Free Higher Education

Regressive Transfer or Implicit Loan ?

V. Vandenberghe

Discussion Paper 2005-31

Département des Sciences Économiques
de l'Université catholique de Louvain

UNIVERSITAS CATHOLICA LOVANIENSIS SEDES SAPIENTIAE 1425

UCL

Free Higher Education

Regressive Transfer or Implicit Loan?

June 2005

V. Vandenberghe[*][!]

Abstract:

Should access to higher education remain 'free'? Theoretical answers to this question are at least twofold. First, public higher education is said to be regressive as a privileged minority profits from extra human capital, and all the private benefits it generates, while the general public foots the bill. A frequent reply is that higher education students enjoying 'free' access are implicitly borrowing public money that they pay back when entering the labour market, via progressive income taxes. Using a simple lifecycle framework this paper produces realistic estimates of how much graduates are likely to 'reimburse' society via income tax. Using Belgian data on higher education public expenditure and income taxes paid by both graduates and non-graduates over their lifetime, we show that the implicit reimbursement rate ranges from 37% to 95%. It is much higher for bachelors than master graduates, and for males.

JEL classification: I28 (Education: Government Policy), H520 (National Government Expenditures and Education).

Key works: Higher Education Finance, Regressive Transfers, Implicit Loans.

[*] Economics Department, IRES, Université Catholique de Louvain, 3 place Montesquieu, B-1348 Belgium. Email : vandenberghe@ires.ucl.ac.be. Fax : + 32 (0)10 47 39 45

[!] We would like to thank F. Waltenberg and participants of the EALE-SOLE 2005 conference for their helpful comments and suggestions on preliminary versions of this text. All remaining errors and omissions are ours. This research benefited from the ARC convention 02/07-274 (French-Speaking Community of Belgium) and the grant PAI P5/10 (Belgian Federal Government).

Introduction

In most European countries, public financing has been considered as the traditional approach for supporting higher education. Even if tuition fees have been introduced in various countries, they only contribute for a small amount in addition to resources provided by governments. The average subsidy rate for higher education[1] in European countries ranges from 76% to 99% (Debande, 2003). In most cases the subsidy rate is above 90%. But this situation is currently debated. The existing economic literature (Johnes & Geske 1993 ; Creedy, 1995) suggests al least two strains of apparently conflicting reasoning on this issue.

First, many economists consider that using public to finance higher education is regressive (Hansen & Weisbrod, 1969 ; Barr, 2001, 2002 ; Chapman 1997, 2001 ; Johnstone, 2004). Despite public financing and decades of political efforts to democratise access to higher education, enrolment and diplomation statistics reveal the persistence of a strong social bias in favour of better-off students. A socially privileged minority gains access to human capital, and all the private benefits it generates, while the general public foots the bill. Other economists (Creedy, 1995 ; Levy-Garboua, 1999 ; de la Fuente & Jimeno, 2005 ; Vandenberghe, 2004) reply that higher education students enjoying 'free' higher education are just implicitly borrowing public money that they pay back when entering the labour market, via progressive income taxes. Financing higher education with income tax money imposes and obvious burden on those who do not invest in higher education. But it is not a 'free' good from the point of view of the graduates who must pay higher taxes than otherwise during their working lives (Creedy, 1995). This is the implicit loan argument.

The central aim of this paper is to disentangle these two apparently conflicting arguments. It is to develop and estimate a model of finance by implicit loan, in which the *ex post* contributions by both graduates (ie,

[1] Defined as the share of direct public expenditure in educational institutions and total public subsidies to households and other private entities in total sources of funds for higher education.

the magnitude of implicit reimbursements) and non-graduates (ie, the importance of potentially regressive transfers) are identified.

Section 1 exposes the simple model developed to assess the outcomes of a system where public higher education operates as an implicit loan mechanism. Section 2 contains the presentation of the Belgian data exploited to estimate this model and the method developed to estimate the level of contributions that non-graduates and different categories of graduates are likely to make via progressive income taxation. Section 3 contains the results and concludes.

1. Financing higher education via an implicit loan mechanism: a simple model

As stated in the introduction, 'free' higher education can be conceived as an implicit loan mechanism: student enjoy 'free' access but they are implicitly charged when entering the labour market, via higher income taxes. Before moving to empirical analysis and simulation (section 2) we need to develop a simple model reproducing – with a reasonable level of realism -- the functioning of a such a system.

We shall assume that the current level of per student public spending corresponds to a human capital loan or investment (*INV*) made by society on a (fraction) of a particular cohort. It takes place at the age of *18* and lasts until age 65. Non-graduates start repaying immediately, provided they make enough money to pay income taxes. While graduates logically start repaying later: at the age 22 for bachelor graduates and 24 for master graduates. In other words, we envisage the situation where public resources financing a particular cohort's 'free' higher education is equivalent to a piece of public debt, issued when individuals are aged 18 and paid gradually during their whole working live.

1.2. Income tax

Implicit loans are paid by income tax. We thus need to build taxation profiles T capturing future fiscal contributions by individuals, at different points of their adult lifetime. We also need to express these values – and all the others at stake -- in *present* value Euros. Said differently, monetary units of a certain age of the cohort's lifecycle. We retained the age of 24.

But not all income tax receipts from a particular cohort are used to finance higher education investment. A reasonable and simple assumption is to consider that there will be a fraction η of present value of total income taxes implicitly used to cover investment costs. In algebraic term the value of η must verify:

$$N\ INV\ (1+r)^5 = \eta\ \left[N \Sigma_a\ [T_{a,g,}\ (1+\tau)^{a-24}\ /(1+r)^{a-24})] + (P-N)\ \Sigma_a\ [T_{a,ng}(1+\tau)^{a-24}\ /(1+r)^{a-24})]\right] \qquad [1]$$

where:

- a ranging from 18, 22 or 24 (the moment of labour market entrance) to 65 (the end of working live);
- T is the expected amount of income tax paid by the representative individual (graduate and non-graduate);
- r the discount rate;
- N is the number of graduates in a cohort, P is the size of the whole population;
- τ capturing the general tendency of wages and thus taxes to grow, due for example to technological progress[2] ;

[2] We assume here that wage progression is uniform across the education distribution. This assumption might be irrelevant in the presence of strong skill-biased technological progress resulting in a rising higher-education/college premium (Taber, 2001). The latter is well documented in the context of the US or the UK. The evidence is less clear for continental Europe, and Belgium in particular (OECD, 2000).

The second term of the right-hand term in equation 1 reflects the contribution of non-graduates (those who do not attend higher education). Equation 1 can be restated, after dividing both sides by N, to become:

$$INV\,(1+r)^5 = \eta \left[\Sigma_a \left[T_{a,g}(1+\tau)^{a-24} / (1+r)^{a-24}\right)\right] + \theta\, \Sigma_a \left[T_{a,ng}(1+\tau)^{a-24} / (1+r)^{a-24}\right)\left]\right] \quad [2]$$

with $\theta \equiv (P\text{-}N)/N$ the relative importance of non-graduates vis-à-vis graduates.

From equation 2 we derive the central expression of our analysis:

$$RIR_g \equiv \eta\, \Sigma_a \left[T_{a,g}\,(1+\tau)^{a-24} / (1+r)^{a-24}\right)\right] / INV\,(1+r)^5 \quad [3]$$

where RIR_g captures the rate of implicit reimbursment of educational investment by graduates. The higher this rate, the lower the level of regressive transfers between non-graduates and graduates.

Note that if we assume that T is the result of progressive taxation of annual gross wage ie, $T(gw)=bgw+c(gw)^2$ with $c>0$, we clearly have that -- for any value of η -- ηT is also progressive[3].

Finally, it is also implicit from equations 1,2 & 3 that the data we will be using are *cross-sectional* and not longitudinal. Transforming these data in lifetime wage functions or profiles need to be done with some care. As suggested by Jacobs (2002), the main reason why cross-sections differ from time-series is that there is wage growth due to total factor productivity gains (technological progress). This justify the presence of τ capturing the general tendency of wages -- and thus taxes -- to grow in real terms.

[3]Considering that progressivity requires rising average tax rate (*ATR*), we have indeed:

$\underline{T(gw)\ \ :}$	$\underline{\eta.T(gw)}$
$ATR=b+c.gw$	$ATR=\eta(b+c.gw)$
ATR rises with gw if $c>0$	*MTR* is also rising with *gw* if $c>0$

1.3. Refinements

Higher education is vast and relatively heterogeneous. The typical investment on a student attending a bachelor program (*dur*=3 years) is obviously less important than the one made on someone attending a master (*dur*=5 years). In addition, annual per student costs (*INVY*) can vary across programs. It makes thus perfect sense to consider that implicit borrowing varies significantly among graduates. This justifies assuming implicit loans of different size across categories *k* or graduates.

$$INV_k = dur_k \; INVY_k \qquad [4]$$

Similarly, tax contribution is likely to vary a lot among graduates. Hence, it might interesting to estimate the rate of implicit reimbursement of higher education costs by category *k*.

$$RIR_{g,k} = \eta \; \Sigma_a \; [T_{a,g,k}(1+\tau)^{a-24} /(1+r)^{a-24})] \; / \; INV_k \; (1+r)^5 \qquad [5]$$

2. Empirical evaluation

In the simple model above, the key variables are the taxation profiles (*T*) of non-graduates and graduates and the implicit reimbursement of educational investment by graduates (*RIR*). The former will be estimated here after, while the results for the latter are presented in section 3. We could immediately have move to the simulation exercise, using somehow arbitrary values for each of these parameters. But the result would be trivial and bring little substance to the paper. So we opted for the more appealing approach that consists of estimating the value of the profiles or parameters using real information on tax payments of both graduates and non-graduates.

2.1. Data

Our data come from a 2002 Belgian survey: the Panel Study on Belgian Households (PSBH). For a sample of 4,068 individuals it provides data on annual net and gross wages, participation to labour market, working hours and personal characteristics (age, gender, region of residence and – most importantly – education).These data are useful to evaluate the relationship between the type of higher education (bachelor or master[4] degrees) and wage or taxation at different stages of individuals' career, relative to less educated people.

Insert table 1 about here (sample characteristics)

2.2. Taxation profiles

We do not use these individual data directly to compute taxation. The amount of missing values about net and (even more importantly) gross wages would represent a significant loss of information. Our strategy is inferential as it aims at using individual data to estimate plausible taxation by age *profiles*.

We first use individual net wage data (w_i,), to estimate the OLS coefficients of a 2nd order polynomial function of experience (equation 6), separately for non-graduates and graduates, but also sub-categories of graduates (bachelor, master, male, female...).

$$w_i = \alpha + \beta \, exp_i + \gamma \, (exp_i)^2 + \varepsilon_i \qquad [6]$$

where potential work experience (*exp*) is defined as the number of years since (theoretical) graduation age (ie; 17 for secondary school drop-outs, 19 for secondary education; 21 for bachelors, 23 for masters). Note that the dependent variable covers part-time workers as well as people without salaries. Strictly speaking

[4] Typically organised within universities

thus, it combines the wage and employment benefits of education. In the Belgian context, the second effect is particularly important. As shown by Karasiotou (2004) up to 50% of the total labour market benefit of education is generated by higher employment rates.

Second, using equation 6 OLS coefficients (α, β, γ), we compute expected net wage by age[5] profiles ($w_{a,j,k}$) for graduates ($j=g$) and non-graduates ($j=ng$), as well as for different categories k of graduates (bachelor vs master degree, female vs males, people living in Flanders vs Wallonia or Brussels).

A third step implies computing expected tax by age profiles ($T_{a,j,k}$). This is done in two stages. We first estimate the OLS coefficients of the individual gross wage (gw_i) regressed on a 2nd order polynomial of net wage (w_i).

$$gw_i = \gamma + \delta w_i + \zeta (w_i)^2 + v_i \qquad [7]$$

We then compute the expected gross wage ($gw_{a,j,k}$) by applying equation 7 OLS coefficients (γ, δ, ζ) to the values generated by the net wage by age profile ($w_{a,j,k}$). Our taxation profiles are obtained simply by taking the difference between expected net and gross wages ($T_{a,j,k} \equiv gw_{a,j,k} - w_{a,j,k}$). Examples of these profiles are displayed in graphs 1 & 2.

Insert graph1 (male) & graph 2 (female) about here

Results suggest sizeable differences in lifetime contributions. They also clearly show that higher education graduates are likely to pay more taxes on wages. These estimates also confirm the persistence of significant gender gaps.

Note also that our profiles can be used to estimate present values of lifetime gross wages and taxes and

[5] The shift from wage/experience to wage/age function is immediate. We simply use the relation between age and potential labour experience (ie, $a \equiv$ theoretical graduation age + exp)

thus of the level of progressivity inherent to the current level taxation in Belgium. Results are displayed in graph 3.

Insert graph3 about here

3. Results and concluding comments

The last set of estimates to report are the most interesting ones. Computations of implicit reimbursement rates (RIR_g, $RIR_{g,k}$ in equations 3 & 5) presented here are based on the following technical assumptions. Following Jabocs (2002), general level of wage and tax receipts grow at an annual rate of 2 percent (τ=0.02). Remember that the justification for this could be that technical progress generates productivity gains that somehow benefit all individuals, and eventually produces extra tax receipts[6]. We also assume a discout rate (r) of 4 percent, equal to the historical return on public (risk free) European bonds. Investment is made at age 18, and payment starts at age 18, 22 or 24. All values are expressed in Euros at the age of 24. The amount of money invested (*INV)* at the age of 18 is 6,000*3 Euros for bachelor students (ie, 21,900 Euros at the age of 24) and 8,000*5 Euros (ie, 48,666 Euros at the age of 24) for master degrees. Finally, the proportion of a cohort that is likely to graduate is set to 35 percent (θ =(1-0.35)/0.35 in equation 2*)*. These figure reflect the situation of the Belgian higher education system at the beginning of the XXI century.

Assuming the progressive wage tax system as it currently operates in Belgium remains unchanged, we estimate that the average rate of implicit reimbursement (*RIR*) for a typical graduate is 52 %. In others words, for every Euro spent on higher education, about 48 cents is paid by the rest of the cohort that does not attend higher education.

Table 2 contains the detailed value for the various type *k* of graduates ($RIR_{g,k}$). It shows essentially that

[6] In the case of Belgium, but also Netherlands (Jacobs, 2002), this might be a lower bound. Long-term statistics of hourly wage growth suggest actual rates can reach 3%.

bachelor graduates are likely to reimburse a greater proportion of what society has invested in them than students who attend university and get master degrees. For bachelor males, the rate can reach 95%, while it is only of 48% for males who graduate from masters. The other major result is that female graduates are likely to reimburse much less their male counterpart. A female with a bachelor degree will repay a maximum of 49% of the initial investment. And one with a master degree is expected to pay back 35% of what she received via 'free' access to university.

Insert table 2 about here

These results should be considered with caution. The gender differences for example that appear in table 2 could be partially offset if we could account for the fact that girls tend to be over represented in less expensive study programs (social sciences, liberal arts, psychology...). The reader should also keep in mind that the results presented here are not based on longitudinal data, but cross-sectional observations from which lifecycle wage and taxation profiles are inferred. Further work is thus needed to check the robustness of these results.

This said, they give some credit to those who claim that 'free' higher education is just a form of implicit loan that graduates tend to reimburse at a further stage of their life. In the Belgian context, it seems that males students attending bachelor/non-university programs are bound to reimburse up to 95% of what they received from society. But this percentage is significantly lower for university students taking master degrees, and females in general. For these categories, the idea that public financing might be regressive has still a strong appeal.

Bibliography

Barr, N. (2001), *The Welfare State as Piggy Bank: Information, Risk, Uncertainty, and the Role of the State*, Oxford University Press, Oxford.

Barr, N. (2002), *Funding higher education: policies for access and quality*, House of Commons Education and Skills Committee, London.

Chapman, B. (1997), Conceptual Issues and the Australian Experience with Income Contingent Charges for Higher Education, *The Economic Journal*, 107 (442),;738-751.

Chapman, B. (2001), Australian higher education financing: issues for reform, *Centre for Economic Policy Research, DP No 434*, Australian National University.

Creedy, J. (1995), *The Economics of Higher Education. An Analysis of Taxes vs. Fees*, Edward Elgar, Cheltenham, the UK.

Debande, O. (2003), Student finance schemes: a market assessment, *EIB sector paper*, EIB, Luxemburg.

de La Fuente, A, & Jimero, J.F. (2005), The Private and Fiscal Returns to Schooling and the Effect of Public Policies and Private Incentives to Invest in Education: A General Framework and Some Results for the EU, Documentos de Trabajo, Direccion General de Presupuestos, Ministerio de Economia Y Hacienda, Spain.

Hansen, W.L. & Weisbrod, B.A. (1969), The distribution of Costs and Direct Benefits of Public Higher Education: The Case of California, *Journal of Human Resources*, 4, 176-191.

Jacobs, B. (2002), An investigation of education finance reform – Graduate taxes and income contingent loans in the Netherlands, *CPB Discussion Paper*, July.

Johnes, G. & Geske, T.G. (1993), *The Economics of Education*, The MacMillan Press, London.

Johnstone, B. (2004), The economics and politics of cost sharing in higher education: comparative perspectives, *Economics of Education Review*, 23, 403–410

Karasiotou, P. (2004), General education vs vocational training : How do they affect individual labour market performance ?, *IRES Discussion Paper*, No 2004-14.

Levy-Garboua, L. (1999), Le financement public d'un enseignement supérieur de masse, in Bourdon, J & Thélot, C (eds.), *Education et Formation : l'apport de la recherche aux politiques éducatives*, volume édité en hommage à Jean-Claude Eicher, Paris : CNRS Editions, 271-285.

OECD (2000), Trends and Driving Factors in Income Distribution and Poverty in the OECD Area, *Labour market and social policy- occasional papers*, 42, Paris.

Taber, C.R, (2001) The Rising College Premium in the Eighties: Return to College or Return to Unobserved Ability?, *Review of Economic Studies*, 68(3), 665-91

Vandenberghe, V. (2004), L'université doit-elle être gratuite ?, *Problèmes Economiques*, 2850 (avril), La documentation française, Paris.

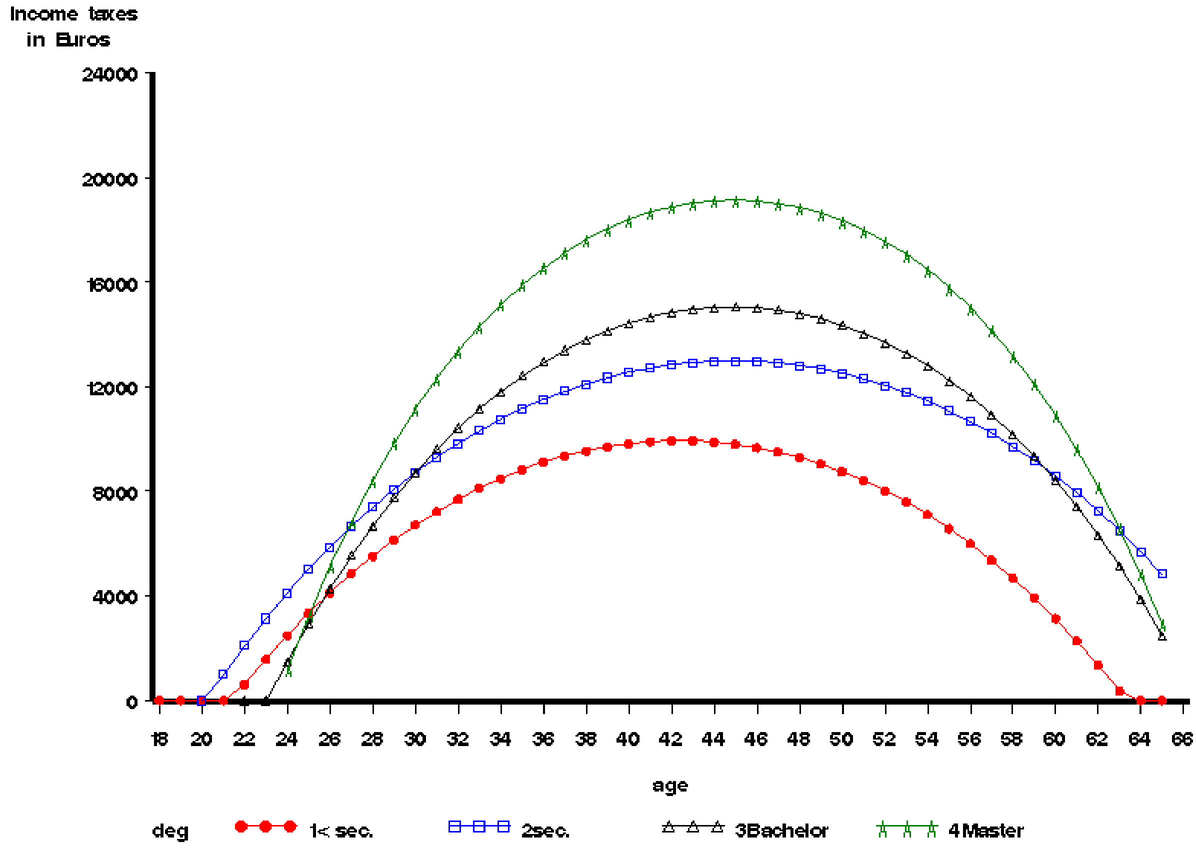
Tables and Graphs

Table 1 – Sample statistics. Sample size *(row %)* and breakdown by education level, gender and geographical area

		Highest degree obtained				
Gender	**Region**	**Less than secondary**	**Secondary**	**Higher education (bachelor program*)**	**Higher Education (master program**)**	**Total**
Male	Flanders	357	396	226	183	1162
		(0.31)	(0.34)	(0.19)	(0.16)	(1.00)
	Wallonia & Brussels	234	243	121	175	773
		(0.30)	(0.31)	(0.16)	(0.23)	(1.00)
Female	Flanders	317	459	329	118	1223
		(0.26)	(0.38)	(0.27)	(0.10)	(1.00)
	Wallonia & Brussels	273	272	181	184	910
		(0.30)	(0.30)	(0.20)	(0.20)	(1.00)
Total		1181	1370	857	660	4068

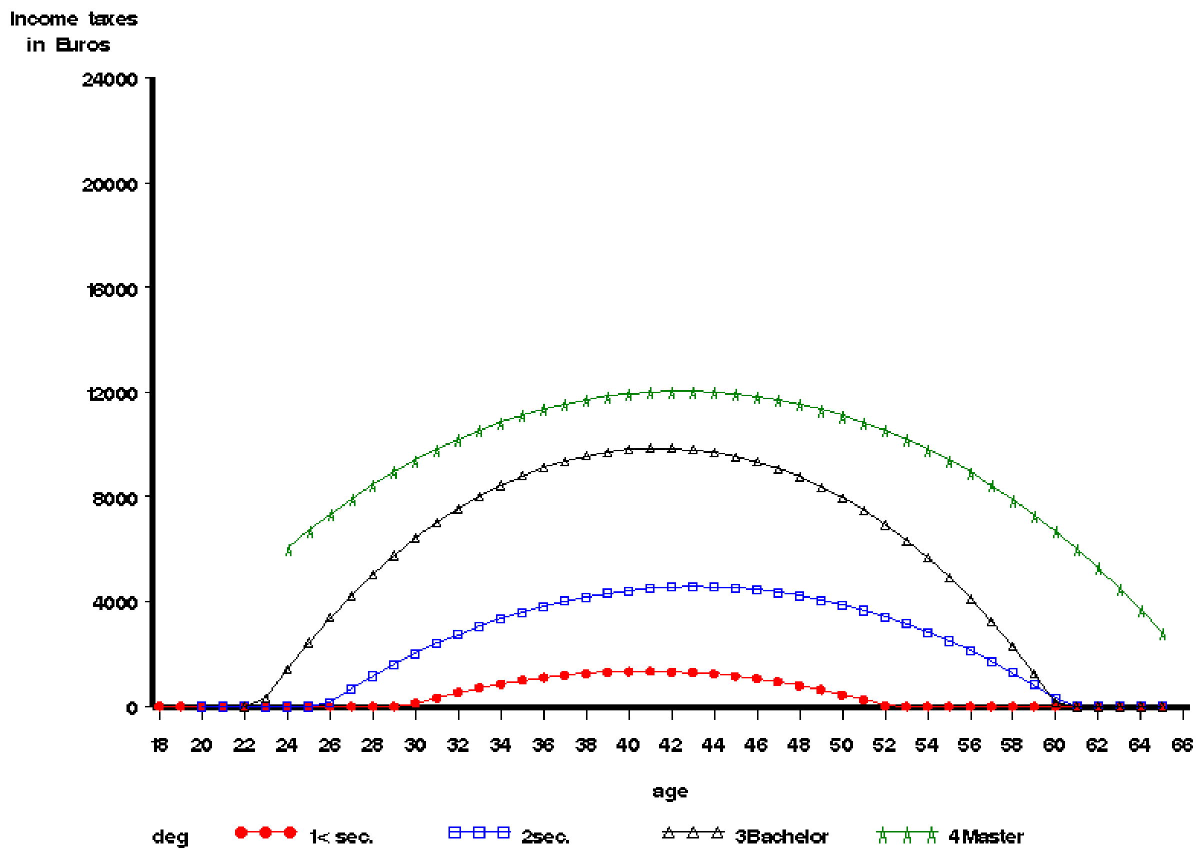
* non-university **mainly university

Graph 1 – Annual income tax profiles. Breakdown by degree. Males living in Wallonia & Brussels



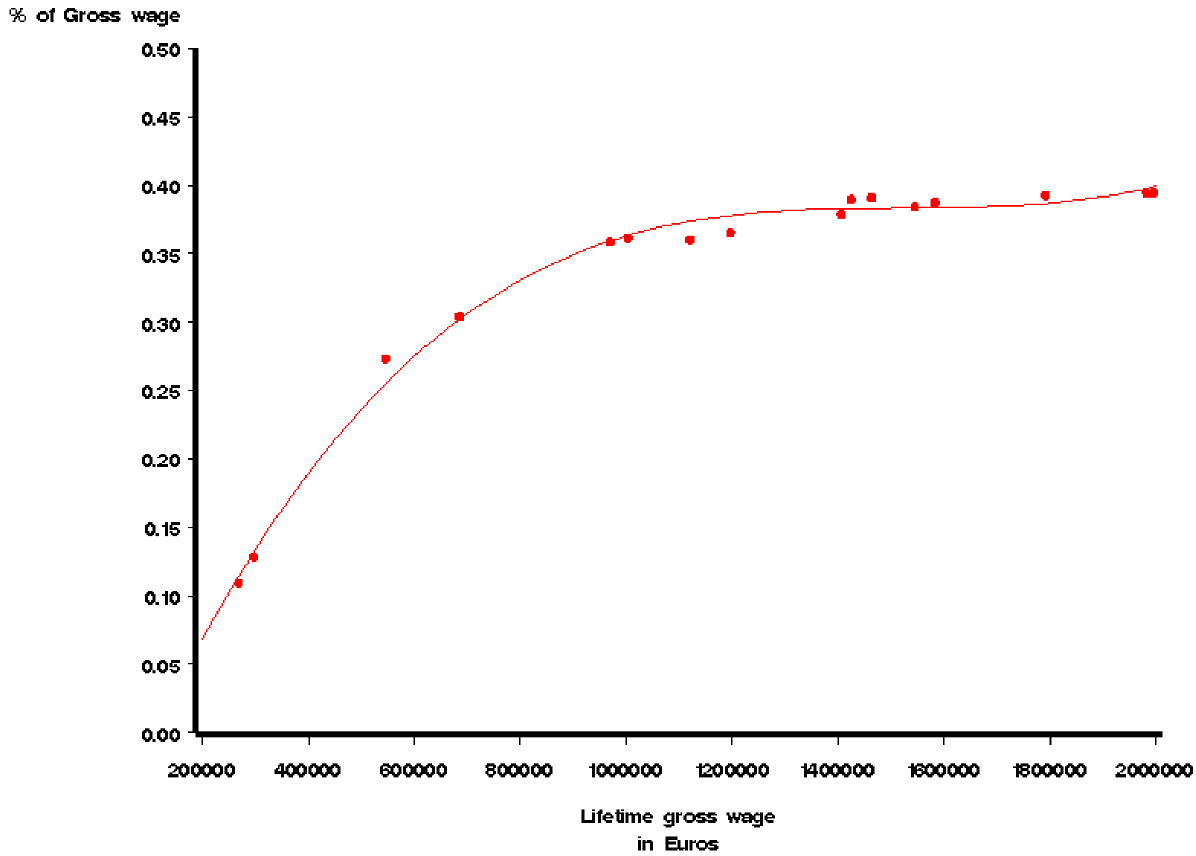
Source: PSBH2002

Graph 2 – Annual income tax profiles. Breakdown by degree. Female living in Wallonia & Brussels



Source: PSBH2002

Graph 3– A*verage lifetime tax* (taxes as % of gross wage) according to level of lifetime gross wage (ie, tax progressivity)



Source: PSBH02

Table 2 – Rate of implicit reimbursement (RIR_k) of higher education public investment. Breakdown by higher education degree, gender and region

Gender	Region	Bachelor graduates*	Master graduates**
Female	Flanders	0.47	0.35
	Wallonia & Brussels	0.49	0.34
Male	Flanders	0.95	0.48
	Wallonia & Brussels	0.83	0.47

* 3 year programs (non-university). Investment worth 21,900 Euros at the age of 24.

** 5 year programs (mainly university). Investment worth 48,666 Euros at the age of 24.

Département des Sciences Économiques
de l'Université catholique de Louvain
Institut de Recherches Économiques et Sociales

Place Montesquieu, 3
1348 Louvain-la-Neuve, Belgique

ISSN 1379-244X D/2005/3082/031