

Higher aspirations: An agenda for reforming European universities

BY PHILIPPE AGHION, MATHIAS DEWATRIPONT,
CAROLINE HOXBY, ANDREU MAS-COLELL AND ANDRÉ SAPIR



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Foreword

When in the early 2000s scholars at the Institute of Higher Education of the Shanghai Jiao Tong University started compiling data on the research performance of the world's universities in order to give guidance about where to send Chinese students, they certainly did not anticipate the upheaval that the release of their ranking would provoke in Europe. In the event, the realisation that many of the continent's higher education jewels in fact ranked low – or did not rank at all – was a major shock that forced European governments to confront a reality they had preferred to overlook. Since its first appearance in 2003, the 'Shanghai ranking' has set in motion a major re-examination of higher education policies throughout Europe. It has also triggered reform initiatives aimed at fostering excellence and recognition, illustrating again the potency of benchmarking.

Europe itself had in fact paved the way for such an external assessment by making academic degrees more comparable and compatible through the Bologna process, launched in the late 1990s. While Bologna did not introduce any commitment to change beyond the mere harmonisation of degrees, it enabled comparative assessment and created the conditions for increased competition through student mobility.

But while comparative indicators are enough to start a discussion, they are not sufficient to conclude it. Why are Europe's higher education institutions performing so poorly in the ranking? Is it because their mission statement does not correspond to the Shanghai criteria? Because they lack resources? Because they are poorly governed? Because they do not select their students? Because they are too small? There are many potential explanations for Europe's inadequate performance, which in turn point forward to different reform priorities. An important additional issue: the fact that many (though not all) European countries perform poorly is not in itself a reason for taking action at the EU level. Education policy remains a national remit and EU initiatives have so far been limited to promoting students' mobility and ensuring comparability of grades through the Bologna process. So whether there is a case for stronger EU involvement in higher education policy is an open issue that deserves thorough examination.

This report is a contribution to the discussion about the priorities of higher education policy in Europe. Building on the preliminary findings presented a year ago in their Bruegel Policy Brief ('Why Reform Europe's Universities?', September 2007), the authors discuss the reasons behind the disappointing performance of higher education in Europe and propose priorities for action at national (or sub-national) and EU level.

All five authors are academic economists, though some of them have also been involved in university and research management. The reason why they have addressed higher education reform and set forth an ambitious agenda for it is their conviction that the upgrading of universities is one of the key levers for improving Europe's growth performance. They certainly do not overlook other, less utilitarian motives, for action. But they conclude from recent research that the major investment in knowledge which Europe needs to make if it is to thrive in a fast-transforming global context cannot be achieved, or at least cannot yield results, without developing first-class higher education institutions.

This is a key finding that justifies calling for more comprehensive reforms, a significant funding effort and a mix of national and EU initiatives. This is what the authors of this report do in the ambitious, yet practical, agenda they propose. The temptation, obviously, will be to pick and choose the easier-to- implement components within their list of proposals. This may certainly help, but it is worth recalling the significant complementarities between governance and funding pointed out in the report. In the same way, national and EU initiatives can and must be mutually reinforcing. There is thus a strong case for designing and implementing a comprehensive package, as proposed in the report.

*Jean Pisani-Ferry, Director, Bruegel
Brussels, June 2008*

Executive summary

European growth has been disappointing for the past 30 years, remaining persistently lower than in the United States. There is now much evidence that this situation is closely linked to the state of innovation and higher education in Europe.

This Bruegel Blueprint has three main goals:

- To analyse differences in higher education systems across Europe and the US;
- To identify the factors behind the differences in university performance across Europe;
- To suggest reforms in national and EU policies designed to improve the performance of European universities.

This Blueprint puts forward three findings and three recommendations.

The three findings are that:

- The level of student mobility in Europe is low and the Bologna process, designed to create a European Space of Higher Education, will result in quality convergence of undergraduate education more than in a substantial increase in mobility across countries;
- More generalist and flexible undergraduate curricula are better at 'matching' institutions with students and may thus contribute to reducing the failure rates at undergraduate level;
- The research performance of Europe's universities still lags far behind that of their US counterparts, particularly in the top 50 universities in the so-called 'Shanghai ranking', thus selection at entry should become the norm, specialisation and therefore mobility should be encouraged, and fees are easier to justify if supported by scholarships, income-contingent loans, and teaching assistantships.

We recommend that the performance of Europe's universities can and should be improved by:

- **Increasing the funding for universities:** it would make sense gradually to raise annual expenditure on higher education by one percent of European Union GDP over the next ten years;
- **Increasing university autonomy:** autonomy and funding are mutually reinforcing factors;
- **Increasing mobility and competition:** the EU level should foster mobility for students and faculty and promote the development of autonomous and competitive graduate schools.

1. Introduction

European growth has been disappointing for the past 30 years, remaining persistently lower than in the United States. There is now much evidence that this situation is closely linked to the state of innovation and higher education in Europe (see Sapir *et al.* 2004, and Aghion *et al.* 2007), which also triggered the launch of the EU's Lisbon agenda.

That higher education has become increasingly important for growth in Europe can be understood in light of recent work on appropriate institutions and economic growth (see Acemoglu, Aghion and Zilibotti, 2006). Productivity growth can be generated either by imitation or by frontier innovation, with innovation becoming increasingly important for growth as countries get closer to the world technology frontier. Imitation and frontier innovation each require different institutions and policies. Thus, while investment in primary and secondary education is more likely to make a difference for a country's ability to implement existing technologies, higher (particularly graduate) education investment has a bigger effect on a country's ability to make leading-edge innovations. Therefore, it is not only the total investment in education, but also its allocation between different levels of education, that impact on a country's growth depending on its stage of development. This intuition has been confirmed statistically in a study for 22 OECD countries over the period 1960-2000, which indicates that the impact of higher education on growth increases when countries approach the technological frontier (see Vandenbussche, Aghion and Meghir, 2007).

Thus, as Europe moves closer to the world technological frontier, it needs to rely increasingly on innovation as the main engine of growth, and therefore to invest more in higher education. Yet the investment gap in higher education between Europe and the United States is considerable. In 2005, the proportion of the total population with higher education amounted to 39 percent in the US compared to only 24 percent in the EU, although the gap is narrower for the younger population. This educational attainment gap is mirrored by a gap in expenditure, with the US devoting 3.3 percent of its GDP to higher education versus only 1.3 percent in the EU. The upshot

is a significant difference between European and American universities in terms of research performance.

This Bruegel Blueprint has three main goals. The first is to analyse differences in higher education systems across Europe and the Atlantic. The second is to identify the factors which explain differences in university performance across Europe. The final goal is to suggest reforms in national and EU policies designed to improve the performance of European universities¹.

Main findings and recommendations

The level of student mobility in Europe is and will remain low at the undergraduate level. The Bologna process, which aims to create a European Space of Higher Education, will result more in convergence of undergraduate education in terms of quality than in a substantial increase in mobility across countries.

In view of this low mobility, the different systems of access to higher education that currently co-exist across Europe will remain viable. The three systems are: (i) a *numerus clausus* at the national level; (ii) selection by the universities themselves; (iii) unrestricted access with subsequent selection, typically after the first year of studies. We discuss the pros and cons of all three procedures, linking the discussion to the issue of fees. Overall, we conclude that systems of free access with selection after the first year or of selection prior to entry are both functional as matching procedures. In either case, our preference is for moving towards more generalist and flexible undergraduate curricula whereby students can wait one or two years before they specialise. This in turn should contribute to reducing the failure rates at undergraduate level, as measured for example by the share of undergraduate students that become durably unemployed.

Our main finding is that, although Europe has recently made great progress in the production of graduate degrees, the research performance of its universities still lags far behind that of their American counterparts. This is particularly true when we restrict attention to the top 50 universities (in the Shanghai ranking). However, as we move from the top 50 to the top 500, we see European performance becoming increasingly comparable to the US. In other words, US universities dominate European universities in the top tier (top 50 and top 100) but Europe has many good

1. For other papers formulating suggestions about reforms of the higher education system, see, for instance, Lambert and Butler, 2006, or Mas-Colell, 2004a, 2004b.

universities in the second (top 200) and third tier (top 300 and beyond). It is also interesting to note that some countries do much better than others: the Nordic countries, Switzerland, Netherlands, Belgium, Ireland and the UK are doing relatively well, while southern and eastern Europe lag behind.

In contrast to the undergraduate level of education where mobility and student fees are not essential, and where free access at entry can work well if accompanied by suitable selection *ex post*, once we move to graduate education, then: (i) selection at entry should become the norm; (ii) specialisation and therefore mobility should be encouraged; (iii) the introduction of fees is easier to justify, supported by scholarships, income-contingent loans, and teaching assistantships.

How can one improve the performance of European universities?

- First, by increasing funding. Countries with better performing universities (in terms of the Shanghai ranking) devote a higher fraction of their GDP to higher education. Similarly, better performing universities have higher budgets per student. The EU25 spends on average €8,700 per student versus €36,500 in the US. And within Europe, Switzerland, Sweden, the Netherlands and the UK are countries with well-funded universities, whereas southern Europe has particularly large but poorly funded universities. To give a rough target – which would only close half the gap between the EU and the US – it would make sense gradually to raise annual expenditure on higher education by one percent of European GDP over the next ten years². Regardless of whether this increase is financed publicly or privately (through fees, private donations and the setting up of endowments), it should go hand-in-hand with fostering equality of opportunity in terms of university access.
- Second, by increasing university autonomy. Universities in high-performing countries typically enjoy some degree of autonomy, whether in hiring or in wage-setting. On the other hand, universities in southern Europe, for example, enjoy much less autonomy. In Aghion *et al.* (2007) we showed that the research performance of European universities, as measured by their Shanghai ranking, is positively correlated with their budget per student. We also found that the level of budgetary autonomy and research are positively correlated. Moreover, we found that autonomy and funding are mutually reinforcing factors: more funding has a bigger effect on performance in more autonomous universities. This finding mirrors results for the United States which show that the effect of additional spending

2. A similar target was already proposed by the European Commission (2006a).

on patenting is higher in states with more autonomous universities (see also Aghion *et al.* 2005). In this Blueprint, we stress that advocating autonomy is not tantamount to endorsing 'self-government'. In fact, we argue that significant external influence in university boards, as is the case in successful countries like the Nordics, Ireland, the UK and especially the Netherlands, is desirable.

- Third, by increasing mobility and competition. This will ensure that increasing money and autonomy will come with better accountability. Here, the European Union can help, by fostering mobility for students and faculty. In order to 'connect Lisbon to Bologna', the Union could also strengthen support for starting researchers, by promoting the development of autonomous and competitive graduate schools, which are an essential part of the US success in research-oriented higher education.

Our findings and recommendations are detailed in the remainder of this Blueprint.

2. A European space of higher education

2.1 Introduction

The European higher education landscape is currently undergoing important changes that result from the so-called Bologna process and related efforts to create a European Space of Higher Education (ESHE), where academic degrees and quality standards would be more comparable and compatible throughout Europe. The process started with the Sorbonne Declaration signed by the education ministers of France, Germany, Italy and the United Kingdom in 1998³, although it had roots in the Erasmus Programme introduced a decade earlier by the European Commission to foster student and faculty mobility⁴.

By breaking down some of the barriers to mobility across institutions in different countries, the Bologna process holds the promise of being a decisive step towards a new dynamic in Europe. A dynamic that propels higher education by bottom-up forces of imitation and innovation, rather than by top-down initiatives that impose uniformity.

The Bologna process structures higher education in three cycles: Bachelor, Master and Doctorate (or PhD). The Bachelor degree is obtained at the end of the undergraduate level, whereas the Master and the Doctorate require graduate level studies.

The Bologna process has mostly focused on undergraduate education. It has devoted a lot of effort to defining education and evaluation standards for the Bachelor. By

3. The complete text of the Sorbonne Declaration can be found on the website of the Berlin Summit in 2003: http://www.bologna-berlin2003.de/pdf/Sorbonne_declaration.pdf.

4. See European Commission, Eurydice, 2007 and 2007b, or the European Commission website http://ec.europa.eu/education/policies/educ/higher/higher_en.html for background and a description of its current state of development. Also, Haug, 2006.

contrast, the attention devoted to graduate education in general, and to Doctoral studies in particular, has been much more limited. This is problematic because graduate education is precisely where Bologna meets Lisbon, where education meets research and innovation. Weakness in this link can be a serious handicap for the European knowledge economy.

Considerations of practicality account for Bologna's (partial) neglect of graduate education. But there are deeper reasons as well, which reflect an implicit fundamental distinction between the undergraduate and graduate levels of higher education.

We will argue that this distinction is in fact desirable, as it delineates a good compromise between prudence and innovation in European higher education policy, thus providing an opportunity for the development of a pragmatic policy approach that may command sufficient social and political support on the part of the citizens of Europe to become a reality.

In our view, the regulation of the undergraduate level should pay special attention to accessibility, to levelling the playing field and to fairness issues. The main emphasis should be on maintaining and deepening one of the distinctive positive features of European higher education: the fact that it produces Bachelor degrees with an average quality which appears to be reasonable (even if this statement should be qualified by the lack of good data on the subject). Europe should aspire to improve this average level further, to reduce the gap in standards and to guarantee sensible minimum performance levels.

By contrast, at the graduate level (Master and PhD) higher education institutions should be less regulated and freer to formulate their own conditions of access and curricula. It is at this level that the ESHE may develop most vigorously, that mobility may have most of its impact in fostering competition and that, if the process is aided by good policies, the peaks of European higher education, and research, may emerge.

This paper, therefore, mostly focuses on graduate education, since this is the area that has received least attention from Bologna and to which Europe needs to devote more effort for the sake of innovation and competitiveness.

We begin, however, by examining the landscape of European undergraduate education.

2.2 The Undergraduate Level

This section is organised in four parts: we first consider the students who arrive at the doors of universities (the ‘demand side’ of degrees), next we examine the universities (the ‘suppliers’ of degrees), we then proceed to match students and institutions (the ‘matching’ mechanisms), and conclude with some considerations about the undergraduate curricula.

2.2.1 Students: from compulsory education to the threshold of higher education

Everywhere in Europe, the minimum requirement for accessing undergraduate education is an upper secondary qualification. It is important, therefore, to start by examining the percentage of the population that has successfully completed an upper secondary education.

Figure 1 shows that the share of the European population eligible for undergraduate education has risen in most countries and is now around 80 percent, which is still a little less than in the United States, although the gap is closing. Nonetheless, there are differences across individual countries.

As for the proportion of the total population that has successfully completed higher education in Europe, the figure is only 24 percent, compared to 39 percent in the United States⁵. However, we can see in Figure 2 that the gap is narrowing as the trend in Europe has also been towards an increase here. For the population aged 25-34 in 2005, the proportion of those with a higher education qualification reached 30 percent on average in Europe and 40 percent in the United States.

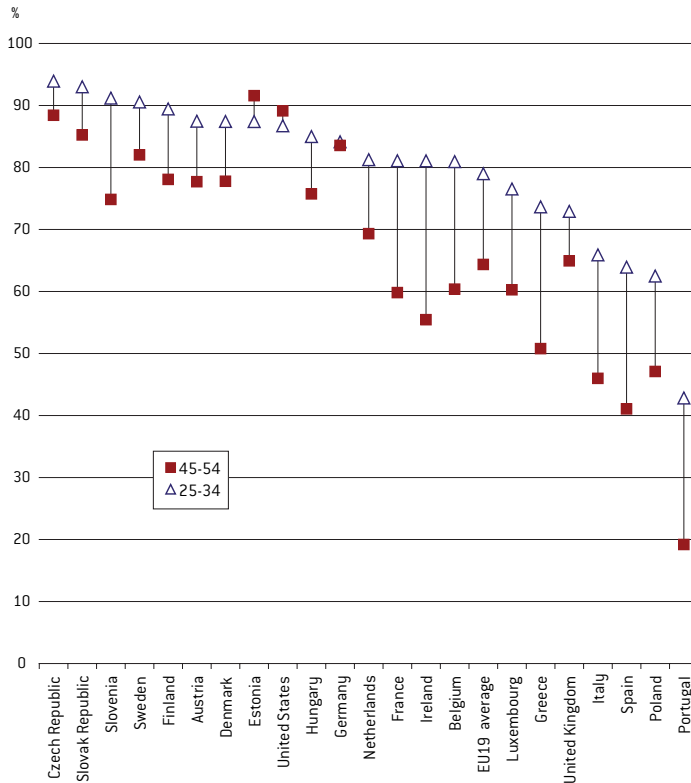
Europe should probably contemplate and promote an increase in the percentage of young people of a given age that attain a university, or other higher, degree. It should evolve, in this respect, in the same direction as the US. An objective of at least 40 percent is reasonable. This development should be gradual, but not too slow.

Increasing the share of the population with higher education is important both on efficiency and equity grounds. The high-productivity knowledge economy requires higher education. Equity considerations point in the same direction. The right to access higher education should be viewed as a basic right of what constitutes European civilisation. To guarantee that no one with the will is left out of higher

5. Source: OECD, Education at a Glance, 2007.

education should be a central object of policy⁶.

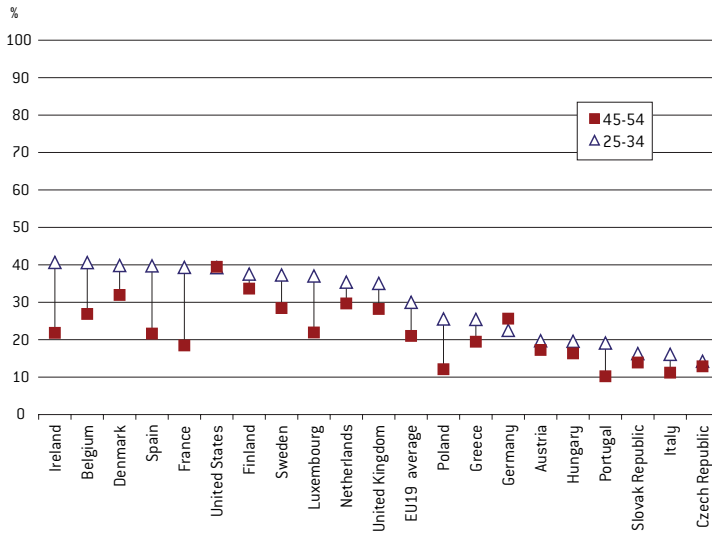
Figure 1: population that has attained at least upper secondary education (2005), percentage, by age group



Source: OECD

6. See Usher and Cervenán, 2005, for an international survey on the accessibility issue.

Figure 2: population that has attained at least tertiary education (2005), percentage, by age group



Source: OECD

2.2.2 Higher education institutions

With around 4,000 institutions involved, the reality of higher education in Europe is necessarily diverse. In particular, the boundary between universities and other higher institutions varies significantly across countries.

There is horizontal and vertical differentiation across institutions. Horizontal differentiation covers differences in characteristics such as location or curriculum. Vertical differentiation essentially means differences in ‘quality’, which in turn reflects a mix of many components, such as quality of the faculty, quality of the students, quality of research and richness of interaction with the environment.

An important question is whether the degree of differentiation, especially vertical, is optimal, in some appropriate sense. This is, obviously, a very complex issue, which goes beyond the scope of this Blueprint. Suffice it say that, in practice, the degree of differentiation is neither fully exogenously determined by public authorities nor fully endogenously driven by market forces. One aspect that is bound to be relevant is the procedure for matching demand and supply, namely students and institutions, to which we now turn.

2.2.3 The matching of students to institutions

Fiscal jurisdictions and the geographical perimeter of mobility

Institutions of higher education in Europe are driven by public funding. Yet there is not one single fiscal jurisdiction. Each state (or, in some cases, sub-state entities) funds its own higher education system.

Within the EU, states may not exclude students from other fiscal jurisdictions. And, indeed, there is some, albeit modest, degree of mobility of students across EU countries (see Figure 3), which goes some way towards preventing the European Space of Higher Education from being simply a juxtaposition of isolated national (or sub-national) systems.

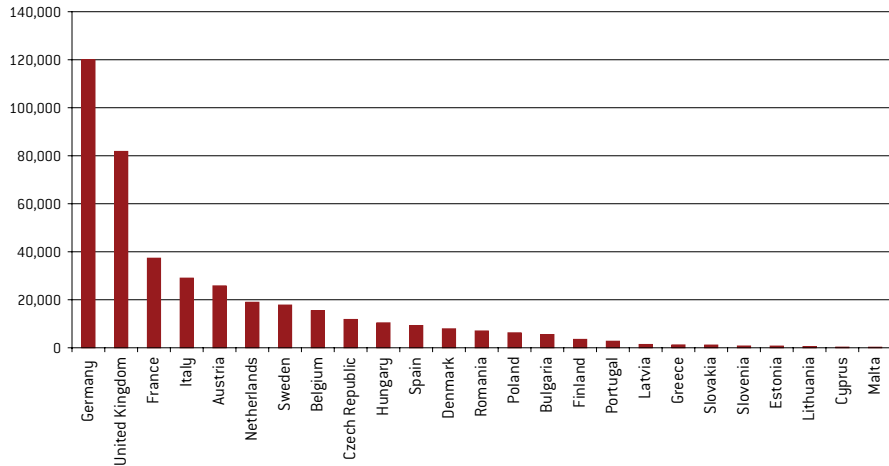
In theory, the lack of concordance between the fiscal jurisdiction (typically the nation state, at times the regions) and the space of permissible mobility of students (the European Union) risks generating problems of the free riding or fiscal competition-type. So far, however, these problems have been small at the undergraduate level because, especially if we exclude short-term, Erasmus-like exchanges, mobility at this level remains very limited in Europe⁷.

In fact, the low level of mobility at undergraduate level should not be viewed as an anomaly. Even in the United States, mobility of undergraduate students is relatively low.

Limited mobility is likely to persist even after the Bologna process is fully implemented. For one thing, countrywide specialisation in undergraduate curricula is not likely to emerge, since there is no prospect of increasing returns to encourage it. On the other hand, Bologna could in principle result in an increase in student mobility across countries if it induces an increase in qualitative differences. However, a more likely scenario is that the creation of the ESHE will result in convergence of the quality of undergraduate education among countries. In a more transparent landscape, where good practice and performance become more visible, public opinion is more likely to demand better public policy.

7. There have been highly-publicised specific exceptions linked to the limitation of access to some degrees (eg in medicine and related fields) in some countries (namely, France and Germany), with students then flocking to countries without such limitation (namely, Belgium and Austria). For an analysis of this issue, see Gérard (2007).

Figure 3: European students that study a tertiary programme in a European country other than their home country



Source: Eurostat 2005

Selection procedures

In most European countries, selection procedures are used to limit the number of admissions to higher education, or to assure institutions that candidates have the qualifications they deem necessary.

Three kinds of selection procedure prevail⁸:

- A *numerus clausus* set at the national level. Here the government limits the number of places available and exercises direct control over the selection procedure, which is usually anonymous. This *numerus clausus* typically applies to all degrees.
- Selection by the institutions themselves. This is the opposite of the previous system. There is no central procedure. Institutions are free to set their own limit on the number of places available and to apply their own procedures for selecting students. However, there may be centrally determined criteria for setting limits in the case of some categories of student.
- Access is totally unrestricted, except for certain degrees (such as medicine or engineering). The general rule is that institutions accept all applicants with an

8. For background see European Commission (2007), Key Data on Education in Europe 2007.

upper secondary qualification. However, a *numerus clausus* may be set at the national level or institutions may set their own limits in a small number of specific fields.

We asked European universities in the 2006 Top 500 Shanghai ranking to respond to a questionnaire which included items on student selection at the Bachelor and Master levels⁹. Table 1 provides country averages for selection procedures at these levels. It indicates a great deal of heterogeneity between countries at the Bachelor level:

- Access is generally unrestricted in Belgium, Italy and the Netherlands as well as in Switzerland.
- A system of centralised selection prevails in Denmark, Ireland, Spain and Sweden.
- Decentralised selection applies in Germany and the United Kingdom.

By contrast there is much less heterogeneity at the Master level: almost all countries have selection procedures, with the selection being decentralised at the level of individual institutions.

Table 1: Selection of students by the universities in the sample (averages)

Country	Bachelor level		Master level	
	Selection (1=yes, 0=no)	Centralised System (1=yes, 0=no)	Selection (1=yes, 0=no)	Centralised System (1=yes, 0=no)
Belgium	0.1	0.2	0.1	0
Denmark	0.6	0.8	1	0
Germany	0.7	0.2	1	0
Ireland	1	1	1	0
Italy	0.2	0.2	0.8	0
Netherlands	0.3	0.8	1	0
Spain	1	0.8	0.7	0
Sweden	1	0.6	1	0.4
Switzerland	0.4	0.2	0.4	0
UK	1	0.1	0.9	0
Total	0.7	0.4	0.8	0.1

9. For details on our survey, see section IV.

Evaluating selection procedures

Selection procedures can be evaluated from several perspectives. Broadly speaking they can be grouped according to two overarching criteria: equity vis-à-vis students, and efficiency from the standpoint of society¹⁰.

The free access model is good from the standpoint of the equity criterion, since it gives every student an opportunity to prove him/herself. However, it is quite unattractive from the standpoint of efficiency. Therefore most countries implement a variant of the model which could be called 'free access with selection in the first year'. Here the obligation for the institution to accommodate all students is only valid for a limited period. Conditional on performance, enrolment may continue or not.

The free access model with selection in the first year has clear advantages and disadvantages. On the one hand, it provides maximum opportunity to students and, assuming the model works properly, a powerful screening process. On the other hand, it is costly: the resources devoted to an entire year of screening, although even non-selected students presumably accumulate some human capital. In the end, it is up to the policy authorities, and to society in general, to ascribe relative weights to these costs and benefits and to reach a conclusion about the advisability of this model.

At any rate, if the selection year is the policy adopted then it is most desirable that this be stated clearly and in a formalised way rather than operating it in a *de facto* manner and perhaps even denying that it is the practice. Clarity in this matter is very important so that the prospective student may formulate reasonable expectations.

The other two procedures, with selection prior to entry and executed either centrally or by the institutions themselves, contrast with the previous model. Leaving aside the matter of fees, it seems evident that selection is not as satisfactory from the equity point of view as free access because, at best, it makes fairness a collateral product of competition. Certainly, competition may push institutions to bid for the more talented students, but then it may not. Various forms of distortion may frustrate the proper working of this system (eg favouritism).

From the point of view of providing quality-enhancing signals and incentives the

10. For an account of extensive literature on these matters see Roth and Sotomayor (1992), Roth (2002), Abdulkadiroglu-Sönmez (2003).

systems with selection prior to entry are more attractive than free access, at least if one condition is satisfied: funding, from whatever source, must be available for all selected students. If so, the system may work well, not only in terms of both equity and efficiency. However, concern for equity, in particular avoidance of the type of distortion alluded to in the previous paragraph, would tend to favour the centralised, anonymous, selection procedure over the decentralised option.

The last point makes it clear that the issue of selection procedures cannot be separated from the issue of fees (and loans) as far as both equity and efficiency are concerned.

Our survey indicates that student fees vary a great deal across countries, although in one case there are also differences across universities within a given country. Among the countries in our sample, three situations prevail:

- There are no fees in the Nordic countries (Denmark and Sweden). There are also no fees in many German universities, although quite a few have fees of €1,000.
- Fees are high in the Anglo-Saxon countries (Ireland and the United Kingdom): around €4,000.
- In the other countries, average fees range between around €750 (Belgium, Spain and Switzerland) and around €1,800 (Netherlands), with Italy in the middle of the range.

This suggests that countries which select prior to entry fall into three categories:

- Selection and no fees: the selection in those countries is usually centralised (Denmark and Sweden), although it is decentralised in German universities.
- Selection and high fees: two different models prevail among those countries: centralised selection in Ireland, but decentralised selection in the United Kingdom.
- Selection and moderate fees: two models prevail here as well: centralised selection in Spain and decentralised selection in German universities.

In other words there is double selection in Anglo-Saxon countries: academic and financial selection¹¹. By contrast, there is only academic selection in the Nordic countries.

On the other hand, in countries where there is no selection prior to entry (but with a

11. Obviously the severity of financial selection depends on the availability and level of student aid.

selection year policy), fees tend to be neither very low (zero) nor very high. This is the situation that prevails in Belgium, Italy, the Netherlands and Switzerland. These countries, therefore, practice only moderate selection, both academically and financially.

Summing up

Undergraduate education currently entails little mobility between European countries. In all likelihood this will continue to be the case in spite of the Bologna process. Geographical proximity to home will remain a consideration of paramount significance for most students having to choose a higher education institution at undergraduate level. It seems reasonable to conclude, therefore, that systems of free access with selection in the first year or of selection prior to entry can both work satisfactorily as matching procedures, even if implemented in national (or sub-national) fiscal jurisdictions.

2.2.4 The undergraduate curricula and evaluation: towards a more generalist and flexible approach

This is, of course, a central topic but we will deal with it only briefly as the pedagogical issues are well covered by the ongoing Bologna process.

There is a point worth making here, because it relates at least partly to graduate studies, which are our main focus. Ideally, undergraduate curricula in Europe should become more generalist and more flexible. The obligation to commit to a future degree in a particular field while still a teenager is not the best feature of current European higher education systems. It is bound to be a source of inefficiency and a major cause of academic failure. Indeed, we believe that the undergraduate level would fulfil its matching mission better if students had the possibility to delay specialisation until after the first or second year. For example, only 30 percent of undergraduate students in the US end up specialising in the field which they initially chose upon entering the college or university. Shifting the timing of specialisation from undergraduate to graduate studies is on the agenda of the Bologna process. It will not be easy to implement, but it would be unfortunate if nothing came of it.

2.3 The graduate level

An important yardstick for the success of the Bologna process is its capacity to steer the development of a Europe-wide area of mobility driven by competition, innovation

and imitation among institutions. As we have argued in the previous section, the extent of this phenomenon is likely to be limited at the undergraduate level, but that this is not in itself alarming. Yet it would be a very significant failure if it did not materialise at the graduate level.

The central role of the second level of higher education, the Master level, is a major trait of the Bologna process. It has some parallels in the US system of professional schools (law, medicine, business, etc.), but no exact analogue that is as comprehensive. It thus provides an opportunity to develop something characteristically European. It seems clear that the typology of Masters will span a wide range with, at one end of the spectrum, strictly professional, practice-oriented degrees, perhaps offered in association with enterprises and, at the other end, research-oriented degrees which open the way to a PhD. But the field is evolving and many intermediate cases will emerge. It is still too early for a final model to have crystallised. This is a domain where a bottom-up approach is the appropriate strategy: experimentation and institutional risk-taking are fully justified and should be encouraged.

The student access policies discussed for the Bachelor level should now be qualified in two ways for the Master level.

First, Master degrees typically represent a commitment of student time of one or two academic years¹². It would not make much sense to devote a substantial fraction of this time to selection. Therefore the matching system which leaves the selection of admitted students to the institutions themselves will now come into its own. Since we are contemplating the emergence of fierce competition, this should not have a negative impact on efficiency, rather the contrary. It should be added, however, that the matching task would be much aided by the development of Europe-wide standardised voluntary tests.

Second, while the principle of the right of access should be strictly maintained and actively promoted, the argument in favour of fees embodying a substantial subsidy is now somewhat weaker. A policy of scholarships and of income-contingent loans may suffice for guaranteeing the equity objectives. The specific policy may, of course, depend on the nature of the Master. A research Master leading to a Doctoral degree should not be treated in the same way as a professional Master commanding a more immediate market return. For example, the University of California at

12. Both lengths are currently present, even within the same country, and the expectation is that they will continue to coexist.

Berkeley, one of the elite American public universities, charges fees for professional Masters (for the academic year 2007-08) ranging from \$13,861 for Public Health or Public Policy to \$27,000 for Law or Business (these are residents' fees, for non-residents the amount increases by a factor of 1.5 to 2). For research Masters the equivalent fee is \$9,577.

This point can only be reinforced by observing that, if successful, the Master studies should attract students from outside Europe, some talented and with limited means (and therefore arguably deserving of scholarship help), some less so. It is not self-evident that the cost of their education should be sustained by European taxpayers. At any rate, as for the undergraduate level, different countries may have different policies. It is clear, however, that in a context of increased mobility, conceivable at the Master level, the harmonisation issue will come more to the fore.

For the third cycle, Doctoral studies, the principle of selection by the institution is already well established, and there is no reason to modify it. Note also that PhD training, to be effective, should be based on fellowships, or teaching assistantships. There is no significant room for fees or for loans here.

In contrast with undergraduate education, specialisation, and therefore student mobility, should be encouraged at the graduate level. Offering focused Master degrees of high quality and capable of attracting students beyond the immediate catchment area may be a successful strategy in the new context.

Competition will, undoubtedly, also induce vertical differentiation in graduate studies. This is as it should be. The optimal degree of vertical differentiation is probably higher at this level than for undergraduate studies. Europe needs elite institutions providing excellent training for excellent graduate students. A programme designed to ensure that every university be excellent at the graduate level would be, in economic terms, a non-starter. Any attempt to implement such a programme would be tantamount to preventing the emergence of excellence.

The mission of graduate studies is to create a link between education, research and innovation. The more advanced professional Masters provide high-skilled human resources to technology-based enterprises, while research Masters and Doctorates provide the resources needed by universities and (public and private) research centres.

Graduate education, and particularly but not only the Doctoral (and pre-Doctoral

research Master) level is where the European Space of Higher Education and the European Research Area – ie Bologna and Lisbon – meet. We believe that the time has come to make the development of graduate studies a central focus for policy in Europe. Much as we think that competition will help, it will not be sufficient¹³.

To be sure, Europe has recently made great progress in the production of graduate degrees, including at the Doctoral level. For instance, a recent report by the US National Science Foundation indicates that in 2003 EU15 produced more science and engineering Doctorates than the United States, both in absolute and in relative terms (compared to total population)¹⁴. Although this partly reflects stagnation in the United States, it also results from a significant increase on this side of the Atlantic. This situation is by no means limited to science and engineering. Thus in 2005, EU27 produced 96,000 Doctorates (20 per 100,000 inhabitants) in all fields against 53,000 (18 per 100,000 inhabitants) in the United States¹⁵.

However, as we will show in the next section, European universities still lag far behind their American counterparts in terms of research excellence.

What are the policies needed to foster graduate studies in Europe? One is money. There is a very basic fact which is often not fully appreciated in Europe: quality graduate education is very costly. Hence a sizeable increase in resources will need to be mobilised at this level. But money alone is not enough. The promotion of graduate studies also requires organisational changes¹⁶.

Universities should not aspire to organisational homogeneity across different tasks. The needs of undergraduate education, graduate training, research, technology transfer, impact on local development etc. are simply not comparable. The appropriate development of all its functions requires decentralisation and institutional creativity. In this respect, we believe there is a type of institution which may be particularly suitable and valuable in the development of the ESHE and which universities could usefully promote: graduate schools. We view these schools as satisfying a

13. The European Commission has taken an active position in this matter, see for example European Commission, 2003. See also Van der Ploeg and Veugelaers, 2007.

14. In 2003, the number of science and engineering Doctorates produced by EU15 was 42,000 compared to 27,000 for the United States. The respective populations aged 18-23 were 28 and 24 million. See National Science Foundation, *Asia's Rising Science and Technology Strength, Comparative Indicators for Asia, the European Union, and the United States*, Washington, D.C, May 2007.

15. The data for the EU are from Eurostat. Those for the US from the National Center for Education Statistics (NCES).

16. General introductions to Doctoral education in Europe are included in European University Association, 2007, or Sadlak, 2004. See also LERU, 2007a, 2007b.

clear need and, without attempting to postulate a norm, as requiring (at least many of them) the following characteristics:

(i) They should be institutionally strong and their leaders should be free to act on their own initiative and react to competition, that is, they should be reasonably autonomous and display good governance.

(ii) While they may or may not have their own legal status, graduate schools should have a budget. In some cases it may be for hiring permanent faculty. However this is unlikely to be the most frequent scenario since typically graduate schools would borrow their core faculty from their host universities. The strength of graduate schools will, therefore, crucially depend on the strength of their host institutions.

(iii) More frequently, the budget of graduate schools would be used for financing temporary faculty appointments (including post-Docs) and, most important of all, for student fellowships and scholarships.

(iv) We believe that it is intellectually indispensable that they should have volume and critical mass. This has, at least, two implications:

- The defining theme should not be too narrow, and certainly not sub-disciplinary.
- Graduate schools may constitute a primary basis for collaboration between (nearby) universities. Experience of this type already exists (for example, economics in Holland or Belgium, or physics in Scotland).

We confess that graduate schools is an idea that comes from the US. Indeed, they are the jewels in the crown of US research-oriented universities. Europeans should not be self-conscious about this instance of 'imitation'. By developing graduate schools we would only be bringing back home a European institution. It is well known that the American Graduate School is nothing but the model of the Humboldtian university, imported to the US by American scholars training in Germany at the end of the nineteenth century, and then grafted and superimposed onto the liberal arts education campuses of the traditional American universities¹⁷ (the first example was Johns Hopkins University, founded in 1876). The global, and very positive, phenomenon of

17. Explained by Matthias Doepke in the conference 'New Generation-New Approach, Germany and US in an Age of Global History'. For other background references, see Nybom, 2003, or W.Clark, 2006.

the generalisation of university education witnessed over the last 40 years gave an abrupt shock to the Humboldtian model in Europe, the reverberations of which are driving the current need for reform. But it was not a major disturbance in the US: the brunt of the generalisation of university education was absorbed, very well, by its liberal arts component. Europe now has an opportunity to bring Humboldt back, and the formula to do so may be the graduate schools.

3. The research performance of European universities

Europe is faced with a challenge in the research field. The Lisbon agenda formulates a programme for the development of a high-productivity ['knowledge-based'] economy which is second-to-none, that is, an economy at the productivity frontier (see Sapir *et al.* 2004). It follows from this approach that Europe requires a research system which is cutting-edge and second-to-none. Europe has a good research system but it does not lead the world. It is a solid second (see Pavitt, 2001, Dosi, Llerena, Sylos-Labini, 2006, Bauwens, Mion and Thisse, 2007). In a sense the Lisbon objective of achieving an economy which is second-to-none applies also to research itself.

Universities constitute a main locus for research activities, especially for the more curiosity-driven, basic aspects. In fact, it can be argued (as some of us have, see Aghion, Dewatripont, Stein, 2006) that the organisational model of a university, with the high degree of freedom it gives to professors and other teaching staff, provides an optimal environment for the development of basic, frontier research. Be that as it may, 22 percent of European research activity takes place at universities¹⁸.

When discussing the role of universities in research there is a tension which is difficult to confront but which should not be ignored. Insisting that all universities, without exception, should have research as a goal helps, no doubt, in maintaining the average quality of universities (and of the teaching they provide). Yet the ambition that all may achieve a similar - presumably high - level of research performance is unrealistic if 'high' means 'very high'. In the US there are 7,018 universities of which only 1,640 offer Master programmes and 614 Doctoral programmes¹⁹. The cultural

18. Research and development expenditure by sector, Eurostat: http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,39140985&_dad=portal&_schema=PORTAL&screen=detailref&language=en&product=Yearlies_new_science_technology&root=Yearlies_new_science_technology/I/11/eca10000.

19. Source: US National Center for Education Statistics.

diversity of Europe should ensure a more dispersed map of excellence, but there is no denying that the high peaks cannot make up a significant proportion of the whole. And Europe needs these peaks.

The recognition of this fact has been stirred greatly by the publication, since 2003, of the so-called 'Shanghai ranking/index' (more precisely, the 'Shanghai Jiao Tong University Academic Ranking of World Universities'), which measures university research performance across the world. Indeed, this ranking tends to reinforce the evidence that the US is well ahead of Europe in terms of cutting-edge university research.

Constructed by a group of Chinese scholars, the Shanghai index is a weighted average of six different indicators of research performance (see Box 1). While the weightings are admittedly somewhat arbitrary and accord too little importance to social sciences and humanities, the main advantage of the index is its reliance on publicly available information. In any case, this ranking is now receiving worldwide attention. Its only rival is the ranking computed annually, since 2004, by the Times Higher Education Supplement (THES), which follows a somewhat different methodology (relying to a significant extent on opinions from experts they have selected).

BOX 1: THE SHANGHAI INDEX

This index aggregates six different indicators:

- The number of alumni from the university winning Nobel Prizes in physics, chemistry, medicine, and economics and Fields Medals in mathematics (this makes up 10 percent of the overall index).
- The number of university faculty winning Nobel Prizes in physics, chemistry, medicine, and economics and Fields Medals in mathematics (20 percent of the overall index).
- The number of articles (co)authored by university faculty published in Nature and Science (20 percent of the overall index).
- The number of articles (co)authored by university faculty published in Science Citation Index Expanded and Social Sciences Citation Index (20 percent of the overall index).
- The number of highly cited researchers from the university in 21 broad subject categories (20 percent of the overall index).
- The academic performance with respect to the size of the university (10 percent of the index).

Note that the Shanghai index tends to undervalue countries where a great deal of academic scientific research takes place outside universities (the Max Planck Institutes in Germany) or in organisations whose researchers are affiliated to several universities (the CNRS laboratories in France). This partly explains the poor performance of France and Germany in Table 2.

In our Policy Brief (Aghion *et al.* 2007), we discuss the research performance of EU countries and its determinants. Table 2 (overleaf) presents a detailed account of relative country performance, looking successively at the Top 50, Top 100, Top 200 and Top 500 universities in the Shanghai ranking. To understand how to read this table, consider first the column 'Top 50'. The best university in the Top 50 is given a score of 50, the next best university is given the score 49, and so on down to a score of 1 for the lowest performing university within the Top 50. For each country (or region), we then compute the sum of Top 50 Shanghai rankings that belong to this country, and divide the sum by the country's population. Finally, all the country scores are divided by the US score, so that each entry in the column 'Top 50' can be interpreted as a fraction of the US per capita performance for the Top 50 universities. This gives our country performance index for the Top 50 universities. The same logic applies to the 'Top 100', 'Top 200' and 'Top 500' columns, where the best university receives a score of, respectively, 100, 200 and 500, and the lowest placed always receives a score of 1. There are, obviously, fewer zero entries in a column as one moves from the Top 50 to the Top 500.

Table 2: Country performance in the Shanghai ranking (measured as percentages of the US per capita performance)

Country	Population (millions)	Top 50	Top 100	Top 200	Top 500
Austria	8.2	0.0	0.0	0.4	52.6
Belgium	10.4	0.0	0.0	61.3	122.4
Czech Republic	10.2	0.0	0.0	0.0	13.1
Denmark	5.4	0.0	74.6	113.5	160.5
Finland	5.2	0.0	45.5	75.4	80.5
France	60.2	3.0	15.2	28.6	45.1
Germany	82.5	0.0	17.0	36.5	67.0
Greece	11.1	0.0	0.0	0.0	12.2
Hungary	10.1	0.0	0.0	0.0	13.3
Ireland	4.0	0.0	0.0	0.0	50.0
Italy	57.6	0.0	0.0	11.1	33.9
Netherlands	16.3	20.2	50.7	75.9	131.3
Poland	38.2	0.0	0.0	0.0	3.5
Spain	42.7	0.0	0.0	0.1	14.2
Sweden	9.0	6.7	116.5	178.8	216.9
UK	59.8	72.0	86.1	98.0	123.9
EU15	383.3	12.7	26.0	41.0	67.3
EU25	486.6	10.0	20.5	32.4	53.9
Norway	4.6	0.0	65.8	90.6	107.0
Switzerland	7.4	97.1	165.5	228.1	229.6
Australia	20.1	0.0	31.4	65.8	100.7
Canada	31.9	39.3	54.2	62.9	103.6
Japan	127.7	14.3	17.2	24.3	26.7
US	293.7	100.0	100.0	100.0	100.0
California	36.1	234.2	198.5	163.2	103.2
Massachusetts	6.4	448.7	307.8	301.7	263.0
New York	19.3	195.7	167.4	138.7	147.7
Pennsylvania	12.4	110.7	176.9	161.0	115.2
Texas	22.9	32.7	60.9	82.8	102.5

Again as discussed in our Policy Brief, Table 2 reveals several interesting findings:

- **First**, the United States completely dominates all European countries in the Top 50 universities. Only Switzerland and the United Kingdom rival the US on a per capita basis. By contrast, the EU15 and EU25, with a greater population than the US, score much lower.
- **Second**, the top 4 US states (Massachusetts, California, New York and Pennsylvania) score better than any European state in the Top 50 and Top 100.
- **Third**, country performance converges as one enlarges the number of universities considered. In particular, the gap between the EU15 or the EU25 and the US narrows as one moves from the Top 50 to the Top 500. In part this is due to the way the scores are constructed, but it mostly reflects a reality: American universities dominate European universities in the top tier (the Top 50 and Top 100), but Europe has many good universities in the second (the next 100) and the third (the next 300) tiers.
- **Fourth**, there are major differences among European countries: Switzerland, the UK and Sweden do particularly well, even in the Top 100, where they out-perform (Switzerland and Sweden) or almost match (the UK) the United States on a per capita basis. Denmark, Finland, Belgium and the Netherlands also perform well in the Top 200 and Top 500. By contrast, southern and eastern Europe lag far behind. France and Germany do relatively poorly, except in the third tier, ie the universities ranked between 301 and 500.

These findings mean that: (i) Europe should improve at the top, given that so much of the benefits of research come from 'the frontier'; (ii) various countries should moreover improve their overall performance.

How? This question prompted us to look, in our Policy Brief, at the determinants of research performance, in terms of funding and governance. We turn now to these two topics, which of course also influence the other missions of universities.

4. The funding of European universities

To explain the performance of European universities, an obvious starting point for economists is to look at money. Table 3 presents aggregate data on the levels of private and public expenditure on higher education across countries.

Table 3: Public and private expenditure on higher education in 2001

Country	In thousands of € per student			As a percent of GDP		
	Public	Private	Total	Public	Private	Total
Austria	11.0	0.5	11.5	1.4	0.1	1.5
Belgium	10.6	1.6	12.2	1.4	0.2	1.6
Czech Republic	2.3	0.4	2.7	0.8	0.1	0.9
Denmark	25.6	0.4	26.0	2.7	0.0	2.7
Finland	10.3	0.3	10.6	2.1	0.1	2.2
France	7.5	1.2	8.7	1.0	0.2	1.2
Germany	11.5	0.9	12.4	1.1	0.1	1.2
Greece	3.3	0.0	3.3	1.2	0.0	1.2
Hungary	2.6	0.6	3.2	1.1	0.3	1.4
Ireland	9.7	1.6	11.3	1.2	0.2	1.4
Italy	5.6	1.4	7.0	0.8	0.2	1.0
Netherlands	13.0	2.7	15.7	1.3	0.3	1.6
Poland	1.7	.*	.*	1.1	.*	.*
Spain	4.0	1.2	5.2	1.0	0.3	1.3
Sweden	18.9	1.8	20.7	2.1	0.2	2.3
UK	8.4	3.1	11.5	0.8	0.3	1.1
EU25	7.3	1.4	8.7	1.1	0.2	1.3
US	16.6	19.9	36.5	1.5	1.8	3.3
Japan	6.5	7.3	13.8	0.5	0.6	1.1

Source: DG Research; *, not available. Note: not PPP-converted.

The main findings are that:

- Richer countries spend relatively more on higher education than poorer countries.
- The US spends a lot more on higher education than any European country, especially thanks to private funding. But public spending alone is relatively higher than in the EU.
- The Nordic countries also spend a considerable amount, with most of the money coming from public sources.
- The UK spends surprisingly little.

While there has been much talk in recent years about the ‘research spending deficit’ of Europe relative to the US, which concerns in fact private research spending (see Sapir *et al.* 2004, for example), we should in fact speak of the ‘double deficit’, since there is also a deficit in terms of higher education funding (and, in terms of GDP per capita, it again stems mainly from a difference in levels of private funding, though there is a very substantial difference in public funding, too, in terms of € per student).

Beyond this, the situation within Europe varies significantly. And there is the intriguing case of the UK, which does very well in the Shanghai ranking, thanks to its top performers, while its aggregate funding is relatively modest.

This brings us to the observation that these aggregate data do not indicate how the money is split between higher education institutions, in particular between research-oriented and teaching-oriented universities. In the remainder of this section we therefore present the results of our survey questionnaire which elicits information on individual budgets and on the governance of top research performers.

This survey questionnaire was sent to the European universities in the 2006 Top 500 Shanghai ranking²⁰. We received 71 responses, an overall response rate of 36 percent, which can be considered very satisfactory. We decided to focus on the ten countries for which the response rate was at least 25 percent and the number of respondents at least two²¹. This left us with a total sample of 66 universities, with an average response rate of 41 percent for the ten countries considered. We were able to

20. The 2006 Shanghai ranking includes roughly 200 European universities belonging to EU25 and Switzerland.

21. The ten countries are: Belgium (4 responses out of 7 universities in the Shanghai 500 ranking), Denmark (2 out of 5), Germany (11 out of 40), Ireland (2 out of 3), Italy (9 out of 23), Netherlands (4 out of 12), Spain (6 out of 9), Sweden (5 out of 11), Switzerland (6 out of 8) and the UK (17 out of 43). We omitted France because only 4 out of 21 universities responded and, moreover, university budgetary data are not comparable with those of other countries.

check that, for each country, respondent universities have an average Shanghai 500 rank fairly close to that of the whole population of universities from that country, so that we could be satisfied of the representativity of our sample²².

Table 4 provides country averages on the size and financing (per student) of top European universities²³. It confirms the high degree of heterogeneity between countries for the universities in the Top 500:

- Southern European countries (Italy and Spain) have very large (more than 40,000 students on average) but not well-funded universities.
- Sweden and the Netherlands have universities of average size (mostly of the order of 20-25,000 students), and are better funded.
- Several other countries have universities of similar size but with lower levels of funding: Belgium, Denmark, Germany or Ireland.
- UK and Switzerland have small (10-15,000 students) and very well funded universities.

One striking observation is thus that, referring to the data on aggregate expenditure in Table 3, the UK significantly favours top research performers, since the universities in our sample (which belong to the group of top universities) have a budget per student which is about double the average for all universities in the country.

Beyond this, Table 4 clearly shows that in many countries, these universities, which are the top European research performers, have to work with modest financial means. Indeed, the previous table showed that, *on average*, US universities have much higher budgets per student. And it is well known that the concentration of money at the top of US research universities (through endowments, private donations and US-wide research money²⁴) is much more pronounced than in a largely publicly-funded European university landscape.

In fact, the low budget per student in many European countries is a symptom of ‘massification’ without accompanying budgets, and southern Europe is the most extreme example of this phenomenon: public authorities ask top European research universities to educate more students (indeed we saw in Section II that Europe has made progress in this respect) while providing them with comparatively very low

22. In fact, respondents had a somewhat higher rank for all countries except for Spain.

23. We obtain very similar results when looking at medians rather than averages.

24. See Lombardi, Capaldi, Abbey, 2006.

budgets per student. While there are clear synergies between research and teaching and it is not necessarily desirable to keep top research universities small in terms of student numbers, it is clearly unwise to impose upon them many students but a limited budget.

Table 4: Size and funding of the universities in the sample (averages)

	Number of students (thousands)	Budget per student (€ 000s)*	% budget coming from public core funding	% budget coming from tuition fees	% budget coming from competitive research grants	% of budget coming from other sources
Belgium	21.7	11.3	65	5	21	9
Denmark	18.2	11.4	70	0	19	2
Germany	26.2	9.6	73	1	22	4
Ireland	16.3	12.7	38	32	18	12
Italy	44.9	10.1	63	12	12	9
Netherlands	21.4	20.5	68	7	15	10
Spain	44.8	7.0	62	16	10	13
Sweden	27.1	16.2	60	0	34	6
Switzerland	12.8	26.2	72	3	18	7
UK	14.6	24.5	35	23	21	20
Total	24.9	16.1	58	11	19	11

* PPP adjusted

If we turn to budget composition, there are also several interesting facts:

- All countries have a share of public core funding of 60-70 percent, except for the UK and Ireland.
- This fact is explained in particular by the high proportion of the budget coming from tuition fees in these latter two countries (23 percent and 32 percent respectively), even if southern European countries also have a non-trivial proportion of their (relatively low) budgets coming from fees. By contrast, Nordic universities receive nothing from students, and student fees are symbolic for several other countries, including Germany and Switzerland.
- The share of the budget coming from competitive research grants is typically 15-22 percent, with outliers being Spain (10 percent) and Italy (12 percent), and Sweden (34 percent).

Comparing these facts with the results in terms of research performance indicates that there are several 'successful models' in Europe. One can be successful without having significant fees, as the Nordic countries and Switzerland indicate, or with fees, as the UK indicates. Our Policy Brief shows, however, that higher budgets do significantly help research performance. This means that, if funding does not come from fees, it must come from other sources, in particular public funds. Universities cannot rely on very sizeable amounts of money from 'market-oriented activities' such as spin-offs, or from endowments, which in any case take time to build up. While these sources of income should be encouraged, as a first approximation budgets are in general determined by fee income and public funding.

There is also the question of how public money is awarded. A detailed discussion of this important issue is beyond the scope of this paper. But it is worth stressing the importance of 'competitive research grants' in university budgets. Ensuring meritocratic distribution of such grants is a key to research success. There has been much innovation in recent years on this front (eg the UK Research Assessment Exercises, among others), with a general trend towards stricter evaluation. This is a welcome development. Let us simply stress three elements:

1. First, in order to raise the efficiency of the research allocation process, it is desirable gradually to raise the amount of money distributed as a result of EU-wide competition, and not just as a result of national or regional competition.
2. Second, one should bear in mind that universities are 'multi-task organisations', involved in teaching, research and 'service to society'. As is well known from incentive theory (eg Holmstrom and Milgrom, 1991), increasing incentives for one task can be expected to raise effort devoted to that task but also to divert it from other tasks. One should therefore ensure a balance in terms of incentives provided to education systems in general (this does not mean that individuals cannot 'self-select' and focus on specific tasks). This means for example that the provision by the higher education system of stronger incentives for quality research should be accompanied by stronger incentives for quality teaching. And the same is true for the relationship between the university and its faculty: institutions should bear in mind that incentives should also be provided for 'service to society' and for managing the organisation, otherwise these two tasks will be neglected in favour of pursuing scientific publications and/or good student evaluations²⁵.

25. See Dewatripont *et al.* (2001, 2002) for analyses of these issues.

3. Finally, one should be aware of the intrinsic imperfections of 'quality measures'. For example, it is natural to try to take advantage of bibliometric indicators in research evaluation. However, just as Table 2 indicated that it is somewhat arbitrary to make country comparisons based on university rankings, it is also somewhat arbitrary to compare journals or simply to sum citations. One must take account of these difficulties and do 'robustness checks' of quantitative comparisons, ideally combined with peer evaluation committees. That said, citation numbers computed by independent sources have one advantage over indicators such as numbers of Ph.D's awarded: they are harder to 'manipulate' by varying the quality of the output.

5. The governance of European universities

All universities in Europe are heavily funded by public authorities. On the other hand, there is considerable variation in the degree of 'autonomy' of universities and other higher education and research institutions with respect to these public authorities. We devote this section to analysis and discussion of this crucially important organisational characteristic. We also draw attention to a distinction between the concepts of 'autonomy' and 'self-government'²⁶.

5.1 Autonomy and research performance

A university, or any institution, is autonomous if it has legal status and can conclude contracts, and if its governing bodies (collectively 'the board') can determine with a considerable degree of freedom the policies and practices needed to accomplish its mission (as laid down in the constitution of the institution). Thus, for example, complete autonomy in our case (higher education institutions) would mean, among other things, that the university could determine its own curricula, choose fee levels, select students, select professors and other teaching staff and decide on remuneration levels (within the limits of its means), establish development plans, etc.

Even in this case of 'complete autonomy' some limitations have to be pointed out:

- i Obviously, the institution is subject to the law of the land and to the accountability requirements to which any institution, from the purely private to the public (especially an educational institution) is subject.
- ii Complete autonomy can only really prevail with financial independence. If the

26. Of course, this is an issue where the perspectives of political science, management and other social sciences in general have much to offer. See for some recent examples Shattock, 2003, 2006, Bonnacorsi, 2007, Capano, 2007, Lazzaretti and Tavoletti, 2006. For a US economist's point of view, see Ehrenberg, 1999.

university depends – as is the general case in Europe – on public subsidies, it is inevitable that this will limit its autonomy.

Even taking the above into account it is clear that there are few universities in Europe that could be considered, on the above criteria, to be completely autonomous.

In order to illustrate this, Table 5 (overleaf) presents evidence on the governance of our sample of universities. As with size and funding, there is also a great deal of heterogeneity as far as university governance is concerned:

- State intervention is clearly pervasive, even when universities are not public.
- Wage-setting autonomy is rare, with Sweden and the UK being the foremost exceptions.
- Ownership of university buildings is commonplace (except in the Nordic countries and Switzerland).
- Hiring autonomy is prevalent, except in southern Europe.

A striking fact is the high variation in types of university governance across European countries, even among those which are performing well in terms of research. For example, among the three European countries with the best performance index, wage-setting autonomy exists in Sweden and the UK but not in Switzerland. Universities are mostly public in Denmark, Sweden and Switzerland, whereas they are mostly private in the Netherlands and the UK. This does not mean that all the dimensions of autonomy should not be pursued in parallel in order to improve performance. It merely suggests that universities in countries with low performance in rankings, such as France, Italy and Spain, could already improve their situation by reforming some dimensions of governance.

One dimension where there is little variation across European countries is the age of universities. Top European universities are old institutions: the average age of the 66 universities in our sample is nearly 300 years. It ranges from 220 years in the Netherlands to 450 years in Italy. The only outlier is Denmark where the average age is only 60 years. This suggests that European universities have a lot of accumulated knowledge, but that they may also be complicated to reform.

As discussed in our Policy Brief, our survey allows us to examine how budget per student and various measures of university governance correlate with research performance measured by the Shanghai ranking. Namely, we show that the research performance of a university is:

Table 5: Characteristics of governance of the universities in the sample (averages)

	Age (in years)	Public status (1 if public, 0 if private)	Budget autonomy (1 if yes, 0 if no)	Building ownership (1 if yes, 0 if no)	Hiring autonomy (1 if yes, 0 if no)	Wage-setting autonomy (1 if yes, 0 if no)	% of Faculty with own PhD degree	Proportion of internal board members
Belgium	284	0.5	0.375	1.0	1.0	0.0	63	0.8
Denmark	59	1.0	1.0	0.25	0.5	0.5	40	0.4
Germany	289	0.9	0.0	0.5	0.8	0.0	8	0.9
Ireland	259	0.5	0.5	1.0	1.0	0.0	49	0.6
Italy	444	1.0	0.9	1.0	0.4	0.0	24	0.9
Netherlands	217	0.8	0.8	1.0	0.8	0.2	33	0.1
Spain	342	1.0	0.5	1.0	0.5	0.0	69	0.8
Sweden	266	0.8	0.8	0.2	1.0	1.0	58	0.4
Switzerland	326	0.8	0.1	0.4	0.8	0.0	24	0.9
UK	242	0.5	0.9	0.9	1.0	0.8	8	0.4
Total	290	0.75	0.55	0.76	0.8	0.31	29	0.7

- Positively correlated with the size of its budget per student: the higher the budget per student, the better the performance;
- Negatively correlated with its degree of public ownership: private universities perform better than public institutions;
- Positively correlated with its budget autonomy: not being required to have its budget approved by governmental authorities is associated with better performance;
- Not correlated with its building ownership: more autonomy with respect to buildings is not associated with better performance;
- Positively correlated with its hiring and wage-setting autonomy : universities that decide on faculty hiring and set faculty wages do better;
- Negatively correlated with its degree of endogamy in faculty hiring: universities which tend to hire their own graduates as faculty do less well.

Taken together these results suggest that the research performance of a university is positively affected by all our measures of university autonomy (except for building ownership), and also by funding. However, these partial correlations do not tell us: (i) which of these autonomy indicators dominates and how interrelated they are; (ii) whether funding and autonomy improve performance separately from one another, or whether there are positive interactions between the two.

This can be done using ‘regression analysis’, a statistical technique for the investigation of relationships between variables, to assess the effect of budget and governance on research performance measured by Shanghai rankings. We are interested in the effect of budget and university governance on university research performance. However, we need to begin by taking into account two other factors that also affect Shanghai rankings, our measure of university research performance. The first is the size of the university. As Box 1 clearly indicates, all other things being equal, larger institutions are likely to have a better Shanghai ranking because they have more researchers. We do not have data on the number of researchers in our survey, so we proxy the size of the university by the number of students. The second factor is the age of the university. Box 1 also indicates that, all other things being equal, older institutions may have a better Shanghai ranking because they have more alumni.

As expected, the regression analysis indicates that the research performance of universities is positively associated with their size and their age. More importantly, it also confirms the existence of a positive linkage between budget per student and research performance. These effects are statistically significant.

Once these three important factors (size, age and money) are taken into account, it turns out that one of the autonomy indicators reported in Table 5, namely budget autonomy, has a statistically significant effect on research performance. The others have no statistical impact on performance.

But our main result is not simply that more money or more autonomy is good for research performance. It is that more money has much more impact when it is combined with budget autonomy. To be more precise: we find that having budget autonomy doubles the effect of additional money on university research performance.

Hence, increasing budget per student helps research performance, and having budget autonomy doubles this beneficial effect.

5.2 Internal versus external governance

Let us now turn to the issue of who controls universities. Table 5 only presents summary data on the composition of the board of directors of universities. We are well aware of the fact that there are many dimensions to the internal control of complex institutions like universities. However, we found it useful to look at the percentages of 'internal' and 'external' members of their boards. By internal members we mean representatives of faculty, of teaching and research assistants, of students and of administrative and technical personnel, while by external members we mean representatives of alumni and of public authorities, as well as 'independent outsiders'. We are thus seeking to capture the extent of 'self-government' in universities (knowing moreover that within a given country there can be heterogeneity, for example when public and private universities co-exist).

We see that the proportion of internal board members ranges from 0.1 to 0.9. The Netherlands is the country where outside members have the most power, while at the other extreme internal members have most power on the board in Belgium, Germany, Italy, Spain or Switzerland. Finally, we have a more equal relationship between internal and external members in the Nordic countries, in the UK and in Ireland.

It is interesting to investigate whether board composition is correlated with 'endogamy', measured as the percentage of faculty trained in-house at the PhD level. In fact, endogamy seems to be negatively correlated with country size: it is relatively high in small countries (Belgium, Denmark, Ireland and Sweden, but not in Switzerland which is highly open to hiring scholars with PhDs from other

institutions), and low in large countries (Germany, Italy and the UK, but not in Spain). This finding clearly reflects the absence of significant academic mobility between European countries. On the other hand, there is no clear relationship between board composition and endogamy: internal control co-exists with low endogamy in Germany, Italy and Switzerland, but high endogamy in Belgium and Spain. At the other extreme, the Netherlands are characterised by external control while being ‘average’ in terms of endogamy. And countries with a more equal relationship between internal and external members have either high endogamy (Nordic countries and Ireland) or very low endogamy (UK).

Once again, successful countries differ in terms of board composition. Indeed, the Netherlands and Switzerland offer an interesting contrast in this respect. That said, while we should reiterate that board composition is only one indicator of the allocation of power in organisations, our feeling is that having significant outside representation on the board may be a necessary condition to ensure that dynamic reforms taking into account long-term institutional interests can be decided upon without undue delay.

5.3 Entrepreneurship and intellectual property

Universities are economic forces. They are stores of knowledge and creativity. Part of their success lies in the multiple spillovers they give rise to, of which entrepreneurship and business creation are among the most important. Going beyond this, it is often submitted that the university should be ‘entrepreneurial’²⁷. While not addressing this issue in detail here, we will make several remarks.

First, if by being entrepreneurial it is meant that universities should be attuned to their environment, both social and economic, and reactive to it, then we agree. But if it means that universities should become very active agents in the market for ‘innovation’ and that they should strive to obtain a significant amount of financing in this way, then we are more reluctant. There may be better-designed institutions for this, for example technological centres and technological parks located close to universities (even with the participation of the latter in their management). Raising money through direct entrepreneurial activities may be tempting (much of the needed equipment and human resources being in place and, perhaps, paid for) but the quantitative significance of these funds may easily be overestimated. The university has a core mission that is not business. It is education and research that only

27. On this topic, see for example Clark, 1998, 2001.

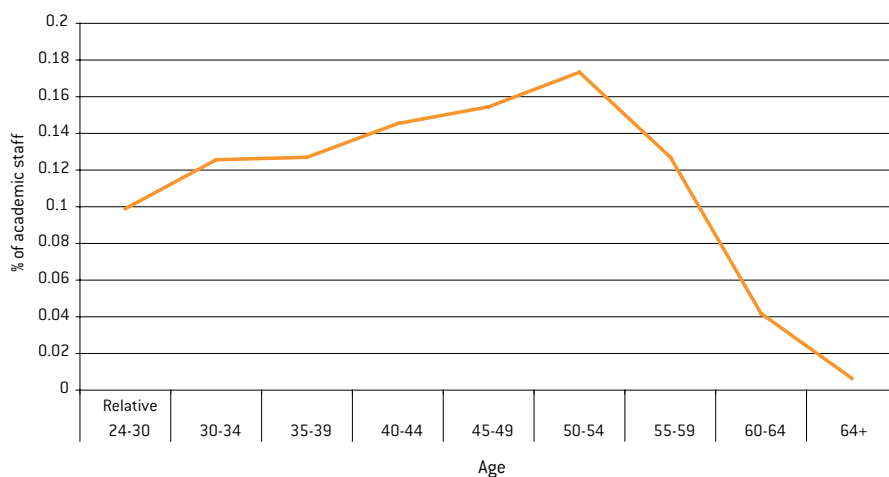
universities – and research centres – can accomplish: what is now commonly called ‘frontier research’. University research is heavily subsidised because it is, or it should be, of the long-term, high-risk variety that could not be developed in the marketplace. University research results cannot be reduced to a quarterly statement.

That said, the following two caveats are evident. First, universities should protect the intellectual property (IP) they generate (and share it with their researchers). It is also sensible that they dedicate efforts to gain financially from it. Even more, they should have an obligation to make it available for exploitation (in exchange for compensation, of course). Traditionally, universities have not been very good at all this: witness the massive relinquishing of potential IP that the publication of university research in outside journals represents. Second, the best way for a research university to foster competitiveness and growth is by being very good at its core mission. That is, by being, so to speak, a showcase of cutting-edge techniques and ideas, by generating frontier ideas and by having, in or in the vicinity of the university premises, human talent that is entrepreneurial enough to perceive the possibilities of market exploitation, and willing enough to take risks to that end.

6. Faculty and careers

From the quantitative point of view, present faculty numbers at European universities are adequate for current needs. The student/teacher ratio of around 16 is reasonable, although it is not evenly distributed across countries. Expansion of the student population will necessarily require more faculty. As for faculty demographics, the age distribution of university teaching staff in Europe shows an average age of around 44 years²⁸.

Figure 4: age distribution of academic personnel in the European Union



Source: OECD

Where is Europe to find the additional teaching staff needed to fill gaps left by natural wastage and to provide for the increase in faculty numbers? There are two sources.

28. OECD, *Education at a Glance*, 2007. This graph combines data for 18 EU countries: Austria, Belgium, Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Poland, Portugal, Slovak Republic, Spain, Sweden and United Kingdom.

First, the internal European production of PhDs. In 2005, Europe produced a total of 96,000 PhDs and the total stock of PhDs in Europe was approximately 1.5 million²⁹. Figures 5 and 6 show the total production and employment of PhDs.

In 2005, there were 65,299 non-European students seeking a PhD in Europe³⁰. It appears, therefore, that if all non-Europeans granted their PhDs in Europe were to remain in Europe and the brain-drain effect were to be contained or even reversed – and assuming industry did not absorb a higher proportion of PhDs than at present – Europe would be on the right replacement track. It is to be expected, however, and it is desirable, that there will be a process of concentration in the production of PhDs.

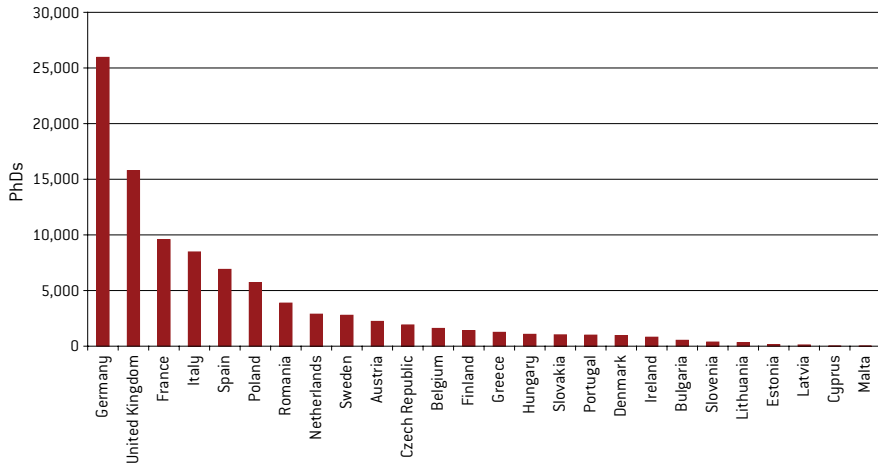
The second source is the import of PhDs qualifying outside Europe. This is an appropriate option and Europe certainly should not limit in any way the possibility for highly skilled professionals to come to Europe in response to incentives, to the desire for a better life or to pursue professional challenges. That said, it is clearly beneficial for less-developed countries to retain local talent to a greater extent than currently. Development funding might even be directed towards policies designed to provide incentives for high-skilled personnel to return, remain or relocate in the less-developed world.

We could also look at mobility within Europe. We should, first of all, emphasise that it is imperative to free the European academic world of the still-too-numerous barriers to mobility, from manifestations of petty protectionism in the area of degree recognition to the limits on the portability of pension rights. Yet a note of caution is needed here. The success of an ESHE cannot be tested and judged simply by the attainment in every institution of a full mix of nationals and non-nationals (for both teaching staff and graduate students). This would be too mechanical. Europe is culturally more diverse than the US (think of languages!). Nor is it to be expected that the impact of implementing ESHE would be a rate of concentration such as we find in the US. What is essential is that there should not be any obstacle to mobility. But if the outcome of the free operation of the ESHE is that a high percentage of researchers who are nationals of a given country end up in that same country, this result would not in itself be negative. To repeat, it all depends on how the result is achieved. People may opt to live near family if this is what they prefer. There is no clear evidence that the effect of such preferences necessarily hampers the long-run welfare of the citizens of Europe. Consider the following transitional ‘paradox’ (we made a similar point for

29. Source: Eurostat. Data for EU27.

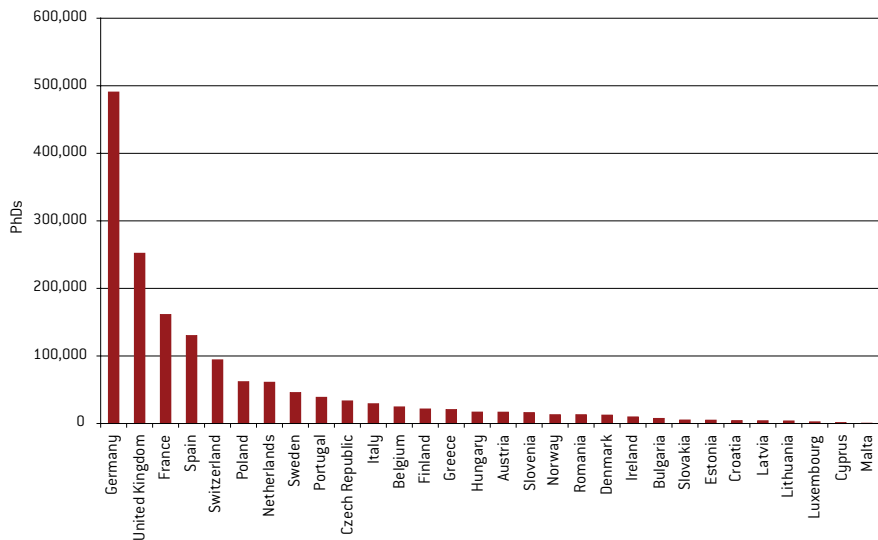
30. Source: Eurostat.

Figure 5: PhD production in Europe in 2005



Source: Eurostat

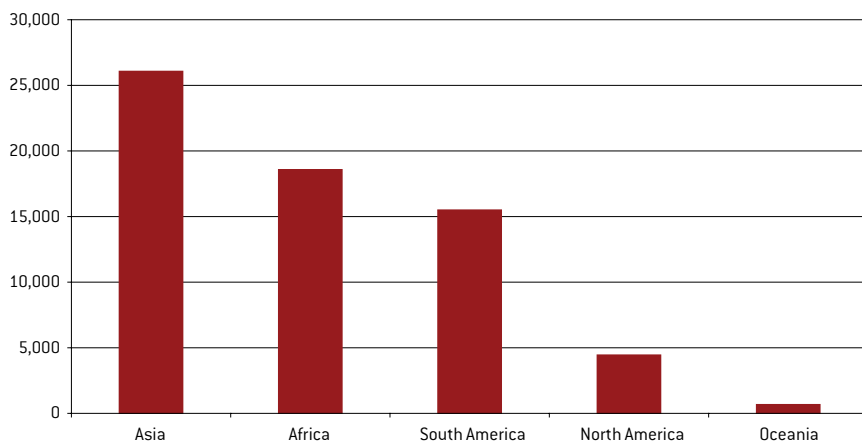
Figure 6: Employed PhDs in Europe



Source: Eurostat (2005)

undergraduate students in Section II]: suppose that a country has a very closed system of recruitment of university faculty but a large contingent of researchers working abroad, perhaps because they were trained there. If this country were suddenly to throw open recruitment, many of its researchers might return. The paradox is that this positive development would have a negative impact on the mix statistics. Some countries will lose international faculty if staff return to their country of origin.

Figure 7: ISCED 6 students trained in Europe that are non-European



Source: Eurostat (2005).

It is self-evident that the human resources dimension of a policy of excellence in higher education is crucial³¹. There is little point, for example, in spending considerable amounts of money installing cutting-edge facilities if insufficient care is taken in selecting those who are to use the facilities. This question involves examining remuneration levels. Traditionally, Europe has undervalued this aspect of academic competition for the recruitment, retention and recovery of top talent. Indeed, salaries have traditionally not even been viewed as currency in the competition for talent. This attitude is not completely without foundation. To a certain extent university faculty and researchers trade off higher remuneration against a freer and less directed working environment than that prevailing in a typical private firm (Aghion, Dewatripont, Stein, 2006). But this observation should not be overstated, especially if international academic competition were to lead to higher pay and even more freedom.

31. For a detailed comparative study of hiring practices for faculty in France, Germany and the US, see Musselin, 2005.

Salary structures for university teaching staff are not uniform across Europe. Non-uniformity is unavoidable and, in itself, not objectionable. What is important, we believe, is for university institutions and research centres to have the ability to set their own salaries and to design a competitive policy that includes, in recruitment matters, the remuneration dimension. Nonetheless, there are some important questions in this regard.

First, European countries currently have different levels of GNP per capita. Where two countries of a similar per capita income choose to have different salary structures for faculty and researchers, this is clearly unobjectionable. However, a relatively poor country is unlikely to be able to compete with the institutions of a relatively rich country on a level playing field.

Second, European higher education institutions tend to exhibit an egalitarian bias in salary matters, either because of deeply ingrained notions of fairness or because of the constraints imposed by the nature of governance structures, often based on self-management. It may not be straightforward for universities to switch to levels of remuneration that are perceived as being 'very high'. An additional complicating factor is that, in many European countries, university teachers and researchers are civil servants, which makes it difficult to operate salary flexibility (and, in some cases, to hire foreign citizens).

Third, the possibility for high-level remuneration is often limited simply because funding is 'soft', ie it derives from programmes, typically public, with a limited lifespan (rarely more than five years: the case of the recent Excellence Initiative in Germany³²). Such initiatives are certainly helpful, but not sufficiently so. It will be difficult to attract to Europe somebody with tenure at a solid university in the US if his/her salary is guaranteed for only five years, even if tenure is guaranteed.

32. Quoting directly from the explanatory website on the German initiative: 'Plans include the establishment of approximately 40 graduate schools, each to receive an average of €1 million annually, and approximately 30 clusters of excellence, which will each receive an average of €6.5 million annually': http://www.dfg.de/en/research_funding/coordinated_programmes/excellence_initiative/general_information.html.

7. Recommendations

We have argued that in the current era of knowledge-intensive growth it is crucial for Europe to foster the emergence of world-class universities, while maintaining its good average higher-education level. Achieving this twin objective of excellence and equity requires in turn action along three dimensions: (i) financing; (ii) autonomy and governance; and (iii) competition and mobility. This calls for action by both EU member states (and their regions) and the European Union itself.

We are well aware that advocating a combination of more money, more autonomy and more accountability is not new. It is, for example, broadly in line with the analysis of the European Commission (2006b). However, turning these three general principles into precise recommendations requires having a clear picture about the reality of higher education in Europe and its member states (and regions). Existing statistics are useful but insufficient in this respect. One contribution of this Blueprint is to present new evidence collected from a sample of top European research universities, pertaining to their size, funding and governance. It would be very useful if this kind of effort were undertaken systematically by (European and national) statistical authorities.

7.1 Financing

The level of funding

Europe suffers from a 'double deficit' in higher education and research in comparison with the United States: as a percentage of GDP, there is the much talked-about deficit in terms of research funding, but there is also a sizable deficit in terms of higher education funding. The level of funding of European universities varies across countries but, on average, it is insufficient for a satisfactory discharge of its teaching and research missions. This, plus a strong egalitarian bias in public funding, has made the development of elite research institutions very difficult.

It is to be noted that the expected expansion of the student population at the under-

graduate level and the unsatisfactory state of teaching facilities and equipment at many universities (with considerable variation across countries) make a substantial increase of funding at that level inevitable (again, with variations across countries). To this we should add the financial challenges of graduate education.

A reasonable target of reform would be to increase, over a period of 10 years, annual expenditure on higher education by a full one percent of European GDP. Admittedly, we only mean here to provide a rough order of magnitude, in the same spirit as the 'Lisbon three percent' target. Note that this target would only close half the current gap between the EU and US status quo (1.3 percent versus 3.3 percent of GDP spent on higher education). Stressing a one percent target may help focus attention on the task before us.

Where should this increased funding come from? Note that, just as the 'research deficit' originates in lower private funding in Europe as compared to the US, the same is true for the 'higher education deficit'. Indeed, American universities benefit from higher fees and also higher donations than their European counterparts.

We remain agnostic as to whether public or private money should be used to close the gap between European and American university budgets. But we stress two key ideas: (i) it is crucial for Europe that this gap gradually be closed; and (ii) this should be done while fostering equality of opportunity in terms of university access. We discuss in turn various possible sources of university funding.

We also point out that not all the increased revenue should go to institutions. In order to increase the quality of education, scholarships to students allowing them to devote themselves full-time to their studies are also very valuable.

Fees and student aid

We have repeatedly drawn a distinction between the Bachelor level, where a policy of fees below cost is defensible and, in our view, reasonable, and the postgraduate Master level, which should, ideally, be less regulated and where in all probability a variety of acceptable models will emerge, some including subsidies and some more self-sufficient.

We should emphasise, however, that if the graduate level evolves in such a way as to generate a structure of fees aligned with cost, then it is indispensable that this be backed up by a vigorous policy of scholarships for reasons of merit, of need or of the

nature of the particular studies (for example, PhD studies). In fact, both political expediency and funding needs imply that part of the increased revenues that higher education institutions may derive from a policy of liberalised fees be devoted to scholarships.

More generally, we believe that any hope of success for any well designed and ambitious initiative for the funding of higher education and research rests on its being accompanied by a powerful policy of scholarships, loans and income-contingent repayment schemes³³.

Note also that, in systems where (direct and indirect) fees become substantial, it is important to guard against the natural tendency of universities to start 'targeting' richer students. The most famous case in this respect is that of the Ivy League 'legacy students' in the US, where preferential treatment is given to students who are children of big donors. Such discrimination based on parental income is, of course, highly objectionable. It means that, in systems where students and their family contribute a sizeable portion of university budgets, admission policies ought to be based on centralised meritocratic indicators rather than left to the discretion of individual universities.

Concerning Doctoral education, essential to the vigour of European science, the US example is clear enough: good PhD training is very expensive. Thus, in contrast to most European universities, the major PhD-granting universities in the US devote a very large slice of faculty resources to the task. We believe that this economic consideration is by far the primary issue for European Doctoral education. The conclusion is inescapable: Doctoral training should be a central focus for the channelling of new public resources directed towards higher education, and the indispensable critical mass will only be reached if these new resources are targeted very selectively (as, for example, has been done recently in Germany with the Excellence Initiative).

Private funding

Unleashing the generosity of private donors (individuals, firms or foundations) would constitute a dramatic change for the funding underpinnings of European higher education and research. Tax incentives should play a role here and, in particular, we would advise that countries adopt appropriate legislation. But the main limitation is still cultural, which is both bad and good news: bad, because cultural change is

33. See Barr, Crawford, 2005, Vandenberghe and Debande, 2006.

difficult to engineer and good, because cultures do change. In this respect we would like to think that the time is ripe for a change and the only piece of advice we can give is: do not hesitate to celebrate those that give.

Endowments

The autonomy, responsibility and quality of decision-making of universities, research centres or graduate schools would be much helped if these institutions had endowments, not merely physical but also financial. Obviously we cannot pretend, or hope, that in the foreseeable future all European universities will possess endowments capable of sustaining them with their return³⁴. But even if, on average, endowments were to generate revenue of the order of five percent of universities' budgets, this would be very significant and it would have much added value, in the currency of quality of decision-making, beyond the monetary return.

Endowing institutions with this capability would represent a one-shot commitment of approximately one percent of European GDP. This is certainly significant and not all countries will be in a position fiscally to undertake an injection of this type. But in the end it is a question of priority. The idea, incidentally, is not new. In 2007, the Australian government established a Higher Education Endowment Fund (HEEF) that does exactly what we suggest³⁵.

Incentives

In matters of funding incentive effects are of paramount importance. Beyond the cost-covering aspects one should also consider the consequences that different types of funding induce on the effort and the commitment of universities to research. This means that public funding rules should be transparent and stable over time. In particular, they should not penalise success. In fact, the opposite should prevail: they should reward it. This is currently not always the case. University officers sometime live in fear that success in private fund-raising will lead to 'compensatory' decreases (or unexpectedly low increases) in public funding. This tendency should clearly be avoided.

34. For an interesting discussion of the role of endowments in US universities, see Hansmann, 1990.

35. See Australian Government, 2007.

7.2 Autonomy and governance

Increased funding must go hand-in-hand with reform of autonomy and governance.

Autonomy

The degree of autonomy of universities from public authorities should be, on average, considerably higher than what it is at present. It is true that there are restrictions on student access and fees (especially at the first degree level) that may be appropriate and that certainly limit the scope of autonomy. It is legitimate for public authorities to impose a number of public policy objectives on universities in compensation for the funding they award them. This applies also to the structure of curricula (sometimes derived from international agreements) that need to be accepted. But beyond this we think that the ESHE will be better and more vibrant if it is open to the free play and interaction of self-set strategies on the part of universities.

To be more concrete, we propose that every university in Europe should be autonomous, in the sense of having legal standing, owning assets, having the capacity to contract, to hire staff and set their pay, and freedom to set budgets and develop policies of every kind. Ideally, universities – or, for that matter, research centres – should be endowed with (i) a board which decides policy; (ii) an efficient and professional management structure (the best use of faculty resources is not in management); and (iii) internal participatory mechanisms.

(Self-)governance

Self-governance is a different issue than autonomy. A university can be viewed as self-governed if its board, or a good part of it, emerges from an internal election process involving the different components of the university community, in varying proportions. And, especially, if the main authority of the university – president, rector, vice-chancellor – also emerges from such a process. University autonomy is neither implied by, nor implies, self-government. A university can have very little autonomy if its head, endowed with little real authority and chiefly representative status, is internally elected. Conversely, a university can be very autonomous if it has a board that selects the main authority (not necessarily from within the university) through an external, political process.

We put forward three observations:

1. Entirely internal selection of the main authority should be avoided. It makes governance excessively biased in favour of the interests of current constituents. As a result, it becomes difficult, or even impossible, to make choices or steer policies that are viewed as inimical to powerful internal groups. For example, if the university can fix its salaries it is likely that the scales will be too flat and not conducive enough to a competitive recruitment policy outside the institution. Or if the university can hire its faculty it may be difficult to prevent the existence of small and low-quality Doctoral programmes that subsist only because of a self-generated, endogamic demand.
2. To the extent that the board is appointed through a (political) process external to the university it is important that the appointment mechanism fosters independence and expertise.
3. If the main authority is selected (from inside or outside the university) by a board appointed through an external process, the views of internal constituencies, and especially those of long-term employees, should be taken into account on important matters.

One sensible possibility would consist of (i) an externally appointed, independent board, including some internal representation, which should not dominate, and (ii) for the selection of the main authority, the board should organise a search that leads to a proposal that must be approved by an internal senate. This approach, or variations thereof, constitutes in our view a good balance between the need to ensure good leadership on one hand and good cohesion and collegiality, which are indispensable components for a smooth-running university community, especially for those enjoying a good degree of autonomy.

External influence on the board is of course not a panacea. In particular, the process by which external members are appointed may have flaws: can we trust those public authorities which design suboptimal rules for their university systems to appoint the right people onto university boards? While this is not guaranteed, we observe that the countries that have gone for significant external influence on university boards (Nordic countries, UK, Ireland or Netherlands, see Table 5) are countries which do well in terms of research performance. Effective boards represent one dimension through which universities compete, and we expect the discipline of competition to ensure that a significant number of European universities will finally have professional boards.

7.3 Competition and mobility: the role of Europe

The main force that can trigger the development and maintenance of peaks of excellence in the European landscape of higher education is, it seems to us, the will and the ability of their (autonomous) institutions operating in a competitive field for students, faculty and (research) funding. Higher education is and should remain a responsibility of member states (or their regions), but Europe can and should help, beyond doing what it already does, in ensuring greater mobility and therefore more vigorous competition. We discuss in turn students, faculty members and university budgets.

Competition for students

We stressed the beneficial role that the Bologna process is playing in fostering competition at the Master level. This could be enhanced by the introduction of a 'Standardised European Test' (SET), which could follow similar principles as the Graduate Record Examination (GRE) in the United States. Such a test could be useful in particular in making more 'objective' the admission requirements at the Master level. Indeed, one can predict that fees will probably rise in various countries for such programmes, if only because of the peculiarity of a European system which combines uniform fees for all EU citizens without generalised transferability of education subsidies across countries (or even regions, in some cases). Since one can expect cross-country mobility to be substantial at the Master level, raising fees may be the only way to avoid subsidising foreign students. There will then be a temptation for universities to discriminate in favour of more 'remunerative' students. Standardised tests can help combat this danger and ensure access based on academic merit.

Competition for faculty

Autonomy, both in terms of recruiting and in terms of wage-setting, is crucial to fostering competition for top faculty. Further measures can be decisive too. For example, ensuring the mobility of scientists, through the portability of pension rights, would be a very welcome step. More generally, policies towards the 'recruiting, retaining and recovering' of talent are a dimension where public policy, at the member state and EU level, may be decisive in asserting the competitiveness of European academia in the global world. Even further, partnership between universities (or research centres), the public sector and the private sector (business or foundations), may be especially useful in this area, since it may allow the funding of permanent and competitive compensation packages, which should be awarded through open tender and after

strict evaluation. It is fundamental that these programmes be excellence-based. We suggest going beyond current practice on two main grounds: (i) the long-term character of the grants and (ii) the possible participation of the private sector.

Fostering competition: the 'no-endogamy principle'

To facilitate mobility, but also the strengthening of PhD-granting institutions, we believe that it would be healthy if European universities were to endorse a no-endogamy principle for faculty recruitment. That is, a commitment of institutions producing PhDs not to provide the *first* employment of their awardees (or, more generally, not to consider in any way their own awardees for an employment contract for a period of, say, three years after the granting of the title). The advantages of adopting this principle go beyond the obvious ones (cross-breeding). The principle is also very helpful from the standpoint of providing good incentives for quality and critical mass, since it makes it impossible for Doctoral programmes to generate their own demand. It should be emphasised that our suggestion only concerns employment *just after* the PhD.

Competition for research funds

To foster research excellence, it is of crucial importance that significant research funds – for individuals, research centres and departments – be allocated competitively at all levels: member states, regions and the European Union (grants by the EU should be free, if possible, of compensatory – network-like – arrangements). In particular, we believe that institutions (universities or research centres) should not be provided with basic financing that includes all the research funding they need. A substantial part of funding should be obtained as a collateral result of their ability to attract competitive grants.

A mechanism to accomplish this is the use of overheads³⁶. Individual researchers tend not to like these because they resemble taxation. But overheads are very important. Not only for the purpose of paying maintenance costs, but also because they provide incentives to universities (and/or research centres) to obtain research grants and, therefore, to develop the right policies (on faculty hiring, etc) to obtain them in sufficient volume.

36. Contracts and grants for university-administered research funding should include not only the direct costs of the project, but also a range of indirect costs, such as infrastructure. Universities should be able to recover these costs in the form of overhead charges typically calculated as a percentage of the direct costs.

In order to achieve greater efficiency in the allocation of research funding, it is probably desirable to raise the amount of resources awarded through EU-wide competition. In this respect, an important step has been the creation of the ERC (European Research Council), the first EU programme to fund 'bottom-up research' (as opposed to thematic research geared towards 'European competitiveness' or mobility and network programmes) which promotes competition at EU level, emulating in this sense the US National Science Foundation and National Institutes of Health. The ERC has a budget of around €1 billion per year in the 2007-2013 period. This remains modest in comparison with the NSF (around \$6 billion per year) and especially the NIH (around \$30 billion per year). Of course, in Europe, member states themselves account for the bulk of public research funding, which totals around €100 billion per year. Given the relative underfunding of higher education in Europe, national and regional funding should not be reduced. But there is a clear need to increase the EU budget for university research and to allocate it on the basis of excellence on the ERC model.

It is likely that the need to compete for research grants, as well as for students and faculty, will induce specialisation and it is not impossible that many universities will end up being excellent at something. The 'excellent' universities will then be those that manage to be excellent at many things. By definition, there will not be many of those.

Completing the people policies: graduate fellowships

The development of a vibrant European space of graduate education would be much helped by closing a gap in the 'people' policies of the EU. There are now in place excellent European mobility programmes at the undergraduate level (Erasmus), at the advanced Doctoral and initial post-Doctoral phase (Marie Curie), at the more advanced post-Doctoral start of a career phase (ERC junior grants), and so on.

But there is no significant programme for the initial graduate phase (leading to research Masters or the PhD). This is a pity. A programme focusing on that segment could provide a good stimulus for the development of strong graduate schools endowed with a drive for excellence. The US experience in this respect is very positive. There, the prestigious Graduate Research Fellowship (GRF) Program of the National Science Foundation (NSF) fulfils the required role. To quote from its statement of purpose: *'The NSF aims to insure the vitality of the human resource base of science, technology, engineering and mathematics in the US and to reinforce its diversity by offering approximately 1,000 graduate fellowships in this competition.'*

The GRF provides three years of support for graduate study leading to research-based Master or Doctoral degrees and is intended for students who are at the early stages of their graduate study.'

The Fellowship pays around €30,000 per year per student (including tuition fees), which means €90,000 for three years. In the European case the graduate schools should probably also receive compensation aligned with cost. Hence the global disbursement may be around €120 million per year for 1,000 students (€90 million for students and €30 million for universities).

From people to institutions: a funding programme for graduate schools

In order to promote the development of graduate schools, and their launch on a sound European basis, a possible scheme, inspired by some features of the recent Excellence Initiative in Germany, could be developed along the following lines: in an evaluation and selection process taking place in several waves, the EU would choose, in an open and competitive manner, up to, say, 1,000 graduate schools³⁷. Each would receive €1 million per year in European funding. The annual cost would therefore be €1 billion per year.

Together, the two new EU-funded programmes - the graduate fellowships and the graduate school - would cost €1.12 billion per year, or roughly one percent of the EU budget.

37. There are about 200 top universities in Europe and about 50 fields of research, which gives a maximum of 10,000 departments in the top universities. We assume that one in ten departments would be selected for funding of a graduate school. Put it differently, for every research field, there would be 20 universities selected throughout Europe.

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