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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 Information and Communication Technology (ICT) skills and their utilization in the retirement decision. We provide empirical evidence based on Italian panel data in favour of the hypothesis that - ceteris paribus - better educated male employees with ICT know-how retire later. Such effect is stronger the longer the time horizon considered, and its magnitude is remarkably larger than the one observed in US and Germany in previous studies. We also document that ICT do not play a crucial role in the retirement decision of women. Our results are robust to the estimation strategy adopted.

JEL codes: J26 (Retirement, Retirement Policies) , J24 (Human Capital; Skills; Occupational Choice; Labour Productivity), J14 (Economics of the Elderly; Economics of the Handicapped)
Keywords: retirement, skill-biased technological change

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1. Introduction

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 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. While they can be modelled quite easily from a theoretical standpoint, skills are hard to measure empirically. Workers' productivity within occupations is likely to depend upon many factors, some observables and some not. Talent, which is only very partially observable, is a major determinant, but we should not overlook the importance of training, experience, firm organization and technological progress.

Skills are likely to influence retirement choices as well. In particular, given the fast diffusion of ICTs across sectors and professions, workers with poor "technological endowments" tend to become less and less productive, particularly in industries and professions characterized by rapid technological progress. This might lead to lower expected wages and worse expected job conditions, making (early) retirement preferable. At the same time, if human capital and technology are complementary, we cannot disregard the possibility that a skill-biased technological change may favour more experienced (and older) workers because of their higher level of human capital accumulated (see Weinberg, 2004) and that this effect might vary across education levels. Hence, the prediction of the sign and the size of the effect of "technological endowments" on the probability of retiring earlier is mainly an empirical issue. In this analysis we should be aware that the ability to cope with technology is structurally different from the actual use of technology on the job. In fact, ability in dealing with technology is a valuable asset by itself, being an indicator of a more general ability to cope with changes affecting job tasks. On the other hand, the use of technology at work might just be an implicit job requirement, which does not necessarily create extra value added (once we control for job characteristics).

In this paper we are able to disentangle the effects of technological skills from those arising from the use of technology on the job. In our work we focus on the retirement decisions of Italian employees aged 45-70. Data are drawn from the 2000-2004 panel section of the Bank of Italy Survey on Household Income and Wealth (SHIW). SHIW turns out to be a unique source of information for the Italian case because of its panel component and since the wave 2000 contains questions about computer literacy and computer use at work of each household member.

Our results indicate that Italian male employees with higher education who use a computer at work tend to retire later, and the magnitude of this effect is remarkably larger than the one observed in US and Germany in previous studies. Moreover, we provide clear evidence that -for males employees with high education- the ability in the use of computers is a factor affecting long run retirement outcomes even if a PC is not used at work. In other words, if ability in the use of PCs can be considered a good proxy for individuals' technological capabilities, we find that this factor affects the retirement decision of males with higher education only. On the contrary, there is no evidence of any significant effect for female employees. These results are robust to the econometric strategy adopted.

Our work proceeds as follows: Section 2 briefly reviews the literature on retirement choices and skill-biased technological change; Section 3 provides prima facie evidence of the relation between PC utilization and retirement based on our SHIW dataset; Section 4 discusses the results of our alternative econometric strategies; Section 5 draws the conclusions.

2. Skills and retirement: literature review

The classical economic approach to modelling retirement decisions is based on the assumption that individuals choose whether or not to retire by comparing the present value of the streams of benefits and costs occurring in the two cases (see Lazaear, 1986 and Lumsdaine and Mitchell, 1999 for a complete review of the literature). Within this framework, preferences for leisure, actual and expected levels of labour and non labour income, pension benefits, pension tax contributions and health conditions play a crucial role. We can approximately group the empirical works on retirement in two sets: the first is inspired by the work of Gustman and Steinmeier (1986), Rust (1989), Rust and Phelan (1997) and Stock and Wise (1990) who propose structural dynamic stochastic models; the second one relies upon reduced form models of the conditional probability of retirement, and does not impose any restriction on individual preferences. Models belonging to this class typically focus on variables such as the accrual rate, the implicit tax rate or the option value of working an additional year.

The analysis of retirement behavior shows that individuals tend to retire at around the standard age of eligibility, with some retiring happening at an earlier age when early retirement is allowed (see for instance Blundell et al., 2002 and Tanner, 1998), and that institutional details of the Social Security system do matter (see Coile and Gruber, 2000 and 2001).[1]

Few empirical papers focus on the role of technological skills in the retirement decision. In this case, the econometric analysis is complicated by the fact that the relation between skills and

[1] For recent results on the Italian case see the special issue of *Labour*, August 2003, 17.

retirement is affected also by the business cycle and by the training policy adopted by firms[2].

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 decisions and the depreciation of the stock of human capital. In particular, they test two complementary hypotheses. According to the former, everything else constant, individuals retire later in industries in which technological change is particularly rapid. According to the latter, 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 their analysis, whose main limitation is in the use of sector data to measure technological change.

Friedberg (2003) tries to provide an answer to a question very similar to the one analyzed in our paper. In fact, she investigates whether there exists evidence of a significant relationship between computer use and retirement. The basic intuition for her analysis is that computers have affected the demand for labour in various ways. First, they tend to be a substitute for unskilled labour and 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 and hence more likely to be assigned to routine jobs. For these workers training may be generally less profitable given the higher investment costs and the reduced time horizon over which they can be recouped. Friedberg uses the US Health and Retirement Study (from 1992 to 1996) to study how the frequency of computer use at work affects the transitions towards retirement of workers aged 50-62 in 1992. She takes into account the possible correlation between the use of the computer and the unobserved propensity to retire later by estimating a linear probability model using an instrumental variable approach. In particular, she opts to instrument the use of a PC by an individual with the percentage of computer users among prime-age workers in the same occupation and industry. Her findings show that in the long run case (that is, over a four-year horizon), even controlling for many individual, firm and sector characteristics, computer use tends 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".

In a very similar framework Schleife (2006) uses the German Socio Economic Panel to investigate the effect of computer use at work on the retirement outcomes of employed males aged

[2] Notice that rapid technological change has two effects of opposite sign on the training of older workers. On the one hand, it makes training more profitable, but, on the other one, the speed of technological 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.

50-60 in 1997. As Friedberg (2003), she models retirement by means of a linear probability model, distinguishing between different timing of retirement (transitions occurring within 1999 and those occurring within 2001 are studied separately). The potential endogeneity of computer use on the job is addressed by means of an instrumental variables approach that considers computer use at home as the additional instrument. Her IV results provide no evidence that Germans who use a computer at work tend to postpone their retirement.

Our paper is strictly related to Friedberg (2003) and Schleife (2006) in the use of microdata and the focus on the effect of the use of PCs on workers' retirement decisions. However, we depart from their analyses by distinguishing between the use of a computer at work and the level of computer literacy. On the one hand, if the use of a PC at work is a requirement of a certain job profile, we incur the risk of imputing to the use of PCs effects that are actually due to structural organizational changes. On the other hand, the degree of computer literacy may effectively proxy ability to react to (past and future) innovations. Hence, we expect individuals with computer skills to be more valuable for the firm and - ceteris paribus - less likely to retire.

However, both computer utilization and computer literacy are likely to be endogenous in an equation describing retirement decisions: workers who plan to retire later, have - ceteris paribus - more incentives in investing in an upgrade of their skills. We address the endogeneity issue by using an IV approach, exploiting the information on the computer literacy of the members of the workers' household. The validity of these instruments relies on the evidence that workers living in a family where the other members are computer literate are themselves more likely to be able to use a computer and to use it at work (see Miniaci and Parisi, 2006) and on the assumption that living with people with a good knowledge of ICTs affects the individual retirement decisions only through the level of her own technological skills.

3. Data description

Data are drawn from the Bank of Italy Survey of Household Income and Wealth (SHIW), which, every two years, provides a sample of about 8,000 households, representative of the Italian population. It contains detailed information on demographics, income and wealth at the individual and household level[3]. The 2000 wave provides us with information on the ability of individuals in the use of computers and, for those who are working, on their use of a PC at work. Specifically, the 2000 survey, for each household member, records self-rated computer skills on an increasing five-step scale. We rearranged this scale in order to define a dichotomous variable that takes a value of

[3] See Banca d'Italia (2002) for further details.

one if the individual declares to have at least some ability in PC utilization and zero otherwise[4]. For people at work, the 2000 survey also collects information concerning whether they use a PC at work. Since half of the households participating to the sample belong to a longitudinal survey, we exploit the panel section coming from the 2000, 2002 and 2004 waves. These data provide unique and valuable information for the question analyzed in this paper, since they permit us to estimate whether computer skills and computer use at work are positively influencing the probability of remaining employed.

In our work attention is focused on employees. In particular, we consider household's heads and their spouses who are employees and aged 45-70 in 2000. All the following tables refer to this group, if not otherwise specified. The percentage of "PC skilled" workers[5] goes from 46.6% for the 45-49 age group to 25.4% for those 60+ (see Table 1). The survey documents a remarkable gap between the North and South of Italy, and strong differences between workers with at most compulsory education and those with higher education.

Table 1: Percentage of skilled workers.

	Males (n=1330)	**Females (n=783)**	**Total**
Age			
45-49	46.39	47	46.66
50-54	43.13	42.35	42.88
55-59	39.44	26.85	35.20
60+	23.76	29.73	25.36
Education			
Elementary	5.11	2.65	4.24
Middle	25.51	23.08	24.78
High	62.18	58.36	60.67
University	81.25	67.72	75.14
Region			
North	53.26	45.26	49.89
Centre	44.33	42.93	43.80
South	29.72	35.16	31.36
Total	42.25	41.89	42.12

Given our aim, it is crucial to distinguish between workers who are computer literate and those who do use a computer at work. As reported in Table 2, according to SHIW[6] only 31% of

[4] While this reduces the variability in our explanatory variable, it also has the effect of reducing the measurement error due to the fact that individuals self-evaluate their skills. In addition, adopting finer partitions produces severe multicollinearity problems in the econometric specifications presented in the following sections.

[5] These are workers for which the dichotomous variable previously defined takes a value equal to one.

[6] Miniaci and Parisi (2004) document that the estimate for the percentage of computer users in the population based on SHIW is consistent with the one that can be obtained using the much larger ISTAT Multiscope Survey: according to the latter, at least 13.5% of the overall population uses a computer at work, while, according to the SHIW, this percentage amounts to 12.2%. The Bank of Italy survey tends to slightly underestimate the proportion of skilled individuals among

workers in our reference group were using a computer in 2000 and only 73% of skilled individuals use their computer skills at work.

Table 2: Percentage of workers using a computer at work.

	Males	Females	All
Age			
45-49	35.67	35.25	35.48
50-54	33.33	28.24	31.68
55-59	29.11	13.89	23.99
60+	14.85	13.51	14.49
Education			
At most primary	2.55	0.66	1.88
Lower secondary	14.39	17.16	15.22
Upper secondary	49.79	42.62	46.96
Tertiary	67.71	42.41	56.29
Region			
North	42.34	34.21	38.91
Centre	30.67	30.43	30.58
South	22.44	18.72	21.32
Total	32.11	28.99	30.95

Before starting to analyze how computer skills and computer use affect individuals' retirement, it is necessary to recognize that such a process is heterogeneous and this makes it difficult to develop a tight definition of retirement. For some individuals the labour supply decision is well represented by a dichotomous choice between working full time and abandoning the labour market altogether. This is the case of a typical retirement pattern by which an individual, once eligible for Social Security benefits, chooses to exit from the labour force. Alternatively, individuals may experience a smoother retirement process: despite the fulfilment of some eligibility criteria, they may choose to remain employed reducing progressively the amount of hours worked. In such a case, although a pension benefit might be formally withdrawn, these individuals should not be considered as retired from the labour market. Finally, retirement may be a by-product of a firm downsizing. In fact, this process may include an institutional arrangement that provides unemployment benefits to workers aged beyond a chosen threshold until they are eligible for Social Security. Although these workers result to be formally unemployed, they do not have any incentive to look for another job and hence they are substantially out of the labour force.

In our empirical analysis we look at two definitions of retirement. Both are based on self-reporting and hence exposed to the risk that the same expression means different things to different individuals. According to the first definition (*strict definition*) we focus only on individuals employed in year 2000, who in the following years declare themselves as job pensioner. According

the young and to overestimate it among people over 45 years old.

to the second definition (*broader definition*), we consider retired those who leave the initial state of employment for whatever reason.

For those workers who are retired according to the strict definition, the 2002 SHIW wave contains the self-reported information on the retirement age. Its distribution peaks at the typical ages of 55 and 60 for, respectively, females and males, confirming the evidence obtained on the basis of the Social Security administrative dataset by Brugiavini and Peracchi (2003).

Table 3: Transition toward retirement.

	Strict definition		*Broader definition*	
	Within 2002	**Within 2004**	**Within 2002**	**Within 2004**
Males				
Sample size (#)	604	436	635	451
Retired (%)	14.6	25.7	18.7	28.2
With PC skills	8	20.2	10	21.4
Without PC skills	20.1	30.5	25.7	33.9
Using a PC at work	6.1	17	8.3	18.0
Not using a PC at work	19.1	30.7	24.2	33.8
Females				
Sample size (#)	344	247	370	274
Retired (%)	8.7	19.8	15.1	27.7
With PC skills	7.9	18.9	11.9	21
Without PC skills	9.4	20.6	17.5	32.5
Using a PC at work	9.6	15.8	12.2	19
Not using a PC at work	8.3	21.6	16.4	31.3

In Table 3 we consider the two definitions of retirement and distinguish between transitions occurring within 2002 and those occurring within 2004. The total number of observations is reduced with respect to Table 1 and 2 because here we focus on individuals belonging to the panel section of the survey. We point out that the number of individuals followed up to 2002 is larger than that of those followed up to 2004. This is due to the fact that the survey has the sampling design of a rotating panel (some attrition might also be at work).

Overall, if we consider the **broader definition of retirement**, 18.7% (15.1%) of male (female) employees aged over 45 in 2000 retired by the end of 2002 and a further 11.7% (=(28.2-18.7)/(100-18.7)) of employees still working in 2002 retired between 2003 and 2004 (assuming that participation to the survey is independent of the retirement behavior). There are remarkable differences between workers with ICT skills and their colleagues. In the 2000-2002 period while for females the fraction of unskilled workers retiring is 50% higher than that of their skilled counterparts, it is more than 100% higher when we consider male workers. A gap of similar magnitude is observed for females also in the longer time interval, while for male workers the gap is slightly reduced. Analogous patterns are found when we consider PC utilization at work.

When we focus upon the **strict definition of retirement**, which implies a (potentially endogenous) selection of the individuals in the sample, only for female workers we record noteworthy differences with respect to the previous case. In particular, the differences between skilled and unskilled females are almost negligible in the 2000-2002 interval.

The relationship between retirement and computer skills is then explored by means of non-parametric estimates of the survivor functions obtained stratifying by the variable of interest. We test the hypothesis of equality of the survivor functions between groups using the suitable log-rank tests.

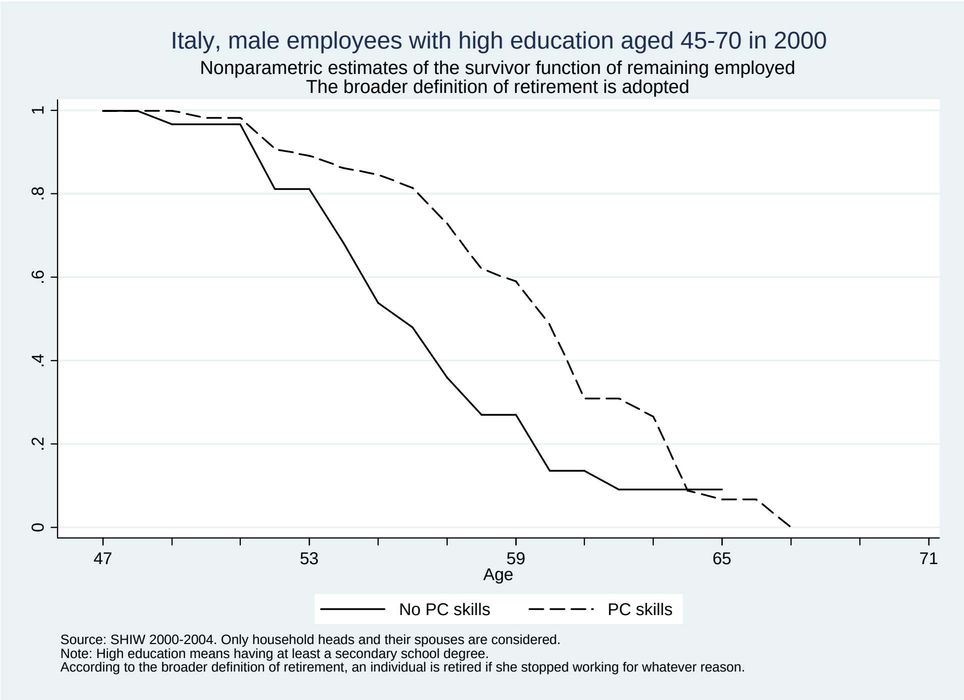

Figure 1: Survivor functions for high education males.

In Figure 1 we consider the broader definition of retirement and, for the sample of male workers with at least secondary education, we compare the survivor functions of those with and without computer skills. Individuals with some ability in the use of PCs exhibit a higher probability of remaining employed up to age 64, and the log-rank test confirms that the difference is statistically different from zero. The previous results are not confirmed when we focus on males with lower education, as reported in Figure 2.

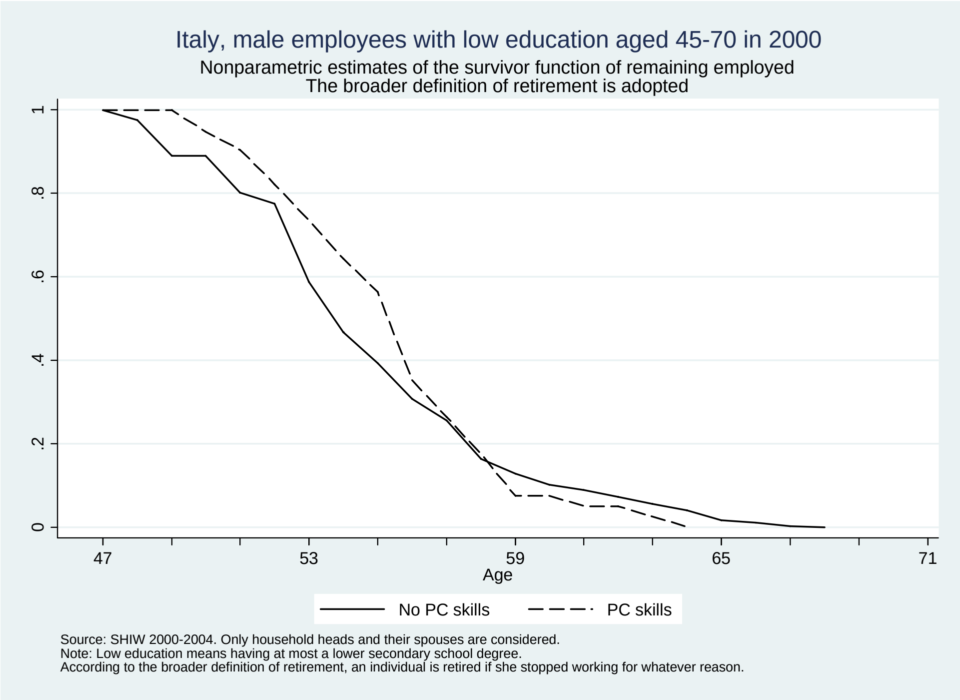

Figure 2: Survivor functions for low education males.

Here the curves cross around age 58 and no clear pattern emerges. Consistently, the log-rank test does not reject the null hypothesis of equality. Similar results hold when we consider computer use at work.

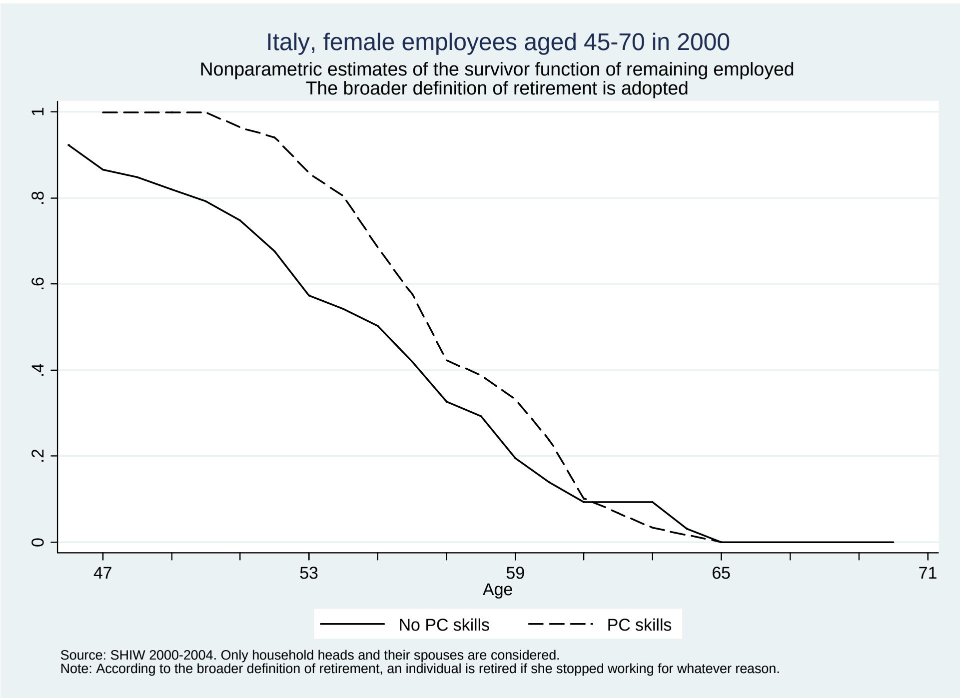

Figure 3: Survivor functions for females.

As for females, Figure 3 shows that computer literate women tend to leave their job later. In spite of this evidence, the log-rank test does not reject the null hypothesis of equality, even stratifying the sample by education. This result is due to the small size of this sample and it is confirmed also when we focus on the PC utilization at work.

When the strict definition of retirement is taken into account, all these results are confirmed.

4. Multivariate analysis

The evidence discussed so far does not take into account that PC skills and PC use on the job may be correlated with other potentially relevant determinants of the retirement choice, such as the type of job, the sector of employment, firm dimension, labour income, income from other sources and the demographic characteristics of the worker's household. Therefore, we run two types of multivariate analysis. In the first, as Friedberg (2003) and Schleife (2006), we use discrete choice models in order to describe how the probability of transition towards retirement is affected by computer utilization at work and/or computer skills. In the second, we investigate the same research question by estimating a semiparametric duration model.

4.1 Discrete choice models

In our first exercise, following Friedberg (2003) and Schleife (2006), we analyze the effect of the use of a PC at work on the probability of retirement, distinguishing between changes occurring within 2002 and those occurring within 2004. In all the specifications we control for age, age squared, education, number of days spent at home for illness during 2000, region of residence, number of household components, labour income and other household’s income. As proxies for experience and pension wealth, we use -respectively- the age at the time of the first job and the number of years of contribution to Social Security up to 2000. Moreover, we control for job characteristics, sector of employment and firm dimensions in order to allow for variation in the rate of diffusion of new technologies in the economy.

When we estimate these models, we should take into account that OLS results might be biased due to a potential endogeneity of the variable concerning the use of a computer at work (besides computer literacy) among workers. Endogeneity may arise from the fact that individuals who use a computer have unobserved abilities which make them more likely to continue working. Moreover, individuals who plan to retire later might decide to use a computer in order to increase their skills and hence their future employment probability. Hence, they would have a stronger incentive to improve their ICT skills because they expect a longer period of permanence in the labour market, in which the benefits from their training investments can be recouped.

Aware of this, we estimate a linear probability model also by means of an instrumental variable approach. The set of instruments we use in order to achieve the identification of the parameters of interest consists of the number of other family members with some computer skills, its interaction with the number of household components, its interaction with education and, finally, the number of children at school in the household. Our exclusion restrictions can be summarized as follows: the skills of other household members may affect the skills of the worker, but, once controlled for her actual computer abilities, other household members skills do not affect her retirement decision. Miniaci and Parisi (2006) show that within-household peer effects are indeed relevant for the diffusion of computer skills: considering the 2000 SHIW wave, 70% of individuals co-habitating with somebody skilled are skilled, and this percentage falls to less than 10% if nobody else in the family is able to use a computer.

Table 4: Linear probability model: effects of PC use at work on the probability of retirement. Standard errors in parenthesis. ***:p-value≤0.01, **:0.01<p-value≤0.05, *:0.05<p-value≤0.1.

	2000 → 2002			
	Strict definition		**Broader definition**	
	Males	**Females**	**Males**	**Females**
OLS estimates	-0.1043 ***	0.024	-0.0858 ***	0.0158
	(0.0299)	(0.0339)	(0.0316)	(0.0392)
2SLS estimates	-0.1048 *	-0.0402	-0.1194 *	-0.1773
	(0.0631)	(0.1003)	(0.0704)	(0.1292)
Significance of instruments	33.06 ***	10.12 ***	34.90 ***	11.19 ***
Overidentifying restrictions	0.5625	0.9752	0.1211	3.8666
Hausman exogeneity test (*t stat*)	0.01	0.68	0.55	1.68 *
Num. of Obs.	604	344	635	370
	2000 → 2004			
	Strict definition		**Broader definition**	
	Males	**Females**	**Males**	**Females**
OLS estimates	-0.1114 ***	-0.0541	-0.0939 **	-0.0438
	(0.0416)	(0.0451)	(0.0422)	(0.0533)
2SLS estimates	-0.2402 ***	-0.2214	-0.2419 ***	-0.3462 **
	(0.0906)	(0.1431)	(0.0925)	(0.1739)
Significance of instruments	27.95 ***	8.26 ***	27.52 ***	9.53 ***
Overidentifying restrictions	0.7408	5.1104	0.2943	2.1741
Hausman exogeneity test (*t stat*)	1.64	1.26	1.82 *	1.94 *
Num. of Obs.	436	247	451	274

Table 4 reports the estimates of the effects of using a computer at work on the transition towards retirement in the two-year period 2000-2002 and in the four-year period 2000-2004 (for both definitions of retirement). For sake of brevity, in the text we show only the estimates of the main parameters of interest[7]. The effects of the control variables present the expected sign. They confirm that the likelihood of retirement increases with age and with cumulated pension wealth (proxied by the age at first job and the number of years the individual contributed to the Social Security). Moreover, public sector employees tend to retire later. Furthermore, once we control for pension wealth, job characteristics and computer utilization, our estimates show that the educational attainment does not play a prominent role.

The OLS results for the two year period confirm the descriptive evidence of Table 3: male workers who use a computer at work retire significantly later than their companions, while for females the difference is negligible. In particular, the reduction of the retirement probability is equal to 8.6 percentage points if we consider the broader definition of retirement in the short period. This amounts to half the difference in the average probability of retirement between users and non users documented before (see Table 3). A similar proportion is found for the four-year interval.

Instrumental variable point estimates are almost equal to the OLS ones in the two-year interval, but they more than double in the 2000-2004 period, where the difference between users and non users is significant even for females if we refer to the broader definition of retirement. We test for the joint significance of the additional instruments in the first stage equations and we always reject the null hypothesis of insignificance. Further, we test the validity of the additional instruments and always accept the null of validity of the exclusion restrictions. The Hausman exogeneity test[8] marginally rejects the null in three of the eight cases we consider. To summarize, we have weak evidence that using an instrumental variable approach is necessary in our case.

Our results are in line with Friedberg (2003), who refers to a sample of US workers (either employee or self-employed, males and females together) aged 50-62 in 1992. In fact, although in her study the raw difference in retirement probability between users and non users is about one third of the one we estimated for our sample, her OLS estimates of the effect of using a computer on the retirement probability amount to about half of it. We are also consistent with her results when comparing IV and OLS estimates since her IV estimates are almost three times larger than the OLS ones. Instead, we find remarkable differences with Schleife (2006), who, based on a sample of German male workers (either employee or self-employed) aged 50-60 in 1997, finds no evidence that computer use induces to postpone retirement.

At the moment we are not in the position to disentangle a potential skill effect from the effect of actual computer use. In what follows we enrich the previous specification by introducing a dummy variable equal to one if the worker has some computer skills as well as its interaction with

[7] The complete set of results is presented in Tables A1-A4 in the Appendix.
[8] The validity of both overidentifying restrictions and exogeneity assumption is tested allowing for heteroskedasticity.

the low-education dummy. Since PC users at work are by definition PC skilled, we then define the *overall* effect of using a PC at work as the sum of the effect of having PC skills and the one of using a PC at work taken per se. We also point out that now the parameter on the dummy for computer use measures the *additional* effect of using a PC at work for a PC skilled individual. It is worth noting that plugging in the specification the interaction between PC skills and the low-education dummy allows the impact of being PC literate and, in turn, the overall effect of using a PC at work to vary across education groups[9]. As in the previous case, both OLS and IV estimates are considered.

Table 5 shows that in the **two-year period** (2000 - 2002) the OLS estimates of the overall effect of PC utilization at work are significant and negative for males, irrespective of their education. On the contrary, being computer skilled produces significant and negative variations in the probability of retirement only for low education individuals who quit employment to become job pensioners. Further, it should be noticed that once we condition on PC skills, the additional effect of using a PC on the job is significant and strikingly positive only for females who retire according to the strict definition. In the **longer period** (2000 - 2004) we find significant results only for high education males. In particular, both the overall effect of using a PC on the job and the one of being computer literate are negative and significant. Again, it is worth noting that once PC skills are allowed for, the additional effect of using a PC at work is never significant.

These results are weakened when we switch to the instrumental variable approach. This lack of coherence is probably due to the considerable increase of standard errors, which causes a loss of precision in the estimates. However, we tested the validity of both the additional instruments and the exclusion restrictions finding no evidence of misspecification. Finally, the Hausman tests always accepted the null hypothesis of exogeneity, suggesting that there is little advantage in using an IV approach and that we can rely on OLS estimates.

[9] On the contrary, the additional effect of using a PC at work is assumed not to depend on education levels.

Table 5: Linear probability model: <u>effects of computer skills and computer use at work</u> on the probability of retirement. Standard errors in parenthesis. ***:p-value≤0.01, **:0.01<p-value≤0.05, *:0.05<p-value≤0.1.

	2000 → 2002			
	Strict definition		**Broader definition**	
	Males	**Females**	**Males**	**Females**
OLS				
PC use at work	-0.0446	0.0631 *	-0.0245	0.0477
	(0.0461)	(0.0375)	(0.0474)	(0.0453)
Higher education				
PC skills	-0.0800	-0.0415	-0.0795	-0.0267
	(0.0561)	(0.04)	(0.0584)	(0.046)
Overall effect of PC use at work	-0.1246***	0.0216	-0.1040 **	0.0210
	(0.039)	(0.0405)	(0.0418)	(0.0452)
Lower education				
PC skills	-0.0848 *	-0.1251 **	-0.0907	-0.1287
	(0.0508)	(0.0592)	(0.0566)	(0.0882)
Overall effect of PC use at work	-0.1294 ***	-0.0619	-0.1152 *	-0.0811
	(0.0489)	(0.0642)	(0.0539)	(0.0887)
2SLS				
PC use at work	0.2966	-0.9387	0.1858	-1.2870
	(0.7162)	(1.6806)	(0.9819)	(1.0803)
Higher education				
PC skills	-0.3433	0.5651	-0.2510	0.7242
	(0.5912)	(1.0376)	(0.8088)	(0.664)
Overall effect of PC use at work	-0.0467	-0.3737	-0.0652	-0.5629
	(0.1410)	(0.6567)	(0.1867)	(0.4503)
Lower education				
PC skills	-0.1563	0.3438	-0.1514	0.3078
	(0.3618)	(0.7507)	(0.4760)	(0.5244)
Overall effect of PC use at work	0.1403	-0.5949	0.0344	-0.9792
	(0.3875)	(0.9977)	(0.5319)	(0.7002)
Hausman exogeneity test (χ^2_3)	0.46	0.42	0.07	1.58
Num. of Obs.	604	344	635	370

	2000 → 2004			
	Strict definition		**Broader definition**	
	Males	**Females**	**Males**	**Females**
OLS				
PC use at work	-0.0374	-0.0679	-0.0277	-0.0467
	(0.0662)	(0.0665)	(0.0673)	(0.0709)
Higher education				
PC skills	-0.1465 *	-0.0024	-0.1328 *	-.0178178
	(0.0769)	(0.0729)	(0.0772)	.0766185
Overall effect of PC use at work	-0.184 ***	-0.0702	-0.1604 ***	-.064511
	(0.0536)	(0.0509)	(0.0532)	.0617021
Lower education				
PC skills	0.0129	0.1146	0.0115	.0904506
	(0.0862)	(0.1035)	(0.0867)	.119693
Overall effect of PC use at work	-0.0246	0.0467	-0.0162	.0437575
	(0.074)	(0.1029)	(0.0758)	.1185991
2SLS				
PC use at work	0.1761	-1.0617	0.0894	-1.2608
	(0.5831)	(0.7652)	(0.6375)	(1.0110)
Higher education				
PC skills	-0.3549	0.5526	-.2704227	.610567
	(0.4893)	(0.4900)	.5254682	.6535467
Overall effect of PC use at work	-0.1788	-0.5091	-.1810066	-.6501882
	(0.1291)	(0.3211)	.1430564	.4052823
Lower education				
PC skills	-0.1722	0.4602	-.1691973	.3988272
	(0.3026)	(0.3832)	.3297897	.544161
Overall effect of PC use at work	0.0039	-.6014911	-.0797812	-.861928
	(0.35)	.6165536	.3722211	.743762
Hausman exogeneity test (χ^2_3)	0.38	1.73	0.61	2.04
Num. of Obs.	436	247	451	274

Table 6: Logit model: effects of computer skills and computer use at work on the probability of retirement. Standard errors in parenthesis, marginal effects at the average level in italics. ***:p-value≤0.01, **:0.01<p-value≤0.05, *:0.05<p-value≤0.1.

	2000 → 2002			
	Strict definition		**Broader definition**	
	Males	**Females**	**Males**	**Females**
PC use at work	-0.8609	1.1022	-0.4554	0.3231
	(0.5726)	(1.1672)	(0.4879)	(0.7290)
	-0.0317499	*0.0113044*	*-0.0416783*	*0.0222254*
Higher education				
PC skills	-1.0875 *	-0.6374	-0.7566	-0.0127
	(0.6496)	(1.1803)	(0.5548)	(0.7371)
	-0.0437	*-0.0049*	*-0.0713*	*-0.0008*
Overall effect of PC use at work	-1.948 ***	0.4648	-1.2112 ***	0.3105
	(0.5660)	(0.8043)	(0.4597)	(0.5974)
	-0.0755	*0.0064*	*-0.1130*	*0.0214*
Lower education				
PC skills	-0.7378	-2.3927	-0.5808	-2.0398
	(0.6198)	(1.7383)	(0.5167)	(1.1820)
	-0.0276	*-0.0122*	*-0.0534*	*-0.06760*
Overall effect of PC use at work	-1.5987 ***	-1.2905	-1.0362 *	-1.7166
	(0.6384)	(1.4809)	(0.5284)	(1.0508)
	-0.0593	*-0.0009*	*-0.0950*	*-0.0454*
Rivers - Vuong test (χ^2_3)	2.25	2.44	0.60	4.41
Num. of Obs.	604	344	635	370
	2000 → 2004			
	Strict definition		**Broader definition**	
	Males	**Females**	**Males**	**Females**
PC use at work	-0.6882	-1.3760	-0.5001	-0.6387
	(0.5680)	(0.9091)	(0.5154)	(0.6532)
	-0.0539924	*-0.0143021*	*-0.0579407*	*-0.086362*
Higher education				
PC skills	-1.4203 ***	0.3687	-1.1532 *	-.0871
	(0.6724)	(0.8579)	(.6209)	(.6315)
	-0.1192	*0.0047*	*-0.1374*	*-.0128*
Overall effect of PC use at work	-2.1084 ***	-1.007	-1.6534 ***	-.7258
	(0.5634)	(0.9152)	.5195	.5878
	-0.1732	*-0.0096*	*-0.1954*	*-0.0991*
Lower education				
PC skills	1.6098 *	3.2943 **	0.1931	0.8910
	(0.7468)	(1.3392)	(0.5147)	(0.9071)
	0.2219	*0.1580*	*0.0926*	*0.1701*
Overall effect of PC use at work	-0.4987	1.9183	-0.3070	0.2523
	(0.6163)	(1.3213)	(0.5471)	(0.8995)
	-0.0487	*0.1437*	*-0.0346*	*0.0837*
Rivers - Vuong test (χ^2_3)	1.54	1.89	0.94	3.22
Num. of Obs.	436	247	451	274

If exogeneity is not an issue, more efficient estimates are obtainable by adopting alternative discrete choice approaches. Table 6 reports the ML estimates[10] of the logit model for a specification with the same covariates of Table 5 and the statistics of the Rivers - Vuong (1988) tests of exogeneity. Also in this case we never reject the hypothesis of exogeneity. Therefore, we can compare these ML estimates with the previous OLS results to see that almost all the findings of the linear probability models are confirmed. In the two-year period the overall effect of using a PC at work is negative and significant for males, irrespective of their educational attainment and the definition of retirement considered. On the contrary, being PC literate produces a decrease of the probability of leaving the initial state of employed only for high education males in the strict definition case. Further, once PC skills are allowed for, the additional effect of using a PC at work is always statistically negligible. In the four year period most significant results are found only for high education males. As it is shown, both the overall effect of using a PC on the job and the impact of being PC literate are negative and significant. Finally, we point out how the additional effect of using a PC at work, once we condition on PC skills level, is not significant.

4.2 Semiparametric duration analysis

So far we have modelled the retirement process as a dichotomous choice to be made in a given time horizon (two or four years). However, retirement can be more properly studied exploiting the tools of the survival analysis since it is a decision process mainly concerned with the choice of the optimal timing of exit from the labour force. Therefore, we estimate a semiparametric Cox model conditioning on the same set of control factors used in the previous subsection. As our dataset has a panel structure, we exploit the possibility provided by SHIW of updating the control variables as time elapses. The covariates measured as of year 2000 are used for studying transitions between 2000 and 2002, while the information conveyed by their updates to their 2002 values is exploited for transitions between 2002 and 2004. In other words, we use a duration model with time-varying covariates. Unfortunately, the information on PC skills and PC use at work is available only in year 2000.

We decide to model the duration in the initial state of employment using Cox specifications and handling tied events of exit by means of the exact partial likelihood method[11]. Basically, the outcome of interest is the discrete-time hazard rate of retirement, which is defined as the probability of retiring at age *a* conditional on arriving employed at age *a-1*. Further, we assume the

[10] Tables A9-A10 show the complete set of estimates.
[11] See Thernau and Grambsch (2000) for further detail concerning the methods for handling tied events.

proportionality for the odds of the hazard rate. This amounts to saying that the odds of retiring result from the product between a baseline odds common to all individuals and a function summarizing individual specific characteristics. Hence, the parameters we intend to identify measure the effect of the explicative variables on the odds and, in turn, on the hazard. Cox models are particularly suitable because they can be rewritten as logit regressions, similar to those considered in the previous section. This allows us to maintain the validity of the Rivers and Vuong (1988) exogeneity test conducted for the previous discrete choice analysis.

As reported in Table 7, most significant results are found for high education males[12]. While being computer literate decreases the likelihood of retirement only in the strict definition case, the overall effect of using a PC at work is found to be always significantly lower than zero. It should be noticed that, conditional on PC skills, the additional effect of using a PC at work is significant and negative for all males who retire to become job pensioners.

Table 7: Cox model: effects of computer skills and computer use at work on the conditional probability of retirement. Standard errors in parenthesis. ***:p-value≤0.01, **:0.01<p-value≤0.05, *:0.05<p-value≤0.1.

	Strict definition		**Broader definition**	
	Males	**Females**	**Males**	**Females**
PC use at work	-0.7895 ***	-0.1313	-0.4181	-0.1499
	0.3803	0.5697	0.3438	0.4393
Higher education				
PC skills	-0.7779*	-0.0188	-0.6511	-0.0353
	(0.4453)	(0.5815)	(0.4031)	(0.4392)
Overall effect of PC use at work	-1.5674 ***	-0.1501	-1.0692 ***	-0.1852
	(0.3905)	(0.5225)	(0.3365)	(0.3964)
Lower education				
PC skills	0.1503	0.2834	0.0324	-0.3855
	(0.3903)	(0.9301)	(0.3345)	(0.7001)
Overall effect of PC use at work	-0.6392	0.1521	-0.3857	-0.5354
	(0.4319)	(0.9274)	(0.3663)	(0.6641)
Number of Spells	961	556	1001	596
Number of Employees	608	344	639	370

[12] Table A11 in the Appendix reports the full set of estimates.

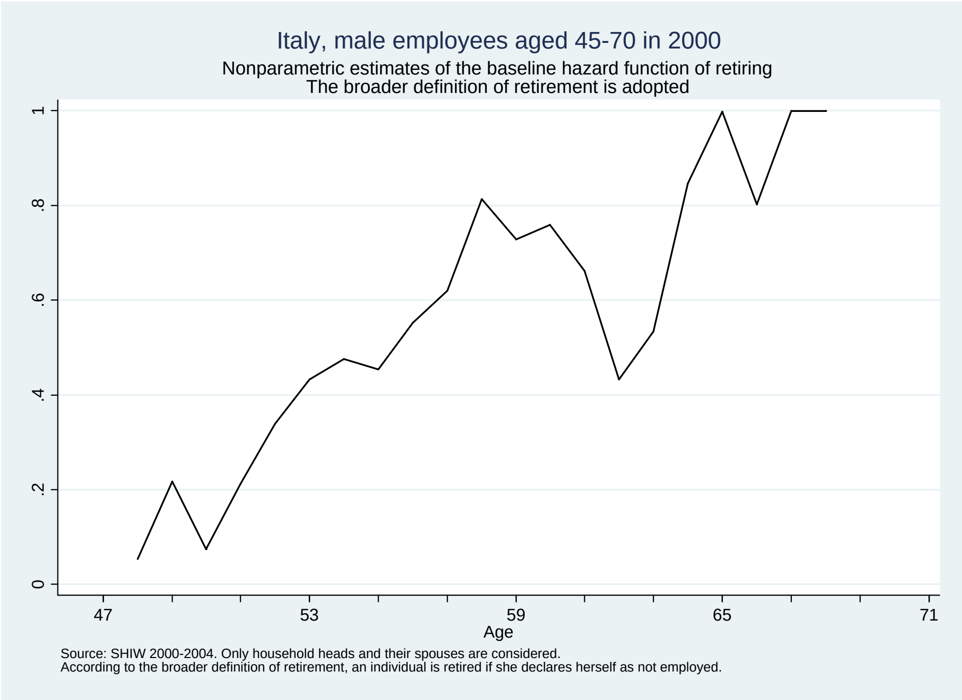

Figure 4: Cox model baseline hazard rate.

Looking at the shape of the baseline hazard rate reported in Figure 4 it is easy to recognize peaks at the typical retirement ages. As expected, male employees tend to retire around the age of 57 and 65 because of the entitlement rules for the seniority pension (*pensioni di anzianità*) and old age pension (*pensioni di vecchiaia*). These results confirm the evidence given for Italian workers by Brugiavini and Peracchi (2003) using the Social Security administrative dataset.

5. Conclusions

We empirically investigated the relation between technological skills and retirement choices of Italian employees aged 45-70 in 2000. We exploited the longitudinal structure of the Bank of Italy Survey on Household Income and Wealth, which provides information on a wide set of both individual, household and job characteristics. Among these we have variables capturing at the individual level the ability in the use of a computer and the actual use of a PC at work.

Two definitions of retirement are taken into account. According to the former, we consider retired individuals who leave the initial state of employment to become job pensioners (*strict definition*). According to the latter, retirement occurs if employment status is left for whatever reason (*broader definition*).

The main findings of our analysis refer to specifications which disentangle the effect of using a PC at work from that of being PC literate. In other words, keeping in mind that users of a PC on the job are by definition PC skilled, we are able to distinguish the *additional* effect of using a

PC at work conditional on PC skills level from the *overall* effect of using a PC on the job, which is given by the sum of the impact of being PC literate and the one of using a PC at work taken per se.

All our results highlight that, overall, using a PC on the job entails a lower probability of retirement for male employees with high education. This evidence is invariant to the time horizon considered (two or four years), to the definition of retirement adopted, and to the choice of the modelling strategy (linear probability models, logit models and semiparametric survival analysis). They are weakened only in the case of instrumental variable estimates of the linear probability models. However, we document that, both in the linear probability model and in the logit model, endogeneity is not a major concern.

This result is consistent with the hypothesis that computer skills and education are complements and that the diffusion of personal computers in the economy strengthens the demand for highly skilled labour. According to this view, only high-education workers are able to fully exploit ICT technologies and hence more likely to find the conditions, for instance in terms of expected wages, that make preferable postponing retirement. We also show that at least for the broader definition of retirement, once computer skills are allowed for, the additional effect of using a computer at work is no longer significant. Furthermore, our estimates show that computer skills and computer utilization at work do not seem to play a crucial role in the retirement process of women.

Therefore we obtain two main results:

1. there is a relevant heterogeneity on how ICT adoption affects different groups of older workers. It is only for the well educated male employees that the lack of computer skills may result in early retirement. For low-education males and for females, who tend to be concentrated either in manual job positions (employees with low education) or in selling, caring or teaching activity (women with high education), there is no effect of ICT skills on the retirement decision. Viceversa, given that more than 50% of males with high education use a computer at work and more than 65% are able to use it, the lack of computer skills among this group is such that not being able to use a PC is a strong signal of the obsolescence of human capital;
2. it is important to recognize that for males, when the relation between computer utilization and retirement is investigated but skills are not taken into account, the effect of computer utilization on the retirement process is likely to be overestimated. In fact, when we do not control for PC skills, the variable that captures PC use at work soaks the effects of both "technological skills" and their use on the job. Consistently, when we control for the level of the skills, the overall effect of the PC utilization on the job is found to be significant, both statistically and economically, but in almost all cases the additional effect of the use of a PC at work is no longer

relevant.

These results resemble the findings of the empirical literature on the computer wage premium. The first evidence (Krueger, 1993) was strongly supportive of a remarkable wage premium, but as soon as more detailed data became available (see for instance DiNardo and Pischke, 1997) it was realized that heterogeneity was an issue and that it was necessary to disentangle the skill premium and the one related to the utilization of the computer. As in the case of the literature on the estimates of earnings return to computer use, more detailed data are necessary to further investigate to what extent both ability and utilization of new technologies can affect the labour supply of individuals.

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Appendix

Variable name	Type	Meaning
Demographics		
ncomp	C	Number of household components
eta	C	Age
eta2	C	Age squared
Education		
no_edu	D	At most a primary school degree
low_edu	D	Lower secondary school degree
sec_edu	D	Secondary school degree
hig_edu	D	Tertiary school degree (baseline)
Work history		
age_fir	C	Age at first job
yea_con	C	Years of contribution as of 2000
Health		
ill	C	Days spent at home for illness in 2000
Job characteristics		
blu	D	Blue-collar
whi	D	Non blue-collar employees (baseline)
Sector of employment		
agr_ind	D	Agriculture, energy, mining, quarrying, manufacturing, construction
com_ser	D	Trade, transport, communication, financial sector, other services
pub_ext	D	PA, extraterritorial organizations (baseline)
Firm dimension, in terms of number of employees		
dim1	D	Lower than 20
dim2	D	Between 20 and 499
dim3	D	Higher than 499 (baseline)
Region of residence		
res1	D	North
res2	D	Centre
res3	D	South and Islands (baseline)
Income		
lab_inc	C	Ln(labour income)
oth_inc	C	Ln(other household income)
PC utilization		
pc_uti	D	Having at least some ability in PC utilization
pc_uti_ledu	D	Having at least some ability in PC utilization and at most a middle school degree
complav	D	Using a PC at work

Note : Type: “C”=continuous variable, “D”=dummy.

Table A1. Dependent variable: retirement status in 2002 or 2004, strict definition of retirement. Sample: employees household heads and their spouses aged 45-70 in 2000. Estimation method: OLS estimates of the linear probability model.

	2000-2002						2000-2004					
	Males			Females			Males			Females		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
ncomp	0.0090	0.0122	0.4630	-0.0077	0.0126	0.5400	0.0077	0.0165	0.6390	0.0075	0.0207	0.7190
eta	-0.1815	0.0411	0.0000	-0.3209	0.0854	0.0000	-0.0376	0.0571	0.5110	-0.3829	0.0922	0.0000
eta2	0.0020	0.0004	0.0000	0.0033	0.0008	0.0000	0.0007	0.0005	0.1750	0.0042	0.0009	0.0000
age_fir	-0.0027	0.0037	0.4630	-0.0004	0.0027	0.8810	-0.0139	0.0051	0.0060	0.0000	0.0038	0.9940
yea_con	0.0091	0.0021	0.0000	0.0078	0.0021	0.0000	0.0129	0.0031	0.0000	0.0102	0.0028	0.0000
ill	-0.0003	0.0006	0.6220	-0.0011	0.0005	0.0160	-0.0006	0.0007	0.4090	-0.0019	0.0005	0.0000
no_edu	-0.0150	0.0710	0.8330	-0.0990	0.0740	0.1820	-0.0380	0.0897	0.6720	-0.0614	0.1059	0.5620
low_edu	0.0066	0.0577	0.9090	-0.0593	0.0621	0.3400	-0.0021	0.0760	0.9780	-0.1441	0.0857	0.0940
sec_edu	0.0250	0.0399	0.5320	-0.0592	0.0375	0.1150	-0.0013	0.0555	0.9810	-0.0948	0.0589	0.1090
blu	0.0191	0.0397	0.6310	-0.0583	0.0459	0.2050	-0.0535	0.0582	0.3590	-0.0346	0.0721	0.6320
agr_ind	0.0643	0.0369	0.0820	0.0442	0.0503	0.3800	0.1316	0.0528	0.0130	0.1222	0.0661	0.0660
com_ser	0.0147	0.0375	0.6940	-0.0122	0.0465	0.7940	0.0978	0.0586	0.0960	0.0687	0.0584	0.2400
dim1	-0.0504	0.0446	0.2590	-0.0297	0.0388	0.4450	-0.1448	0.0607	0.0170	-0.1505	0.0589	0.0110
dim2	-0.0769	0.0373	0.0400	0.0700	0.0466	0.1340	-0.0758	0.0512	0.1400	-0.0379	0.0599	0.5270
res1	0.0243	0.0340	0.4750	0.0385	0.0298	0.1980	0.0208	0.0452	0.6450	0.1096	0.0510	0.0330
res2	0.0317	0.0369	0.3910	0.0344	0.0374	0.3590	0.0944	0.0512	0.0660	0.0321	0.0570	0.5740
lab_inc	-0.0018	0.0402	0.9640	-0.1103	0.0399	0.0060	-0.0014	0.0553	0.9790	-0.1166	0.0411	0.0050
oth_inc	0.0037	0.0071	0.6020	0.0022	0.0082	0.7880	0.0154	0.0075	0.0400	0.0214	0.0153	0.1640
complav	-0.1043	0.0299	0.0010	0.0240	0.0339	0.4800	-0.1114	0.0416	0.0080	-0.0541	0.0451	0.2320
Constant	3.9577	1.1407	0.0010	8.7721	2.2111	0.0000	0.0001	1.6307	1.0000	9.5047	2.4155	0.0000
Num. of Obs.		604			344			436			247	

Table A2. Dependent variable: retirement status in 2002 or 2004, broader definition of retirement. Sample: employees household heads and their spouses aged 45-70 in 2000. Estimation method: OLS estimates of the linear probability model.

	2000-2002						2000-2004					
	Males			Females			Males			Females		
	Coef.	**Std. Err.**	**P-value**	**Coef.**	**Std. Err.**	**P-value**	**Coef.**	**Std. Err.**	**P-value**	**Coef.**	**Std. Err.**	**P-value**
ncomp	0.0180	0.0143	0.2060	0.0154	0.0187	0.4110	0.0081	0.0173	0.6390	0.0112	0.0255	0.6610
eta	-0.0779	0.0452	0.0860	-0.1289	0.0734	0.0800	-0.0099	0.0592	0.8680	-0.0192	0.1114	0.8630
eta2	0.0011	0.0004	0.0140	0.0015	0.0007	0.0310	0.0005	0.0006	0.4110	0.0007	0.0011	0.5380
age_fir	-0.0062	0.0040	0.1190	0.0014	0.0036	0.6940	-0.0148	0.0051	0.0040	0.0072	0.0048	0.1370
yea_con	0.0033	0.0027	0.2290	0.0015	0.0028	0.5840	0.0131	0.0032	0.0000	0.0057	0.0036	0.1140
ill	-0.0002	0.0008	0.8450	-0.0015	0.0006	0.0120	-0.0002	0.0008	0.8170	-0.0013	0.0007	0.0630
no_edu	-0.0116	0.0760	0.8780	-0.0790	0.0957	0.4100	-0.0339	0.0924	0.7140	-0.0911	0.1225	0.4580
low_edu	0.0027	0.0606	0.9640	-0.0808	0.0747	0.2800	-0.0055	0.0764	0.9430	-0.1302	0.1003	0.1960
sec_edu	0.0133	0.0424	0.7530	-0.0521	0.0413	0.2080	-0.0164	0.0564	0.7710	-0.0485	0.0672	0.4710
blu	0.0054	0.0426	0.8980	-0.1240	0.0639	0.0530	-0.0228	0.0581	0.6960	0.0123	0.0854	0.8850
agr_ind	0.0878	0.0404	0.0300	0.1168	0.0615	0.0580	0.1415	0.0543	0.0090	0.1753	0.0855	0.0410
com_ser	0.0348	0.0409	0.3950	0.0447	0.0578	0.4400	0.1287	0.0589	0.0290	0.0601	0.0725	0.4080
dim1	-0.0103	0.0502	0.8380	0.0567	0.0588	0.3350	-0.1312	0.0637	0.0400	-0.0705	0.0776	0.3640
dim2	-0.0588	0.0401	0.1430	0.0343	0.0518	0.5080	-0.0634	0.0509	0.2140	-0.0317	0.0772	0.6820
res1	0.0234	0.0369	0.5270	0.0538	0.0435	0.2160	-0.0311	0.0469	0.5070	0.0945	0.0613	0.1240
res2	0.0249	0.0397	0.5310	0.0572	0.0478	0.2320	0.0417	0.0524	0.4260	0.0510	0.0688	0.4590
lab_inc	-0.0651	0.0444	0.1430	-0.2101	0.0422	0.0000	-0.0167	0.0583	0.7740	-0.2488	0.0528	0.0000
oth_inc	0.0040	0.0077	0.6010	-0.0171	0.0180	0.3440	0.0196	0.0081	0.0160	0.0220	0.0162	0.1760
complav	-0.0858	0.0316	0.0070	0.0158	0.0392	0.6870	-0.0939	0.0422	0.0260	-0.0438	0.0533	0.4120
constant	1.9952	1.2563	0.1130	5.0644	1.8509	0.0070	-0.5409	1.7254	0.7540	1.6405	3.0422	0.5900
Num. of Obs.		635			370			451			274	

Table A3. Dependent variable: retirement status in 2002 or 2004, strict definition of retirement. Sample: employees household heads and their spouses aged 45-70 in 2000. Estimation method: 2sls estimates of the linear probability model. Additional instruments: number of other family members with at least some computer skill, its interaction with the number of household components, its interaction with education, number of children at school in the household.

	2000-2002						2000-2004					
	Males			Females			Males			Females		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
complav	-0.1048	0.0631	0.0970	-0.0402	0.1003	0.6890	-0.2403	0.0906	0.0080	-0.2214	0.1431	0.1230
ncomp	0.0090	0.0123	0.4640	-0.0078	0.0128	0.5420	0.0101	0.0168	0.5470	0.0046	0.0217	0.8320
eta	-0.1815	0.0410	0.0000	-0.3227	0.0854	0.0000	-0.0416	0.0601	0.4890	-0.4177	0.0989	0.0000
eta2	0.0020	0.0004	0.0000	0.0033	0.0008	0.0000	0.0008	0.0006	0.1780	0.0045	0.0010	0.0000
age_fir	-0.0027	0.0037	0.4710	-0.0002	0.0027	0.9400	-0.0135	0.0051	0.0090	0.0002	0.0038	0.9570
yea_con	0.0091	0.0021	0.0000	0.0078	0.0021	0.0000	0.0132	0.0032	0.0000	0.0110	0.0031	0.0000
ill	-0.0003	0.0006	0.6220	-0.0011	0.0005	0.0180	-0.0004	0.0007	0.5770	-0.0019	0.0005	0.0000
no_edu	-0.0151	0.0717	0.8330	-0.1149	0.0762	0.1330	-0.0732	0.0930	0.4320	-0.1268	0.1205	0.2940
low_edu	0.0064	0.0578	0.9110	-0.0714	0.0619	0.2490	-0.0388	0.0806	0.6310	-0.1905	0.0923	0.0400
sec_edu	0.0249	0.0395	0.5280	-0.0600	0.0373	0.1080	-0.0106	0.0567	0.8520	-0.1161	0.0604	0.0560
blu	0.0189	0.0424	0.6550	-0.0783	0.0595	0.1890	-0.0930	0.0645	0.1500	-0.0856	0.0871	0.3270
agr_ind	0.0644	0.0374	0.0860	0.0667	0.0621	0.2840	0.1423	0.0539	0.0090	0.1902	0.0850	0.0260
com_ser	0.0148	0.0379	0.6960	0.0069	0.0566	0.9030	0.1116	0.0603	0.0650	0.1290	0.0772	0.0960
dim1	-0.0504	0.0443	0.2560	-0.0333	0.0390	0.3940	-0.1558	0.0614	0.0110	-0.1692	0.0623	0.0070
dim2	-0.0770	0.0372	0.0390	0.0685	0.0463	0.1400	-0.1002	0.0530	0.0600	-0.0490	0.0614	0.4250
res1	0.0244	0.0348	0.4830	0.0477	0.0324	0.1420	0.0429	0.0473	0.3660	0.1197	0.0526	0.0240
res2	0.0317	0.0372	0.3940	0.0419	0.0380	0.2700	0.1016	0.0516	0.0500	0.0286	0.0572	0.6180
lab_inc	-0.0018	0.0402	0.9640	-0.1023	0.0419	0.0150	0.0062	0.0552	0.9110	-0.1037	0.0442	0.0200
oth_inc	0.0037	0.0072	0.6070	0.0007	0.0080	0.9320	0.0171	0.0076	0.0260	0.0201	0.0170	0.2380
constant	3.9578	1.1393	0.0010	8.7767	2.2130	0.0000	0.0616	1.6936	0.9710	10.3790	2.5910	0.0000
Num. of Obs.		604			344			436			247	

Table A4. Dependent variable: retirement status in 2002 or 2004, broader definition of retirement. Sample: employees household heads and their spouses aged 45-70 in 2000. Estimation method: 2sls estimates of the linear probability model. Additional instruments: number of other family members with at least some computer skill, its interaction with the number of household components, its interaction with education, number of children at school in the household.

	2000-2002						2000-2004					
	Males			Females			Males			Females		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
complav	-0.1194	0.0704	0.0900	-0.1773	0.1292	0.1710	-0.2420	0.0925	0.0090	-0.3462	0.1739	0.0480
ncomp	0.0191	0.0145	0.1880	0.0148	0.0191	0.4380	0.0110	0.0177	0.5340	0.0052	0.0270	0.8470
eta	-0.0788	0.0453	0.0830	-0.1348	0.0733	0.0670	-0.0141	0.0624	0.8220	-0.0588	0.1205	0.6260
eta2	0.0011	0.0004	0.0140	0.0016	0.0007	0.0260	0.0005	0.0006	0.4010	0.0010	0.0011	0.3810
age_fir	-0.0060	0.0040	0.1370	0.0020	0.0036	0.5730	-0.0144	0.0052	0.0060	0.0078	0.0048	0.1060
yea_con	0.0033	0.0027	0.2240	0.0019	0.0028	0.5040	0.0134	0.0033	0.0000	0.0068	0.0040	0.0950
ill	-0.0001	0.0008	0.8660	-0.0014	0.0006	0.0160	0.0000	0.0008	0.9930	-0.0014	0.0007	0.0590
no_edu	-0.0201	0.0774	0.7950	-0.1324	0.0947	0.1630	-0.0732	0.0966	0.4490	-0.1955	0.1401	0.1640
low_edu	-0.0066	0.0618	0.9140	-0.1239	0.0738	0.0940	-0.0482	0.0820	0.5570	-0.2082	0.1087	0.0560
sec_edu	0.0111	0.0423	0.7930	-0.0532	0.0430	0.2170	-0.0274	0.0579	0.6370	-0.0761	0.0710	0.2850
blu	-0.0037	0.0459	0.9350	-0.1766	0.0776	0.0240	-0.0679	0.0649	0.2960	-0.0818	0.1041	0.4330
agr_ind	0.0914	0.0411	0.0270	0.1808	0.0779	0.0210	0.1549	0.0557	0.0060	0.2950	0.1090	0.0070
com_ser	0.0381	0.0414	0.3570	0.1010	0.0690	0.1450	0.1459	0.0610	0.0170	0.1728	0.0976	0.0780
dim1	-0.0130	0.0502	0.7950	0.0475	0.0610	0.4370	-0.1454	0.0648	0.0250	-0.1078	0.0822	0.1910
dim2	-0.0644	0.0403	0.1100	0.0281	0.0535	0.6000	-0.0927	0.0536	0.0840	-0.0567	0.0782	0.4700
res1	0.0284	0.0379	0.4540	0.0792	0.0471	0.0940	-0.0063	0.0494	0.8980	0.1128	0.0633	0.0760
res2	0.0271	0.0400	0.4980	0.0775	0.0503	0.1250	0.0492	0.0530	0.3540	0.0501	0.0720	0.4870
lab_inc	-0.0632	0.0443	0.1550	-0.1907	0.0443	0.0000	-0.0086	0.0580	0.8820	-0.2308	0.0564	0.0000
oth_inc	0.0045	0.0078	0.5660	-0.0199	0.0166	0.2310	0.0216	0.0082	0.0090	0.0207	0.0198	0.2970
constant	2.0039	1.2585	0.1120	5.1076	1.8506	0.0060	-0.4736	1.7923	0.7920	2.6561	3.2843	0.4190
Num. of Obs.		635			370			451			274	

Table A5. Dependent variable: retirement status in 2002 or 2004, strict definition of retirement. Sample: employees household heads and their spouses aged 45-70 in 2000. Estimation method: OLS estimates of the linear probability model.

	2000-2002						2000-2004					
	Males			Females			Males			Females		
	Coef.	**Std. Err.**	**P-value**	**Coef.**	**Std. Err.**	**P-value**	**Coef.**	**Std. Err.**	**P-value**	**Coef.**	**Std. Err.**	**P-value**
ncomp	0.0099	0.0122	0.4160	-0.0065	0.0124	0.6010	0.0089	0.0165	0.5890	0.0068	0.0205	0.7390
eta	-0.1819	0.0411	0.0000	-0.3188	0.0853	0.0000	-0.0431	0.0570	0.4500	-0.3875	0.0937	0.0000
eta2	0.0020	0.0004	0.0000	0.0033	0.0008	0.0000	0.0008	0.0005	0.1430	0.0043	0.0009	0.0000
age_fir	-0.0032	0.0037	0.3900	-0.0004	0.0027	0.8920	-0.0140	0.0051	0.0060	-0.0003	0.0038	0.9450
yea_con	0.0096	0.0022	0.0000	0.0079	0.0021	0.0000	0.0129	0.0032	0.0000	0.0102	0.0028	0.0000
ill	-0.0003	0.0006	0.6260	-0.0011	0.0004	0.0120	-0.0008	0.0007	0.2570	-0.0018	0.0004	0.0000
no_edu	-0.0363	0.0757	0.6310	-0.0883	0.0794	0.2660	-0.1069	0.0942	0.2570	-0.0952	0.1101	0.3880
low_edu	-0.0076	0.0660	0.9090	-0.0343	0.0733	0.6400	-0.0851	0.0861	0.3240	-0.1946	0.1002	0.0530
sec_edu	0.0154	0.0399	0.7000	-0.0603	0.0380	0.1140	-0.0165	0.0560	0.7690	-0.0984	0.0590	0.0970
blu	0.0161	0.0395	0.6840	-0.0756	0.0471	0.1090	-0.0594	0.0580	0.3060	-0.0178	0.0742	0.8110
agr_ind	0.0649	0.0370	0.0800	0.0448	0.0507	0.3780	0.1389	0.0526	0.0090	0.1242	0.0654	0.0590
com_ser	0.0172	0.0375	0.6480	-0.0058	0.0467	0.9010	0.1084	0.0585	0.0650	0.0609	0.0588	0.3010
dim1	-0.0586	0.0449	0.1920	-0.0314	0.0390	0.4210	-0.1499	0.0606	0.0140	-0.1504	0.0581	0.0100
dim2	-0.0787	0.0375	0.0360	0.0708	0.0462	0.1270	-0.0819	0.0510	0.1090	-0.0400	0.0594	0.5020
res1	0.0270	0.0340	0.4280	0.0399	0.0299	0.1830	0.0168	0.0462	0.7170	0.1108	0.0509	0.0310
res2	0.0345	0.0368	0.3490	0.0309	0.0375	0.4110	0.0957	0.0510	0.0610	0.0374	0.0573	0.5140
lab_inc	-0.0028	0.0401	0.9440	-0.1048	0.0403	0.0100	0.0014	0.0547	0.9790	-0.1280	0.0417	0.0020
oth_inc	0.0037	0.0071	0.5990	0.0010	0.0079	0.8940	0.0152	0.0074	0.0410	0.0233	0.0166	0.1610
pc_uti	-0.0801	0.0561	0.1540	-0.0415	0.0400	0.3000	-0.1465	0.0769	0.0570	-0.0024	0.0729	0.9740
pc_uti_ledu	-0.0048	0.0596	0.9360	-0.0836	0.0656	0.2040	0.1594	0.0866	0.0660	0.1170	0.1072	0.2760
complav	-0.0446	0.0461	0.3340	0.0631	0.0375	0.0930	-0.0374	0.0662	0.5720	-0.0679	0.0665	0.3080
constant	4.0032	1.1359	0.0000	8.6708	2.2170	0.0000	0.1677	1.6159	0.9170	9.7445	2.4526	0.0000
Num. of Obs.		604			344			436			247	

Table A6. Dependent variable: retirement status in 2002 or 2004, broader definition of retirement. Sample: employees household heads and their spouses aged 45-70 in 2000. Estimation method: OLS estimates of the linear probability model.

	2000-2002						2000-2004					
	Males			Females			Males			Females		
	Coef.	**Std. Err.**	**P-value**	**Coef.**	**Std. Err.**	**P-value**	**Coef.**	**Std. Err.**	**P-value**	**Coef.**	**Std. Err.**	**P-value**
ncomp	0.0190	0.0142	0.1820	0.0168	0.0187	0.3700	0.0090	0.0173	0.6020	0.0107	0.0254	0.6730
eta	-0.0780	0.0453	0.0850	-0.1287	0.0739	0.0830	-0.0144	0.0591	0.8080	-0.0237	0.1134	0.8350
eta2	0.0011	0.0004	0.0140	0.0015	0.0007	0.0320	0.0005	0.0006	0.3630	0.0007	0.0011	0.5220
age_fir	-0.0066	0.0040	0.0950	0.0014	0.0035	0.6870	-0.0148	0.0051	0.0040	0.0069	0.0048	0.1500
yea_con	0.0037	0.0028	0.1730	0.0017	0.0028	0.5560	0.0131	0.0032	0.0000	0.0058	0.0036	0.1100
ill	-0.0002	0.0008	0.8420	-0.0015	0.0006	0.0080	-0.0004	0.0008	0.6420	-0.0013	0.0007	0.0770
no_edu	-0.0299	0.0806	0.7110	-0.0623	0.0989	0.5290	-0.0977	0.0967	0.3130	-0.1223	0.1301	0.3480
low_edu	-0.0080	0.0704	0.9100	-0.0476	0.0840	0.5720	-0.0803	0.0864	0.3530	-0.1756	0.1199	0.1440
sec_edu	0.0047	0.0429	0.9130	-0.0523	0.0417	0.2100	-0.0301	0.0570	0.5970	-0.0526	0.0676	0.4370
blu	0.0030	0.0427	0.9440	-0.1404	0.0647	0.0310	-0.0279	0.0580	0.6310	0.0247	0.0887	0.7810
agr_ind	0.0878	0.0407	0.0310	0.1155	0.0618	0.0630	0.1479	0.0540	0.0060	0.1772	0.0850	0.0380
com_ser	0.0365	0.0410	0.3740	0.0497	0.0585	0.3970	0.1385	0.0589	0.0190	0.0556	0.0731	0.4470
dim1	-0.0187	0.0506	0.7120	0.0534	0.0586	0.3620	-0.1346	0.0638	0.0350	-0.0704	0.0771	0.3620
dim2	-0.0614	0.0401	0.1260	0.0348	0.0516	0.5000	-0.0679	0.0507	0.1810	-0.0356	0.0762	0.6410
res1	0.0262	0.0369	0.4780	0.0550	0.0433	0.2050	-0.0357	0.0479	0.4560	0.0938	0.0615	0.1280
res2	0.0273	0.0397	0.4920	0.0515	0.0474	0.2780	0.0424	0.0524	0.4190	0.0549	0.0698	0.4320
lab_inc	-0.0662	0.0442	0.1350	-0.2062	0.0428	0.0000	-0.0141	0.0580	0.8080	-0.2553	0.0526	0.0000
oth_inc	0.0040	0.0077	0.6030	-0.0178	0.0175	0.3120	0.0195	0.0081	0.0160	0.0235	0.0172	0.1730
pc_uti	-0.0795	0.0584	0.1740	-0.0267	0.0460	0.5620	-0.1328	0.0773	0.0860	-0.0178	0.0766	0.8160
pc_uti_ledu	-0.0112	0.0658	0.8650	-0.1021	0.0907	0.2610	0.1443	0.0876	0.1000	0.1083	0.1223	0.3770
complav	-0.0245	0.0474	0.6050	0.0477	0.0453	0.2930	-0.0277	0.0673	0.6810	-0.0467	0.0709	0.5110
constant	2.0343	1.2546	0.1050	5.0114	1.8669	0.0080	-0.4020	1.7173	0.8150	1.8334	3.0931	0.5540
Num. of Obs.		635			370			451			274	

Table A7. Dependent variable: retirement status in 2002 or 2004, strict definition of retirement. Sample: employees household heads and their spouses aged 45-70 in 2000. Estimation method: 2sls estimates of the linear probability model. Additional instruments: number of other family members with at least some computer skill, its interaction with the number of household components, its interaction with education, number of children at school in the household.

	2000-2002						2000-2004					
	Males			Females			Males			Females		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
pc_uti	-0.3433	0.5912	0.5620	0.5651	1.0376	0.5860	-0.3549	0.4893	0.4690	0.5526	0.4900	0.2610
pc_uti_ledu	0.1871	0.2772	0.5000	-0.2212	0.4149	0.5940	0.1827	0.2776	0.5110	-0.0924	0.4114	0.8230
complav	0.2966	0.7162	0.6790	-0.9387	1.6806	0.5770	0.1761	0.5831	0.7630	-1.0617	0.7652	0.1670
ncomp	0.0065	0.0128	0.6120	-0.0216	0.0310	0.4860	0.0094	0.0170	0.5810	-0.0164	0.0348	0.6380
eta	-0.1773	0.0443	0.0000	-0.3332	0.1240	0.0080	-0.0446	0.0577	0.4400	-0.4503	0.1735	0.0100
eta2	0.0019	0.0004	0.0000	0.0034	0.0012	0.0040	0.0008	0.0005	0.1420	0.0048	0.0017	0.0040
age_fir	-0.0050	0.0061	0.4160	0.0037	0.0079	0.6370	-0.0151	0.0057	0.0080	0.0029	0.0056	0.6110
yea_con	0.0095	0.0024	0.0000	0.0084	0.0035	0.0170	0.0138	0.0035	0.0000	0.0127	0.0050	0.0120
ill	-0.0007	0.0008	0.3860	-0.0008	0.0008	0.3470	-0.0010	0.0011	0.3600	-0.0017	0.0006	0.0040
no_edu	-0.0978	0.1436	0.4960	-0.0978	0.1298	0.4510	-0.1507	0.1392	0.2800	-0.1935	0.1891	0.3070
low_edu	-0.0744	0.1262	0.5560	-0.0080	0.1597	0.9600	-0.1093	0.1325	0.4100	-0.2125	0.1819	0.2440
sec_edu	-0.0005	0.0567	0.9930	-0.0336	0.0786	0.6700	-0.0365	0.0662	0.5810	-0.1381	0.0954	0.1490
blu	0.0599	0.0786	0.4460	-0.1853	0.2146	0.3890	-0.0500	0.0845	0.5540	-0.1620	0.1567	0.3020
agr_ind	0.0535	0.0453	0.2380	0.2455	0.3471	0.4800	0.1386	0.0543	0.0110	0.3777	0.2120	0.0760
com_ser	0.0153	0.0394	0.6970	0.1649	0.3005	0.5840	0.1127	0.0588	0.0560	0.2840	0.1906	0.1380
dim1	-0.0558	0.0474	0.2400	-0.0492	0.0664	0.4600	-0.1655	0.0637	0.0100	-0.1888	0.0917	0.0410
dim2	-0.0559	0.0548	0.3080	0.0707	0.0677	0.2970	-0.0766	0.0627	0.2220	-0.0568	0.0861	0.5100
res1	0.0009	0.0496	0.9850	0.1119	0.1322	0.3980	0.0155	0.0627	0.8050	0.1449	0.0824	0.0800
res2	0.0282	0.0389	0.4690	0.1052	0.1432	0.4630	0.0981	0.0517	0.0580	0.0402	0.0809	0.6200
lab_inc	-0.0155	0.0500	0.7560	-0.0326	0.1369	0.8120	-0.0044	0.0590	0.9400	-0.0850	0.0658	0.1980
oth_inc	0.0011	0.0086	0.8950	-0.0171	0.0361	0.6360	0.0128	0.0102	0.2110	0.0160	0.0300	0.5950
constant	4.0766	1.1664	0.0010	8.4855	3.2117	0.0090	0.3281	1.6597	0.8430	11.1850	4.5639	0.0150
Num. of Obs.		604			344			436			247	

Table A8. Dependent variable: retirement status in 2002 or 2004, broader definition of retirement. Sample: employees household heads and their spouses aged 45-70 in 2000. Estimation method: 2sls estimates of the linear probability model. Additional instruments: number of other family members with at least some computer skill, its interaction with the number of household components, its interaction with education, number of children at school in the household.

	2000-2002						2000-2004					
	Males			Females			Males			Females		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
pc_uti	-0.2510	0.8088	0.7560	0.7242	0.6640	0.2760	-0.2704	0.5255	0.6070	0.6106	0.6535	0.3510
pc_uti_ledu	0.0996	0.3704	0.7880	-0.4163	0.3837	0.2790	0.1012	0.2825	0.7200	-0.2117	0.4871	0.6640
complav	0.1858	0.9819	0.8500	-1.2870	1.0803	0.2340	0.0894	0.6375	0.8890	-1.2608	1.0110	0.2140
ncomp	0.0175	0.0158	0.2690	-0.0103	0.0355	0.7710	0.0094	0.0184	0.6090	-0.0166	0.0435	0.7030
eta	-0.0757	0.0476	0.1120	-0.1096	0.1091	0.3160	-0.0156	0.0600	0.7950	-0.0889	0.1565	0.5700
eta2	0.0010	0.0004	0.0200	0.0013	0.0010	0.2280	0.0005	0.0006	0.3660	0.0012	0.0015	0.3960
age_fir	-0.0077	0.0070	0.2700	0.0067	0.0065	0.3030	-0.0157	0.0057	0.0060	0.0110	0.0070	0.1160
yea_con	0.0038	0.0032	0.2280	0.0030	0.0044	0.5000	0.0142	0.0037	0.0000	0.0076	0.0055	0.1720
ill	-0.0004	0.0011	0.7410	-0.0010	0.0009	0.2950	-0.0003	0.0010	0.7770	-0.0013	0.0008	0.1070
no_edu	-0.0723	0.1894	0.7030	-0.0832	0.1583	0.5990	-0.1224	0.1421	0.3900	-0.2341	0.2168	0.2810
low_edu	-0.0494	0.1601	0.7580	-0.0105	0.1724	0.9510	-0.0859	0.1329	0.5180	-0.1870	0.2099	0.3740
sec_edu	-0.0067	0.0680	0.9210	-0.0111	0.0893	0.9010	-0.0467	0.0676	0.4900	-0.0869	0.1067	0.4160
blu	0.0291	0.1128	0.7970	-0.2983	0.1451	0.0410	-0.0336	0.0900	0.7090	-0.1857	0.1851	0.3170
agr_ind	0.0802	0.0547	0.1430	0.3852	0.2327	0.0990	0.1471	0.0576	0.0110	0.4932	0.2584	0.0570
com_ser	0.0352	0.0421	0.4030	0.2949	0.2058	0.1530	0.1449	0.0595	0.0150	0.3493	0.2352	0.1390
dim1	-0.0188	0.0530	0.7230	0.0311	0.0945	0.7420	-0.1524	0.0659	0.0210	-0.1426	0.1159	0.2200
dim2	-0.0480	0.0681	0.4810	0.0296	0.0849	0.7270	-0.0703	0.0694	0.3110	-0.0624	0.1005	0.5350
res1	0.0114	0.0670	0.8650	0.1486	0.1002	0.1390	-0.0272	0.0684	0.6910	0.1469	0.0950	0.1230
res2	0.0231	0.0417	0.5800	0.1462	0.1168	0.2110	0.0450	0.0536	0.4010	0.0629	0.0992	0.5260
lab_inc	-0.0732	0.0559	0.1910	-0.1139	0.0875	0.1940	-0.0163	0.0611	0.7900	-0.2158	0.0709	0.0030
oth_inc	0.0027	0.0096	0.7780	-0.0332	0.0219	0.1300	0.0183	0.0106	0.0840	0.0166	0.0319	0.6030
constant	2.0844	1.2700	0.1010	3.8048	2.9510	0.1980	-0.2958	1.7633	0.8670	3.4165	4.3189	0.4300
Num. of Obs.		635			370			451			274	

Table A9. Dependent variable: retirement status in 2002 or 2004, strict definition of retirement. Sample: employees household heads and their spouses aged 45-70 in 2000. Estimation method: ML estimates of the logit model.

	2000-2002						2000-2004					
	Males			Females			Males			Females		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
ncomp	0.1165	0.1481	0.4320	-0.2666	0.3835	0.4870	0.0912	0.1639	0.5780	-0.2555	0.3368	0.4480
eta	0.1068	0.7001	0.8790	0.5139	1.9530	0.7920	0.8332	0.7413	0.2610	-0.3937	2.7889	0.8880
eta2	0.0017	0.0063	0.7810	-0.0003	0.0179	0.9880	-0.0045	0.0068	0.5060	0.0112	0.0262	0.6680
age_fir	-0.0239	0.0411	0.5610	0.0153	0.0572	0.7890	-0.1301	0.0454	0.0040	0.0383	0.0612	0.5320
yea_con	0.1774	0.0393	0.0000	0.1662	0.0673	0.0130	0.1785	0.0402	0.0000	0.2329	0.0791	0.0030
ill	-0.0072	0.0109	0.5090	-0.0280	0.0224	0.2120	-0.0181	0.0125	0.1490	-0.0161	0.0196	0.4110
no_edu	-0.1602	0.8390	0.8490	-1.7011	1.4603	0.2440	-1.1043	0.8478	0.1930	-2.1904	1.5785	0.1650
low_edu	0.2786	0.7903	0.7240	-0.5988	1.1893	0.6150	-0.8193	0.7678	0.2860	-2.7401	1.2441	0.0280
sec_edu	0.7946	0.6610	0.2290	-1.2578	0.7798	0.1070	-0.0013	0.6015	0.9980	-2.2316	0.8820	0.0110
blu	0.4539	0.4410	0.3030	-0.6104	1.0265	0.5520	-0.3370	0.4615	0.4650	0.5591	1.0677	0.6010
agr_ind	0.8038	0.4714	0.0880	0.2272	0.8841	0.7970	1.5385	0.4925	0.0020	2.6936	1.3472	0.0460
com_ser	0.3955	0.4817	0.4120	0.0393	0.9312	0.9660	1.4762	0.4873	0.0020	0.8632	1.0186	0.3970
dim1	-1.0505	0.4984	0.0350	-0.4837	1.0987	0.6600	-1.9310	0.6277	0.0020	-3.0894	1.4081	0.0280
dim2	-1.2575	0.4211	0.0030	1.9016	0.8482	0.0250	-1.1991	0.4271	0.0050	-0.5749	1.0456	0.5820
res1	0.1081	0.3875	0.7800	1.2225	0.9611	0.2030	0.0914	0.4204	0.8280	1.5837	0.9238	0.0860
res2	0.2167	0.4099	0.5970	1.3953	0.9165	0.1280	0.9465	0.4435	0.0330	0.8580	0.8644	0.3210
lab_inc	0.1085	0.3850	0.7780	-1.1204	0.6763	0.0980	0.0616	0.4379	0.8880	-2.1717	1.0460	0.0380
oth_inc	0.0700	0.0888	0.4310	0.0129	0.4746	0.9780	0.2828	0.1662	0.0890	0.7214	0.4472	0.1070
pc_uti	-1.0875	0.6496	0.0940	-0.6374	1.1803	0.5890	-1.4203	0.6724	0.0350	0.3687	0.8579	0.6670
pc_uti_ledu	0.3497	0.7585	0.6450	-1.7553	1.6402	0.2850	1.6098	0.7468	0.0310	2.9256	1.4391	0.0420
complav	-0.8609	0.5726	0.1330	1.1022	1.1672	0.3450	-0.6882	0.5680	0.2260	-1.3760	0.9091	0.1300
constant	-19.8604	19.4801	0.3080	-21.7562	52.5347	0.6790	-38.6163	20.3392	0.0580	-3.0242	74.7037	0.9680
Num. of Obs.		604			344			436			247	

Table A10. Dependent variable: retirement status in 2002 or 2004, broader definition of retirement. Sample: employees household heads and their spouses aged 45-70 in 2000. Estimation method: ML estimates of the logit model.

	2000-2002						2000-2004					
	Males			Females			Males			Females		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
ncomp	0.1693	0.1104	0.1250	0.2715	0.2164	0.2100	0.0887	0.1436	0.5370	0.0484	0.2218	0.8270
eta	0.7264	0.5312	0.1710	-0.3239	0.9985	0.7460	0.7428	0.6741	0.2710	-0.7643	1.3004	0.5570
eta2	-0.0043	0.0048	0.3780	0.0062	0.0094	0.5120	-0.0042	0.0062	0.4970	0.0109	0.0125	0.3820
age_fir	-0.0450	0.0329	0.1720	0.0239	0.0307	0.4360	-0.1201	0.0410	0.0030	0.0509	0.0346	0.1420
yea_con	0.0427	0.0223	0.0560	0.0144	0.0307	0.6390	0.1548	0.0355	0.0000	0.0616	0.0355	0.0820
ill	-0.0030	0.0072	0.6740	-0.0300	0.0201	0.1350	-0.0069	0.0086	0.4230	-0.0086	0.0077	0.2660
no_edu	-0.2541	0.6890	0.7120	-0.4649	0.9519	0.6250	-0.9770	0.7882	0.2150	-1.3098	0.9726	0.1780
low_edu	0.0206	0.6417	0.9740	-0.3540	0.8342	0.6710	-0.7558	0.7126	0.2890	-1.7318	0.8423	0.0400
sec_edu	0.2550	0.5265	0.6280	-0.5449	0.5580	0.3290	-0.0979	0.5610	0.8620	-0.7250	0.5483	0.1860
blu	0.1671	0.3652	0.6470	-1.7222	0.7247	0.0170	-0.0807	0.4238	0.8490	0.1930	0.6622	0.7710
agr_ind	0.7821	0.3905	0.0450	1.1118	0.6512	0.0880	1.4029	0.4477	0.0020	1.2759	0.7074	0.0710
com_ser	0.4428	0.3955	0.2630	0.5694	0.6225	0.3600	1.4906	0.4520	0.0010	0.4038	0.6587	0.5400
dim1	-0.3674	0.3988	0.3570	0.5822	0.5980	0.3300	-1.3582	0.5345	0.0110	-0.3480	0.6900	0.6140
dim2	-0.6384	0.3388	0.0600	0.5615	0.5708	0.3250	-0.8514	0.3799	0.0250	0.0055	0.5971	0.9930
res1	0.1364	0.3166	0.6670	0.8831	0.5477	0.1070	-0.3811	0.3744	0.3090	0.9460	0.5691	0.0960
res2	0.1113	0.3347	0.7390	0.8091	0.5860	0.1670	0.3268	0.3893	0.4010	0.5573	0.5793	0.3360
lab_inc	-0.5049	0.3053	0.0980	-1.9241	0.4194	0.0000	-0.1384	0.3916	0.7240	-2.1998	0.5227	0.0000
oth_inc	0.0401	0.0632	0.5260	-0.1961	0.1368	0.1520	0.2299	0.1359	0.0910	0.3592	0.2641	0.1740
pc_uti	-0.7566	0.5548	0.1730	-0.0127	0.7371	0.9860	-1.1532	0.6209	0.0630	-0.0871	0.6315	0.8900
pc_uti_ledu	0.1758	0.6317	0.7810	-2.0271	1.1763	0.0850	1.3464	0.6808	0.0480	0.9781	0.9617	0.3090
complav	-0.4554	0.4879	0.3510	0.3231	0.7290	0.6580	-0.5001	0.5154	0.3320	-0.6387	0.6532	0.3280
constant	-23.8346	14.9054	0.1100	18.7662	26.4544	0.4780	-31.2040	18.3359	0.0890	25.8893	34.3992	0.4520
Num. of Obs.		635			370			451			274	

Table A11. Partial ML estimates of the Cox model. Sample: employees household heads and their spouses aged 45-70 in 2000.

	Strict definition						Broader definition					
	Males			Females			Males			Females		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
ncomp	-0.0219	0.1068	0.8370	-0.4714	0.2385	0.0480	0.0531	0.0859	0.5370	0.0161	0.1344	0.9050
age_fir	-0.0415	0.0307	0.1770	0.0453	0.0363	0.2130	-0.0642	0.0250	0.0100	0.0430	0.0204	0.0350
yea_con	0.1930	0.0305	0.0000	0.1413	0.0402	0.0000	0.0765	0.0189	0.0000	0.0294	0.0217	0.1750
ill	-0.0091	0.0080	0.2560	-0.0069	0.0081	0.3970	-0.0010	0.0048	0.8290	-0.0055	0.0063	0.3850
no_edu	-0.7722	0.5914	0.1920	-1.3064	0.8537	0.1260	-0.5040	0.5101	0.3230	-1.0764	0.6380	0.0920
low_edu	-0.5581	0.5466	0.3070	-1.3030	0.7997	0.1030	-0.3945	0.4743	0.4060	-1.0455	0.5818	0.0720
sec_edu	0.4120	0.4364	0.3450	-1.1739	0.4890	0.0160	0.0724	0.3844	0.8510	-0.4146	0.3655	0.2570
blu	0.6060	0.3269	0.0640	-0.3048	0.6691	0.6490	0.2432	0.2714	0.3700	-0.0687	0.4597	0.8810
agr_ind	0.9539	0.3231	0.0030	0.7700	0.6282	0.2200	0.9363	0.2779	0.0010	1.1585	0.4561	0.0110
com_ser	0.7214	0.3375	0.0330	0.2245	0.6520	0.7310	0.7272	0.2897	0.0120	0.8030	0.4315	0.0630
dim1	-1.3509	0.3638	0.0000	-1.0547	0.7797	0.1760	-0.6035	0.2872	0.0360	0.2211	0.4224	0.6010
dim2	-1.2317	0.3005	0.0000	1.0840	0.5559	0.0510	-0.7174	0.2487	0.0040	0.5399	0.3887	0.1650
res1	0.1612	0.2719	0.5530	1.0637	0.5584	0.0570	-0.1062	0.2261	0.6380	0.7507	0.3527	0.0330
res2	0.4821	0.2877	0.0940	1.2765	0.5529	0.0210	0.0740	0.2356	0.7540	0.6286	0.3882	0.1050
lab_inc	-0.2492	0.2177	0.2520	-1.3037	0.3735	0.0000	-0.3416	0.1815	0.0600	-1.0430	0.2248	0.0000
oth_inc	0.1229	0.0810	0.1290	0.7062	0.3206	0.0280	0.0823	0.0586	0.1600	0.0249	0.0978	0.7990
pc_uti	-0.7779	0.4453	0.0810	-0.0188	0.5815	0.9740	-0.6511	0.4031	0.1060	-0.0353	0.4392	0.9360
pc_uti_ledu	0.9282	0.5244	0.0770	0.3022	0.9905	0.7600	0.6835	0.4480	0.1270	-0.3502	0.7139	0.6240
complav	-0.7895	0.3803	0.0380	-0.1313	0.5697	0.8180	-0.4181	0.3438	0.2240	-0.1499	0.4393	0.7330
Num. of Spells		961			556			1001			596	
Num. of Employees		608			344			639			370	