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GUIDE TO REFORM OF HIGHER EDUCATION: A EUROPEAN PERSPECTIVE

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ABSTRACT

Guide to Reform of Higher Education: A European Perspective*

Although there are exceptions, most European universities and institutions of higher education find it difficult to compete with the best universities in the Anglo-Saxon world. Despite the Bologna agreement and the ambitions of the Lisbon agenda, European universities are in need of fundamental reforms. We look at structural reforms of higher education and propose more effective use of public subsidies, more efficient modes of financing institutions of higher education, more diversity, competition and transparency, and larger private contributions through income-contingent student loans. In the process we discuss the nature of an institution of higher education, grade inflation, fair competition, private and social returns to education, income-contingent loans, student poverty and transparency. We sum up with seven recommendations for reform of higher education.

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1. Introduction

Since the sixties there has been huge democratisation of higher education in developed countries. The proportion of adults with a higher education degree in OECD countries has in a quarter century almost doubled. In China, India and the rest of Asia there will be an incredible further growth in the demand for higher education. The dual objective of mass access and excellence requires a dynamic and competitive higher education sector. The new growth economics indicates that knowledge and creativity are replacing land, mineral resources and physical capital in becoming the most important production factors and engines of economic growth. The advent of globalisation and the internet has made distance irrelevant. More and more prospective students choose to go to the best university irrespective of where it is. This has contributed to increased competition for the best students, top professors and research grants. All this suggests that a golden age for universities has arrived. Still, as *The Economist* (The Brains Business, 10 September 2005) points out, academia in Europe do not seem ready to pick up the challenges ahead and get stuck in struggles with politicians about more funding. European higher education is stifled by excessive regulation from the state. The US, in contrast, is much better at letting thousand flowers bloom.

It is perhaps not a surprise that many of the best students of Europe move to a US top university as soon as they get the chance to go. This is also true for many top post docs and professors in Europe. Most academics argue that the US offers a more exciting, dynamic and competitive environment of higher education than Europe. Indeed, Europe only has five universities in the Times Higher Education Supplement list of top 50 universities. Two of these are in Switzerland, two in France, one in Germany, and none in Italy, Spain, the Benelux or Scandinavia. Of the top universities 41 have an Anglo-Saxon system of higher education. This year's global university rankings published by the Shanghai Jiao Tong University, the most thorough of world rankings, showed only two European universities in the top twenty and they were both British (Cambridge and Oxford). Much of the policy debate in Europe is therefore about reforming the system of higher education towards a more Anglo-Saxon oriented system.

Still, the continental European system may have merits over the US system. For example, the average quality of higher education institutes (HEI's) may be better in Europe, accessibility of higher education for children from less privileged background may be better, and there may be a stronger focus on more long-run research. Indeed, the Education Commission of the States warns in its recent 'Closing the College Participation Gap' that the US does far worse than other developed countries when it comes to preparing its young people for the 21st century. In 2000 the US was tied in 13th place out of 32 industrialised countries in the percentage of the population that entered higher education. Furthermore, the US suffers from relatively a high dropout rate at schools. OECD data indicate that the average

years of schooling for Americans is 12.7 years behind Norway, Denmark, Iceland, the Netherlands, Luxemburg, Germany, Switzerland, Australia and Canada. The US also only comes tenth in the percentage of young people that are awarded a high school diploma. Fewer Americans aged 25-34 obtain a high school diploma or higher education degree than the US baby boomers. Yet another chilling fact of the US higher education system is that students of poor backgrounds drop out much more often than rich students: only 54 per cent of students with family income of less than $25.000 complete their studies versus 77 per cent of students with family income exceeding $70.000. Loan aversion is rife among poor students, who work excessive hours during their study or do not even start or complete their study. Although the US has some of the best universities in the world, the US system does not appear as successful as other industrialised countries. Even in research Switzerland, the UK, Denmark, Spain, Sweden, Belgium, Canada and Australia score better in terms of number of scientific publications per ten researchers and per dollar than the US (e.g., NOWT, 2003).

The challenge for those who wish to reform the European system of higher education is thus to get the diversity and quality for which part of the US system is justly praised without throwing out the benefits of the European system such as the wide accessibility for students of all backgrounds. Continental Europe may have more to learn from the British, Canadian and Australian than the US system of higher education. However, policy discussions on higher education are often highly controversial. Controversies arise about the roles of the government and the private sector. They also arise about whether higher education should be elitist or not and whether higher education can be left to the market. Many argue in favour of strong government intervention in higher education: to guarantee equality of opportunity, to secure universal access to higher education, to maintain a diverse higher education system, to avoid commercialisation of research, and so on. Table 1 gives a summary of the issues and problems arising in discussions about the reform of higher education.

Student funding schemes often involve large education subsidies. In most countries, the government subsidises tuition costs with 80-100 per cent. In addition, students receive additional public support in the form of (means-tested) grants or interest-free loans. During their lifetimes most graduates belong to the well-off. This raises the question whether large education subsidies are really equitable. In addition, some students who, in the absence of subsidies, would have chosen to work are strongly encouraged to enrol in higher education even if they have insufficient academic capabilities to do so. Similarly, subsidies may stimulate students to enrol in subsidised public HEI's and stay out of private education. In many European countries only public HEI's receive funding, while private HEI's are denied such funds. Governments in Europe, typically, set uniform tuition rates for higher education regardless of the costs or demand for a particular degree. In addition, in many countries HEI's

are not allowed to select students on the basis of ability or of aptitude. Governments also intervene by allocating budgets to HEI's. These government contributions typically depend on the number of students enrolled and the number of students graduating. The latter may induce grade inflation. Some countries still allocate funds based on historically determined practices. The government contribution per student is usually not very differentiated for different subjects even though costs and demand for each subject may vary a great deal.

The substantial growth in student enrolment during the last few decades opens each year a debate about whether grades are what they used to be. For example, in the UK 30 per cent of young people attend some kind of university, compared with 12 percent in the seventies and only 5 per cent in the fifties. This is a huge achievement. But the A-level pass rate has increased from 68 percent in 1982 to 97 per cent, and nowadays the fraction getting an A-grade has in twenty years doubled to almost a quarter. Many doubt whether all this reflects brighter pupils or better teaching. More likely is that the standard of A-level exams has gone down. Also, many have dropped mathematics, science and foreign languages. Similar concerns about the trade-off between bigger participation rates and grade inflation are voiced in other countries.

In this paper we attempt to sketch the contours of a policy agenda to reform higher education in Europe. We, as public economists, frame our analysis in modern welfare economics. That is, we identify the reasons why higher education cannot be left to the market alone and that government interference may be necessary to correct for these market failures. We analyse the consequences of *external effects* in higher education and how the government should organise its subsidies to internalise these externalities. Related to this discussion is the question how to maintain *diversity* in higher education. *Capital and insurance market failures* make it impossible for students from poor backgrounds to obtain funds and insure the risks of doing a study. These failures in financial markets lie at the root of accessibility problems and the government may intervene through loans. We ask whether higher education policies should be exploited for *income redistribution*. Should equity arguments matter in higher education? How do education policies interact with other redistributive policies such as the income tax and doesn't this create *tax distortions*? We pay attention to *monopolies or cartels* in higher education. In some countries, scale in the higher education sectors increased so much that one should worry about fair competition and undercutting of quality and quantity of higher educational services. We also stress the importance of *information and transparency* in order to improve the functioning of the market for higher education.

However, government intervention is not without problems either and we have to pay attention to government failure as well. Subsidies often create all kinds of unintended side effects: dead weight losses, substitution and crowding out effects. Subsidies may also be inequitable. Government funding schemes for HEI's may also produce unintended side effects

like grade-inflation, monopolistic practices and misallocation of scarce public resources. Based on our assessment of market and government failures, we attempt to give some directions for policy reform. We argue that current government policies are not well targeted and propose alternatives to current policies that are arguably more efficient, equitable or both.

To set the stage, we start in section 2 with an extensive summary of quantitative and qualitative data on higher education systems in Europe and elsewhere, notably the US and Australia. We provide stylised facts on higher education in Europe and point out how prevalent central planning is. We present some statistics on enrolment rates, the level of funding per student, the share of private funding, the share of total funding going to HEI's, the share of grants in total student contributions, literacy and science scores, student/staff ratios, and enrolment rates. We also attempt to illustrate the effects of these variables on educational attainment, dropout, enrolment durations, returns to higher education and the fraction of foreign students enrolled. We further give a qualitative description of the funding schemes for HEI's, setting of tuition fees, admission criteria, etc.

In section 3 we provide a qualitative assessment of the goals and ambitions of a university or college of higher education. We discuss whether it should be an ivory tower divorced from business and other outside stakeholders or an entrepreneurial institute seeking connections with society and sponsors from business and alumni. We pay attention to the potential merits of introducing bachelor and master degrees and the conditions that are necessary to make sure that they materialise. Further, we study how to monitor and encourage quality of teaching and research.

Section 4 is devoted to a formal discussion of optimal pricing, subsidy and tuition rules. The objective of the government is to internalise externalities and we analyse when and how the government should subsidise higher education. We show that optimal subsidies should generally be differentiated according to the academic capacity of students, the total costs of the study involved and size of externalities attached to the particular study and/or students. This is severely at odds with common practice where almost no differentiation along to these dimensions can be found. Section 5 is also concerned with optimal funding rules, but asks how these rules should be modified when HEI's are behaving monopolistically. This section discusses the impact of monopolistic practices, the trade-off between input funding and output funding, and the phenomenon of grade inflation.

Section 6 explains why higher education in Europe should rely less on public subsidies and seek more funding from higher tuition fees and sponsoring. The reasons are that private returns on higher education are growing, the gap between private and social returns is probably narrowing, and the costs of higher education will grow even further due to technical progress lagging behind other sectors of the economy. Section 7 discusses issues of equity and higher education and we argue that equity should be organized through the tax system or

basic education, not through higher education. Section 8 makes the case for income-contingent student loans instead of subsidies to warrant access. If, as we argue, private contributions should increase, one should safeguard access and make sure that also students from poor backgrounds enrol higher education. Section 9 argues that the structural reforms generically require much more transparency. Section 10 concludes and offers seven policy recommendations for reform of higher education in Europe.

2. Higher education in Europe: Central planning galore?

Much of European higher education suffers from the bureaucracies of central planning and too little autonomy. Almost all parameters are fixed: subsidies per student are fixed, tuition fees cannot be varied, the number of places for each course is often fixed by the ministry of education, and applicants cannot be refused once they have passed their national exams. HEI's find it thus almost impossible to respond to changes in demand or to engage in competition. Much of the time and energy goes into securing government subsidies for education and research rather than into academic entrepreneurship. To illustrate this gloomy picture, we present some quantitative and qualitative evidence on funding practices in higher education in Europe. In sections 2.1-2.2 and 2.4 we follow CHEPS (2001, 2002) and confine the analysis to ten countries: Belgium (Flanders), Denmark, France, Germany, the Netherlands, New Zealand, Sweden, United Kingdom and the United States. In sections 2.3 and 2.5-2.6 we use the data described in the Appendix to examine the partial correlation between PISA scores, student/staff ratios, the share of government funding going to HEI's and the share that students pay themselves, on the one hand, and enrolment duration, dropout and returns, on the other hand.

2.1. Enrolment in higher education

Figure 1 shows that enrolment in higher education has increased steadily during the last thirty years: from about 20 per cent of the relevant birth cohort in the early seventies to around half in most countries. Pressure on government budgets have increased steadily. In the UK, Germany, the Netherlands and elsewhere some even speak of a funding crisis.[1] Table 2 indicates a diverging pattern for admission criteria. Most European countries do not set admission standards, or only for specialised disciplines such as medicine, hotel management or music. If admission standards are set, this is primarily due to lack of capacity at HEI's and regulations forbidding institutions to charge higher fees if there is excess demand. This is the

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[1] The Economist notes that it probably costs Oxford University at least £10,000 a year to teach an undergraduate, but it can (even after allowing for top-up fees) charge students at most £3,000 a year and receive only about £5,000 subsidy per student a year. This still leaves Oxford with a deficit of £2.000 per student a year.

case in Belgium, Denmark, Germany, and the Netherlands. Countries with strict entrance criteria are the UK, Sweden and in the 'grand ecoles' of France. In the US admission standards vary according to the type of university or college.

2.2. Expenditures on higher education

Many claim that the macro budget for higher education has not kept pace with the huge increase in enrolment rates, so the government contribution per student has dropped significantly. However, Figure 2 indicates that in many countries real total education expenditures per student remained quite constant over the last fifteen years according to OECD figures – witness Denmark, Sweden and the Netherlands. In contrast to the pessimistic conclusions of CHEPS (2001), real Dutch education expenditures per student are not low according to international standards (only Denmark and Sweden have larger outlays) and real expenditures per student are not declining over time. Figure 3 plots the data from UNESCO (2003) over the longer period 1970-97. This reveals that in the pre-1985 period many countries did respond to increasing enrolment rates by decreasing expenditures per student like in Belgium and France. Most notable are the decreases in real education expenditures per student in the UK, Australia and New Zealand. Figure 4 shows that countries with a high real expenditures per student typically also have less students per member of staff. Still, there is considerable variation. Greece, Italy and the US seem to have more extensive forms of teaching while Sweden, Japan and Spain have more intensive teaching. The reason may be that staff stand fewer hours in the front of the class or that they are more expensive. The most striking feature is that the US is way ahead in spending per student than the rest of the OECD.

2.3. PISA scores, student/staff ratio's and educational performance

Educational performance can be measured by attainment rates, dropout rates, average duration of enrolment for those who complete their studies, and the returns on each year of higher education. Apart from students working harder, the two main ways in which educational performance can be improved is by having better quality students and by having more staff per student. The quality of incoming students can be measured to some extent by the PISA scores of 15-year old pupils. The scatter diagrams presented in Figure 5 does suggest that higher PISA science scores are indeed associated with a greater fraction of the population that attains tertiary education, fewer dropouts, shorter duration of enrolment to graduation and bigger returns. The scatter diagrams for PISA reading scores show a similar pattern. Figure 6 shows that more intensive teaching indicated by lower student-staff ratio's, is associated with lower dropout rates, shorter duration of enrolment to graduation and higher returns on education. These are, of course, partial correlations, but the diagrams are suggestive. Of course, the real value added of education is how much teaching adds to the

quality of a student. One would then want to examine how teaching affects the improvement in educational performance.

2.4. Input versus output funding of higher education

Funding of HEI's is typically organised around three pillars: lump-sum grants, 'input funding' dependent on the number of students enrolled and/or square meter floor surface, and 'output funding' based on the number of diplomas or grade points each university delivers. Traditionally, funding of HEI's was based on itemised budgets. Nowadays, most governments have abandoned these practices and rely more on (lump-sum) 'block grants'. HEI's can spend these the way they wish as long as they comply with government regulations. Furthermore, many governments apply strict funding formulae to determine the size of the block grant. Both output and input criteria enter in these funding formulae. Governments have also introduced contract-based funding (e.g., Eurydice, 2000).

Countries can be ranked according to the extent on input or output funding of HEI's:

← Input			Output →
France Belgium	Sweden		
N.Zealand USA	Netherlands		Denmark

Most countries organise funding on the basis of inputs such as the number of enrolled students (Australia, Belgium, France, and New Zealand). Funding in Denmark has the largest emphasis on output. Danish HEI's only receive funding on the number of grade points that students receive (the so-called 'taxi-meter model'). The Netherlands and Sweden take intermediate positions, where output funding seems to be more dominant. About half of funding in the Netherlands depends on the number of diplomas.[2] A similar amount of resources depends on the number of grade points in Sweden. The UK and Germany are somewhat exceptional, because public funds are generally allocated on historical grounds independently of the number of students or output criteria. Nevertheless, government funding is based on negotiations with HEI's and is based on budget forecasts. These budget forecasts generally reflect increases in enrolment, so the German and UK systems are characterised to some extent by input funding. Furthermore, in recent years, the UK government has put a growing emphasis on output and performance in teaching and research (Eurydice, 2000). In contrast, (public) funding schemes in Australia, Belgium, Denmark, the Netherlands, Sweden,

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[2] Dutch universities are funded on diplomas (approximately half); the number of first-year students enrolled (about 13 per cent) and a historically determined lump-sum grant (remaining 37 per cent). Dutch higher vocational schools are only funded on input (enrolment rates) and output criteria (number of diplomas and dropouts). It is not clear how large the fraction of funding is that depends on inputs.

UK and USA are independent from basic research and related activities. This is not the case in Germany, France, and New Zealand (Eurydice, 2000; CHEPS, 2001).

With output funding universities have strong incentives to cut costs and weak incentives to improve educational quality, because the quantity rather than the quality of output is rewarded due to the difficulties in measuring quality. With input funding HEI's are fully responsible for cost savings that can be made. Also, with lump-sum grants institutions are encouraged to cut costs. With input funding HEI's therefore have stronger incentives to cut costs and, at the same time, weaker incentives to supply quantity of output. Moreover, with input funding HEI's have no incentive to sacrifice quality for quantity. This implies a trade-off between, on the one hand, keeping incentives to reduce costs and avoid grade inflation, and, on the other hand, providing the socially desirable level and quality of output.

We conclude that incentives for HEI's are not optimal. If monopolistic practices are prevalent among HEI's, input funding schemes create welfare losses as institutions under-supply (quality of) education (also see Box I). Output financing restores these incentives, but results in grade inflation and weaker incentives to operate HEI's cost effectively. There is thus a trade-off between incentives to cut costs and monopoly rent extraction (cf., Laffont and Tirole, 1993). We return to these issues in section 5.

A drawback of output funding is that institutions may substitute quality for quantity in their educational output. The countries that do rely on substantial output funding (Denmark, Sweden and the Netherlands), all have quality safeguarding committees. In Denmark it is the independent Evalueringsinstitut (EVA). Furthermore, Denmark intensively uses external examiners so as to prevent grade inflation. In the Netherlands there is not an independent institute, but there are the so called 'Visitatiecommissies', who evaluate faculties every few years and operate under the flag of the association of universities (VSNU) or the council for higher vocational schools (HBO-Raad). In Sweden the National Agency for Higher Education evaluates all courses and programmes offered at universities every six years. None of these committees has direct powers to intervene in the funding of the educational sector in case institutions are not performing well. The UK employs external examiners to guarantee quality and avoid grade inflation. Since these examiners are allocated to each course, this is a very effective control mechanism.

2.5. Demand- and supply-side funding

Another dimension of funding schemes is the extent to which subsidies on education are driven by demand or supply factors. Ignoring incidence of funding and taking a partial perspective, education subsidies boost demand for education if funds are directly given to students (e.g., through student support or vouchers) or determined by the number of students. In that case, funding of education follows demand. Supply funding may be regarded as

funding on outputs or through lump-sum grants to HEI's. Demand funding is important in countries with an emphasis on input funding. Furthermore, substantial resources are directly spent on students through grants and loans, which correspond to demand-driven funding. However, Sweden the Netherlands and Denmark have substantial supply-side funding.

Figure 7 presents scatter diagrams between the share of funding that goes to HEI's rather than to students and attainment rates, enrolment durations, dropout rates and returns on study. Interestingly, the data suggest that directing government funding of higher education to students rather than institutes implies higher attainment rates, higher dropout rates and lower returns, and not much of an effect on enrolment durations for those who graduate. We would indeed expect this due to larger enrolment of less motivated students. At the same time, the data are not inconsistent with the idea of grade inflation, that is HEI's have incentives to keep students enrolled as long as possible if they are rewarded on enrolment and increase graduation rates if funding is based on diploma's.

If one takes a general equilibrium perspective, it is not clear who benefits from government grants to HEI's. From tax incidence analysis we know that the inelastic side of the market reaps the benefits, regardless of whether subsidies are allocated to the demand or supply side of the market. There is evidence that demand for HEI's is not very price-elastic. Table 3 suggests that doubling tuition fees reduce enrolment (inflow of students as percentage of cohort of students) by 5 to 10 percentage points. In fact, universities have absorbed the massive increases of enrolment in education without much trouble in many countries. This suggests that supply is quite elastic. One is tempted to conclude that the larger part of the incidence of education subsidies falls on the students despite the fact that in most countries universities receive the government contributions.

2.6. Funding rates and tuition fees

Governments typically determine the amount resources for various students in various fields of study at a centralised level. Common practice is that governments use a number of tariffs in the funding formulae of HEI's for various disciplines. Table 4 shows the number of tariffs applied to funding of HEI's in various countries. In all countries we observe that more expensive disciplines such as medical or natural sciences receive larger government contributions than cheaper disciplines such as social sciences (cf. CHEPS, 2001). Tuition and/or registration fees are, typically, also centrally planned in Europe and governments do not allow HEI's to differentiate tuition fees charged to students (CHEPS, 2001; Eurydice, 2000). This holds for all countries except the US and New Zealand. Further, no tuition fees exist in Denmark, Germany and Sweden. Other countries have fixed but positive tuition fees that may differ between various fields of study (Australia, France, Netherlands, and the UK). There is no relation between the costs of education and the prices charged to students in

almost all countries (except in the US and New Zealand). The consequence of government controls on both the prices charged to students and the government contributions to HEI's is that institutions can only adapt by changing the quantity and quality of their educational services. This may not be efficient. Moreover, if the market for higher education is imperfectly competitive, this could result in cross-subsidies from cheap to expensive studies.

In recent years, many governments (Australia, Belgium, France, Netherlands and United Kingdom) have increased tuition rates in order to keep sufficient resources flowing into higher education in the face of increasing enrolment (Eurydice, 2000). Also, in the US and New Zealand where institutions are free to set fees, tuition rates increased substantially during the last decades (Kane, 1995; CHEPS, 2001). Similarly, some countries have decreased the level of grants given to students and increased loan facilities. This occurred in Belgium, the UK and the Netherlands. In contrast, Germany, Sweden and Denmark, have increased grants and loan facilities, whereas France only increased grants. New Zealand and Australia both substantially increased loan facilities (Eurydice, 2000; CHEPS 2001). In Australia this is organised through the so-called Higher Education Contribution Scheme (Barr, 1993; Chapman, 1997; CPB, 2001). Also, conditions governing awards of student grants have become tighter in some countries by linking grants/loans to academic progress (Denmark, Germany, Netherlands, and Sweden). Interestingly, these are the countries with relatively large subsidies on higher education (Eurydice, 2000; 2001).

The scatter diagrams presented in Figure 8 indicate that a higher proportion of student loans rather than student grants is associated with lower tertiary attainment rates, shorter duration of enrolment for those who graduate, less dropout and bigger returns. Figure 9 also suggests that a bigger share of private expenditures on higher education is associated with higher tertiary attainment rates, less dropout and shorter duration of enrolment for those who graduate, but there is no clear correlation with returns. The data are not inconsistent with the idea that if students borrow more and may more of their study themselves that educational performance improves. To illustrate, the present value of lifetime earnings varies from around 1.2 million euros for economics, medical, agriculture and technical university male graduates to 0.9 for behavioural and social graduates and 0.8 million euros for arts male graduates in the Netherlands (Jacobs, 2002). Graduates of higher professional schools have about 0.3 million euros less. Present value of lifetime earnings of female graduates is much less, but still many factors more than the present value of the costs of higher education (45 thousand euros). The cost of studying is thus much less than lifetime earnings. And the return on different types of studies is very different, even though tuition fees in Europe are typically the same for different types of studies. All this suggests that is worthwhile to investigate the potential merits of higher and more differentiated tuition fees.

2.7. Summary of stylised facts

We are fully aware of the limitations of some our partial correlations, but nevertheless summarise our overview with the following suggestions:

• Enrolment rates more than doubled during the last thirty years in virtually every country.

• Real total expenditures and/or (direct) government contributions per student remained constant in most countries, but declined in Australia, New Zealand and the UK.

• Higher PISA scores suggest less dropout, shorter study lengths for those who actually graduate and higher returns. Also, lower student/staff ratios are associated with less dropout, shorter enrolment duration for graduates and higher returns.

• Typically, admission criteria are soft without strong selection with the exception of France, the UK and the US.

• Increased demand for education is met by either increasing public budgets (Denmark, Germany, Sweden), higher tuition rates (Australia, Belgium, France, Netherlands, New Zealand, UK and US), or decreasing grants (Belgium, Netherlands, UK).

• Countries with high public expenditures have tightened the link between academic progress and eligibility to grants and loans (Denmark, Germany, the Netherlands, and Sweden).

• Emphasis in most countries is on input funding of HEI's, but not in Denmark, Sweden and the Netherlands. Incentives are generally not very good. Input funding is generally more important than output funding.

• Government contributions to universities are generally fixed and centrally set. Most governments apply tariffs to differentiate between disciplines with different costs of provision. Tuition rates are typically centrally determined and there appears no link between real costs and tuition costs or government contributions.

• Targeting government funding at students rather than HEI's may indicate more dropout, a bit longer study duration for those who graduate and lower returns.

• Demand for higher education seems moderately inelastic and supply fairly elastic. This suggests that the benefits of grants are shifted to students.

• If students borrow more and get less grants, this may be associated with shorter duration of study for those who graduate, less dropout and bigger returns. Also, a bigger share of private expenditures is associated with less dropout and shorter enrolment.

• Higher education yields high returns and thus constitutes an excellent investment.

3. Variety, selection and structural reform

3.1. University Ltd.? or Universitas Praesidium Libertatis

There is much debate about what the nature of a university should be. Some stress academic freedom and argue in favour of a university that cherishes excellence in teaching and research somewhat devoid of everyday life. Such a Universitas Praesidium Libertatis should be a charity or at least a non-profit organisation, even better if it is financed by government grants. At the other extreme, others argue that a university should be seen as a business that attempts to make profits. Although there are many types of university, varying from pure state to commercial universities, many of the best universities are a mixture of both ideals. Some of the activities can be offered on a commercial basis and for some research commercial sponsorship can be sought. For other less market-oriented, academic activities state funding, tuition fees and or untied sponsoring are crucial. A related question is what the optimal scale of a university or institute of higher vocational education should be. The scale should not be too big to avoid excessive bureaucracy, but should not be too small either in order to reap the benefits of returns to scale. Some universities operate and compete together in a network, think of the University of California. As higher education is a business, albeit a noble one, and thrives in a competitive environment, one should worry if the scale of operations becomes so large that competition between HEI's is hampered.

Just like in nursing, police, child care or development aid, it is difficult to write a contract that specifies a price for the quality of the detailed and complex menu of education and research that is offered. Students, state and sponsors lack the information necessary to judge. They do not know exactly what they are purchasing. Their education is a one-off purchase and in some cases it is the parents that do it on behalf of their children. Some of the nature of academic interchange even disappears if a price is attached to it. Intrinsic motivation of students and staff and trust are vital in any system of higher education and may disappear if too many incentives are introduced to stimulate extrinsic motivation. These are the reasons why higher education is probably best operated as a non-profit enterprise (e.g., Winston, 1999). A problem with non-profit organisations is that they have a tendency for bureaucratic slack, which may be witnessed from the funds spend on magnificent offices for central administration, prestige projects introduced from the top rather than evolved from the bottom, prestigious sport or cultural activities, etc. Non-profit organisations also tend to under-estimate the costs of its capital services such as buildings and campuses (e.g., Stiglitz, 1994, Chapter 5). In practice, these potential inefficiencies may not be so big, since non-profit organisations are often run by dedicated professionals committed to the pursuit of high-quality research and teaching and/or wide and diverse access to higher education. Objectives are typically not profits, but how well they do compared to their peers. Rankings and peer

reviews and the competition that result from it, is thus what drives HEI's. Of course, peer effects are also crucial for students as they form values, academic interests and aspirations in the interchange with other students. Any modern institution of higher education needs to recognise that funding must come not just from the state but also from students, alumni, estates and sponsors. In this sense, non-profit public institutions do not differ that much from profit organisations. The government should realise that they also do not differ that much in terms of management and agency problems. Every organisation runs into incentive problems. The fundamental problem for the government is its lack of commitment not to bail out such HEI's if they get into financial trouble. This leads to the problem of soft budget constraints. Public institutions make wrong decisions, because market forces do not discipline them and governments are too weak to penalise malfunctioning institutions. On the other hand, owners of private universities may also run into problems as the quality and reputation of their institute is not easily measurable (as opposed to profits).

HEI's differ from normal enterprises in other respects as well. They subsidise or should subsidise some of their customers, namely bright students. The quality of their output and the degree to which they are able to extract revenues from state, students, alumni and sponsors depends to a large extent on the inputs of high-quality customers/students (Rothschild and White, 1995). Institutions can, if allowed, try to generate an excess demand for their services by selling below cost in order to control who they sell to. This way they can select the smartest students. Of course, attracting the smartest students generates a positive feedback loop as it raises the quality and reputation of the institute and thus increases further demand from smart students. Having high-quality customers/students will also make it possible to attract much better employees/professors. All these factors make higher education a very special form of non-profit organisation indeed. Furthermore, in the US and the UK there are very large differences in endowments and ability to tap sponsors or money from alumni. This also leads to very large differences in the ability to attract the smartest students and professors. This lays the foundation for a strongly hierarchical market for higher education with huge differences in price-cost ratios, at least in Anglo-Saxon markets of higher education (Winston, 1999). Consequently, most US and UK HEI's belong to a niche in the hierarchy and compete with their peers in that niche. In Europe, however, the differences in ability to tap money from the state, students and/or sponsors are much less marked. The European market for higher education therefore has much fewer niches and is not very hierarchical.

3.2. Hierarchy and stratification in higher education
Many policymakers and politicians express fears that a move towards an Anglo-Saxon style university system gives rise to a much more hierarchical higher education system, which is

stratified along incomes. These fears are not completely unjustified. In the US we observe that access to the top ranked universities is generally unaffordable by the poor without further assistance. Many students with insufficient academic quality from well-off backgrounds can also be found at the best universities. Also, it is important to realise that higher education gives privileged access to queues of high-quality jobs. Surprisingly, not much theoretical or empirical literature exists on this matter in the specific context of higher education (except Epple, Romano and Sieg, 2004). However, we can draw upon insights from the literature on endogenous stratification models of local financing of education in the US (Bénabou, 1992, 1994, 1996a, 1996b; Durlauf, 1994, 1996; Fernàndez and Rogerson, 1996, 1998; Epple and Romano, 1998).

In the US public schools are generally financed locally from property taxes. Many parents move to better communities as soon as they can afford it. Consequently, members of more wealthy communities can and do pay higher taxes and have better public schools. This yields a geographical stratification according to incomes, where the best schools are located in the wealthiest neighbourhoods and the worst public schools are found in the ghettos. Moreover, the stratification of neighbourhoods may entail persistent income inequality and reduce income mobility as parents get trapped in low-income neighbourhoods and cannot give their children appropriate education even if they have sufficient capacities to study.

The analogy with universities is as follows. Universities can be seen as 'communities', where individuals gather to invest in their human capital. Like in the models discussed above, it is the gathering of the best students, professors and researchers at one location that determines the attractiveness of the university. Decentralised universities set tuition rates, which are the equivalent to the property taxes set by communities. In an equilibrium, therefore, most people go to the best universities that they can afford. This generates a stratification and hierarchy according to incomes. Conditional upon academic talent, the wealthiest individuals go to the best universities. To get a market for higher education which is stratified along incomes, the willingness to pay to attend a better university must be increasing in income which may be the case with credit market imperfections. Conditional upon ability, poor students or their parents have a lower willingness to pay for a higher education if they are more credit constrained. Without capital market imperfections, the hierarchy of universities is such that there will be stratification along academic capacities. The best and most able students have the highest willingness to pay and therefore go to the best universities (e.g., Fernàndez, 1998).

Positive *local* externalities that raise the human capital only of those students attending a particular university magnify stratification (cf., the 'customer input technology' of Rothshield and White, 1995). The best universities are the universities where the best students and professors come together and where the probability of entering 'elite networks' is large.

Universities internalise these externalities of attracting better students, researchers and professors by setting higher tuition rates. Such externalities can also be generated through interactions among individuals with good networks that increase the odds of getting a high-paid job when graduated. In principle, these local externalities are internalised at the university level and the outcome is then efficient. Without capital market imperfections, the hierarchy of higher education is determined by differences in academic capacities, not incomes, and local externalities will thus make the stratification along academic abilities more pronounced. However, with credit market imperfections preventing the poor but able students to enrol in the best universities, these externalities thus reinforce the adverse effects of capital market imperfections and also strengthen stratification along incomes. Moreover, it also introduces mismatches of students over universities (Fernàndez, 1998). Rich but less able students enrol in the better universities and the poor but able do not. This is not efficient.

Stratification on incomes is not a just outcome and may even reduce income mobility. This is certainly not our intention in our pleas for a move towards larger private contributions in Europe. Therefore, we emphasise that it is of utmost importance that the poor obtain sufficient funds to finance their education by making income-contingent loans available. Stronger local externalities at universities produce a steeper hierarchy and a more diverse education system and this is in principle economically efficient. We want to encourage elitism in a purely academic sense.[3]

Education is not only an investment but also a consumer good. More wealthy people may consume more and better education. Then, the willingness to pay for higher education also increases with income, like with capital market imperfections. In this case however, we do not see a violation of equality of opportunity. A priori it is not a problem when the wealthier people send their children to the more expensive universities even though the children have less academic potential. Rational universities will charge higher tuition rates to students who contribute less to the academic quality of the institution. Indeed, the poor, but able students may benefit from this because they may receive a discount on the tuition rates which are financed by the 'dumb and rich'. We therefore do not agree with those who voice concerns about the emergence of elite universities if an Anglo-Saxon style higher education system is introduced in continental Europe. As long as the government safeguards access, indeed a stronger hierarchy will emerge, but this will in principle be a hierarchy along academic potential, not incomes.

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[3] If a more equal distribution of academic outcomes generates more macroeconomic externalities, complete stratification on abilities may be undesirable (Bénabou, 1996b). Since macroeconomic external effects of education are unlikely to be derived from more homogeneity in higher educational outcomes and come from more academic excellence, i.e. more specialisation, instead, we are sceptical of this argument. We admit that we are not aware of any empirical evidence on this matter.

A final remark on competition is in order here. If there is imperfect competition due to a limited number of suppliers, the higher education system may not cater sufficiently to the variety in academic abilities and student demands. Under perfect competition and perfect capital markets, each student with a certain academic level can find a corresponding university that perfectly matches his or her ability (Fernandez, 1998). This stratified equilibrium internalises all externalities at the university (Rothshield and White, 1995). Imperfect competition, however, hampers the effective internalisation of local externalities as students with different abilities are mixed and educational programmes cannot be perfectly tailored to internalise the local external effects and efficiency losses occur. Consequently, more effective competition, i.e. more suppliers, results in more variety, a steeper hierarchical distribution of universities, and less welfare losses in internalising externalities of higher education (cf., Epple and Romano, 1998).

3.3. The Bologna agreement: more variety, flexibility, transparency and harmonisation?

With the signing of the recent Bologna agreement members of the European Union have agreed to reform the structure of their university courses towards the Anglo-Saxon system of three- or four-year bachelor degrees and one- or two-year master degrees. This has numerous potential advantages. However, if other reforms (mainly deregulation and engendering stiffer competition between HEI's) remain absent, these potential advantages will not come off. The potential advantages of the system of bachelors and masters can be motivated by the option value of being able to switch more easily and to delay and come back, more variety and a better match demand of supply, more transparency, and a better international harmonisation.

First, it encourages many students in continental Europe to complete their studies more quickly. The Anglo-Saxon system of higher education features almost no dropouts, because students know exactly when to study and when they can work or have fun. Much waste can be avoided if students complete their studies on time and universities in continental Europe switch to three year bachelor and one rather than two year master degrees. This could reduce the nominal study length by one and half to two and a half years. Indeed, the data in section 2 indicate that longer nominal study length is associated with higher dropout rates. The culture of many retakes of exams in many parts of continental Europe would hopefully disappear. UK graduates study less years, but receive a bigger return on their studies (see section 2). One reason for the success of the British system is that students specialise early during their A-levels and thus complete their university degree in three rather than four or more years and drop out less often. The UK also attracts many foreign students, but those continental European universities that teach bachelor and master programmes in English are catching up.

Second, the Bologna reforms reduce the risk of choosing the wrong study and encourages students to take a more demanding study. This argument is motivated by the option value of irreversible investment in a tough study and the benefits of flexibility and variety that the bachelor-master system can in principle offer. Many prospective students hesitate in choosing mathematics or other science subjects for fear of failing and/or getting locked into a discipline in which they may not excel. A first degree in mathematics or science perhaps spiced up with minors in physics, engineering, economics, biology or psychology that lasts three rather than five or six years is a less daunting prospect. Those who like mathematics and science can go on afterwards with a specialised degree and others can choose another discipline or go for the job market in the sure understanding that their initial grounding in mathematics and science will come in very useful.

By the same token, the Bologna reforms allow students to wait in the presence of uncertainty with regards to their capacities, interests and job market circumstances.[4] Some of the students may prefer to gain work experience after a three- or four-year degree rather than after completing a study after five to seven years. So far, UK students had an advantage on the job market as they were available to employers at a younger age and could be more easily moulded into the corporate culture. However, many of these students continue directly or come back for a professional master degree after a few years of work experience and when they know better what they want. This also makes sense, because larger enrolment durations in higher education are profitable in the face of the high returns and there is a buoyant demand for highly trained workers. In fact, annual rates of return to higher education in the UK are above those in continental Europe (e.g., Harmon, Oosterbeek and Walker, 2003). This may be due to diminishing returns of further years of study.

Third, the Bologna reforms stimulate more students to take and combine different studies. In the complex society in which we live there is a growing demand for people that can combine different disciplines and points of view. Think of chemists with a master degree in law, who may find a career in due diligence regarding firms and environmental pollution, mathematicians who continue in evolutionary biology, historians who do a master course in political science, or artists with a postgraduate degree in business economics. Much of technological and economic progress in contemporary society occurs in the twilight zone between different disciplines. Unexpected cross-overs and serendipity seem to matter. For example, the technological revolution in mobile telecommunication depends to a large extent

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[4] However, it is not always optimal to delay further study as opportunity costs are low when people are young and do not earn a lot and have a long ahead to reap the benefits of higher education. Returns to investment in human capital of older people are lower and may even be negative (e.g., Heckman, 2001; Carneiro and Heckman, 2003). The gains from permanent education and returning after some years of work are presumably only apparent in disciplines where expertise becomes rapidly outdated.

on synergy with creative designers and other artists. This potential advantage relies on the benefits of more product variety.

Moreover, the Bologna reforms induce a better allocation of students to courses in vocational higher education and universities. University students who discover that they have more of a professional interest can switch to a professional master course at a college of professional higher education and some of the more academically minded vocational bachelors may switch to university. Universities will go for the pursuit of academic excellence and research. Colleges of higher professional education will offer the best courses they can give for students who wish to prepare themselves for practical careers in society. The majority of US universities and higher professional schools are of mediocre quality and only a few universities are truly excellent, but the US system does offer a lot of variety for students of different talents and interests. Many European countries offer a much higher average quality than the US, but do not have that many really good centres of excellence. Europe offers much less diversity and flexibility than the US system and also offers much less choice between, say, intensive and extensive forms of education. This may be due to the US being a much larger and open academic market. This means that the mismatch between demand and supply of higher education is probably much larger in Europe than in the US. The Bologna agreement stimulates HEI's to provide more diversity and to find a niche and distinguish themselves from competitors. Now the European university system has too much uniformity and too few programmes trying to break away from the average fare that is offered.

Fourth, if regulation is enacted to enforce competition, the Bologna reforms can engender competition between a larger number of shorter degree programmes. Currently, however, many HEI's in Europe are colluding and collaborating and stifling competition as may be witnessed from many mergers and the fact that the majority of degrees seem to be standardised. If students are unhappy with a particular degree programme, they should vote with their feet and leave after the first year or after the bachelor degree and go to another institution for further postgraduate study. Institutions can differentiate themselves by offering intensive rather than extensive teaching programmes, investing in special niches of postgraduate education, anticipating the greying of the population by offering special programmes for mature students, etc.

Finally, the Bologna reforms make the European system more compatible with Anglo-Saxon systems of higher education found in UK, US, Canada, Australia, New Zealand, India, Pakistan and much of Asia and Latin America. This enhanced transparency encourages European HEI's to compete on a global scale.

In sum, the Bologna reforms can make a real contribution to improve the European system of higher education and make it more flexible, dynamic, interdisciplinary and outward-looking. This may yield more variety in the menu of higher education offered. The

success depends on two important necessary conditions. On the one hand, the potential advantages of the introduction of the bachelor and master programmes only materialise if competition between HEI's is stimulated and cartels are not tolerated. On the other hand, a revolutionary change in mindset is necessary so that secondary school pupils and students become discriminating and critical consumers of higher education. Currently, most of them go to their local university or college near to the home of their parents even if this is evidently a bad match with their talents or their demand for education. Transparency of the system is thus crucial, as school pupils and students should base their decisions on better premises, and more transparency fosters competition. Michelin guides for the quality of teaching and research are of utmost importance in this respect (see section 9).

3.4. Striving for quality: selection, peer review, external examiners and grade inflation

In much of continental Europe universities seem hesitant to strive for academic excellence. Although the average quality of European universities may be higher than their US counterparts, the US seems to top the bills in terms of rankings in, for example, the Times Higher Education ranking of the world's top 200 universities. The ranking considers peer review, international faculty, international students, faculty/student and citations/faculty scores. Table 5 shows that this list of top universities is dominated by US institutions. More interesting is that 41 of the top fifty universities are from countries with an Anglo-Saxon system of education. If we also count the Indian Institute of Technology, then there are 42. Continental Europe (excluding Switzerland) only has three universities in the top fifty. Much of the top research in Germany is supposed to be done in the Max Planck Institutes, but none of them appear as teaching is not their core business. Still, the picture for continental Europe seems gloomy. The key question is whether the move towards an Anglo-System of higher education leads to more top universities in Europe. Despite ferocious competition among students, Japan has only two top universities. Many expect China and India to deliver more top universities in the future.

European universities are more comfortable providing a decent education for all with not much diversity in the fare offered. Of course, one cannot blame only universities as this seems to be deeply ingrained in the European culture. In particular, even though conservatoires, theatre schools and higher hotel schools select among applicants, most universities in Europe are reluctant to do so for fear of denying applicants from underprivileged backgrounds a fair chance. This is difficult to understand. For example, with borrowing constraints for students, selection on ability seems fairer and more efficient than selection on prices and thereby on parental income (Fernandez, 1998). Even with loans that remove liquidity constraints, there is a case for admission standards because of the signalling function of higher education (Fernandez and Galí, 1999). If students are charged cost-based

tuition and offered loans to remove liquidity constraints, lowering admission standards while keeping graduation requirements fixed, boosts output and promotes wage equality but harms relative income mobility and diminishes the scope for affirmative action. Furthermore, again within the realms of a calibrated overlapping generations model, income-based affirmative action offers a better trade-off between output and relative mobility than income-neutral admissions (Gilboa and Justman, 2005).

However, the US has considerable experience in aptitude rather than ability tests. These test aptitude, innate intelligence and suitability for higher education rather than ability or knowledge, which can be crammed by the fortunate ones with extra training. Unfortunately, there are signals that during the last few years the aptitude tests have become more like ability tests. This undermines the huge success of the US higher education system and threatens to move the US away from a meritocracy towards a system where family ties and background matter. Europe would benefit from a move towards selective entries. It is true that, say, France has its 'grand ecoles', but the majority of its HEI's suffer from huge intakes of uninterested students. Utrecht University and the International University Bremen experiment with honours programmes and tough selection at entrance, but the majority of universities in the Netherlands and Germany accept on the basis of a high school diploma only. No wonder many first year students fail and that the real selection takes place after one year and sometimes even later. The match may be better then, but it leads to a huge waste of resources.

The taboo on selection has to do with a deep commitment to equality. Of course, this is a legitimate policy choice, but it may hurt efficiency and excellence. Selection should not be directed from above by central government. Some courses will want to select at entry, others later. Some will want to use aptitude test, others in-depth interviews. Test scores at secondary school are not necessarily a good predictor and selection is bound to be somewhat subjective. Degree programmes will therefore make type I errors when they accept bad students and type II errors when they reject good students. Reducing the probability of type I error logically increases the chance of type II error, and vice versa. It is thus unavoidable that very picky programmes make mistakes and turn away good students. In an open and decentralised system this should not matter too much, because rejected students get another chance at another programme and competition will weed out programmes that are too lax in their selection. European universities may benefit substantially from more selection. This should work both ways. Prospective students should also be much pickier about where they are going to study (see section 9).

In much of Europe the market for lecturers and professors is closed to outsiders. In Italy we still hear of scholars with Harvard or MIT Ph.D.'s and excellent publication records beaten to the job by local heroes with the right connections with local professors. It is not that different in France or Greece, although Spain seems to open up. Even in the national

competition for chairs in those countries, it is difficult to penetrate for outsiders let alone foreigners (e.g., Perotti, 2002). Germany is stifled by the hierarchy of its universities, where until recently outsiders and foreigners did not get a real chance to establish themselves. HEI's in all those countries suffer from a bureaucracy that drives much talent away. The UK, Scandinavia and the Netherlands have more open recruitment, so benefit from a more competitive environment. Apart from cultural and institutional hurdles for appointing talent, most countries suffer from administrative civil servant salary scales. It is thus impossible to reward and attract young talent, while older academics are encouraged to stay on even if their productivity has declined substantially. Consequently, many post docs and young professors leave Europe for the US as soon as they get an opportunity. Although in some countries there are experiments with prizes for academic talent covering salary and research outlays, allocation of these awards is often affected by geographical considerations and salary scales remain unaffected. The severe tenure hurdles and the competitive publication race one sees in the US, is much less pronounced in Europe. More generally, insider-outsider problems drive up real costs of higher education, reduce educational output, dwarf the effectiveness of public resources spent on higher education and waste academic potential. Insider-outsider problems are exacerbated if there is less competition in the market for higher education. If universities have more market power, monopoly rents are larger and this results in more rent seeking activities of insiders.

Peer review is crucial for giving the right incentives for high-quality research. The top journals are often dominated by Americans or Europeans living and working in the US. Anonymous peer review is the key way in which academics evaluate each other. The top academics in Europe know they have to publish in these top journals as well. Peer review is, however very weak in Europe. Member states are beginning with external five-yearly evaluations of teaching and research programmes, but it is unclear whether many consequences are drawn from critiques. In any case, in those parts of Europe where peer review of research has really taken off, it has tended to overshoot at the expense of educational quality. This is particularly likely if higher education teachers can teach their own courses and mark their own exams. Apart from the UK, there is almost no use of external examiners to contents of audit marks given to courses. Without such a time-intensive system of external examining there is a danger of grade inflation, especially if funding of institutions depends on the number of awarded degrees. More generally, grade inflation may be a consequence of lack of variety, transparency and incentives that result in low quality and uniform education. We return to this when we discuss optimal tuition rules in the presence of monopolistic price setting (see section 5).

4. Towards optimal subsidies and pricing of higher education

Suppose that there are no equity concerns and no monopoly power of HEI's. What is the market outcome? To answer this question we develop a benchmark general equilibrium model of the market for higher education with students demanding various varieties of education, universities supplying the various varieties of education, and firms hiring graduates for production activities. An important feature is that attracting good students boosts academic reputation and thus attracts more students and sponsor income, which generates more revenues and/or lowers costs. Section 5 discusses the trade-off between output and input funding under monopolistic competition and the problem of grade inflation.

4.1. Students

First, students borrow money to finance their education and costs of living. Second, they work and pay back their loans. Students are credit constrained if loans are insufficient to cover the costs of education and living. Students differ in ability and initial wealth holdings. Student i has ability θ_{in} in degree n and initial wealth ω_i.[5] The cumulative distribution of students is F(i). Students can enrol in N types of higher education. Educational investment in study n is denoted by e_{in}. One may view e_{in} as the number of years student i is enrolled in discipline n or, alternatively, as the intensity of educational effort if enrolment durations are fixed. Total production of human capital h_i of student i depends on investment in all disciplines:

$$h_i = \sum_{n=1}^{N} \theta_{in}\phi(e_{in}), \quad \phi' > 0, \phi'' < 0, \forall i, n$$

where θ_{in} denotes the ability of student i in course n. Students with higher ability in a particular programme thus generate relatively more human capital if they direct their effort in that direction. Some students may have a comparative advantage compared to other students in doing a particular study. For example, student i has a comparative advantage over student j in β-studies rather than α-studies if $\theta_{i\beta}/\theta_{i\alpha} > \theta_{j\beta}/\theta_{j\alpha}$ holds. Our specification allows for the extreme case where student i has only one talent, e.g., $\theta_{in}>0$ and $\theta_{im}=0$, $\forall$ $m\neq n$. Typically, students invest in the disciplines that suit their relative abilities best.

Student i pays tuition fees of p_{in} per year if they are enrolled in course n. Tuition fees may thus be conditioned on particular student types if they have value added to the university. This makes sense if education is a 'customer input technology', where students are consumers of education and (co-)producers of education. This occurs if good peers raise the quality of

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[5] We could interpret θ_{in} as student performance and make it endogenous. This would introduce various incentive issues. We abstract from that here.

education (e.g., Winston, 1999). There is some quasi-experimental evidence that good students improve and bottom-ranking students worsen the exam performance of middle-ranking students (Williams and Zimmerman, 2003). With peer effects, universities want to reward students for their contribution to the educational process by giving them a discount on their tuition (Rothschild and White, 1995).

Tuition fees are subsidised at the rate s_{in}. This subsidy may be differentiated according to the ability of the student and the field of study. We defer discussion of the consequences of restricting subsidies to be uniform across students and/or disciplines. We ignore opportunity costs of education in terms of forgone income and only discuss their implications if they change our main insights, even though they constitute about three quarters of total costs. We assume that the cost of living for students c is exogenous. Students may borrow d_i to finance their cost of living and educational expenditures. We introduce a maximum borrowing limit $d^* \geq 0$ to capture imperfect capital markets. If $d^*=0$, borrowing is impossible and the costs of education and living must be financed from initial income endowments ω_i. The student budget constraint is given by:

$$d_i = \sum_{n=1}^{N}(1-s_{in})p_{in}e_{in} + c - \omega_i \leq d^*, \quad \forall i,$$

where total borrowing equals total outlays on tuition (net of subsidy) plus cost of living minus initial wealth. We assume total education expenditures are tax deductible for the income tax. Students work after graduation and repay their debts. The wage rate per unit of human capital for graduate i with education n is fixed and denoted by w_{in}. Graduates with different education face different prices per unit of human capital. We could allow for general equilibrium effects on wages, but the production efficiency theorem (Diamond and Mirrlees, 1971) suggests that this does not affect our main results if production displays constant returns to scale, markets are perfectly competitive, and various types of workers in production activities are perfect substitutes. Every student pays the same interest rate r on the debt arising from student loans. Interest is not tax deductible, since this would distort saving.[6] After-tax graduate income y_i equals after-tax labour earnings minus repayment of and interest on student loans:

$$y_i = \left(\sum_{n=1}^{N}w_{in}\theta_{in}\phi(e_{in})\right)(1-t_i)-(1+r)d_i, \quad \forall i.$$

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[6] If students are thought to be short-sighted and suffer from debt aversion, one could resort to hyperbolic discounting.

Graduate utility equals graduate net income plus immaterial benefits of education:

$$U_i \equiv y_i + \sum_{n=1}^{N} \alpha_{in} \theta_{in} \phi(e_{in}), \quad \forall i,$$

so students obtain utility from studies that give them fun or status ($\alpha_{in}>0$) or disutility from studies they detest but may given them a high return in money ($\alpha_{in}<0$). The immaterial returns may reflect the symbolic value of a certain job (e.g., lawyers versus teachers). Immaterial benefits are effectively untaxed. Each student maximises graduate utility by choosing levels of investment in the various degree programmes subject to loans not exceeding the credit limit. Necessary and sufficient conditions for maximising graduate utility are:

$$\left((1-t_i)w_{in} + \alpha_{in} \right) \theta_{in} \phi'(e_{in}) = \left(1+\mu_i+r\right)(1-t_i)(1-s_{in})p_{in}, \quad \forall i,n,$$

where μ_i is the shadow value of one extra resource unit of credit limit to student i, and

$$\text{c.s.} \begin{cases} \mu_i \geq 0 \\ d_i \leq d* \end{cases}, \quad \forall i,$$

are the complementary slackness conditions for the credit limit on student loans. If capital markets are perfect or student i can borrow sufficiently from the government, we have $d_i<d*$ and $\mu_i =0$. If capital markets are imperfect and student i is credit constrained, we have $d_i=d*$ and $\mu_i>0$. From the first-order conditions we derive the demand of individual i for degree programme n:

$$e_{in} = \Phi\left(\frac{\left(1+\mu_i+r\right)(1-s_{in})p_{in}}{\left(w_{in}+\alpha_{in}/(1-t_i)\right)\theta_{in}} \right) \leq \Phi\left(\frac{\left(1+r\right)(1-s_{in})p_{in}}{\left(w_{in}+\alpha_{in}/(1-t_i)\right)\theta_{in}} \right), \quad \Phi' \equiv 1/\phi'' < 0, \quad \forall i,n.$$

Hence, individual i invests more in higher education in discipline n if interest costs r are low if the individual is not credit constrained ($\mu_i =0$), subsidies for that discipline s_{in} are high, tuition fees for that discipline p_{in} are low, graduate wages in that discipline w_{in} are high, and academic ability in that discipline θ_{in} is large. Students also invest more in studies that give them high immaterial value and the more so if a large part of immaterial returns escape the

income tax, i.e, when t_i is high.[7] Alternatively, they will study even if the wage is relatively low. Conversely, students are discouraged to take courses that give little esteem and a lot of sweat. A higher tax rate depresses after-tax graduate income and thus discourages investment in higher education. A higher interest rate on student loans discourages study, but less so if interest on student loans is tax deductible. We now assume that the government makes sufficient borrowing possible, so that students are not credit constrained in financing their education and costs of living.

4.2. Universities and other institutions of higher education

Each degree programme n sets tuition fees to maximises profits:

$$\Pi_n \equiv \int_I p_{in} e_{in} \mathrm{d}F(i) - C_n(e_n, h_n) \text{ with } e_n \equiv \int_I e_{in} \mathrm{d}F(i) \text{ and } h_n \equiv \int_I \theta_{in} \phi(e_{in}) \mathrm{d}F(i),$$

subject to the demand of each student for its courses. The cost function of degree programme n increases with total student demand e_n (i.e., $C_{ne}>0$), but decreases with total human capital produced by the programme h_n (i.e., $C_{nh}<0$). If students are more able, more human capital is produced. Positive peer group and reputation effects then occur, the quality of education improves and consequently courses are easier and cheaper to teach (cf. Rothschild and White, 1995). Alternatively, with better students and a better reputation for academic excellence it is easier to attract funding from sponsors and the state and thus (as a short cut) costs are less. The optimal tuition fees are determined by the following mark-up formula:

$$p_{in} = \left(\frac{C_{ne} + C_{nh} \theta_{in} \phi'(e_{in})}{1 - (1/\varepsilon_{in})} \right) \text{ with } \varepsilon_{in} \equiv -\phi'/(\phi'' e_{in}) \geq 0.$$

Without peer group or reputation effects degree programmes set prices equal to a mark-up on marginal cost C_{ne}. The mark-up is particularly high for courses with a low price elasticity of demand ε_{in}. This may be the case for pure mathematics or anthropology.[8] Such courses may have high marginal cost anyway, so are extra likely to be expensive in the absence of cross subsidies or special government support. If peer group and reputation effects matter, tuition fees are higher for the less able or less motivated students with low θ_{in} and lower for the smart students with high θ_{in}. This explains why universities like to award scholarships to bright students. To close this setup of monopolistic competition among HEI's, we either have

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[7] In absence of other distortions, there will be over-investment in education with immaterial returns as tax rates on total returns are less than deduction rates on costs.
[8] The effect of immaterial value of study on the demand elasticity of education is only second order.

restricted entry and exit (N fixed) or free entry and exit (N adjusts until profits are driven to zero).

We take up the issue of monopolistic price setting in section 5. Here we assume that HEI's operate under perfect competition. In that case, the optimal tuition fees are $p_{in}=C_{ne}+C_{nh}\theta_{in}\phi'(e_{in})$ and it is not difficult to show that they correctly internalise all peer group and reputation effects. In fact, a government that simply maximises social welfare, i.e., graduate utility minus tuition subsidies

$$\int_I \left(U_i - \left[\sum_{i=1}^{N} (1+r)s_{in}p_{in}e_{in} \right] \right) dF(i),$$

and has access to non-distortionary taxes, sets the optimal subsidies to zero and the market outcome is efficient (see also Rothschild and White, 1995). Furthermore, price discrimination is absent. If we also assume that peer group and reputation effects are absent, tuition fees equal marginal costs. If marginal costs are exogenous, tuition fees will be also, that is $p_{in}=C_{ne}>0$ is constant and fixed by technological considerations.

4.3. Objectives of higher education policy

The government maximises a social welfare function, which is defined over the sum of individual utilities and 'educational welfare' Γ. We are not concerned with equity here, which should not matter here as education policies and redistribution of incomes can be separated (Bovenberg and Jacobs, 2005). Since individual utility functions are linear in income and therefore display risk neutrality, an utilitarian sum of individual utilities does not imply a social preference for redistribution. We only consider efficient education policies.

The government has a preference for studies that are of interest to society and yet do not survive in the market as private (marginal) benefits are too low (cf., Sandmo, 1975). One could think of, say, anthropology, Sanskrit or pure mathematics. The government may also have a preference for education if this contributes to citizenship, democratic participation and the transmission of (cultural) knowledge and values. The government may also want to reduce the popularity of those studies that are associated with excessive status seeking and signalling. Educational welfare is a weighted sum of educational investments by students in those so-called merit studies:

$$\Gamma \equiv \int_I \sum_{n=1}^{N} \xi_{in} e_{in} dF(i),$$

where ξ_{in} is the marginal contribution to educational welfare of individual i investing in education of type n. We could take a concave sum of individual investments in human capital, but this does not add much to our insights. This specification is sufficiently general to capture other interpretations as well, since ξ_{in} lumps *all* external effects that individual i may generate through investing in education n. If education type n is a merit study, the marginal social contribution to the educational surplus may be positive ($\xi_{in}>0$). However, if education type n is law, rent seeking may increase waste of productive resources (Murphy, Schleifer and Vishny, 1991) and induce negative externalities ($\xi_{in}<0$). Signalling may also lower the social value of education below the private value of education as students signal their ability by taking up more education ($\xi_{in}<0$). Firms may use these educational signals to attract high-ability workers and pay higher wages accordingly (Arrow, 1973, Spence, 1973, Stiglitz, 1975).

Apart from merit good studies and adverse externalities due to rent seeking and signalling, there are two other types of externalities. One occurs if human capital formation in certain disciplines contributes to aggregate labour productivity (e.g., Lucas, 1988, Romer, 1990). Examples include R&D related disciplines like science and engineering. Another one occurs if human capital is a status good. The more one gets of it relative to the human capital of others, the higher is one's status (e.g., Lommerud, 1989, Layard, 1980).

The marginal contribution to the educational surplus ξ_{in} may also depend on the ability of individual i. If especially the brighter students generate educational surplus, i.e. students with a large θ_{in}, the marginal contribution ξ_{in} is larger than the marginal contribution ξ_{jn} of a less able student j with $\theta_{jn}<\theta_{in}$.

The government may want to exert distributional preferences for 'equality' in educational outcomes by putting a larger weight ξ_{in} on individuals with a relatively low level of education e_{in}. Alternatively, the government may give a larger weight to the education of poor students or other disadvantaged students. This is a pure paternalistic motive as, in the absence of capital market imperfections, poor students invest optimally in higher education.

4.4. Optimal subsidies with selection and free tuition fees

If the government perfectly observes individual abilities in the various degree programmes (i.e., the θ_{in}), it can tailor education subsidies to exactly internalise the external effects that each individual in each course generates. As a benchmark we therefore derive the Pigouvian subsidies under full information. Universities can select in the sense that they can discriminate the fees they charge to students according to ability and type of education programme. However, the government may have imperfect information on individual abilities. In section 4.5 we derive the flat-rate subsidies that are independent of individual abilities θ_{in} and the fields of study n, which demand even less information.

The government finances the outlays on education subsidies $(1+r)s_{in}\,p_{in}$ from general tax revenues. The interest factor appears, since the government gives subsidies to students and the social surplus is generated afterwards by graduates. Effectively, the government issues government debt to finance the subsidies and repays debt including interest. The resource cost of raising one unit of revenue is denoted by η. It exceeds unity if lump-sum taxes are infeasible and the government has to levy distortionary taxes to finance outlays on education subsidies. We assume that marginal cost is constant for each programme of study and independent of characteristics of students (C_{ne} constant). The government then maximises social welfare:

$$\max_{\{s_{in}\}} \int_I \left(U_i + \sum_{n=1}^N \left(\xi_{in} e_{in} - \eta(1+r) p_{in} s_{in} e_{in} \right) \right) dF(i)$$

subject to the demand for the different types of study programmes by all students and the pricing schedule of these programmes. This yields the first-order conditions for the optimal second-best education subsidies:

$$\frac{s_{in}}{1-s_{in}} = \left[\left(\frac{\xi_{in}/\eta}{\left((1-t_i)w_{in} + \alpha_{in}\right)\theta_{in}\phi'(e_{in})} \right) - (\sigma_{in}/\eta) - \left(\frac{1-1/\eta}{\varepsilon_{in}} \right) \right] / (1+\sigma_{in})$$

$$= \left[\left(\frac{\xi_{in}/\eta}{(1+r)(1-t_i)(1-s_{in})p_{in}} \right) - (\sigma_{in}/\eta) - \left(\frac{1-1/\eta}{\varepsilon_{in}} \right) \right] / (1+\sigma_{in}), \quad \forall i,n$$

where $\sigma_{in} \equiv e_{in} C_{nh} \theta_{in} \phi''/p_{in} \geq 0$ denotes the elasticity of the price set by universities for their degree programme n to student i with respect to this student's demand for this degree programme. We call σ_{in} the elasticity of prices with respect to the peer or reputation effect, which is larger for smarter students. If the government has access to non-distortionary means of taxation, the marginal cost of public funds is unity ($\eta=1$) and the optimal subsidies are:

$$s_{in} = \left(\frac{\xi_{in}}{(1+r)p_{in}} \right) - \sigma_{in}, \quad \forall i,n.$$

Clearly, the optimal education subsidies exactly internalise the merit study externalities of education. If the social marginal value of education ξ_{in} is $x\%$ above the private return, the government subsidises the private costs with $x\%$ as well to line up the private incentives with the social incentives to invest in education. The government taxes enrolment of smart students

if they raise quality and/or lower cost higher education. This counteracts the reduction of costs due to peer and reputation effects and the scholarships or discounts offered to bright students by universities.

In general, lump-sum taxes are unavailable ($t_i > 0$) so that the marginal cost of public funds exceeds unity (i.e., $\eta > 1$). The optimal second-best subsidies then consist of three terms.

The first term is a Pigouvian one that corrects for merit good aspects of higher education, but less so if the marginal cost of public funds exceeds unity. The optimal education subsidies thus increase with the size of the marginal merit value of education ξ_{in}. Hence, if society values education of individual i in field n more, education subsidies should be higher. Education subsidies decrease - ceteris paribus - with ability θ_{in} of student i in course n. This may seem counter-intuitive at first blush, but it is not. Suppose that the social returns to education of type n are equal for high- and low-ability individuals, i.e., $\xi_{in} = \xi_{jn} \equiv \xi_n$. Then, a higher ability results in a higher private return to education. Hence, the percentage-wise shortfall in the private return from the social return is lower for high-ability students. Consequently, lower subsidies (as a percentage of private costs) are needed to internalise the externality. Nevertheless, the value of the education subsidy $(1+r)(1-t_i)s_{in}p_{in}e_{in}$, is larger for high-ability than low-ability individuals. For the Pigouvian case we see that this value equals $\xi_{in}e_{in}$. Since high-ability individuals learn more effectively, larger subsidies - in absolute terms - are given to them. Clearly, it is optimal to condition education subsidies, if possible, on students' characteristics. Hence, selection is desirable. Optimal subsidies as a percentage of total costs increase with a larger social value of education and decrease with a large private return to education.

Education types with a large social return must also be expensive. Optimising individuals equate the marginal returns of investing in education of type n to the marginal costs. Hence, if marginal returns are large, marginal costs must be large as well. Consequently, we deduce that optimal subsidies (as a fraction of total costs) *decrease* with the more expensive types of education. Again, the absolute subsidy increases by definition if education becomes more expensive. Education subsidies are also larger if individuals have a lower private return to education relative to the social return to education, that is if $(1-t_i)w_{in}\theta_{in}\phi'(e_{in})$ is low relative to ξ_{in}. The intuition is that a bigger gap between private and social returns implies larger education subsidies. We have tacitly assumed that education only generates positive external effects, $\xi_{in} > 0$. However, if education causes social damage (rent seeking, signalling), education should optimally be taxed to correct for excessive investments in disciplines which may not be socially desirable.

The second term in the expression for the optimal second-best subsidies to higher education corresponds to the peer or reputation effect tax, which is less if the elasticity of prices with respect to peer and reputation effects (σ_{in}) is small and public funds are relatively scarce. This second tax is directed at smart students. It explains why governments pay fewer subsidies to smarter students in situations where universities find it profitable to offer scholarships or discounts to brighter students.

The third term corresponds to the Ramsey motive of taxation, which insists that higher education be taxed if public funds are scarce. The Ramsey motive drives the second-best optimal subsidy below the optimal Pigouvian subsidy. The reduction is larger if it is more costly to raise tax revenues and if the elasticity of educational effort ε_{in} with respect to the relevant subsidy is low (and thus much tax revenue is needed to induce individuals to invest more in education). In fact, if a particular type of education has no social merit and public funds are scarce, the government taxes rather than subsidises it even if there are no peer or reputation effects ($s_{in}<0$ if $\eta>1$ and $\xi_{in}=\sigma_{in}=0$).

Both the first-best and second-best expressions for the optimal education subsidies make clear that uniform tuition fees are *never* optimal if social returns differ between disciplines and students. Subsidies should therefore be optimally targeted to fields of study that have the largest social returns. Furthermore, subsidies should be targeted towards the students that appear to generate most social value. Also, subsidies that 'lean along with the market', i.e., subsidies on studies with a relatively large private rate of return compared to the social rate of return, violate optimal rules for education subsidies. Subsidies should be directed towards studies with a large social value, not a large private value. Optimal policies are furthermore *independent* from social economic characteristics such as initial wealth if student loans are used to deal properly with capital market imperfections (see section 8). Only if initial wealth determines the characteristic ξ_{in}, can educational policies and distribution not be separated. This is a pure 'paternalistic' motive, since the government wishes the poor to enrol in certain fields of study just for the sake of it. A final remark is that the mere fact that for some disciplines the marginal benefits are mainly non-monetary ($\alpha_{in}>0$) is not a reason for government subsidies. That will lead to over-investment in those disciplines. Students will take account of immaterial benefits themselves.

With imperfect capital markets, the optimal subsidies for higher education are higher. For example, with a unit marginal cost of public funds ($t_i=0$, $\eta=1$) and no peer or reputation effects ($\sigma_{in}=0$), one has:

$$s_{in} = \left(\frac{\xi_{in}}{(1+r)(1-s_{in})p_{in}} \right) \left(\frac{1+r}{1+r+\mu_i} \right) + \left(\frac{\mu_i}{1+r+\mu_i} \right), \quad \forall i, n.$$

Effectively, the subsidy alleviates the credit constraint and thus students need to borrow less.

4.5. Optimal subsidies without selection: uniform pricing

In much of Europe politicians and HEI's hesitate to select students at entry level, since they view this as unfair for children of less privileged backgrounds. Even if selection is desirable, it is not clear whether tests are good enough to discriminate 'good' from 'bad' students. Suppose therefore that the government does not want or is unable to select students. It then gives subsidies that are independent of student's abilities θ_{in} and potentially also independent of field of study n. Subsidies are thus denoted by s_n or s, respectively. If there are no immaterial benefits (α_{in}=0) and reputation or peer effects (σ_{in}=0), the optimal education subsidy on education type n then equals:

$$\frac{s_n}{1-s_n} = \left(\frac{\int_I \varepsilon_{in} \xi_{in} dF(i)/\eta}{\overline{\varepsilon}_n \int_I (1-t_i) w_{in} \theta_{in} \phi'(e_{in}) dF(i)} \right) - \left(\frac{1-1/\eta}{\overline{\varepsilon}_n} \right), \quad \forall n,$$

where $\overline{\varepsilon}_n \equiv \frac{\int_I \varepsilon_{in} w_{in} \theta_{in} \phi'(e_{in}) dF(i)}{\int_I w_{in} \theta_{in} \phi'(e_{in}) dF(i)}$ is the weighted elasticity of educational effort in course n with

respect to the subsidy for course n. If this elasticity is constant and equal to ε, we derive:

$$\frac{s_n}{1-s_n} = \left(\frac{\int_I \xi_{in} dF(i)/\eta}{\int_I (1-t_i) w_{in} \theta_{in} \phi'(e_{in}) dF(i)} \right) - \left(\frac{1-1/\eta}{\varepsilon} \right), \quad \forall n.$$

Hence, the optimal subsidy is now defined in terms of average levels of education. Similarly, the optimal subsidy if restricted to be equal across all levels of education equals:

$$\frac{s}{1-s} = \left(\frac{\sum_{n=1}^N \int_I \varepsilon_{in} \xi_{in} dF(i)/\eta}{\overline{\varepsilon} \sum_{n=1}^N \int_I (1-t_i) w_{in} \theta_{in} \phi'(e_{in}) dF(i)} \right) - \left(\frac{1-1/\eta}{\overline{\varepsilon}} \right),$$

where $\overline{\varepsilon} \equiv \frac{\sum_{n=1}^N \int_I \varepsilon_{in} w_{in} \theta_{in} \phi'(e_{in}) dF(i)}{\sum_{n=1}^N \int_I w_{in} \theta_{in} \phi'(e_{in}) dF(i)}$. With constant elasticities we find:

$$\frac{s}{1-s} = \left(\frac{\sum_{n=1}^{N} \int_I \xi_{in} \mathrm{dF}(i)/\eta}{\sum_{n=1}^{N} \int_I (1-t_i) w_{in} \theta_{in} \phi'(e_{in}) \mathrm{dF}(i)} \right) - \left(\frac{1-1/\eta}{\varepsilon} \right).$$

For a given marginal cost of public funds, aggregate welfare is lower now in both cases and more so in the latter case where more subsidies are misallocated. In the real world uniform pricing schemes, or pricing schemes with limited variation, are indeed commonly observed. This is even true if one takes into account the supply side tariffs. Since most government use only a limited amount of tariffs, prices after price adjustments are still limited in number. However, any pricing scheme which charges uniform prices to students in various disciplines (or a limited set of prices less than I) can be replaced by the market pricing scheme which result in higher educational output. Uniform pricing generally thus results in under-utilisation of academic potential.

4.6. Summary

We summarise some of the findings of this section with the following bullets:

• In the absence of distortions (externalities, monopoly, redistribution), equilibrium in the market for education is Pareto-efficient. There is no need for government intervention. Prices optimally reflect marginal costs and are equal to the marginal benefits of education. These benefits encompass both monetary and non-monetary benefits. Any pricing scheme other than market prices will result in loss of academic potential.

• Universities fully internalise the beneficial effects of having smarter, more motivated students on the quality and reputation of its activities and on the possibility of generating more money from state and sponsors and attracting even more able students. They do this by charging smarter students less, e.g., by offering them scholarships or discounts. Governments respond by paying universities less subsidies for brighter students.

• Positive merit good externalities like production externalities or public good value of education requires subsidies. However, negative externalities like status good and signalling value of education requires taxes on education. Prices should not be uniform and should reflect the social marginal value of education. Uniform price setting is sub-optimal and cannot be justified from externalities.

Three final remarks are perhaps useful. First, the vast majority of students display a preference for their local university or college of higher education, perhaps as they prefer to stay close to their parents, family and friends or prefer familiar surroundings. The optimal tuition fees are higher for such students, because their price elasticity of demand is lower. See also Justman and Thisse (1997) on mobility of students and optimal funding of higher

education. Second, the framework of optimal funding we have developed, abstracts from uncertainty about the quality of the courses that are on offer and makes no difference between subsidies and vouchers for higher education. In the real world the government has insufficient information about the preferences of individual students and the supply of courses and may wish to use vouchers rather than subsidies to higher education. By giving students personal vouchers which they can use to pay for their higher education courses, the government encourages students to 'vote with their feet' and switches from subsidising supply to subsidising demand. This encourages students to make a sharper choice about their career in higher education and can foster competition between HEI's. Third, our framework abstracts from uncertainty about the quality of applicants and from student performance. In future work we would like to analytically investigate how various types of funding and restrictions on the setting of tuition fees affect selection and the standard of exams. More generally, our analysis abstracts from problems of adverse selection (e.g., think of the access from students of less privileged backgrounds) and moral hazard (e.g., the problem of grade inflation).

5. Handling monopolistic practices and preventing grade inflation

In response to scarcer public budgets governments have been tempted to cut average costs by increasing scale of higher education institutions at the expense of creating larger public monopolies or even cartels. Such monopolists and cartels do not necessarily act in the national interest. They reduce quality ('grade inflation'), ignore demand of students and employers, and increase overhead costs. Central administrators tend to abuse scarce public resources on prestige projects. Although monopolists are inclined to reduce quantity, HEI's are often encouraged to engage in a race to attract as many students as possible and thus to attract more state funds. Indeed, many governments take these problems for granted by applying funding based on historical grounds or student numbers. Some governments apply funding criteria based on outputs. Since quality of output is not well observable, such funding schemes typically exacerbate grade inflation and may even cause fraud. Moreover, governments deliberately obstruct competition in the market for higher education by only granting subsidies to accredited public institutions, excluding newcomers and foreign institutions, and allowing incumbents to use cross-subsidies to kill competing private initiatives. In some countries internal checks and balances have been destroyed by abolishing university democracy. The Board of Governors of HEI's have usually too little information from the 'shop floor' to act as effective countervailing powers to central administrators. In fact, neither governments, nor students, nor stakeholders, nor potential entrants can effectively discipline incumbent HEI's.

Whereas externalities are the main reason for differences in social and private marginal benefits of higher education, monopolistic behaviour by HEI's cause differences in

social and private marginal costs of education. Monopolistic price setting drives up tuition fees and lowers the quantity and quality of supply of higher education below the social optimum, especially if the price elasticity of demand is low. To achieve social efficiency, the government can subsidise either output or costs of higher education. In the absence of informational problems subsidies for a particular course have to be large if the price elasticity of demand for that particular type of higher education is low. Since the price elasticity of demand is likely to differ between disciplines, optimal subsidies should be differentiated accordingly. For example, if some students feel they can only do art or pure mathematics whereas they can easily choose between law and economics, art and pure mathematics warrant bigger subsidies than law or economics.

Neither output funding nor input funding is without problems. Educational outputs are difficult to observe, since quality is difficult to measure. At the same time, the government faces various information problems in determining the correct costs of operation as they are malleable by the efforts of university managers. These managers may misrepresent the true costs to the government and favour prestige objects that have little to do with the core tasks of teaching and research. As a result, both output funding and input funding have unintended side effects (e.g., Laffont and Tirole, 1993). On the one hand, output funding to curb monopolistic practices has the unintended disadvantage that it induces grade inflation. Further, output funding does not give strong incentives to university bureaucrats to minimise costs. Indeed, the government may inadvertently reward institutions that operate inefficiently though output funding. On the other hand, input funding does not induce grade inflation but leaves monopolistic practices in tact. At the same time, university bureaucrats have stronger incentives to be more efficient. Governments and HEI's thus have to strike a difficult trade-off between, on the one hand, avoiding grade inflation and inefficiently run universities, and, on the other hand, curbing monopolistic practices.

Although incentive issues will affect the design of optimal transfer schemes, they typically do not affect the optimal pricing formulae for educational institutes. That is, in the absence of externalities and peer effects, optimal prices will satisfy the Ramsey rules that state that the Lerner index for the pricing of higher educational services varies inversely with the elasticity of demand (cf., Laffont and Tirole, 1993). The fundamental assumption driving this result is that the marginal costs of cost-reducing efforts by university managers are independent from the marginal costs of providing a particular education. Incentive problems do, however, affect the optimal funding schemes and more high-powered schemes should be implemented if efforts of university managers are more responsive to financial incentives. High-powered incentive schemes make the incomes for HEI's less predictable. Indeed, if there is a lot of uncertainty involved and efforts of university managers correlate only little with cost reduction, high-powered incentives become less attractive.

In addition, most government financing schemes suffer from 'ratchet effects' as a consequence of budgeting and accounting procedures. It is in general not in the interest of university management to seriously pursue cost-effective and efficient policies, because the government cream skims the cost savings or penalises efficiently operated higher education institutions with lower future government contributions. Indeed, such budgeting procedures typically exacerbate the problems of giving university bureaucrats incentives and therefore dwarf the gains of incentives in the funding schemes for cost-reducing efforts. We think that this is especially the case for long-term investments in buildings and equipment. Box I tells the worrisome tale of the Netherlands, where the enormous increases in scale and monopolistic practices have gone hand in hand with huge increases in overhead and capital expenditures leading to a substantial decline in resources for teaching.

Box I: Mergers and acquisitions in higher education in the Netherlands
Before the introduction of the BAMA structure, the Dutch higher education system was binary. There were higher professional schools and universities. During the past twenty years the Netherlands has witnessed a dramatic increase in scale in the higher education sector:

	Higher professional schools					Universities				
	1980	1985	1990	1995	2000	1980	1985	1990	1995	2000
# stud. (1000)	165	163	212	232	261	144	154	171	171	158
# HEI's	353	432	91	77	56	13	13	13	13	13
Students/HEI	375	345	2.105	2.990	4.465	10.275	12.040	12.630	13.750	13.500

In 1980 there were 353 higher professional schools with an average number of students of 370. In 2000 there were only 56 HEI's with an average number of students of 4.460. Hence, scale increased more than ten-fold! Scale in the university sector did not change dramatically. There are 13 universities with on average 10.275 students in 1980. In 2000 the average number of students per university (still 13 in total) increased to 13.500. Hence, scale at universities increased about 30 per cent.

At the same time, total expenditures on HEI's declined in real terms: 16 per cent for higher professional schools and 32 per cent for universities in the period 1980-2000. These are the total contributions to HEI's including tuition fees. Total expenditures to students have increased since 1985 due to the introduction of the basic grant:

Total real expenditures per student (x1000 euro)

	1980	1985	1990	1995	2000	Index 1980-2000
Higher professional	10.6	9.3	9.0	9.1	8.9	84
University	14.6	11.3	9.7	8.6	9.9	68

In the face of declining contributions per student, total expenditures on overhead costs (administration, governance and maintenance) increased dramatically during the same twenty year period. For higher professional schools the increase in overhead costs is an extraordinary 83%, while for universities it is also substantial at 31 per cent. The share of overhead in total costs in the Netherlands is 33% for higher professional schools and 38 per cent for universities:

Share of overhead in total expenditures, and index of overhead costs

	Fraction					Index				
	1980	1985	1990	1995	2000	1980	1985	1990	1995	2000
Higher prof.	18%	19%	21%	30%	33%	100	106	117	167	183
University	29%	32%	35%	37%	38%	100	110	121	128	131

Note: we use a narrow definition of overhead costs.

This development of course meant that real expenditures on the primary process (teaching, research) fell quite strongly. There was a real decline in expenditure per student of 31 per cent for higher professional schools and 40 per cent during these twenty years:

	Real primary expenditure per student, excluding overhead costs (x1000 euro)					
	1980	1985	1990	1995	2000	Index 1980-2000
Higher professional	8.6	7.7	6.3	5.4	6.2	69
University education	10.4	7.7	6.3	5.4	6.2	60

In the absence of incentive effects, an increase in scale would have led to a decrease in resources spent on overhead and a corresponding increase in resources spent on the primary process (teaching and/or research). In other words, real costs per student should have fallen relative to overhead costs. We observe exactly the opposite. With the benefit of the hindsight, one may also question the usefulness of lump-sum block grants to HEI's that were introduced in 1980's.

Without competition in the market for higher education, scale increases seem to induce monopolistic practices and produce adverse incentive effects on university management as universities are not disciplined by market forces. In the Netherlands, HEI's form a strong cartel through the union of higher professional schools (HBO-Raad) and the union of cooperating universities (VSNU). We believe that the massive increases in scale that we have witnessed in the Netherlands are the major explanation for the dramatic increase in overhead costs and the corresponding fall in real resources per student available for teaching and research.

Source: *Bureaucratisering en schaalfactoren in het onderwijs*, Onderwijsraad, Den Haag, 2004.

A further problem in Europe is that many institutions are themselves unaware of how much each programme costs. Many universities allocate government contributions themselves not according to rational cost-based criteria and allow for all kinds of cross-subsidies. Apparently, Munich University does not even know its total budget as the state of Bavaria foots whatever is the bill. More generally, very little work has been done on estimating technical and allocative efficiency of HEI's (e.g., Salerno, 2003). For example, estimation of stochastic frontiers has been used to estimate the relative cost efficiency of UK universities (e.g., Glass, McKillop and Hyndman, 1995; Izadi et al., 2002) and of US universities (e.g., Robst, 2002). Non-parametric data envelopment analysis has been used to assess the relative efficiency of Australian universities (e.g., Abbott and Coucouliagos, 2003). The problem with these empirical estimates is that they only allow for comparisons of *relative* efficiency levels between institutes. They do not assess the *absolute* efficiency of HEI's. The observation that in some countries institutions have a high overall score on relative efficiency may also imply that they are all managed equally badly. More important, it is difficult to correct for the quality of both inputs and outputs. In most of this analysis a ceteris paribus increase in the student-staff ratio is seen an improvement in technical efficiency, but it may well imply a worsening of educational quality and ignore all kinds of intangible aspects of education. This renders a lot of this type of applied work less useful.

A more level playing field must be created in the market for higher education. This is not always the case. For example, the Russel group of medical institutes in the UK and the Ivy League of US top universities have in the past been accused of collusion. In Europe this may happen as well. Both private and public institutions are better able to compete on the same terms if government subsidies are allocated directly to students by means of vouchers/grants, even though this may make the incomes for HEI's less predictable. Students

can spend the vouchers on the institution and courses of their preference. Barriers to enter the market for higher education should be lowered by abolishing all kind of historical funding schemes and barring those cross-subsidies that hinder fair competition. Competition authorities should break cartels and penalise abuse of market power. It helps if an independent authority publishes yearly performance criteria of universities and institutions of higher professional education. These criteria should cover dropout rates, average enrolment durations, average exam marks, student evaluations, the quality of scientific publications, evaluations of independent scientific committees, and so on. If students can vote with their feet, this will discipline HEI's. The government can then rely less on highly distortive output funding schemes that induce excessive grade inflation and reward malfunctioning bureaucrats. Moreover, a level playing field opens up national markets to the international environment, especially if students are able to get student loans for study abroad and even more so if they can spend (part of) their vouchers abroad.

6. Why higher education should rely less on public funding

It is not clear that the crisis of higher education in Europe is due to lack of *public* funding. In fact, there is no evidence that the social return to higher education exceeds the private return sufficiently to warrant bigger state subsidies. If anything, the private return to higher education seems to be rising as may be witnessed from the growing skill premium that graduates command in the market. We acknowledge that higher education in many parts of Europe is starved of funds. In fact, the lack of funds of higher education will become worse in future years due to the relentless operation of Baumol's cost disease. This is due to a lack of private funding. Much more can be asked from students provided that they can make use of income-contingent loans (see sections 7 and 8). Even though student poverty is a real issue, graduates are relatively well off.

6.1. The gap between social and private returns is small and declining

The returns to education have been estimated many times and the evidence suggests a causal relation between education and higher wages (e.g., Card, 1999; Ashenfelter, Harmon and Oosterbeek, 1999; Harmon, Oosterbeek and Walker, 2003). Each additional year of education, typically, raises wage incomes with 5-10 per cent. These so-called Mincer returns apply to all levels of education, but generally are larger for higher education. If the social exceeds the private return, education causes positive external effects to society and the government should support education. If the social equal the private returns, the private sector's incentives to invest in education are exactly lined up with the optimal social incentives to invest in education.

Endogenous growth theories (e.g., Romer, 1986, 1990; Lucas, 1988) emphasise that human capital can be accumulated without decreasing returns setting in. Education is thus an important engine of technological improvements generating economy-wide benefits above the private benefits. Still, one cannot increase the level of education without limits as human beings are mortal and take their human capital with them into their graves. Hence, decreasing returns eventually set in. Initial empirical evidence found positive effects of human capital on growth (e.g., Barro, 1991; Benhabib and Spiegel, 1994; Barro and Sala-i-Martin, 1995), but these results are not robust due to the poor quality of the data and various econometric problems (Krueger en Lindahl, 2001). Although endogenous growth driven by human capital is empirically implausible, there may be externalities of education so that people under-invest in education compared with what is socially desirable.

Many have estimated the effect of a one-year increase in the average level of education on income per capita (e.g., Temple, 2001; Sianesi and Van Reenen, 2002). If these macro-Mincer returns exceed micro returns, there are positive externalities of education that go undetected in micro estimates. However, the point estimates for the macro-Mincer returns are roughly the same as for the micro-Mincer returns (e.g., Heckman and Klenow, 1998; Acemoglu and Angrist, 1999, Cohen and Soto, 2001; Krueger and Lindahl, 2001; Ciccone and Peri, 2002). Estimating macro-economic Cobb-Douglas production functions where outputs are explained by human as well as physical capital (cf., Mankiw, Romer and Weil, 1992), one obtains macro-Mincer returns of about 5-6 per cent for each year of education. This is at the lower end of the estimated micro-Mincer returns (e.g., Bassani and Scarpetta, 2001; Cohen and Soto, 2001; De la Fuente and Domenech, 2002). There seems to be no evidence that human capital (growth) increases total factor productivity (growth) (Wolff, 2000). In fact, the largest increases in the levels of education have been in sectors that display no or very slow productivity growth such as services sectors or government (Griliches, 1996).

In second-generation endogenous growth theories, human capital plays a crucial role in the R&D process (Romer, 1990; Jones, 1995). Although there is overwhelmingly robust evidence for the importance of R&D for total factor-productivity growth (Griliches 1992, Nadiri 1993, Mohnen, 1996), no robust effects of the complementarity of education and R&D can be found. Nonneman and Vanhoudt (1996) find that effects of education on output disappear once R&D variables are entered in the Mankiw, Romer and Weil (1992) study. Klenow (1998) also strongly support R&D-based models of productivity growth over human-capital based models. Further, a well-educated labour force may help to catch up with more advanced countries and absorb and diffuse technologies more easily (Nelsson and Phelps, 1966). However, the role of catching up and technology adoption is probably only of minor importance as most OECD countries are currently at the technological frontier. No robust

evidence for human capital as a catching-up or assimilation device can be found (Sianesi and Van Reenen, 2002).

In sum, there is no suggestive empirical evidence favouring externalities of human capital. Most recent and advanced evidence suggests that the macro returns to education are (at most) equal to the micro returns. Empirical findings suggest that the private returns to higher education are substantial: wage incomes increase in real terms approximately by 15-30 per cent once graduates obtain their bachelor degree and by 25-50 per cent result if students obtain a combined bachelor-master degree. However, despite the widespread belief in large externalities of education, the social returns are not that different and may even be a bit lower than the private Mincer returns. These findings suggest that signalling is of minor importance, because macro estimates suggest that education is indeed productive. Perhaps, the potential positive external effects of education cancel the negative external effects of signalling at the macroeconomic level. A final caveat is that, if there are indeed positive externalities of education, the finding that social approximately equal private returns, could suggest that the government currently chooses the optimal level of education subsidies so as to internalise the externalities at the macroeconomic level (Heckman and Klenow, 1998). There is therefore no evidence that public expenditures on higher education are sub-optimally low.

In popular policy debates there is much confusion on the returns to education. The most popular argument is that the *private* (Mincer) returns to (higher) education are higher than the safe real return on government bonds, approximately 3 per cent. Consequently, it is argued that the government should expand investment on education because this yields a higher rate of return than the reduction of public debt. By the same line of misguided reasoning one could argue that the government should massively invest in the stock market and pay off the government debt with the higher returns on equity.

The argument confuses private and social returns to higher education. The fundamental reason why the government should intervene in higher education is because the social exceeds the private return to education, not whether the private returns are large. Investment in higher education should be compared with investments with similar risk, liquidity and other properties, not with government bonds. The returns on education are much higher than on government bonds because human capital is illiquid (slavery is forbidden) and more risky as labour incomes fluctuate due to business cycles, sectoral shifts, technological developments, international trade, etc. (Palacios-Huerta, 2003, 2004). The Mincer return is only comparable to a return on a financial investment under very strict conditions, which are not met in practice (Heckman, Lockner and Todd, 2003). The acquisition of human capital requires direct material (tuition) and immaterial (effort, psychic) costs. The Mincer approach assumes that these costs are negligible and that the only costs of education are forgone earnings. Further, it assumes that individuals are infinitely lived. Both direct costs and finite

time-horizons drive up the required returns for an investment in education. Consequently, there are good reasons why private (and social) returns are high and there is generally no free lunch when governments invest in education instead of paying off government debt.

We conclude from our discussion of private and social returns to education that, at current levels of subsidies on higher education, there are no convincing arguments to extend the overall level of public subsidies to higher education.

6.2. Rising private returns to education

Private returns to education are rising as wage inequality between skilled and unskilled workers has increased in many industrialised countries. If skilled graduates earn higher incomes than low-skilled workers, it may be profitable to invest in higher education. Especially, the US and the UK have experienced dramatic increases of the skill premium. Similar but less dramatic stories can be told for many European countries (Davis, 1992).

The first and most dominant explanation for the rise in the skill-premium is skill-biased technological change (Katz and Murphy, 1992; Bound and Johnson, 1992; Berman, Bound and Grilliches, 1994, Murphy, Riddell and Romer, 1998). This boosts relative demand for skilled workers and thus the skill premium, especially after the ICT revolution (Krueger, 1993; Autor, Katz and Krueger, 1998). Some endogenous growth theories suggest that skilled workers spur R&D activities, which leads to new technologies that are more complementary to skilled workers. Consequently, stimulating skill formation does not only increase the relative supply of skilled workers, but also the relative demand for skilled workers. If this effect is strong enough, the skill premium may even increase in the long-run (Acemoglu, 1998, 2002; Kiley, 1999; Nahuis and Smulders, 2002).

Increasing international trade offers the second explanation for the rise in relative demand for skilled workers in highly developed countries. The reason is that countries with an abundance of skilled workers specialise in skill-intensive production, whereas low-wage countries specialise in labour-intensive production. Relative wages then depend on global relative supplies and demands for skilled workers (Topel, 1999; Katz and Autor, 1999). However, this explanation of increasing wage inequality is disputed due to the limited volume of international trade (Wood, 1994; Borjas and Ramey, 1995; Feenstra and Hanson, 1999; Krugman, 1995). Some recent studies hint at capital skill complementarity, that is higher educated workers are more complementary to capital than unskilled workers. This implies that the relative demand for skilled workers increases with the capital intensity of the economy, analogously to skill-biased technical change (Goldin and Katz, 1998; Krussell et al., 2000; Beaudry and Green, 2000). The question remains whether capital-skill complementarity is indeed empirically relevant, because it is difficult to disentangle from skill-biased technological change. Furthermore, explaining rising wage inequality with capital skill

complementarity is difficult to reconcile with a constant capital share in output (Heckman, Lochner and Taber, 1998).

All these explanations for the rising skill-premium are based on the labour demand side of the economy. However, supply side and institutional factors play a role as well. A number of authors suggest that the relative supply of skilled workers has, in fact, decreased in the US due to ageing of the population, lower fertility rates and the inflow of low-skilled migrants (Katz and Murphy, 1992; Murphy and Welch, 1992; Borjas, Freeman and Katz, 1997). Alternatively, wage inequality may have increased due to falling costs of signalling and relaxation of liquidity constraints (Willen, Hendel and Shapiro, 2004). In particular, low skilled wages are based on a pool of (credit-constrained) high-ability and low-ability workers. Slackening liquidity constraints induce high-ability workers to invest in education, so the pool of unskilled workers contains less high-ability workers as a result and low-skilled workers' wages fall.

Changes in labour market institutions may also have contributed to increases in the skill premium. Lower minimum wages and erosion of union power have increased in wage inequality in the US (DiNardo, Fortin and Lemieux, 1996; Lee, 1999). However, in Europe skill-biased labour demand shifts do not result much in larger wage inequality, but in higher unemployment rates amongst the low skilled, especially if their incomes are protected by minimum wages, strong unions, strong labour market regulations, and so on. See Krugman (1995) and David (1998) for the effects of skill-biased labour demand shifts due to increased international trade in the presence of minimum wages. However, institutional changes may well have been triggered by changed labour market conditions, so that the standard labour market model of supply and demand explains differences in wage inequality for a large number of developed countries well (Oosterbeek, Leuven and van Ophem, 2004).

Not all wage inequality can be attributed to differences between different skill groups. There is a steady increase in wage inequality *within* groups of workers with similar skills as well. Further, sectoral shifts in employment have stimulated relative demand for skilled labour. Nevertheless, Katz and Autor (1999) conclude that only a third of overall wage inequality in the US can be attributed to gender, education and experience. The bulk of wage inequality remains unexplained and can not be attributed to observed skill, experience, sector of employment, etc. Skill-biased technological change is therefore the major candidate to explain this residual wage inequality.

Empirical estimates suggest that the skill-premium continues to grow in the future at about three per cent per year for the US if relative supply of skilled workers remains fixed (Katz and Murphy, 1992; Heckman, Lochner and Taber, 1998). For Sweden the figure is lower, about one per cent per year (Edin and Holmlund, 1995). For the Netherlands it is

roughly two percent per year (Jacobs, 2004). In most of Europe the growth in relative supply of skilled workers levels off, so the returns to education will grow substantially.

Evidence from the UK Labour Force Surveys 1996 to 2003 suggests that the mean return on higher education has not dropped despite an almost doubling of the student participation over that period, but that there seems to have been a marked fall in returns for recent cohorts and that the mean return may have stayed high due to the increasing number of maths and engineering graduates (Walker and Zhu, 2005). The shift towards more profitable studies may thus contribute to high and rising private returns to higher education as well.

With rising private returns to higher education it makes sense to let the private sector invest more in higher education. However, many governments in Europe obstruct these investments. They should get out of the way and facilitate these investments. The right way to do so is to allow students to borrow for their educational costs through income-contingent loans. Section 8 discusses these in more detail.

6.3. Baumol's cost disease also suggests a shift towards more private funding

Higher education is, like the performing arts, intrinsically labour intensive and has little possibilities for technological progress. It thus suffers from Baumol's cost disease (Baumol, 1967). Teaching and research need to be done by highly qualified people and cannot be replaced by technology. Compare that with the huge technological progress during the last few centuries in services and manufacturing. Since productivity growth in higher education lags behind other sectors of the economy, the cost and price of higher education rise over time unless wages in higher education consistently lag behind wages in the rest of the economy. To make sure demand and provision of higher education goods do not fall, some in Europe argue that a growing government subsidy is required. This is unconvincing, since the increase in productivity elsewhere in the economy gives rise to corresponding increases in purchasing power. If people value the degree programmes offered by labour-intensive HEI's, they will use their new riches to pay for it. Since higher education is a luxury good, it will flourish as technical progress makes people wealthier.

With Cobb-Douglas preferences, Baumol's cost disease does not destroy jobs or output in higher education even though the ratio of output of higher education to other economic output dwindles away and prices of higher education continue to rise. The technological progress in the rest of the economy boosts purchasing power of people sufficiently to keep up expenditures on higher education despite its rising costs. There are two unrealistic assumptions in this discussion of Baumol's cost disease. First, Cobb-Douglas preferences and indeed any form of homothetic preferences imply linear Engel curves and unit income elasticities of demand. However, other goods may be necessary and include basic needs such as food, drink and shelter while higher education is a luxury good. In that case, Stone-Geary preferences are more relevant. The budget

share of higher education then rises over time, since people give relatively more priority to basis needs if they are poor and more to education as they grow richer. Second, the elasticity of substitution between higher education and other consumption goods is probably less than unity. A CES utility function with an elasticity of substitution less than unity generates a budget share of higher education that rises over time as well.

When discussing Baumol's cost disease in the context of higher education, it is important to realise that skill-biased technical change also boosts the returns to higher education. Graduates can thus rationally use the higher returns to pay for the higher cost of education. Provided the opportunity costs of education do not increase as much as tuition fees, Baumol's cost disease actually creates jobs and output in higher education. Indeed, if education is a pure investment good, demand for education features zero income elasticities of demand for higher education. Hence, despite rising relative prices, there are good reasons to believe that the budget share of higher education rises over time. People become sufficiently rich due to technological advances to be able to afford that.

In any case, Baumol's cost disease leads to a number of offsetting trends. The rise in the relative price of labour-intensive educational activities causes a shift towards less labour-intensive forms of teaching and research. Think of the advent of video and long-distance teaching, computer-aided courses and other technological innovations. Technology may induce new economies of scale and substitution in the type of higher education. An example is the rise in self-teaching with the aid of special DVD or web-based teaching programmes. All of this need not crowd out the real thing. Demand for physical teaching may even increase. In addition, rising prices of higher education induce a shift from small-scale to large-scale teaching programmes. We indeed see that many institutions now have bigger class sizes than a few decades ago, and the famous tutorial system of Oxbridge is becoming very expensive. The possibilities for a good academic operating on a world market have grown enormously with the advent of globalisation and the Internet. These developments have led to super incomes for only a few academic superstars (Rosen, 1981). Baumol's cost disease also explains the shift from higher education for the elite to higher education for the masses. This may induce dumbing down at the expense of diversity and research. This gives a strong case for subsidising pure research and unprofitable, less popular, but academically worthy studies.

6.4. Other trends and developments

There are few other trends and developments that affect the future management of higher education. Internationalisation will increase demand and supply elasticities of higher education. This will increase competitive pressures. Of course, this does not require larger subsidies but may make it desirable to shift from funding suppliers of higher education to voucher funding. The market (students and professors) - rather than the government - will

curb monopolistic behaviour of universities. Another inexorable trend is individualisation and increased heterogeneity. Societies are rapidly changing and one could argue that the demand for higher education becomes more diverse. An educational system which is a straitjacket to individuals increases the welfare costs of uniform prices as is the case under the current system. Consequently, the government should optimally respond by allowing for more degrees of freedom in price setting of HEI's so as to meet the stronger variety in demands for higher education. This trend should not lead to more subsidies.

Many governments face increasing scarcity of public funds due to the ageing of the population. Also, criteria on deficits and debt for EMU member states impose ceilings on government expenditures. Further, increased mobility of tax bases (also due to internationalisation) increases the costs of public funds. As arrangements in the welfare states become more costly (Baumol's disease and individualisation), the marginal benefits of public goods decrease and willingness to pay taxes for these public goods diminishes as a consequence. For all these reasons, there is not much hope for extra state funding for higher education so that efficiency of the system of higher education needs to be increased and more external funding has to be found.

7. Why equity should not matter in higher education

If anything, education is associated with the pursuit of a more equal society. The participation of young people in higher education is highly correlated with the educational attainment of their parents. In many countries those whose parents have completed higher education are about twice as likely to participate as those whose parents lack upper-secondary education qualifications (Blöndal, Field and Girouard, 2002). Still, the *relative* prospects of young people from less advantaged backgrounds have not worsened with the expansion of higher education. It is much more important to focus attention at getting children from less advantaged backgrounds up to the level of entrance level for higher education.

Whereas subsidies are thus justified for lower and secondary education, the case to provide large-scale subsidies for higher education on equity grounds is doubtful as subsidies on higher education are regressive. The vast majority of students in higher education belong to the richest half of the population. To finance education subsidies from general tax revenues therefore implies perpetuation of inequality over the generations and a reduction of income mobility, because these subsidies redistribute resources away from the poorer individuals in each birth cohort towards the richer ones. Moreover, education subsidies are regressive from a life-cycle perspective. The average tax payer has a lower life-time income than the average recipient of education subsidies in view of the high financial returns to higher education (Card, 1999, Harmon, Oosterbeek and Walker, 2003). Currently, a grand coalition of politicians from the left to the right of the political spectrum block necessary structural reforms in the

degree and manner in which students are financed by repeatedly raising equity or accessibility issues for the wrong reasons. We will attempt to illustrate the flaws in this populist discourse.

Many politicians argue that access to education is a 'basic right' and should thus be supplied free of charge. Of course, education should be accessible to all with sufficient academic capabilities. But this does not imply that higher education should be free from charge, neither does it imply that all should pay the same price, or should pursue the same quality of education. Sufficient access to food or healthcare is also a basic human right, but this does not imply that food and health are supplied free or of uniform quality (Barr, 2004).

Some argue that subsidies on higher education should be employed to lower wage premiums of graduates and thus in that way reduce inequalities. That is, by giving incentives to over-invest in higher education, workers without an academic qualification become scarcer relative to workers with a higher degree and therefore wages of graduates fall relative to those of other workers. This argument cannot stand the test of empirical and analytical scrutiny. Indeed, the wage premium of graduates falls, but this comes at the cost of transferring resources towards the rich. The latter effect is estimated to be about as important as the first (Dur and Teulings, 2004). Hence, no net reduction in inequality results. Furthermore, the income tax is a more direct and efficient instrument to redistribute resources towards low-skilled workers. It avoids over-investment and can redistribute the same amount of resources with lower taxes as the tax base is larger without over-investment.

Another misguided, yet popular argument is that regressive higher education subsidies are a good idea as graduates pay more taxes later on in life. However, theory and data suggest that the increase in tax revenues of graduates does not recoup higher education subsidies as most governments over-subsidise education from a fiscal perspective (De La Fuente and Jimeno, 2005; Bovenberg and Jacobs, 2005). This argument also violates horizontal equity norms in tax laws, which state that people in identical positions should be treated equally. The point is that higher education subsidies discriminate against high-income earners who did not study and accordingly did not receive large subsidies, but they still pay much higher net taxes compared to those who did study.

When it comes to the interaction of the tax system and educational investments, higher education subsidies should be used to offset the tax distortions of progressive taxes on human capital investments (Bovenberg and Jacobs, 2005). Here, education subsidies are not used for equity but efficiency reasons. As progressive taxes reduce human capital investment, the tax base erodes and this harms the redistributive powers of the government. Consequently, it is optimal for the government to make the costs of higher education effectively tax deductible, by subsidising higher education at the rate of the marginal income tax. This is equivalent to the neutrality of the corporate income tax on corporate investments if all investment costs can be deducted at the same rate at which the returns are taxed. This second-

best policy ensures neutrality of the income tax on educational investments and leaves the tax base in tact. Therefore, the poor benefit from regressive higher education subsidies because they allow the government to tax income more progressively. Hence, more regressive higher education subsidies can be justified only in conjunction with more progressive income taxes. Note that the above does not imply that interest should be tax deductible. This would distort private decisions in favour of over-investment, because the discounted value of future returns on higher education would be boosted. Also, deducting tax interest would distort saving behaviour and encourage arbitrage as students would borrow more and try to get a market return in order to cash in on the implicit subsidy.

Another argument is that higher education policies should be used to 'limit the domain of inequality' as Tobin (1970) puts it. The government could make the distribution of educational outcomes less unequal and, as education is strongly correlated with income, thereby reduce dispersion in the income distribution. This argument appears in many forms. For example, some politicians vehemently reject 'elitist' higher education systems where the brightest students receive the best and most expensive education. At closer inspection this argument simply boils down to a plea for high implicit or explicit taxes on investments in higher education. This is not efficient for it effectively shrinks the tax base by effectively obstructing profitable investments in human capital. The best students migrate abroad and ultimately the individuals with lowest incomes are worse off than with direct redistribution through the income tax. Apart from efficiency reasons, 'limiting the domain of inequality' is fundamentally at odds with principles of equal opportunity. By forcing the most talented students to reduce their educational investments at apparently socially desirable low levels, these brightest students are not able to develop their capacities because society does not allow them. Apart from efficiency and equity arguments, we find this morally repugnant.

Uniform tuition fees should not be used for equity reasons either. Still, it is often claimed that it is equitable to charge the same (low) uniform tuition rates to both poor and rich students. If the purpose is to reduce income inequality, it is highly inefficient to effectively tax educational investments at a 100 per cent rate above the fixed tuition fee for those individuals who want to invest more than the fixed tuition fee in higher education, whether they are poor or not. Again, the targeting principle suggests that income redistribution should be carried out through the tax system and not through the education system. Taxing higher education erodes the tax base by causing under-investment and the poor are eventually worse off with fixed tuition fees than with more progressive taxes. If the purpose of uniform tuition rates is to guarantee access to higher education, and not to promote income equality, an income-contingent loan scheme is sufficient and does the job of ensuring access well. Instead of using highly indirect and regressive education policies, governments should use the income tax system and improve basic education to directly reduce inequality.

More progressive income taxes may discourage students furthering their career and harm investments in human capital, so should be accompanied by higher education subsidies to ensure the neutrality of income taxes on educational investments.

Governments should give priority to pre-school, primary and secondary education. Empirical research suggests that the ability of the student and long-run background factors ('culture', 'family', 'environment') are the most important determinants of enrolment in higher education (Cunha et al., 2005). Parental incomes do play a role, which vindicates government intervention to make contingent loans available. However, its effect seems to be of little quantitative importance (Heckman, 2000; Shea, 2000; Carneiro and Heckman, 2002, 2003; Plug and Vijverberg, 2004; Cameron and Taber, 2004). Increasing enrolment in higher education of children from lower socio-economic backgrounds requires intervention in basic and secondary education and not generic subsidies for higher education. Moreover, the social returns of primary and secondary education are more obvious and quantitatively more important. If students drop out before completing secondary education, they impose large costs on society arising from larger dependency on welfare benefits, tax avoidance by working in the black circuit and higher crime rates (e.g., Lochner, 2004).

8. From student grants towards income-contingent student loans

One of the main problems of higher education in Europe is that universities and colleges of higher education are starved of funds while students are unable to study effectively. With ceilings on public spending on higher education, the main way HEI's can improve their teaching and research is to ask higher fees from students. And even that is not possible in most countries. Further, capital markets may fail to deliver the funds to finance increased tuition and costs of living. Human capital is not considered as good collateral to secure repayment of loans, because it cannot be traded (slavery is forbidden). Furthermore, banks cannot easily assess the risks of some students and face difficulties monitoring efforts by students and graduates to perform well. Resulting adverse selection and moral hazard effects result in high interest rates, credit rationing or even a collapse of the credit market for student loans (Stiglitz and Weiss, 1982). In addition, students are risk averse and hesitate to take up large loans (Lehvari and Weiss, 1973; Eaton and Rosen, 1980). Indeed, the risks associated with human capital investments cannot be insured for similar reasons as credit markets fail, i.e., incomplete contracts and information problems (Rothshild and Stiglitz, 1976; Sinn, 1995).

Imperfect capital and insurance markets generally cause underinvestment in higher education. More importantly, these financial market failures typically hurt students from poorer socio-economic backgrounds as they have less money available to put up front to finance their studies and are typically more averse to borrow. Many students depend on their parents or forced to take little jobs to pay for tuition fees and their costs of living if sufficient

loan facilities are not available. Private schemes such as asking (possibly interest-free and tax-friendly) bonds from family and friends are only a solution for some students. Large numbers of students are forced to work more, and therefore study less and harm the quality of higher education. Hence, there is a case to help such students so that they can pay higher tuition fees.

8.1. Income-contingent loans

Students do not need grants, but credit. To tackle student poverty, students should be allowed to borrow the full amount of fees and cost of living. Income-contingent student loans appear to be the most efficient way to overcome problems of capital market imperfections with risk-averse students (Nerlove, 1972, 1975; Barr, 1993, 2004, 2005; Chapman, 1997; Oosterbeek, 1998; Jacobs, 2002). An income-contingent loan scheme (ICL) allows students to finance their education, but only requires them to pay back principal and interest if their incomes after graduation are high enough for them to afford this. ICL-schemes thus offer students a combination of loans and social insurance. This restores access to higher education by directly tackling both the capital market and the insurance market imperfections. Further, if income risks are shared among graduates by pooling the risks at the macro level, the government needs fewer subsidies to eliminate risk aversion.

The market cannot come up with such a solution. Private banks and insurers are unable to write contracts based on future incomes, but the government can enforce such contracts through the monopoly of the tax authorities. In addition, the government has more information than private banks or insurance companies and is thus better able to avoid problems of adverse selection and moral hazard. Through selection and tracking of student performance and denying funds to non-performing students, it can more easily eliminate the 'rotten apples' from the ICL-scheme. Collecting repayments through the income tax system avoids costly verification procedures to determine earned incomes. The government can also collaborate with other governments and other tax authorities in the European Union in order to track down graduates who try to escape repaying their loans by working abroad.

In principle an ICL-scheme features no subsidies and thereby avoids the direct efficiency costs of distortionary taxes to finance subsidies. However, the social risks on non-repayment may also be borne by society rather than the graduates. In that case, default risks are shifted rather than shared. This comes at a cost, because (ex post) education subsidies still enter the system. Moreover, an ICL-scheme can be defended on equity grounds as well. The majority of students comes from the most wealthy income classes and will belong to the most wealthy income classes after graduation. ICL-schemes avoid perverse redistribution of incomes from the average taxpayer to students.

8.2. Graduate taxes

An alternative approach is for the government to provide students funds through a graduate tax (GT).[9] Under a GT every graduate receives an amount of resources financed through the issue of government debt.[10] Graduates retain a (potentially differentiated) fraction of their incomes and pay a fraction of their lifetime incomes to the government: the graduate tax. The government pools all the repayments so as to repay the government debt including interest. From the individual perspective, repayments under a GT may (far) exceed initial funds (including interest). Therefore, contributions by graduates with high incomes under a GT system are relatively larger than under an ICL-scheme and there is more insurance and redistribution. From the individual perspective, there is no link between the amount of equity received and the total repayments. However, the government may easily set different graduate tax rates ex ante for different levels of funding. Hence, the connection between funds and repayments does not need to be completely dwarfed.

8.3. Income-contingent loans versus graduate taxes

In practice, there is only a gradual difference between a GT and ICL-schemes. The main difference is that ICL-schemes have less insurance than a GT, since income solidarity is maximised under a GT. The reason is that under a GT repayments by high-earning graduates exceed the costs of their education and the surplus is used to subsidise low-earning graduates. If the GT is in this sense budgetary neutral, it is not unlike an income-contingent loan with risk pooling. With a GT there is no ex post relationship with the amount of money that has been provided to the student (only ex ante if the GT is differentiated).

Both ICL-schemes and a GT have some disadvantages arising from the insurance character of the schemes. These disadvantages are inevitable, but are more severe with a GT as it features more insurance. Insurance of repayment risks will entail some distortionary income redistribution. In the absence of moral hazard, a GT provides more insurance than a ICL-scheme and thus dominate a pure loan. A GT also dominates a ICL-scheme if the non-repayment risks are borne by society (García-Peñalosa and Walde, 2002). With moral hazard, however, a ICL-scheme provides better incentives as it features less insurance and performs better than a GT if risks are pooled among students and not borne by the government.

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[9] A GT can be viewed as equity financing as opposed to debt financing of higher education (Friedman and Kuznets, 1945; Friedman, 1962; Jacobs and van Wijnbergen, 2005).

[10] Occasionally, a 'pay-as-you-go' version of the graduate tax is proposed where the grants to current students are paid for by special taxes by current graduates. Just like PAYG pension schemes may lead to people saving less than what is socially optimal, people may invest more in their studies than what is socially optimal if the growth rate of student population is below the real interest rate. We think that one should not mix education finance with intergenerational redistribution. The latter can be better organised through government debt.

Both ICL-schemes and a GT cause distortions in labour supply and delaying career choices in order to avoid paying taxes as the repayments are contingent on incomes. A common misconception is that only a GT, and not a ICL-scheme, has these disadvantages. Further, students are effectively insured against failure outcomes, which avoids debt aversion, but may also induce free riding behaviour (moral hazard). Students may not put enough effort in studying hard; they may study longer or enrol in fun studies. These moral hazard problems can be avoided to a large extent by selection and introducing penalties for those who do not make satisfactory progress with their studies. It also helps to differentiate the payback tariff by study length and size of loan. In particular, a bigger loan warrants a higher tariff. This prevents cross-subsidies from cheap to expensive courses and avoids income redistribution from smart (high return, low risk) to less bright (low-return, high-risk) students. As a result, there is less moral hazard and more pure insurance. To prevent cross-subsidies from profitable to loss-making studies, tariffs per course and per discipline must be differentiated (see section 4). We think that an ICL-scheme should be preferred to a GT, because it features less insurance, allows for more flexibility in repayment conditions, and can be better tailored to avoid moral hazard. This holds especially if repayment parameters are not very differentiated according to the level of funds received, the type of study or student performance. In that case, the GT causes a potentially large moral hazard problem as the link between funds received and repayments is weakened a lot.

Insurance of risks of non-repayment may also give rise to adverse selection. Rich students may not be willing to participate in an ICL-scheme or GT so as to avoid risk pooling. This problem is avoided if the government pays the cost of bad debtors and the cost of insurance out of general funds rather than out of a surcharge on the interest charged on student loans. An additional advantage is that these transfers are hardly regressive, since only students with very low lifetime incomes benefit. Alternatively, the government may make participation in an ICL-scheme or GT obligatory. Adverse selection also arises if talented but 'poor' students do not participate due to loan aversion and prefer to work rather than study. Good information is needed to convince these students that it pays for them to study and that they do not run large income risks if they finance their studies with income-contingent loans. Carefully designed income-contingent loans can thus substantially reduce problems of adverse selection and moral hazard.

Box II: Australian experience with income-contingent student loans
The reason for the Australian Higher Education Contribution Scheme (HECS) was the introduction of (differentiated) tuition fees to fund further expansion of the higher education system. The Australian government had budgetary problems and only wanted to increase the budget for higher education from general tax revenues if at the same parliament accepted the HECS. Other reasons that were voiced in favour of tuition fees were the small difference between private and social returns, equity concerns, and reduction of moral hazard and adverse selection. One option under the HECS is for students to pay

(part of) fees upfront with a 25 per cent discount. Roughly one third of students choose this option. The remaining one thirds chooses to defer their payments until after graduation under the HECS. There is no interest charged on outstanding debt, but the debt is annually indexed to changes in the consumer price index. Repayments are collected by the tax office. They only occur if income is above a threshold ($A 22.346 in 2001) and increases gradually from 3 to 6 per cent of income. Higher earning graduates thus repay their debt more quickly and thus receive less interest subsidy.

The HECS hardly changed the high rates of return on higher education for students. Indeed 99 per cent of the outstanding debt is repaid within eight years after graduation. The introduction of tuition fees did not affect student enrolment adversely either. In fact, total enrolment increased in the eight years after the introduction of the HECS by 50 per cent. Furthermore, the proportions of students from different socio-economic backgrounds have hardly changed since the introduction of the HECS (Chapman, 1997). However, groups from lower social-economic background are still very much under-represented, which may be due to non-financial factors such as family customs and attitudes. OECD data suggest that the shift towards income-contingent student loans after the introduction of the HECS in 1989 decreased enrolment of students in humanities and education studies, which are presumably the disciplines with less earning prospects. Students did not seem to suffer much from debt aversion. Administrative costs seem modest: only 2 per cent of HECS revenues for compensation of institutions and 1 per cent of HECS revenues for the administrative costs of the Australian Taxation Office.

8.4. Income-contingent loans versus education subsidies

Education subsidies may restore access by reducing the need to borrow, but they do not fundamentally tackle the problems with failing capital and insurance markets. However, education subsidies do have several important disadvantages over income-contingent loans. First, education subsidies involve large transfers to students who do not need financial assistance because they come from well-off backgrounds. More importantly, most students are not credit constrained in a lifecycle sense as the returns to education are so high that they can easily fund the costs of their education from their lifetime incomes. Further, education subsidies are not effective in reducing risks of a particular study. Consequently, most of the subsidies will be directed to students with relatively safe earnings prospects such as medical doctors, lawyers or business economists. Furthermore, large subsidies on higher education also provoke an excessive enrolment of less talented and lazy students, who feature large risks of dropping out and excessively low returns on their education.

Student grants or subsidised tuition fees paid for by general taxes therefore suffer from massive deadweight losses and, consequently, much more subsidies are needed to achieve the same degree of accessibility. Large sums of money are directed towards students/graduates who on average do not face problems to finance their education, have no income uncertainty and/or have too low returns on their education. Since education subsidies have to be financed from general tax revenues, these dead weight losses are costly. Income-contingent student loans generate much smaller dead weight losses from misallocation of subsidies, require lower levels of taxation than student grants, have less perverse redistribution effects, and weed out the 'fun' students who are only there to delay work rather than study hard.

8.5. Income-contingent loans versus means-tested subsidies

Many popular arguments for means-tested student grants or subsidised tuition fees are based on the notion that especially the poor suffer from credit market imperfections and the inability to insure human capital risks. These arguments are not very convincing, because income-contingent student loans appear to be a more efficient and appropriate instrument to tackle these market imperfections directly and subsidies are unnecessary. This is also the case for subsidies that are based on parental incomes. Means-testing also has an important disadvantage: it discourages parental savings (Edlin, 1993; Feldstein, 1995). Poor students can apply for income-contingent loans and do not need to rely on their parents, nor need to be afraid that they suffer huge repayment burdens. Finally, means-tested subsidies cannot be defended on equity grounds either as graduates from poor backgrounds can also look forward to high lifetime incomes. If equity is a concern for the government, it is much better to target aid at school children than at students from poor families. Once children of deprived backgrounds have managed to reach the stage of university entrance examinations, they do not seem to fare worse than children of richer backgrounds.

8.6. The international dimension of student loans

Any form of ICL-scheme, GT or indeed student grant system, has to face up to the prospect that some of the most able graduates will migrate and not contribute to tax revenues. Some may even not pay back their student loans. Hence, if there is a brain drain of graduates leaving the country, recouping student loans is more difficult. In that case, governments have an incentive to give bigger higher education subsidies for degrees focusing on country-specific skills such as law and lower subsidies for internationally applicable disciplines such as medicine, engineering and economics (Poutvaara, 2005). For more on migration of graduates and the brain drain, see Bhagwati and Hamada (1974), Beine, Docquier and Rapoport (2001), Stark, Helmenstein and Prskaetz (1997) and Poutvaara (2004).

9. Why transparency is a must

The virtues of competition only materialise if markets are transparent, so that both producers and consumers base their decisions on the right premises and no side of the market can systematically exploit informational advantages to their own benefits. Transparency in the market for education is of the utmost importance, because most people only enrol once in their lifetime and this makes higher education an irreversible investment. If the university does not deliver services according to one's expectations, it is impossible to ask your money back and, more importantly, the time invested in a course will be down the drain.

When it comes to earnings prospects, many students do not realise how high the returns to higher education really are. It is hard to understand that many European students are

reluctant to borrow €50.000 for an investment whose return approaches those on equity on average, especially if after graduation a similar sum is borrowed to buy an exclusive car. Strange enough, many students express excessive fears of being unemployed, earning low incomes and having high levels of debt at the same time. Clearly, there is an urgent need that students are well informed on the average returns on their education, the risks associated with such investments (employment probabilities, etc), the repayment obligations of student-loans in normal circumstances and in cases of low incomes, and so on. In our opinion there are no convincing reasons *not* to take up income-contingent loans to finance the costs of higher education once the decision to enrol in higher education is based on more objective premises. Indeed, well-informed students should have less debt aversion.

Due to inadequate information and advertising, students have inadequate insight in their own abilities, inadequate insight in future returns on their studies and inadequate insight in the quality of the various degree programmes. We think that due to lack of transparency, the majority of pupils at secondary schools go to their local university or college of higher education. Many simply go where their friends go. Especially, international comparisons are difficult. If students cannot asses the quality of the education they are enrolling in, students cannot compare various studies and this obstructs fair competition. Universities and higher professional schools are likely to abuse their informational advantages to (price-) discriminate, select and cream-skim the best students and undercut average educational quality below socially desirable levels. In effect, informational advantages effectively bolster the monopolistic powers of universities. This should change, because otherwise the potential merits of introducing more flexibility and variety through competition will not materialise. Government, secondary school teachers and HEI's should therefore invest in informing school children where they can best study in terms of quality of teaching, research reputation, extracurricular assets, etc. Further, it is necessary that the achievements of universities and higher professional schools are published and made available through Michelin guides of higher education. These could for example contain average grade-marks, average number of times that exams are retaken, average enrolment durations, scientific accomplishments of university personnel, teaching evaluations, student evaluations, average salaries of graduates, average employment rates, average job-seeking durations, and so on.

If tuition fees are differentiated, universities may give a discount on the fees of the best students ('customer input technology'). However, the input of the best students in terms of the contribution to the institution is probably rather difficult to verify. Hence, the inability to observe the quality of applicants at educational institutes may cause problems similar to the ones we know from the 'efficiency wage' literature. Universities may give too high discounts on tuition to recruit, to retain and to motivate the best students, while at the same time rationing the number of places available. Hence, there may be a pool of qualified students

which have the right capacities and are still unable to enrol in the best universities and higher professional schools. Furthermore, in order to reduce the underlying informational problems, universities and students engage in excessive screening and signalling activities which are also wasteful from an aggregate perspective. A consistent and non-discriminatory system of screening student qualities and capacities which is based on academic aptitudes helps to avoid waiting lists for the best applicants and misallocation of students over universities and higher professional schools.

Information problems arise between students and HEI's, but also between the government and these institutes. As discussed earlier, competition policy and the effective use of public subsidies requires that the government can effectively monitor costs, quality of educational output and knows how public subsidies are allocated. Therefore, universities and higher professional schools not only have to be more transparent for prospective students, but also for the government and therefore society in general. Indeed, much more information is needed to hold university management publicly accountable.

10. Seven recommendations for reform of higher education

Private returns to higher education are rising due to skill biased-technological change and internationalisation, which induce specialisation in skilled production activities in Western countries. It is not clear that the gap between social and private returns is large enough to warrant more *public* investment in higher education. Baumol's cost disease suggests that the budget share higher education in national income will rise further, if demand is price inelastic. As people are getting richer at the same time, they can afford to pay for the rising costs. These developments call for more *private* investment in higher education. Currently, governments obstruct these investments through a battery of central planning regulation and instruments.

Most governments determine about everything in the sector, from the level of tuition fees to government contributions to HEI's, from grants to loan possibilities and from admission standards to funding formulae for universities and higher professional schools. In spite of the desired and expected rise in the demand for higher education, many governments in Europe do not allow supply of higher education to expand so as to meet demand. The reason is that public contributions do not keep pace and governments do not allow private parties to invest more in higher quality education. Furthermore, the fixed parameters of government policies have no clear economic rationale and produce 'one size fits all' higher education systems that cannot adapt to changing circumstances in an increasingly international market for higher education with mobile researchers and students. At the same time societies are rapidly becoming more complex due to individualisation trends, more dynamic labour markets and changes in life-cycle patterns of individuals. Changes in the demand for certain graduates in various disciplines cannot in Europe be met by increasing

variety and by varying levels of quality of HEI's. All in all, current institutional settings lower the quality of European educational institutions, introduce mismatches between supply and demand of studies and students, and result in waste of tax payers' money.

The quality of higher education systems is also threatened by a lack of transparency and, consequently, by a generic lack of competition between supplying institutions. In the face of stagnant of or even declining resources per student, many governments in Europe have aimed at increasing scale so as to cut average costs per student. As a consequence of such scale increases the education market has become monopolistic. Some cartels are now firmly institutionally embedded through non-level playing fields between private and public institutions and highly distortionary funding practices (e.g., based on historical funding). Furthermore, inappropriate methods of funding give rise to ever-rising overhead costs and status-seeking university bureaucrats wasting scarce resources on nonsense projects.

Finally, a grand coalition of politicians from the left to the right of the political spectrum form a 'cordon sanitaire' against many necessary structural reforms by repeatedly raising equity or accessibility issues for the wrong reasons. Of course, education should be accessible to all with sufficient academic capabilities. But this does not imply that higher education should be free from charge, neither does it imply that all should pay the same price, or should pursue exactly the same quality of education. European nations should be worried about the large-scale violations of equality of opportunity we currently see by denying the most talented youngsters a high quality, and therefore expensive education, and also about the relatively inefficient system of higher education. As a consequence of 'glass' ceilings on academic excellence, many academic 'fines fleurs' flee to the top US universities to develop their academic careers.

European higher education seems to be hijacked by inert politicians with visionless and mistaken egalitarian policies, which impose a straitjacket for students and institutions. Central planning and control deny possibilities to reform in response to changing societies in which there is an urgent need for more investment in human capital. Students are not challenged, lazy and drop out massively. Current policies grant monopoly positions and render strongholds of power to the insiders: a tyranny of vested interests of the university bureaucrats and malfunctioning university personnel. All this reduces the development of future generations, erodes the quality of European universities and higher professional education, and ultimately threatens the future wealth and civilization of European nations. To break this vicious circle, we propose a seven-tier agenda for the reform of higher education.

I. Expand private funding by higher tuition fees
At current levels of public spending on higher education there are no convincing economic arguments to further increase public funding. Rather, governments should get out of the way

of private parties who want to invest in higher education and instead the government should facilitate rather than obstruct such private initiatives by allowing young individuals to borrow against their future earnings by means of income-contingent loans. We do not advocate raising tuition fees without alleviating credit constraints for poorer students as now seems to happen in Austria and Germany. Graduates will repay these loans through a percentage-wise repayment of their incomes after graduation. In providing loans coupled to an insurance to cover the losses in low income states after graduation, the government guarantees universal access at very low public costs because in principle no subsidies are needed to safeguard access. The supply of higher education can expand in response to larger demand without burdening the public finances. By providing sufficient funds through income-contingent loans, all students, from all walks of life, can enrol in higher education without having to rely excessively on disruptive, part-time jobs or their parents to finance their costs of living or tuition fees. Whether the governments should cover the costs of non-repayment of graduates with low life-time incomes or whether these costs should be shared among graduates remains an open policy question. If 'low risk-high income' graduates easily opt out of the public income-contingent loan schemes and self-finance their education, risk sharing of non-repayments becomes less attractive (adverse selection). Covering these default risks through general tax revenue avoids adverse selection and keeps the 'low risk/high income' graduates in the system, because repayment conditions are then independent from levels of default. Also, since students are effectively insured against failure outcomes, risk sharing may cause more default due to laziness in college going years, reduced labour force attachment after graduation and excessive enrolment in low return 'fun studies' (moral hazard). Governments should in principle try to eliminate the 'rotten apples' from the higher education system through selection, tracking and monitoring students' efforts and progress.

II. Distinguish studies that are public goods from those that are private goods
The government should not subsidise education to warrant access, but subsidise those studies whose social benefits lie above the private benefits. Some disciplines in higher education have, for sure, public benefits over and above the private benefits. For example, science students are important to maintain fundamental research for which no private markets exist. The same holds for say art history and archaeology. These disciplines may have a too low private rate of return to survive on the market. Nevertheless, there are studies for which it is difficult to justify large government subsidies such as business economics or law. Economists receive the social reward of their education on their future paycheques. Indeed, law studies may even generate negative externalities by increasing transaction costs in the economy. Also, studies that have large 'status' or 'signalling' value should not be publicly supported because too many students may choose to do these studies, whereas the status and signalling value of

education is social waste from a macroeconomic perspective. Subsidies should in principle be differentiated according to the size of external effects. The larger are external effects of a particular discipline, the larger the subsidies to that discipline. Uniform tuition rates and government contributions to HEI's are irrational from an economic perspective because too many students will enrol in fields, which have no social value over and above the private value. And, vice versa, too few students will enrol in fields that have large private value relative to the social value of education. Currently, giving subsidies on higher education across the board wastes many government resources. Politicians and policymakers should clearly define their objectives, i.e., determine which studies should receive public support, and subsequently, allocate scarce government budgets to these disciplines only. This will free up scarce resources that can be used realise the real goals of government intervention: a diverse and intellectually challenging higher education system that secures the continuity of academia in its broadest sense.

III. Differentiate tuition fees and offer a greater diversity of higher education

Different studies have different costs. Higher quality has a price tag. Different students have different academic abilities. Those with higher capacities and potentially high returns on their education are willing to pay more for higher education of a higher quality. Furthermore, universities are willing to give the best students discounts on their tuition fees because they raise the quality and reputation of the institution. In addition, governments give fewer subsidies for smarter students that induce peer or reputation effects. Again, it makes no sense from an economic perspective to charge uniform (possibly zero) tuition fees if costs of various studies differ. Indeed, uniform prices distort both universities' and students' choices. Universities will undercut supply of expensive studies and students will excessively demand those. Moreover, fixed tuition fees squeeze the educational efforts of the more able as they are not able to achieve their potential if the quality of the education does not meet their capacities. Similarly, the 'bottom' of the higher education market may disappear completely as students with lowest academic capacities are not enrolling anymore because at 'average' tuition fees they find it not rewarding enough to continue to a higher education. In practice this mechanism is probably less relevant, since tuition fees are very low anyhow. Finally, uniform tuition rates do not reward the high-ability students for their contribution to the higher quality of the institution and implicitly rewards the low-ability students. This implicit cross subsidy from high-ability to low-ability students lowers the quality of higher education, because educational efforts of high-ability students diminish and there will be excessive enrolment of the less talented students that should not enrol in higher education. In short, differentiation of tuition fees allows the market for higher education to respond to changing preferences of students, changing conditions on the labour market and changing circumstances in the market

for higher education. Fixed tuition fees result in a severe mismatch of supply and demand on the market for higher education, because fees do not function anymore as signals of scarcity. It thereby reduces variety, results in one-size fits all education with a uniform and lower average quality.

IV. Selection, tracking and incentives

As long as governments publicly support higher education with education subsidies, they should make sure that resources are wisely allocated. However, in many European countries one observes generous treatments of non-studying students. Most European students are allowed to be enrolled for many more years than the nominal study duration. Furthermore, the eligibility to student loans, grants and subsidised tuition fees is only weakly subject to selection upon admission and subsequent tracking of student performance. The consequences are obvious: actual enrolment durations exceed nominal ones tremendously and dropout rates are high. A lot of public funds are squandered along the way. Of course, this is not an issue if higher education is completely privately financed. In that case, individual students are financially responsible for their own behaviour and are not able to shift the financial consequences of non-performance to the tax payer. Good public policy requires the design of subsidies that avoids waste of resources and gives proper incentives to students. Therefore, selection of students based on academic aptitude upon admission helps to avoid enrolment of too many non-qualified students and reduces dropout rates. Entitlements to subsidies should also be made contingent on student performance. This will raise student effort and reduce the risks of failure. Non-performing students should loose their eligibility to public subsidies (grants/low tuition), but should be allowed to continue their education at full cost at the same time. Again this frees up resources that can be allocated to raise the government contributions to students that do perform well. This will raise educational quality and gives taxpayers more value for money. By allowing HEI's to select, retain and motivate the best students, they can also compete more successfully for the best teachers and professors. The best staff is attracted by good salaries for which private funding through higher tuition fees is needed, but also by being able to teach excellent students.

V. Foster competition, introduce vouchers and diminish government control

Education and incentives/competition are seen as unhappy bedfellows. Indeed, many pleas for strong central planning and control are based on the notion that higher education should not be left to the vices of the market. It is argued that unbridled market forces erode the public good character of higher education, keep the poor out of higher education, and lead to elite universities and the disappearance of financially less rewarding studies. Defenders of strong state intervention often paint an extremely rosy picture of the virtues of central steering. For

sure, we see a legitimate government role to warrant access through making loans available and to maintain studies of large societal importance. But, we do not adhere to the critics' belief that incentives, introduced by the market or not, should be kept out of higher education.

In response to scarcer public budgets some irresponsible governments have (perhaps inadvertently) stimulated the creation of large public monopolies and cartels in higher education by increasing scale so as to cut average costs. These monopolists do not act in the national interest. Monopolists and cartels in higher education reduce the quality (grade inflation) and quantity, ignore the demands of students and employers, increase overhead costs and encourage university bureaucrats to abuse scarce public resources on prestige projects. Many governments take these problems for granted by applying the wrong incentives in funding, e.g. based on historical grounds or on student numbers. Some governments indeed apply funding criteria based on outputs (e.g., the number of awarded degrees), but as quality of output is generally not well observable, these incentive schemes typically exacerbate grade inflation and may even cause fraud. Moreover, many governments deliberately obstruct competition in the market for higher education by granting public subsidies only to public institutions, do not accredit foreign institutions, and allow incumbents to use cross-subsidies to kill competing private initiatives. In some countries, internal checks and balances in the higher educational sector have been destroyed by abolishing university democracy. Students and university personnel have fewer possibilities to correct non-functioning university management. In short, neither governments, nor students, nor the stakeholders, nor potential entrants can effectively discipline incumbent HEI's. Fundamental changes are therefore necessary.

A fair level playing field must be created for higher education in Europe. Both private and public institutions should compete on the same terms by allocating government subsidies directly to the students by means of vouchers. Students can spend these on the institution of their preference. Barriers to enter the market for higher education should be lowered by abolishing historical funding and potential cross-subsidies that may hinder fair competition. Competition authorities should break cartels and penalise abuse of market power. Universities and higher professional schools should be obliged to yearly publish performance criteria with respect to students' dropout rates, average enrolment durations, average exam marks, student evaluations, scientific publications, evaluations of scientific visitation committees and so on. If students vote with their feet, HEI's will be disciplined. The government can then rely less on distortionary output funding schemes and avoid grade-inflation. Moreover, a level playing field effectively opens up national markets to the international environment, especially if students can decide to spend their vouchers/grants anywhere they want abroad or at home.

VI. Abolish equity issues from higher education

Although equity arguments feature prominently in discussions of higher education, they are not very convincing. Subsidies on higher education are fundamentally regressive. Education policies should not be used to limit the domain of inequality in educational outcomes. If the government wants to redistribute incomes, a legitimate objective, it should do this through the tax system or through basic education. Whether individuals enrol in higher education or not is determined earlier on in life, at the start of secondary school, and much less when people reach the age of going to higher education. A progressive tax system should be accompanied by education subsidies to neutralise the distortionary effects of more progressive taxes on education subsidies. Let all flowers flourish should be the device. Education policies should be separated from equity issues and only be geared towards the pursuit of economic efficiency defined in a broad sense, which includes the immaterial rewards of education.

VII. Better incentives for research and teaching

Government budgets for research should be uncoupled from budgets for education. Research budgets should be based on academic performance and potential. When allocating research funds, one should watch out for 'backing the winners'. One should also avoid insider-outsider issues in labour market for teachers and researchers. There is a danger in the race for the best researchers that the best academic exempt themselves from teaching undergraduates. This should be avoided, because this will in the long run undermine the quality and reputation of the university. Students are the core business of a university, so one should be careful to give proper incentives for the best teachers and make sure that the best researchers also contribute to teaching. More generally, Europe would benefit from some form of tenure-track appointment system with regular assessment of both teaching and research performance of every staff member. The assessments should have implications for salary, tenure and promotion in order to provide the right career incentives.

Two important warnings for policy makers and politicians

The two corner stones of our policy recommendations are: increase private funding so as to raise the quality of education, and allow for more differentiation and variety. However, our policy recommendations cannot be viewed in isolation of each other. Our policies come as a package deal and we want to warn policy makers that cherry picking from our list of recommendations may have disastrous and unintended consequences. Therefore, we end with two important warnings.

(i) Do not raise and differentiate tuition fees or select students without an income-contingent loan scheme

In the absence of income-contingent loans to warrant accessibility, allowing HEI's to set their own pricing and selection policies will result in cream skimming of the best and, more importantly, the wealthiest students. Moreover, students will be mismatched with institutions, because there will be too many wealthy students with insufficient capacities in the best universities and too many smart and poor students in low-quality universities. As enrolment in higher education will then be determined by parental wealth, this causes strong violations of equality of opportunity. Indeed, this will imply a step back in time where the best education is only affordable by the affluent.

(ii) Do not pursue laissez faire policies without ensuring competition in higher education
Government control in higher education is a necessary evil in the absence of fair competition, entry barriers and insufficiently transparent markets for higher education. Despite the inevitable grade inflation, and potentially other unintended side consequences, output incentives are needed in the absence of competition in order to curb monopolistic practices, rent-seeking among scientific and teaching personnel, and rent-seeking activities of university bureaucrats. Laissez faire policies in monopolistic education sectors will not result in more competition if the market structure is not fundamentally affected, but will exacerbate the social costs of monopoly by allowing HEI's to lower standards, lower educational outputs, and increase costs of overhead. All this results in larger waste of tax payers' money and lower educational performance.

To sum up: Europe would benefit from reform in the direction of the Anglo-Saxon system of higher education with much more choice, differentiation and competition, but should not throw away the baby with the bathwater. Europe should strive to give the best possible access to the smartest students from less privileged backgrounds and charge less bright, well-off students substantially higher tuition fees. At the same time, Europe should be careful not to only invest in top academic universities, but maintain and cherish the high average quality of HEI's in Europe.

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Data appendix

Most education data are from the OECD Education Data Base, 2005 (http://www1.oecd.org/scripts/cde/members/EDU_UOEAuthenticate.asp):
number of graduates, numbers of entrants and total enrolment in A-type (long) and B-type (short) tertiary education, student/staff ratios, educational attainment by various cohort-ages, numbers of foreign students enrolled, total/public/private expenditures on higher education, public total/capital/other expenditures on HEI's, public total/grant/loan expenditures to students, total/public/private expenditures on HEI's, total/capital/personnel expenditures on HEI's. Data on enrolment durations and survival rates were taken from OECD Education at a Glance 2003 and 2004
 (http://www.oecd.org/document/11/0,2340,en_2825_495609_33712011_1_1_1_1,00.html).

We used data on consumer price indices, US dollar purchasing power parities, gross domestic product, population sizes, and PISA scores from the OECD Fact Book 2005 (http://iris.sourceoecd.org/vl=15396015/cl=12/nw=1/rpsv/factbook/). Expenditure data are deflated in real terms using the consumer price index (2000 = 1) and converted in US dollars using US $ purchasing power parities. The OECD Labor Force Data Base, 2005 gave data on the age composition of the total population
(http://www1.oecd.org/scripts/cde/members/lfsdataauthenticate.asp) .

Wages by schooling level were obtained from the European Community Household Panel collected by the European Union. We computed 'quasi' Mincer returns by taking the log of the ratio of the average wage of a tertiary educated worker and the average wage of a secondary educated worker and dividing this by the average enrolment duration of higher education. We did not control for experience or any other standard controls. Comparing our data with estimated Mincer returns by Harmon, Oosterbeek and Walker (2003, Table 2), and Denny, Harmon and O'Sullivan (2004, Table 2) shows that our short-cut is not that bad.

Table 1: Issues and problems in higher education

Policy issue	Economic problems
Access	Imperfect capital/insurance markets
	Wrong/costly instruments (i.e. subsidies) to guarantee access
General quality	No private contributions
	Insufficient state funding: declining resources per student, increasing costs of public funds
	Massive higher education and grade inflation
	Skill-biased technical change/higher returns demand more (private) investment in higher education
BA-MA structure	Undifferentiated state budgets
Lack of excellence	No tuition fee differentiation
Uniformity	Lack of variety without BA/MA
	Large failure risks students
	No competition
	Increased heterogeneity requires less uniform education
	No equality of opportunity: high ability students cannot flourish
Selection	Without selection: subsidies are inefficiently allocated
	Selection necessary for higher quality through customer input technology
	Selection on aptitude, not on exam-scores.
Equality	Education not right instrument to redistribute incomes.
Income redistribution	Subsidies higher education strongly regressive
	Fixed tuition not right instrument to guarantee access.
	Equal funding of different disciplines causes distortions in demand/supply
	Equal funding reduces quality ('customer input')
Market	Cartels/lack of competition
structure	Counter veiling powers obstructed
	Large costs overhead & prestigious projects
	Asymmetric information student-university
Input vs. output funding	Asymmetric information government-university
Vouchers	Output funding harms incentives to supply quality
Demand/supply side	Input funding harms incentives to reduce costs/avoids prestigious projects
	Input funding optimal if education markets competitive
	Output funding necessary in presence of monopolistic practices
	Historically determined grants: obstruct fair competition, allow for cross-subsidies, exacerbate agency problems
Market vs government	Externalities not internalised: equal subsidies for all
	Unclear government objectives:
	not all studies have merit good / public good characteristics
	Negative externalities: signalling and status goods
	Unfair competition & uneven playing field private-public universities.
Accreditation/	Asymmetric information: students are ill informed
Transparency	Institutional quality unclear
International dimension	Inefficiencies in current 'rigid' systems are strongly exacerbated
	No specialization, not utilising comparative advantage
	More/stronger competition for (brightest) students/researchers
	Research 'networks' and complementarities more important: 'brain drain'/'strategic trade'
Research	Crowding out of resources and time devoted to education activities
	Too much backing the 'winners' not 'challengers'
	Hard trade-off between competition and internalising network externalities
	Unfair competition if research funding is mixed with educational funding
Education	No separation of scientific and professional education
	Inefficient allocation of money
	Universities have comparative advantage in research
	No separation of research and education: cross-subsidies.
	Lack of incentives/rewards for educational quality

Table 2: Selection in higher education

	Strong selection	Almost no selection
Australia		
Belgium		H,U
Denmark		H,U
France		U
Germany		H,U
Netherlands		H,U
New Zealand		
Sweden	H,U	
UK	H,U	
US	Various	various

Note: H refers to colleges of higher vocational education and U to universities.
Source: Eurydice (2000), CHEPS (2001).

Table 3: Enrolment and tuition fees

Enrolment responses to changes in tuition costs and quasi-elasticities

Study	Country	Data (a)	Control	Selection	Sign? (b)	-dq	dp/p	Elasticity
Kodde (1985)	NL	CS	Yes	No	-	0.0045	0.5	0.01
Oosterbeek (1995)	NL	CS	Yes	No	No	0	-	0.00
Kane (1994)	US	CS+TS	Yes	No	Yes	0.05	0.83	0.06
Kane (1995)	US	CS+TS	Yes	No	Yes	0.035	1,33	0.03
Leslie et al. (1987)	var.	M	-	No	-	0.006-0.008	0.029	0.21 -- 0.27
Hilmer (1998)	US	M	Yes	No	Yes	0.01	0.028	0.36
Dynarksi (1999)	US	CS	Yes	Yes	Yes	0.036	0.1	0.35 (.03) (c)
Heckman et al. (1998a)	US	SM, P	Yes	Yes	Yes	0.08	.80 (d)	0.07
Card et al. (2000)	US	CS+TS	Yes	No	Yes	-	-	0.01 -- 0.04
Cameron et al. (2001)	US	P	Yes	Yes	Yes	0.03 -- 0.06	0.80 (d)	0.02 -- 0.05

Notes:
`Control' indicates whether estimations are done when controlling for background characteristics, IQ, and other individual characteristics.
(a) CS=cross section; TS=time series; P=panel; M=meta analysis; SM=structural model
(b) Indicates significance at 5% level of estimated coefficient for tuition.
(c) Price change relative to all costs of college including tuition, room and board. In parenthesis we show elasticity evaluated at average tuition rates used by Cameron and Heckman (2001).
(d) Price changes taken relative to an approximated weighted mean of 2 and 4 years tuition costs for Blacks, Hispanics and Whites in Cameron and Heckman (2001) ($1250).

Source: Jacobs (2004)

Table 4: Tariffs and tuition fees in higher education

	No. of tariffs	Free tuition fees	No. of tuition fees
Australia	5	No	3
Belgium	3	Mixed	Various
Denmark	12	No	1 (free tuition)
France	31	No*	Various
Germany	n.a.	No*	1 (free tuition)
Netherlands	7	No	2
New Zealand	12	Yes	Various
Sweden	12	No	1 (free tuition
UK	4	No	1
US Tennessee	3	Yes	Various

*Applies only to public institutions.

Table 5: The THES list of the world's top universities

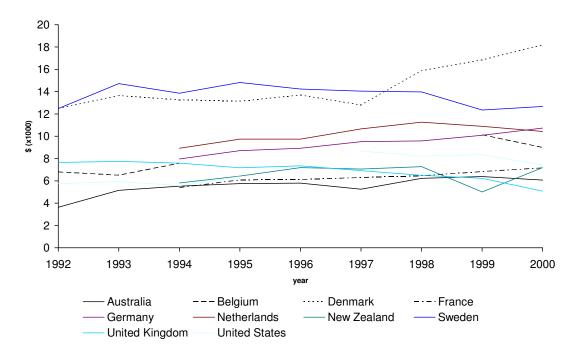|			
1. Harvard University	1000	26.UCLA	316.4
2. UC, Berkeley	880.2	27. Ecole Polytechnique	315.5
3. MIT	788.9	28. Pennsylvania University	306.9
4. California Institute of Technology	738.9	29. Kyoto University	303.7
5. Oxford University	731.8	30. ENS, Paris	298.4
6. Cambridge University	725.4	31. Michigan University	293.3
7. Stanford University	688.0	32. EPF, Lausanne	289.4
8. Yale University	582.8	33. Monash University	286.0
9. Princeton University	557.5	34. UCL, London	284.2
10. ETH Zurich	553.7	35. Illinois University	281.6
11. LSE, London	484.4	36. New South Wales University	275.7
12. Tokyo University	482.0	37. Toronto University	272.5
13. University of Chicago	444.0	38. Carnegie Mellon University	259.4
14. Imperial College, London	443.7	39. Hong Kong University	249.5
15. Austin, Texas	421.5	40. Sydney University	245.2
16. ANU, Canberra	417.7	41. India Institute of Technology	241.7
17. Beijing University	391.8	42. Hong Kong Un. Sc. and Tech.	240.6
18. National University, Singapore	385.9	43. Manchester University, UMIST	238.5
19. Columbia University	384.1	44. SOAS, London	235.8
20. UC, San Francisco	367.5	45. Massachusetts University	235.7
21. McGill University	364.1	46. UBC, Vancouver	230.4
22. Melbourne University	353.2	47. Heidelberg University	228.3
23. Cornell University	348.8	48. Edinburgh University	227.6
24. UC, San Diego	331.5	49. Queensland University	223.9
25. John Hopkins University	330.8	50. Nanyang University, Singapore	217.1

Universities in top 50	
US	20
Canada	3
Australia	6
UK	8
Hong Kong/Singapore	4
Europe excl. UK	5
Asia excl. HK/Singapore	4

Figure 1: Enrolment rates in tertiary education as percentage of cohorts
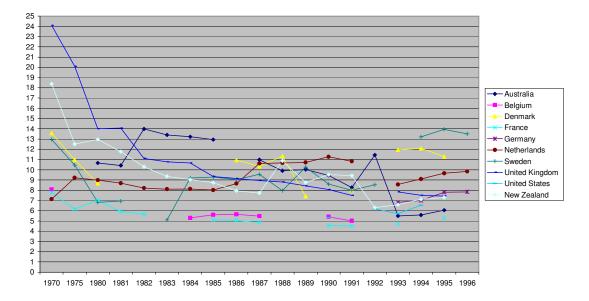

Source: UNESCO (2003)

Figure 2: Real total resources per student in higher education – international comparison

Source: OECD (2003a). CPI indices have been used from OECD (2003) to obtain real expenditures in terms of constant 1995 PPP US dollars, where OECD (2003c) gives the PPP deflators relative to the US.

Figure 3: Real resources per student in higher education

Real total expenditures per student in tertiary education in PPP dollars x 1000 (base=1990)
Sources: UNESCO Education Data Base 2003, OECD PPP deflators 2003, OECD CPI 2003

Source: UNESCO (2003), OECD 2003b) for CPI indices to deflate all series, OECD (2003c) provides PPP deflators relative to the US

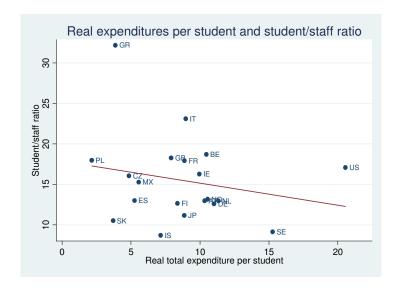**Figure 4: Real expenditures per student and student/staff ratio**
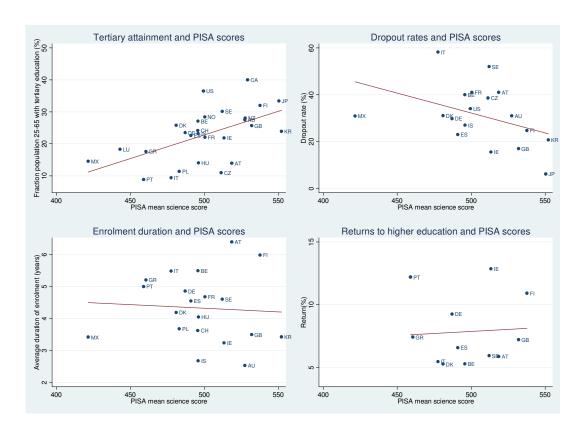
Figure 5: PISA mean science scores and performance in higher education

Figure 6: Student/staff ratio's and performance in higher education
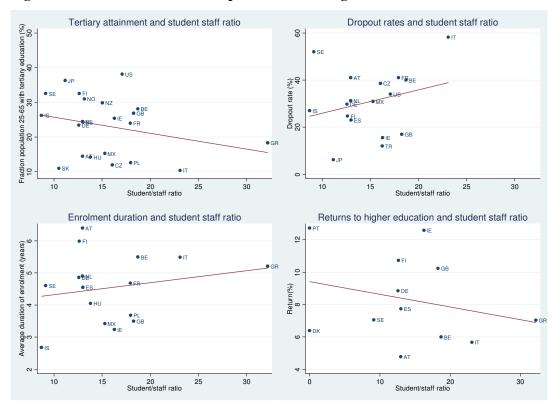
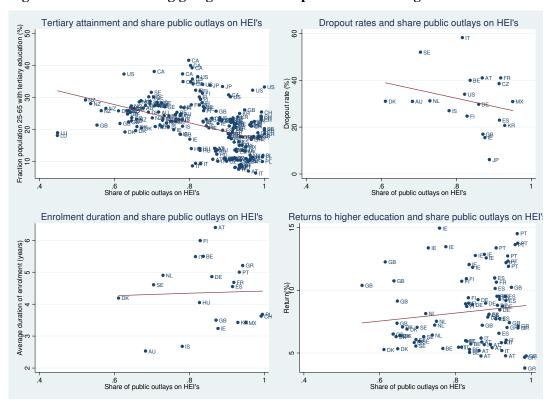**Figure 7: Share of funding going to HEI's and performance of higher education**
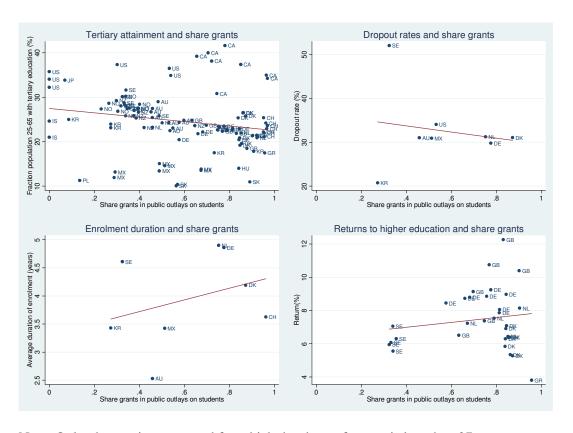

Figure 8: Share of student grants rather than loans and educational performance

Note: Only observations are used for which the share of grants is less than 97 per cent.

Figure 9: Share of private expenditures in total expenditures on higher education for institutions and students and educational performance