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TECHNOLOGY, SKILLS, AND RETIREMENT

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Technology, Skills, and Retirement

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Abstract

In our work we study the role of skills in the retirement decision. Our main research question is to find whether individuals who are more technologically endowed, ceteris paribus, tend to retire later. After a decade or more of intense research on the importance of skill biased technological change, we believe that it is possible to conclude that observed and unobserved skills are among the most important determinants of workers wages and employment status (besides income inequality). While easier to model theoretically, the empirical counterpart of "skills" is not easily found. Workers productivity within an occupation are likely to depend on many factors, some observables and some not. Talent (only very partially observable) is a major determinant, the other being education, training, experience, the relationship with the overall structure of the firm organization, the degree of technological progress experienced by the profession and the way in which technological progress is handled by the firm. We believe that skills are likely to influence the retirement choice as well: everything else constant, a worker with low technological skills will tend to become less and less productive (experience is a poor substitute for rapid technological change) in industries and profession characterized by rapid technological progress. This means that, everything else constant, workers poorly endowed with technological skills are expected to be less valuable for the firm and hence more likely to retire earlier (in one fashion or another). In our work, using data from the Bank of Italy Survey on household's income and wealth (SHIW), we test the hypothesis that individuals that possess a more technologically advanced human capital (proxied by and use and ability in using computers) tend to retire later. Our results indicate that the hypothesis is confirmed, especially when concentrating on males employees.

1 Introduction

In our work we study the role of skills in the retirement decision. Our main research question is to investigate empirically whether individuals who are more technologically endowed, ceteris paribus, tend to retire later. After a decade or more of intense research on the importance of skill biased technological change, we believe that it is possible to conclude that observed and unobserved skills are among the most important determinants of workers wages and employment status (besides income inequality). While easier to model theoretically, the empirical counterpart of "skills" is not easily found. Workers productivity within occupations are likely to depend on many factors, some observables and some not. Talent (only very partially observable) is a major determinant, the other being education, training, experience, the relationship with the overall structure of the firm organization, the degree of technological progress experienced by the profession and the way in which technological progress is handled by the firm. As usual some of these variables are mostly under workers control, others are mostly under firm control and others are jointly determined. We believe that skills are likely to influence the retirement choice as well: everything else constant, a worker with low technological skills will tend to become less and less productive (experience is a poor substitute for rapid technological change) in industries and professions characterized by rapid technological progress. This means that, everything else constant, workers poorly endowed with technological skills are expected to be less valuable for the firm and hence more likely to retire earlier (in one fashion or another). In our work, using data from the Bank of Italy Survey on household's income and wealth (SHIW), we test the hypothesis that individuals that possess a more technologically advanced human capital (proxied by the use and ability in using computers) tend to retire later. Our results indicate that the hypothesis is confirmed, especially when concentrating on males employees.

Our work proceeds as follows: Section 1 reviews the literature on retirement choices and skill-biased technological change, while Section 2 provides some descriptive statistics on retirement and skills in the use of Personal Computers (by age, gender, education and employment status). Section 3 contains the estimation exercise: we have considered both standard probit regression and duration analysis, taking advantage of the panel structure of our data. Section 4 (to be written) concludes our work.

2 Literature review

The research on retirement behavior is wide and growing. Here we briefly review the main approaches found in the literature and then we discuss the evidence on the relationship between skill acquisition and retirement, which is at the heart of our research.

The first problem researchers encounter is in the definition of retirement. Retirement is a process by which individuals abandon a productive role and

withdraw from the labor market. For some individuals this is well represented by a dycothomous choice between working full time or abandoning the labor market altogether, while for others retirement is indeed a smooth process, for instance realized with a progressive reduction of hours worked. For some other individuals, retirement is obtained as a by-product of a down-sizing, which ultimately forces out of the labor force individuals that are unwilling or unable to find another job. Finally, when invalidity benefits exists, as it is the case of Italy, many have noticed that invalidity pensions operate as substitutes for old age pensions.

The first conclusion is hence that the process by which individuals withdraw from the labor market is multifaceted. This also means that there exists an inherent difficulty in trying to represent with a unique model individuals who are facing very different work experiences. For instance, we can observe a typical retirement pattern by which an individual, once eligible for Social Security benefits, chooses to stop working altogether[1], but we can also observe somebody else who, satisfying the same eligibility criteria, chooses to continue working, either maintaining the same amount of hours worked or reducing it. While working, he could even receive pension benefits (if the law allows the cumulation of labor and pension income), but we would not consider such an individual economically inactive (and hence retired from the labor force). Alternatively, we can have individuals who have been involved in restructuring processes and hence expelled from employment. Depending on the institutional arrangement, they are unemployed or employed at zero hours (in this case a portion of their wage is usually paid by the State). If these individuals are older that 50 years old, there are good chances that they will end up being permanently out of the productive process (while perhaps resulting formally part of the labor force). These examples are meant to show that any definition of retirement is bound to be somehow artificial.

In our empirical analysis we choose to work with two definitions of retirement. Both are based on self-reporting and as such are exposed to the risk that the same word means different things across individuals. According to the first one we consider retired only those who declare themselves retired ("pensionati"). The second one is wider, since in this case, besides the previous category, we consider retired also those who are unemployed or those who have exited the labor force for whatever reason[2].

When trying to analyze retirement one is typically interested in the role played by the explanatory variables. From the previous examples it is evident that some variables, such as technological change or firm restructuring, affect the labor-demand side, while others, such as personal and family conditions, pension benefits, requirements for retirement, and presence of early retirement schemes, will affect mostly the labor-supply side. Furthermore, factors like wages, training and incentive plans for retirement set at the firm or sector level will affect both demand and supply.

[1] We could still observe individuals retiring even without having the characteristics necessary to receive pension benefits, but this is much less frequent.

[2] In both cases we look at the behaviour of individuals above age 45.

The contribution of these variables to the retirement outcome can be appreciated once a retirement model is specified, by which individuals choose whether and how much to work, taking into account the present value of the streams of benefits and costs in both cases (for a recent survey see Lumsdaine and Mitchell, 1999; see also Lazaear, 1986). The variables usually considered relevant in the explanation of retirement behavior are: expected labor and non labor income, expected pension benefits and expected pension contribution, health conditions referred both to the individual considering retirement and to other family members, preferences for leisure.

As for the models, we have structural dynamic stochastic models (see Gustman and Steinmeier, 1986; Rust, 1989, Rust and Phelan, 1997), according to which, based on the expectations for the relevant explanatory variables, individuals choose the optimal consumption, saving and retirement paths. Alternatively we have models in which, at each instant in time, the individual re-evaluates his/her labor supply choice, taking into account the option value of remaining in the labor market versus the benefits of retiring (see Stock and Wise, 1990). This type of modeling strategy allows researches to take into account time-to-time changes in the explanatory variables.

Finally we have reduced form models, in which researches do not estimate a full consumption/retirement model but simply look at the effects of some variables (the ones that would affect retirement according to the fully structural model) on the retirement choice. This class of models[3] typically include some variable capturing the effects of Social Security legislation on the benefits and costs of remaining active in the labor market[4]. More specifically, given the focus on the conditional probability of retirement usually found in reduced form econometric models, the variables capturing the generosity of the Social Security system are generally representing the marginal benefit of remaining one more year in the labor market (researchers typically look at the accrual rate, at the implicit tax rate or at the option value).

Typically, the econometric analysis of retirement behavior finds that individuals tend to retire at around the standard age of eligibility, with some retiring happening at an earlier age when early retirement is possible (see Blundell et al., 2002; Tanner 1998). Moreover most studies find that social security legislation, both in term of eligibility and in terms on net benefits, is an important determinant of retirement behavior (see Coile and Gruber, 2000; Coile and Gruber 2001).

In our work we try to capture the role of skills in the retirement decision. Our main research question is to find whether individuals who are more technologically endowed, ceteris paribus, tend to retire later. After a decade or more of intense research on the importance of skill biased technological change, we believe that it is possible to conclude that observed and unobserved skills are among the most important determinants of workers wages and employment status (and income inequality, see Acemoglu, 1998; Acemoglu, 2001; Acemoglu,

[3] For an application to Italy, see Miniaci (1998).

[4] Notice that if it is possible to receive both public pension and labor income, the model needs to be enriched.

2003, Juhn, Murphy and Pierce, 1993; Katz and Murphy, 1992; Murphy and Welch 1992; Krueger, 1993; Krueger and Pischke, 1992, Blau and Khan, 1996).

While easier to model theoretically, the empirical counterpart of "skills" is not easily found. Worker's productivity within a given occupation is likely to depend on many factors, some observables and some not. Talent (only very partially observable) is a major determinant, the other being education, training, experience, the relationship with the overall firm organization, the degree of technological progress experienced by the profession and by the firm. As usual, some of these variables are mostly under worker's control, others are mostly under firm's control and others are jointly determined. Skills are likely to influence the retirement choice as well: everything else constant, a worker with low technological skills will tend to become less and less productive[5] in industries and professions characterized by rapid technological progress. This means that, everything else constant, workers poorly endowed with technological skills are expected to be less valuable for the firm and hence more likely to retire (in one fashion or another).

But normally "everything else" is not constant. First, firms in sectors with low technological progress might face difficult times and be forced to downsize (older and unskilled workers are likely to be the first to be released). Moreover, workers endowed with poor technological skills might be offered the possibility of upgrading them through training. Training might increase their future wages and employment probabilities, but it comes at a cost (usually shared by firms and workers) and generates benefits, which are very much age-related, since an older worker has a shorter time horizon in which he or she can appropriate (and share with the firm) the benefits arising because of the higher productivity obtained through training.

Bartel and Sicherman (1993) study the effect of technological change on the career of older workers. They notice that technological change can affect retirement, influencing both the training decision and the depreciation of the stock of human capital. They test two complementary hypotheses. According to the first hypothesis, everything else constant, individuals retire later in industries in which technological change is particularly rapid. This hypothesis is based on an overall positive relationship between technological change and training[6]. According to the second conjecture, an unexpected rise in the depreciation rate of human capital, for instance following an unexpected rise in the rate of technological change, should lead to earlier retirement. Both hypotheses are confirmed by the analysis of Bartel and Sicherman, whose main limitation is in the fact that uses sector data to measure technological change.

Recent work by Friedberg (Friedberg, 2003) tries to provide an answer to a question very similar to the one analyzed in our paper. In fact, the author considers whether there exists evidence of a significant relationship between

[5] Experience is a poor substitutute for rapid technological change.

[6] Notice that two effects are at work. On the one hand, rapid technological change makes training more profitable, but, on the other one, technogical change increases the depreciation rate of human capital and hence reduces the incentives to train especially for older workers, since a long period at work is required to make training beneficial for both parties.

computer use and retirement. The basic intuition for this analysis is that computers might have affected the demand for labor in various ways. First, they tend to be a substitute for unskilled labor for routine tasks. Second, they have altered the performance of non-routine tasks, mainly held by skilled workers. Finally, computerization alters the "bundle of skills and tasks that define a job". These changes can affect the retirement choice of older individuals, given that older generations tend to be less educated so that they are more likely to be assigned to routine jobs and training is for them generally less profitable (given the higher investment costs and the reduced time horizon over which these investment costs can be recouped).

Friedberg studies the relationship between retirement and computer use at work with two datasets that refer to the U.S. The first one is the CPS, in particular she takes into account the October surveys for the years 1984, 1989, 1993 and 1997, which report a question on the use of computers at work[7]. The second dataset is the Health and Retirement Study, which, in the 1992 wave, asks how often workers are required to work with computers.

She estimates a reduced form model, where the training choice and the retirement choice are modeled with simultaneous equations, with personal and firm characteristics as common explanatory variables. Notice that Friedberg recognizes that at least two are the causation chains that govern the training and retirement choice. First, it can be that individuals with low level of training, and hence low level of human capital, are displaced by the technological revolution and hence opt to retire early. Second, it can be that, since they plan to retire early, for instance due to technology shocks, older individuals choose not to train. Due to the endogeneity problem, Friedberg chooses to instrument for the training or computer use choice[8]. She finds that, even when adding many individual, firm and sector controls, computer use tend to induce delayed retirement. She concludes that "holding everything else constant, the median retirement age if everyone had used a computer would have occurred 12 months later".

3 Data description

Data are drawn from the Bank of Italy Survey of Household Income and Wealth, which, in the 2000 wave, provides us with information on the ability of individuals in the use of computers and, for those who work, on their use of personal computers at work. Specifically, the 2000 Survey, for each household's member, records computer skills on an increasing scale from 1 (corresponding to inability) to 5 (very high ability). We rearranged this scale in order to define a variable, "Pc_uti", which takes a value of one if the individual declares to have at least some ability in Pc utilization and zero otherwise.

For people at work, the 2000 Survey also reports a variable recording the

[7] The 1991 January survey asks questions about job training, including computer skills.

[8] The instrument is average computer use by prime-age workers in the same occupation and industry.

answer to the question "Do you use a computer at work?". This variable is named "Complav".

These data provide us unique and valuable information for the question analyzed in this paper, since they permit us to estimate whether computer skills or computer use at work, which are to be considered as proxies for individual technological ability, are positively influencing the probability of remaining attached to the labor market.

Before turning to our basic research question, it is useful to describe what the SHIW data say about the variables of interest: computer skills, computer use at work and retirement.

3.1 Pc skills and Pc utilization at work in the population

From Figure 1 we can observe that computer skills are gender and age specific. Those that have some computer skills (above level 2 in the SHIW scale) are mostly males, belonging to young (age interval 19-24) and adult (25-59) cohorts. We also notice that the gender difference is really concentrated in the adult cohorts (the gap is highest at age 55). While for females the overall pattern is steadily negative, for males we notice a hump from the age of 30 to the age of 50, then followed by a rapid decline. Notice also that, because we have information on this variable only in the 2000 SHIW wave, we are not able to distinguish between age and cohort effects.

Next, we look at composition of (declared) computer skills by education and gender. In Figure 2 we report the age (and hence cohort) profile for men with secondary school or more and for those with primary education or less. For both groups the profiles are almost flat up to the age of 55, but the levels are very different: more than 60% among those with higher education (with an evident drop around the age of retirement) and only 20% among the remaining group.

When looking at females in Figure 3 we notice that the gap between the highly and low-educated is even bigger, since the proportion of those with some computer skills among the low-educated is around 12%. We also notice that the drop in the proportion of females with some computer skills among the more educated starts at around age 50 (compared with age 60 for males). These numbers are due to across-gender differences in job opportunities and job selection, which we later control for in the empirical exercise.

Other potentially interesting distinctions are those by work characteristics. At this stage we only look at the employee-self employed issue (Figure 4 and Figure 5). We can notice that the age profiles are quite similar within gender types, but they differ across genders. The profiles for employees are smoother due to the larger number of observations.

It is interesting to note that some of the previous results change when we focus only on those who are effectively working (either as employees or as self-employed) and above age 25. As it is shown in Figure 6, the gender difference no longer appears to be very relevant: in the 25-30 age interval the fraction of those with some computer skills is actually higher among females, which becomes lower among those around age 50. As it is reported in Figure 7 and in

Figure 8, the education gap in computer skills appears to remain very strong for both males and females. Furthermore, such a gap does not appear to be gender specific, once we focus on prime-age workers.

These data are consistent with different causal interpretations, but they seem to show that the labor market attachment of females with low education and their technological skills are related: women with low education and low computer skill tend not to participate in the labor market.

Next, we turn to the description of the variable capturing the use of computer at work ("Complav").

From Figure 9 we notice a pattern similar to that shown by Figure 6: within the young and adult cohort, the fraction of females using a computer at work tend to be higher than the analogous counterpart among males, while the opposite is true for the cohorts past age 50. This different behavior hides differential access to education, job opportunities and jobs characteristics.

Taking into account Figure 10 and Figure 11, we look at the use of computers at work as a function of gender and education. The main finding is that the use of computer at work is very much an education related phenomenon. While around 55% of those with secondary education or more use a computer at work up to age 55, only around 10% use it among those with primary education or less. The main difference between males and females has to do with the age profile for those with higher education: for females the profile declines earlier (around age 45) than for men (around age 55).

Finally, when we consider the employee-self employed grouping in Figure 12 and in Figure 13, we find that, for both males and females, the age profiles representing the percentage of individuals using a computer at work at a given age tend to be quite similar. In both cases, there is a larger proportion of users among self employed at young age, up to 40 for males and up to 29 for females. Then the figures show declining profiles. The proportion of users among employees is relatively higher for females.

3.2 Pc skills, Pc utilization at work and retirement choices

We now consider what our data say about retirement behavior.

First, we need to clarify what our definition for retirement is. The SHIW dataset contains a question where the individual is asked to declare whether he or she is in the labor force (as a worker or as an unemployed) or not, specifying the reason for such a position. Among the available reasons for not working the questionnaire reports "retired" (i.e. receiving an old-age or retirement pension). This is the first definition of retirement used in our paper. Some of those who declare themselves as "retired" do actually still receive a labor income so that they have not completely exited the labor force[9]. Symmetrically, some that declare themselves as retired, do not report pension income among their sources of funds. We have also considered a wider definition of retirement, according to which are retired all those who are no longer part of the labor force.

[9] We have chosen to maintain the self-reported definition so that we consider retired those who so self-report, even if they still perceive a labor income.

Using the 2002 wave we can construct the distribution of the age of retirement for those that, in 2002, are retired (according to one of the two definitions used in our paper). Notice that the group used for this exercise coincides only partially with the one later considered in our estimation[10]. In spite of this, we believe that a general glance at retirement pattern is of some use, given that we look at the same overall population.

First, we look at the gender distribution for the age of retirement. From Figure 14 we notice that the age of retirement is especially concentrated around age 55 and 60 for females. This peaks are due to women retiring with, respectively, "pensioni di anzianità" (retirement pension) and "pensioni di vecchiaia" (old age pension). For males the peaks are at age 60 and 65 for similar reasons.

In Figure 15 and in Figure 16 the gender-education distribution for the retirement age is reported. We find that it tends to be more concentrated for those with lower education. Those with at least secondary education tend to have a more diversified behavior, as far as retirement age is concerned. This is to be expected, since for this group benefits and costs from retirement are more unequally distributed.

Taking into account Figure 17 and Figure 18, we also notice that the retirement age pattern changes across types of work. While the ages at which we observe more concentration are the same for both employees and self-employed, the behavior of employees appears to be less uniform.

We now turn to the transition to retirement. As we wrote before, we consider two definitions of retirement. According to the first, we consider retired those who declare themselves retired for old-age pension or retirement pension. According to the second, we consider retired all people who are not working for whatever reason. We restrict our attention to household heads and their spouses who in year 2000 (i) declare to be either employees or self-employed and (ii) are between 45 and 70 years old. The panel section of SHIW allows us to track these people in 2002 and in 2004, so that we can observe the transitions towards retirement which may occur between 2000 and 2002 and between 2002 and 2004. At this stage, we decide not to distinguish between the different timing of the transition and in the descriptive analysis the outcome of interest is just a binary variable which takes on value one if the individual retired between 2000 and 2004 and zero otherwise.

We start considering the strict definition of retirement. In Figure 19 we report the proportion of people, by age and gender, who retired between 2000 and 2004. We notice that, for both men and women, almost 100% of those who are 65 in 2000 are retired by year 2004. The graph clearly points towards a higher incidence of retirement among males in the age interval 45-53, followed by a reversion in the age interval 53-60 (as it is expected given that among women retirement is concentrated in the age interval 55-60), and then by another reversion past age 60 (corresponding to an age interval in which retirement is particularly frequent among males).

[10] In the estimation we consider the sample of those that: 1) in 2000 are working and 2) in 2002 or 2004 are either working or retired.

Some interesting insights emerge when we look, by each gender separately, at the retirement behavior of the two education groups previously considered. From Figure 20 we notice that, at each age (evaluated in 2000) the proportion of individuals retiring from the labor force tends to be higher among those who have lower education, in other words they retire earlier[11]. This is due to the fact that benefits from remaining in the labor force are different for the two types of workers, but also to the fact that the avenues for retirement differ. In fact, men with lower education typically have started working earlier and hence are more likely to be entitled to "pensione di anzianità"[12], and so they retire at an early age. The opposite is true for females, Figure 21 shows how the age of retirement tends to be lower for females with higher education so that, at each age (evaluated in year 2000) the fraction of females retired from the labor force is higher for this group.

Finally, we look at the gender specific distribution of the conditional frequency of those that are retired at a given age, distinguishing on the basis of computer skills and computer use at work. When considering computer skills, from Figure 22 we notice that from age 45 to age 53 the percentage of those that in 2002 and 2004 are retired is lower among those who have some computer skills, while it fluctuates widely past age 53 (it is worth remembering that in the axis it is reported the age in year 2000, so that individuals that are 59 years old in 2000 are 61 and 63 years old, respectively, in 2002 and 2004). In Figure 23 we can see how the opposite is true for females. While for males there appears to be some sort of negative correlation between computer skills and the conditional probability of retirement at a given age[13], the result for females suggest exactly the opposite result. Similar results are obtained when we look at the distribution of the frequency of retirement by use of PC at work. Retirement age is higher (lower) among males (females) using a PC at work.

When we consider the broader definition of retirement[14] we notice that all the results described above are substantially confirmed for males.

On the contrary, for women we have different results. In Figure 24 we notice that, for each age, the proportion of women who leave the status of worker between 2000 and 2004 is higher than the one for males. In particular, for women, this proportion increases with respect to the case of the strict definition of retirement, whereas, for men, it remains constant. Figure 25 analyzes, by age and education, the proportion of women who retire between 2000 and 2004. We find that, from age 45 to age 56, having a lower level of education is associated with a higher probability of retirement. Past age of 56, there is not a single group steadily characterized by a higher probability of retirement. Finally, Figure 26 shows how, for women in the age interval 45 to 52, having Pc skills is associated with a lower probability of retiring at any given age. This result is confirmed when we take into account the Pc utilization at work. In both the figures, the

[11] The only exeption is at age 59.

[12] The requirement are in terms of a minimum of contributing years and not in terms of age.

[13] Notice that we are not controlling for any other covariate apart from age and gender.

[14] We consider retired from the labor market individuals who declare so and also individuals who are not active in the labor market, past age 45.

pattern after age 52 becomes difficult to interpret.

4 Estimation

Our empirical analysis is aimed at estimating the effect on retirement choices of having Pc skills and using a Pc at work. The population of interest consists of household heads and their spouses who in 2000 (i) declare to be employees or self-employed and (ii) are in the age interval 45-70. Our empirical strategy consists of both a discrete choice analysis and a duration analysis.

We consider the two definition of retirement described in the previous paragraph. Furthermore, we stratify the overall sample by gender and for each gender we consider either only employees or both employees and self employed workers. As a result, for each definition of retirement, we have four groups[15].

Notice that available data allow us to control for variables relating to the individual, his or her household and the firm in which he or she is employed. This fact leads us to estimate the effect of the variable of interest conditional on age, education, age at the first job, labor and non labor income[16], marital status, macro-region of residence, number of days spent at home because of illness in the year of reference, work status[17], the number of household components and the sector of the firm in which the individual works.

In our empirical specifications we describe the maximum level of education level attained by the individual by means of a set of four dummies. The first dummy takes on value one if the individual has an elementary school degree, the second dummy takes on value one if the individual has at most an intermediate or professional secondary school degree and, finally, the third dummy equals to one if the individual has at least an university degree. The baseline dummy equals to one if the individual does not have any educational qualification.

We include among the control factors the variable reporting the age at the time of the first job since it can be considered as a proxy (i) for the total amount of contributions paid to the pension system and (ii) the experience built up by the individual. Furthermore, notice that sector controls are particularly important if there are substantial differences across sectors in the adoption and diffusion of new technologies. In fact, by controlling for sector dummies we eliminate a source of additional endogeneity when estimating the effect of Pc utilization or computer skills.

We do not include among the regressors a direct measure of marginal benefits from remaining one extra year in the labor market because this variable would be highly collinear with labor income.

As a control for the expected generosity of the public pension system, we use the reported value for the replacement rate. This is not fully satisfactory as

[15] For any of the two definitions of retirement, the groups are: 1) all males (employees+self employed); 2) only males employees; 3) all females (employees+self employed); 4) only females employees.

[16] Non labor income is defined as total household income minus individual income.

[17] The categories are: blue collar, white collar, executive, craftsman and enterprenuer.

a variable capturing pension wealth, but we also notice that, especially in Italy, pension wealth is a function of wages, so that by controlling by labor income we also control for pension wealth. As we wrote before, we also include cohort or age dummies (or directly age, depending on the specification), since different cohorts are likely to experience different rules governing the Social Security system.

Finally, we introduce the variables that capture computer skills and computer use at work. As we wrote before, in SHIW individuals are asked to report the level of their computer skills as measured on an increasing scale from 1, corresponding to inability, to 5 which indicates very high ability. We rearranged this scale in order to define a variable, "Pc_uti", which takes on value one if the individual declares to have at least some ability in Pc utilization and zero otherwise. We also describe individual ability in computer use with a set of three dummies obtained from the same underlying information. The first dummy "Compsk_med" takes a value of one if the individual declares to possess average computer skills and zero otherwise. The second dummy "Compsk_high" takes a value of one if the individual declares to possess above-average computer skills, and zero otherwise. The baseline dummy takes on value one if the individual declares to be unable to use a Pc. As we pointed out before, the information concerning computer use at work, "Complav", is collected directly by SHIW[18].

4.1 Discrete choice analysis

In this case the sample is made of men and women that (i) declare themselves actively working in year 2000 and (ii) are observed in the 2002 wave. In year 2002 they self-report either as workers or as retired ("pensionati") or as not employed. In both cases we study the relationship between the explanatory variables, measured as of year 2000, and the probability of continuing to be employed (or to declare so) in year 2002. We model this through a standard probit approach.

In Table 1-3 we report our main results for the four the groups of interest[19].

In all the groups of interest, and for both definitions of retirement, we find the expected result that age is negatively correlated with the probability of remaining active in the labor market. On the contrary, the age at the time of the first job influences negatively and significantly the probability of exiting from the labor market. It is worth remembering that this variable is a proxy for (i) the total amount of contributions paid to Social Security and (ii) the experience built up by the worker.

We find that in none of the groups of interest the education dummies are associated to significant effects on the probability of retirement. In spite of this,

[18] Each employed individual is asked if he or she uses a Pc at work.

[19] In Table 1 we include only Pc skills, in Table 2 we only control for Pc at work, while in Table 3 we include both Pc skills and Pc at work. These tables report the results obtained using the narrow definition of retirement. The results referring to the wider definition can be obtained from the Authors upon request.

we decided to keep on controlling for education levels because Pc utilization is a phenomenon very much related to education, as the descriptive statistics show.

Labor income, defined at the individual level, influences positively but not significantly the probability of retirement of males[20], while the effect for females is negative and significant. Other income influences positively and significantly the probability of retirement for males, while for females the coefficient is negative but not significant.

In none of the groups of interest we find statistically significant differences across occupations. However, we find that, for males, the point estimates show that blue collars have a higher probability of retirement, whereas the opposite is true for females.

Now we come to our main question and we explore the effect of Pc utilization on retirement choices.

Taking into account the strict definition of retirement (i.e. job pensioner), we find that having some computer skills (a value of one for the variable "Pc_uti"), is associated with a negative effect on the probability of retiring (see Table 1). This effects is significant for males, while it is not significant for females. When we use the broader definition of retirement (i.e. out of the labor force for any reason), we find that the point estimate of the effect of having Pc skills is still negative but significant only for males employees.

Next, when we consider the variable capturing PC utilization at work (see Table 2), we find that using a computer at work is associated with a negative and significant effect on the probability of retiring when looking at males. On the contrary, the coefficient is positive but not significant for females. Both results are confirmed when using the broader definition of retirement.

Finally, we consider jointly the effects of having Pc skills and using a Pc at work (see Table 3). We find that, for both the definitions of retirement considered, in none of the groups of interest the estimates of the parameters associated to these variables are significant. For males both point estimates are negative. For females, while having Pc skills is associated with a negative effect on the probability of retirement, the opposite is true for using a Pc at work (i.e. the point estimate is positive). All these results are confirmed when we use the alternative classification for computer skills, that is the one that distinguishes among, low, average and above average skills.

One of the main insights of the discrete choice analysis is the evidence of a gender difference: when we consider the variables of interest separately, we get significant estimates only for men. For women the estimates are not significant and the point estimates do not have the expected sign. This fact points out the importance of considering separately males and females in the analysis of outcomes describing labor market participation.

However, the differences between genders in the relationship between computer use and retirement choice were anticipated by the descriptive statistics presented before. In Figure 22 and in Figure 23 we found *prima facie* evidence

[20] When we say that a result is valid for males (females), we mean that it is valid for both the definitions of retirement and for the groups of (i) employees and self-employed males (females) and (ii) employees males (females) only.

that the association between computer use and retirement varies with genders. Furthermore, when we consider female labor supply, we should be aware that factors such as marital status and household composition plays a great role, so that a stratification according to these variables in order to control for unobserved heterogeneity would be recommended. Unfortunately, the (small) sample size of our dataset does not allow us to follow such a strategy.

A second puzzle which arises from the obtained results lies in the fact that when we consider the variables indicating Pc skills and Pc utilization separately, their effect is significant, whereas when we consider them jointly, the estimates are not significant.

This fact suggests that when we are interested in the impact of technological skills on retirement, both the variables are relevant. In fact, omitting one of them would lead to misleading results. Moreover, we think that it is important to consider both variables jointly because each of them can be affected by endogeneity. In other words, there might be common factors affecting both the retirement process and technological skills. For example, using a Pc at work might be the result of factors which might lead the individual to retire later. In this framework controlling for Pc skills[21] is an attempt to avoid endogeneity problems of the estimates[22].

4.2 Duration analysis

We now present the results from our duration analysis, i.e we focus on the duration of the time period elapsed in the initial state, where the latter is the state of employment or self-employment in which we find (by construction) all the individuals in our sample at the beginning of the duration analysis. It is worth remembering that, in our framework, time is represented by age.

In this case the sample is made of men and women who (i) declare themselves actively working in year 2000 and (ii) are tracked either in wave 2002 only or in waves 2002 and 2004.

Throughout all the duration analysis, we assume that the duration has a continuous distribution.

First, we explore the relationship between retirement and the variables indicating Pc utilization by means of a completely non parametric estimator. In other words, we stratify each group (e.g. males employees) by the variable of interest (e.g. Pc utilization at work), and, for each subgroup, we estimate nonparametrically the hazard rate[23] and the survivor function. Through the comparison of the results obtained for the two groups, we get a nonparametric estimate of the effect of the variable of interest (in this case, Pc utilization at work) on retirement. The advantage of this strategy lies in the fact that we do not impose any assumption on the distribution of the duration, but this comes

[21] Remember that we use two different classifications for measuring computer skills.

[22] Analogous considerations hold if we consider having Pc skills as an endogenous variable and we attempt to overcome this problem by allowing for the Pc utilization at work.

[23] The hazard rate is the probability of leaving the initial state between time t and $t+1$, conditional on being in the initial state at the beginning of the time interval.

at the cost of not allowing for any other control factor[24]. We could allow for other variables by means of further stratifications of the sample, but, doing so we would get estimates that rely heavily on sample size, which tend to become smaller as we increase the number of variables used for stratification. The small size of our overall sample does non allow us to use this strategy.

In Figure 27 we consider the strict definition of retirement and we see how, up to age 59, males who are not Pc users have a higher hazard rate then males with at least some ability in Pc utilization. This fact means that up to this age men who do not have any ability in Pc utilization have a higher risk of becoming retired at any given age. In other words, if we compare two men, one Pc user and the other not, both younger than 59 and both of the same age in the initial state of employment or self-employment, the one without Pc skills has a higher probability of retirement at that age.

Furthermore, the survivor function indicates that, up to age 65, Pc users have a higher probability of remaining in the initial state.

For both functions, the smoothness decreases with age. This is due to the fact that the number of people still at work decreases with age too, so that the estimation relies on a number of observations which decreases with age.

Analogous considerations hold if we take into account Pc utilization at work, as it is shown in Figure 28.

These results do not change when we consider only employees and when we focus on the broader definition of retirement.

Now we consider women and the strict definition of retirement. In Figure 29 we observe a very different picture. In fact, the hazard rate for employees and self-employed women with Pc skills is higher than the one for women without any Pc ability, up to age 59. This means that, up to age 59, women who are able to use a Pc have a higher risk of leaving the initial state (i.e. employment) at a given age. Similarly, the survivor function for the subgroup of women with Pc skills is dominated by the one of the other group. In other words, women who have at least some ability in Pc utilization have a lower probability of remaining in the initial state. Analogous considerations hold if we consider the Pc utilization at work, Figure 30, and if we consider employed women only.

Now we turn to the broader definition of retirement. In Figure 31 we consider all women and we see how the hazard rate for not Pc users is steadily higher than the one for Pc users up to age 54, then several crosses between the lines makes the pattern not clear. As for the survivor function, we see how women with at least some Pc skills have a higher probability of remaining in the initial state up to age 61. These results are confirmed when we look at the group consisting of only employed women. In Figure 32 it is reported how, up to age 56, women who do not use a Pc at work have a higher risk of leaving the initial status at a given age than those who use a Pc at work. For subsequent ages, the pattern is not clear. As for the survivor function, there is not a group with a steadily higher probability of remaining in the initial state, but, on the contrary,

[24] The non parametric estimation of the effect of the variable of interest relies on the strong assumption that this variable is exogenous with respect to retirement choices. It is clear that this assumption may not hold if we do not allow for other factors.

there are several crosses between the two hazards. These results are valid also if we consider the group of employed women only.

The lack of a clear pattern for the broader definition of retirement might be due to the fact that we are considering as similar very different exits from the status of employees or self-employed. Furthermore, factors such as marital status and household composition play an important role in the decision process of the woman concerning whether working or not and we are not able to control for most of them.

To summarize, the non parametric analysis shows that, for males, having Pc skills and using a Pc at work seem to have a negative effect on the probability of retirement. In fact, at least up to some age (around 59), men who use Pc seem to be more likely to postpone the exit from the status of employees or self-employed. For females, the picture is rather complex. Considering the stricter definition of retirement, having Pc skills and using a Pc at work seem to have the opposite effect (with respect to the males' case). If we consider the broader definition of retirement, no clear pattern emerges.

Finally, we introduce explanatory variables. We condition on covariates measured as of year 2000 for studying how labor market participation varies between 2000 and 2002 (lower bound excluded), whereas we condition on the information contained in the covariates measured as of year 2002 for studying the transition which may occur between 2002 and 2004 (lower bound excluded). We follow this strategy because it is important to observe how variables such as household composition, labor income and household's other income vary across time, being aware of the role played by them in the individual retirement decision. For these reasons, we think it is useful to exploit the possibility provided by SHIW of updating all the control variables. Unfortunately, the information concerning Pc skills and Pc utilization at work is collected only in the wave 2000, and so it remains constant across time.

We assume a proportional hazard rate, which amounts to saying that the relationship between the hazard rate and the covariates is independent from the duration. In this case the hazard rate is the product of a baseline hazard, common to all individuals, and an exponential transformation of a linear combination of the covariates.

In our analysis we used the Cox model. It is a semiparametric model particularly suited since it is of general application and does not make any assumption on (i) the duration distribution[25] and (ii) the relationship between the hazard rate and duration.

We allow for the same variables used in the Probit specification, apart from age, which is now interpreted in terms of duration and then it is implicit in the hazard rate analysis (Tables 4-6).

We find that the variable representing the age when getting the first job is negatively and significantly associated with the hazard rate. In other words, everything else constant, a lower age when getting the first job (which is likely

[25] The unique assumptions made are (i) that the duration is continuous and (ii) the hazard is proportional.

to be inversely proportional to the amount of tax contributions paid to Social Security and to experience) increases the hazard rate of exiting the initial state.

Education does not appear to influence significantly the hazard rate for either males nor females[26]. However, for sake of completeness, let us notice that, when we consider both employees and self-employed women under the strict definition of retirement, having a university degree tends to increase significantly the hazard rate.

As for labor income, its effect appears to be non significant for males when we use the strict definition of retirement, but it becomes negative and significant when we look at the broader definition. The effect of labor income for females is always negative and significant. Notice that the interpretation of the coefficient on labor income is particularly complex since: 1) changes in labor income have both an income and a substitution effect (leading to opposite predictions); 2) is highly collinear to net pension wealth[27]. As for other income, its effect is positive and significant for males. This result is expected, since a higher income, say, from capital assets (while probably not exogenous) insures that the individual can maintain a higher standard of living irrespective of his or her pension benefits, hence reducing the gains from continuing working. For females, the effect of the variable "Other income" is always non significant.

Now we come to the variables of main interest for our analysis. We start considering the strict definition of retirement.

When we control for the variable capturing computer skills (see Table 4), we find that it is not associated with any significant effect on the hazard rate in all the groups considered. When we control for the variable capturing the use of a Pc at work (see Table 5), we find a significant effect on the hazard rate only in the group of men employees. In this case Pc utilization on the job entails a significant and negative effect on the hazard rate. When we consider computer skills and computer utilization at work jointly (see Table 6), the former variable continues to be non significant in all the groups, whereas the latter one has a significant effect only (and again) among the group of males employees. In this case Pc utilization at work is associated with a significant reduction of the hazard rate. This finding is confirmed also when we use the alternative set of Pc skills dummies.

The considerations which we made in the previous section about the necessity of controlling for both the variables describing Pc skills and Pc utilization at work are still valid. As we wrote before, controlling for Pc skills is an attempt to avoid endogeneity problems for the variable indicating the Pc utilization at work and vice versa.

When we take into account the broader definition of retirement, our results show how having computer skills and using a Pc at work are never associated with significant effects on the hazard rate.

[26] Like before, the baseline dummy equals to one if the individual does not have any educational qualification.

[27] This is especially true in Italy and for the cohorts considered in our analysis, given that for them pension benefits are basically parametrized to labor income at the end of their working life.

Although we consider the Cox model as the main approach of our duration analysis, we think that it is also interesting to look at the results from a log-log specification for the hazard rate. This class of models is used when we face interval-censored data, that is when we do not know the exact amount of time elapsed in the initial state but we only know the interval in which the duration falls. This model still assumes that the hazard is continuous but it allows for the fact that survival data that are available to us do not describe this feature. In other words, the complementary log-log model is suitable when we face a discrete-time representation of a continuous-time proportional hazard model[28].

The complementary log-log model identifies (i) the effects of the covariates on the hazard rate and (ii) a parameter describing the duration dependence in each interval. By means of appropriate restrictions on how the duration dependence varies from interval to interval, we can obtain the discrete time representations of all the parametric proportional hazard models. Since we do not make such assumptions, our approach is semi-parametric and, because of this, it mimics the Cox model.

The complementary log-log model substantially confirms the results described above. The only difference refers to the results for the group of employees and self-employed males (i.e. "all males") under the strict definition of retirement. For this group we find that the effect of having computer skills on the hazard rate is still not significant, consistently with what we found using the Cox model while the effect of Pc utilization at work implies a negative and significant reduction of the hazard and this result remains valid even if we control for Pc skills[29].

This lack of complete coherence between the results obtained with alternative models could be due to the fact that the complementary log-log model allows for grouped data.

To summarize, with the Cox model we find significant results only for the group of males employees under strict definition of retirement: for them we have clear evidence that using a Pc at work leads to a significant decrease of the hazard rate of leaving the initial state. This result is confirmed also if we add controls for Pc skills and if we adopt an alternative specification for the hazard rate.

5 Conclusions

To be written.

[28] For instance, when we see that the reported age at retirement is 60, it could be that the individual retired in the year in which he or she became 60 years old, but at the moment of retirement he or she was 59. Alternatively, it could be that the actual age at retirement is 60 but the individual at the moment of leaving the status of worker was very close to becoming 61 years old.

[29] In other words, the significance of Pc utilization at work, obtained with the Cox model only for the group of male employees, with the log-log model is obtained for the larger group of males employees and self employed.

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7 Figures

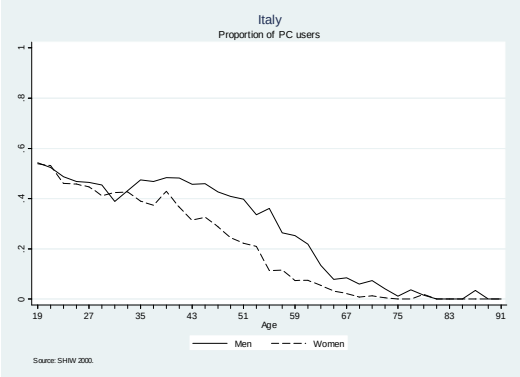

Figure 1: Proportion of Pc users: men and women by age

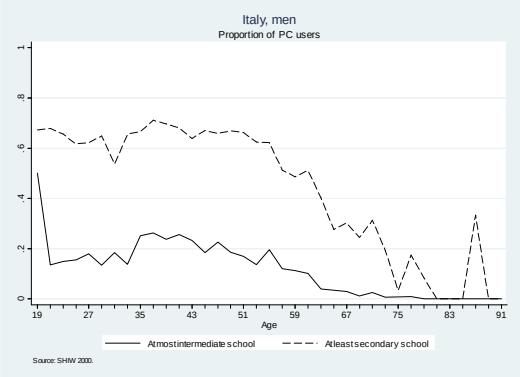

Figure 2: Proportion of Pc users: men, by age and education.

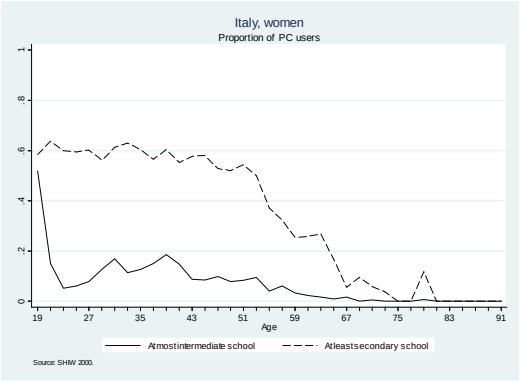

Figure 3: Proportion of Pc users: women, by age and education.

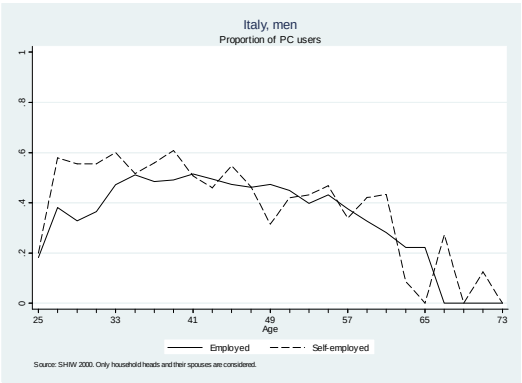

Figure 4: Proportion of Pc users: men, by age and work characteristics.

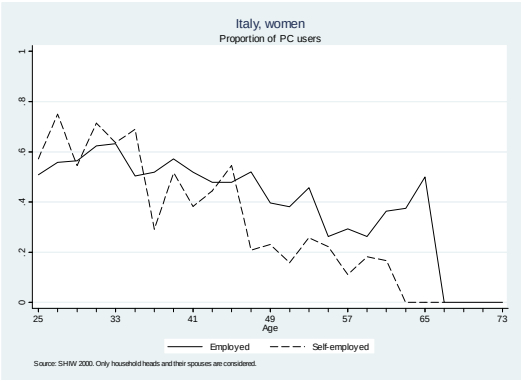

Figure 5: Proportion of Pc users: women, by age and work characteristics.

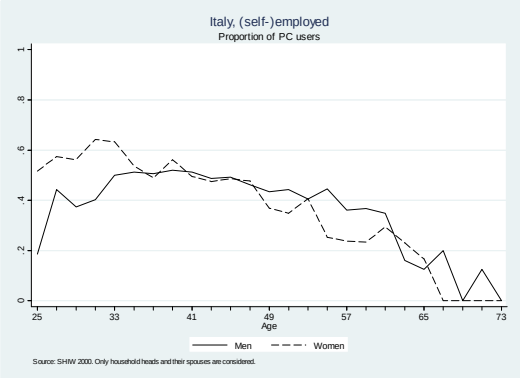

Figure 6: Proportion of Pc users among employed and self-employed by age and gender.

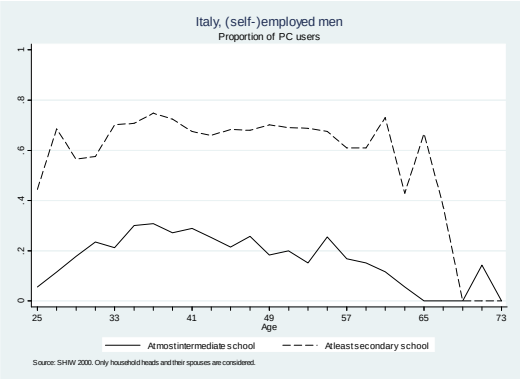

Figure 7: Proportion of Pc users among men employed and self-employed by age and education.

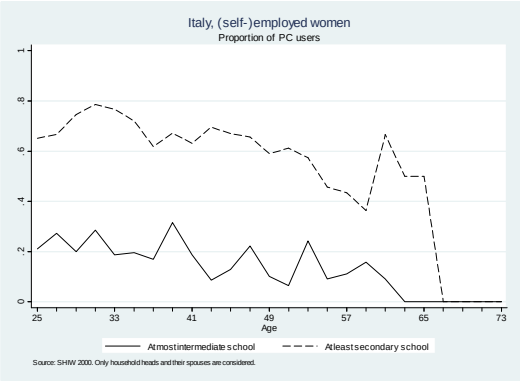

Figure 8: Proportion of Pc users among women employed and self-employed by age and gender.

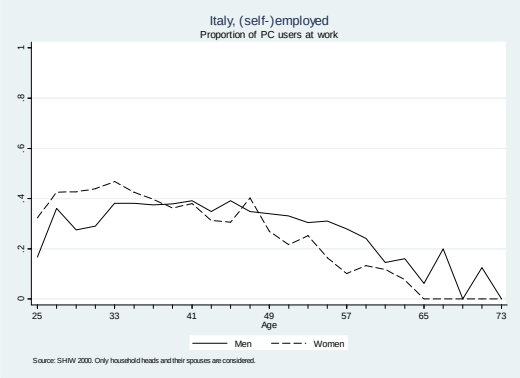

Figure 9: Proportion of Pc users at work among self-employed by age and gender.

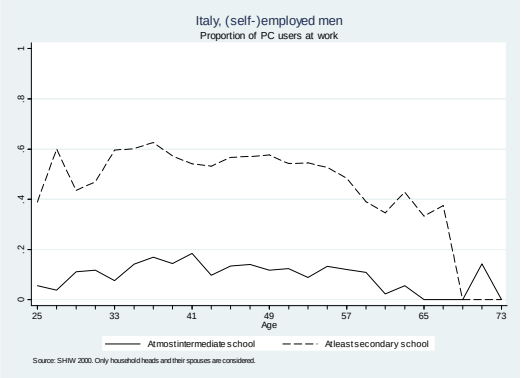

Figure 10: Proportion of Pc users at work among men by age and education.

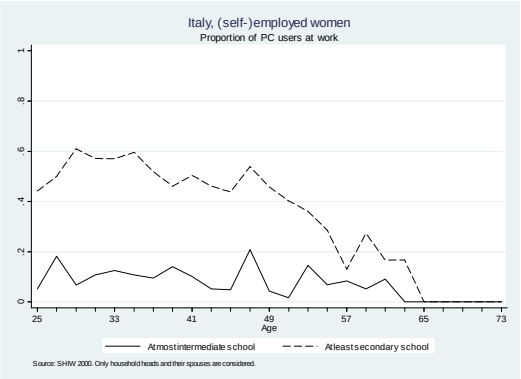

Figure 11: Proportion of Pc users at work among women by age and education

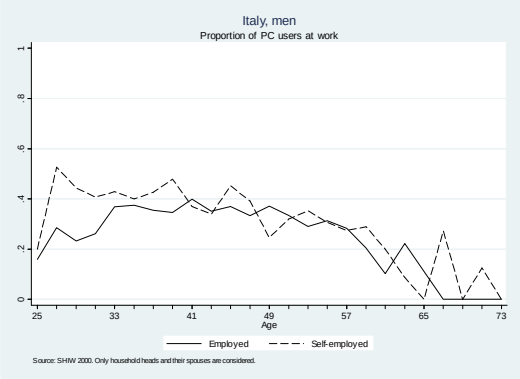

Figure 12: Proportion of Pc users at work among men by age and work characteristics.

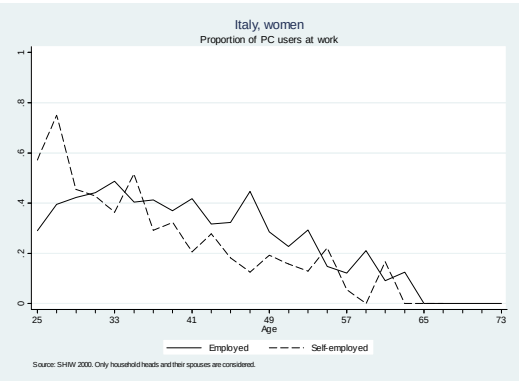

Figure 13: Proportion of Pc users at work among women by age and work characteristics.

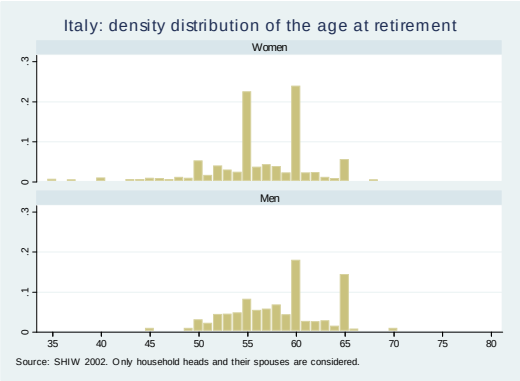

Figure 14: Age at retirement by gender.

Figure 15: Age at retirement among men by education.

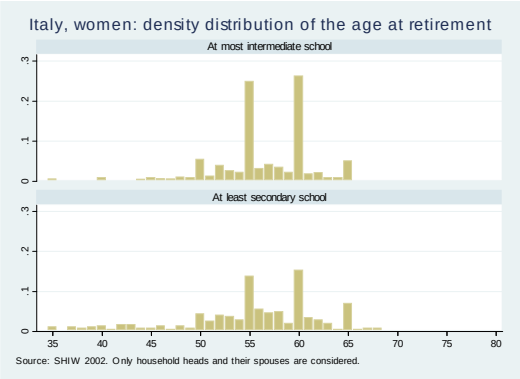

Figure 16: Age at retirement among women by education.

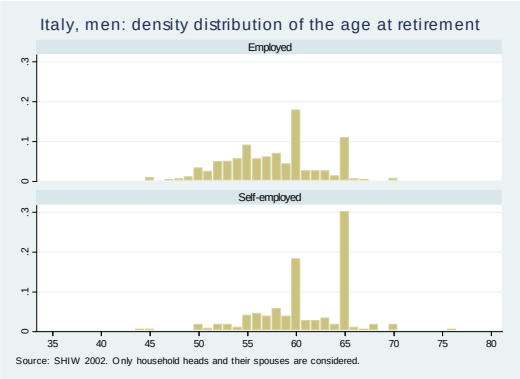

Figure 17: Age at retirement among men by work characteristics.

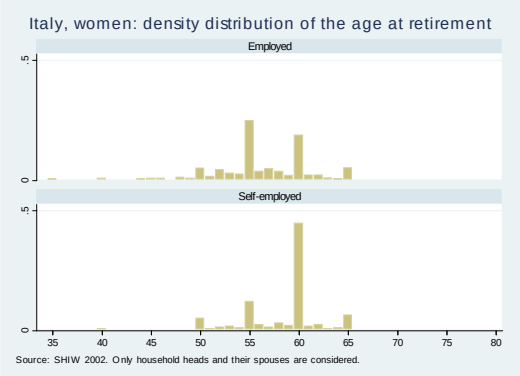

Figure 18: Age at retirement among women by work characteristics.

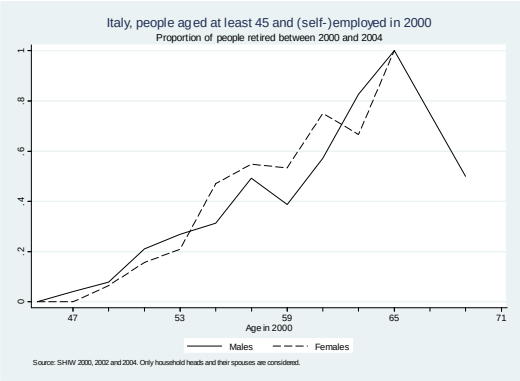

Figure 19: Retirement by age and gender.

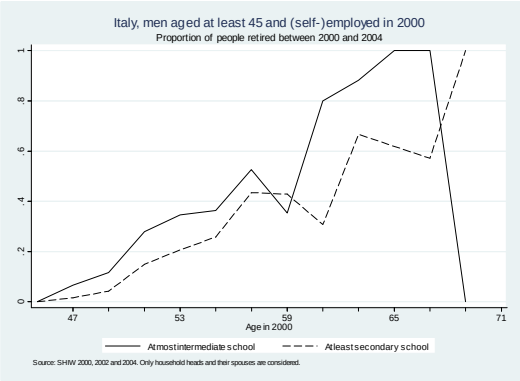

Figure 20: Retirement among men by age and education.

Figure 21: Retirement among women by age and education.

Figure 22: Retirement among men by age and Pc utilization.

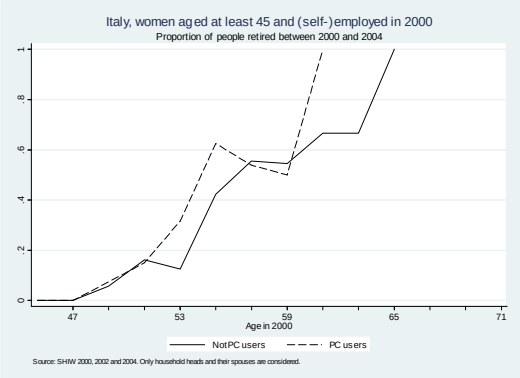

Figure 23: Retirement among women by age and Pc utilization.

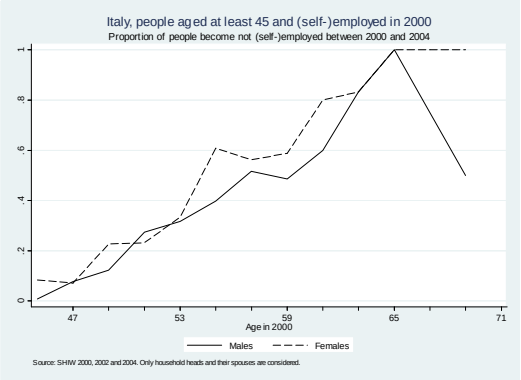

Figure 24: Retirement (broad definition) by age and gender.

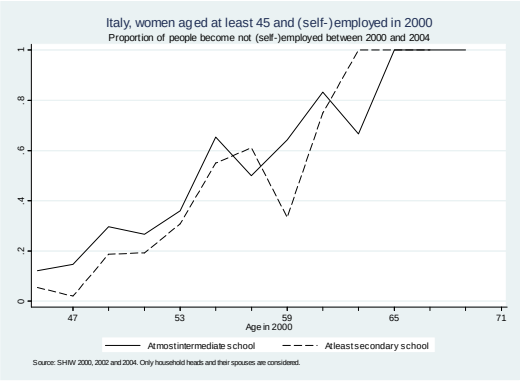

Figure 25: Retirement (broad definition) among women by age and education.

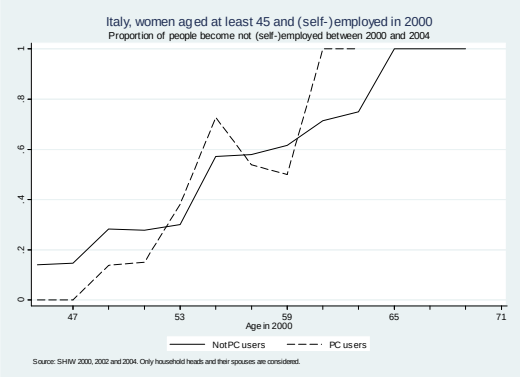

Figure 26: Retirement (broad definition) among women by age and Pc utilization.

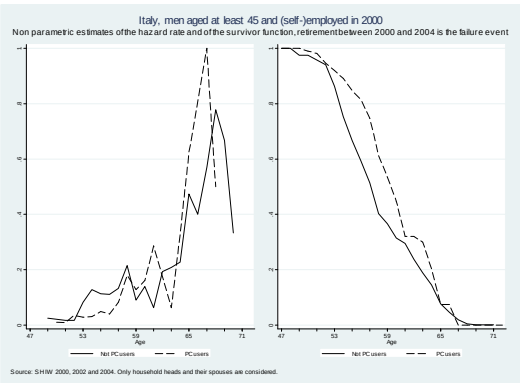

Figure 27: Non parametric estimates for men.

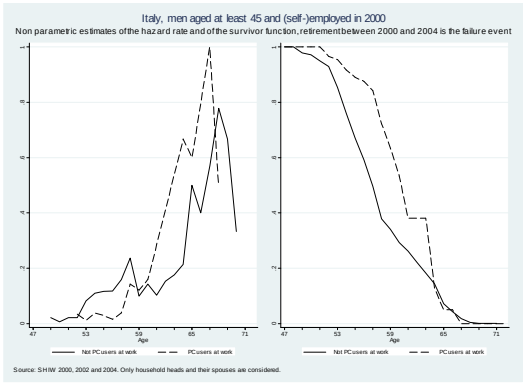

Figure 28: Non parametric estimates for men.

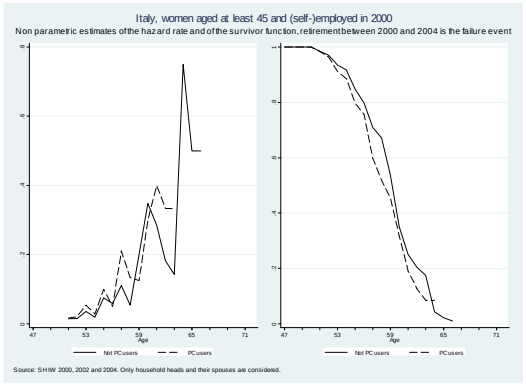

Figure 29: Nonparametric estimates for women.

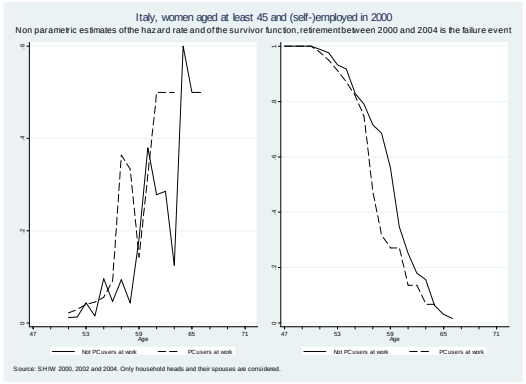

Figure 30: Nonparametric estimates for women.

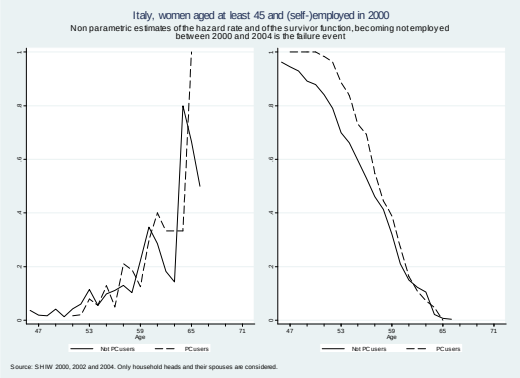

Figure 31: Non parametric estimates for women.

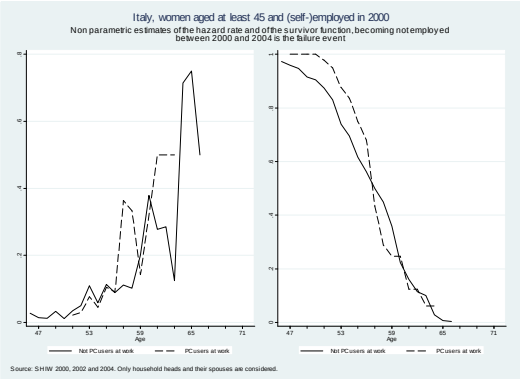

Figure 32: Non parametric estimates for women.

8 Tables

Table 1: Italy, employed people aged 45-70 in 2000. Probit estimation of the probability of retiring within 2002. All specifications also allow for marital status, number of household components, days spent at home for illness during the last year, forecast of the replacement rate at retirement, job characteristics, sector of employment, region of residence.

	All		Employees	
	Males	Females	Males	Females
Age at first job	-.0445612 **	-.0339469 *	-.0354245 *	-.0533558 **
	(.0195203)	(.0197942)	(.0207875)	(.0258927)
Low education	.2591321	.1481237	.3090019	-.1495255
	(.1977378)	(.4464692)	(.219772)	(.5568681)
Sec. education	.1270011	.29605	.3839896	-.2069347
	(.2452546)	(.5040043)	(.2801012)	(.6719855)
High education	-.4784093	.6756843	-.0016627	.3185692
	(.3745823)	(.5984224)	(.4094084)	(.7204759)
Rep. rate	.0028218	.0064753	.0092566 *	.0011577
	(.0044156)	(.0066599)	(.0051773)	(.0089792)
Lab. income	.0250666	-.1743146 **	.0095501	-.1592048 *
	(.1084975)	(.0807856)	(.1151305)	(.0874251)
Oth. income	.1158039 **	-.040671	.1098589 **	-.0201768
	(.0490135)	(.1149777)	(.0531939)	(.1697414)
Pc Skills	-.3153914 *	-.1183007	-.5467937 ***	-.1966346
	(.1813595)	(.2991976)	(.2001979)	(.3298444)
Lr test	259.39	97.32	162.46	84.41
p-value	0.0000	0.0000	0.0000	0.0000
No. of obs.	844	397	620	326

Source: SHIW 2000 and 2002. Only household heads and their spouses are considered. *Note*: Numbers in brackets are standard errors. ***: p-value $\leq$0.01; **: 0.01<p-value$\leq$0.05; *: 0.05<p-value$\leq$0.10.

Table 2: Italy, employed people aged 45-70 in 2000. Probit estimation of the probability of retiring within 2002. All specifications also allow for marital status, number of household components, days spent at home for illness during the last year, forecast of the replacement rate at retirement, job characteristics, sector of employment, region of residence.

	All		Employees	
	Males	Females	Males	Females
Age at first job	-.0414989 **	-.0333242 *	-.0297731	-.0510794 **
	(.0195767)	(.0198429)	(.0207889)	(.0258402)
Low education	.2307143	.0645529	.2629804	-.2052792
	(.1954541)	(.445528)	(.2165667)	(.55706)
Sec. education	.110197	.0752979	.3269047	-.4285206
	(.2406101)	(.5075223)	(.2738384)	(.6787441)
High education	-.5047408	.4511104	-.1327906	.0919808
	(.3705717)	(.6045473)	(.4005153)	(.7256012)
Rep. rate	.0025408	.0073914	.0091469 *	.0018818
	(.0044332)	(.0068241)	(.0051615)	(.0092494)
Lab. income	.0274828	-.1677023 **	.0090575	-.1485637 *
	(.1072731)	(.0823799)	(.1118748)	(.0884782)
Oth. income	.1168697 **	-.0266298	.1100002 **	-.0105878
	(.0490857)	(.1220664)	(.0534279)	(.1693856)
Pc use at work	-.4132693 **	.3125766	-.6026577 ***	.2754714
	(.1982338)	(.3258035)	(.2173549)	(.3493058)
Lr test	260.79	98.08	162.84	84.66
p-value	0.0000	0.0000	0.0000	0.0000
No. of obs.	844	397	620	326

Source: SHIW 2000 and 2002. Only household heads and their spouses are considered. *Note*: Numbers in brackets are standard errors. ***: p-value $\leq$0.01; **: 0.01<p-value$\leq$0.05; *: 0.05<p-value$\leq$0.10.

Table 3: Italy, employed people aged 45-70 in 2000. Probit estimation of the probability of retiring within 2002. All specifications also allow for marital status, number of household components, days spent at home for illness during the last year, forecast of the replacement rate at retirement, job characteristics, sector of employment, region of residence.

	All		Employees	
	Males	Females	Males	Females
Age at first job	-.0420892 **	-.0331809	-.0319427	-.0537324 **
	(.0196188)	(.0205058)	(.0209188)	(.0265538)
Low education	.244781	.1356399	.2926023	-.1605903
	(.1977474)	(.4518723)	(.2194227)	(.5667146)
Sec. education	.1329491	.2173975	.3862993	-.3024048
	(.2448392)	(.512258)	(.2790707)	(.6853867)
High education	-.4720291	.580477	-.0266829	.2326296
	(.3758293)	(.6082207)	(.4102883)	(.7361748)
Rep. rate	.0025454	.0080571	.0089924 *	.0028843
	(.0044331)	(.0068824)	(.0051709)	(.0092069)
Lab. income	.0295404	-.1770297 **	.0149034	-.1563992 *
	(.107984)	(.0860051)	(.1143217)	(.0922327)
Oth. income	.1176921 **	-.0289473	.1118658 **	-.0172853
	(.0490766)	(.120006)	(.053354)	(.1795657)
Pc skills	-.1174666	-.5824714	-.310727	-.7405395
	(.2330263)	(.4514054)	(.2555901)	(.5251819)
Pc use at work	-.3321231	.7433785	-.3909649	.8272231
	(.2561595)	(.4834861)	(.2808685)	(.5512277)
Lr test	261.05	99.92	164.38	86.98
p-value	0.0000	0.0000	0.0000	0.0000
No. of obs.	844	397	620	326

Source: SHIW 2000 and 2002. Only household heads and their spouses are considered. *Note*: Numbers in brackets are standard errors. ***: p-value $\leq$0.01; **: 0.01<p-value$\leq$0.05; *: 0.05<p-value$\leq$0.10.

Table 4: Italy, employed people aged 45-70 in 2000. Cox estimation of the hazard rate of retiring. All specifications also allow for marital status, number of household components, days spent at home for illness during the last year, forecast of the replacement rate, job characteristics, sector of employment, region of residence.

	All		Employees	
	Males	Females	Males	Females
Age at first job	-.0622378 ***	-.0584916 ***	-.0771984 ***	-.0690726 ***
	(.0217427)	(.0224518)	(.025837)	(.0261637)
Low education	.1387097	-.1376119	.0229277	-.3186193
	(.211139)	(.4378034)	(.252066)	(.5210285)
Sec. education	.0396281	(.472081)	.2307747	.1972896
	(.2780279)	(.5015956)	(.3382245)	(.6435465)
High education	-.5918575	1.332678 **	-.2173527	1.165772 *
	(.4160094)	(.59101)	(.4902307)	(.6917421)
Rep. rate	.0025695	.0100161	.0166489 **	.0099776
	(.0050348)	(.0079063)	(.0069792)	(.0108218)
Lab. income	-.0695187	-.1873916 **	-.1103265	-.2873549 ***
	(.0986635)	(.087513)	(.0954333)	(.1078755)
Oth. income	.139751 ***	.0265474	.1388714 ***	.0886743
	(.046997)	(.1327135)	(.0493861)	(.1706241)
Pc Skills	-.1085258	-.197469	-.2822251	-.2482367
	(.2071789)	(.333079)	(.2386619)	(.3811171)
Lr test	92.89	50.26	72.01	47.16
p-value	0.0000	0.0000	0.0000	0.0001
No. of obs.	1364	659	1005	542

Source: SHIW 2000, 2002 and 2004. Only household heads and their spouses are considered. *Note*: Numbers in brackets are standard errors. ***: p-value $\leq$0.01; **: 0.01<p-value$\leq$0.05; *: 0.05<p-value$\leq$0.10.

Table 5: Italy, employed people aged 45-70 in 2000. Cox estimation of the hazard rate of retiring. All specifications also allow for marital status, number of household components, days spent at home for illness during the last year, forecast of the replacement rate, job characteristics, sector of employment, region of residence.

	All		Employees	
	Males	Females	Males	Females
Age at first job	-.0598032 ***	-.0566401 **	-.0736651 ***	-.0669809 ***
	(.0217864)	(.0223325)	(.0258466)	(.0255868)
Low education	.1387863	-.1803004	.0113812	-.3451847
	(.2093487)	(.4373642)	(.2507756)	(.5197335)
Sec. education	.0762787	.3859217	.2564421	.1060212
	(.2720333)	(.5013699)	(.333537)	(.638858)
High education	-.5294598	1.245423 **	-.1818741	1.086601
	(.4117598)	(.5955881)	(.4835248)	(.6940267)
Rep. rate	.0026156	.0097485	.0165151 **	.00974
	(.0050517)	(.0079218)	(.0069436)	(.0108993)
Lab. income	-.0642018	-.1920015 **	-.1041424	-.2891607 ***
	(.0995986)	(.0866505)	(.0963121)	(.1081383)
Oth. income	.1429748 ***	.021708	.1420149 ***	.0821602
	(.0473342)	(.126795)	(.0499648)	(.1631489)
Pc use at work	-.3529611	.0313778	-.5364833 **	-.0821957
	(.2309801)	(.3626563)	(.26238)	(.3998755)
Lr test	94.99	49.91	74.88	46.77
p-value	0.0000	0.0000	0.0000	0.0001
No. of obs.	1364	659	1005	542

Source: SHIW 2000, 2002 and 2004. Only household heads and their spouses are considered. *Note*: Numbers in brackets are standard errors. ***: p-value $\leq$0.01; **: 0.01<p-value$\leq$0.05; *: 0.05<p-value$\leq$0.10.

Table 6: Italy, employed people aged 45-70 in 2000. Cox estimation of the hazard rate of retiring. All specifications also allow for marital status, number of household components, days spent at home for illness during the last year, forecast of the replacement rate, job characteristics, sector of employment, region of residence.

	All		Employees	
	Males	Females	Males	Females
Age at first job	-.0592625 ***	-.0573344 **	-.0735646 ***	-.0687371 ***
	(.0217937)	(.0226988)	(.0258695)	(.0263477)
Low education	.1258332	-.1485852	.0096202	-.3191439
	(.2107422)	(.4374487)	(.251672)	(.5201765)
Sec. education	.0503802	.4525488	.2525142	.1841732
	(.2770256)	(.5027796)	(.3369379)	(.6446185)
High education	-.55619	1.298102 **	-.1874306	1.145019 *
	(.4153593)	(.5949149)	(.488043)	(.6969199)
Rep. rate	.0025334	.0104343	.0165037 **	.0101432
	(.0050517)	(.007968)	(.0069478)	(.0108556)
Lab. income	-.0653668	-.1861076 **	-.1045815	-.2864047 ***
	(.1000112)	(.0872373)	(.0964755)	(.1079217)
Oth. income	.1420266 ***	.0261693	.1418876 ***	.0874508
	(.0474025)	(.1340109)	(.0500005)	(.1709855)
Pc skills	.1399985	-.3295701	.0238891	-.3090445
	(.2493453)	(.424764)	(.2808963)	(.4797843)
Pc use at work	-.4473881	.243816	-.5518731 *	.1082309
	(.2833113)	(.4633857)	(.3182452)	(.5079939)
Lr test	95.30	50.54	74.89	47.20
p-value	0.0000	0.0001	0.0000	0.0001
No. of obs.	1364	659	1005	542

Source: SHIW 2000, 2002 and 2004. Only household heads and their spouses are considered. *Note*: Numbers in brackets are standard errors. ***: p-value $\leq$0.01; **: 0.01<p-value$\leq$0.05; *: 0.05<p-value$\leq$0.10.