

Shall I stay or shall I go? Late graduation and retirement decision

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Shall I stay or shall I go?
Late graduation and retirement decision

Christelle Garrouste and Omar Paccagnella

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Abbreviations:

EU27 (European Union of 27 Member States from 1 January 2007) comprises Belgium (BE), Bulgaria (BG), Czech Republic (CZ), Denmark (DK), Germany (DE), Estonia (EE), Ireland (IE), Greece (GR), Spain (ES), France (FR), Italy (IT), Cyprus (CY), Latvia (LV), Lithuania (LT), Luxembourg (LU), Hungary (HU), Malta (MT), the Netherlands (NL), Austria (AT), Poland (PL), Portugal (PT), Romania (RO), Slovenia (SI), Slovakia (SK), Finland (FI), Sweden (SE) and the United Kingdom (UK), Turkey (TR), Croatia (HR), Former Yugoslav Republic of Macedonia (MK), Iceland (IS), Norway (NO).

Lifelong learning (LLL) combines formal education and training (FED), non-formal education (NFE) and informal learning (IFL). Adult education and training (AET) designates any adult learning activity that is either FED or NFE.

1. Introduction

Early retirement from regular employment provides a major challenge to social and health policies in Europe. "As people older than 60 will comprise close to one third of the population in several European countries over the next two decades, a shrinking number of economically active people will have to support a growing number of economically dependent elderly people" (SHARE, 2009, p.5). There is, therefore, a political focus on the need to maintain workers longer in employment. An example of this European endeavour is the declaration by the European Council (Stockholm, March 2001) that claimed that by 2010 at least half of the EU population aged between 55 and 64 shall be in employment.

The benchmark indicator on the employment rate of the 55-64 years old (Figure 1) reveals an improvement over the period 2004-2010, moving from 41% at the EU 27 average level to 46.3%. The gap in employment rate between the 25-54 years old and the 55-64 years old during that period decreased from 47% to 40%. The reduction in the gaps across age cohorts observed since 2004 may be interpreted as a signal of a less discriminatory EU labour market. Still, these trend results at the EU27 average level hide strong country variations with, for instance, DK that actually increased its age gap between 2004 and 2010, and SE that remained stable.

Hence, although the presence of an age gap does not constitute in itself an evidence of a potential age-based discrimination practice on European labour markets, it is clear from Figure 1 that senior workers are significantly less likely to be employed than their younger peers in all EU Member States.

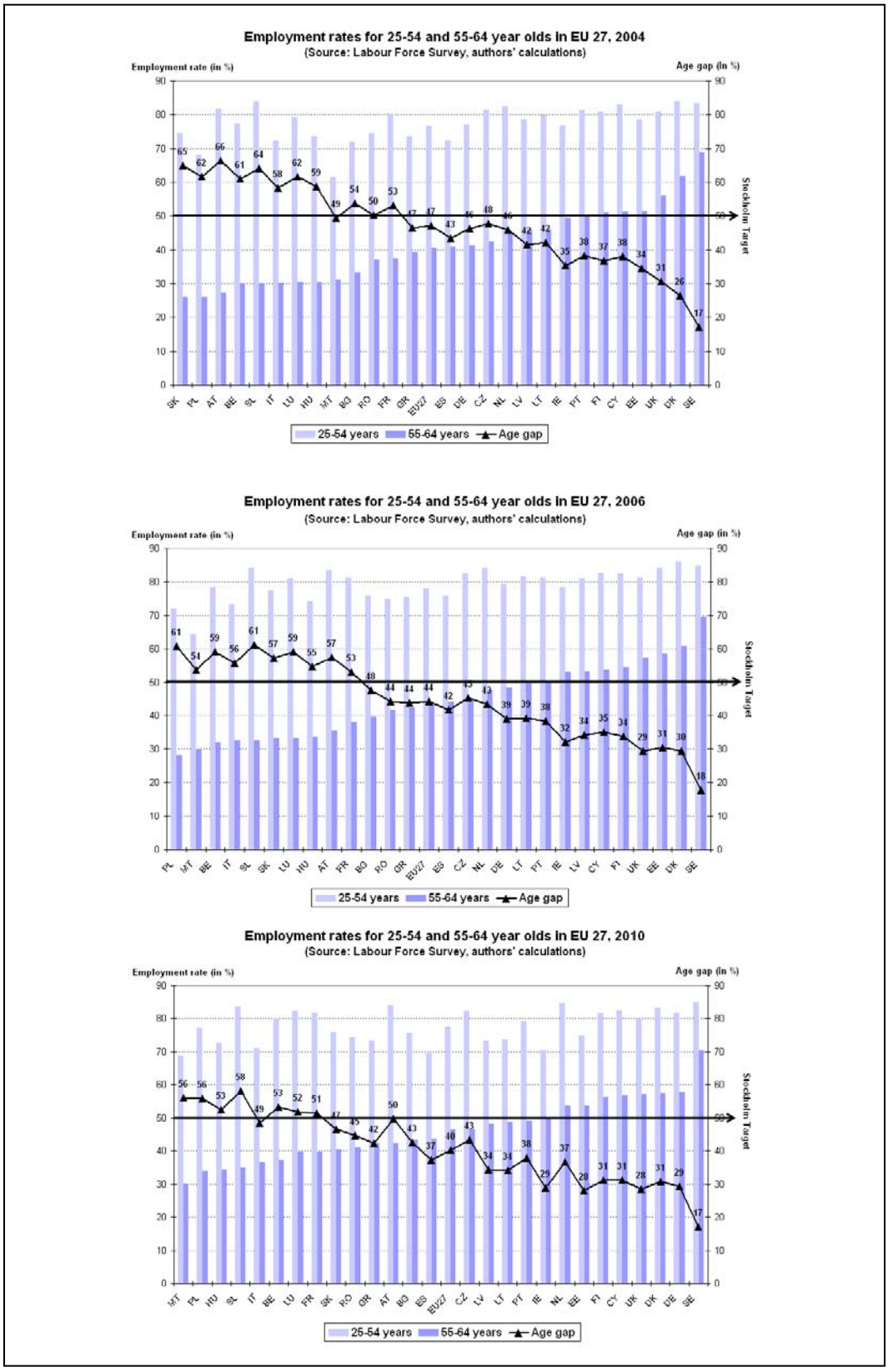


Figure 1. Employment rate for 25-54 and 55-64 years old in 2004, 2006 and 2010

While some may leave the labour market earlier than desirable because of their health or socio-demographic characteristics, in many European countries a large majority of early retired individuals reveal no specific disability. On the one hand, as pointed out in several studies (Angelini et al., 2009; Gruber and Wise, 1999, 2004; OECD, 2006; Blöndal and Scarpetta, 1998; Brugiavini et al., 2002), in many European countries a large fraction of healthy 50 years old and above could work but do not because of financial incentives provided by the public pension system to retire early. Hence, Bosch and Schief (2005) argue that the retention of older workers in the labour market would be favoured by pension schemes that are better adapted to individual specificities linked to gender, type of occupation, sector of activity, work humanization, flexible working patterns (e.g., progressive reductions in working time at the end of the working life).

On the other hand, Bosch and Schief (ibid.) also argue that the development of a lifelong learning culture that enhances continuous update and upgrade of workers' skills and qualifications is equally crucial to maintain workers longer and efficiently on the labour market. Indeed, the demands for different skills are constantly changing in response to globalisation, changes in technology, work organisation and consumption patterns. In face of such a flux, older workers are especially likely to see their human capital depreciate. Continuous investment in their skills is therefore essential (OECD, 2011). Previous empirical studies have shown that participation in on-the-job training compensates for the depreciation of human capital and increases the employability of workers (Bishop, 1997; Groot and Maassen van den Brink, 2000). Still, the level of compensation gained with further investments in human capital is conditioned by the period available to gain back the costs of such an investment (Neumann and Weiss, 1995).

Hence, because institutions favouring early retirement shorten the payback period of human capital investment, in particular that of older workers (Lau and Poutvaara, 2006), they make it less attractive to invest in training from both the employer's and the worker's perspective (Fouarge and Schils, 2009).

This paper investigates how much a late formal upgrade of skills contributes to delaying the planned age to retire, after controlling for the fixed effects caused by the

degree of generosity and flexibility[1] of early retirement schemes. The late formal upgrade of skills is measured as the completion of the highest educational degree at the age of 40 or later. Because the decision to engage in formal education at an advanced stage of the career is not random, we treat the selection bias with a treatment effects model in which we first derive the probability of being treated (i.e. of having graduated at least at the age of 40), conditioning on individual characteristics and institutional factors. We then make use of this estimated probability to estimate the planned age to retire. The model is run using the microdata from the ad-hoc module of the LFS 2006 on the transition from work to retirement, which is the only European survey asking senior workers (aged 50 or above) at what age they plan to retire.

Although most of the adult education and training occurring after the age of 40 is non-formal[2] (NFE), and only a marginal part of it is formal[3] (FED), this paper focuses on FED, mainly for data reasons. Compared to panel data used in previous research (e.g., the European Community Household Panel, ECHP; the European Survey on Income and Living Conditions, EU-SILC) asking the same respondent each year a question on his participation in formal and non-formal education and training, the annual LFS is a cross-sectional survey that gathers one shot information about the current participation in FED or NFE (i.e. in the 4 weeks preceding the interview). Hence, the time of the participation coincides with the time at which the ad-hoc module of 2006 asks the respondent about his planned age to retire. Is the participation in adult education and training (AET) conditioned by the planned age to retire, or is the planned age to retire conditioned by the current participation in AET? In absence of a time lag between the occurrence of these

[1] "Flexibility refers to the freedom of choice the individual has in deciding upon timing of retirement, or how easy or difficult it is to meet the entitlement conditions of the early retirement schemes" (Fouarge and Schils, 2009, p.91).

[2] Non-formal learning (NFE) takes place alongside the mainstream systems of education and training and does not typically lead to formalised certificates. Non-formal learning may be provided in the workplace and through the activities of civil society organisations and groups (such as in youth organisations, trade unions and political parties). It can also be provided through organisations or services that have been set up to complement formal systems (such as arts, music and sports classes or private tutoring to prepare for examinations) (European Commission, 2000). Results from a logit regression on the probability of engaging in NFE in the 12 months preceding the time of the Adult Education Survey's (2007) interview, reveals that among the 39% of the adult population likely to enrol in NFE, 41.5% are 24-39 years old and 36.4% are 40-65 years old (see Tables 1 and 13 for detailed results).

[3] Formal education (FED) takes place in education and training institutions, leading to recognised diplomas and qualifications (ibid.). A logit regression of the probability of engaging in FED on the AES data reveals

two events (the time of participation in AET and the time when the individual is asked about his retirement plans), it is impossible to estimate any causal-effect relationship between them. Therefore, because the year of highest graduation is the only time-lagged educational data available in the LFS, there has been no alternative option than to focus on the contribution of a late completion of a higher formal educational degree.

This analysis aims therefore at providing insights into the specific role played by an upgrade (rather than an update[4]) of skills at an advanced stage of the career in maintaining senior workers longer on the labour market. Still, it is worth highlighting that a preliminary investigation of the individual characteristics of adult participants in different lifelong learning programmes using microdata from the Adult Education Survey (AES) (presented in section 3) revealed that, despite the smaller size of the target population of such a treatment, the senior workers engaging in FED differ less from the senior workers engaging in NFE than from the younger workers engaging in FED[5]. Hence, we assume that the focus on FED rather than NFE should not bias significantly the representativeness of the estimated retirement decision.

The second added value of this paper is its focus on the planned age to retire rather than the effective age of retirement. Such a focus has the advantage of capturing the intention of retirement at a time when the individuals are, according to their age, in possession of a different degree of information necessary for the estimation of their personal utility of a transition from work to retirement. It is assumed that in countries with a relatively rigid pension system, the older the respondent is, the closer his planned age to retire will be to the official pensionable age. It is also assumed that the later the respondent graduated, the later his planned age to retire will be, to ensure a longer payback period of its human capital investment. In this paper, by controlling for the degree of flexibility and generosity of early pension schemes, we can test these two assumptions by estimating whether the effect of late graduation on the planned age to

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that, overall, less than 5% of the adult population is likely to enrol in FED, among which 7.5% of the 24-39 years old and only 2.8% of the 40 years old and above (see Tables 1 and 13 for detailed results).

[4] In this context, an "update" of skills refers either to the completion of an additional degree at the same ISCED level as the previously highest degree completed or to the completion of a non-formal qualification that does not necessarily enter the ISCED classification.

[5] Details about the profile of the adults engaging in FED after the age of 40 are presented in section 3.

retire does indeed vary according to the age of the respondent and the number of years since graduation.

Overall, we find that graduating after the age of 40 has a positive and statistically significant effect on the planned age to retire, when measured in absolute value. It also plays its expected role on the relative planned age to retire by decreasing the probability of retiring before the normal pensionable age and by increasing the probability of retiring after the normal pensionable age. Moreover, our results highlight that this positive effect of a late graduation on the absolute planned age of retirement is mainly true in countries with a low degree of flexibility and a high degree of generosity of their early retirement schemes, such as Spain or France. Hence, the effect of a late formal upgrade of skills on an increase in the absolute planned age to retire is stronger at the margin in countries where the pension system acts as an incentive for not remaining on the labour market beyond the official pensionable age. As a consequence, we find that the relative effect on the probability of planning to delay the retirement age beyond the normal age is more significant in countries with highly flexible but less generous early retirement schemes (e.g., the UK). No statistically significant effect is found on the probability of retiring earlier than the normal pensionable age.

The paper is divided in six sections including this introduction. The second section reviews the literature on adult education and retirement decisions and the third section describes the specific profile of our targeted sample, namely the workers who completed their highest formal degree at the age of 40 or later (treatment group) compared to the workers who completed their highest degree before the age of 40 (control group). The fourth section presents the treatment effects model used to estimate the role of late graduation on the planned age to stop working, the data and the characteristics of the sample. The results are examined in section 5 and discussed in the concluding section 6.

2. Adult education and retirement decision: a review of the literature

2.1. Human capital investment of older workers

The main literature on human capital investment is derived from the human capital theory according to which human capital refers to both formal and informal knowledge obtained through pre-school learning, education, and job-related learning. The human capital theory predicts that the probability of participating in learning activities is lower for older workers because the net returns to education are lower for them than for younger workers. As reviewed by Fouarge and Schils (2009), at least four reasons are given for this: (i) because of the shorter payback period for older workers; (ii) because 'learning begets learning'; (iii) because of human capital depreciation caused by technical and economic skills obsolescence[6]; and (iv) because of the assumption that older workers are less trainable than younger workers due to their lower learning ability and flexibility which is expected to increase the cost and efforts associated with late AET. Theory further suggests that, apart from age, a worker's human capital endowments are expected to affect his or her training probability. Two contradictory theoretical perspectives can be distinguished. On the one hand, the accumulation perspective argues that people with higher human capital endowments are more likely to accumulate skills and knowledge during their working life compared to people with lower human capital levels. This means that formal education and continuous training are complementary. On the other hand, the compensation perspective of lifelong learning argues that workers with the lowest human capital endowments are the ones who need to be trained the most to compensate for their lack of skills and knowledge. So far, evidence supports the accumulation perspective (e.g., Arulampalam and Booth, 1998; Riphahn and Trübswetter, 2008).

Finally, the human capital theory defines an individual life-cycle in four main phases. Phase I is characterized by investments in human capital without employment.

Phase II is the starting phase of the working career and is characterized by both employment and investments in human capital. Phase III is a phase of employment without investments in human capital (the individual reaps the benefits of the previous investments in human capital). Phase IV is the end of the working career (i.e. the individual retires) (Blinder and Weiss, 1976). Hence, as demonstrated by Dostie (2006), there is a wage-productivity gap for workers of older age starting in phase III which can prevent further wage increases. Fouarge and Schils (2009) argue that this wage-productivity gap can constitute an incentive for employers to either stimulate early retirement of their older workers (i.e. anticipating phase IV) or increase their productivity relative to their wage by stimulating their training (i.e. postponing the entrance into phase III). By improving the older workers' position at work and their employability, AET might in turn, increase their job satisfaction and their utility of work, which may delay their retirement decision.

Fouarge and Schils (ibid.) also demonstrate that the probability to participate in AET at older ages is lower in countries with generous early retirement schemes. Apart from the generosity of the early retirement schemes, they show that their flexibility is also of high importance. "Flexibility refers to the freedom of choice the individual has in deciding upon timing of retirement, or how easy or difficult it is to meet the entitlement conditions of the early retirement schemes" (ibid., p.91). Hence, in a flexible early retirement scheme, the individual has more incentives to engage in training as he or she does not necessarily have to take up the first early retirement opportunity that is offered.

The negative role of generous early pension schemes on the likelihood to participate in AET was confirmed by the analysis by Bassanini et al. (2005) of the relationship between training participation of workers aged 50-59 (relative to the participation of the 25-49 years old) and the expected benefits of retiring earlier, measured with the indicator of implicit tax rate on continued work (as computed by Duval, 2004). The implicit tax rate on continued work is defined as minus the change in pension or social wealth from remaining in the labour market during the 5 years from age 60 to 64 divided by the length of the interval. What they find is that a higher value of

[6] The depreciation of human capital has been particularly strong in terms of declining relative productivity and wages of low skilled older workers in times of rapid technological change (Perrachi and Welch, 1994;

implicit tax is associated with a lower relative training participation for workers aged 50 to 59 in all European Community Household Panel (ECHP) countries, except Italy and Sweden.

2.2. Retirement behaviour

The past 15 years have witnessed an increase in the economic literature addressing issues related to the decision to retire (see Topa et al., 2009; Wilson and Palha, 2007; Beehr and Adams, 2003, for recent reviews of the literature). Still, very few studies address the specific role of AET participation in the decision to retire.

Topa et al. (2009) insist on the difficulty to provide a univocal definition of a multifaceted phenomenon like retirement, which can be seen both as a process and as an act. Indeed, many factors lead people to think of retiring (planning or preference) and such preferences of plans have an impact on the decision to retire (retirement decision). Still, planning the action and making the decision are two different processes. While the planning of an action implies identifying certain salient traits of the problem, gathering relevant information and creating a meaningful organization of such information by developing a representation of the problem that serves to reduce uncertainty (Berkley and Humphreys, 1982; Hastie, 2001; Pitz and Sachs, 1984); to make a decision, people need to analyse the costs and benefits, combine their desires or preferences and their expectations about the situation (Camerer, 1995; Luce, 2000; Savage, 1954; von Neumann and Morgenstern, 1947). They can also simply avoid such analysis and base their decision on prudential rules that imply moral considerations and concerns about self-control (Prelec and Herrnstein, 1991).

Hence, retirement decisions are likely to be affected by the pension system. When there is no pension system (utility maximizing), people retire when the marginal utility of inactivity is equal to their marginal productivity at work (Cremer et al., 2004). People in poor health and with low productivity will retire earlier than people in good health and with high productivity. When there is a pension system, this trade-off may or may not be affected, depending on the design of the benefit formula. In a first-best (full information)

Lee, 2003).

setting, an optimal retirement system would imply the same trade-off. Such a pension system can be referred to as 'neutral' or 'actuarially fair'. Provided that the individual is already eligible for a pension, and that the receipt of a pension cannot be combined with earnings from work, remaining in the labour market for an additional year implies foregoing one year of benefits. If the cost in terms of foregone pensions and contributions paid is exactly offset by an increase in future pension benefits, the pension system is said to be "actuarially neutral", but if the cost is not offset, there is an implicit tax on continued work (Duval, 2004). As explained by Cremer et al. (2004), the actuarial fairness considered in this context is at the margin (no distortion) and is therefore different from global actuarial fairness (benefits equal to contributions), which, by definition, is violated by redistribution schemes. Still, in reality, pension systems are often not neutral and they distort the retirement decision.

As well reported by Duval (2004), Gruber and Wise (2002) and Blöndal and Scarpetta (1998), the observed age of retirement is likely to be distorted downwards in a number of countries. The main explanation for this distortion is the incentive structure implied by social protection programmes aimed at older workers (e.g., pension plans, unemployment insurance, disability insurance and early retirement schemes). Prolonged activity for older workers is subject to an implicit tax, which includes both the payroll marginal tax and foregone benefits. Consequently, social protection systems are far from being actuarially fair at the margin in countries such as Belgium and France where people retire relatively early. On the other hand, in countries such as Sweden or Denmark, the implicit tax is much lower so that the system tends to be rather neutral and people retire later (Cremer et al., 2004).

Three main econometric approaches aim at estimating this value of additional years of work, namely the "lifetime budget constraint" approach (as applied by Burtless, 1986), the hazard model approach (as applied by Hausman and Wise, 1985) and the option value model developed by Stock and Wise (1990), upon which the implicit marginal taxes on continued work are derived (see Duval, 2004, for an explicit definition of its econometric computation).

On the one hand, the economic literature converges on the role of gender and marital status in the decision to retire. According to the rational choice theory, because

the oldest retiring cohorts were socialized within the male-breadwinner perspective, retirement is typically viewed as an event that men experience at the end of their careers. As such, most families experience only one retirement: that of the husband and breadwinner. From this perspective, women tend to retire earlier than men because of care responsibilities (Dentinger and Clarkberg, 2002; Ho and Raymo, 2009). Moreover, according to the couple decision-making theory, decision-making processes of couples with regard to retirement also affect the outcomes of these decisions (Smith and Moen, 2004), especially in dual-earner families (Denaeghel et al., 2011). This assumption is for instance confirmed in the Danish context by Bingley and Lanot (2004; 2007), using a dynamic structural model applied to a Danish matched panel of workers and establishments, who find that marital status and family size do increase the disutility of work for both men and women.

Furthermore, the literature also converges in finding a greater elasticity of retirement age with respect to a permanent increase in wages for men than for women, possibly due to men's higher instantaneous marginal utility of income and lower rate of time preference, as advocated by Bingley and Lanot (ibid.). There is also evidence of a positive association between higher education and a greater utility of leisure (retirement) for men, whereas for women the opposite is true. In other words, given a constant income stream, a more educated man would retire earlier than one with less education, and a more educated woman would retired later. Finally, age increases the disutility of work for everyone (Bingley and Lanot, ibid.).

On the other hand, beyond these demonstrated common factors to the decision to retire, there is still very little evidence of the specific role of participation in AET on the age of retirement. For instance, developing a lifetime budget constraint approach, Lau and Poutvaara (2006) demonstrate that the effectiveness of AET as a strategy to postpone retirement is significantly reduced by the presence of generous early retirement schemes (which entail high implicit marginal taxes on continued work). Moreover, using longitudinal data from the ECHP survey, Fouarge and Schils (2009) show that more flexible early retirement schemes yield a higher effectiveness of AET in increasing the duration of the stay on the labour market of older workers. On the contrary, Stenberg, de

Luna and Westerlund (2011) find no significant effect of adult education on the timing of retirement in Sweden[7].

Our study aims at contributing to this literature by investigating this issue from a slightly different angle than the one taken so far. Instead of estimating the contribution of adult education to the observed age of retirement, we focus on the estimation of the specific contribution of a late formal upgrade of skills (defined as the completion of an individual's highest educational level at least one year before the interview but not earlier than at the age of 40) to the planned age of retiring of the currently working population aged 50 and above.

[7] Stenberg et al. (2011) analyzed transcripts from adult education for the period 1979-2004 and annual earnings 1982-2004 using register data from Sweden and adopting a hazard model approach. They matched samples of treated individuals (i.e. in adult education between 1986 and 1989), and untreated on the propensity score and estimated the timing of exit from the workforce by non-parametric estimations of the survival rate in the labour force.

3. Profile of workers engaging in formal education after the age of 40: Evidences from the AES 2007

In a preliminary step, it is essential to understand the specificity of the targeted population of this analysis, namely workers who completed a formal educational degree at the age of 40 or after. How much do these workers differ from those completing a degree at a younger age? How much do these workers differ from those engaging in other forms of learning activities at the same age? In order to answer these questions, we make use of the Adult Education Survey (AES) which is the only European survey collecting information on the formal, non-formal and informal learning activities in the 12 months preceding the interview of individuals aged 25-64, living in private households.

The AES is part of the EU Statistics on lifelong learning. The survey reports anonymised microdata from 24 countries. The reference year is set at 2007. The classification of education, occupation and economic activities in the AES are fully harmonised with the classifications used in other fields of the European Statistical System like the Labour Force Survey (LFS). The classification of education activities is based on ISCED, the one of occupation on ISCO and the one of economic activities is in accordance with NACE Rev.1.1 (Eurostat, 2008).

To better understand if and how the determinants of a participation in AET vary for senior workers and younger workers, a logistic model was estimated, in which the dependent variable is a binary indicator that takes value 1 if the individual participated in a lifelong learning activity in the past calendar year, and 0 otherwise. Individuals were grouped in two age cohorts, namely the 25-39 years old and the 40 years old and above, and only those employed at the time of the survey and active on the labour market (either employed or unemployed) one year before were retained.

We are interested in the estimation of the likelihood of participation (i) in adult education and training (AET), defined as the participation in either formal or non-formal education; (ii) in formal education (FED), controlling for the participation in other forms of learning activities; (iii) in non-formal education (NFE), controlling for the

participation in other forms of learning activities; (iv) in informal learning (IFL)[8], controlling for the participation in other forms of learning activities; and (v) in FED but not in NFE. We define these likelihoods as a function of country fixed effects, α_C, and a vector of observed individual, job and firm characteristics, $\mathbf{X}_{ic}$:

$$\Pr\left[LLL_{ic} = 1 \mid \mathbf{X}_{ic}\right] = F(\alpha_c + \mathbf{X}_{ic}\beta) \tag{3.1}$$

where *LLL* stands for lifelong learning participation, which can take be FED, NFE, AET or IFL, *i* is the index for individuals, *c* the index for countries, and F is the distribution function from the Logit distribution.

All estimations are computed applying the individual design weighting factor (*coefindw*) produced by the AES survey, which is the inverse of the individual inclusion probabilities. Since the institutional factors, proxied by the country fixed effects, are estimated at a higher level of aggregation than the dependent variable, we adjust the estimated standard errors for the clustering effects induced by an aggregation at country level.

Summary descriptive statistics are displayed in Appendix Table A1, by type of lifelong learning activity and by age group (less than 40 years old vs. 40 years old and above). Our final AES sample is composed of 45,861 observations, of which 58% are at least 40 years old. The share of participation in AET is higher for the younger cohort than for the older one (45.7% vs. 37.8%). Among those engaging in AET, the majority engages in non-formal activities (NFE). While the share of participants to NFE is 41.5% for the younger cohort and 36.4% for the older cohort; in FED, it drops to 7.5% and 2.8% for each age cohort, respectively. Among the few workers engaging in FED, 42.3% (if

[8] Informal learning (IFL) is defined as learning resulting from daily life activities related to work, family, or leisure. It is often referred to as experiential learning and can to a certain degree be understood as accidental learning. It is not structured in terms of learning objectives, learning time and/or learning support. Typically, it does not lead to certification. Informal learning may be intentional but in most cases, it is non-intentional (or 'incidental'/random) (European Commission, 2000).

aged less than 40) and 37.1% (if aged at least 40) are also enrolled in NFE. A large share of the FED or NFE participants is also reporting informal learning activities (IFL)[9].

When considering the sample enrolled in FED but not in NFE, we observe that the gender distribution between age groups is very similar, with 46.5% of women in the younger cohort and 47% in the older cohort. The share of workers in FED but not in NFE who declare having abandoned a formal educational degree earlier in their life is also rather close across age groups (18% vs. 16%). The additional variables collected for the estimated sample (presented in the last rows of Appendix Table A1) reveal that none of the FED activities, and only a very limited share of the NFE activities, take place during paid working hours, with no age differences. Finally, no significant variation is observed across age cohorts with regard to the main reasons for participating in a NFE activity.

The main differences lie only on four variables: (i) the share of workers with a positive occupation change in the past year[10]; (ii) the share with a temporary full-time contract; (iii) the share with a tertiary education attainment (ISCED 5-6); and (iv) the share of workers from the wholesale and retail trade sector and from the education sector. In the three first cases, the share of workers reporting a FED activity but no NFE activity is higher among 25-39 years old than among their older peers (12% vs. 5%, in the two first cases and 48% vs. 40%, in the third case). In the case of the sector of activities, the share is biased in favour of the younger cohort for the wholesale and retail trade (12% vs. 7%) and in favour of the older cohort for the education sector (10% vs. 14%).

Hence, overall, we observe very few divergences across age cohorts in the profile of the workers engaged in lifelong learning activities and even less across types of lifelong learning (LLL) activities.

Table 1 presents the average partial effects of the participation in a learning activity (i.e. the deviations from the reference individual indicated in the table) by age group, after controlling for all individual and work related characteristics described above. Percentage point effects can be obtained by multiplying the figures by 100

[9] 52.95% of the younger cohort and 47.1% of the older cohort reporting FED participation were also enrolled in an IFL activity in the 12 months preceding the interview. Among the NFE participants, 52.9% of the younger cohort and 46.95% of the older cohort report IFL activities.

[10] The LFS collects information on the occupation level (coded as ISCO-2 digits levels) one year before the survey and at the time of the survey. The positive occupational change is a dummy variable taking value 1

(Wooldridge, 2002). From Table 1, we observe that being a woman only plays a statistically significant role in decreasing the probability of enrolment in informal learning (IFL). The main difference between the likelihood of participating in FED and the likelihood of participating in NFE is in the role played by a positive change in the occupation level. A positive change in the occupation level implies an increase in the level of skills required by the job. While it is insignificant for the probability of NFE, it plays a statistically significant positive role in the probability of FED attainment (see columns 3-6 and 9-10).

More differences are observed between age cohorts than between types of LLL activities. For instance, while the probability of the younger cohort (25-39 years old) to engage in FED or in NFE is negatively influenced by a simultaneous enrolment in another AET activity, it plays no role for the older cohort (40 years old and above) (columns 3-6). This means that for younger workers, FED and NFE tend to be perceived as substitutive forms of learning, while for older workers, they tend to be considered as more independent activities. Similarly, an abandoned degree and a positive change in occupation influence only the probability of the younger cohort to engage in FED rather than in NFE (columns 9-10).

The main finding from this preliminary analysis is the significant similarities between individuals engaging in FED and in NFE (as demonstrated in Tables 1 and 13). Overall, although the probability of engaging in FED (5%, i.e. 7.5% of the 25-39 years old and 2.8% of the 40-65 years old) is much smaller than the probability of engaging in NFE (39%, i.e. 41.5% of the 25-39 and 36.4% of the 40-65 years old), the main individual characteristic determining these probabilities are not very different. The main degree of differentiation is instead to be found between the age groups, with a weaker influence of job related characteristics on the participation of the 40 years old and above than for the younger cohort.

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if the individual upgraded his occupation level in the past year (i.e. if isco2d<isco1y2d) and 0 if not (i.e. if isco2d>=isco1y2d).

Table 1 Estimated probability of engaging in a lifelong learning (LLL) activity, by type of LLL and by age group (24-39 and 40+) (AES sample)

Logit	AET		FED		NFE		IFL		FED vs. NFE	
	25-39 years old	≥ 40 years old	25-39 years old	≥ 40 years old	25-39 years old	≥ 40 years old	25-39 years old	≥ 40 years old	25-39 years old	≥ 40 years old
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
FED					-0.22*	-0.02	0.42**	0.30*		
					(0.090)	(0.218)	(0.156)	(0.142)		
NFE			-0.24**	-0.04			0.76***	0.88***		
			(0.077)	(0.202)			(0.117)	(0.105)		
IFL			0.43**	0.33*	0.76***	0.89***				
			(0.167)	(0.137)	(0.118)	(0.103)				
female	-0.06	-0.00	-0.03	0.08	-0.03	0.01	-0.10*	-0.09**	-0.15	0.00
	(0.054)	(0.096)	(0.110)	(0.094)	(0.051)	(0.096)	(0.049)	(0.036)	(0.134)	(0.157)
abandoned education	0.51***	0.41***	0.72*	0.35	0.32***	0.31***	0.39***	0.45***	0.47*	-0.01
	(0.069)	(0.084)	(0.326)	(0.188)	(0.056)	(0.074)	(0.119)	(0.065)	(0.233)	(0.298)
positive occupation change	0.12	0.10	0.93***	0.82***	-0.11	0.05	0.37**	0.17*	0.99***	0.09
	(0.117)	(0.125)	(0.155)	(0.140)	(0.056)	(0.125)	(0.124)	(0.075)	(0.125)	(0.354)
permanent contract full-time	0.36*	0.27*	-0.27	-0.15	0.45*	0.35**	-0.42**	-0.11	-0.28	-0.62
	(0.142)	(0.137)	(0.474)	(0.271)	(0.227)	(0.119)	(0.130)	(0.067)	(0.790)	(0.367)
permanent contract part-time	-0.01	0.02	-0.28	-0.42	0.08	0.08	-0.45*	-0.02	-0.07	-0.56
	(0.114)	(0.171)	(0.500)	(0.285)	(0.198)	(0.144)	(0.180)	(0.075)	(0.813)	(0.346)
temporary contract full-time	0.35**	0.13	0.38	0.06	0.36*	0.18	-0.43**	-0.12	0.22	-0.30
	(0.122)	(0.095)	(0.229)	(0.296)	(0.159)	(0.125)	(0.136)	(0.093)	(0.479)	(0.559)
temporary contract part-time	0.18	-0.14	0.76*	-0.17	0.02	-0.02	-0.64	-0.46*	1.04	-0.06
	(0.138)	(0.075)	(0.301)	(0.514)	(0.186)	(0.105)	(0.341)	(0.210)	(0.558)	(0.409)
Highest educational attainment, reference category: ISCED 0-2										
ISCED 3-4	0.79***	0.73***	1.00***	0.37*	0.63***	0.59***	0.53***	0.67***	0.27	-0.09
	(0.148)	(0.038)	(0.219)	(0.151)	(0.111)	(0.053)	(0.127)	(0.110)	(0.236)	(0.166)
ISCED 5-6	1.40***	1.49***	1.53***	0.98***	1.06***	1.19***	1.21***	1.39***	0.46	-0.00
	(0.197)	(0.074)	(0.291)	(0.276)	(0.149)	(0.072)	(0.253)	(0.189)	(0.314)	(0.257)
Constant	-1.55***	-1.55***	-4.91***	-5.32***	-1.99***	-2.15***	0.68***	0.22**	-3.83***	-3.98***
	(0.152)	(0.077)	(0.337)	(0.454)	(0.240)	(0.083)	(0.116)	(0.080)	(0.381)	(0.504)
Observations	18,730	26,327	19,063	26,738	18,675	26,276	19,076	26,785	7,932	9,680
pseudo R^2	0.128	0.152	0.153	0.146	0.146	0.174	0.187	0.193	0.178	0.161

Source: Authors' estimations using the AES 2007 microdata.

Notes: Robust standard errors clustered by country in parentheses. *** p<0.001, ** p<0.01, * p<0.05. Non-reported controls include NACE2D categories, size of business (1-10, 11-19, 20-49, ≥ 50 persons) and country fixed effects.

4. Late upgrade of skills and planned age to retire: Empirical model and dataset

The previous section only served as background statistical information on the profile of the workers who engage in FED at the age of 40 or later, using the AES survey to compare with participation in other forms of LLL activities e.g., NFE and IFL. Hereafter, we are concerned with the contribution of a late (after the age of 40) formal upgrade of the educational attainment level to the delay of the planned age to retire of senior workers aged at least 50 years old. That further step could only be estimated using the Labour Force Survey ad-hoc module 2006. This section presents the treatment effects model and the variables retained for the estimations.

4.1. Treatment effects model

We look at the age at which the respondent graduated at his highest level (excluding all respondents who graduated the same year as the year of interview) to estimate the impact of an upgrade of skills at the age of 40 or after on the age at which the respondent currently plans to retire. As demonstrated in section 3, the senior workers engaging in FED are rather similar to the younger workers engaging in FED and they differ even less from the senior workers engaging in NFE. Hence, we assume that the focus on FED rather than NFE should not bias significantly the representativeness of the estimated planned age to retire.

Because of the lack of independence of the variable on the late upgrade of skills from several of the variables affecting the planned age to retire, a treatment effects model is applied to control for the endogeneity bias caused by the selection into treatment. The treatment effects model has many applications in program evaluation. In particular, it is useful when evaluators have data that were generated by a non-randomized experiment, and, thus, are faced with the challenge of non-ignorable treatment assignment or selection bias, as in our case (Guo and Fraser, 2010). The treatment effects model estimates the effect of an endogenous binary treatment, Z_{ic}, on a continuous, fully-observed variable

y_{ic}, conditional on the independent variables x_{ic} and w_{ic} (Cong and Drukker, 2000). The primary interest is in the regression function

$$y_{ic} = \mathbf{X}_{ic}\beta + \delta z_{ic} + \alpha_c + \varepsilon_{ic} \tag{4.1}$$

where z_{ic} is an endogenous dummy variable indicating whether the treatment is assigned or not to individual i in country c. In this case, the treatment consists in the completion of a higher degree at the age of 40 or later. α_c are country dummies. The binary decision to obtain the treatment z_{ic} is modeled as the outcome of an unobserved latent variable, z_{ic}^*. It is assumed that z_{ic}^* is a linear function of the exogenous covariates $\mathbf{W}_{ic}$ and a random component u_{ic}. Specifically,

$$z_{ic}^* = \mathbf{W}_{ic}\gamma + \alpha_c + u_{ic} \tag{4.2}$$

and the observed decision is

$$z_{ic} = \begin{cases} 1, \text{if } z_{ic}^* > 0 \\ 0, \text{otherwise} \end{cases}$$

where β and δ are the parameters to be estimated, and ε_{ic} and u_{ic} are bivariate normal with mean zero and covariance matrix

$$\begin{bmatrix} \sigma_\varepsilon & \rho \\ \rho & 1 \end{bmatrix}.$$

The Treatment effects model is estimated using the *treatreg* command in Stata/SE 11.2 and applying the maximum likelihood estimator derived by Maddala (1983).

As demonstrated in the literature (section 2), the degree of flexibility and generosity of early pension schemes plays a role in both the probability of attending education and training after the age of 40 and in the decision to retire. Therefore, in a

second stage, the country dummies are replaced by a set of two dummy variables taking value 1 if the scores of the flexibility and generosity of the national early pension scheme are at least equal to the weighted mean of the respective flexibility and generosity scores over all the countries of the sample. Tables 2 and 3 present the framework adopted for the construct of these two indicators.

Table 2 Definition of the flexibility and generosity of early pension schemes

Flexibility of early retirement schemes		
First pillar: entitlement conditions pension scheme	**Second and third pillars: Assets as a Percentage of GDP**	**Score**
Only a minimum wage or a minimum contribution period	More than 80%	1.5
Both a minimum wage and a minimum contribution period or a redundancy condition	Between 50% and 80%	1.0
No first pillar early retirement option	Between 10% and 50%	0.5
	Less than 10%	0
Generosity of early retirement schemes		
First pillar: Implicit tax on continued employment	**Second and third pillars: Replacement rates**	**Score**
Higher than 40%	Higher than 50%	1.5
Between 10% and 40%	Between 30% and 50%	1.0
Lower than 10%	Lower than 30%	0.5
Generosity of social security schemes		
Replacement rate social security		**Score**
Higher than 50%		1.5
Between 30% and 50%		1.0
Lower than 30%		0.5

Source: Fouarge and Schils (2009), p. 93.
Note: the first pillar refers to publicly managed pension schemes; the second to occupational managed schemes (e.g., unions or occupational pension funds), and the third to privately managed schemes. (See Schils, 2005, pp.100-106 for a full methodological discussion).

Table 3 Country scores and derived dummy variables for the degree of flexibility and generosity of early pension schemes

Country	Flexibility score	Flexibility dummy	Generosity score	Generosity dummy
DK	2.5	1	2.0	1
ES	1.0	0	2.0	1
FR	1.0	0	2.0	1
IT	1.5	1	2.0	1
NL	1.5	1	3.0	1
PT	1.0	0	1.5	0
UK	1.5	1	1.0	0
Weighted mean	1.29		1.7	

Source: Flexibility and generosity scores extracted from Fouarge and Schils (2009), p.94. Flexibility and generosity dummies are computed by the authors using the weighted mean value of the pulled sample.

Furthermore, the two dummy variables on the generosity and flexibility of the early retirement schemes are used to stratify the analysis by groups of countries according to their flexibility-generosity status. While the first group is composed of countries presenting a high degree of flexibility and a high degree of generosity (*hflexhgen*), the second group is composed of countries with highly flexible and little generous early retirement schemes (ERS) (*hflexlgen*) and the third group of countries with little flexible and little generous ERS (*lflexlgen*). This stratification procedure aims at better identifying variations in the contribution of late graduation on the planned age to retire across types of ERS.

Finally, we test the assumption that the difference between the planned age to retire and the official pensionable age decreases with the age of the senior worker and the assumption that the planned to retire decreases with the time gap since graduation, by re-estimating our model with four new treatment variables according to the time period since graduation and by stratifying the analysis by age group. All estimations are computed applying the weighting factor (*coeff*) produced by Eurostat for the LFS module 2006, which is the inverse of the individual inclusion probabilities for individuals aged 50-69. Moreover, because the institutional variables in both specifications (with country fixed effects and with early pension schemes characteristics) are estimated at a higher level of aggregation than the dependent variable, we adjust the estimated standard errors for the clustering effects induced by an aggregation at country level.

4.2. Dataset: LFS 2006 ad-hoc module

The LFS ad-hoc module of 2006 on the transition from work to retirement complements the main annual LFS survey of 2006 with a set of 11 questions asked only to the respondents aged 50-69 years old. The module aims primarily at understanding how the transition at the end of the career towards full retirement is expected to take place or takes place. In that effort it collects specific questions on the plans for transitions/past transitions towards full retirement and plans for exit from work. The second aim of this ad-hoc module is to know which factors would be at play in determining the exit from work, and which factors could make the persons postpone their exit from work.

The variable of interest of our model is the planned age to stop working (*plagestp*) which is asked to all respondents aged at least 50 who are currently working. To answer the question of a potential significant role of late graduation on the planned age to retire we start by regressing on *plagestp*, coded as a continuous variable. Then, to understand better whether a late upgrade of skills could contribute to decreasing the probability of retiring earlier than the normal pensionable age and to increasing the probability of retiring later than the normal pensionable age, we construct three dichotomous variables taking respectively value 1 if the planned age to stop working is (i) inferior to the normal pensionable age, (ii) equal to the normal pensionable age, and (iii) higher than the normal pensionable age.

The 'official (or normal) pensionable age' is defined as the age at which people can first draw full benefits (i.e. without actuarial reduction for early retirement). Although normal pension ages in most countries are clearly set out in legislation, it may be possible to retire earlier than the normal age without an actuarial reduction in pension benefits (to reflect the longer duration of benefit payment). Typically, this requires that certain contribution requirements are met. Some countries do not have a 'normal' pension age; instead, they define a range of ages at which the pension may first be drawn. This is for instance the case in Finland and Sweden, where the official retirement age is flexible, between 63 and 68 years old in Finland and from 61 onwards in Sweden (Appendix Table A2).

To compute the official pensionable age, we use the information displayed in the Table 2-1 of the *Special Report n° 1/2006-Annex* by the European Commission Directorate-General for Economic and Financial Affairs (European Commission, 2006), on the formulation of pension benefits in the social security system (public) pension schemes in Member States. More specifically, we extract the information on the number of years of contribution needed for a full pension and on the statutory retirement age. We construct the normal pension age variable as equal to the statutory retirement age if the minimum years of contribution needed for full pension has been reached (see Table 4). Because some pension systems estimate the age at which a full pension entitlement can be received according to a minimum number of years of residence in the country (e.g., DK and the NL), we retain only the individuals who have spent their entire life in the country to be able to rely upon the information provided by the variable on the number of years of experience. To estimate whether the minimum number of years of contribution will have been met by the age at which the individual plans to retire, we compute a variable which adds to the current number of years of experience the difference between the planned pension age and the current age of the individual[11].

[11] $acc_experience_{t+i}=experience_t+(plagestp_{t+i}-age_t)$, where $acc_experience_{t+i}$ is the expected accumulated experience by the time of retirement ($t+i$), $experience_t$ is the number of years of experience in date t, $plagestp_{t+i}$ is the planned age to stop working in $t+i$ and age_t is the current age of the respondent.

Table 4 Definition of the normal pensionable age (PR = private sector; PU = public sector)

Country	Number of years needed for a full pension	Statutory retirement age (M=men, W=women)	Other factors included in the social security pensions schemes that could not be taken into account in the computation of the normal pensionable age variable
DK	40 lived in DK	65	A separate voluntary early retirement scheme (with a small own contribution). Supplemented by fully funded occupational pensions.
ES	35	65	Bonuses for later retirement and reductions for early retirement
FR	PR: 40; PU: 37.5→40	60	Increases for children brought up. For the private sector: supplemented by a mandatory partially funded scheme (second tier). No supplement in public sector.
IT	40	65M 60W	Higher transformation coefficient for women with children
NL	40 lived in the NL	65	100% net min. wage for couples. A separate early retirement scheme. Supplemented by occupational pensions.
PT	PR: 40; PU: 36→40	60.5	Reductions for early retirement. For the PU: merged to general scheme as of 2006.
UK	M: 44; W: 39	65M 60W	Supplemented by earnings-related State Second Pension, from which people can opt out to private schemes

Source: European Commission (2006).

Given this definition, the 'normal' pensionable age is defined as a dichotomous variable taking value 1 if (i) the planned age to retire is equal to the statutory retirement age and the expected accumulated experience by the time of the planned age of retirement is equal to or higher than the minimum number of years of contribution required for full pension entitlement; (ii) the planned age to retire is inferior to the statutory retirement age and the expected accumulated experience by the time of the planned age of retirement is equal to or higher than the minimum number of years of contribution required for full pension entitlement; (iii) the planned age to retire is superior to the statutory retirement age and the expected accumulated experience by the time of the planned age of retirement is equal to the minimum number of years of contribution required for full pension entitlement.

Consequently, the 'early' planned age to retire is defined as a dichotomous variable taking value 1 if the planned age to retire is inferior to the statutory retirement age and the expected accumulated experience by the time of the planned age of

retirement is inferior to the minimum number of years of contribution required for full pension entitlement. The 'late' planned age to retire is defined as a dichotomous variable taking value 1 if the planned age to retire is superior to the statutory retirement age and the expected accumulated experience by the time of the planned age of retirement is superior to the minimum number of years of contribution required for full pension entitlement.

The explanatory variables affecting the planned age to retire (equation 4.1) are the number of years of experience interacted with the age group of the respondent; the number of years of tenure at the current work place; an interaction effect between female and marital status (married or not); a dummy taking value 1 if the respondent is supervising other people at work; a set of three dummies on the type of occupation (professional, technician or operator); a set of three dummies on the sector of activity (agriculture, industry or service); a set of four dummies on the size of business (1-10 persons, 11-19 persons, 20-49 persons; 50 persons or more); and a set of three dummies on the financial motivation to work longer ("to increase retirement pension entitlements"; "to provide sufficient household income"; "no financial incentive"). This last financial control complements the information on the occupation, sector and experience towards a proxy of the individual and household income level which is not directly collected in the LFS[12].

In equation (4.2), the treatment variable is defined as a dummy taking value 1 if the highest graduation was completed at the age of 40 or later (and at least one year before the survey) and 0 if completed before the age of 40. The explanatory variables affecting the selection into treatment are the number of years of experience the individual had accumulated at the time of his highest graduation[13]; the interaction between the gender and the marital status; a set of three dummies for the age group of the respondent

[12] The variable *incdecile,* which collects in the LFS the income decile of the respondent, was removed from the anonymized microdata in 2009 for all the annual data up to 2008. It will be reintegrated in the microdata only as from 2009.

[13] The number of years of experience at the time of highest graduation is computed as the difference between the number of years of experience at the time of the survey and the number years since the highest graduation was completed. This computation assumes no major discontinuities between the time of highest graduation and the time of the survey.

(50-54; 55-59; 60-64)[14]; and a set of three dummies on the highest educational level completed (low = ISCED 0-2; medium = ISCED 3-4; high = ISCED 5-6). The experience at the time of graduation and the level of education affect only the selection into treatment but not the planned age to retire.

The professional experience at the time of highest graduation gives an information on the potential life-cycle phase in which the individual was at the time of graduation[15]. If the number of years of experience accumulated at the time of the highest graduation is high, the individual was probably in either phase II or phase III of his life-cycle. In that case, the completion of a formal educational degree after the age of 40 may have been motivated by his expectation to increase his productivity relative to his wage by stimulating his training (i.e. postponing the entrance into phase III) (as shown by Fouarge and Schils, 2009). If, on the other hand, the number of years of experience was null or very low at the time of the completion of the highest degree, then the individual was still either in phase I or in phase II of his life-cycle. If the individual happens to have completed that highest degree at an advanced age with a low number of years of experience, he may have been the victim of an obsolescence of non-applied skills. If the individual did not enter the labour market immediately after his previous graduation, or did not remain long enough on the labour market to apply his formal qualifications and acquire further on-the-job skills, his need for a formal upgrade of skills is increased. This is for instance the case for many women aged 50 years old and above, for whom it was common to spend a few years at home after graduation (or even to interrupt their studies) to raise up their children. By the time they needed to (re)enter the labour market, they often found themselves in need of a new degree. For this reason, we expect the interaction term between female and marital status to be positive and statistically significant in determining the probability of completion of a degree at the age of 40 or above.

Moreover, as demonstrated in the literature and confirmed in our preliminary analysis of the AES data (section 3), the probability of engaging in adult education and

[14] We dropped all the respondents aged 65 and above due to their outlier nature. Indeed, in all the countries retained for the analysis, there is no official pensionable age set at more than 65 years old. Hence, an individual still working after the age of 65 will never be entitled to an early retirement scheme, and would therefore systematically bias upwards the results of our estimates.

training increases with the level of educational attainment. Moreover, the more advanced the degree, the longer time it is expected to take before graduating. Hence, we add a control for the level of the highest completed degree in the form of three dummies of which the low educational attainment level is the reference level to the estimated average partial contributions of the medium and high levels.

Finally, in order to test the assumption that the difference between the planned age to retire and the official pensionable age decreases with the age of the senior worker and the assumption that the planned age to retire decreases with the time gap since graduation, we re-estimate four new models, each with a new treatment variable defined according to the time period since graduation, and we stratify the analysis by age group. The first new model defines a treatment variable (*gradt5*) taking value 1 if the respondent graduated at least one year before the survey and maximum 5 years before; and 0 if he graduated more than 5 years before. The second model defines a treatment variable (*gradt10*) taking value 1 if he graduated between 6 and 10 years before and 0 if more than 10 years before. The third new model defines a treatment variable (*gradt15*) taking value 1 if he graduated between 11 and 15 years before and 0 if more than 15 years before. Finally, the fourth new model defines a treatment variable (*gradt20*) taking value 1 if he graduated between 16 and 20 years before and 0 if more than 20 years before[16].

Because of the presence of missing values for the dependent variables and for some of the independent variables, the number of countries was reduced to seven, namely DK, ES, FR, IT, the NL, PT and the UK. The final LFS sample is composed of 6,493 workers aged at least 50. Descriptive summary statistics for each model specifications are presented in the Appendix Tables A3-A8. Countries with both a high degree of flexibility and a high degree of generosity (*hflexhgen*) include DK, IT and the NL. Countries with a low degree of flexibility and a high degree of generosity (*lflexhgen*) are ES and FR. The only country with a high degree of flexibility and a low degree of generosity (*hflexlgen*) is the U.K.; and the only country with a low degree of flexibility and a low degree of generosity (*lflexlgen*) is PT (Figure 2).

[15] See section 2.1 for a description of the four life-cycle phases as defined by the human capital theory.

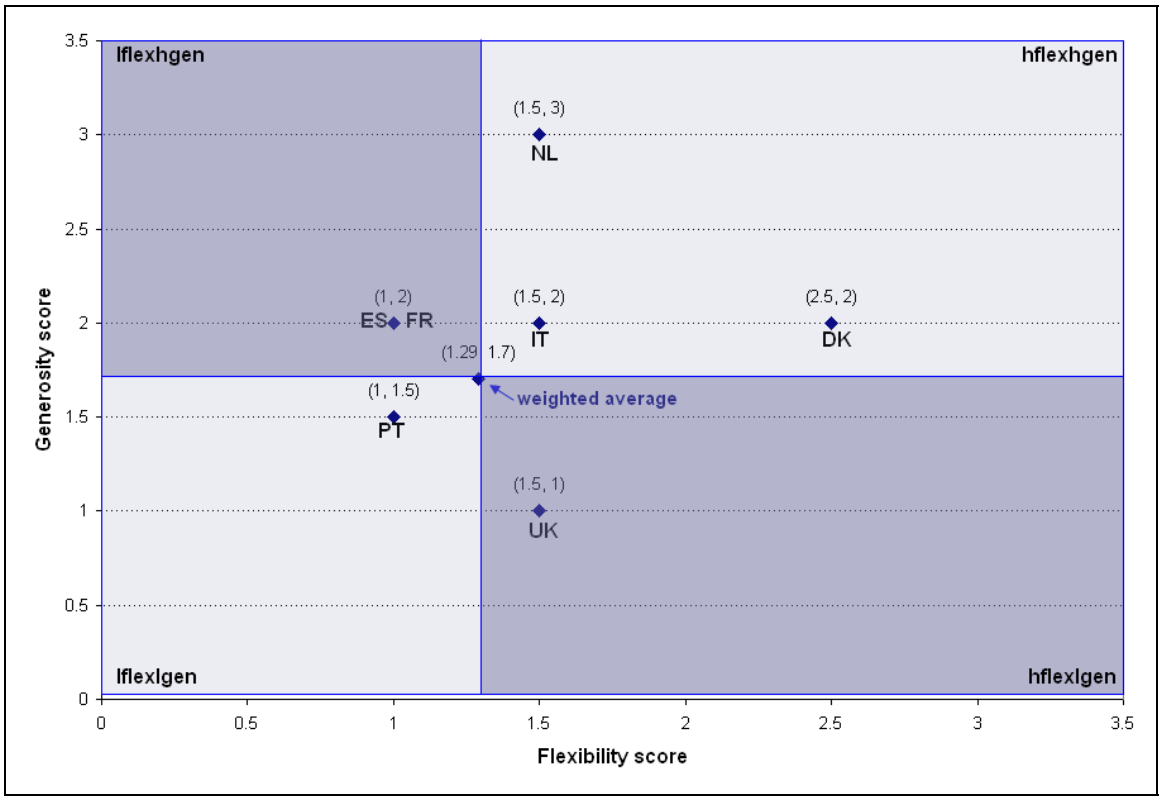


Figure 2 Generosity and flexibility of early retirement pension schemes

Note: Based on data presented in Table 3. *hflexhgen*=high degree of flexibility and high degree of generosity of the early retirement schemes (ERS); *hflexlgen*=high degree of flexibility and low degree of generosity of the ERS; *lflexhgen*=low degree of flexibility and high degree of generosity of the ERS; *lflexlgen*=low degree of flexibility and low degree of generosity of the ERS.

[16] Because its treatment is defined as the probability of having graduated between 16 and 20 years before the time of the interview, this last model is estimated only on respondents aged 55 and above.

5. Results from the LFS 2006 ad-hoc module

This section presents the results from the treatment effects model. It starts with the contribution of a graduation at the age of 40 or later on the planned age to retire (section 5.1). Then, in section 5.2 we test the assumption that the difference between the planned age to retire and the official pensionable age decreases with the age of the senior worker and the assumption that the planned to retire decreases with the time gap since graduation, by re-estimating the model with four new treatment variables defined according to the time period since graduation, and by stratifying the analysis by age group.

5.1. Contribution of a graduation after the age of 40 on the planned age to retire

From the 6,493 senior workers composing the sample, 42% are women, 29% is aged 50-54 years old, 41% 55-59 yeas old and 30% 60-64 years old. It is distributed evenly between types of occupation and educational attainment levels (Appendix Table A3).

Our treatment effects model reveals that graduating after the age of 40 affects positively the estimated planned age to retire when controlling either for the country fixed effects (column 1, Table 5) or for the flexibility and generosity of the early pension schemes (column 3, Table 5). The size of the coefficient of the treatment is slightly bigger when controlling for country fixed effects than when controlling only for the ERS characteristics (+0.52 vs. +0.37), which implies that other non-observed institutional characteristics drive this positive effect.

When stratifying the analysis by country (Table 6), this statistically significant effect is not confirmed anymore, which stresses the importance of the national institutional settings over the individual characteristics. Descriptive statistics of the sample by country is provided in Appendix Table A4.

The stratification of the analysis by type of ERS corroborates this assumption (Table 7). We find a positive and statistically significant effect of a graduation after the age of 40 in countries with a low degree of flexibility and a high degree of generosity

(*lflexhgen*) – e.g., ES, FR (+1.17). Hence, the effect of a late formal upgrade of skills is higher in countries where the pension system acts as an incentive for not postponing the age of retirement.

Beyond the effect of a late education upgrade on the absolute planned age to retire, it is essential to estimate its contribution to the reduction of the probability of retiring before the normal age of retirement and its contribution to retaining individuals beyond the normal age of retirement. The hypothesis we are testing is whether the graduation after the age of 40 has a negative impact on the probability of retiring earlier than the normal age and a positive impact on the probability of retiring later than the normal age. From our pulled sample (Appendix Table A5), while 16.8% of senior workers plan to retire earlier than the normal age, 31.8% plan to retire later than the normal age and 45.4% at the normal age. On average, 10.74% of them graduated at their highest level at the age of 40 or later.

Table 5 (columns 5 to 12) reveals that, overall, the graduation after the age of 40 does indeed play a negative and statistically significant role in the probability of retiring before the normal pensionable age and a positive and statistically significant role in the probability of retiring after the normal pensionable age. The significance and the size of the effect remain stable after controlling for country fixed effects or for the generosity and flexibility of the ERS. On the one hand, in the case of the likelihood of planning an early retirement, the most significant ERS characteristic is the degree of flexibility. On the other hand, in the case of the likelihood of planning a late retirement, it is the degree of generosity of the ERS that plays the most significant role compared to the degree of flexibility.

The negative sign of the reported inverse hyperbolic tangent of rho (athrho)[17] in the lower cells of Table 5 confirms that least squares would have underestimated the treatment effect in all of the reported cases. This result confirms the appropriateness of

[17] For numerical stability during optimization, the command *treatreg* in Stata does not directly estimate ρ or σ. Instead, *treatreg* estimates the inverse hyperbolic tangent of ρ,

$$\text{athan}\rho = \frac{1}{2}\ln\left(\frac{1+\rho}{1-\rho}\right)$$

and $\ln\sigma$. Also, *treatreg* reports $\lambda = \rho\sigma$, along with an estimate of the standard error of the estimate and a confidence interval for it (Cong and Drukker, 2000).

our treatment effects model to handle the endogeneity bias caused by selection into treatment.

Furthermore, because we expect the nature of the national early retirement schemes to condition strongly the probability of retiring before or after the normal pensionable age, we expect a stronger variability in the treatment effect across ERS than within ERS. Table 8 presents the results after stratifying by type of ERS. As expected, it reveals no statistically significant effect of a graduation after the age of 40 on the probability of planning to retire earlier than the normal age and a positive effect on the late retirement probability only in countries with a high degree of flexibility and a low degree of generosity (*hflexlgen*) e.g., the UK[18]. This result is intuitively sound as it confirms the importance of a highly flexible pension scheme to enable a minimum degree of variability in the time of retirement; and at the same time, a system that is not too generous to ensure that the financial returns of working longer will be positive.

[18] Descriptive statistics for the sample stratified by ERS are presented in the Appendix Table A6.

Table 5 Estimated contribution of an upgrade of skills at the age of 40 or later to the planned age to retire and to the probability of planning to retire earlier or later than the normal pensionable age (Treatment effects model), pulled sample

	plagestp				plagestp_early				plagestp_late			
	Country FE		Generosity and Flexibility of ERS		Country FE		Generosity and Flexibility of ERS		Country FE		Generosity and Flexibility of ERS	
treatreg	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
VARIABLES	**plagestp**	**grad40**	**plagestp**	**grad40**	**plagestp_early**	**grad40**	**plagestp_early**	**grad40**	**plagestp_late**	**grad40**	**plagestp_late**	**grad40**
grad40	0.45*		0.37*		-0.06***		-0.06***		0.09**		0.08**	
	(0.208)		(0.187)		(-0.011)		(-0.014)		(0.027)		(0.028)	
experience	-0.06**		-0.08**		-0.04***		-0.04***		0.00		0.00	
	(-0.017)		(0.026)		(-0.008)		(-0.008)		(0.004)		(0.004)	
experience_grad		0.27***		0.26***		0.28***		0.27***		0.28***		0.27***
		(0.011)		(0.011)		(0.017)		(0.018)		(0.016)		(0.016)
tenure	-0.03***		-0.03***		0.00*		0.00*		-0.00***		-0.00	
	(-0.006)		(0.007)		(0.001)		(0.001)		(0.000)		(0.001)	
female	-0.61***	0.92***	-0.57**	0.90***	-0.08	0.91***	-0.08	0.87***	0.09	0.94***	0.10	0.90***
	(-0.166)	(0.095)	(0.210)	(0.085)	(-0.063)	(0.212)	(-0.06)	(0.183)	(0.126)	(0.242)	(0.125)	(0.212)
married	-0.33**		-0.06		0.02		0.01		-0.08**		-0.07*	
	(-0.113)		(0.161)		(0.015)		(0.014)		(-0.027)		(-0.03)	
femaleXmarried	-0.02	0.29	-0.37***	0.26	0.02	0.28	0.03*	0.22	0.03	0.22	0.02	0.17
	(-0.117)	(0.383)	(0.107)	(0.376)	(0.011)	(0.401)	(0.013)	(0.404)	(0.014)	(0.444)	(0.022)	(0.433)
supervisor	0.09		0.13		-0.02		-0.02		0.04**		0.04*	
	(0.116)		(0.126)		(-0.018)		(-0.018)		(0.015)		(0.020)	
Country Fixed Effects, reference: DK												
ES	0.12	1.09***			-0.19***	1.00***			0.09***	0.94***		
	(0.087)	(0.047)			(-0.009)	(0.058)			(0.004)	(0.087)		
FR	-2.48***	0.55***			-0.07***	0.17***			0.18***	0.21***		
	(-0.089)	(0.068)			(-0.01)	(0.04)			(0.037)	(0.05)		
IT	-0.77***	0.47***			0.09***	0.61***			0.22***	0.53**		
	(-0.169)	(0.121)			(0.023)	(0.139)			(0.03)	(0.168)		
NL	-0.72***	0.50***			0.02	0.44***			-0.07**	0.41***		
	(-0.124)	(0.065)			(0.019)	(0.09)			(-0.021)	(0.104)		
PT	1.79***	0.13			-0.14***	0.1			0.75***	0.08		

	plagestp				plagestp_early				plagestp_late			
	Country FE		Generosity and Flexibility of ERS		Country FE		Generosity and Flexibility of ERS		Country FE		Generosity and Flexibility of ERS	
treatreg	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
VARIABLES	**plagestp**	**grad40**	**plagestp**	**grad40**	**plagestp_early**	**grad40**	**plagestp_early**	**grad40**	**plagestp_late**	**grad40**	**plagestp_late**	**grad40**
	(0.171)	(0.071)			(-0.021)	(0.084)			(0.037)	(0.059)		
UK	-0.15	0.50***			0.06***	0.24***			0.24***	0.21**		
	(-0.104)	(0.065)			(0.019)	(0.055)			(0.021)	(0.077)		
generosity_d			-1.11	-0.05			-0.01	0.10			-0.30**	0.10
			(0.608)	(0.168)			(0.026)	(0.135)			(0.112)	(0.120)
flexibility_d			0.31	-0.33			0.18***	-0.21			-0.15	-0.24
			(0.745)	(0.242)			(0.028)	(0.274)			(0.107)	(0.248)
Constant	64.37***	-7.01***	64.67***	-6.12***	1.68***	-7.04***	1.51***	-6.29***	0.12	-6.96***	0.56*	-6.34***
	(0.364)	(-0.37)	(1.033)	(0.310)	(0.233)	(0.301)	(0.267)	(0.339)	(0.164)	(0.351)	(0.225)	(0.308)
athrho	-0.2*		-0.19		-0.04**		-0.02**		-0.15*		-0.15*	
	(-0.146)		(0.122)		(-0.068)		(-0.062)		(-0.104)		(0.095)	
lnsigma	1.09***		1.14***		-1.16***		-1.15***		-0.89***		-0.86***	
	(0.034)		(0.037)		(-0.054)		(-0.052)		(-0.04)		(0.035)	
Observations	6,493	6,493	6,493	6,493	5,650	5,650	5,650	5,650	5,650	5,650	5,650	5,650

Source: Authors' estimations using the LFS ad-hoc module 2006 microdata.

Notes: Robust standard errors clustered by country in parentheses. *** p<0.001, ** p<0.01, * p<0.05. plagestp=planned age to stop working; plagestp_early=planned age to stop working is lower than the normal pensionable age; plagestp_late=planned age to stop working is higher than the normal pensionable age. ERS=Early Retirement Schemes. Non-reported controls for the selection equation: age group, highest educational attainment level; non-reported controls for the main equation: age group, interaction between the age group and the years of experience, financial incentives to continue to work, type of occupation, sector of activity, size of business. Non-reported estimated parameters are available upon request.

Table 6 Estimated contribution of an upgrade of skills at the age of 40 or later to the planned age to retire (Treatment effects model), by country

	DK		ES		NL		PT		UK	
Treatreg	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
VARIABLES	**plagestp**	**grad40**	**plagestp**	**grad40**	**plagestp**	**grad40**	**plagestp**	**grad40**	**plagestp**	**grad40**
grad40	1.50		1.06		-0.03		0.53		0.20	
	(1.073)		(0.553)		(0.275)		(0.594)		(0.159)	
experience	0.01		-0.02		-0.10		-0.03		0.05	
	(0.068)		(0.037)		(0.067)		(0.032)		(0.048)	
experience_grad		0.37***		0.34***		0.32***		0.30***		0.28***
		(0.077)		(0.054)		(0.036)		(0.069)		(0.022)
tenure	-0.02		-0.03***		-0.04***		-0.01		-0.02**	
	(0.018)		(0.009)		(0.007)		(0.013)		(0.007)	
female	-0.52	0.43	0.09	1.96***	-0.38	0.90	-1.24	1.32	-0.92**	0.89**
	(0.678)	(0.561)	(0.645)	(0.521)	(0.378)	(0.497)	(0.662)	(0.750)	(0.285)	(0.301)
married	0.13		0.06		-0.67		-0.93		-0.32	
	(0.704)		(0.580)		(0.345)		(0.575)		(0.235)	
femaleXmarried	-0.59	0.61	-0.19	-1.38*	-0.10	1.07*	1.25	-2.13*	-0.33	0.83*
	(0.720)	(1.051)	(0.676)	(0.673)	(0.436)	(0.479)	(0.722)	(0.985)	(0.314)	(0.332)
supervisor	0.67		-0.26		0.16		-0.21		0.03	
	(0.394)		(0.263)		(0.200)		(0.335)		(0.152)	
Constant	59.33***	-12.68***	65.06***	-7.56***	67.61***	-7.36***	67.17***	-7.75***	60.73***	-6.89***
	(2.632)	(2.319)	(1.397)	(1.359)	(2.184)	(1.183)	(1.304)	(2.196)	(1.886)	(0.681)
athrho	-0.73		-0.26		0.23		-0.52		-0.05	
	(1.124)		(0.264)		(0.167)		(0.365)		(0.098)	
lnsigma	1.03***		1.10***		0.86***		1.05***		1.04***	
	(0.148)		(0.028)		(0.077)		(0.041)		(0.023)	
Observations	253	253	1,145	1,145	1,067	1,067	595	595	1,941	1,941

Source: Authors' estimations using the LFS ad-hoc module 2006 microdata.

Notes: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05. plagestp=planned age to stop working; grad40=highest graduation completed at the age of 40 or later. Non-reported controls for the selection equation: age group, highest educational attainment level; non-reported controls for the main equation: age group, interaction between the age group and the years of experience, financial incentives to continue to work, type of occupation, sector of activity, size of business. Non-reported estimated parameters are available upon request.

Table 7 Estimated contribution of an upgrade of skills at the age of 40 or later to the planned age to retire (Treatment effects model), by type of ERS

	hlexhgen		hflexlgen		lflexhgen		lflexlgen	
Treatreg	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(9)**	**(10)**
VARIABLES	**plagestp**	**grad40**	**plagestp**	**grad40**	**plagestp**	**grad40**	**plagestp**	**grad40**
grad40	-0.01		0.20		1.17*		0.53	
	(0.374)		(0.159)		(0.542)		(0.594)	
experience	-0.12*		0.05		-0.06		-0.03	
	(0.055)		(0.048)		(0.037)		(0.032)	
experience_grad		0.37***		0.34***		0.29***		0.30***
		(0.077)		(0.054)		(0.041)		(0.069)
tenure	-0.03**		-0.02**		-0.04***		-0.01	
	(0.008)		(0.007)		(0.007)		(0.013)	
female	-0.33	0.52	-0.92**	0.89**	-0.41	1.47***	-1.24	1.32
	(0.361)	(0.336)	(0.285)	(0.301)	(0.375)	(0.349)	(0.662)	(0.750)
married	0.07		-0.32		-0.49		-0.93	
	(0.309)		(0.235)		(0.344)		(0.575)	
femaleXmarried	-0.30	1.16**	-0.33	0.83*	0.18	-0.95*	1.25	-2.13*
	(0.416)	(0.354)	(0.314)	(0.332)	(0.419)	(0.467)	(0.722)	(0.985)
supervisor	0.49*		0.03		0.18		-0.21	
	(0.202)		(0.152)		(0.188)		(0.335)	
Constant	66.35***	-8.70***	62.21***	-6.89***	65.45***	-6.41***	65.65***	-7.75***
	(1.845)	(1.000)	(1.881)	(0.681)	(1.274)	(1.048)	(1.290)	(2.196)
athrho	0.21		-0.05		-0.59*		-0.52	
	(0.243)		(0.098)		(0.234)		(0.365)	
lnsigma	1.16***		1.04***		1.06***		1.05***	
	(0.031)		(0.023)		(0.026)		(0.041)	
Observations	2,141	2,141	1,941	1,941	1,816	1,816	595	595

Source: Authors' estimations using the LFS ad-hoc module 2006 microdata.

Notes: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05. plagestp=planned age to stop working; grad40=highest graduation completed at the age of 40 or later. hflexhgen = high flexibility and high generosity (e.g., DK, IT, NL) ; hflexlgen = high flexibility and low generosity (e.g., UK); lflexhgen = low flexibility and high generosity (e.g., ES, FR); lflexlgen = low flexibility and low generosity (e.g., PT).

Non-reported controls for the selection equation: age group, highest educational attainment level; non-reported controls for the main equation: age group, interaction between the age group and the years of experience, financial incentives to continue to work, type of occupation, sector of activity, size of business. Non-reported estimated parameters are available upon request.

Table 8 Summary table of the estimated contribution of a late upgrade of skills to the planned age of retirement, by type of ERS (hflexhgen, hflexlgen, lflexhgen, lflexlgen)

	plagestp			
Treatreg	**hflexhgen**	**hflexlgen**	**lflexhgen**	**lflexlgen**
grad40	-0.01	0.20	1.17*	0.53
	(0.374)	(0.159)	(0.542)	(0.594)
	plagestp_early			
Treatreg	**hflexhgen**	**hflexlgen**	**lflexhgen**	**lflexlgen**
grad40	-0.04	-0.02	-0.04	0.01
	(0.050)	(0.017)	(0.041)	(0.037)
	plagestp_late			
Treatreg	**hflexhgen**	**hflexlgen**	**lflexhgen**	**lflexlgen**
grad40	-0.07	0.06*	0.07	0.12
	(0.060)	(0.028)	(0.078)	(0.080)
Observations	1,882	1,590	1,622	556

Source: Authors' estimations using the LFS ad-hoc module 2006 microdata.
Notes: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05. plagestp=planned age to stop working; plagestp_early=planned age to stop working is lower than the normal pensionable age; plagestp_late=planned age to stop working is higher than the normal pensionable age.
hflexhgen = high flexibility and high generosity (e.g., DK, IT, NL) ; hflexlgen = high flexibility and low generosity (e.g., UK); lflexhgen = low flexibility and high generosity (e.g., ES, FR); lflexlgen = low flexibility and low generosity (e.g., PT). grad40= graduation at the age of 40 or later. Estimates computed controlling for all the $\mathbf{X}_i$ and $\mathbf{Z}_i$ variables listed in section 4 with country fixed effects. Non-reported estimated parameters are available upon request.

5.2. Contribution of the time since graduation on the planned age of retirement

In this section we test the validity of the assumptions that in a country with rigid pension institutions, the older the respondent is, the closer his planned age to retire will be to the official pensionable age (hence, the weaker the effect of a late graduation will be on the planned age to retire); and the later the respondent graduated, the later his planned age to retire will be to ensure a longer payback period of his human capital investment (hence, the stronger the effect of the treatment).

The model was re-estimated for each of the four new treatment variables defined to estimate the contribution of the time since graduation on the planned age to retire of the pulled sample, of the stratified sample by type of ERS and of the stratified sample by age group (50-54 years old, 55-59 years old and 60-64 years old)[19]. Table 9 and Table 10 summarize the results for each of the treatment specifications for the pulled sample and for the stratified sample by type of ERS, respectively. Table 11 summarizes the results for each of the treatment specifications for the stratified sample by age group (50-54, 55-59, and 60-64).

We find that all the graduation specifications tested have a statistically positive effect on the planned age to retire, except the graduation 11 to 15 years before (gradt15) that is not statistically significant (Table 9). The size of that impact decreases with the time since graduation after controlling for either the country fixed effects or the generosity and flexibility of the ERS. After stratifying by type of ERS (Table 10), we find that the effect of late graduation is especially strong if the graduation took place maximum 5 years before the survey (+3.67) in a country with a high degree of flexibility and a high degree of generosity - *hflexhgen* (e.g., DK, IT, NL). This result validates the hypothesis that the later the respondent graduated, the later his planned age to retire will be, provided that the pension system is sufficiently flexible to allow the delay by a few years of the time of retirement, to make use of the newly acquired skills, and sufficiently generous to cover the remaining costs of such a late investment in human capital.

[19] Descriptive statistics for these model specifications are presented in the Appendix Tables A3, A7 and A8.

Table 9 Summary table of the estimated contribution of a late upgrade of skills to the planned age of retirement by time of graduation, pulled sample

	plagestp	
treatreg	**Country FE**	**Generosity and Flexibility of ERS**
grad40	0.45*	0.37*
	(0.208)	(0.187)
Observations	6,493	6,493
gradt5	1.00***	0.85***
	(0.269)	(0.178)
Observations	6,493	6,493
gradt10	0.81***	0.79***
	(0.154)	(0.171)
Observations	6,267	6,267
gradt15	0.84	0.87
	(0.508)	(0.452)
Observations	6,067	6,067
gradt20	0.40**	0.74**
	(0.147)	(0.275)
Observations	5,884	5,884

Source: Authors' estimations using the LFS ad-hoc module 2006 microdata.

Notes: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05. plagestp=planned age to stop working; grad40= graduation at the age of 40 or later; gradt5= graduation min 1 year before and max 5 years before; gradt10= graduation min 6 years before and max 10 years before; gradt15= graduation min 11 years before and max 15 years before; gradt20= graduation min 16 years before and max 20 years before the interview. Estimates computed controlling for all the $\mathbf{X}_i$ and $\mathbf{Z}_i$ variables listed in section 4. Non-reported estimated parameters are available upon request.

Table 10 Summary table of the estimated contribution of a late upgrade of skills to the planned age of retirement, by type of ERS (hflexhgen, hflexlgen, lflexhgen, lflexlgen) and by time of graduation

	plagestp			
Treatreg	**hflexhgen**	**hflexlgen**	**lflexhgen**	**lflexlgen**
grad40	-0.01	0.20	1.17*	0.53
	(0.374)	(0.159)	(0.542)	(0.594)
Observations	2,141	1,941	1,816	595
gradt5	3.67***	0.59	1.96	
	(0.742)	(0.321)	(1.332)	
Observations	2,141	1,941	1,816	
gradt10	-1.21	0.37	0.74	
	(2.538)	(0.371)	(0.878)	
Observations	2,106	1,782	1,794	
gradt15	-0.48	0.10	1.92	0.82
	(1.324)	(0.390)	(1.122)	(1.328)
Observations	2,072	1,649	1,768	578
gradt20	-0.17	0.12	0.53	
	(0.521)	(0.481)	(0.803)	
Observations	2,024	1,551	1,741	

Source: Authors' estimations using the LFS ad-hoc module 2006 microdata.
Notes: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05. plagestp=planned age to stop working.
hflexhgen = high flexibility and high generosity (e.g., DK, IT, NL) ; hflexlgen = high flexibility and low generosity (e.g., UK); lflexhgen = low flexibility and high generosity (e.g., ES, FR); lflexlgen = low flexibility and low generosity (e.g., PT).
grad40= graduation at the age of 40 or later; gradt5= graduation min 1 year before and max 5 years before; gradt10= graduation min 6 years before and max 10 years before; gradt15= graduation min 11 years before and max 15 years before; gradt20= graduation min 16 years before and max 20 years before the interview.
Estimates computed controlling for all the $\mathbf{X}_i$ and $\mathbf{Z}_i$ variables listed in section 4 with country fixed effects.
Non-reported estimated parameters are available upon request.

Table 11 Summary table of the estimated contribution of late upgrade of skills to the planned age to retire, by age group and by time of graduation

	plagestp		
	50-54	**55-59**	**60-64**
grad40	1.75*	0.21	0.06
	(0.783)	(0.207)	(0.106)
Observations	1,653	2,702	2,138
gradt5	2.39**	1.07**	0.08
	(0.751)	(0.358)	(0.29)
Observations	1,653	2,702	2,138
gradt10	1.82*	0.08	0.4
	(0.714)	(0.372)	(0.467)
Observations	1,595	2,617	2,055
gradt15	2.16*	0.63*	0.1
	(1.012)	(0.284)	(0.254)
Observations	1,549	2,530	1,988
gradt20	0.11	0.83**	0.06
	(0.865)	(0.289)	(0.762)
Observations	1,503	2,457	2,457

Source: Authors' estimations using the LFS ad-hoc module 2006 microdata.
Notes: Robust standard errors clustered by country in parentheses. *** p<0.001, ** p<0.01, * p<0.05. plagestp=planned age to stop working; grad40= graduation at the age of 40 or later; gradt5= graduation min 1 year before and max 5 years before; gradt10= graduation min 6 years before and max 10 years before; gradt15= graduation min 11 years before and max 15 years before; gradt20= graduation min 16 years before and max 20 years before the interview. Estimates computed controlling for all the $\mathbf{X}_i$ and $\mathbf{Z}_i$ variables listed in section 4 with country fixed effects. Non-reported estimated parameters are available upon request.

Furthermore, after stratifying by the age group of the respondents (Table 11), we find that the contribution of a graduation after the age of 40 to an increase in the planned age to retire weakens with the age of the respondent and that it is statistically significant only for the youngest sub-group, namely the 50-54 years old (+1.75).

After redefining the treatment according to the time since graduation, we find a similar result, namely that the effect always decreases with the age of the respondent. Moreover, the positive and significant effect is stronger if the graduation occurred within the 5 years preceding the interview for both the 50-54 and 55-59 years old (+2.39 and +1.07, respectively). No significant impact is found for the 60-64 years old, whatever the time since graduation. These results validate the hypothesis that the older the respondent is, the closer his planned age to retire will be to the official pensionable age, and the

weaker the treatment effect is expected to be. Finally, it is worth noticing that the size of the effect does not decrease linearly with the time since graduation for any of the sub-age groups. This non-linearity may be explained by the presence of an endogenous factor, such as the type of the early pension scheme (as shown by Table 10), or by the presence of other non-observed institutional characteristics.

Overall, after stratifying our analysis by type of early retirement scheme, by age group of the respondent and by time since graduation, our results confirm the assumption that the older the senior worker is, the weaker the effect of a late graduation will be on his planned age to retire, and the assumption that the most recently he graduated, the stronger the effect will be on his probability of delaying the time of his retirement.

6. Conclusions

This paper was concerned by the effect of a late upgrade of skills (i.e. completion of highest degree at the age of 40 or later) on the retirement decision of workers aged at least 50 years old. It made use of the microdata from the ad-hoc module of LFS 2006 which collected information on the planned age to retire in addition to the traditional variables on work characteristics of the annual LFS. In order to assess whether our sample may suffers from a profile bias caused by the peculiar type of upgrade of skills we are considering, we investigated the profiles of the workers aged at least 40 years old engaging in different types of learning activities (formal, non-formal, informal) and we compared them with their respective younger peers aged 25 to 29 years old, using the AES 2007 microdata. We found few differences across age cohorts and even fewer across types of lifelong learning activities. This means that the profile of our treated senior workers is close to the profile of our non-treated workers who attended another type of adult education, making our results comparable with other studies conducted on adult education and training.

Still, the profile of our treated cohort is expected to differ from the profile of the senior workers who did not attend any type of adult education or training at an advanced stage of their career. Therefore, because of the presence of a selection into treatment bias, we estimated the contribution of an upgrade of skills on the planned age to retire with a treatment effects model that aims specifically at controlling for the potential overestimation or underestimation bias induced by such an endogeneity in ordinary least squares regressions.

Overall, when considering the pulled sample, we find that graduating after the age of 40 has a positive and statistically significant effect on the planned age to retire, measured in absolute terms. It also plays its expected role on the relative planned age to retire by decreasing the probability of retiring before the normal pensionable age and by increasing the probability of retiring after the normal pensionable age.

Moreover, our results highlight that this positive effect of a late graduation on the absolute planned age of retirement is mainly true in countries with a low degree of

flexibility and a high degree of generosity of their early retirement schemes, such as Spain and France. Hence, the effect of a late formal upgrade of skills on an increase in the planned age to retire (in absolute terms) is stronger at the margin in countries where the pension system acts as an incentive for not remaining on the labour market beyond the official pensionable age. As a consequence, the probability of planning to delay the retirement age beyond the normal age is more significantly affected by a late graduation in countries with highly flexible but less generous early retirement schemes (e.g., the UK). No statistically significant effect is found on the probability of retiring earlier than the normal pensionable age.

Finally, after stratifying our analysis by type of early retirement scheme, by age group of the respondent and by time since graduation, our results confirm the assumption that the older the senior worker is, the weaker the effect of a late graduation will be on his planned age to retire, and the assumption that the most recently he graduated, the stronger the effect will be on his probability of delaying the time of his retirement.

The main finding from this analysis is the evidence of the significant role played by the institutional settings over the individual characteristics. In order to ensure a systematic (rather than marginal) positive effect of education and training at an advanced stage of the career on the retention of workers longer on the labour market, it appears essential to provide the appropriate balance between flexibility and generosity of national pension schemes. While a minimum degree of flexibility is required to allow workers to choose their time of retirement, the degree of generosity of early retirement schemes should be kept low to ensure a lower implicit tax from a prolonged activity.

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Appendix

Table A1. Descriptive statistics of the AES sample used for the Logit model (section 3)

	AET				FED				NFE			
	25-39 years old		≥ 40 years old		25-39 years old		≥ 40 years old		25-39 years old		≥ 40 years old	
Variables	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
AET/FED/NFE/IFL	0.4567	0.4981	0.3781	0.4849	0.0749	0.2632	0.0281	0.1651	0.4154	0.4928	0.3637	0.4811
NFE/FED					0.4229	0.4940	0.3707	0.4830	0.0744	0.2625	0.0281	0.1653
IFL/NFE					0.5295	0.4991	0.4707	0.4991	0.5286	0.4992	0.4695	0.4991
female	0.4493	0.4974	0.4640	0.4987	0.4498	0.4975	0.4646	0.4988	0.4495	0.4975	0.4638	0.4987
abandoned education	0.1725	0.3778	0.1530	0.3600	0.1712	0.3767	0.1521	0.3591	0.1728	0.3781	0.1531	0.3601
positive occupation change	0.1132	0.3168	0.0542	0.2264	0.1126	0.3161	0.0540	0.2260	0.1132	0.3168	0.0542	0.2265
permanent contract full-time	0.7627	0.4254	0.8068	0.3948	0.7613	0.4263	0.8058	0.3956	0.7624	0.4256	0.8068	0.3948
permanent contract part-time	0.0672	0.2504	0.0896	0.2856	0.0668	0.2497	0.0886	0.2842	0.0674	0.2507	0.0895	0.2854
temporary contract full-time	0.1250	0.3307	0.0565	0.2309	0.1241	0.3297	0.0561	0.2301	0.1252	0.3310	0.0566	0.2310
temporary contract part-time	0.0251	0.1565	0.0167	0.1282	0.0253	0.1572	0.0167	0.1281	0.0252	0.1567	0.0168	0.1283
Highest educational attainment level, reference category: ISCED 0-2												
ISCED 3-4	0.4283	0.4948	0.4309	0.4952	0.4283	0.4948	0.4297	0.4950	0.4282	0.4948	0.4304	0.4951
ISCED 5-6	0.3757	0.4843	0.2638	0.4407	0.3773	0.4847	0.2673	0.4426	0.3755	0.4843	0.2641	0.4409
Sector of activity, NACE2D categories, reference category: Manufacturing												
Electricity, gas and water supply	0.0147	0.1205	0.0191	0.1367	0.0146	0.1199	0.0188	0.1357	0.0147	0.1204	0.0189	0.1362
Construction	0.0878	0.2830	0.0763	0.2655	0.0871	0.2819	0.0758	0.2647	0.0878	0.2830	0.0764	0.2656
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	0.1263	0.3322	0.0867	0.2814	0.1264	0.3323	0.0864	0.2810	0.1264	0.3323	0.0867	0.2815
Hotels and restaurants	0.0368	0.1882	0.0271	0.1624	0.0370	0.1887	0.0275	0.1635	0.0369	0.1885	0.0272	0.1625
Transport, storage and communication	0.0662	0.2486	0.0735	0.2610	0.0660	0.2483	0.0735	0.2610	0.0661	0.2485	0.0734	0.2608
Financial intermediation	0.0303	0.1715	0.0268	0.1615	0.0308	0.1728	0.0272	0.1627	0.0303	0.1714	0.0268	0.1615
Real estate, renting and business activities	0.0844	0.2780	0.0552	0.2284	0.0841	0.2776	0.0549	0.2278	0.0845	0.2781	0.0552	0.2284
Public administration and defence; compulsory social security	0.0933	0.2909	0.1230	0.3284	0.0950	0.2932	0.1242	0.3298	0.0934	0.2909	0.1231	0.3286
Education	0.0761	0.2652	0.1038	0.3051	0.0767	0.2662	0.1056	0.3073	0.0759	0.2649	0.1038	0.3051

	AET				FED				NFE			
	25-39 years old		≥ 40 years old		25-39 years old		≥ 40 years old		25-39 years old		≥ 40 years old	
Variables	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
Health and social work	0.0961	0.2947	0.1137	0.3174	0.0963	0.2950	0.1138	0.3176	0.0960	0.2946	0.1138	0.3175
Other community, social and personal service activities	0.0445	0.2063	0.0413	0.1989	0.0443	0.2058	0.0411	0.1985	0.0445	0.2062	0.0413	0.1989
Activities of households	0.0163	0.1265	0.0235	0.1516	0.0161	0.1259	0.0233	0.1508	0.0163	0.1267	0.0234	0.1513
Extra-territorial organizations and bodies	0.0006	0.0237	0.0010	0.0323	(omitted)		(omitted)		0.0006	0.0238	0.0010	0.0323
Size of business, reference category: 1-10 persons												
11-19 persons	0.2110	0.4080	0.1902	0.3924	0.2127	0.4092	0.1916	0.3935	0.2106	0.4078	0.1901	0.3924
20-49 persons	0.1989	0.3992	0.1910	0.3931	0.1985	0.3989	0.1919	0.3938	0.1992	0.3994	0.1910	0.3931
≥ 50 persons	0.4819	0.4997	0.5124	0.4999	0.4805	0.4996	0.5105	0.4999	0.4819	0.4997	0.5124	0.4999
Country fixed effects, reference country: AT												
BE	0.0463	0.2102	0.0511	0.2202	0.0457	0.2087	0.0504	0.2188	0.0465	0.2105	0.0512	0.2204
BG	0.0415	0.1996	0.0498	0.2176	0.0411	0.1986	0.0494	0.2168	0.0417	0.1998	0.0499	0.2178
CY	0.0041	0.0642	0.0036	0.0601	0.0041	0.0637	0.0035	0.0594	0.0041	0.0643	0.0036	0.0602
EE	0.0076	0.0870	0.0095	0.0970	0.0075	0.0866	0.0094	0.0966	0.0076	0.0871	0.0095	0.0971
ES	0.2491	0.4325	0.2104	0.4076	0.2462	0.4308	0.2081	0.4059	0.2495	0.4327	0.2104	0.4076
FI	0.0236	0.1518	0.0320	0.1760	0.0234	0.1511	0.0317	0.1753	0.0237	0.1520	0.0321	0.1762
FR	0.3294	0.4700	0.3403	0.4738	0.3259	0.4687	0.3370	0.4727	0.3300	0.4702	0.3407	0.4739
GR					0.0101	0.1001	0.0085	0.0917				
HR	0.0168	0.1285	0.0175	0.1310	0.0164	0.1270	0.0172	0.1299	0.0166	0.1278	0.0174	0.1307
HU	0.0475	0.2127	0.0475	0.2128	0.0470	0.2117	0.0471	0.2120	0.0476	0.2129	0.0476	0.2130
LV	0.0101	0.0999	0.0119	0.1085	0.0097	0.0981	0.0118	0.1080	0.0098	0.0987	0.0119	0.1085
PT	0.0544	0.2267	0.0512	0.2204	0.0538	0.2256	0.0506	0.2193	0.0545	0.2270	0.0512	0.2205
RO	0.1001	0.3002	0.1028	0.3037	0.0977	0.2969	0.1010	0.3014	0.0989	0.2985	0.1021	0.3027
SI					0.0028	0.0525	0.0027	0.0520				
SK	0.0292	0.1683	0.0264	0.1602	0.0289	0.1675	0.0261	0.1595	0.0292	0.1685	0.0264	0.1603
weight	1192.61	1067.86	1005.85	871.82	1183.28	1064.51	998.75	870.00	1192.97	1068.92	1005.99	872.29
Additional indicators												
FED took place during working hours	0.0004	0.0193	0.0003	0.0163	0.0004	0.0192	0.0003	0.0162	0.0004	0.0194	0.0003	0.0163
NFE took place during working hours	0.0132	0.1143	0.0123	0.1103	0.0134	0.1151	0.0126	0.1114	0.0133	0.1145	0.0123	0.1104

	AET				FED				NFE			
	25-39 years old		≥ 40 years old		25-39 years old		≥ 40 years old		25-39 years old		≥ 40 years old	
Variables	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
NFE mainly job related	0.2321	0.4222	0.2033	0.4024	0.2416	0.4280	0.2131	0.4095	0.2323	0.4223	0.2033	0.4025
NFE to do a job better or improve carrier prospects	0.1270	0.3330	0.1324	0.3390	0.1391	0.3461	0.1480	0.3551	0.1269	0.3328	0.1324	0.3390
NFE to be less likely to lose a job	0.0440	0.2051	0.0553	0.2285	0.0424	0.2015	0.0530	0.2240	0.0441	0.2053	0.0554	0.2287
NFE to increase possibilities of getting a job, or changing a job/profession	0.0282	0.1655	0.0145	0.1196	0.0275	0.1634	0.0135	0.1156	0.0281	0.1653	0.0143	0.1187
NFE to start own business	0.0036	0.0597	0.0017	0.0407	0.0034	0.0583	0.0016	0.0396	0.0034	0.0585	0.0017	0.0407
NFE participation was obligatory	0.1057	0.3075	0.1217	0.3270	0.1046	0.3060	0.1207	0.3258	0.1059	0.3078	0.1218	0.3271
NFE to get knowledge or skills useful in the everyday life	0.1977	0.3983	0.1997	0.3998	0.1935	0.3951	0.1953	0.3964	0.1977	0.3983	0.1999	0.4000
NFE to increase knowledge or skills on a subject that interests the respondent	0.2174	0.4125	0.2254	0.4179	0.2143	0.4103	0.2220	0.4156	0.2174	0.4125	0.2254	0.4179
NFE to obtain certificate	0.1389	0.3459	0.1145	0.3184	0.1394	0.3464	0.1140	0.3178	0.1385	0.3455	0.1142	0.3181
NFE to meet new people or for fun	0.0874	0.2824	0.0805	0.2721	0.0868	0.2815	0.0786	0.2692	0.0876	0.2827	0.0805	0.2721
NFE other reason	0.0502	0.2185	0.0544	0.2268	0.0491	0.2161	0.0534	0.2247	0.0504	0.2187	0.0544	0.2267
Number of obs	7,932(a)		26,327(b)		19,063(c)		26,276(d)		18,675(e)		26,276(f)	

Notes: AET=adult education and training (either formal or non-formal); FED=formal education; NFE=non-formal education; IFL=informal learning activity. For questions nfe_reason1-nfe_reason10, number of observations: (a) =6,708; (b) =7,853; (c) =7,029; (d) =8,266; (e) =6,692; (f) =7,838.

Table A1 (cont'd)

	IFL				FED vs. NFE			
	25-39 years old		≥ 40 years old		25-39 years old		≥ 40 years old	
Variables	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
AET/FED/NFE/IFL	0.5295	0.4991	0.4707	0.4991	0.0978	0.2970	0.0401	0.1962
NFE/FED	0.0748	0.2631	0.0280	0.1651				
IFL/NFE	0.4229	0.4940	0.3708	0.4830				
female	0.4499	0.4975	0.4644	0.4987	0.4611	0.4985	0.4739	0.4993
abandoned education	0.1712	0.3767	0.1522	0.3592	0.1795	0.3838	0.1618	0.3683
positive occupation change	0.1126	0.3161	0.0540	0.2259	0.1219	0.3272	0.0533	0.2247
permanent contract full-time	0.7612	0.4264	0.8057	0.3956	0.7753	0.4174	0.8293	0.3763
permanent contract part-time	0.0668	0.2497	0.0886	0.2841	0.0669	0.2499	0.0858	0.2800
temporary contract full-time	0.1242	0.3298	0.0561	0.2302	0.1193	0.3242	0.0481	0.2140
temporary contract part-time	0.0253	0.1571	0.0167	0.1280	0.0239	0.1526	0.0124	0.1108
Highest educational attainment level, reference category: ISCED 0-2								
ISCED 3-4	0.4281	0.4948	0.4296	0.4950	0.3903	0.4879	0.4058	0.4911
ISCED 5-6	0.3776	0.4848	0.2674	0.4426	0.4822	0.4997	0.3993	0.4898
Sector of activity, NACE2D categories, reference catorgy: Manufacturing								
Electricity, gas and water supply	0.0146	0.1199	0.0187	0.1356	0.0166	0.1277	0.0259	0.1588
Construction	0.0870	0.2819	0.0757	0.2645	0.0587	0.2351	0.0516	0.2212
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	0.1263	0.3322	0.0863	0.2808	0.1152	0.3193	0.0726	0.2595
Hotels and restaurants	0.0370	0.1887	0.0274	0.1634	0.0251	0.1564	0.0175	0.1310
Transport, storage and communication	0.0660	0.2482	0.0734	0.2608	0.0625	0.2421	0.0660	0.2484
Financial intermediation	0.0308	0.1727	0.0272	0.1626	0.0414	0.1993	0.0414	0.1992
Real estate, renting and business activities	0.0841	0.2775	0.0548	0.2276	0.0926	0.2899	0.0535	0.2250
Public administration and defence; compulsory social security	0.0950	0.2932	0.1241	0.3297	0.1205	0.3256	0.1573	0.3641
Education	0.0767	0.2661	0.1055	0.3071	0.0993	0.2990	0.1388	0.3458
Health and social work	0.0963	0.2949	0.1137	0.3175	0.1153	0.3194	0.1455	0.3526
Other community, social and personal service activities	0.0443	0.2058	0.0410	0.1984	0.0447	0.2066	0.0411	0.1986
Activities of households	0.0161	0.1259	0.0233	0.1507	0.0087	0.0928	0.0055	0.0738
Extra-territorial organizations and bodies	0.0006	0.0236	0.0010	0.0322	(omitted)		(omitted)	
Size of business, reference category: 1-10 persons								
11-19 persons	0.2126	0.4092	0.1915	0.3935	0.1740	0.3792	0.1579	0.3647

	IFL				FED vs. NFE			
	25-39 years old		≥ 40 years old		25-39 years old		≥ 40 years old	
Variables	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
20-49 persons	0.1985	0.3989	0.1919	0.3938	0.1891	0.3916	0.1867	0.3897
≥ 50 persons	0.4806	0.4996	0.5106	0.4999	0.5437	0.4981	0.5808	0.4934
Country fixed effects, reference country: AT								
BE	0.0459	0.2092	0.0506	0.2193	0.0565	0.2309	0.0614	0.2400
BG	0.0411	0.1986	0.0494	0.2167	0.0551	0.2281	0.0733	0.2607
CY	0.0041	0.0639	0.0036	0.0598	0.0058	0.0760	0.0048	0.0688
EE	0.0075	0.0865	0.0094	0.0965	0.0101	0.0999	0.0117	0.1074
ES	0.2463	0.4309	0.2081	0.4059	0.2423	0.4285	0.2136	0.4099
FI	0.0234	0.1510	0.0317	0.1752	0.0323	0.1768	0.0546	0.2271
FR	0.3257	0.4687	0.3368	0.4726	0.3908	0.4880	0.3661	0.4818
GR	0.0101	0.1001	0.0085	0.0916				
HR	0.0164	0.1270	0.0172	0.1300	0.0145	0.1195	0.0141	0.1181
HU	0.0470	0.2116	0.0471	0.2118	0.0170	0.1294	0.0137	0.1164
LV	0.0097	0.0981	0.0118	0.1079	0.0094	0.0967	0.0121	0.1095
PT	0.0538	0.2256	0.0507	0.2193	0.0492	0.2163	0.0463	0.2101
RO	0.0976	0.2968	0.1009	0.3012	0.0337	0.1804	0.0244	0.1543
SI	0.0028	0.0525	0.0027	0.0520				
SK	0.0289	0.1674	0.0261	0.1594	0.0375	0.1901	0.0412	0.1988
weight	1183.14	1064.47	998.03	869.92	1191.72	1149.57	995.83	875.51
Additional indicators								
FED took place during working hours	0.0004	0.0192	0.0003	0.0162	0.0001	0.0112	0.0005	0.0227
NFE took place during working hours	0.0135	0.1153	0.0126	0.1116	0.0265	0.1606	0.0314	0.1744
NFE mainly job related	0.2417	0.4281	0.2131	0.4095	0.4890	0.4999	0.5268	0.4993
NFE to do a job better or improve carrier prospects	0.1391	0.3461	0.1478	0.3550	0.1244	0.3301	0.1313	0.3377
NFE to be less likely to lose a job	0.0425	0.2017	0.0529	0.2239	0.0477	0.2131	0.0572	0.2322
NFE to increase possibilities of getting a job, or changing a job/profession	0.0274	0.1633	0.0135	0.1155	0.0274	0.1633	0.0140	0.1176
NFE to start own business	0.0034	0.0583	0.0016	0.0396	0.0037	0.0605	0.0017	0.0416
NFE participation was obligatory	0.1046	0.3061	0.1207	0.3258	0.1062	0.3081	0.1233	0.3288
NFE to get knowledge or skills useful in the everyday life	0.1933	0.3949	0.1953	0.3965	0.2117	0.4086	0.2038	0.4029
NFE to increase knowledge or skills on a subject that interests the respondent	0.2145	0.4105	0.2222	0.4158	0.2137	0.4100	0.2225	0.4160
NFE to obtain certificate	0.1394	0.3464	0.1138	0.3176	0.1338	0.3404	0.1142	0.3181
NFE to meet new people or for fun	0.0867	0.2814	0.0788	0.2694	0.0809	0.2728	0.0771	0.2667

	IFL				FED vs. NFE			
	25-39 years old		≥ 40 years old		25-39 years old		≥ 40 years old	
Variables	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
NFE other reason	0.0490	0.2160	0.0534	0.2248	0.0505	0.2190	0.0549	0.2278
Number of obs	19,076(g)		26,785(h)		7,932(i)		9,680(j)	

Notes: AET=adult education and training (either formal or non-formal); FED=formal education; NFE=non-formal education; IFL=informal learning activity. For questions nfe_reason1-nfe_reason10, number of observations: (g) =7,036; (h) =8,279; (i) =5,980; (j) =7,487.

Table A2. Main features of the pension reforms that may affect the retirement perspectives of the working cohort aged 50 years old and above in 2006

Country	Year of the reforms	Main features of the reforms implemented
DK	2003	In 2003, eligibility to disability pensions was redefined so that, instead of defining the disability degree, the work ability degree is defined. Persons with some work ability are directed to subsidised jobs (and if unemployed, to special unemployment benefit) instead of granting a disability pension.
	2004	As of 1 July 2004, the statutory retirement age is 65 instead of 67. At the same time, the voluntary early retirement pension was made less attractive with the aim of increasing the effective retirement age.
ES	2002-2005	The mandatory retirement age (65) was abolished, while the accrual of pension rights after 65 was increased by 2%/year and the contributions abolished. Early retirement is discouraged by the reduction of contributions rates (50% at the age of 60, increasing by 10 p.p. by each additional year) and made possible only from the age of 61 provided that contributions have been paid at least during 30 years and the person has been unemployed at least 6 months. Moreover, the pension is reduced by 6-8%/year, depending on the number of contribution years. Pensions have also been made compatible with part-time work; the pension benefit is reduced according to the length of the working day.
FR	2004	The main measures of the reform implemented as of 2004 include a prolongation of the contribution period for a full pension from 37.5 to 40 years for public sector employees and a further increase to 41 years for all employees between 2009 and 2012 and to 41.75 in 2020. Thereafter, further gains in life expectancy (at 60) will prolong the contribution period by 2/3 of the increase in life expectancy. Moreover, retirement was made more flexible but bonus/malus adjustments will be applied to deferred/earlier retirement. In the case of postponement, the bonus is 3% per year. As of 2006, the amount of the penalty ("la décote", applied if retired before 40 years of contributions) will decrease gradually from 10% to 5% of pension per year of anticipation in 2015 for the private sector and will increase from 0,5% to 5% for civil servants). Furthermore, pensions were indexed to prices only and the contribution rate will be increased by 0.2 p.p. as of 2006.
IT	2004	As of 2008, regardless the regime (earnings-related, mixed, contribution-defined), the take-up of early pensions will be tightened. To take-up a pension at an age lower than 65 for men (60 for women) is allowed only to those with 40 or more years of contributions or to those with 35 years of contributions and the age of 60 for the employed (61 for the self-employed), instead of the flexible age range 57-65 before the reform. Further, the age limits will be raised by one year in 2010 and 2014, thus reaching 62 for the employed and 63 for the self-employed. A further postponement of pension is envisaged with respect to the moment at which the requirements are met through the so-called 'exit windows' ("finestre"). During the period 2008-2015, the take-up of seniority pensions for those having met the requirements of the legislation before 2004 (at least 35 years of contributions and the age of 57 for the employed / 58 for the self-employed) is limited to women who accept the pension calculation according to a less favourable contribution method. During the period 2004-2007, those employed in the private sector and having satisfied the requirements for a seniority pension may opt for a different regime providing: i) an additional pay corresponding to the whole pension contribution (32.7% of gross wages), ii) the total tax exemption of this additional income and iii) pension amount calculated according to the contribution years matured at the date of the option and indexed to inflation for the period until old-age retirement.
NL	2006	Decisions have been taken to reduce the incentives for the take-up of early retirement pensions (VUT), mainly via the reduction of the favourable tax treatment of such pensions.
PT	2002	The general social security pension scheme was reformed in 2002, changing the calculation rules of pensions to be based on lifetime earnings (max. 40 years) instead of the best 10 years over the last 15 years' wages, however, being phased in over a long transition period.
	2005	The 2005 reform aligned the public sector employees' pensions with the general

Country	Year of the reforms	Main features of the reforms implemented
		pension scheme (previously aligned only to those who had entered the labour market after 1993), raising the statutory retirement age from 60 in 2005 to 65 by 2015, raising the length of the contribution period required for a full pension from 36 to 40 by 2013 and applying bonus/malus adjustments for deferred/earlier retirements.
UK	2002-2003	Between 2010 and 2020, women's pensionable age will gradually rise from 60 to 65, as for men. In 2002, the State Second Pension was introduced (replacing the earlier State Earnings-related Pension), resulting in time in higher benefits. In 2003, the Pension Credit was introduced, increasing income-related benefits to people over 60. Also, the basic State pension has been increased more than what the statutory indexation rule (with prices) requires.

Source: European Commission (2006), Table 2-6.

Table A3 Descriptive statistics of the LFS sample used to estimate the planned age to retire, by time of graduation

	grad40 / gradt5		gradt10		gradt15		gradt20	
Variables	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
plagestp	62.50	3.67	62.46	3.68	62.42	3.69	62.40	3.70
grad40/t10/t15/t20	0.1082	0.3107	0.0359	0.1860	0.0304	0.1718	0.0273	0.1630
gradt5	0.0372	0.1892						
experience	36.26	6.83	36.19	6.84	36.16	6.86	36.09	6.89
experience_grad	5.15	9.93	3.98	8.00	3.05	6.36	2.33	4.91
tenure	19.05	13.15	19.34	13.14	19.56	13.14	19.67	13.11
female	0.4166	0.4930	0.4125	0.4923	0.4092	0.4917	0.4068	0.4913
married	0.7657	0.4236	0.7682	0.4220	0.7723	0.4194	0.7736	0.4185
femaleXmarried	0.2834	0.4507	0.2815	0.4498	0.2811	0.4496	0.2811	0.4496
supervisor	0.3247	0.4683	0.3265	0.4690	0.3280	0.4695	0.3280	0.4695
Age group, reference category: 50-54 years old								
55-59	0.4119	0.4922	0.4137	0.4925	0.4129	0.4924	0.4133	0.4925
60-64	0.3047	0.4603	0.3024	0.4593	0.3006	0.4586	0.2999	0.4583
Interaction age group and experience, reference category: 50-54Xexperience								
55-59Xexperience	15.16	18.52	15.21	18.52	15.17	18.51	15.17	18.50
60-64Xexperience	11.82	18.35	11.70	18.27	11.63	18.23	11.57	18.18
Financial motivation to work longer								
"to increase retirement pension entitlements"	0.2151	0.4110	0.2171	0.4123	0.2186	0.4133	r.c.	
"to provide sufficient household income"	0.4776	0.4995	0.4714	0.4992	0.4682	0.4990	0.4625	0.4986
"no financial incentive"	r.c.		r.c.		r.c.		0.3177	0.4656
Type of occupation								
professional	0.3037	0.4599	0.3088	0.4620	r.c.		0.3108	0.4629
technician	r.c.		r.c.		0.2958	0.4564	r.c.	
operator	0.4049	0.4909	0.3960	0.4891	0.3949	0.4889	0.3947	0.4888
Sector of activity								
agriculture	0.0115	0.1068	r.c.		0.0120	0.1088		
industry	r.c.		0.2189	0.4135	r.c.		0.2230	0.4163
services	0.7695	0.4212	0.7693	0.4213	0.7664	0.4231	0.7647	0.4242
Size of business, reference category: 1-10 persons								
11-19 persons	0.1403	0.3473	0.1396	0.3466	0.1419	0.3490	0.1410	0.3480
20-49 persons	0.1597	0.3664	0.1575	0.3643	0.1580	0.3647	0.1583	0.3650
≥ 50 persons	0.4904	0.4999	0.4922	0.5000	0.4892	0.4999	0.4886	0.4999
Highest educational attainment level, reference category: ISCED 0-2								
ISCED 3-4	0.3861	0.4869	0.3761	0.4845	0.3736	0.4838	0.4133	0.4925
ISCED 5-6	0.3064	0.4610	0.3111	0.4630	0.3071	0.4613	0.2999	0.4583
Country fixed effects, reference country: DK								
ES	0.1711	0.3767	0.1757	0.3806	0.1800	0.3843	0.1828	0.3865
FR	0.2652	0.4415	0.2717	0.4449	0.2768	0.4475	0.2803	0.4492
IT	0.0945	0.2925	0.0977	0.2969	0.1004	0.3005	0.1033	0.3044
NL	0.0518	0.2217	0.0525	0.2231	0.0532	0.2245	0.0531	0.2243
PT	0.0439	0.2048	0.0446	0.2065	0.0456	0.2086	0.0461	0.2097
UK	0.3423	0.4745	0.3265	0.4690	0.3124	0.4635	0.3033	0.4597
generosity_d	0.6139	0.4869	0.3190	0.7482	0.6420	0.4795	0.6506	0.4768
flexibility_d	0.5198	0.4996	0.7922	0.1705	0.4976	0.5000	0.4908	0.5000
weight	0.4192	0.3339	0.4181	0.3372	0.4164	0.3387	0.4163	0.3405
Number of obs.	6493		6267		6067		5884	

Notes: Standard deviation not adjusted for clustering. r.c. = reference category. plagestp=planned age to stop working; grad40= graduation at the age of 40 or later; gradt5= graduation min 1 year before and max 5 years before; gradt10= graduation min 6 years before and max 10 years before; gradt15= graduation min 11 years before and max 15 years before; gradt20= graduation min 16 years before and max 20 years before the interview.

Table A4 Descriptive statistics of the LFS sample used to estimate the planned age to retire (for treatment grad40), by country

	DK		ES		NL		PT		UK	
Variable	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
plagestp	63.1180	3.0066	63.2186	3.2364	62.7680	2.5966	64.4867	3.1086	63.8117	3.2428
grad40	0.1402	0.3479	0.0435	0.2041	0.0980	0.2974	0.0552	0.2286	0.2207	0.4148
experience	36.16	5.92	34.34	7.71	36.34	7.58	36.72	7.57	38.06	6.58
experience_grad	8.50	10.32	2.41	6.13	6.11	8.76	3.38	7.92	9.36	12.99
tenure	16.44	11.26	22.24	13.06	21.80	11.92	21.42	11.65	10.96	10.74
female	0.3809	0.4866	0.3363	0.4727	0.3642	0.4814	0.4673	0.4994	0.4089	0.4917
married	0.7677	0.4231	0.8273	0.3782	0.7167	0.4508	0.8386	0.3682	0.7457	0.4356
femaleXmarried	0.2590	0.4390	0.2251	0.4178	0.2093	0.4070	0.3448	0.4757	0.2718	0.4450
supervisor	0.2866	0.4531	0.2919	0.4549	0.2909	0.4544	0.2704	0.4445	0.3880	0.4874
Highest educational attainment level, reference category: ISCED 0-2										
ISCED 3-4	0.4154	0.4938	0.1719	0.3775	0.3922	0.4885	0.0978	0.2973	0.5220	0.4996
ISCED 5-6	0.5560	0.4978	0.3295	0.4702	0.4417	0.4968	0.1488	0.3562	0.3180	0.4658
Age group, reference category: 50-54 years old										
55-59	0.3105	0.4636	0.3130	0.4639	0.5582	0.4968	0.3545	0.4788	0.3626	0.4809
60-64	0.2492	0.4334	0.3155	0.4649	0.3436	0.4751	0.1744	0.3797	0.4340	0.4958
Interaction age group and experience, reference category: 50-54Xexperience										
55-59Xexperience	11.42	17.35	11.01	16.76	19.81	18.42	13.39	18.56	13.71	18.48
60-64Xexperience	9.96	17.59	11.74	17.98	13.47	19.15	7.53	16.70	17.49	20.53
Financial motivation to work longer, reference category: "no financial reason"										
"to increase retirement pension entitlements"	r.c.		r.c.		r.c.		r.c.		r.c.	
"to provide sufficient household income"	0.7982	0.4021	0.5106	0.5001	0.4489	0.4976	0.6265	0.4841	0.6285	0.4833
Type of occupation, reference category: professional										
technician	0.2828	0.4513	0.2317	0.4221	0.3086	0.4621	0.2356	0.4247	0.2982	0.4576
operator	0.2964	0.4576	0.5322	0.4992	0.2489	0.4326	0.6101	0.4881	0.3805	0.4856
Sector of activity, reference category: agriculture										
industry	0.1828	0.3872	0.2807	0.4495	0.1662	0.3724	0.2302	0.4213	0.2078	0.4058
services	0.8090	0.3939	0.6920	0.4619	0.8283	0.3773	0.7356	0.4414	0.7863	0.4100
Size of business, reference category: 1-10 persons										
11-19 persons	0.0894	0.2859	0.1439	0.3512	0.0915	0.2885	0.5900	0.4923	0.0976	0.2968
20-49 persons	0.2276	0.4201	0.1706	0.3764	0.1640	0.3705	0.0370	0.1890	0.1885	0.3912

	DK		ES		NL		PT		UK	
Variable	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
≥ 50 persons	0.5755	0.4952	0.4267	0.4948	0.6776	0.4676	0.0749	0.2634	0.4897	0.5000
weight	0.3365	0.0497	0.4068	0.2908	0.1322	0.0470	0.2007	0.1200	0.4799	0.0698
Number of obs.	253		1145		1067		595		1941	

Notes: plagestp=planned age to stop working; grad40=highest graduation completed at the age of 40 or above.

Table A5 Descriptive statistics of the LFS sample used to estimate the probability of planning an early or a late retirement (for treatment grad40)

Variables	Mean	Std.Dev.
plagestp_early	0.1683	0.3741
plagestp_late	0.3180	0.4658
grad40	0.1074	0.3097
experience	37.63	5.71
experience_grad	5.49	10.21
tenure	19.47	13.35
female	0.3599	0.4800
married	0.7744	0.4180
femaleXmarried	0.2427	0.4288
supervisor	0.3369	0.4727
Highest educational attainment level, reference category: ISCED 0-2		
ISCED 3-4	0.3930	0.4885
ISCED 5-6	0.2971	0.4570
Age group, reference category: 50-54 years old		
55-59	0.4252	0.4944
60-64	0.2675	0.4427
Interaction age group and experience, reference category: 50-54Xexperience		
55-59Xexperience	16.16	19.04
60-64Xexperience	11.17	18.68
Financial motivation to work longer, reference category: "no financial incentive"		
"to increase retirement pension entitlements"	0.2072	0.4053
"to provide sufficient household income"	0.4900	0.4999
Type of occupation, reference category: professional		
technician	0.2888	0.4532
operator	0.4103	0.4919
Sector of activity, reference category: agriculture		
industry	0.2386	0.4263
services	0.7494	0.4334
Size of business, reference category: 1-10 persons		
11-19 persons	0.1419	0.3490
20-49 persons	0.1561	0.3630
≥ 50 persons	0.5021	0.5000
Country fixed effects, reference country: DK		
ES	0.1841	0.3876
FR	0.2606	0.4390
IT	0.0906	0.2870
NL	0.0548	0.2276
PT	0.0481	0.2140
UK	0.3277	0.4694
generosity_d	0.6242	0.4844
flexibility_d	0.5073	0.5000
weight	0.4129	0.3306
Number of obs.	5650	

Note: Standard deviation not adjusted for clustering. r.c. = reference category. plagestp_early=planned age to stop working is lower than the normal pensionable age; plagestp_late=planned age to stop working is higher than the normal pensionable age; grad40=highest graduation completed at the age of 40 or above.

Table A6 Descriptive statistics of the dependent variables from the Treatment effects model for the probability of retiring earlier and later than the normal pensionable age, by type of early retirement scheme (hflexhgen, hlexlgen, lflexhgen, lflexlgen) (LFS sample)

	plagestp_early				plagestp_late			
	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Dependent variables	**hflexhgen**							
plagestp_early/plagestp_late	0.29	0.46	0	1	0.20	0.40	0	1
grad40	0.0648	0.2463	0	1	0.0648	0.2463	0	1
Number of obs	1,882				1,882			
	hflexlgen							
plagestp_early/plagestp_late	0.17	0.37	0	1	0.43	0.50	0	1
grad40	0.2255	0.4180	0	1	0.2255	0.4180	0	1
Number of obs	1,590				1,590			
	lflexhgen							
plagestp_early/plagestp_late	0.13	0.34	0	1	0.22	0.41	0	1
grad40	0.0429	0.2026	0	1	0.0429	0.2026	0	1
Number of obs	1,622				1,622			
	lflexlgen							
plagestp_early/plagestp_late	0.03	0.17	0	1	0.86	0.34	0	1
grad40	0.0588	0.2355	0	1	0.0588	0.2355	0	1
Number of obs	556				556			

Notes: hflexhgen = high flexibility and high generosity (e.g., DK, IT, NL) ; hflexlgen = high flexibility and low generosity (e.g., UK); lflexhgen = low flexibility and high generosity (e.g., ES, FR); lflexlgen = low flexibility and low generosity (e.g., PT). plagestp_early=planned age to stop working is lower than the normal pensionable age; plagestp_late=planned age to stop working is higher than the normal pensionable age. grad40= graduation at the age of 40 or later.

Table A7 Descriptive statistics of the dependent variables from the Treatment effects model for the planned age to retire, by type of early retirement scheme (hflexhgen, hlexlgen, lflexhgen, lflexlgen) and by time of graduation (LFS sample)

	grad40				gradt5			
Dependent variables	**Mean**	**Std.Dev.**	**Min**	**Max**	**Mean**	**Std.Dev.**	**Min**	**Max**
	hflexhgen							
plagestp	62.66	3.54	51	90	62.66	3.54	51	90
grad40/gradt5	0.0627	0.2424	0	1	0.0158	0.1249	0	1
Number of obs	2,141				2,141			
	hflexlgen							
plagestp	63.81	3.24	52	86	63.81	3.24	52	86
grad40/gradt5	0.2207	0.4148	0	1	0.0813	0.2734	0	1
Number of obs	1,941				1,941			
	lflexhgen							
plagestp	61.21	3.62	51	77	61.21	3.62	51	77
grad40/gradt5	0.0438	0.2048	0	1	0.0128	0.1124	0	1
Number of obs	1,816				1,816			
	lflexlgen							
plagestp	64.49	3.11	53	70	64.49	3.11	53	70
grad40/gradt5	0.0552	0.2286	0	1	m		0	1
Number of obs	595				595			

Notes: m=missing. hflexhgen = high flexibility and high generosity (e.g., DK, IT, NL) ; hflexlgen = high flexibility and low generosity (e.g., UK); lflexhgen = low flexibility and high generosity (e.g., ES, FR); lflexlgen = low flexibility and low generosity (e.g., PT). plagestp=planned age to stop working.
grad40= graduation at the age of 40 or later; gradt5= graduation min 1 year before and max 5 years before; gradt10= graduation min 6 years before and max 10 years before; gradt15= graduation min 11 years before and max 15 years before; gradt20= graduation min 16 years before and max 20 years before the interview.

Table A7 (cont'd)

Dependent variables	gradt10				gradt15				gradt20			
	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
	hflexhgen											
plagestp	62.65	3.55	51	90	62.66	3.56	51	90	62.65	3.57	51	90
gradt10/15/20	0.0165	0.1273	0	1	0.0180	0.1328	0	1	0.0259	0.1590	0	1
Number of obs	2,106				2,072				2,024			
	hflexlgen											
plagestp	63.80	3.27	52	86	63.79	3.24	52	86	63.79	3.30	52	86
gradt10/15/20	0.0776	0.2675	0	1	0.0588	0.2353	0	1	0.0450	0.2073	0	1
Number of obs	1,782				1,649				1,551			
	lflexhgen											
plagestp	61.19	3.62	51	77	61.18	3.62	51	77	61.17	3.62	51	77
gradt10/15/20	0.0154	0.1231	0	1	0.0172	0.1300	0	1	0.0170	0.1294	0	1
Number of obs	1,794				1,768				1,741			
	lflexlgen											
plagestp	m				64.50	3.13	53	70	m			
gradt10/15/20					0.0194	0.1379	0	1				
Number of obs					578							

Notes: m=missing. hflexhgen = high flexibility and high generosity (e.g., DK, IT, NL) ; hflexlgen = high flexibility and low generosity (e.g., UK); lflexhgen = low flexibility and high generosity (e.g., ES, FR); lflexlgen = low flexibility and low generosity (e.g., PT). plagestp=planned age to stop working.
grad40= graduation at the age of 40 or later; gradt5= graduation min 1 year before and max 5 years before; gradt10= graduation min 6 years before and max 10 years before; gradt15= graduation min 11 years before and max 15 years before; gradt20= graduation min 16 years before and max 20 years before the interview.

Table A8 Descriptive statistics of the LFS sample used to estimate the planned age to retire, by time of graduation and by age group

	50-54		55-59		60-64	
Variable	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
plagestp	61.02	4.24	61.82	3.25	64.81	2.28
grad40	0.0716	0.2579	0.1068	0.3089	0.1443	0.3515
gradt5	0.0356	0.1853	0.0329	0.1785	0.0443	0.2059
experience	32.74	5.41	36.8	6.03	38.8	7.65
experience_grad	3.94	8.16	5.03	9.63	6.44	11.56
tenure	18.73	12.34	19.96	13.35	18.11	13.52
female	0.3888	0.4876	0.4117	0.4922	0.4489	0.4975
married	0.7745	0.4181	0.7622	0.4258	0.7624	0.4257
femaleXmarried	0.2796	0.449	0.2784	0.4483	0.2938	0.4556
supervisor	0.3093	0.4623	0.3347	0.472	0.3255	0.4687
Financial motivation to work longer						
"to increase retirement pension entitlements"	r.c.		0.2195	0.414	0.209	0.4067
"to provide sufficient household income"	0.5712	0.4951	0.4502	0.4976	0.4276	0.4949
"no financial incentive"	0.2134	0.4098	r.c.		r.c.	
Type of occupation						
professional	0.294	0.4557	r.c.		0.3065	0.4612
technician	r.c.		0.3067	0.4612	r.c.	
operator	0.421	0.4939	0.3849	0.4867	0.4169	0.4932
Sector of activity						
agriculture	r.c.		r.c.		0.0102	0.1004
industry	0.2548	0.4359	0.2216	0.4154	r.c.	
services	0.7334	0.4423	0.766	0.4234	0.8078	0.3941
Size of business, reference category: 1-10 persons						
11-19 persons	0.166	0.3722	0.1293	0.3356	0.1312	0.3378
20-49 persons	0.1439	0.351	0.1544	0.3614	0.1816	0.3856
≥ σνοσρεπ 05	0.5042	0.5001	0.5129	0.4999	0.447	0.4973
Highest educational attainment level, reference category: ISCED 0-2						
ISCED 3-4	0.3688	0.4826	0.3901	0.4879	0.3967	0.4893
ISCED 5-6	0.3051	0.4606	0.2999	0.4583	0.3166	0.4652
Country fixed effects, reference country: DK						
ES	0.2244	0.4173	0.13	0.3364	0.1772	0.3819
FR	0.3467	0.4761	0.3197	0.4664	0.1156	0.3198
IT	0.0438	0.2047	0.1175	0.322	0.1105	0.3136
NL	0.018	0.1328	0.0702	0.2556	0.0585	0.2346
PT	0.0729	0.2601	0.0378	0.1907	0.0251	0.1565
UK	0.2456	0.4306	0.3012	0.4589	0.4876	0.5
weight	0.4666	0.3842	0.4149	0.3466	0.3878	0.2645
Number of obs.	1653		2702		2138	

Note: Standard deviation not adjusted for clustering. r.c. = reference category. plagestp=planned age to stop working; grad40= graduation at the age of 40 or later; gradt5= graduation min 1 year before and max 5 years before.

Table A8 (cont'd)

	50-54		55-59		60-64	
Variable	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
plagestp	60.96	4.2427	61.78	3.2567	64.79	2.294169
gradt10	0.0271	0.1625	0.0378	0.1906	0.0415	0.199406
experience	32.71	5.44	36.75	6.05	38.70	7.65
experience_grad	2.95	6.34	3.99	7.88	4.95	9.33
tenure	18.98	12.30	20.25	13.30	18.42	13.60
female	0.3879	0.4874	0.4099	0.4919	0.4390	0.4964
married	0.7800	0.4144	0.7623	0.4258	0.7653	0.4239
femaleXmarried	0.2814	0.4498	0.2776	0.4479	0.2871	0.4525
supervisor	0.3117	0.4633	0.3359	0.4724	0.3275	0.4694
Financial motivation to work longer						
"to increase retirement pension entitlements"	0.2171	0.4124	0.2229	0.4163	r.c.	
"to provide sufficient household income"	0.5635	0.4961	0.4445	0.4970	0.4217	0.4939
"no financial incentive"	r.c.		r.c.		0.3693	0.4827
Type of occupation						
professional	0.2973	0.4572	0.3131	0.4638	0.3136	0.4641
technician	r.c.		0.3094	0.4623	r.c.	
operator	0.4168	0.4932	r.c.		0.4019	0.4904
Sector of activity						
agriculture	r.c.		r.c.		r.c.	
industry	0.2459	0.4308	0.2251	0.4177	0.1849182	0.3883257
services	0.7420	0.4377	0.7621	0.4259	0.8047137	0.3965174
Size of business, reference category: 1-10 persons						
11-19 persons	0.1634	0.3698	0.1285	0.3347	0.1325	0.3391
20-49 persons	0.1437	0.3509	0.1516	0.3587	0.1786	0.3831
≥ 50 persons	0.5054	0.5001	0.5157	0.4999	0.4476	0.4974
Highest educational attainment level, reference category: ISCED 0-2						
ISCED 3-4	0.3677	0.4823	0.3799	0.4855	0.3789	0.4852
ISCED 5-6	0.3073	0.4615	0.3035	0.4599	0.3250	0.4685
Country fixed effects, reference country: DK						
ES	0.2309	0.4215	0.1324	0.3390	0.1831	0.3868
FR	0.3503	0.4772	0.3287	0.4698	0.1198	0.3248
IT	0.0454	0.2082	0.1205	0.3256	0.1156	0.3198
NL	0.0179	0.1327	0.0708	0.2565	0.0600	0.2376
PT	0.0729	0.2601	0.0388	0.1932	0.0260	0.1592
UK	0.2335	0.4232	0.2857	0.4518	0.4699	0.4992
weight	0.4664	0.3860	0.4143	0.3504	0.3856	0.2683
Number of obs.	1595		2617		2055	

Note: r.c. = reference category. Standard deviation not adjusted for clustering. plagestp=planned age to stop working. gradt10= graduation min 6 years before and max 10 years before.

Table A8 (cont'd)

	50-54		55-59		60-64	
Variable	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
plagestp	60.92	4.2502	61.76	3.2642	64.77	2.29851
gradt15	0.0294	0.1689	0.0295	0.1693	0.0327	0.1777985
experience	32.67	5.47	36.75	6.09	38.67	7.67
experience_grad	2.30	5.03	3.02	6.21	3.79	7.51
tenure	19.06	12.29	20.60	13.27	18.62	13.65
female	0.3862	0.4870	0.4067	0.4913	0.4347	0.4958
married	0.7848	0.4111	0.7678	0.4223	0.7665	0.4231
femaleXmarried	0.2842	0.4512	0.2789	0.4486	0.2813	0.4498
supervisor	0.3119	0.4634	0.3398	0.4737	0.3270	0.4692
Financial motivation to work longer						
"to increase retirement pension entitlements"	r.c.		0.2257	0.4181	0.2104	0.4077
"to provide sufficient household income"	0.5604	0.4965	0.4406	0.4966	0.4182	0.4934
"no financial incentive"	0.2226	0.4161	r.c.		r.c.	
Type of occupation						
professional	0.2929	0.4552	0.3156	0.4648	0.3163	0.4651
technician	r.c.		0.3092	0.4623	r.c.	
operator	0.4188	0.4935			0.3992	0.4899
Sector of activity						
agriculture	r.c.		r.c.		0.0108	0.1035
industry	0.2476	0.4318	0.2286	0.4200	r.c.	
services	0.7405	0.4385	0.7585	0.4281	0.80194	0.3986379
Size of business, reference category: 1-10 persons						
11-19 persons	0.1653	0.3716	0.1303	0.3368	0.1356	0.3424
20-49 persons	0.1455	0.3527	0.1537	0.3607	0.1757	0.3807
≥ 50 persons	0.4973	0.5002	0.5137	0.4999	0.4477	0.4974
Highest educational attainment level, reference category: ISCED 0-2						
ISCED 3-4	0.3666	0.4820	0.3774	0.4848	0.3752	0.4843
ISCED 5-6	0.3008	0.4588	0.2991	0.4580	0.3239	0.4681
Country fixed effects, reference country: DK						
ES	0.2352	0.4242	0.1361	0.3430	0.1878	0.3907
FR	0.3567	0.4792	0.3339	0.4717	0.1222	0.3276
IT	0.0454	0.2082	0.1246	0.3304	0.1194	0.3243
NL	0.0176	0.1316	0.0715	0.2578	0.0621	0.2414
PT	0.0734	0.2608	0.0400	0.1960	0.0268	0.1614
UK	0.2230	0.4164	0.2700	0.4440	0.4560	0.4982
weight	0.4672	0.3898	0.4124	0.3494	0.3821	0.2707289
Number of obs.	1549		2530		1988	

Note: Standard deviation not adjusted for clustering. r.c. = reference category. plagestp=planned age to stop working. gradt15= graduation min 11 years before and max 15 years before.

Table A8 (cont'd)

	50-54		55-59		60-64	
Variable	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
plagestp	60.88	4.2645	61.74	3.2606	64.76	2.303645
gradt20	0.0281	0.1652	0.0300	0.1707	0.0228	0.1493302
experience	32.60	5.47	36.70	6.14	38.58	7.71
experience_grad	1.70	3.63	2.34	4.84	2.93	5.88
tenure	19.20	12.24	20.68	13.22	18.72	13.64
female	0.3841	0.4865	0.4060	0.4912	0.4298	0.4952
married	0.7887	0.4083	0.7680	0.4222	0.7669	0.4229
femaleXmarried	0.2858	0.4519	0.2799	0.4491	0.2782	0.4482
supervisor	0.3143	0.4644	0.3384	0.4733	0.3266	0.4691
Financial motivation to work longer						
"to increase retirement pension entitlements"	0.2171	0.4124	0.2270	0.4190	0.2123	0.4090
"to provide sufficient household income"	0.5553	0.4971	0.4347	0.4958	0.4122	0.4924
"no financial incentive"	r.c.		r.c.		r.c.	
Type of occupation						
professional	0.2933	0.4554	0.3166	0.4652	0.3195	0.4664
technician	r.c.		0.3076	0.4616	r.c.	
operator	0.4207	0.4938	r.c.		0.3957	0.4891
Sector of activity						
agriculture	0.0121719	0.1096895	r.c.		r.c.	
industry	r.c.		0.2283	0.4198	0.1896403	0.3921183
services	0.7376	0.4401	0.7584	0.4281	0.799178	0.4007194
Size of business, reference category: 1-10 persons						
11-19 persons	0.1612	0.3678	0.1315	0.3380	0.1347	0.3415
20-49 persons	0.1454	0.3526	0.1555	0.3624	0.1744	0.3795
≥ 50 persons	0.4991	0.5002	0.5102	0.5000	0.4487	0.4975
Highest educational attainment level, reference category: ISCED 0-2						
ISCED 3-4	0.3675	0.4823	0.3755	0.4844	0.3679	0.4824
ISCED 5-6	0.2927	0.4552	0.2947	0.4560	0.3244	0.4683
Country fixed effects, reference country: DK						
ES	0.2371	0.4255	0.1374	0.3444	0.1933	0.3950
FR	0.3572	0.4793	0.3387	0.4734	0.1264	0.3323
IT	0.0467	0.2111	0.1283	0.3345	0.1230	0.3285
NL	0.0167	0.1283	0.0714	0.2576	0.0628	0.2426
PT	0.0746	0.2628	0.0412	0.1988	0.0256	0.1581
UK	0.2187	0.4135	0.2591	0.4383	0.4450	0.4971
weight	0.4674	0.3892	0.4121	0.3519	0.3819	0.2737988
Number of obs.	1503		2457		1924	

Note: Standard deviation not adjusted for clustering. r.c. = reference category. plagestp=planned age to stop working. gradt20= graduation min 16 years before and max 20 years before the interview.

European Commission

Joint Research Centre – Institute for the Protection and Security of the Citizen
Title: Shall I stay or shall I go? Late graduation and retirement decision
Author(s): Christelle Garrouste and Omar Paccagnella
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Abstract
Early retirement from regular employment provides a major challenge to social and health policies in Europe. As people older than 60 will comprise close to one-third of the population in several European countries over the next two decades, a shrinking number of economically active people will have to support a growing number of economically dependent elderly people. There is therefore a political focus on the need to maintain workers longer in employment. Using the Labour Force Survey ad-hoc module (2006) on the transition from work to retirement, this study investigates the role of a late graduation on the decision of workers aged 50 and above to stay longer on the labour market. Overall, we find that graduating after the age of 40 has a positive and statistically significant effect on the planned age to retire, measured in absolute terms. It also plays its expected role on the relative planned age to retire by decreasing the probability of retiring before the normal pensionable age and by increasing the probability of retiring after the normal pensionable age. Moreover, our results highlight that this positive effect of a late graduation on the absolute planned age of retirement is mainly true in countries with a low degree of flexibility and a high degree of generosity of their early retirement schemes, such as Spain or France. Hence, the effect of a late formal upgrade of skills on an increase in the absolute planned age to retire is stronger at the margin in countries where the pension system acts as an incentive for not remaining on the labour market beyond the official pensionable age. As a consequence, we find that the relative effect on the probability of planning to delay the retirement age beyond the normal age is more significant in countries with highly flexible but less generous early retirement schemes (e.g., the UK).

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