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Education and the labor market

Pavlina Karasiotou [1]

Abstract – *Putting them together, education and work account for the largest period in a person's life. Furthermore, as the relevant literature points out, there are strong ties between education and the labor market. This paper (summary of a PhD thesis) explores the interrelations among them in a microeconomic level and identifies gains and losses for the individual from adolescence till retirement. We address several questions such as: How can parental working status affect children's educational choices in a tuition-free school system and what are the implications? How different types of education affect wages and employment? And finally, how and why better educated workers stay longer in the labor market? These questions are examined for Belgium, placing special emphasis on the specificities of the country's socioeconomic environment and education system. Our results (both empirical and theoretical) imply the existence of strong, positive relation between education on the one hand and wages, earnings and employment on the other, covering the life-span of individuals.*
JEL Classification: *I21, I29, J31*

1 INTRODUCTION

1.1 Another project on private returns of education?

The main idea behind the literature on education and the labour market is that better educated workers receive an education premium, resulting to higher earnings. We go beyond this well established evidence and raise the question of other potential benefits of education. First we ask whether better educated workers enjoy less unemployment or higher labour market participation. The next question was how persistent are education benefits and could they imply significant longer duration of careers for the high skilled? And finally, could parental labour market

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outcomes influence youth educational attainment making it a two-way relationship? These three questions resulted into three different thesis' sections, a summary of which is presented here.

The three sections deal with "schooling", the human capital an individual acquires usually from the age of five or six until adolescence or early adulthood. We have put the individual at the centre of our research, and we follow throughout his education and working years. It is a micro-level research project, and does not cover issues such as the contribution of education to growth or the social benefits of education. All three sections discuss individual decisions. The educational system, the level of wages, and unemployment benefits, the unemployment rate are exogenously set. Individual ability is also exogenous.

1.2 Extending the Becker/ Mincer approach

This project has its roots in the intellectual tradition initiated by Mincer (1958) and Becker (1964), but extends it to account for issues that have gradually become more relevant such as the effect of education on lifelong labour supply/retirement decision.

This literature on the wage premium (Ashenfelter (1978), Card (1999), Ashenfelter et al., 1999) was developed at a time when the economic benefits of education could be restricted to wages. As the labour market conditions worsened, the question became whether education can also protect against unemployment and inactivity. As soon as from the late 1970's Ashenfelter & Ham (1979) noticed that the benefit of education can be decomposed to an income and a time effect. Much later, Mincer (1991a, b) decomposes unemployment rates into unemployment incidence and unemployment duration. Better educated workers have better probabilities to find a suitable job and remain attached to it, while they face less risk to become unemployed.

The assumption of homogeneous and undifferentiated human capital proved another restrictive assumption, especially for continental Europe with stratified education systems. While US evidence show that vocational high-school courses improve future labour market outcomes for those who choose not to follow tertiary education (Bishop & Mane, 2004; Mane, 1999), research in Europe compares vocational and academic education and the later proves to be more efficient and rewarding in labour market terms (Conlon, 2001; Dearden et al., 2000).

There has been a great concern lately on the effects of ageing in Europe and its labour market implications (Boersch-Supan (2001), Blanchet, (2001)). However, little have been said on how education can affect the moment of individual retirement, probably because many believe that education effects diminish and gradually disappear after entering the labour. We felt however that there might be significant differences in the retirement behaviour between high and low educated individuals, due to heterogeneity in earnings from work, and retirement incomes. Social security schemes might increase or alleviate these differences.

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1.3 Why is Belgium an interesting case?

To extend the Becker/Mincer analysis of education we worked with Belgian data. Belgian educational system delivers heterogeneous forms of human capital (i.e. different tracks). It has large participation rates in vocational and technical programmes (both in secondary and tertiary education), higher from the EU19 and the OECD average (Table 1).

Table 1: Upper secondary enrolment patterns, by programme destination and programme orientation, 2006 (%)

	By programme destination		By programme orientation		
	ISCED 3A[2]	ISCED 3C	General	Vocational	Combined school and work-based
Belgium	49.4	50.6	30.6	69.4	3.5
EU19	70.1	24.1	46.7	47.8	16.3
OECD	69.8	26.0	53.8	44.0	15.2

Source : OECD (2008a)

School performance is higher in general than in vocational education (Table 2). The over 100-point difference in maths and science performance between the two tracks is very large compared to the OECD average and one of the highest among European countries and persists even after controlling for pupils' socioeconomic background (ESCS).

Table 2: Performance of 15 year-olds on the PISA science and mathematics scales

		General programmes (A)	Vocational programmes (B)	(A)-(B)	(A)-(B) after controlling for ESCS
Maths (2003)	Belgium	585	469	116	78
	OECD	510	466	45	27
Science (2006)	Belgium	558	458	100	78
	OECD	509	473	35	24

Source : OECD (2008a, 2007)

Better educated workers perform better in the labour market, in terms of earnings but also in terms of (un)employment rates. According to OECD (2008a), wage premia in Belgium have been relatively stable during the past decade, but, the employment premium has risen. This tentatively suggests that Belgium is ideal to explore the non-wage benefits associated to education.

2. ISCED: International Standard Classification of Education.

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A final reason behind our country choice is simply the novelty of our analysis in the Belgian context. Up to date most works focus on programme and policies evaluation (Cockx & Ries, (2004)), special features of the Belgian labour market (D'Addio & Nicaise (2003)), or policy reforms and their effectiveness (Desmet et al. (2003)).

The dataset we use is the Panel Study of Belgian Households (PSBH) (1992-2002). The survey was launched in 1992 jointly by the Universities of Liege (for Wallonie) and Antwerp (for Flanders). From 1994 till 2002 it became part of ECHP, the European Household Panel. It includes three separate questionnaires, for adults, households and children 0-16 years old. It provides rich information on income, employment and education household composition. Its eleven waves also allow us to follow persons and households and examine transitions and changes in their lives.

2 DO PARENTAL JOBS AND MONEY BUY BETTER SCHOOLING? EVIDENCE FROM TRACK CHOICE IN BELGIUM

2.1 Introduction

Belgium is a country with an extensive social security system which comprises transfers earmarked for families with children, such as child allowances or higher unemployment benefits for those with dependent children. Significant resources are also spent on combating parental unemployment.

Regarding the success of these programs, Belgium seems to have been successful at combating child poverty (child poverty was at 10 percent of the total population in 2005 compared to 11.0 percent for EU-26 and 12.4 percent for OECD (OECD, 2008b)).

Here we discuss a possible causal relationship between parental income and employment with educational attainment, which in its turn is a crucial determinant of the long-term employment and income prospects for children when they will enter labor market. For Belgium, a significant factor for childrens' educational attainment is the sorting between the qualification (vocational and technical education) and the transition (general and artistic education) track that usually occurs around the age of 14. In principle it is considered to be a neutral choice, however in reality it is a strong predictor of continuing and successfully completing tertiary education (Eurostudent, 2005). Given the early age of youth, sorting can be influenced by parental background, including income (Checchi & Flabbi, 2007; Dustmann, 2004). Even in a tuition-free system such as the Belgian one, poorer students could choose the qualification track for example, to enter the labor market sooner. Poorer or unemployed parents could also persuade children to opt for shorter qualification tracks in order to be prepared to enter labor market at the end of compulsory education, or they themselves could lack the motivation to persuade their children to follow more ambitious education tracks (Barron, 2009; Gregg et al., 2008).

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However, there exist several reasons why the relationship between parental income, employment and school choices is not causal. Parents with high income also have higher education, reflecting differences in ability or motivation that might be passed on to their children (Chevalier et al., 2005). Social relations and pressure from peer groups can also inuence schooling decisions (Mohanty & Raut, 2009).

We try to capture causal effects by comparing school choices made by siblings in different points in time, thus we cancel out motivation or ability factors (Levy & Duncan, 2000). We dismiss the idea of a causal relationship once we control for unobserved family characteristics which is in line with similar works that discuss university attendance (Vandenberghe, 2007; Dearden et al., 2004) or track choice in Germany (Tamm, 2008). By contrast, the labour market status of parents could matter.

2.2 Choosing between different educational tracks in Belgium

Education in Belgium is primarily the responsibility of the Communities. The structure of the education system is very similar between the Communities and also resembles those of Central Europe. One of its main features is the existence of multiple tracks and sorting of students at a very early age.

After completing primary education, and providing they have not repeated any grades that far, young pupils enter secondary education around the age of 12. After two common years of studies they are asked to choose among two tracks. The transition track (general and artistic education) provides general and academic knowledge preparing for tertiary education. Since pupils in the transition track usually continue with tertiary education, they also get on average more years of schooling. This in general implies higher earnings (Belzil (2004); Heckman et al. (2003)), lower unemployment and less time spent in inactivity (Mincer, 1991a). The qualification track (technical and vocational) provides professional qualification in several fields (Eurydice, 2001). Many pupils enter this cycle after 14 as a result of poor performance. Although in theory it does not exclude students from tertiary education this is rarely the case.

School systems with very early tracking have been held partly responsible for low mean and high variance in literacy scores of 15-year-olds in the PISA 2000 assessment (OECD, 2000). Furthermore, some works argue that early sorting of students also leads to low educational mobility and could be held responsible for a strong association between educational attainment and labour market inequality (Checchi & Flabbi, 2007).

2.3 The sample and estimation method.

We seek to estimate the effect of family income and parental activity on young pupils' educational choices once we have controlled for family background variables F and child characteristics C. We estimated linear probability models for their

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simplicity and because they give good estimates of the partial effects near the center of the distribution compared to nonlinear estimates (Wooldridge (2001)). To correct for bias resulting from unobserved family factors we used family fixed effects models ([3]) (within-families differences).

The sample included 402 families with at least 2 children in secondary education during the 11 waves of the PSBH (897 observations). For each of the children we observed their track choice and family income and employment at that specific moment (Table 3). We used as controls children's characteristics (sex, age, siblings' birth order, and the number of grade repetitions as a proxy for school performance), and family background (parental education and nationality, region of residence and family wealth). We catch possible time effects with wave dummies.

Table 3: Track choice, family income and employment (percentages)

	Mean (%)	Families that experienced a change ([4])
pupils in the qualification track	32,80	29,10
pupils in the transition track	67,20	15,24
relative family income ([5])	1,362 (0,57)	
father unemployed	8,51	26,44
Father absent	15,72	12,42
Mother unemployed	10,02	35,40
Mother housewife	20,23	19,07
Mother not in the labor force	3,02	42,22
Mother never worked	9,71	10,11

2.4 Results and policy implications

In cross-section models, family income has a strong negative effect on track choice, even after controlling for children's and family characteristics. One unit positive change in the relative position of the household in the income distribution decreases by 35 percent the probability of following the qualification track, after controlling for observable characteristics (Table 4). These results are different from Carneiro & Heckman (2002) and Dearden et al. (2004), where income effects

3. For detailed description of the econometric model and estimation methods used, refer to the complete text: "Education and the Labour market: Three essays on interrelations and multiple effects during lifetime", March 2010, Presses Universitaires de Louvain
4. The third column captures the percentage of families that experienced a change between the time of track choice of the older and younger sibling
5. The income variable includes information on net monthly income from wage, salaries and social allocations. It measures relative household income vis-a-vis mean income per wave, so to capture the relative position of each household in the income distribution and to have comparable information between waves (St.d. in parenthesis).

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become negligible and statistically insignifiant after controlling for observable characteristics. On the other hand, Tamm (2008) is in line with our findings.

Table 4. Family income and track choices (cross-section)

	Model 1 ([6])	Model 2 ([7])	Model 3 ([8])
Income	**-0.504 (0.063)**	**-0.476 (0.061)**	**-0.352 (0.067)**
Income square	**0.080 (0.014)**	**0.076 (0.014)**	**0.070 (0.013)**
Obs	897	897	897

(in bold): statistically significant at 95 percent confidence level

School performance, measured by no grade repetitions has a strong negative effect on choosing the qualification track. Low-educated parents increase the probability of children following the qualification track, with mothers' education having a larger effect on track choices, implying a greater impact on children's school performance and preferences.

When we control for unobserved family characteristics (sibling fixed effects), the income effect remains negative, however it shrinks considerably and is no longer statistically significant. This implies that children face no short run constraints due to low income. Our results are in line with Tamm (2008). We can then interpret findings in both works as a proof of no causal relationship between income and track choice.

We get different results once we regress track choice on parental activity (Table 5). When the father is unemployed, there is a greater probability that children will follow the qualification track. This effect remains significant (at 90 percent confidence level) even after controlling for income. On the other hand we get a positive effect on track choice when the mother stays at home, implying that quality time spent with children has a positive influence (non-significant coefficients are probably due to small sample). Our results are somewhat different from those in Nörberg-Schönfeldt (2008). They find that full-time working mothers as well as non-working mothers have negative impact on their children's school performance, compared to part-time working mothers; these differences between them and us, could just reflect different model specifications. However, the general idea is that a mother affects her children's choices and school performance through income and the time she spends with them. The one effect offsets the other (the more she works, the more she can provide but also the less she interacts with her children) and the final result is ambiguous.

6. Regress only on family income
7. Model 1 plus controls children's characteristics
8. Model 2 plus controls family observed characteristics

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Table 5. Parental activity and track choices (FE models, st.errors in parenthesis)

	Model 4 ([9])	Model 5 ([10])	Model 6 ([11])
Unemployed father	*0,188 (0,110)*	*0,208 (0,127)*	*0,181 (0,108)*
Unemployed mother	-0,089 (0,081)	-0,118 (0,083)	-0,046 (0,081)
Housewife mother	-0,143 (0,122)	-0,142 (0,123)	-0,189 (0,116)
Mother never worked	*-0,371 (0,195)*	**-0,391 (0,197)**	**-0,366 (0,187)**
Observations	897	897	897

(In bold): Statistically significant at 95 percent confidence level

(in italics): Statistically significant at 90 percent confidence level

In general the results suggest that mother's activity affects children's education mainly in the long run compared to the effects of father's activity which are mainly in the short run (track choice is affected by father's activity at that point in time), while income effects are negligible. Therefore income interventions at the age of track choice might have minimal or no results at all. Alternatively, increasing father's employment can improve track choices in the short run.

3 GENERAL EDUCATION VERSUS VOCATIONAL TRAINING. HOW DO THEY AFFECT INDIVIDUAL LEARNING PERFORMANCE?

The scope of this chapter is to examine possible gains from different forms of education (general and vocational, initial and lifelong), in terms of income and unemployment.

Compared to the traditional human capital model (Becker, 1964) and earnings' equation developed by Mincer (1974) we still measure schooling with years spent in education but we distinguish between general and vocational education and introduce vocational life-long training.

Then we estimate separately the effect of education on monthly wages, labour supply and unemployment. They sum up to the total effect of education on individual annual earnings and reflect the idea that individual gains from education come not only from increased wages but also from better career prospects.

9. Regress on parental activity
10. Model 4 plus controls for income
11. Model 5 plus controls for children's characteristics

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3.1 The multiple dimensions of education

We wanted to create variables to measure the duration of schooling, but also to capture qualitative aspects of education such as the curriculum, specific features of the educational system and educational reforms.

To this end we examined thoroughly the Belgian education system, its specificities due to the federal nature of the state, the cycles of education (primary, secondary, tertiary), two major educational reforms, one in 1971 that changed the structure of secondary education and one in 1990 that affected tertiary education. Finally we distinguished between general and vocational school tracks and also included in the analysis post-school vocational courses (offered at workplace or elsewhere e.g. ORBEM).

Depending on the questions asked the relevant literature delivers different results. Evidence from the US (Mane (1999)) suggests that pupils who do not continue to college, do considerably better when they follow a vocational high-school curriculum. On the other hand, European (including UK) surveys report extra gains for individuals with academic qualifications (McIntosh, 2004; Conlon, 2001). However, there is the argument that better performance in the labour market is not a result of academic qualifications, but rather an indication of self-selection bias, since abler individuals usually follow general education (Malamud & Pop-Eleches, 2008).

Evidence also suggest that education benefits depend on several factors other than duration and type of schooling, such as successfully completing a course, the field of studies and its relevance to the labour market and the sector (Grubb, 1997; McIntosh, 2004).

3.2 Monthly or annual earnings?

Crucial to the analysis is the choice of a measure of earnings, which is however often dictated by necessity (available information on datasets) (Card, 1999).

Reported effects of schooling on annual earnings are usually higher than the effects on monthly or hourly earnings (Card, 1999; Mincer, 1974), since annual income is the product of hourly wages, hours worked per day, and days worked per year. Going a step further, an individual receives income a) when he is in the labour market i.e. is not in education or retirement and b) when he is not unemployed.

Employment surely depends on education, otherwise, the effects of education would be the same, no matter the time dimension of income.

Usually the education/working time relationship is positive either because labour supply increases with schooling or because more educated individuals become less frequently unemployed and/or spend less time in unemployment. Both of these explanations are plausible (Table 6).

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Table 6: Labour force participation (LFS) and unemployment rates by education and gender, Belgium, 25-64 year olds (2001)

	Education				
	Below upper secondary (≤12yrs)	Upper secondary and post-secondary (12-14 yrs)	Tertiary non-university (13-14 yrs)	University and post-graduate(≥ 18yrs)	All levels
LFS rates					
Males	69	87	91	92	81
Females	39	69	81	84	60
Unemployment rates					
Males	7.4	4.4	2.5	2.5	4.8
Females	10.4	6.9	2,4	3.8	6.3

Source : OECD (2003) Extracts from Tables A12.1 and A12.2

Education improves labour market experiences via technological changes (Nickell & Bell, 1995), screening from employers (Holzer, 1996), more effcient on- and off-the-job searching (Mincer, 1991a), psychological and sociological reasons (discouragement and exit from labour force for less skilled workers, family decisions such as the raising of children). It is interesting to estimate the gap between education effects on annual and monthly earnings and see which part is due to higher labour force participation and which part to less unemployment.

Among the first to discuss these issues were Ashenfelter & Ham (1979) (A&H), whose model we use here. They assume that labour supply (h*) is the sum of employed (h) and unemployed (u) months, i.e. h*= u+h. All months spent in activities other than in a job or in unemployment are assumed as a part of an individual's decision not to offer his labour supply. This holds as long as no restrictions such as compulsory schooling or compulsory military service exist.

With a monthly wage w, desired earnings are then:

wh* = w(h + u) ⇒ wh* = wh(1 + u/h) (1)

where wh are annual realised earnings from work and u/h is the fraction of unemployment to employment months. By taking logs and differentiating with respect to schooling S the relationship becomes:

$$\frac{\partial \ln wh}{\partial S} = \frac{\partial \ln w}{\partial S} + \frac{\partial \ln h^*}{\partial S} - \frac{\partial (1 + u/h)}{\partial S} \qquad (2)$$

Equation (2) decomposes the effect of schooling into its parts, i.e. the effect of schooling on wages, labour supply and u/h. Assuming that *wh*, *w*, *h** and *u/h* are linear functions of schooling and a vector *x* of explanatory variables (equation (3)), any consistent estimates of β's would estimate the gap between education returns on annual and monthly earnings and determine its source.

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$$\ln y_i = \alpha_i + \beta_i S + x_i'\gamma + \varepsilon_i \quad (3)$$

Any consistent estimates of the return to schooling in (3) will satisfy the relationship

$$\hat{\beta}_{wh} = \hat{\beta}_w + \hat{\beta}_{h*} - \hat{\beta}_{u/h} \quad (4)$$

which is equivalent to (2). Equation (4) gives four possible cases that explain the gap between monthly and annual earnings. The first is the trivial one $\hat{\beta}_{wh} - \hat{\beta}_w = 0$, implying that education has no effect on employment time. $\hat{\beta}_{wh} - \hat{\beta}_w = \hat{\beta}_{h*}$, implies that education does not affect unemployment and the gap is due to the effect on labour supply. The third $\hat{\beta}_{wh} - \hat{\beta}_w = \hat{\beta}_{u/h}$ case implies that labour supply is independent of schooling. The last case is that all components in (4) are different from 0 and both labour supply and unemployment matter.

3.3 The sample and estimation techniques

We use longitudinal data, which, compared to cross section, allow for control for omitted or unobservable individual specific effects. However, we cannot use any of the two traditional panel data estimators (fixed- and random-effects). With FE our main variable schooling is eliminated from the transformation of variables as deviation from the mean, as it is time invariant. RE produces inconsistent estimates if schooling is correlated to unobserved ability (a plausible assumption in this kind of models). Hausman & Taylor (1981) (HT) have then proposed an instrumental variable estimator that produces consistent estimates for time invariant variables. The idea behind HT is that control variables are divided into four groups depending on their time variability and their correlation to unobserved effects. Appropriate estimation techniques are used to produce estimates for each group. The drawback is that we need to make assumptions as to which control variables are exogenous; this can prove to be a tenuous task and here we omit all econometric details.

We use data from years 1995-2001 of the PSBH. The sample includes males and females 18-65 years old, who have completed school and are at least one year working or unemployed. This left us with 10,811 observations (2,765 individuals).

We use four variable groups:

i. The education group: years of (school) education, general and vocational, and after-school vocational education.

ii. The income group: net annual income and monthly wages.

iii. The time variables group: months in employment, unemployment and labour supply.

iv. The control variables group: Marital status, age cohort, health, experience and experience square, sector of employment, profession and region (time-variant) and sex, nationality, father and mother education (time-invariant).

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Income (annual and monthly) and education are positively correlated and the correlation is larger for general education. Individuals with less than compulsory education earn 76.2% and university graduates earn 132% of the average monthly income. This divergence is even higher when we compare annual instead of monthly earnings.

An individual with primary education spends around 4.5 less days per year in the labour market compared to a university graduate. He also faces about 9% higher unemployment to employment (u/h) ratio. Again individuals with vocational education have higher u/h ratios, but we see no significant differences in labour supply.

41.16% of the sample has followed after school vocational education. Workers with higher-than-average schooling engage more often in after school vocational education and training; a first indication that initial and after-school education are complements. Most workers follows courses organised at school or other academic establishment (18.66%).

Most of individuals in the sample are married, have good health, are Belgian citizens, age 30 to 45, they work in the services sector and live in the Flemish region.

3.4 Estimation results

Estimation results (Table 7) show strong and significant effects of education on income and employment time.

Table 7. Estimation results using HT estimators (st. errors in parentheses)

	Annual income	Monthy wages	Labour supply	Unempl/ empl
Initial education: Years Vocational	**0.193 (0.042)** **-0.078 (0.024)**	**0.098 (0.029)** **-0.056 (0.015)**	**0.041 (0.015)** *-0.018 (0.011)*	**-0.048 (0.015)** **0.0024 (0.012)**
Followed adult education after: General educ. Vocational educ.	**0.2519 (0.0849)** **-0.068 (0.026)**	**0.024 (0.007)** -0.013 (0.014)	0.004 (0.008) -0.005 (0.015)	-0.007 (0.008) **0.050 (0.015)**
Obs.	10,811			

(in bold): statistically significant at 95 percent confidence level

(in italics): statistically significant at 90 percent confidence level

For all estimated coefficients, equation (4) approximately holds. For example, applying (4) to education coefficients, leaves us with (0.193 – 0.098 – 0.0409 + (-0.048)) = -0.0061, a very small and not statistically different from 0 difference. Hence the initial hypothesis that the effect of education on earnings is decomposed to the effect on monthly wages and employment time is confirmed.

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General education produces better incomes, less unemployment, and more time in the labour market. These results are in line with European surveys that speak in favour of general education (Dearden et al., 2004; Cooke, 2003; Conlon, 2001).

The effects of vocational after school education vary considerably depending on completed schooling ([12]). There are considerable gains from after school education for those secondary education or university graduates, implying that general and adult education are complements. Similar results are found in Cooke (2003).

The effects of initial general education are higher for women than for men for all of our four models. Education is more important for participation in the labour market for women than it is for men but it does not change wages of men and women. Vocational initial education implies lower wages and consequently earnings for both genders, but it hurts women more.

We also estimated separate models for three age cohorts: those born before 1945, between 1946 and 1965 and between 1966 and 1983. The main conclusion was that education affects mainly younger cohorts, both in terms of earnings and time.

Finally we performed separate regressions for the three Belgian regions (Wallonie, Flanders and Brussels). Initial general education has strong positive effects for those who live in Brussels and in Flanders, while effects for Wallonia are much smaller. Moreover, in Wallonia there is a much stronger negative effect of initial vocational education compared to Flanders. The return of after school vocational education is higher for Wallonia, slightly lower in Flanders and much lower in Brussels.

3.5 Conclusions

Not many studies estimate the effect of education on earnings and employment time in the way that it is done here. We have shown that education improves significantly not only the income of individuals but also the experiences they have in the labour market. This improvement is much larger than traditional estimation methods predict.

Comparing general and vocational education, the evidence speak in favour of general schooling, both in terms of income and employment, even after controlling for individual ability. Vocational education and training seems a better choice after school. The assumption of complementarities between initial and after school education is also confirmed.

Individuals should be encouraged to receive education to enjoy higher income and better labour market experiences. However the choice between different types of education also matters.

12. Results are available upon request from the author

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4 RETIREMENT, EDUCATION AND THE ROLE OF PENSION BENEFITS

4.1 Introduction

Modern societies are getting older as a result of dramatic drop in birth rates and improved medical and living conditions that raised the average age expectancy. According to the European Commission, from 2010 the EU15 will start experiencing a fall in the total working age population and from 2020 a fall in the total population (EC, 2003a). At the same time, employment and labour force participation of older workers drops because of generous retirement benefits and other retirement incentives. Among European countries, Belgium holds one of the last positions (EC, 2003a) in employment and participation of older workers.

These demographic changes cause major burdens on social security and medical care systems (EC, 2003a), significant wage/ productivity gaps (Hellerstein et al., 1996), increased labour costs, drops in the productivity, and uncovered vacancies (EC, 2003b). For policy makers the answer to these problems is to increase labour force participation and employability of older workers (EC, 2003a, b, 2002). They propose education and training as means to keep older workers longer in the labour market.

In Echevarria & Iza (2006), individuals engage in education because they discount future wages and future pension benefits. Then, the better educated enter the labour market later and they prolong their stay in education, because of higher discounted wages and pensions. In our case all workers enter the labour market at the same time, but higher ability workers have accumulated higher human capital. This is crucial, as in our model, postponing retirement implies a true increased duration of working lives rather than a later age of leaving the labour market.

We present analytically and expand a lifecycle model of human capital and earnings with endogenous retirement (Alders (1999)). Then we change the initial assumptions on retirement benefits and examine the implications. In most cases, human capital postpones individual retirement decisions, but the magnitude of this effect depends strongly on the assumptions made on retirement benefits.

4.2 Some facts on retirement decisions and pension systems.

Policy makers insist that education and training will increase employability of older workers, and this will help improve the burden on social security and health systems. On the other hand the general rise in the education level during the past decades does not seem to increase average stay at the labour market.

Below we examine how the probability of being employed by age and education level has evolved through years, using data from the Belgian Census for 1961 and 2001. The sample includes males 50 to 65 years old. We used three variables:

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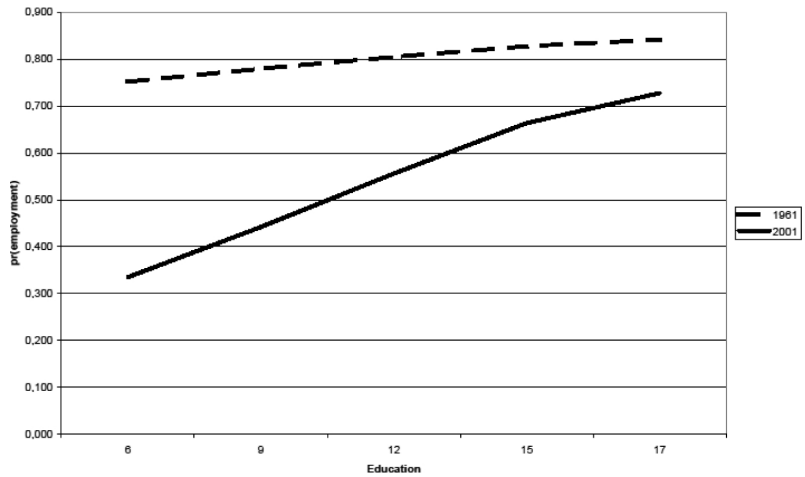
i) *year*, a dummy for 1961 or 2001, ii) *school*, for education years and iii) *comb*= year × school, to measure joint effects of education and year. The reference year is 1961. Table 8 shows estimated employment probabilities for different levels of education. Figure 1 presents graphically the results.

Table 8: Employment probabilities by education level, males 50-65, Belgian Census 1961 and 2001 (%)

education	1961	2001
6	75.2	33.5
9	78.0	44.2
12	80.5	55.6
15	82,8	66.4
17	84,2	72.8

Between 1961 and 2001 there has been a dramatic drop in the employment probability for older workers for **all** education levels (downward shift in the employment probabilities curve in Figure 1) by on average nine percentage points.

Figure 1 : Employment probabilities, men 50-65, Belgian Census, 1961 and 2001



Between 1961 and 2001 we notice a significant increase in the human capital effect on employment probability (steeper probability curve for 2001). Human capital increases the probability of remaining in the labour market after the age of 50 and the effect is statistically significant both in 1961 and 2001. Moreover in 2001 there is an extra education gain in the probability of employment. We develop then a theoretical model to explain why education keeps workers longer in the labour market and why this effect is stronger in 2001 than in 1961.

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4.3.A lifecycle model with endogenous retirement

At the beginning of their lives individuals are full time in education. They enter the labour market at time 0, and they are endowed with H(0). After entering the labour market, employees share time between work and OJT (OJT increases their human capital stock). Human capital is subject to an exogenous rate of depreciation, as workers' physical and mental condition deteriorates, and as new technologies make human capital obsolete.

Workers differ in learning efficiency during schooling (initial human capital) and in OJT (here we assume that these two are equal). Hence workers end up with different levels of human capital because of individual ability and not because of more education years.

After entering the labour market, individuals work full-time until point Tr_i. After that point they retire and use all of their time as leisure, until time T, which is the point of physical death. They maximise their lifetime utility under a budget constraint. Utility is the sum of utility accumulated during work and during retirement.

While at the labour market, the individual receives income from work and accumulated assets and spends on consumption. Labour income $I(t) = wH(t)(1–s(t))$ depends on three factors a fixed wage rate w (no heterogeneity between jobs), human capital at time t, H(t) and s(t) which is the fraction of time spent on OJT. Even though all jobs are the same, high skilled workers receive more money from work because they have a higher H.

After retirement, individuals receive some form of retirement benefits b(t). For now we assume that b(t) is a function of time, thus retirement benefits are the same (uniform) across workers and are independent of human capital and past income history.

4.4 The retirement decision

The time of retirement is endogenous and this is what distinguishes this paper from similar literature. Workers decide their retirement by maximising their lifetime utility under a budget constraint. If the utility from leisure is larger than the utility of continuing working (and enjoying higher consumption) then the worker retires. At the moment of retirement, leisure and consumption utility are equal. To examine the effect of human capital on retirement decisions it is then sufficient to examine the effect of learning skills on retirement, because here these two are positively and linear correlated. We omit here the all the algebraic details and formulas and discuss results intuitively.

There are two opposite effects of human capital on the retirement decision. The first is an income effect. High skilled workers have a higher lifetime income. For them, leisure is less expensive in terms of consumption and they have a higher demand for leisure. If the income effect prevails, high skilled workers leave the labour market earlier. The income effect is negative and smaller than 1 in absolute value.

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The second is a substitution effect. High skilled workers earn at each point in time better wages. As a result, retirement implies a higher opportunity cost making leisure more expensive in terms of consumption. It is positive and larger than one. When the substitution effect prevails, high skilled workers retire later. Which one of the two prevails depends on the level of intertemporal rate of substitution (ρ) that is the rate of time preferences of individual for the present or the future. High skilled workers retire later for $\rho>1$ and also for $\rho< 1$, as long as wealth or retirement benefits are non-zero. Most empirical works in the field report ρ's above 0.5 and some are even close to 1 (Koskievic, 1999; Hahm, 1998; Kugler, 1988; Barro & King, 1985). With these estimates we can safely expect high skilled will retire no earlier than the low skilled.

4.5 Retirement decisions under different retirement schemes

Up to now, we assumed uniform retirement income across workers. In real life retirement benefits depend on past and present income; therefore they also depend on human capital. Especially for Belgium, retirement pensions are a function of past income, years in the labour market and family structure. There are also "floors" and "ceilings" in pensions (Office National des Pensions (www.onprvp.fgov.be)).

First we assume that retirement benefits depend on income at the moment of retirement *(bH(t) = γwH(t))*, with γ being the replacement rate (here constant). The basic guidelines of the model are the same as before. However the income effect is now larger than in benchmark case of uniform retirement benefits. High skilled workers have a higher total income not only because they receive higher wages during their working careers, but also because they receive higher benefits when they retire. As a result, high skilled workers have a higher incentive to retire earlier.

The substitution effect, contrary to the benchmark case is smaller (it is equal to 1). With uniform b(t), high skilled workers faced a higher opportunity cost of retirement. Here high skilled workers do not face such a cost, because everyone receives a fixed share of his past income as retirement benefit.

The last case we discuss, is the case of "floors and "ceilings". We assume that the replacement rate is negatively related to past income, i.e. that those who earn more when at work receive a smaller share of their work income effect as pension. In this case $(bH(t)) = \gamma(H(t))wH(t)$, with $\frac{\partial \gamma}{\partial H} < 0$. In this case the income is negative and smaller than 1 in absolute value and the substitution effect is positive and larger than 1.

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4.6 Comparing retirement incentives for high-skilled workers.

Human capital affects retirement decisions, but the sign and magnitude of this effect depends on several factors such as the rate of intertemporal substitution ρ, the size of wealth and the pension benefits scheme. We compare now the three benefit cases (uniform b, constant replacement rate and variable replacement rate) as to the retirement incentives they create for the high skilled. We are interested in the relative position of the three regimes as to one another and we set ρ to be the same for all cases and equal to 1, and that workers have no wealth besides their work income.

We omit all algebraic details and only discuss the findings. The constant replacement rate regime gives the least incentives for high skilled to postpone retirement. Under this regime, all workers receive a fixed share of their past income when they retire. Heterogeneity among high and low skilled is only due to the income effect. Then compared to the other two regimes, heterogeneity from human capital is minimal.

In the other two regimes human capital introduces some sort of heterogeneity that makes leisure more expensive in terms of consumption for better educated workers. With uniform benefits, high skilled workers receive a human capital premium in their wages but loose this premium once they retire. In the variable replacement rate case, they receive a higher lifetime income, and they can integrate part of this human capital premium (but not all) to their pensions.

We cannot easily determine whether it is the uniform or the variable replacement rate regime that create more incentives for high skilled workers to postpone retirement. In the variable replacement rate case we end up with a larger income effect than in the uniform case. High skilled workers receive part of their wage income in their pension benefits and have a higher lifetime income. Then they have more incentives to exit the labour market earlier. The substitution effect is also larger in the variable replacement rate regime. At the moment of retirement, high skilled workers receive a smaller share of their past income as retirement benefit compared to the low skilled and they have more incentives to stay in the labour market. Which of the two prevails depends on the specific form of the replacement rate. In general if the replacement rate falls sharply with human capital, the magnitude of the income effect becomes smaller and the magnitude of the substitution effect becomes larger and the variable replacement rate regime gives more incentives for high skilled workers to retire later.

The discussion so far helps explain the rising in the slope of the probabilities curve (Table 8 and Figure 1). The rise in the education effect on employment probability can possibly be explained by a drop in the replacement rate for high skilled workers. Indeed we found data that confirm that low-skilled face higher replacement rates and the gap should have widened during the past 4 decades. Pestieau & Stijns (1997) calculate net replacement rates for 1991 (NRR). A single worker who earned two thirds of average income had a NRR around 0.91. The same replacement rate was 0.80 for a worker who earned 100% of average earnings and 0.60 for someone who earned double the average earnings.

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Blondal & Scarpetta (1999) report disability benefit replacement rates (gross). In 1961 these rates were around 0.40 for all workers. In 2001 they were 0.53 for low earners and only 0.45 for high earners. At the same time disability and other non-work benefit schemes became the path to early retirement for Belgian workers. While in 1961 around 35% of 55+ workers received some form of non-work benefit, this percentage rose to over 65% in 1995. These paths to early retirement became mainly available to those working in low skilled sectors such as manufacturing and mining giving another explanation why the human capital effect on employment has risen between 1961 and 2001.

Finally, we will shortly comment on the downward shift in employment probabilities for all education groups. In our model a positive shock in the level of retirement benefits increases the incentives to retire. Evidence shows that between the 1960's and 1990's old age pension wealth, i.e. the discounted value of old age benefits minus the discounted cost of obtaining them, has significantly risen. A 55-year old Belgian worker in 1967 would expect a 0.2% increase in his old-age pension wealth when postponing his retirement unitil the age of 64. A similar 55-year old worker would expect a 2.3% drop in 1995 (Blöndal & Scarpetta, 1999). Retirement was much more attractive during the 1990's than what it was in the 1960's explaining the downward shift in employment probabilities.

4.7 Conclusions

The relationship between human capital and retirement exists but is far from being positive and linear. We described here a theoretical model that shows that human capital affects the moment of retirement for individuals, but the sign depends on a number of factors. Assuming that higher human capital implies better earnings, high skilled workers have earned more money throughout their lives and retirement is cheaper in terms of consumption (income effect). But retirement includes a higher opportunity cost for them, which induces them to stay longer in the labour market (substitution effect). Which one of the two prevails depends on the parameters of the model.

When we relax the assumption of uniform old age benefits, the effects of human capital on retirement change. A constant replacement rate benefit scheme gives more incentives to exit the labour market earlier compared to uniform and variable replacement rate that create some sort of penalty for the high skilled.

Here we assumed that human capital affects retirement via higher wages, and did not examine other possible effects, such as pleasure from work. Such an assumption would probably strengthen the conclusion that high skilled workers remain longer in the labour market.

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