FINANCING HIGHER EDUCATION WITH STUDENT LOANS

The crucial role of income-contingency and risk pooling

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Abstract:

There are many economic and philosophical arguments supporting the introduction of student loans as a way to complement public financing and secure adequate resources for higher education, particularly in Europe. These arguments are briefly reviewed in this paper. But the case in favour of student loans largely rests on the capability to provide loans that are *income-contingent*. Indeed, income-contingent repayments are critical to both efficiency (students and lenders should not be deterred due to excessive risk) and equity (contributions should be tailored to *ex post* ability to pay). But income-contingency comes at a cost that can be expressed as a risk premium that should be supported and shared between graduates and/or taxpayers. The central aim of this paper is to produce realistic estimates of such a risk, identifying the conditions for the implementation of an income-contingent loan scheme in order to channel additional private funding to higher education systems. How does low lifetime income and/or unemployment spells among higher education graduates translates into risk premia? Results, derived from the analysis of Belgian earnings data, suggest that the risk premium ranges from 13% for university (ISCED 6-7) graduates to 26% for non-university (ISCED 5) ones. The paper further investigates the various ways of pooling and shifting this risk, while addressing the danger of public debt classification (ie, student loans classified as public) and adverse selection (ie, unsustainable pooling of high and low risk loans).

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

Key works: Higher Education Finance, Income-contingent Loans, risk premium, risk pooling

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Introduction

Accumulation of human capital is crucial to economic prosperity. Although this idea is fairly old it is currently gaining a lot more of attention among economists and decision-makers. Mass (and quality) higher education seems justified for several reasons in order to favour economic growth. One of them being the current speed of technological change that makes high-skilled individuals more important than ever as a determinant of economic performance (Kremer, 1993).

In most European countries, public financing has been considered as the traditional approach for supporting tertiary education. Even if tuition fees have been introduced in various countries, they only contribute for a small amount to the funding needs of higher education institutions. The average subsidy rate for higher education[1] in European countries ranges from 76% to 99%. In most European countries, the subsidy rate is above 90%. But beyond the need to deal with increased budgetary pressure affecting the long term sustainability of higher education system, the transfer of the financial burden to students could be justified for several other factors: the magnitude of the private rate of returns to higher education measured in terms of earning premium and lower risk of unemployment, as well as the positive impact on the quality of life. The increase in the private contribution to the cost of higher education could take the form of an income-contingent student loan mechanism based on a deferred repayment scheme mimicking the future flow of earnings .

The idea of increasing private contribution via student loans and not upfront higher fess is directly related to the existence of *liquidity constraints* for students, especially for students from lower socio-economic background not able to finance education themselves.

[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

But the analysis needs to go a step further and consider the conditions under which student loans mechanisms are likely to be *efficient*. Human capital investment is indeed more risky than other forms of investments; a key reason for this being the absence of collateral. The risky nature of human capital investment might affect the behaviour of risk-averse students (the borrowers) as well as that of capital markets (the lenders) and lead to underinvestment by individuals or credit rationing on the market for student loans. Both situations are synonymous with inefficiency. Consequently, incorporating insurance mechanisms seems to be crucial to address efficiency concerns. And i*ncome-contingency* (ie, insurance against the absence of the loss or earnings) is an obvious candidate.

Income-contingency is also a way to ensure that private contribution is *equitable*, in particular that payments are somehow indexed on graduates' ability to pay. A student's current ability to pay is, by definition, unknown as it primarily depends on future earnings. Consequently, the only way to enforce the ability to pay principle at the level of the individual[2] is to deferred its implementation at a time when the resulting income of the student will be verifiable. This is precisely what an income-contingent repayment is about.

There are several ways of implementing payments that are simultaneously deferred and income-contingent. This paper will focus on loans with income forgiveness (LIF) (Palacios, 2004). The latter is essentially a mortgage-type loan, where students explicitly borrow a certain amount of money at time of study and pay monthly or yearly instalments after graduation, up to a predetermined horizon (ie, the duration of the loan). Income-contingency comes from the fact that payment is conditional on the individuals making more than a certain amount of money.

But income-contingency operates like an insurance mechanism, and it comes at a cost. The latter can be expressed as a risk premium that should be supported and shared between the graduates and/or taxpayers. A central aim of this paper is to produce realistic estimates of such a risk and its cost. How does low

lifetime income and/or unemployment spells among higher education graduates translates into a risk premium? Results, derived from the analysis of 1999 Belgian earnings data, suggest that the risk premium ranges from 13% for university (ISCED[3] 6-7) graduates to 26% for non-university (ISCED 5) ones.

Section 2 examines both contextual and theoretical arguments supporting an increased private contribution to higher education costs via deferred payments taking the form of income-contingent loans. Section 3 exploits Belgian panel data to simulate the key characteristics of income-contingent loans, in particular the risk-premium generated by income-contingency. Section 4 further discusses the different ways of shifting and pooling this risk-premium while addressing the danger of public debt classification (ie, student loans classified as public debt when the risk premium if totally paid by the Government) and adverse selection (ie, inadequate pooling of high and low risk loans). Section 5 concludes.

2. The case for higher private contribution via income-contingent student loans

2.1. Why should individuals pay more?

The potential pressure for reforming the existing funding of higher education across the EU is partially related to *increased budgetary pressure,* in a context where higher education is becoming a mass industry reflecting the willingness to increase the average stock of human capital to cope with the demand for a skilled workforce and where governments must cope with booming pension and health costs, but also to increased social demand for higher education coming from individual decision and from public policy orientation[4].

The amount of public funding for tertiary education affordable by EU countries has also to integrate the increased *mobility trends* of students. As EU students are entitled to the same treatment in terms of access

[3]International Standard Classification of Education. See http://www.irdes.fr/ecosante/OCDE/941.html for details
[4]As exemplified by the objectives defined by the European Union in the framework of the Lisbon process.

to tertiary education as nationals, countries which are net hosts of EU or foreign students subsidize the net sending countries. This generates a free-riding problems with unequal costs of the various tertiary education system not compensated by the social benefits of tertiary education for the host country when most students are expected to return to their home counties, with the resulting potential risk of underinvestment by some governments. The push towards free circulation of people associated with a modification in the openness of labour market and the recent convergence process between European higher education systems initiated by the Bologna process could favour mobility of students and graduates and hence affect the sustainability of the public financing of higher education. Indeed, the contribution of graduates through the tax system to the funding of higher education (expressed as a repayment of the implicit loan they benefited from during their studies) depends on the graduates' decision to live in the fiscal territory from which the public funding to higher education institutions is coming from (based on the notion of the principle of 'origin'). The potential mobility of students and graduates, not only inducing a form of 'brain or skill drain' and loss of human capital for the educational host country having borne all the cost associated to the financing of compulsory education, will put additional pressure on the nature of the funding flows within the tertiary education sector. This effect could be partially compensated if the exit of graduates is mitigated by the entry of graduates coming from foreign countries. But it would only indirectly contribute to generating revenues.

At the OECD level, student mobility increased over the last years. An important disparity exists among European countries where the UK has the highest net intake in proportion of tertiary enrolment while Ireland shows the highest net outflow of students[5]. In terms of mobility of graduates, there is a lack of evidences allowing to properly assess the magnitude of migration of high-skilled workers. A recent study[6] based on surveys of graduates in Europe identified a correlation between students' mobility and the likelihood for a student to work abroad after graduation. However, the study reported that '*the majority of*

[5]Although no OECD data are available for Greece for the net intake of foreign students relative to total tertiary enrolment, this country has also a very high number of students going abroad relative to total tertiary enrolment estimated to 13.1%. Excluding Luxembourg which is not offering complete higher education curriculum, Greece is the European countries in 2000 with the large proportion of students enrolled outside the country.

[6]Career After Higher education: a European Research Study (CHEERS), TSER Research project "Higher Education and Graduate Employment in Europe"- http://www.uni-kassel.de/wz1/tseregs.htm.

formerly mobile students are employed at home' (Teichler and Jahr, 2001), not corroborating factual evidences about a brain drain of graduates (e.g. in the Greek situation, Pascharopoulos (2002) reported that Greek students obtaining their degree from well-known Anglo-Saxon universities are not returning to Greece for working).

But there are more *theoretical reasons* for increasing individual participation to costs. One of them is the 'benefit' principle: the person who benefits should pay. There is indeed plenty of empirical research to suggest that the private benefits (higher wages, lower risk of unemployment...) from education are large (Karasiotou, 2004), and probably on the rise due to a rising demand for skills cause by skill-biased technological progress (Kremer, 1993). Additional private benefits are derived from better health and personal satisfaction for individuals gaining qualifications through higher education. As a consequence, higher education could not be considered as a pure public good. Since higher education generates social benefits (e.g. the positive impact on the rate of technological innovation), taxpayers still have to contribute to the financing of higher education, but an appropriate mix between private contribution and public funding has to be found. Indeed, public subsidies (ie, taxpayers contribution) to finance higher education could imply a reverse distribution since the incidence of the costs is borne by the average taxpayers whereas the benefits accrue to the most talented or wealthy individuals[7] The pooling of costs and benefits in the case of free education is not reflecting the individual variation in the sharing of the costs and benefits resulting from tertiary education.

2.2. Why deferred payment?

The simplest way to increase private contribution is to increase fees that students (or their families) are asked to pay upfront. But the consensus among economists is that higher upfront fees would be both inefficient and inequitable. Consequently they generally favour a system where higher education is free at

[7] Noting that recent studies for Germany (Barbaro, 2003) do not find evidence for a regressive impact of public subsidies.

the point of use (Barr, 2001). The argument essentially rests on the idea of (unequally distributed) *liquidity constraints*. Attending higher education represents an investment generating benefits in the form of higher earnings potential later in life, materializing some time after the costs of being educated are incurred. The latter can be high as they include i) fees ii) cost of living and – most importantly – opportunity costs ie, forgone earnings if full-time attendance if required. The presence of a liquidity constraints for students due to the lack of sufficient income or capital market failures when deciding on participation to higher education has three major effects: (i) a loss of talent since high ability low income students will be deter to apply for higher education generating an efficiency and a social loss; (ii) a loss of opportunity to individuals and (iii) a strengthening of the link between family background and a person's lifetime income.

The obvious response to liquidity constraints – in a context where individuals, not governments, should pay more – is to offer (or impose) *deferred payment* options. Various possibilities are usually considered to address the existing funding issues of tertiary education system (Barr, 2001, 2002; Greenaway & Haynes, 2003 ; Jacobs, 2002): introduction of graduate tax or recourse to student contracts. Although the graduate tax (Oosterbeek, 1998; Johnes, 1993, & Barr, 2001) is perceived as favouring equity by equalizing the starting positions of students from low and high income families, such a system does not appear as the appropriate solution to the current funding problem of higher education systems in Europe. The advantages of a graduate tax are: (i) contingent upon the earnings of graduate; (ii) low demanding in terms of administration costs; (ii) generating important amount of additional funding in the long term. However, in a structure with an open-ended graduate tax, such a system appears to be unfair, since people with high lifetime earnings repay considerably more than they have effectively borrowed for completing their degree, not reflecting the differences in costs between degrees and the variability in the earnings profile. In addition, such a system mixes educational and income policy. It does not differentiate total earnings from the incremental amount coming from higher education, with the additional consequence that the final allocation of public funds depends on the political process. The existence of graduate tax will not *per se* increase the priority level of tertiary education with respect to other public policies.

Finally, the mobility of students after graduation could be the source of important leakage without proper European harmonization of income tax collecting systems.

Considering now the case of student contracts, a distinction should be introduced between *debt contract* (ie, the student loans we are interested in here) and e*quity contract*. By definition, a debt contract is a promise to pay back a fixed amount (an instalment), as a stream of interest payment + principal payback. In the case of equity contract, the contractual arrangement corresponds to the engagement to pay a share of the profits generated either as a dividend or/and a rise in the value of the shares. Transposed to student funding, it corresponds to the notion of 'human capital contract', 'in which students commit part of their future income for a predetermined period of time in exchange for capital for financing education' (Palacios, 2004). The equity contract shares the same drawback than the graduate income tax:, ie, not to be commensurate with the additional earnings related to the achievement of higher education studies[8]. Indeed, to achieve a sufficient mutualisation of risks, investors should build a balanced portfolio of students through which they would get back more than their initial investment from relatively successful graduates compensating for the failure to recoup their original investment from unsuccessful ones. As a consequence, the stream of payment from the graduates is not directly proportional to the human capital earnings premium.

2.3. Why income-contingent payments?

The difficulty with debt contracts (ie, student loans) is that they are poised with information and uncertainty problems that need to be properly addressed. Students face higher risks in borrowing to finance human capital than – for example – an average individual borrowing to buy a house due to the lack of collateral. As stated by Barr (2001), a person who buys a house knows what she is buying, the house is unlikely to fall down, the real value of the house will generally increase and – most importantly --

[8]A good way to figure out the nature of this problem is to consider the amount of money Mick Jaeger would have paid over his career compared to his cohort fellows if private contribution to human capital costs was based on graduate tax or an equity contract.

if earnings fall, making repayments burdensome, she can sell the house. In other words, the house generally act as collateral for the loan, meaning that loans can be obtained on good terms from the bank.

By contrast, future students – particularly those from low socio-economic background, whose parents did not attend higher education – are not necessary fully aware of the magnitude of the return on human capital investment. Even well-informed students face risk: though average private rate of return to investment is fairly high, there is considerable variance about that average. In addition, in labour market that tend to be more flexible and household configurations that are much less stable (divorces, separations, relocations...) than a few decades ago, graduates might face large fluctuation in their short-term levels of earnings. Finally, someone who has borrowed to pay for a qualification and faces lower earnings does not have the option to sell his degree, further increasing the exposure to risk and the propensity of private banks to deny access to credit or charge high risk premia.

From the demand-side it is thus important to have a mechanism offering the borrower insurance against potential future poverty, which is of great relevance to reduce the applicant's risk aversion, but at the same time providing the adequate discipline to ensure the repayment of the loan. Repayment is spread over the professional career of the student, improving the matching between repayment of the loan and the materialisation of the benefits of the investment, as an earning premium.

Finally, the case for income-contingency also rests on more philosophical grounds. Reference is frequently made to ability to pay in discussion about higher education finance. Private contribution to education costs should be function of the ability to pay of student. The difficulty with this principle is that students' ability to pay is not known, as it primarily depends on their *future* earnings. [1]Ability to pay, in most discussions about higher education finance, *de facto* refers to the wealth of student's relatives (parents,...); not the student himself. Consequently, the only way to properly and adequately enforce the ability to pay principle (in combination with the benefit principle) is to deferred its implementation at a time when the resulting income of the student will be verifiable. This is precisely what income-contingent

loans repayment is about. Graduates with lower lifetime earnings pay less (or do not pay at all) while those with higher earnings pay in full (principal + interest), but in proportion commensurate to the initial cost of their investment in higher education.

2.4. How to parameter income-contingency?

The idea of income-contingency is central to our argument. But it still needs to be flesh out in order to be implemented. When should graduates be exonerated from payment and benefit from the insurance mechanism ? We think that human capital theory, combined to the 'benefit' principle, provides adequate guidelines to this problem.

Private contribution should somehow be proportional to the benefits derived from the kind of human capital acquired at tertiary level (ie, higher education); not the one acquired at primary or secondary school. And a simple way to translate this idea is to decide that higher education graduates should pay their loan instalment only if their annual net wage is *above* the average wage of less educated ones, typically individual with no higher education attainment. This configuration is often reported in the literature as students loans with income-forgiveness (LIF) (Palacios, 2004). .

3. The cost of income-contingency

The conclusion of section 2 is that in order to secure additional funding resources for higher education systems, students loans are highly desirable. But the case in favour of student loans largely rests on the capability to provide loans that are *income-contingent*. Indeed, the latter is critical to both efficiency (students and lenders should not be deterred due to excessive risk) and equity (contributions should be tailored to *ex post* ability to pay). But income-contingency comes at a cost that should be supported and shared between the graduates and/or taxpayers. But before discussing this risk pooling or shifting question (section 4) we believe is worth quantifying the cost of income-contingency. How does low

lifetime income and unemployment spells among tertiary education graduates – situations in which graduates would be relieved from their payment obligation -- translates into a risk-premium? The central aim of this section is to produce realistic estimates of the level of the risk premium that is likely to affect LIF, in a context where this instrument of private finance would apply to large populations of students. Our estimation strategy is based on a standard model of mortgage-type loans in which we incorporate econometric estimation of the probability of payment using Belgian panel data.

3.1. Model

We shall assume that human capital investment (*INV*) takes place at the age of *18* and lasts a predetermined period *D*. Graduate/individuals start repaying at the age of 22 if they choose short higher education programs[9] (grace period of 3 years) or at the age of 24 if they opt for long programs[10] (grace period of 5 years).

Modelling LIF basically consists in finding the value of the annual instalment Ω such that:

$$INV.\ (1+r)^{G} = \Omega.\ \Sigma_{exp}\ [\mu_{exp}\ /(1+r)^{exp+G})] \qquad [1]$$

with :

- *r* the discount rate reflecting the cost of capital and the general preference for the present (long term rates on treasury bonds for example);
- $exp>0$ the potential professional experience, defined as $exp=age–t$; with *t* the age of study completion ($t=21$ for short higher education programs $t=23$ for long higher education programs);
- *exp* ranging from *1* to *D-G*; where *D* is the duration of the LIF, *G* is the grace period (ie,direclty reflecting the length of studies) ;
- $\mu_{exp} = Prob(w_{,exp,k=g} > w_{exp,k=ng})$ being the probability of payment estimated for a graduate ($k=g$) with a certain labour market experience;

[9] Non university, ISCED 5 programs.
[10] Typically university, ISCED 6-7 programs.

- $w_{exp,k=ng}$ being the annual net earnings threshold under which no payment is required.

In the simple model exposed above, the key parameter is the probability of payment at a given age/experience[11] μ_{exp} It captures the whole idea of income-contingency (or income-forgiveness). Note in particular the assumption we make that higher education graduates($k=g$) should pay only if their annual net wage is *above* the average wage of observed among non-graduates ($k=ng$) with similar potential labour market experience ($w_{exp,k=ng}$).

As one of the objectives of this paper is to quantify the cost of income contingency, we also need to estimate the value of the risk-free installment Ωrf; in other words, the payment that an investor would ask if she could be sure that all graduates would pay at every moment of the loan contract. Algebraically, this case corresponds to :

$$INV.(1+r)^{G} = \Omega rf\,.\,\Sigma_{exp}\,[1/(1+r)^{exp+G})] \qquad [2]$$

where μ_{exp} is now set to 1 in order to reflect the idea that the risk of defaut is nil.

We finally define the notion of risk premium (RP) as the % increase in instalment caused by income-contingency:

$$RP = \Omega / \Omega rf \qquad [3]$$

or, equivalently, in absolute terms:

$$rp = \Omega - \Omega rf \qquad [4]$$

[11] Age and potential experience are related as $exp=a-t$.

3.2. Estimating the probability of payment function

In the simple model exposed above, the key parameter is the probability of payment μ_{exp}. We could immediately move to the simulation exercise using somehow arbitrary values. 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 this probability function using real information on relative wages and employment rates of higher education graduates.

Our data come from a survey carried out in Belgium in 2000: the Panel Study on Belgian Households (PSBH). This is a small national survey undertaken by a consortium of universities. For a sample of about 4,722 individuals drawn randomly for the whole Belgian Population it provides data on annual net earnings, participation to labour market, working hours and personal characteristics such as age, gender and – most importantly -- education attainment.. This data set is useful to evaluate the relationship between higher education (short or long[12] programs) and earnings at different stage of individuals' career, relative to less educated people. In the context of loans with income-forgiveness (LIF), these data can be use to estimate the probability function capturing the risk that annual earnings fall below a certain threshold and, consequently, exonerate individuals from paying their annual instalment. In more technical terms, simple econometrics applied to PSBH help us quantifiy the probability of payment (μ_{exp}) in equation 1.

Note that the notion of *earnings* hereafter includes part-time workers as well as people with no salaries. Strictly speaking thus, it combines wage and employment premia. Our basic wage data will also consist of *net wages*. This choice reflects the supposedly realistic assumption that extra private contribution to higher education funding comes in addition to current levels of taxation.

[12] Typically organised within universities

We define the loan payment/non-payment dummy (ie, the dependant variable of our probability model) by comparing the realized individual level of net earnings with the threshold level (Z_{exp}). The latter is defined as the *expected net annual earnings of individuals without higher education,* as predicted by a 2nd order polynomial experience/earnings profile, estimated using simple OLS regression:

$$Z_{exp} = E(w_{exp,\, k=\text{ng}}) \qquad [5]$$

where:

- $w_{exp,\, k=\text{ng}} = \alpha + \beta.exp + \gamma.exp^2 + \varepsilon$

- *exp=age-18* assuming non gradutes complete their studies at the age of 18;

Each time annual net earning ($w_{exp,\, k=g}$) is below the no-payment threshold (Z_{exp}) we conclude to default (*Pay=0*), and normal payment of instalment Ω otherwise (*Pay=1*).

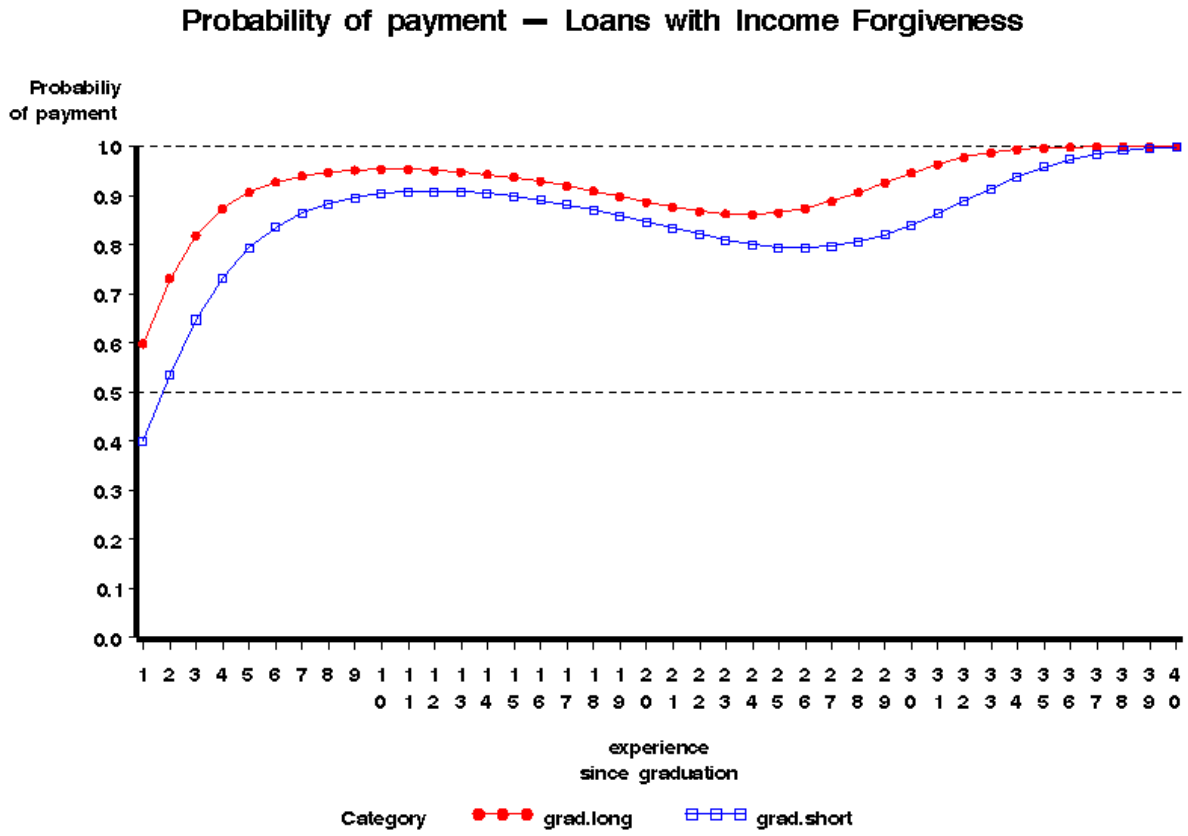
The specification used for the probability function is logistic; specification being a 3rd order polynomial function in potential experience (*exp*)*:*

$$Prob(Pay=1) \equiv \mu_{exp} = exp(\rho + \varsigma.exp + \sigma.exp^2)/[1+exp(\rho + \varsigma.exp + \sigma.exp^2] \qquad [6]$$

Predicted values of probability of payment (ie, 1 – risk of default) are plotted on graph 1 for both short[13] and long[14] program graduates. The highest probability of payment is observed among long program graduates. The graph clearly suggests that the income-contingency is likely to be more important as an insurance mechanism for students who attend short programs. The same graph also indicates that the risk of default is clearly diminishing (probability of paying rising) during the 5 first years of presence on the labour market Finally, it is worth observing the almost complete reduction of the initial gap between the different categories in terms of risk of default at the end of people's carreers.

[13] Non-university programs
[14] Mainly university programs

Graph 1 – Probability that higher education graduates pay their income-contingent instalment according to age



Source: PSBH00

3.3. The cost of income-contingency

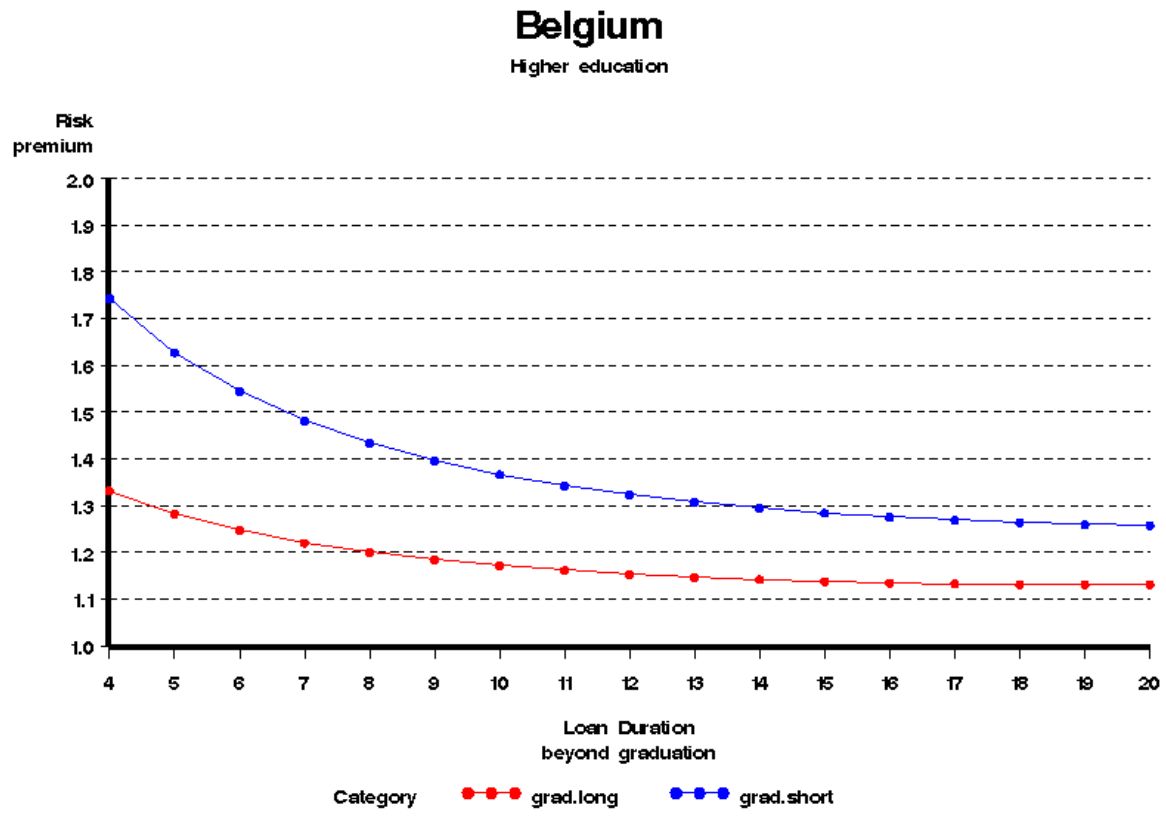
The last step of the exercise involves simulating the value of the annual instalments with (*Ω)* or without (*Ωrf*) risk of default as estimated econometrically here above. Graph2 reports the estimated value of the risk premium (equation [3]) as a function of the post-graduation duration of the loan (*D-G*).

Graph 2 reports risk premia for graduates of both short and long higher education programs. Computations are based on the following technical assumptions. Discount rate is 4 percent (r=0.04). Investment is made

at age 18 and payment starts at age 22 or 24 (3 & 5 years of grace) for a period of 20 years. The amount of money invested (*INV)* is 1,000 €.

Quite logically, given the configuration of the probability of default reported in Graph 1, the risk premium is higher for people who graduate from short programs, particularly if duration of loan is less that 10 years. This result pleads for income-contingent loans with relatively long repayment horizon. Considering the case of loan of 20 years of duration (beyond graduation), results suggest a risk premium ranging from 13% for university (ISCED 6-7) graduates to 26% for non-university (ISCED 5) ones (see appendix 1 for detailed results).

Graph 2. Risk premium according to type of higher education and loan duration (1000 € student loan, study length=3 years or 5 years, 4% discount rate. Risk-free instalment=1).



Source: PSBH00

4. Risk shifting, risk pooling and adverse selection

Section 3 gives us some idea of the plausible cost of offering income-contingency to a large set of graduates. And our results suggest that this cost is substantial. But who should pay for it?

To provide students with income-contingency -- and avoid among other problems high non-take up rates by risk-averse students -- two general approaches could be considered: *risk pooling* among students or *risk shifting* to society. As stated in section 2, it is important, especially for students from disadvantaged background to have some insurance in case of lost of earnings. The case for income contingency is also supported by basic human capital theory as well as justice principle (ability to pay). Risk pooling is an insurance system where risks of default are shared among graduates. Annual instalments contain a risk premium to cover the average cost of default of a given population of students, the premium reflecting the group risk rather than the individual risk.

Under risk shifting, the default risk is borne by the taxpayer. Students would then benefit from income-contingency, face housing-type interest rates or annual payment and private final lenders would enjoy a source of risk-free investment. But a total transfer of risk from lenders to the state induces a substantial fiscal cost and would lead public sector watchdogs to consider student loans as public debt since the taxpayers are supporting the full risk associated to the loan scheme.

Given the classification problem -- and given the context of scarcity of public resources -- risk pooling might be the most relevant option to analyse. At the difference of an equity contract or graduate tax, the repayment remains proportional to the earnings premium associated to the completion of higher education degree. But it still implies, within a cohort of borrowers, redistribution from the students succeeding in the repayment of their loan and those failing to ensure the reimbursement.

This principle of risk pooling was used for the Tuition Postponement Option at Yale University in the early 1970's and was not very successful. The main disadvantage is to put the borrowers at some risk, depending on the probable future earnings capacity of the borrowing class, and more particularly on how

many potential high earners choose to exit the income contingent repayment scheme for fear of getting into a cohort with too many potential low earners. This is an illustration of the typical *adverse selection problem*.

To mitigate this effect, the coverage of the student loans scheme should be as large as possible, ie, applicable to the full cohort of students enrolled in the higher education system. But even, in this more favourable context, to which extent should we fear this adverse selection problem? We believe that the structure of the data used in section 3 allows us to explore the consequences of risk-pooling and identify variables that are likely to mitigate its severity.

Estimates in section 3 immediately reveal that risk-pooling among graduates of long higher education programs[1] (Graph 2) is less expensive than among graduates of shorter programs. Intuitively, we suppose that the former would *a priori* reject risk-pooling or mutualisation with the latter. Our first point is that this doze of additional pooling comes at a cost. that can be easily estimated given our data.

Assuming a proportion α of high risk 1,000 € unit loans in the global portfolio, pooled risk premium (in absolute terms) is equal to:

$$rp^{*} = \alpha . rp_{gshort} - (1-\alpha).rp_{glong} \qquad [7]$$

with

- $rp_{gshort} = \Omega_{gshort} - \Omega rf_{gshort}$, $rp_{glong} = \Omega_{glong} - \Omega rf_{glong}$, using equation 4

- $0 < \alpha < 1$, α being the proportion of high-risk students in the cohort of graduates;

- and in particular $rp^{*} > rp_{glong}$

Estimates of pooled risk premium are reported in table 1. They show that pooling comes at a cost for low-risk graduates (long programs) equal to 35.7% of the non-pooled risk premium. Such an increment could cause adverse selection.

Table 1 – Risk pooling, cost premium for long program graduates* and lower investment on short program graduates as way to reduce it (1,000 € unit loans, study length=3 years or 5 years, 4% discount rate, loan duration beyond graduation = 20 years, proportion α of high risk unit loans=0.5)**.**

Category of graduates		Annual instalment in € (Ω)	Annual risk-free instalment (Ωrf)	Level of annual risk premium in € (rp)	Cost of pooling (in %) for low-risk graduates (rp^*/rp_{glong})
All graduates pooled	[a]	120.01	100.70	19.31	-
Low-risk graduates (k=*glong*)	[b]	123.14	108.92	14.22	19.31/14.22=1.357
High-risk graduates (k=*g short*)	[c]	117.03	93.10	23.93	-

Size of high risk student loan eliminating the cost of pooling of low-risk graduates:

$$\lambda = rp_{glong}/rp_{gshort} = 0.5943$$

*Mainly university graduates

Our second point however is that *investing less money on riskier students* should reduce its intensity. Indeed riskier students can (and even *should*, given the ability to pay principle) be asked to pay *lower cumulated fees,* and consequently borrow less money to finance their study program. Algebraically this means imposing that investment/payment by short program graduates (k=*gshort*) represents only a fraction λ of that of long program graduates (k=*glong*). And to avoid adverse selection, this fraction λ should be such that pooled risk premium is equal to the one faced by long program graduates in a non-pooling context (rp_{glong}). Note also that λ can be applied directly to the risk premium as the latter is strictly proportional to the level of investment (see equations 4, 2 & 1)

$$rp^* \equiv \alpha.\ \lambda.\ rp_{gshort} + (1-\alpha).\ rp_{glong} = rp_{glong} \qquad [8]$$

with $0 < \lambda < 1$,

or equivalently, assuming $\alpha = 0.5$

$$\lambda = rp_{glong}/rp_{gshort} \quad [9]$$

Results in table 1 suggest that the typical loan size of a high-risk student (ie, attending a short program) should be equal to 59.43% of that of a low-risk student. This reduction factor might appear rather important. In practice is very close to what we would expect in the Belgium system with *uniform annual fees* across higher education institutions but *varying lengths of programs.* Considering that riskier students study only 3 years while it takes 5 years for the others to graduate, we should end up with a loan size ratio of 3/5 (ie, 60%). In other words, pooling short and long programs, with uniform annual fees, would mechanically lead to the kind of loan size adjustment that is required to avoid serious adverse selection problems.

5. Conclusion

In order to secure additional funding resources for higher education systems, students loans are highly desirable. But the case in favour of student loans largely rests on the ability of decision-makers to implement *income contingency*. Indeed, income-contingent repayments are critical to both efficiency (borrowers and lenders should not be deterred due to excessive risk) and equity (contributions should be tailored to *ex post* ability to pay).

But income-contingency comes at a cost. Considering the case of a 20 years student loan, our simulations show that risk premia directly reflecting the income contingency clause range from 13% for university graduates to 26% for non-university ones.

Our analysis also suggests that returns to higher education in Belgium, particularly short programs, is not immediate. The first years of professional life are not systematically synonymous with larger net wages or higher employment rates. Keeping the cost of income-contingency at a reasonably level requires long repayment horizons (more than 10 years).

But who should pay for income contingency? Options available are essentially twofold. First, risk shifting. In that case the default risk is borne by the taxpayer. Students would then face real estate-type annual payment and capital markets would enjoy a source of risk-free investment. But a total transfer of risk from lenders to the public sector induces a substantial fiscal cost. It would also lead public sector watchdogs to consider student loans as public debt, adding to the strain public finances currently face.

This leaves us with the risk pooling option where annual instalments contain a risk premium to cover the average cost of default among the cohort (13% to 26% of the risk-free instalment as our estimates suggest in the case of Belgian graduates); the premium reflecting the group risk rather than the individual risk.

The main advantage of risk pooling is that it is redistributive. Its disadvantage is its exposure to adverse selection, as many potential high earners might push for exiting the income contingent repayment scheme for fear of getting into a cohort with too many potential low earners. To mitigate this effect, the coverage of the student loans scheme should be as large as possible, ie, applicable to the full cohort of students enrolled in the higher education system. *De facto* this would confer the loan scheme a status almost equivalent to that of a state institution. It would also make transfers between categories of graduates less traceable or visible.

But even in this more favourable context, adverse section might compromise the long run sustainability of an income-contingent loan scheme. Simple computations suggest that the cost for low-risk (university) Belgian graduates to be pooled with high-risk (non-university) graduates lead to a risk premium inflated by 35%. However we show that investing *less* money on riskier students eliminates this cost. The

tentative conclusion is that riskier students[15] can and even should, given the ability to pay principle, be asked to pay lower cumulated fees, and consequently borrow less money to finance their human capital.

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[15] We refer here to short vs long higher education programs in this paper, but the case should also be made for the fields of study (law or engineering vs. sociology...

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Appendix

Appendix 1 : Annual and monthly instalments on income-contingent loans.

1.1 - Short (3 years) higher education programs: 1,000 € unit loans, 4% discount rate, grace period of 3 years

Loan duration beyond graduation	Annual payment in € with risk premium [a]	Annual payment in € without risk premium [b]	Monthly payment in € with risk premium	Monthly payment in € without risk premium	Risk premium [a/b]	Risk premium in €
4	607.79	348.58	50.65	29.05	1.74	259.21
5	462.76	284.22	38.56	23.69	1.63	178.53
6	372.72	241.37	31.06	20.11	1.54	131.34
7	312.30	210.81	26.02	17.57	1.48	101.48
8	269.38	187.94	22.45	15.66	1.43	81.45
9	237.55	170.18	19.80	14.18	1.40	67.37
10	213.13	156.00	17.76	13.00	1.37	57.13
11	193.88	144.43	16.16	12.04	1.34	49.44
12	178.37	134.82	14.86	11.24	1.32	43.54
13	165.64	126.71	13.80	10.56	1.31	38.93
14	155.05	119.79	12.92	9.98	1.29	35.26
15	146.12	113.80	12.18	9.48	1.28	32.31
16	138.51	108.59	11.54	9.05	1.28	29.92
17	131.97	104.01	11.00	8.67	1.27	27.96
18	126.31	99.95	10.53	8.33	1.26	26.35
19	121.37	96.34	10.11	8.03	1.26	25.03
20	117.03	93.10	9.75	7.76	1.26	23.93

1.2 – Long (5 years) higher education programs: 1000 € unit loans. 4% discount rate, grace period of 5 years.

Loan duration beyond graduation	Annual payment in € with risk premium [a]	Annual payment in € without risk premium [b]	Monthly payment in € with risk premium	Monthly payment in € without risk premium	Risk premium [a/b]	Risk premium in €
4	543.05	407.79	45.25	33.98	1.33	135.26
5	426.43	332.50	35.54	27.71	1.28	93.92
6	352.08	282.37	29.34	23.53	1.25	69.70
7	300.94	246.62	25.08	20.55	1.22	54.32
8	263.80	219.86	21.98	18.32	1.20	43.94
9	235.71	199.08	19.64	16.59	1.18	36.63
10	213.78	182.50	17.81	15.21	1.17	31.28
11	196.22	168.97	16.35	14.08	1.16	27.26
12	181.89	157.72	15.16	13.14	1.15	24.17
13	169.99	148.24	14.17	12.35	1.15	21.76
14	159.98	140.13	13.33	11.68	1.14	19.85
15	151.47	133.13	12.62	11.09	1.14	18.33
16	144.15	127.03	12.01	10.59	1.13	17.12
17	137.81	121.67	11.48	10.14	1.13	16.14
18	132.29	116.93	11.02	9.74	1.13	15.36
19	127.43	112.70	10.62	9.39	1.13	14.73
20	123.14	108.92	10.26	9.08	1.13	14.22