The Low Employment Rate Conundrum Can More Human Capital Help ?

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Abstract

Many EU countries are confronted with low employment rates, particularly among elderly workers. At the same time, levels of human capital are on the rise. Should this lift the age of retirement and lead to higher lifetime employment rates? In order to explore these issues, we develop a simple model with endogenous retirement. It tells us that the impact of education on retirement is ambiguous. Higher wages encourage educated workers to postpone retirement (foregone earnings effect). But higher wages allow faster wealth accumulation (income effect) which could favour early retirement There is also that better educated individuals tend to be older when they enter the labour market. The general prediction is thus that, over their lifecycle, more educated individuals should not necessarily spend more years in employment. The econometric analysis of representative samples of 50+ males and females across various EU countries shows that educated individuals systematically *retire* later, suggesting that the foregone earnings effect dominates the income effect. Yet, the same data reveal that more educated individuals do not have higher *lifetime employment* rates. The benefit in terms of later retirement is not sufficient to offset later labour market entrance.

JEL classification: J24 (Human Capital Formation; Occupational Choice; Labor Productivity) J26 (Retirement; Retirement Policies)

Key works: Endogenous retirement, Human Capital, employment rate

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Introduction

A very well known and worrying fact about Europe today is that its population is getting older. This is caused by the increase in the average life expectancy of the population, due to improved life conditions and medical care, and secondly by a drop in birth rates. The population projections show that from 2010 the EU15 will experience a fall in working age population and an worrisome increase of the rate of dependency[1]

In addition, employment rates are low, particularly for individuals aged 55-64. In EU15 countries it was around 40% (compared to 58% in the US and 62% in Japan). Although most countries have mandatory retirement age equal to 65, these employment rates suggest that retirement is to a larger extent a choice variable or at least a process strongly influenced by decentralized mechanisms.

Aging and low participation rates, particularly among older workers, pose extreme pressure in the pension and health systems in the EU countries. Governments are already working on the problem of ageing and decreasing working population, with special emphasis to the age group 55-65. The Stockholm target, set out in the 2001 European Council, is about increasing the level of employment of those aged 55-65 to at least 50% (to be reached by 2010). Immigration is a way to mitigate the problem but its political sustainability is far from obvious. The current focus is on restricting the access to early retirement schemes, increasing the mandatory age of retirement and more generally on modifying the financial incentives imbedded in social security schemes (Borsch-Supan, 1998 ; Neumark & Powers, 1998 ; Buttler, Huguenin & Teppa, 2004).

[1] The dependency ratio is the number of persons in the "dependent ages" per 100 persons in the independent ages. The "dependent" ages are usually assumed to be younger than 18 and above 64; the "independent" ages are those 18-64. Defined this way, the dependency ratio is an indicator of the number of persons assumed to be either too young or too old to work per 100 persons in the assumed working ages.

Table 1 – EU population that has attained at least upper secondary education in 2002. Evolution across age groups.

Country	25-34 (a)	55-64 (b)	Young to old cohort ratio (a)/(b)
Austria	85	67	1.26
Belgium	77	41	1.89
Denmark	85	72	1.18
Finland	88	52	1.69
France	79	48	1.65
Germany	85	77	1.11
Greece	72	28	2.57
Ireland	77	37	2.09
Italy	60	24	2.54
Luxembourg	64	46	1.38
Netherlands	76	53	1.42
Portugal	35	8	4.27
Spain	58	18	3.29
Sweden	91	67	1.36
United Kingdom	70	56	1.24

Source: OECD (2004)

The aim of this paper is to shed more light on the potential role of rising education levels among senior citizens as a way to lift employment rate, particularly among the 50+. As suggested by figures regularly published by the Oecd (Table 1), the average educational attainment of elderly workers is bound to rise significantly over the coming decades. Yet, with the exception of Alders (1999) or Lau & Poutvaara (2000), the theoretical literature is almost silent of the issue. Most of the existing work focuses on the role of health (Dwyer & Mitchell, 1998), gender (Dahl, Nilsen & Vaage, 1999), social security or pension regimes (Neumark & Powers, 1998 ; Buttler, Huguenin & Teppa, 2004) or taxation (Prescott, 2004).

Section 1 exposes a simple lifecycle model with endogenous retirement explicitly related to human capital endowment. It first looks at the relationship between years of schooling and retirement duration, and then extends the discussion to the number of years out of employment (retirement + education years). Section 2 contains our analysis of EU data on the behaviour of individuals aged 50+. Results show that better educated individuals retire later, but not necessarily enough to compensate for their later entrance on the labour market. Section 3 concludes.

1. Endogenous retirement and human capital. What theory suggests

1.1. Basic framework

Like Lau & Pautvaara (2000), we assume that adult time horizon is equal to life expectancy (T) minus the time he/she spent at school[2] ($T\text{-}S>0$), and that there is no uncertainty about life expectancy or return on human capital investment. Individuals have to decide between retirement duration ($0<R<T\text{-}S$) and work ($T\text{-}R\text{-}S>0$). The interest rates is normalized at zero[3]. Utility is separable in adult lifetime consumption (C) and retirement duration (ie, leisure) (R).

$$W = U(C) + V(R) \qquad (1)$$

where U is a concave function of C, and V is a concave function of the duration of retirement R. Time spent in full-time education (S) translates into human capital. We assume an exogenous distribution of years of schooling – and thus of human capital – that might simply be the consequence of unequally distributed scholastic ability. The point here is that more educated individuals enter the labour market later. Another important but fairly standard assumption is that wage per unit of working time is a monotone increasing and concave function of years of education/human capital ($w'>0,\ w''<0$).

Given this set of assumptions, the lifetime budget constraint states that the value of lifetime expenditure on consumption cannot exceed lifetime income from the supply of labour.

$$(T\text{-}R\text{-}S)\ w(S) \geq C \qquad (2)$$

[2]We assume that human capital accumulation takes place at the beginning of life and is a full-time activity.
[3] Or equivalently that capital markets are perfect in the sense that interest rates individuals get on their savings perfectly compensate their preference for the present.

1.2. Retirement duration and years of schooling

Agents maximize lifetime utility W by choosing a retirement duration (R) subject to the lifetime budget constraint (2).

The first order condition with respect to retirement is:

$$V'(R) - U'(C)w(S) = 0 \qquad (3)$$

with $C=(T-R-S)\, w(S)$

Expression (3) indicates that time spent in retirement is chosen such that the marginal benefit from leisure ($V'(R)$) equals the marginal value of forgone wage and consumption. This expression can be viewed as an implicit function $F(R,S)=0$ characterising the relation between the demand for retirement and years of schooling $R=f(S)$. And following the implicit function theorem we can say that the derivative of this function captures the sensitivity of equilibrium retirement decision to variation in human capital levels:

$$\partial R/\partial S = -\partial F/\partial S \,/\, \partial F/\partial S \qquad (5)$$

Numerator of expression (5) can be stated as :

$$\partial F/\partial S = -\,(\partial U'/\partial S \;\; w + w'U') = -\,U''\,\partial C/\partial S - U'\,w' \qquad (6)$$

or as $\partial C/\partial S= (T-R-S)w' - w$

$$\partial F/\partial S = -\,U''\,[(T-R-S)w' - w] - U'\,w' \qquad (7)$$

And the denominator as:

$$\partial F/\partial R = V'' - \partial U'/\partial R\, w\, S = V'' - U''\, \partial C/\partial R \quad (8)$$

or as $\partial C/\partial R = - w$

$$\partial F/\partial R = V'' + U''\, S^2 w^2 \quad (9)$$

Using (7) and (9), (5) becomes

$$\partial R/\partial H = wU''[(T-R-S)w' - w] + U'\, w' \,/\, (V'' + U''\, S^2 w^2) \quad (10)$$

As by assumption utility functions are concave, $U'' < 0$ and $V'' < 0$ we have that the denominator $V'' + U''\, S^2 w^2 \equiv \Phi$ is negative. The sensitivity of retirement duration to human capital thus depends of the sign and relative magnitude of :

$$U'\, w' \,/\, \Phi \quad (11)$$

which is the *forgone earnings effect*. More education commands higher wages $w' > 0$ meaning that at any particular moment, retirement represents a greater loss of earnings/consumption and utility $U'w' > 0$. As $\Phi < 0$, we clearly have that the ratio is negative. *Ceteris paribus*, the forgone earnings effect should entice better educated individuals to spend less time in retirement (retire later).

$$wU''[(T-R-S)w' - w]/\, \Phi \quad (12)$$

where $U'' < 0$ captures the *income effect*. As marginal utility derived from consumption is decreasing, individuals with higher lifetime earnings and consumption levels should suffer a smaller loss of utility due to retirement. As education generally means higher lifetime earnings and consumption levels, the income effect should logically foster early retirement among educated people.

Strictly speaking however, expression (12) is positive only if $[(T-R-S)w' - w] > 0$ or equivalently -- if we multiply and divide (12) by w -- if $[(T-R-H)w'/w - 1] >, 0$. The first part of this expression represents the career wage premium of an additional year of schooling. It is equal to the product of $T-R-H$ (the number of years spent in employment) by w'/w (the marginal rate of return). The second part (-1) simply reflects the cost of later labour market entrance, or the opportunity cost of an extra year of schooling. If individuals are rational investors à-la-Becker (1964) the lifetime wage premium should always outweigh this opportunity cost, and expression (12) should be positive. Algebraically, this depends on the rate of return (w'/w) and length of people's career. It is immediate to verify that a rate of return of 5%[4] and career lengths of 20+ years are sufficient to compensate for the cost of a year of schooling.

The conclusion is thus that the impact of education via higher wages is theoretically ambiguous. On the one hand, the higher level of compensation for each year worked may encourage educated workers to stay in the labour force longer (foregone earnings effect). But on the other hand, higher wages allow educated workers to accumulate wealth/consumption quicker, and this should entice them to retire earlier (income effect).

1.3. Total time spent in inactivity and years of schooling

In the above model, the dependant variable is the duration of retirement (R) or, equivalently, the age at which individuals retire. From a policy perspective, we could consider that it is more relevant to know whether education is likely to reduce *the number of years out of employment*[5]. Within the model developed above, the issue becomes that of the relation between $R+S$ (retirement + years of schooling) and variations of S. And the answer simply implies finding the sign of :

$$\partial(R+S)/\partial S = \partial R/\partial S + 1 = U''w^2 [(T-R-S)w'/w - 1]/\Phi + U' w'/\Phi + 1 \qquad (15)$$

[4] This value is relatively conservative judging by the results obtained in the abundant empirical literature on the rate of return on human capital investment. For an recent illustration see de la Fuente & Ciccone (2002).

[5] We focus here on how education affect the length of individuals' careers. We neglect the question of the employment rate during the career, and how the latter is crucially influenced by education. Readers interested by this aspect of the discussion should refer to Karasiotou (2004) or de la Fuente & Ciccone (2002).

As seen in the previous section, the first two terms of expression (15) have opposite signs. Strong income effects tend to counteract the incentives better paid/educated workers have to remain active. But the third term of expression (15) further increases that tendency, or at least its effect on time spent in employment. More full-time education mechanically postpones the moment individuals enter the labour market, and reduces the chance of education being a source of higher lifetime employment.

2. The empirical evidence

In order to assess empirically the relationship between years of schooling/human capital, retirement and lifetime employment, we use a new international data set (see Table 2 for descriptive statistics) : the Survey of Health, Ageing and Retirement in Europe (SHARE). It is a multidisciplinary and cross-national data base of micro data on health, socio-economic status (including employment status) and social and family networks of representative samples of individuals over the age of 50. Participating countries include Austria, Denmark, France, Germany, Greece, Italy, the Netherlands, Spain, Sweden and Switzerland. Belgium, although officially involved in the project, did not produce the 2004 data. We decided to circumvent this limitation by using the Belgian 2001 labour force survey (LFS).

Table 2 – Data description. Employment rate among individuals ages 50-70 [+sample frequencies]. Breakdown by gender and highest degree obtained

Country	Female			Male		
	Less than secondary	Secondary	Tertiary	Less than secondary	Secondary	Tertiary
Austria	8.30 [21]	18.51 [67]	36.52 [42]	19.15 [18]	28.24 [96]	45.63 [73]
Belgium	14.11 [1019]	29.62 [744]	44.43 [838]	29.77 [1801]	48.48 [1273]	59.25 [1287]
Denmark	24.43 [32]	41.23 [94]	72.22 [143]	42.86 [30]	56.44 [171]	60.63 [97]
France	31.01 [89]	42.78 [80]	54.70 [64]	30.73 [63]	49.73 [93]	59.32 [70]
Germany	17.73 [36]	34.69 [238]	48.68 [111]	31.58 [18]	38.95 [266]	56.63 [158]
Greece	12.75 [52]	26.60 [50]	49.44 [44]	45.76 [135]	64.04 [114]	63.87 [99]
Italy	9.77 [73]	32.80 [61]	62.50 [35]	25.05 [135]	47.03 [87]	70.37 [38]
Netherlands	15.26 [65]	34.07 [155]	58.97 [115]	33.91 [118]	50.00 [187]	63.71 [158]
Spain	16.07 [108]	47.56 [39]	55.00 [33]	39.78 [183]	57.97 [40]	55.56 [40]
Sweden	43.62 [205]	61.81 [280]	70.48 [117]	49.33 [220]	68.04 [247]	67.24 [78]
Switzerland	40.91 [63]	59.14 [55]	43.86 [25]	60.16 [74]	63.24 [43]	70.00 [63]

Source: Share (2004), Belgian LFS (2001)

It is immediately visible from Table 2 that average employment rates (1- retirement rates) are positively correlated with human capital, proxied here by the highest degree obtained. But the same data can be used to explore the relationship between human capital and retirement more rigoroulsy.

We first estimate a *logit* model, *Prob (EMPL=1)= f(AGE, S*); capturing the effect of *S* the number of years of schooling[6] on employment likelihood, while controlling for age. Quite invariably across EU countries with *a priori* heterogeneous labour market and pension regimes, the results are that more educated 50+ individuals have higher employment rates/lower retirement rates (see Table 3 for males and Table 4 for females, first 3 columns). They are in line with those of Blöndal & Scarpetta (1998) and Berkovec & Stern, (1991).

[6] Share provides information about education that is more detailed than the broad categories reported in Table 1. Technical documentation also inform about how different degrees should be translated into years of schooling.

Referring to our model, they suggest that the foregone earnings effect dominates the income effect. Odds ratio[7] are significantly superior to 1, ranging from 1.08 (males, Greece) to 1.28 (females, Austria). To policy-makers, these results convey the message that rising levels of human capital among elderly individuals -- something that will inevitably materialize over the coming years (see Table 1) -- could mechanically translate into to higher employment rates among individuals aged 50+.

But, as explained in section 1, it might be more relevant, for policy-markers to know whether more education is also likely to increase the cumulated number of *years in employment.* Our simple model was singularly inconclusive on this question. Hence the importance of resorting to the empirical analysis, with which an answer might be easier to provide. Our *logit* model can indeed be re-estimated by replacing *AGE* with potential labour market experience (*EXP*)[8] ie, *Prob (EXP=1)= f(EXP, S*). This simple, and easy to implement, strategy allows us to capture the effect of additional years of schooling on employment *net* of labour market entrance differences.

[7] The ratio of the probability of being employed to the probability of not being employed.
[8] Age – theoretical initial education completion age (16 for individuals with no more that lower secondary education, 18 for those with upper secondary education, 21 for bachelor degrees and 23 for master degrees). We have, so far, abstracted from differences across countries, in terms of completion age.

Table 3 – Years of schooling and probability of employment of elderly *males* (50-70). Logistic regression

Country	Controlling for age			Controlling for potential labour market experience		
	Estimate	*ExpEst (odd-ratio)*	*ProbChiSq*	*Estimate*	*ExpEst (odd-ratio)*	*ProbChiSq*
Austria	0.20*	1.23	0.0001	-0.03	0.97	0.5373
Belgium	0.17*	1.18	0.0000	-0.02*	0.98	0.0033
Denmark	0.14*	1.15	0.0003	0.05	1.05	0.2270
France	0.09*	1.09	0.0016	-0.06*	0.94	0.0374
Germany	0.20*	1.22	0.0000	0.04	1.04	0.3587
Greece	0.04	1.04	0.0627	-0.08*	0.93	0.0026
Italy	0.13*	1.14	0.0000	0.03	1.04	0.1235
Netherlands	0.18*	1.20	0.0000	0.01	1.01	0.7264
Spain	0.06*	1.07	0.0327	-0.03	0.97	0.3583
Sweden	0.08*	1.08	0.0129	-0.12*	0.89	0.0005
Switzerland	0.06	1.07	0.0764	-0.03	0.97	0.4210

Source: Share (2004), Belgian LFS (2001)
*Significant at the 5% level

Table 4 – Years of schooling and probability of employment of elderly *females* (50-70). Logistic regression

Country	Controlling for age			Controlling for potential labour market experience		
	Estimate	*ExpEst (odd-ratio)*	*ProbChiSq*	*Estimate*	*ExpEst (odd-ratio)*	*ProbChiSq*
Austria	0.24*	1.27	0.0000	0.03	1.03	0.5037
Belgium	0.17*	1.19	0.0000	0.02*	1.02	0.0042
Denmark	0.16*	1.17	0.0000	0.03	1.03	0.3917
France	0.07*	1.07	0.0014	-0.03	0.97	0.2078
Germany	0.14*	1.15	0.0001	-0.05	0.95	0.1205
Greece	0.13*	1.14	0.0000	0.06*	1.07	0.0292
Italy	0.22*	1.24	0.0000	0.12	1.13	0.0000
Netherlands	0.20*	1.22	0.0000	0.08*	1.09	0.0025
Spain	0.17*	1.18	0.0000	0.12*	1.13	0.0005
Sweden	0.12*	1.13	0.0000	-0.02	0.98	0.4725
Switzerland	0.08*	1.08	0.0184	0.01	1.01	0.6717

Source: Share (2004), Belgian LFS (2001)
*Significant at the 5% level

Results are reported in the second part of Table 3 (males) and Table 4 (females) (last 3 columns) and suggest that -- when controlling for later entrance on the labour market among more educated individuals – the employment premium tends to vanish. In many countries

examined here, the odd-ratio is not statistically different from 1, suggesting the absence of effect of education on total time spent in employment.

For males, estimated coefficients are generally not significant. And when they are, it turns out that they are *negative*. The odd-ratio is 0.98 in Belgium, 0.93 in Greece and 0.88 in Sweden. For these countries, the conclusion would be that although better educated males retire later, they spend less years in employment over their lifetime.

For females, estimated coefficients are generally not significant either. But contrary to males, those of the coefficients that are statistically significant are *positive*. This is the case in Belgium (odd-ratio of 1.02), Greece (1.06), the Netherlands (1.08), Italy and Spain (1.12). For these countries, the conclusion would be that educated females retire later and also spend more years in employment.

3. Conclusion

The results presented in this paper should be considered with caution. Further work is needed to enrich the theoretical model, and more empirical analysis is needed to check the robustness of the estimates. This said, the paper offers some interesting, although preliminary, insights on the relationship between human capital, retirement and lifetime employment rates.

Many EU countries are confronted with low employment rates, particularly among elderly workers. At the same time levels of human capital are bound to rise significantly. Following the empirical results presented in this paper, more education should *ceteris paribus* lift the age of retirement and increase the employment rate among 50+ individuals. Whether this will also lead to more years in employment over the lifecycle remains largely uncertain, as the benefits in terms of postponed retirement do not compensate for later entrance on the labour market, particularly among men. The tentative conclusion could then be that human capital accumulation can only lift average employment rates if it does not require individuals to study full-time.

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