourage the late retirement is though opening the education opportunities for mid-age population. This does not necessarily only refer to educational attainment but also on-the-job training (OJT) to increase the overall lifelong learning. The government should remove obstacles for receiving adult education.

Women who invest in tertiary education in mid-age have a higher probability to remain in the labor market after 65 than women who invest in tertiary education in any other time in life. This is not the case for men. Men with tertiary level of education, have no difference in retirement behavior regardless of when they did complete their education. This can be further explored in future research, why there is a gender difference in the result. Another interesting aspect that could be further developed is whether high-skilled work full-time or part-time after the standard age of retirement.

The drawbacks with this study are that it is based on cross-sectional data and it may be possible that we omitted independent variables that would be important in individual's retirement decision. We cannot interpret the effect of educational attainment in mid-age on the probability to remain in the labor market after 65 as the causal effect. Another drawback is the lack of economic models that the results can apply on.

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Appendix

A1 Variable description

Variable	Definition
Dependent variables	
RetirementAge	Continuous variable "At what age did you exit the labor market?" Leavers, survey questionnaire
PlannedRetirement	Continuous variable "At what age do you plan to retire?" Stayers, survey questionnaire
ProbitWorkAfter65	.=1 if the individual did continue work after 65, zero otherwise, survey questionnaire
Explanatory variables	
EducUni	.=1 if the individual finished tertiary education of at least two years of studies in mid-age, zero otherwise, survey questionnaire
Health (when they retire or at the age of 64)	.= 1 if excellent or very good at the time of retirement and 64 for stayers, zero otherwise, survey questionnaire
Male	.=1 if male, zero if female, survey questionnaire
Partner	.=1 if married /cohabiting, zero otherwise, survey questionnaire
WorkExperience	Continuing variable, duration of employment up to retirement and 65 for stayers, survey questionnaire
Immigrant	.=1 if immigrant, zero if born in Sweden, survey questionnaire
AverageIncome	Average labor income between age 59 and 64, in 1 000 SEK, LISA
TotUnemployment	Unemployment spell in days (in 100 days), between 59 and 64 years, LISA
Cohort1938_1941	.=1 if the respondent is born between year 1938-1941, zero otherwise, reference group, LISA
Cohort1942_1945	.=1 if the respondent are born between year 1942-1945, zero otherwise, LISA
Cohort1946_1949	.=1 if the respondent are born between 1946 and 1949, zero otherwise, LISA

A2 Multicollinearity test

Variable	VIF	1/VIF
Cohort1~1949	1.45	0.689480
Cohort1~1945	1.43	0.700036
AverageInc~e	1.36	0.734125
Male	1.24	0.808158
TotUnemplo~t	1.13	0.886718
WorkExperi~e	1.12	0.890231
Immigrant	1.05	0.956251
GoodHealth	1.05	0.956594
EducUni	1.03	0.970122
Partner	1.03	0.970330
Mean VIF	1.19	