Creating the European Knowledge Society

An analysis of EU higher education and research policies

A paper for the Higher Education Review Group of the University Grants Committee of Hong Kong

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1. Globalisation and Innovation

1.1 Introduction

Economists have argued for several decades that international forces have altered the basis of economic development. Markets have become increasingly interconnected. Goods, services, capital, labour and also knowledge move around the world in order to find the best conditions. Natural resources are no longer the dominant factor in economic growth. In many developed nations there is now an observable trend toward a process of international outsourcing of increasing numbers of traditional industries as well as routine service activities.

Globalisation is the ongoing process of world-wide economic, political and social integration. We are all influenced by this process, as the recent global economic crisis clearly shows. Globalisation is the result of decreasing costs of communication on the one hand (internet) and increasing political cross-border activities on the other (WTO, UN and G20). It leads to an increasing interconnectedness of markets, to increasing mobility of capital, labour and knowledge and to a world-wide process of 'geo-regionalisation': the development of multi-national global trade regions like Asean, Nafta and the EU.

Since the 1980s we have entered the 'third phase' of globalisation which has brought with it the rise of new global actors (China, India) and the economic integration of former Eastern bloc countries, but also a quintupling of world trade. Globalisation has been and still is the major driver of our economic development.

Globalisation leads to increasing national specialisation. This process of specialisation, which is amplified by scale and learning effects, creates a reallocation of production processes between countries and forces nations to look for their international comparative advantages. Given this situation, national governments try to identify and develop their specific strengths. They try to increase their locational attractiveness for business firms; they try to attract mobile production factors; they develop their sociocultural profiles; and they try to increase their innovation capacity.

Many nations nowadays seek to promote innovation as a principal means of economic growth. They try to find their comparative advantages in the production of knowledge-intensive goods and services. To better compete in a globalised economy, these countries focus increasingly on knowledge, creativity and innovation. In this context higher education and research organisations are becoming crucial objects of national policy. They form a large part of the environment of the knowledge economy and therefore are increasingly addressed by national innovation policies.

The adoption of national innovation policies is altering the framework conditions that have traditionally guided higher education and research. Governmental actors in many countries have similar motives for developing and implementing national innovation policies. They all refer to the growth and importance of the "knowledge society" in which knowledge has become *the* crucial production factor and in which the creation, transfer and application of knowledge is of prime importance for further social and economic development. They also refer to the processes of globalisation and increasing international competition in which the capacity to make use of new and applicable knowledge may lead to important strategic benefits. The creation,

dissemination and application of knowledge are regarded as core factors for the international competitiveness of regions, nations and even whole continents and therefore have become key strategic areas for policies at subnational, national and supranational levels (World Bank 2007).

As a consequence over the last decades many governments have become more assertive in their efforts to influence the behaviour of higher education and research organisations. These institutions, which are primarily funded by public sources, are perceived by policymakers to be one of the remaining instruments to influence international competitiveness.

1.2 National Innovation Systems

During the 1980s a new approach to the economics of innovation has emerged that has become known as the perspective on National Innovation Systems (NIS). This perspective emphasises the interactive character of the generation of ideas, scientific research, and the development and introduction of new products and processes. The NIS approach takes an explicit policy orientation, and its framework has been internationally promoted by organisations such as the OECD, the World Bank and the European Commission (Balzat, 2006). The NIS perspective now informs the national policies of many developed nations and has altered their traditional higher education and research policies.

The development over the last fifty years by the OECD of a standard methodology for collecting and using statistics about research and development (i.e., the Frascati Manual of the 1960s and the Oslo Manual of the 1990s) was instrumental for economists to achieve a better understanding of the positive relationships between innovation, international competitiveness and economic growth (Soete 2006). Researchers subsequently discovered that the key to international competitiveness among the developed countries was national "factors that influence the development, diffusion and use of innovation" (Edquist 1997, 14), i.e., the NIS. This new economic research revealed industrial innovation to be decidedly non-linear. Instead, innovation has proven to be an interactive, reciprocal process involving different actors and organisations (Nelson 1993). From the outset, academic institutions were identified as playing a critical role in the NIS and the evidence suggests that, if anything, their influence has grown over time (Mowery and Sampat 2004). However, the NIS research emphasised that while the tangible outputs of academic research - publications and patents - remain important, equally significant to successful innovation is the production of highly skilled human capital particularly in the form of new science and engineering doctoral research graduates (Cohen, Nelson, and Walsh 2002). Most importantly, and in sharp contrast to the linear assumptions of the traditional "science-push model", the NIS perspective stresses the role of linkages among the various actors and organisations that participate in the overall innovation process (Edquist 1997; Nelson 1993). These linkages include not only formal knowledge transfer arrangements between universities and industry, such as science parks and joint university-industry research ventures, but also soft linkages – the many channels of communication by which knowledge is exchanged. Finally, a distinguishing difference between the NIS perspective and traditional higher education and research policy is the NIS approach's

emphasis on institutional framework conditions: the governance processes, regulations, incentives and underlying beliefs that shape innovative behaviour (Balzat 2006).

The NIS perspective thereby reflects the increasing emphasis within the social sciences on the role institutions play in ensuring, defining and steering market and nonmarket interactions (Eggertsson 2005). The research on NIS emphasises how institutional framework conditions vary across nations and are "path dependent" (Liebowitz and Margolis 1995) in that they are shaped by the distinctive history and political forces within each country. A similar emphasis on historical forces has also characterised studies of national higher education systems where the differing governance traditions of market competition, state supervision and professional control have long been influential on academic behaviour (Clark 1983). Institutional structures are known to change over time, but slowly (North 1990), and there is the potential danger of "lock-in", in which cultural beliefs and political forces sustain existing institutions to the point that they are no longer efficient for the parent society (Liebowitz and Margolis 1995).

Over the last twenty years, the NIS perspective clearly has influenced national reforms in higher education and research policy in many nations (Laredo and Mustar 2001; Lundvall and Borrás 2004; Rammer 2006). One version of the NIS perspective aims at promoting innovation within the existing institutional context of higher education through national and state-level incentive programmes for basic research in fields deemed critical to future industrial innovation, such as biotechnology, information and communication technology (ICT), medical technology, nanotechnology, new materials and environmental technologies. The more systemic and laissez faire version of the perspective focuses on changing the framework conditions of higher education institutions to promote innovation. This latter approach includes changes in higher education governance processes and legal frameworks; the development of new yardsticks for the evaluation of academic research activity; and the adoption of new incentives to promote the transfer of academic research to society, an issue not traditionally considered part of higher education policy. Examples of this approach include changes in the laws governing IPR (intellectual property rights) and academic labour markets; the introduction of competitive market forces into higher education systems; the transformation of institutional financing of research into competitive research funding; the deregulation of university management; the evaluation of academic research ex post, utilising new performance indicators; novel initiatives to strengthen and reform doctoral research education; as well as a number of incentive schemes designed to encourage more effective university-industry linkages.

As these reforms indicate, many nations are now implementing a number of new policy instruments in their efforts to improve the effectiveness of their higher education and research systems. Policy instruments are "the tools of government" (Hood 1983), the mechanisms that governmental actors employ in their policy strategies to try to "produce" certain outcomes. Without these instruments, governmental policies would be no more than abstract ideals or fantasies. The reforms associated with the NIS perspective seem to suggest a significant shift in the types of policy instruments now being applied to steer higher education and research in many nations. The specific nature and impact of these new instruments will be addressed later in this paper.

The NIS perspective and its proposed reforms clearly challenge a number of the traditional academic beliefs including the necessary unity of teaching and research and the essential incompatibility of basic and socially useful research (Martin 2003). Not surprisingly, the NIS perspective has provoked controversy within the academic community. However, it appears that many governments (and certainly also the European Union) are developing "policy strategies" that are clearly based on this perspective. I will address these "policy strategies" in section 2. First let me introduce the innovation agenda of the European Union (EU).

1.3 The EU Innovation Agenda

The European policy domains of higher education and research are embedded in the broader European integration process. Analysing these policy domains necessarily forces us to first look at the broader European political context.

In the aftermath of World War II and during the onset of the Cold War, the wish to create peace and stability in Europe became a common target, and the idea of pooling European countries' interests seemed highly attractive. The 1950s in Europe were a time of reconstruction, reorientation and reconciliation. In this context, European visionaries like Jean Monnet and Robert Schuman conceived of and took the first steps toward an integrated Europe.

The objective to create an integrated Europe, able to act in a supranational way, was addressed in a pragmatic, step-by-step fashion. The results were the first three community treaties, creating the foundation of what is now called the European Union.

The treaties are effectively the basic constitutional texts of the EU. They set out the objectives of the Union and establish the various institutions intended to achieve them. The first three founding treaties of the European Union are: the Treaty of Paris, establishing the European Coal and Steel Community, signed in April 1951, entering into force on July 23, 1952, and expiring on July 23, 2002; the treaty establishing the European Atomic Energy Community (Euratom), signed in March 1957 and entering into force on January 1, 1958; and the treaty establishing the European Economic Community (EEC), signed – along with the Euratom Treaty – in Rome on March 25, 1957, entering into force on January 1, 1958. This third treaty is usually referred to as the "Treaty of Rome."

The first treaties were essentially economic in scope and basically pragmatic. However, they created the first supranational policy context in Europe. In contrast with the pure intergovernmental approach, the new community method began to focus on a true European integration process in key policy domains, with a European Commission (EC), established by the EEC Treaty in 1957, as the major supranational institution.

History shows that further important milestones were the Single European Act (signed in 1986 and entering into force on July 1, 1987), leading to the single market strategy, and the Maastricht Treaty, which paved the way for the Economic and Monetary Union. The Maastricht Treaty (signed on February 7, 1992 and entering into force on November 1, 1993) changed the name of the European Economic Community to simply the "European Community". With the two other so-called pillars (the Common Foreign and Security Policy, and the Police and Judicial Cooperation Policy), the European Community has become known as the European Union, with political and economic scope. It was also this treaty (called the Treaty on European Union) in which,

after some debates on the interpretation of the competences of the community in the EEC Treaty's articles in the 1980s, the subsidiarity principle was formulated. This principle ensures that decisions are taken as closely as possible to the citizens of Europe and that checks are made as to whether actions at community level are justified. The EU is assumed not to take action, except in the areas that fall within its exclusive competence, unless the member states cannot themselves sufficiently achieve the intended results.

In general political terms, the European integration process has moved slowly since then. The political aspiration to create a European constitution, which was the result of the meeting of the European Council (the heads of state or government and the EC-president) of February, 2003, was shattered by the rejection of the draft constitution in the referenda in France, the Netherlands and (later) Ireland. After a period of uncertainty and confusion, in June 2007 the European political leaders reached an agreement. Formally there will not be a constitution, only a review of the existing treaties to be established in a new Treaty of Lisbon (which is still not ratified by all member states).

The most crucial recent phase in the European integration process, which has had a major impact on developments in the policy domains of higher education and research, is the "Lisbon process." When the EU leaders met in Lisbon in 2000, they decided to boost the Union's competitiveness and growth. Inspired by the ideas and concepts of the perspective on National Innovation Systems (NIS), they wanted to create "a Europe of knowledge" and formulated the goal that by 2010 the EU should be "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth, with more and better jobs, and greater social cohesion" (European Council 2000, para. 5). The ambition formulated by the European political leaders created an additional context for European policy making, not so much with classic policy instruments like directives and regulation, but rather under an "Open Method of Coordination" (OMC) by which the governments of the member states themselves agree to a process of peer review and benchmarking on a number of relevant policy indicators (EC 2000a). The OMC radically changed European policy making. It provided a new platform to discuss national policies and their outcomes at the European level without further impinging on national competences. I will come back to this new policy instrument in section 2.

Unfortunately, as the evaluation report of a special high-level group showed (European Communities 2004), at mid-term (2005) the ambitious political goals of the Lisbon summit appeared to be very difficult to reach. Of course, the weak economic growth in the larger member states has been a major factor. But the fact that the design and implementation of the policy actions to reach these European goals rely strongly on the efforts of the member states and of industry has also been identified as a major reason for the failure of the Lisbon process (Weber 2006).

The European Commission deliberately restarted the process. During the 2005 Spring European Council, the Commission launched the New Lisbon Partnership for Growth and Jobs (EC 2005e), which resulted in the singling out of "knowledge and innovation for growth" as one of the main areas of action. In addition, it developed integrated guidelines for the preparation of the three-year so-called National Reform Programmes (NRPs) of the member states as well as the Community Lisbon Programme consisting of a set of Actions for Growth and Employment (EC 2005a), thus building a

new, overarching community-member states partnership. With this new partnership, the EC created the foundations of the EU innovation agenda which became known as the Lisbon agenda.

During the last few decades a supranational European innovation policy has been developed that now includes a number of inter-related policy fields. Generally speaking, these policy fields can be divided into two large policy domains: higher education policy (including doctoral education policy) and research policy (including knowledge transfer policy). Although these two policy domains have their own origins and histories, they increasingly appear to have come together under the broader umbrella of the all-embracing Lisbon agenda.

In particular, since the re-launch of this agenda in the New Lisbon Partnership in 2005, the EC has tried to develop a general strategy that could form a solid base for the further development of the EU. The Union faces fierce economic competition on a global scale and sees it as a major task to develop a comprehensive innovation agenda. The higher education and research policy domains have become crucial elements of this broader agenda.

Referring to the widening gap with the US and (parts of) Asia, the Commission rose to the challenge and presented its proposals for the Union's strategic objectives:

> Europe's performance has diverged from that of our competitors in other parts of the world. Their productivity has grown faster and they have invested more in research and development. We have yet to put in place the structures needed to anticipate and manage better the changes in our economy and society. We need a dynamic economy to fuel our wider social and environmental ambitions. This is why the renewed Lisbon Strategy focuses on growth and jobs. In order to do this we must ensure that: Europe is a more attractive place to invest and work; knowledge and innovation are at the beating heart of European growth; we shape the policies allowing our business to create more and better jobs. (EC 2005e, 4)

The higher education and research policy domains are interpreted as subsystems of a larger overall European innovation policy. To allow Europe to focus on its two principal tasks – delivering stronger, lasting growth and creating more and better jobs – the Union needs a knowledge and innovation policy, consisting of a number of elements:

> public authorities at all levels in the member states must work to support innovation, making a reality of our vision of a knowledge society; more investments by both the public and private sector in spending on research and development are needed; a major reform of State Aid policy should be realised to allow member states to support research and innovation; our universities should be able to compete with the best in the world through the completion of the EHEA; a 'European Institute of Innovation and Technology' should be created; Innovation Poles designed to help regional actors bring together the best scientific and business minds should be supported; the promotion of eco-innovation should be intensified; partnering with industry should be fostered by European Technology Initiatives…. (EC 2005e, 9)

I will address many of these elements in the rest of this paper. Here it is important to emphasise that, inspired by the literature on National Innovation Systems (NIS), the EU has formulated an explicit innovation policy strategy. The renewed Lisbon agenda is

an ambitious innovation agenda to which the higher education and research policies are assumed to contribute. This agenda has been the major overall policy of the EU for nearly ten years. Now that the economic crisis has hit the EU, the Lisbon agenda appears to become only more relevant. The innovation agenda is the EU's answer to the pressure of globalisation and the challenges of economic recession. And European higher education and research are assumed to have crucial roles to play in creating the European knowledge society in a globalising world.

2. EU Higher Education and Research Policies

2.1 Policy Strategies

In the present-day international context, policymakers are seeking to redesign their systems of innovation and research and to adapt them to the new demands of globalisation and competitiveness. For this they employ certain "policy strategies," i.e., processes in which policy-instruments are related to policy-objectives with the intention to realise these objectives. Generally speaking these policy strategies appear to consist of some combination of the basic notions of market coordination and central governmental planning.

The coordinative capacity of the market mechanism is well-known. In a free market with perfect competition, prices carry the information on the basis of which decisions are made with respect to demand and supply. However, the model of the perfectly competitive free market often is not realistic. In reality one has to allow for transaction costs, scale effects, less than perfectly informed actors, less than perfectly mobile production factors, and non-homogeneous goods. In addition, high barriers to entry to a market may provide existing organisations with monopoly power, or competition may take place by means of mechanisms other than prices (e.g., quality or reputation). In short, the perfectly competitive free-market mechanism is seldom a realistic option for policymakers (Teixeira et al. 2004; Weimer and Vining 2005).

But central governmental planning clearly also has its drawbacks. Central governmental planning is an approach to public sector steering in which the knowledge of the object of steering is assumed to be firm; the control over this object is presumed to be complete; and the decision-making process regarding the object is completely centralised. In reality governmental actors are unable to form comprehensive and accurate assessments of policy problems and to select and design completely effective strategies. In addition, governments are unable to monitor and totally control the activities of other societal actors involved in a policy field and run the risk of non-compliance, inefficiency and nepotism (Lindblom 1959; Van Vught 1989).

A "third way" thus has to be found. And this is what governments in many nations appear to be seeking. These third ways are specific combinations of the two basic notions of the free market on the one hand and of central planning on the other. They have been described as manifestations of the "state supervising policy model" which is assumed to be a combination of market coordination (which emphasises decentralised decision making by providers and clients) and framework setting and supervision by government (Van Vught, 1989). In the general policy model of state supervision, the influence by governmental actors is limited. Governments do not intrude into the detailed decisions and operations of other actors. Rather, a certain level of autonomy of these actors is respected and their self-regulating capacities are acknowledged. Governments in this policy model see themselves as the providers of the regulatory, financial and communicative frameworks within which other actors can operate, and as the supervisors of these frameworks.

However, the setting and supervision of governmental policy frameworks in this model can nevertheless have major impacts on the behaviour of other actors. By introducing certain general quality assessment instruments or financial allocation

mechanisms into their national policy frameworks, governments are able to strongly steer higher education and research without introducing detailed regulation.

2.2 The EU Policy Strategy

The EU's overall innovation policy strategy is clearly an example of the "state supervising model", emphasising decentralised decision-making by the EU member states and their own higher education and research institutions on the one hand, but setting general policy-frameworks at the EU-level on the other. These frameworks are regulatory, financial and/or informative/communicative and the various policy-instruments applied at the EU-level (see next two sub-sections) are the tools used to operationalise them.

The general EU policy strategy is also a policy in which competition is combined with social support and an emphasis on the need to stimulate social integration. The EU's innovation agenda not only focuses on a competitive knowledge economy but also on sustainability, better jobs and social cohesion.

I will now discuss both EU higher education and EU research policies. Both are crucial cornerstones of the general EU innovation policy strategy, and hence important dimensions of the Lisbon agenda.

2.2.1 Higher Education Policy

Generally speaking, higher education has come only slowly onto the supranational European agenda. Although some educational activities were developed at the European level during the 1970s (in particular in the field of vocational training and the education of migrant workers' children), the education sector was for a long time "taboo" for European policy initiatives (Neave 1984, 6). The European Community had not been given competence in the field of education by the national governments.

In the Treaty of Nice (2001), it was decided that the EU would be able to contribute to the development of quality education by encouraging cooperation between member states through a wide range of actions, such as promoting the mobility of citizens, designing joint study programmes, establishing networks, exchanging information, and teaching languages for all citizens of the EU. The basic idea was that although the competence for education in general and higher education in particular remains at the level of the member states, the Union has a complementary role to play by adding a European dimension to education, by helping to develop quality education and by encouraging life-long learning.

The main tool for putting this ambition into practice became the Socrates programme. The first phase of this programme ran over the period 1995-1999 and the second phase during the years 2000-2006. The Socrates II programme supported European cooperation in eight areas, from school to higher education, and from new technologies to adult learners. The higher education section of the programme continued the older Action Scheme for the Mobility of the Students, called the Erasmus programme, established in 1987. As the higher education Action of Socrates II, the Erasmus programme aimed to enhance the quality of and reinforce the European dimension of higher education by encouraging transnational cooperation between universities, by boosting mobility, and by improving the transparency and recognition of studies and qualifications.

However, the roots of the current European higher education policy lie, in a special way, in the history of the European universities. In May 1998, the French minister of education used the 800th anniversary of the Sorbonne as an occasion for a joint declaration of the ministers of France, Germany, Italy and the United Kingdom on the "harmonisation of the architecture of the European higher education system." The objective was to create a European higher education area by means of a common two-cycle degree structure, the mutual recognition of degrees, and increased student mobility. The ministers stressed that "the Europe we are building is not only that of the Euro, the banks, and the economy, it must be a Europe of knowledge as well" (Sorbonne Declaration 1998, 1).

The Sorbonne Declaration proved to be a "quantum leap" in the development of European higher education policy (Witte 2006, 124). The four ministers agreed to organise a follow-up meeting in Italy and called on other European countries to join their initiative. The result was astonishing. The eagerness of other European education ministers to participate in this initiative is evident in the twenty-nine signatures of European ministers to the Bologna Declaration, a city with an even older European university. The Bologna Declaration formulates the wish to construct the European higher education area (EHEA), to promote mobility and employability, and to increase the compatibility and comparability of the European higher education systems. It also emphasises the need to increase the "international competitiveness" of Europe's higher education and its "worldwide degree of attraction" (Bologna Declaration 1999).

Since the Bologna conference, the process has accelerated. Follow-up conferences were held in Prague (2001), Berlin (2003), Bergen (2005) and London (2007). The "Bologna ministers" (an expanding group of forty-six nations in 2007) added new actions on lifelong learning, on a common framework of qualifications, on a coherent quality assurance and accreditation mechanism, and on an additional focus on the doctorate level (the third cycle) in the Bologna process. In 2009, the "Bologna ministers" will meet in Leuven (Belgium) to discuss the next 10 years of the Bologna process.

The Bologna process rapidly became a central dimension in the emerging higher education policy of the EU. In particular, since the formulation of the Lisbon agenda in 2000, higher education has rapidly moved up the ladder of EU policy concerns (Shaw 1999; Corbett 2005).

In 2003, the European Commission opened a debate on the "place and role of European universities in society and the knowledge economy" (EC 2003b, 4). Since the European universities at the beginning of the twenty-first century are at the heart of the Europe of Knowledge being responsible for 80 percent of Europe's fundamental research, the EC intended to explore the conditions under which Europe's universities would be better able to effectively play their role in the knowledge society and economy.

The analysis by the Commission is stern: "[t]he European university world is not trouble-free, and the European universities are not at present globally competitive." They should realise that the traditional model of Wilhelm van Humboldt no longer fits the current international context and that the high degree of fragmentation of the European university landscape prevents Europe from responding to new global challenges. These challenges go beyond national frontiers and have to be addressed at a European level. "More specifically, they require a joint and coordinated endeavour by the member states…., backed up and supported by the European Union" (EC 2003b, 10).

In its contribution to the Bergen conference of the Bologna process (2005), the Commission stated clearly that "from the EU perspective, the Bologna process fits into the broader Lisbon Strategy" (EC 2005b, 2). But it again emphasised that Europe and its universities face stronger competition than ever before. The figures tell us "that the situation is alarming". Only 21% of the EU working-age population in 2002 had completed tertiary education, significantly lower than in the United States (38%), Canada (43%), Japan (36%) and South Korea (26%). In the EU, 52% of the relevant age group was enrolled in higher education; this was slightly more than Japan (49%) but less than Canada (59%) and certainly the United States (81%) and South Korea (82%). The number of researchers per 1,000 employees in the EU was 5.4, marginally less than Canada or South Korea, but far below the United States (9.0) or Japan (9.7) (EC 2005d, 3). Only a handful of European universities were found in the top fifty of the world. Indeed, the situation was alarming, and profound reforms were needed.

According to the EC, the European universities have so far failed to unleash their full potential to stimulate economic growth, social cohesion, and improvement in the quality and quantity of jobs. In a policy paper in 2005, the EC identifies the following bottlenecks: a tendency to uniformity and egalitarianism in many national higher education systems, too much emphasis on monodisciplinarity and traditional learning and learners, and too little world-class excellence (EC 2005d). European higher education remains fragmented into medium or small clusters with different regulations and languages; it is largely insulated from industry; graduates lack entrepreneurship; and there is a strong dependency on the state. European higher education is also over-regulated and therefore inefficient and inflexible. In addition, European universities are underfunded; underfunding leads to low enrolment rates, failure to prepare students for the labour market, and difficulties in attracting and retaining top talent.

In the view of the Commission, the quality and attractiveness of the European universities need to increase, human resources need to be strengthened, and the diversity of the European higher education system needs to be combined with increased compatibility (EC 2004a). In 2004 the Commission launched the Integrated Lifelong Learning Programme (2007-2013), with the general objective of contributing to the European knowledge society. The Lifelong Learning Programme consists of four sub-programmes, one of which is the Erasmus programme. A crucial aim of this programme is to reinforce the contribution of higher education institutions to the process of innovation. To achieve this, the autonomy of and investments in universities should be increased. The Commission urges the member states to establish a new partnership with their universities, moving from state control to state supervision and accountability, and to acknowledge that addressing the severe funding deficit in higher education is a core condition for achieving the Lisbon ambitions (EC 2005d).

The political leaders of Europe lent a willing ear to the Commission's analysis and suggestions. In 2006 they decided that all member states should try to reach the overall EU 2010 target for R&D spending of 3% of GDP and that the investments in higher education should rise to at least 2% of GDP by 2010. The Commission produced another communication in which it identified "investing more in knowledge and innovation," as a top-priority (EC 2006e, 14-17). By 2006 higher education had evolved as a crucial policy concern at the supranational European level.

2.2.2 Doctoral Education Policy

A crucial dimension of overall European higher education policy is the increasing attention paid to the importance of doctoral education. The topic of doctoral education was addressed at the European level during the Bologna summit in Berlin (2003) and later in Bergen (2005) and London (2007). In Berlin, the education ministers decided that it was "necessary to go beyond the present focus on two main cycles of higher education and to include the doctoral level as the third cycle in the Bologna process." They emphasised the importance of research and research training in enhancing the competitiveness of European higher education and called for increased mobility at the doctoral level and stronger inter-institutional cooperation (Berlin Communiqué 2003, 7). During the Bergen meeting, the ministers urged European universities "to ensure that their doctoral programmes promote interdisciplinary training and the development of transferable skills, thus meeting the needs of the wider employment market." Also, the number of doctoral candidates should be increased to contribute to the needs of the knowledge society (Bergen Communiqué 2005, 4). At their London meeting (2007), the ministers invited universities to reinforce their efforts to embed doctoral programmes in their institutional strategies and to develop career paths for doctoral candidates and early-stage researchers (London Communiqué 2007).

In 2003, the European Commission (EC) also paid attention to doctoral education. In its communication *Researchers in the European Research Area: One Profession, Multiple Careers*, the Commission discussed the recruitment, training and career opportunities of researchers (EC 2003a). In particular, it argued that the competencies and skills of doctoral candidates should focus on a wider labour market perspective than only academic careers.

Doctoral education is beginning to feature higher on the European research and education agendas. The days of the Humboldtian doctorate as the entrance to an academic career appear to have passed. Doctoral education is assumed to be able to play a major role in creating the highly trained labour force for the knowledge society, which is understood to need knowledge professionals who have the competencies to work in highly complex, knowledge-intensive environments. Europe indeed seems to have discovered the full potential of the third cycle in higher education (Bartelse and Huisman 2008).

Doctoral education is considered to be the major link between the Bologna and Lisbon agendas (Aghion et al. 2008), and more specifically between the European higher education and research areas. Not only has it become an official part of the European political agenda in the Bologna process, it also is a crucial point of attention in the EU innovation strategy. The EC strives for an open, single and competitive labour market for researchers with attractive career prospects and incentives for mobility. In the near future it is assumed that doctoral graduates will find their careers not only in academia, government and private sector R&D laboratories but also in general management positions.

As a consequence, doctoral education is in a phase of further innovation and diversification. The European University Association (EUA) has set up a special Council on Doctoral Education with the objective of contributing to the development, advancement and improvement of doctoral education and research training. European

universities have also recognised the need to offer doctoral candidates a broader experience than core disciplinary research skills based on individual training by doing research. They increasingly introduced courses and modules offering transferable skills-training and preparing candidates for career opportunities in sectors beyond academic institutions (EUA 2005). European universities appear to be accepting the challenge to diversify their doctoral training programmes. Relatively new concepts such as professional doctorates, industrial doctorates, taught doctorates, and practice-based doctorates have entered European discussions. In the years to come the traditional Humboldtian doctorate may very well be supplemented with a variety of new European doctorates (Scott 2006).

2.2.3 Research Policy

European research policy has only fully developed since the 1980s. However, the European Community had been active in this domain since the very beginning of the EU. The Treaty of Rome (1957), the Single European Act (1987) and the Maastricht Treaty (1993) created important foundations for European policy on research and technological development.

A crucial step in the development of EU research policy was the creation of the first multi-annual research and technological development framework programme (FP). The first FP (1984-87) was designed to strengthen strategic areas of European competitiveness. It funded research efforts of business and industry as well as higher education and research institutions, and it stimulated the creation of research networks spanning organisational and national boundaries. After this first FP, a series of other FPs followed. FP2 (1987-90) was deliberately designed as the basis and instrument of European research and technology policy. FP3 (1990-94) regrouped the research activities around three strategic areas and emphasised quality as a major criterion for selection. FP4 (1994-98) emphasised the importance of consistency between national and community policies. FP5 (1998-2002) focused on a problem-solving approach and user needs and involvement (Geuna 1999). FP6 (2002-06) and FP7 (2007-13) have added major new policy elements to the general instrument of the FP (see below).

The FPs have developed into the central EU instrument in the policy domain of research and technology. The FPs have become *the* strategic documents describing broad strategic EU research priorities, each to be implemented through specific programmes. In addition, they address the overall EU budget to be spent for the duration of the programme, the breakdown of this budget into priority areas, and the ways and modalities according to which funding is made available to projects (Caracostas and Muldur 2001). The FPs are a medium-term planning instrument. They indicate the priority areas and the financial scope of European activities in research and technological development. As such, they have become a dominant factor in European research policy.

It should be pointed out, however, that other European programmes have an impact in this domain as well. Particularly the regional and social policy activities funded by EU Structural Funds should be mentioned here. The Structural Funds have as their political objective to strengthen economic and social cohesion in the EU, in particular in less-favoured and declining regions. In the overall European integration policy, economic and social cohesion is seen to be as crucial as the development of the

monetary union and the single market, expressing the political commitment by the EU to bridge the gaps between the more advanced and less-favoured regions of Europe. Throughout the 1980s and 1990s, the Structural Funds have increasingly been used for interventions by means of research and innovation-related activities, hence creating an extra funding base for research and technology policy. In a communication in 2004, the EC argued for a reform of this cohesion policy and for making the Lisbon agenda "one of the main bases for Structural Fund intervention" (EC 2004b, 10). Complementary funding from the Structural Funds and the FP is assumed to strengthen the process of reaching the strategic Lisbon objectives.

In addition, it should not be forgotten that the research and technology policy domain in Europe is a comprehensive, multi-actor environment in which a multiplicity of intergovernmental associations and organisations exist. Examples are the EUREKA initiative, launched in 1985, that finances pre-competitive projects according to a bottom-up industrial cooperation process; ESA (the European Space Agency); CERN (the European research center for particle physics); EMBO (the European molecular biology laboratory); and the European Science Foundation, which brings together a substantial number of networks in many European countries around a large number of research programmes.

Furthermore, although the financial and political strengths of the FPs are considerable, the proportion of their research investments on a Europe-wide scale is limited. In the sixth framework programme, this proportion was only 5 percent. The other 95 percent invested in European research came from the member states. Of course, because these national resources often cover infrastructure, salaries and running costs of European projects, the impact of FP funding reaches much further than the 5 percent invested. Nevertheless, the overall European research landscape suffers from fragmentation and unnecessary duplication of efforts and resources (Andersson 2006). The major challenge in the European research and policy domain is to create critical mass and joint investment schemes. This is the challenge that is being addressed in the proposals for the European Research Area (ERA).

The heads of state or government of the EU decided at their Lisbon summit in 2000 that their common and national investments in research and technological development had to be increased. Aware of the fact that European investments were considerably more limited than those of the United States and Japan, and keeping in mind that they were on the way to the "European Knowledge Society," they proposed to create the European Research Area. The ERA should better integrate national research policies, encourage researchers to work together at the European level, stimulate cooperation between universities and industry, and lower the political and administrative barriers to that cooperation.

The creation of the ERA has its own history. Since the 1980s, the FPs have developed substantially. By the end of the 1990s, not only had the overall funding levels more than quadrupled, but the priorities in terms of support for specific research fields had clearly evolved in the direction of a knowledge economy. In addition, the relationships with industrial and societal needs were substantially intensified.

The ERA was formally launched in 2000, when it was put on the agenda by means of a communication of the EC (EC 2000b). The subsequent conclusions of the Lisbon summit of that year endorsed the idea of the ERA, making it a key component of the Lisbon agenda. However, it was only in 2002 that the ERA took further shape. In

the communication *The European Research Area*, the EC noted that a specific European research policy still did not exist in the full sense of the term and called for a more ambitious approach and greater cooperation. The ERA should be a major vehicle to implement the EU's declared ambition to achieve a genuine common research policy. The objective was "to move into a new stage by introducing a coherent and centred approach at Union level from which joint strategies could be developed." The ERA intended to reflect the political will expressed by the political leaders at the 2000 Lisbon summit. "Without this political will, Europe is condemned to increasing marginalisation in a global world economy. With the ERA, on the other hand, Europe gives itself the resources with which to fully exploit its exceptional potential and to become – in the words of the Lisbon European Summit of March 2000 – "the world's most competitive and dynamic economy"" (EC 2002a, 9).

The EC noted that European research represented a jigsaw of (then) fifteen often very different national scientific and technological policies. The FPs appeared to be no more than a "sort of 16th research policy, coming on top of national effects, but not dynamic enough to have a truly integrating effect." The result was compartmentalisation, dispersion and duplication as well as the failure to assemble the critical mass of human, technological and financial resources that major scientific advances demand today. Europe also still largely lacked a proper market for knowledge capital and technological development. Creating such a market called for a genuine European research policy (EC 2002a, 8).

The Commission pressed for a concerted effort and suggested that FP6 be designed to do exactly that. FP6 would promote integrated, cross-border projects that would benefit from shared resources and critical mass. FP6 was to have three main areas of action: integrating European research, structuring the ERA, and strengthening the foundations of the ERA. FP6 had a substantial budget: over €19 billion, compared to nearly €15 billion for FP5. At a more operational level, FP6 contained various action lines, either existing ones that were strengthened in terms of support for researcher training and mobility, or new lines for development aid and for creating the scientific and technological infrastructures of the ERA. Substantial parts of the programme were also devoted to identifying future European science and technology priorities and to the coordination and reciprocal opening up of national research programmes. In addition, three major new instruments were introduced: support for cross-national networking of thematic centers of excellence in universities, research organisations and business enterprises; support for integrated projects involving a critical mass of scientific and industrial partners and directed towards significant products, processes or service applications; and participation in specific science and technology cooperation programmes set up jointly by particular governments or national research organisations.

In its communication *More Research for Europe* (2002b), the EC stated that the only way to reach the ambitious targets was to increase the general investment in research to 3% of GDP and that a substantial part of this effort should come from business and industry. The Commission challenged the member states, showing that this target would imply an increase in national expenditure levels for research of 6 to 10% on average per year. Nevertheless, during a political summit in Barcelona in March 2002, the 3% of GDP (of which two-thirds was expected to come from private funding) was accepted as a terget to be reached by 2010. The EU took its research area seriously.

Unfortunately, the 3% GDP target for 2010 appeared to be very hard to reach. The knowledge gap between Europe and the United States remained large. In

particular, the European R&D expenditure by business and industry lagged behind (Van Vught 2004). Therefore, it is not surprising that at midterm between 2000 and 2010 the EU was far from its target. It was concluded that "halfway to 2010 the overall picture is very mixed and much needs to be done in order to prevent Lisbon from becoming a synonym for missed objectives and failed promises" (European Communities 2004, 10). There was a large gap between the political rhetoric about the knowledge society and the realities of budgetary and other priorities, and action was urgently needed "before it is too late" (European Communities 2006a).

An important new development in European research policy is the development of so-called technology platforms. These platforms have largely been set up at the initiative of industry and bring together companies, research institutions, the financial world and regulatory authorities at the European level. The objective is to develop a common strategic research agenda per platform that could mobilise a critical mass of public and private funding at the national and European levels (EC 2004b). The technology platforms are bottom-up processes uniting stakeholders around a joint vision and approach for a strategic technology. They define an overall strategy in a specific technological field to be translated into an operational programme. In 2009 there are 34 European technology platforms spanning a wide range of technologies. The platforms' objective is to influence industrial and research policy at the EU, national, and regional level, while encouraging public and private investments in key technological fields. The EC sponsored some of the platforms through specific support actions in FP6. In FP7, the Commission introduced the Joint Technology Initiatives (JTIs), which are eligible for FP funding (see below).

When the sixth FP came to its end, the ERA was still under construction. Of course, FP6 could not realise the full ERA by itself. The EU needed a policy framework that creates incentives for its member states to contribute beyond what the Union is able to offer. "Without active involvement of member states, the Commission cannot succeed in enacting an effective global strategy for science and technology" (European Research Advisory Board 2006, 7).

In developing the seventh FP, the EC took this suggestion to heart. It noted that in FP6 successful efforts were made to improve the coordination of national research programmes but that these efforts must be strengthened. The networking of national programmes (through the so-called ERA-NET activities) should receive more resources, and more attention should be given to the mutual opening up of national research programmes (EC 2004b).

During the summer of 2006, the leaders of the EU reached an agreement on FP7 (2007-2013), with a budget of €53.2 billion. FP7, which started in January 2007, is a major programme for realising the "re-launched" Lisbon agenda. It is the chief instrument for funding European research and innovation and creates a new policy context for the ERA.

Subtitled "Building the European Research Area of Knowledge Growth," FP7 is designed to respond to the competitiveness and employment needs of the EU. It is based on the assumption that knowledge is Europe's greatest resource and that growth and competitiveness can be given a new impetus by this resource. The programme places greater emphasis than before on research that is relevant to the needs of European industry through the technology platforms and the new Joint Technology Initiatives (JTIs), which will develop research projects in fields identified through dialogue with

industry. The programme also, for the first time, provides support for the best European "frontier research," with the creation of a European Research Council (ERC). The ERC funds the best European research activities, as assessed by international academic peer review.

The Commission acknowledges that the technology platforms, led by industry, have been able to create more focus in the European research activities. In FP7, it introduces the JTIs as a new funding scheme, offering a framework for particularly ambitious research and technology agendas that require public and private investment at the European level. JTIs are dedicated legal structures that coordinate the mobilisation of large-scale public and private investments and substantial research resources. JTIs are assumed to accelerate the generation of new knowledge, to enhance the uptake of research results into strategic technologies, and to foster the necessary specialisation in high-tech sectors that may determine the EU's future industrial competitiveness. Initially, six JTIs have been identified.

FP7 is organised into four specific programmes. In the Cooperation Programme, the objective is to gain European leadership in key areas through cooperation of industry and research institutions (like the JTIs). Support is given to research activities carried out in transnational cooperation, from collaborative projects and networks to the coordination of national research programmes.

In the Ideas Programme, the objective is to strengthen the science base of Europe by funding European-wide competition. The autonomous ERC (with a budget of €7 billion) supports frontier research by individuals or partnerships in all scientific and technological fields.

The People Programme has as its objective to reinforce the career prospects and mobility of European researchers. Support is available for training, mobility and the development of European research careers.

In the Capacities Programme, the objective is to develop research and innovation capacities throughout Europe, so that European researchers have excellent facilities at their service. Support is available for research infrastructures, regional clusters, research for and by SMEs, "science in society" issues, and horizontal international cooperation.

FP7 is a continuation of FP6 and continues to develop the ERA. But FP7 intends to be less bureaucratic and simpler in its operation. In addition, FP7 has international cooperation as an integrated dimension in each of its four programmes; it has a focus on the development of the "regions of knowledge" (strengthening the research potential of regions); and it comprises a Risk-Sharing Finance Facility aimed at fostering private investment in research by improving access to the European Investment Bank.

In 2007, the EC took an important next step in developing the ERA. It published a green paper, entitled *The European Research Area: New Perspectives* (2007c) and opened a discussion on how the current research system of Europe can be improved. The Commission intends to further develop the idea of the ERA. It argues that, since the ERA's introduction in 2000, the context of European research has evolved. Globalisation has accelerated, various new socioeconomic challenges have grown (climate change, aging, the risks of infectious diseases), and the European research landscape has changed (notably with the launching of new measures such as the ERC and the European Institute of Innovation and Technology). Within this changing context, the ERA concept itself has been subject to gradual changes. Its scope has broadened from a focus on how to improve the effectiveness and efficiency of the fragmented European

research landscape, to the awareness that more public and private investment in research is needed, and to the view that research policy should be related to other EU policies in order to achieve coherence and synergies in the context of the overall Lisbon strategy. According to the Commission, the expanded ERA must comprise six features: (1) an adequate flow of competent researchers with high levels of mobility among institutions, disciplines, sectors and countries; (2) world-class research infrastructures, accessible to all; (3) excellent research institutions engaged in public-private cooperation, involved in clusters and virtual communities, and attracting human and financial resources; (4) effective knowledge-sharing between the public and private sectors and with the public at large; (5) well-coordinated research programmes and priorities; and (6) the opening of the ERA to the world, with special emphasis on neighbouring countries.

Researcher mobility is clearly a priority throughout the green paper. It suggests that the movement of knowledge is crucial for the future of the EU. The movement of knowledge should become a "fifth freedom" within the EU, complementing the four freedoms of the Treaty on European Union, which protects the free movement of goods, services, capital and labour (EC 2007c).

The 2007 green paper once more reflects the idea that knowledge is Europe's most important resource. According to the EC, investing in knowledge is the best way to foster economic growth and to create more and better jobs while at the same time ensuring social progress and environmental sustainability. The EU research policy plays an important role in achieving these goals. Research has come to be at the core of the EU's renewed ambition to stimulate growth and employment. It is the key component of a broader European innovation agenda.

2.2.4 Knowledge Transfer Policy

In the 2006 Spring European Council of the heads of state, the European member states indicated that they expected to increase their R&D spending. The Commission urged them to implement their NRPs (National Reform Programmes) and to set ambitious expenditure targets for R&D and higher education, but it also indicated that Europe needs to continue to improve its knowledge infrastructure and to reinforce its capacity for knowledge transfer. More investments in knowledge and innovation are needed, and "the quality of the European innovation systems requires particular attention" (EC 2006e, 16). Excellence in both research and higher education needs to be further promoted. But stronger links with business and industry are also needed, and the knowledge transfer processes need to be strengthened.

The 2006 Council called on the EC to present a "broad based innovation strategy for Europe that translates investments in knowledge into products and services" (European Council 2006, 6). In September 2006, the Commission published this strategy in its communication *Putting Knowledge into Practice: A Broad-based Innovation Strategy for the EU* (EC 2006d).

The strategy is a comprehensive European innovation policy, with a clear emphasis on knowledge transfer. It is intended to frame policy discussions on innovation at national and European levels. It outlines the most important planned and ongoing initiatives, identifies new areas of action, and in particular introduces a more focused strategy to facilitate the creation and marketing of new innovative products and services in promising areas - "the lead markets" (EC 2006d, 3).

In April 2007 the Commission published a further communication on knowledge transfer and a set of voluntary guidelines for research organisations to help them improve their links with industry. The document uses a broad definition of knowledge transfer: "Knowledge transfer involves the process of capturing, collecting and sharing explicit and tacit knowledge, including skills and competence. It includes both commercial and non-commercial activities such as research collaborations, licensing, spin-off creation, researcher mobility, publication, etc." (EC 2007d, 2). The general objective of the communication is to serve as a starting point for increased cooperation among the member states and the EU in this field, leading to a common European approach to knowledge transfer.

According to the Commission, major barriers to greater knowledge transfer exist in the EU. They include cultural differences between the academic and the business communities, legal barriers, fragmented markets and lack of incentives. Some member states have set up initiatives to promote knowledge transfer, but these largely ignore its international dimensions (EC 2007d).

The document highlights the importance of a number of measures, including creating a workforce of skilled knowledge transfer staff in universities (and a professional qualification and accreditation scheme), developing a more entrepreneurial mindset in universities, and allowing for exchanges of staff between research organisations and industry. It also emphasises the importance of financial support for knowledge transfer. The suggested voluntary guidelines to help improve knowledge transfer cover issues such as intellectual property management, incentives for researchers to participate in knowledge transfer activities, and the development of knowledge transfer resources (EC 2007f).

During the 2007 Spring European Council of the heads of state or government, the current level of European competitiveness was again discussed. The member states invited the Commission to push forward the implementation of the general innovation policy. The meeting concluded that the member states are determined to improve the conditions for innovation, such as competitive markets, and to mobilise additional resources for research, development and innovation. They also underlined the importance of increased attention to knowledge transfer. In this context, higher education and research organisations are seen as crucial actors for the revitalisation of the knowledge and innovation capacity of Europe.

2.3 Policy Instruments

In the literature on policy sciences, the concept of policy instruments has a notable history. Classical authors in the field (Dahl and Lindblom 1953; Etzioni 1968; Mitnick 1980) have underlined the importance of a clear understanding of the various types of policy instruments. Others have pointed at the need to study their impacts and effectiveness (Ingram and Mann 1980; Mazmanian and Sabatier 1981). Several categorisations of policy instruments have been suggested in the literature (Bardach 1979; Hood 1983; Elmore 1987; Schneider and Ingram 1990; Weimer and Vining 2005), and I will follow a generally accepted categorisation by distinguishing between legal, financial and information policy instruments (Van Vught 1994). I will first discuss the trends in the use of policy instruments at the level of individual EU member states and

then present the policy instruments that are being used at the level of the European Union.

2.3.1 Legal Instruments

Legal policy instruments are the strong tools used by governmental actors to assert their formal authority. Legal instruments are intended to command and to forbid, to commend and to permit. The adoption of national innovation policies in many nations, however, has transformed the traditional use of laws and regulations to influence higher education and research. The expressed goal of improving the quality and productivity of academic research and doctoral research training, particularly in science and technology, and better linking academic knowledge to social and economic development has motivated national governments to rely less on direct regulation of inputs, processes and outputs and more on shaping the institutions that influence the behaviour of universities. The detailed laws and rules by which many governments traditionally directly regulated publicly supported universities are being systematically reduced (i.e., deregulated) in order to provide more space for entrepreneurial action in service to society. For example, in place of line-item budgets and civil service laws, many governments are adopting new framework conditions for influencing higher education organisations that are less detailed. However, these new framework conditions do not necessarily imply less governmental steering. In fact these "remote control" mechanisms appear to be more effective.

This shift from direct regulation to "steering at a distance" is illustrated in several EU countries. As a consequence of the new policy focus on framework conditions rather than direct regulation, universities in the EU are now gaining more institutional autonomy, management flexibility and contractual freedom. In an EU member state like Finland, the formal designation of universities as publicly supported corporations provides greater latitude for institutions to respond to emerging market opportunities as well as greater discretion in their financial, personnel and research activities.

Ironically this shift in framework conditions is also detectable in the UK, where publicly supported universities have traditionally possessed, in comparative terms, remarkable professional discretion in their internal affairs (a situation once characterised as "the private management of public money"). However, the adoption of the Higher Education Reform Act of 1988 and the Further and Higher Education Act of 1992 substantially altered the UK government's relationship to the universities, from one of subsidising independent professional institutions, to one of a formal exchange for public service. This alteration is also reflected in the increasing adoption of contractual agreements between government bodies and universities, as illustrated in both the UK and Finland.

A further example of the new focus on framework conditions rather than direct regulation is the emphasis on reassigning intellectual property rights (IPR) in the university sector, lifting the restrictions imposed by government ownership of publicly funded research, and providing greater latitude and incentive for universities and their academic staff to interact with private industry. First adopted in the United States with the Bayh-Dole Act, similar reforms have been introduced in, for instance, Germany and the UK.

2.3.2 Financial Instruments

The second category of policy instruments is financial instruments. Financial instruments reflect "the power of treasure," the influence of signing cheques (Hood 1983). Crucial instruments in this category include contracts, bounties, and transfers (i.e., subsidies). Financial instruments may be used directly – as when governments introduce "quasi-markets" in which universities, as sellers, must compete with each other for research contracts from a monopsonic government buyer – or indirectly through intermediaries, as when government subsidises doctoral students or private industries to purchase, respectively, education or research from higher education institutions.

Under the growing influence of national innovation policies, financial instruments have become an increasingly dominant means of steering higher education and research. In many countries there now is a strong reliance by governmental actors on financial instruments, in particular as previously suggested, instruments that help implement the policy strategies for innovation.

Most EU member states have traditionally utilised a dual funding model to support higher education and research (Jongbloed and Vossensteyn 2001). General University Funding (GUF) instruments have traditionally allocated funds incrementally on the basis of past history, through formulas linked to input elements, and/or after negotiation. Grants from research councils, in contrast, have traditionally been allocated competitively. Research council grants have been determined not by formulas or past history, but by peer-review, qualitative judgments based upon *expected* performance, and the capacity of applicants. Consistent with recent trends in OECD nations (Geuna 2001), in a number of EU member states we see the continuation of dual funding policies, but with an effort by governments to simulate market conditions by allocating less research funding via GUF and larger proportions competitively through research councils.

A second new element in the financial policy instruments observed in many EU countries is the association of GUF with output measures of "performance", particularly in research. In the case of the Research Assessment Exercise (RAE) in the UK, core institutional funding for research is fully determined by a formula based upon peer ratings of research quality at the subject level as well as indicators of publication productivity and grants received. In other EU countries the linkage between GUF and performance is less pronounced. In these countries peer reviews as an indicator for performance funding are not employed; instead specific indicators of research output are used to assess eligibility for some portion of GUF. The design of these performance-based funding instruments suggests that there is an emerging international consensus on the output measures most useful for assessing the effectiveness of academic research. These include research publications and citations, doctoral graduates, and competitive grants received. Even in the UK, future versions of the RAE will rely to a much greater extent on similar metrics rather than on costly peer evaluations.

A third new element is the allocation of direct government support through competitive tenders, with specific objectives and limited budgets, on the basis of past performance and the "excellence" of the proposal (Geuna 2001). For example, competitive funding for doctoral research support is often linked to PhD completion rates as well to various measures of the research strength of the relevant departments

or programmes (e.g., existence of a center of excellence). In addition competitive funding instruments are increasingly being used in EU member states to allocate the following:

- distinguished faculty chairs
- grants for research infrastructure
- research centers of excellence
- graduate or research schools
- funds to achieve institutional "world-class" status

In some countries (UK, Denmark), competitively allocated infrastructure awards are also being used as incentives for institutional mergers that could help foster greater critical mass for research. The German competitively awarded Excellence grants have similarly encouraged mergers among universities and public research institutions.

In contrast, matching-fund instruments, which also are often competitively allocated, are being used by national, and subnational governments. These are most often employed to better link universities and private industry, for example, in cooperative research programmes or in the development of cooperative research facilities. These matching-grant instruments encourage the creative pull of market forces in a way that the similar UK Third Sector funding initiative, awarded on a competitive basis directly to universities, may not.

A financial policy instrument distinctive to research funding is indirect cost reimbursement. The United States has been unique in its heavy reliance on negotiated indirect costs as a substitute for GUF or institutional block grants. However, a number of European countries have recently also expressed concern that, if not fully costed, competitive grant systems may encourage universities to cross-subsidise research projects with funds intended for other purposes, such as teaching, in an effort to maintain the visibility and vitality of their research programmes. These potentially dysfunctional effects have encouraged nations such as the Netherlands and the UK to commit themselves to the eventual full-cost funding of competitively awarded government research.

2.3.3 Information Instruments

The third category of policy instruments is the instruments of information. These instruments allow governmental actors to send out messages and to provide responses. The instruments of information are used to communicate with other actors, to "launch" certain initiatives, to ask for reactions, to report on certain conditions, to facilitate decisions, and to assure quality and accountability.

With the emergence of national innovation policies, information instruments are playing an increasingly important role in higher education and research policy. They are applied in evaluation and review processes as well as to help identify priority areas and centers of excellence. Several examples are found in Europe of the use of information instruments to identify excellence. The most comprehensive such approach is the German Excellence Initiative, designed to identify and strengthen a selected number of universities with "world class" potential. The more typical form of this instrument is to identify, through a competitive, merit-based process, national centers of excellence in strategically important research fields. This type of instrument is for

instance being applied in Finland by the Centers of Excellence Programme conducted by the Academy of Finland.

In addition, information instruments are being used to assess and strengthen quality in existing subjects and academic programmes. This is a critical role of the RAE in the UK as well, but because of its linkage to institutional research support noted above, the RAE is most often perceived as an instrument for allocating financial resources and concentrating research funding. In a number of European countries, information instruments similar in design to the RAE are being applied to the university sector, but they are not as directly connected to research funding. For example, the German Science Council is experimenting with research evaluations in selected science fields and the Netherlands Royal Academy of Sciences provides recognition for distinguished research schools. However, the goal of these instruments is clearly directed toward longer term improvement rather than immediate accountability.

A related evaluation instrument focuses not on academic fields or programmes, but on each university's capacity for managing research. The Netherlands and the UK have for instance developed information-based policy instruments requiring the review of university research programmes and/or research management plans. The design of this instrument is well illustrated by its emergence in the Netherlands. Initially, the Association of Universities in the Netherlands (VSNU) conducted research assessments by international panels of all subject fields in the university sector similar in focus to those described above. In 2003, however, the focus of the assessments shifted to each university's management of research. Universities in the Netherlands are now required to arrange their own external assessment of their research programme following a standard evaluation protocol. Some accountability is provided by the publication of the research assessment, but again and unlike the RAE, the results of the assessments do not inform government research funding.

Generally speaking, information policy instruments that are applied consistently over time, that are grounded in the core academic process of peer review, and that focus on improving research outcomes relevant to the reputations of academic staff and institutions are highly consistent with academic values and have therefore inspired a significant degree of related self-regulation by universities. Such instruments also help provide an influential signal to potential customers of higher education and research organisations. Well-designed, information-based policy instruments may therefore offer greater potential for improving the contribution of universities to social and economic development than either legal or financial instruments (Majone 1997).

2.4 The EU Policy Instruments

The EU has several categories of policy instruments at its disposal. In accordance with the types of instruments distinguished in section 2.3, three basic categories of European policy instruments will now be discussed. This discussion focuses on the policy strategy of the European Union and offers an overview of the policy instruments used at the EU-level.

The first category consists of the legal policy instruments of the EU. Here it is important to keep in mind that the EU is formally neither a federal government nor an

intergovernmental organisation. The EU is based on the agreements concluded among its Member states.

Generally speaking, there are three types of European legal instruments. The first is the so-called primary legislation type. Primary European legislation basically consists of the various European treaties and their annexes and protocols. Treaties are legally binding and have to be ratified by the parliaments of the member states. The treaties form the "constitutional structure" of the EU and provide the formal contexts in which research and higher education policies can be developed.

In addition to the treaties (primary legislation), secondary European legislation provides the various legal instruments that the EU uses to develop and implement its policies. These instruments are:

- Regulations: legislative acts of the EU that have general scope, are obligatory in all of their elements, and are directly applicable in all member states.
- Directives: legislative acts of the EU that require the member states to achieve a particular result without dictating the means of achieving that result. Directives are only binding on the member states to which they are addressed. In practice, they are addressed to all member states.
- Decisions: binding legislative acts of the EU that are not of general application and only apply to those involved in the issue.
- Recommendations: non-binding EU acts aiming at the preparation of legislation by the member states.

The three binding policy instruments of secondary legislation (regulations, directives, and decisions) are strong and powerful forms of EU law. They are applied in the research policy domain but only minimally in the context of higher education. In the research policy domain in particular, the FPs are implemented through decisions and their more detailed elaboration (in the so-called Rules of Participation) is done through regulations.

The third type of European legal instrument includes the decisions by the European Court of Justice and the Court of First Instance. The European Court of Justice is the EU's Supreme Court, which adjudicates on matters of interpretation of EU law, most commonly claims by member states that the EC has exceeded its authority or by the Commission that a member state has not implemented a binding legislative act. The Court of First Instance (which is an independent Court attached to the European Court of Justice) hears and determines nearly all direct actions brought by individuals and member states, including actions against acts as well as inaction by Community institutions.

In the research and higher education policy-domains, several examples of this type of legal instrument can be found. Well-known is the landmark decision by the European Court of Justice in 1985 (the Gravier case) that access to university is covered under European primary legislation and that any discrimination based on nationality is against European law. As a result, EU students can only be charged the same (if any) study fees as national students. Another well-known case is that of 2004 where a French student claimed financial support from the British government on the basis of the non-discriminatory principle (the Bidar case). The Court judged in favour of the student. In the research policy domain, there have been many cases in which either one or more member states or the Commission ask for the Court's judgment. It appears that in the majority of cases the Court has ruled in favour of the Commission's position.

Nearly all policy issues in the European higher education policy domain are implemented by means of intergovernmental conventions and resolutions, without any legal authority at the level of the Union. In the context of the Bologna process, for example, the action lines (like the three-cycle structure, the Bologna process qualifications framework, and the coordination of quality assurance processes) are all the result of interministerial agreements. The EU does not have the authority to make use of its legal instruments in this policy domain. Given the subsidiarity principle, it necessarily limits itself largely to its instruments of information and communication.

The second category of European policy instruments are financial instruments. Most prominent in this category is the subsidy instrument, which basically refers to the power of signing cheques. Subsidies are payments made to individuals or organisations under the condition that the recipient supplies a particular product or service. In this sense, subsidies are contracts, under which payments are made when the recipient accepts the conditions set by the provider of the funds.

In the EU research policy domain, the FPs employ this policy instrument. In the higher education policy domain, the Life Long Learning Programme and the Socrates/Erasmus mobility programme provide examples of the application of the subsidy instrument.

In addition to the subsidy instrument, other financial instruments, particularly loans and warranties, appear to be increasingly considered in the European context. In the seventh framework programme, the Risk-Sharing Finance Facility is a clear example.

The third and final category of European policy instruments are those of information and communication. Two crucial instruments in this category are the Communication and the Open Method of Coordination (OMC).

The EC can publish communications in areas where it does not have authority to use legal instruments. In practice, the Commission uses this policy instrument for agenda setting and as a means to share its views on certain issues. Communications are usually preceded by consultations of the relevant stakeholders and/or expert groups.

Several examples of the use of the communication instrument have already been presented. Let me repeat a few. The re-launch of the Lisbon strategy started with a communication to the Spring European Council in 2005 (EC 2005e). The 2006 broad EU innovation strategy with its ten-point programme was presented as a communication from the Commission (EC 2006d). In the research and technology policy domain, the Commission used the communication instrument, among others, to develop the ERA and to set the 3% of GDP target for R&D investments (EC 2002a). In the area of knowledge transfer policy, the Commission used the communication instrument to suggest guidelines for effective knowledge transfer (EC 2006d, 2007f). In the higher education policy domain, the Commission used the communication instrument to suggest a modernisation agenda for European universities (EC 2006a) and to start a discussion on the labour market skills of doctoral graduates.

The OMC is a relatively new European policy instrument, which was created at the 2000 Lisbon Council as an instrument for intergovernmental policy analysis. The OMC works through information and communication mechanisms, such as indicators, benchmarking, and the sharing of best practices. Generally speaking, the OMC works in stages. First, a Council of Ministers agrees on a set of (often broad) policy goals. These are then translated by the member states into national and regional policies. Next,

specific benchmarks and indicators to measure best practice are agreed upon. Finally, the results are monitored, compared and evaluated.

The OMC is a "soft" policy instrument that has a decentralised approach. The agreed policies are implemented by the member states and supervised by the European Council. The Commission has primarily a monitoring role, but in practice it appears to have considerable scope for agenda-setting and persuading member states to increase their efforts to reach agreed policy objectives. The OMC indeed allows the Commission to use peer pressure and "naming and shaming" processes to create stronger member state involvement in European policy processes.

In the policy domains of research and higher education, several applications of the OMC can be found. The European Innovation Scoreboard monitors the member states' innovation performance. In the education policy domain, the progress reports analyse progress made towards the Lisbon education objectives and provide a platform to discuss education policies at the European level (see section 2.5).

2.5 Performance and Results

How is the EU performing in higher education and research? What are the results of EU innovation policy and its various sub policies? I will now present the general EU performance in higher education and research and some of the results of the EU innovation policy strategy. In section 3 a number of emerging policy issues will be discussed.

The results of EU policies are monitored by the various assessment and benchmarking instruments that the Commission has developed since the introduction of the Lisbon strategy and by now offer a rather comprehensive statistical overview of the performances of both the member states and the EU.

2.5.1 Innovation

The European Innovation Scoreboard is the main statistical tool for monitoring innovation performance. The Scoreboard was developed after the Lisbon European Council in 2000 and has been published since 2001. It shows the progress of the individual EU member states in terms of the Lisbon ambitions and compares and ranks them on a number of indicators.

In the seventh and eight editions of the Scoreboard (2007, 2008), innovation performance is measured by combining a set of indicators organised in broad categories. The 2008 edition offers 33 indicators in 3 main blocks: enablers (external drivers of innovation), firm activities (efforts that firms undertake to create innovations) and outputs (the outputs of firm activities). The indicators include: the population with tertiary education per 100 of population aged 25-64; broad-band access by firms (% of firms); public R&D expenditures (% GDP); business R&D expenditures (% GDP); venture capital (% GDP): European Patent Office (EPO) patents per million population; employment in knowledge-intensive services (% of workforce); and export of medium and high-tech products (% of total exports). A summary innovation index and an average growth rate of this index allow an assessment of the relative strengths and weaknesses of the innovation performance of the member states and a comparison of EU performance with the United States and Japan.

The comparisons show four groups of countries: innovation leaders, innovation followers, moderate innovators, and catching-up countries. The 2007 and 2008 Scoreboard editions show that the Scandinavian countries (Denmark, Finland and Sweden), Germany, the UK, and non-EU-member Switzerland are the European innovation leaders. Most of the other "old" member states (Austria, Belgium, France, Ireland, Luxembourg and the Netherlands) appear to be followers. The "new" members and the southern European countries are either moderate innovators or catching-up. At the same time, there appears to be a process of convergence in innovation performance in Europe. The countries showing below-average EU innovation performance are closing the gap with the innovation leaders and followers.

The US and Japan are still performing better in innovation than the EU, but the gaps, particularly with the US, are decreasing. Both the US and Japan lead in 12 of the 17 indicators for which comparable data are available (although these indicators are different). Compared to the US, the EU has improved its performance in, among other indicators, the number of science and engineering graduates and employment in medium/high and high-tech goods industries. On the other hand, the EU is lagging behind the US and Japan in areas like business expenditure for R&D, ICT expenditure and tertiary education attainment level.

Increasing investment in R&D is one of the key objectives of the Lisbon agenda, reflected in the target of 3% of GDP (two-thirds by the business sector). The Gross Domestic Expenditure on R&D (GERD) in the EU grew by 14.8% in real terms between 2000 and 2006. However, GDP shows a similar rate of growth over the same period. As a result the EU R&D intensity (GERD as a % of GDP) has not fundamentally changed over this period and stood at 1.84% in 2006. In comparison, R&D expenditure in the US grew by 10.1% in real terms over the same period and US R&D intensity decreased by 4.6%, due to a lower intensity of business funding of R&D.

Nevertheless, the EU is lagging behind the US, Japan and South Korea in terms of overall R&D intensity, due to a lower level of R&D funded (and performed) by the business sector. In 2006 the R&D intensity of the EU was 1.84%, significantly lower than that of Japan (3.39%), South Korea (3.23%) and the US (2.61%). In comparison, the R&D intensity of China in 2006 was 1.42%.

Business expenditure on R&D (BERD) as a percentage of GDP in the EU stands at 1%, compared to 2.62% for Japan, 2.43% for South Korea and 1.69% for the US. R&D financed by business as a % of GDP almost doubled in China between 2000 and 2006 and has now reached the EU-level (0.98%).

Government expenditure on R&D as a % of GDP was 0.63% in 2005 compared to 0.64% in 2000. This is 15% higher than in Japan (0.55%), but 21% and 17% lower than in the US (0.76%) and South Korea (0.74%) respectively (EC, 2008b).

The overall conclusion must be that, in terms of R&D expenditure, the EU is still a long way from its ambitious target (3% GDP). Generally speaking, the results of EU innovation policy are getting better but are still too limited. On average, the European innovation results are still disappointing.

Table1: R&D intensities (% GDP; 2006)

	R&D Intensity	R&D financed by business	R&D financed by government
EU	1.84	1.00	0.63
US	2.61	1.69	0.76
Japan	3.39	2.62	0.55
South Korea	3.23	2.43	0.74
China	1.42	0.98	0.35

Source: EC DG Research, 2008b

It should be pointed out, however, that there are large differences between the member states regarding innovation performance. The R&D intensity in Sweden (3.73%), Finland (3.37%), Germany (2.53%) and Denmark (2.43%) is well above the EU-average (1.84%), while these figures are relatively low for countries like Romania (0.45%), Slovakia (0.46%), Poland (0.56%) or Portugal (0.83%).

The innovation performance over time also shows considerable differences between EU member states. Looking at the four innovation categories mentioned before (innovation leaders, innovation followers, moderate innovators and catching-up countries), "growth leaders" as well as "slow growers" can be identified. Amongst the innovation leaders Switzerland appears to be a growth leader, while Denmark, Sweden and the UK are slow growers. Similarly, in the group of innovation followers Ireland and Austria are growth leaders, while France and the Netherlands are slow growers. There also are considerable differences between the innovation growth rates of the four groups (1.6% growth rate for the innovation leaders and 4.1% growth rate for the catching-up countries), which once more shows that there is group convergence (with the moderate innovators and catching-up countries growing at a faster rate than the innovation leaders and followers).

Furthermore, individual member states show large differences in performance on the various indicators. To give a few examples: the UK appears to be strong in venture capital; Finland in innovative SMEs; Germany in science & engineering graduates; and Estonia in business R&D investments (Innovation Scoreboard, 2008).

2.5.2 Higher Education

With respect to education and training, the Commission publishes its so-called Progress Reports. The first report was adopted by the Commission in 2004 and analysed progress towards the Lisbon objectives in the field of education and training by thirty European countries (including the then fifteen EU countries). The second report delivered a number of strong political messages to the European Spring Council of 2006 (when this Council reviewed the revised Lisbon strategy for the first time). The report stated that reforms are moving forward but more substantial efforts are required and that education and training must be viewed as a priority for investments.

The 2008 Progress Report (EC 2008c) offers a mixed picture of the results in the policy domain of higher education. The EU still suffers from relative under investment

in higher education, but has been able to increase its graduates particularly in mathematics, science and technology.

The total investment (public & private expenditures) in higher education institutions in the EU is 1.30% GDP, while in the US and Japan this is 2.45% and 1.85% respectively. The US total investment level is 245% higher than that of the EU. The difference between the EU on the one hand and the US and Japan on the other is largely the effect of a much higher private investment level in both the US (1.91%) and Japan (0.80%) compared to the EU (0.35%).

Table 2: Expenditure on higher education (%GDP; 2004)

	Total expenditure	Public expenditure	Private expenditure
EU	1.30	0.95	0.35
US	2.45	0.54	1.91
Japan	1.85	1.05	0.80

Source: EC 2008

The EU member states show large differences in terms of higher education expenditures. In Denmark (2.53%), Sweden (2.09%) and Finland (2.07%) total *public* expenditure surpasses the goal proposed by the EC (2% GDP)). On the other hand the share is below 0.8% in Italy (0.78%), Latvia (0.68%), Malta (0.55%) and Romania (0.70%).

Public investment accounts for more than 85% of the amount spent on tertiary education institutions in the EU. In Denmark, Finland and Greece higher education is almost entirely funded by public resources. Cyprus and Latvia are the two countries with the lowest share of public funding (up to 60% from private sources). Generally speaking, the member states that show high overall levels of R&D spending also show high shares of R&D investment in higher education.

The EU still has a very large student population (see Table 3). The total world tertiary student population has grown from 6.5 million in 1950 to 138.6 million in 2005; and since 1990 it has more than doubled. The EU student population has grown by more than 2.5 million. The growth of student numbers has been particularly strong in China, where the number of students has tripled since 2000. China now has more students than the EU or the US.

Table 3: Numbers of Tertiary Students and Graduates (2005)

	Students (1000)	Graduates (1000)
China	21336	2.400
EU	18530	3753.5
US	17488	2639
India	11777	-
Russia	9020	1813.3
Brazil	4275	564
Japan	4085	1067
Korea	3210	608

Source: UNESCO, Eurostat

The higher education systems of the EU member states are "mature" systems in terms of the participations rates of the 20 – 24 age group (see Table 4).The majority of the EU higher education systems have participation rates (20 – 24 years old) of well above 50%. Of the wider age group of 5 – 29 years old the EU shows a 60% education participation rate which is comparable to the US and 18% higher than in Japan.

In 2005 the EU graduated over 1 million more tertiary (ISCED 5 & 6) students than either China or the US. During the period 2000 – 2005 the number of tertiary graduates per 1000 young people aged 20 – 29 has increased in the EU by about 30%. Given strong growth in student numbers China might, however, overtake the EU in the coming years and become the world's leading producer of tertiary graduates.

The EU appears to perform well in terms of the numbers of graduates in mathematics, science and technology (MST). It has set itself the target (in 2003) to increase this number by at least 15% by 2010; and it had already achieved this target by 2005. While in 2000 the EU only produced 686.000 MST graduates, in 2006 it produced 886.000 MST graduates, compared to 425.000 in the US and 226.000 in Japan. However, the number of MST graduates is rising particularly fast in China, where it has more than quadrupled since 2000 to nearly 2 million per annum (including – lower level – ISCED 4). The number of MST graduates in 2006 in the EU was 13.0 per 1000 inhabitants aged 20 – 29, compared to 10.3 in the US. Here again large differences are found between the EU member states, with 21.4 MST graduates per 1000 aged 20 – 29 in Ireland, 17.8 in the UK, and only 5.0 in Hungary and 8.5 in the Czech Republic.

Table 4: Participation in universities in the EU (a percentage of the 20 – 24 age group)

	1998	2002	2006
Austria	50.6	46.4	47.9
Belgium	n.a.	57.1	61.9
Bulgaria	41.2	40.2	45.4
Cyprus	n.a.	26	32.1
Czech Republic	23.6	35.1	48.3
Denmark	51.2	61.8	78.6
Estonia	45.4	62.7	65.6
Finland	78.7	87.2	92.5
France	52.8	52.3	54
Germany	47	45.4	47.2
Greece	44.7	64.3	89.3
Hungary	29.9	45.3	65
Ireland	47.8	54.1	54.1
Italy	46.1	54.6	64.2
Latvia	43.1	68.3	73.4
Lithuania	39.3	62.6	76.7
Luxembourg	7.5	11.4	9.6
Malta	n.a.	24.4	30.4
Netherlands	46.8	53.3	60.1
Poland	39.1	60.6	64.7
Portugal	42.8	51.6	52.3
Romania	20.5	32.8	52
Slovakia	24.3	32.5	44.2
Slovenia	45.9	65.7	82.5
Spain	52.7	58.1	61.9
Sweden	51.1	74.2	80.2
United Kingdom	55	62	58.5
EU/27	*45.5*	*52.9*	*58.5*

Source: Eurostat (2008b)

The policy results thus far in the – geographically broader – Bologna process show that the European universities are going through a remarkable process of change. In less than a decade, the universities have become engaged in processes to adapt their curricula and degree systems, to implement quality assurance systems, to develop their governance models, and to professionalise their management. The European universities have taken responsibility for the emerging European Higher Education Area (EHEA) and support the underlying ideas of student-centred and problem-based learning (EUA 2007). Nevertheless, whether these changes will be enough to create the EHEA still remains to be seen. Much will depend on the ways in which the highly cherished diversity of European higher education systems can be combined with increased cooperation, harmonisation and transparency on the European scale (Floud 2006).

2.5.3 Research

The results in the policy domain of research and technological development are included in the independent five-year assessments of the research FPs. The third assessment reviews the implementation and achievements of the FPs over the period 1999-2003 (FP5 and – partly – FP6).

The review shows that, on the one hand, the FPs have played an important role in developing the European knowledge base. "The strength of emphasis on information and communication technologies and on life sciences has, for example, been instrumental in strengthening European capabilities. There has been strong interest from industry, universities and other research institutes. The FPs have played an important part in the generation and diffusion of new knowledge and the formation and reinforcement of inter-organisational networks." But on the other hand, the achievements of the programmes, in terms of direct contribution to innovations with the potential to dominate global markets, are still limited (Assessment FPs 2004, II).

Regarding FP6, the assessment praised the new instruments of FP6 (the Networks of Excellence and the Integrated Projects) for their ambition and their emphasis on transnational collaborative research, but also pointed out the relatively high costs and risks of participation in these instruments for industry partners, notably SMEs, and the need for more flexibility and simplification (Marimon 2004).

The working document accompanying the 2007 paper on the European Research Area (ERA) (EC 2007b) provides an overall evaluation of research conditions and performance in the EU.

It shows that the number of full time equivalent (FTE) researchers per thousand labour force participants amounted to 5.4 in the EU in 2003, compared to 10.1 in Japan and 9.0 in the US. Nonetheless, this number grew at an annual average rate of 2.8% between 1997 and 2003. This deficit in the proportion of researchers in the labour force compared to Japan and the US is mainly found in the business sector. Of the 1.18 million researchers (FTE) in the EU in 2003, 49% were employed by the business sector. This compared to 67.9% in Japan and 80.5% in the US (European Communities 2005). In contrast, the EU university sector is relatively larger than those in the US and Japan, with nearly 37% of the researchers employed in the EU university sector, compared to about 15% in the US and 25.5% in Japan (EC 2007b, 49).

Especially in the "old" member states, the aging of the research labour force is becoming a concern. In 2003, 34.7% of highly qualified science and technology employees were in the 45-64 year-old age group, compared to 30.8% in the 25-34 year-old age group. In addition to the need to expand the research workforce, there also is a clear need to ensure a sufficient replacement rate. Fortunately, as mentioned before, the EU produces a substantial number of science and technology graduates. Women are still under-represented among both science and engineering researchers and graduates. Their share in the total number of researchers in 2002 was below 50 percent in nearly all member states (EC 2005d).

The intra-European transnational mobility of researchers and doctoral candidates is poor. Only around 5 percent of doctoral candidates and at most 10 percent of researchers at the postdoctoral level are involved in mobility processes. In addition, intersectoral mobility (between the private and public sectors) is still underdeveloped,

largely because of cultural differences, but also because of practical issues such as pension build up (EC 2007b).

There is a considerable drain of EU graduates and researchers, particularly to the US. The number of EU researchers working in the US amounts to some 5 to 8 percent of the total EU researcher population. Most of these researchers are reluctant to return to Europe, primarily because of a lack of attractive research conditions and career prospects.

The overall situation in terms of quality of the research output in the EU can be characterised as "generally good on average, but with a very limited basis of universities at world-level" (EC 2007b, 50).

In terms of both total number and world share of scientific publications, the EU is the world leader. In 2004, the EU's world share was 38%, compared to 33% for the US and 9% for Japan. China ranked fourth with 6%. However, the picture changes when publications are compared to population. Then the US leads with 809 publications per million population, followed by the EU with 639 and Japan with 569 (European Communities 2005).

Evidence clearly shows that the EU's scientific impact lags behind that of the US in almost all disciplines. The data on the field-normalised Citation Impact Score per scientific discipline show that the EU's scientific impact is around or below world average in almost all disciplines. The EU scores above world average in only 6 out of the 37 fields and has lower scores than the US in 35 of the 37 disciplines.

An institutional citation impact analysis per discipline shows that of the universities that are world leaders in at least one discipline only 26% are EU universities while 81% are US universities. In addition, the number of disciplines in which an EU university is the world leader is on average substantially lower than that for US universities. A number of EU universities are considered among the top universities in the world, but their top is generally less broad than that of US universities (EC 2007b).

The EU research performance can also be assessed by analysing the international university rankings. Although there are several problems with these rankings and their value is limited because of methodological flaws (see Van Vught, 2009), they nevertheless provide an indication of the university research performance of different countries (see Table 5).

Table 5 shows the scores of a number of countries in the *Academic and Ranking of World Universities* (ARWU) from Shanghai's Jiao Tong University and in the *World University Ranking* (WUR) of the Times Higher Education Supplement. According to ARWU the EU had 197 of the top 500 universities, while 166 were in the US. The UK and Germany had the highest number of top universities in Europe. When the number of relevant institutions per country is taken into account, the Netherlands performs particularly well (12 out of only 13 universities) and so do Sweden (11 out of 17) and Denmark (4 out of 9). The EU appears to have a solid base of good quality universities if the share in the top 500 (197 out of around 700 doctorate granting institutions) is considered. The US share is 166 out of 413 doctorate awarding universities.

Table 5: Results of two university rankings (2007)

	ARWU		WUR
	top 500	top 100	top 100
EU 27	197	29	34
US	166	54	37
Japan	32	6	4
China	25	0	3
Denmark	4	1	1
Germany	41	6	3
Finland	5	1	1
France	23	4	2
Netherlands	12	2	4
Sweden	11	4	1
UK	42	11	19
Norway	4	1	0

However if only the top 100 universities are considered, the performance of the European universities lags behind the US. According to ARWU, of the top 100 universities, 54 are located in the US and only 29 in the EU. The US leads especially in terms of institutions at the very top: it has 17 of the ARWU top 20 universities (with Harvard as top of the list). The EU has only two institutions in the top 20: Cambridge, ranked fourth, and Oxford, ranked tenth. Japan has one: Tokyo University, ranked 20th.

Regarding the results of the *policies* on research at the EU level a number of issues have been identified that relate to the R&D performance of the EU (EC 2007b):

- The ERA-NET instrument has made a start at addressing the inefficiency and the fragmentation of the European research system. However, the volume involved is still marginal and the national and regional programme owners are still reluctant to further develop genuine joint research programmes.
- Regarding research infrastructure, good progress has been made. A first milestone was the adoption of the European Strategy Forum for Research Infrastructures (ESFRI) Roadmap. However, new legal, institutional and financial tools need to be developed for implementation of the Roadmap.
- In the area of international research cooperation, the EU has demonstrated that it is able to show leadership to address global challenges. The International Thermonuclear Experimental Reactor (ITER) is a showcase. However, these initiatives are far from systematic and often poorly coordinated with those of the member states.
- Although there is some success in better exploiting human resources, Europe still lacks an open, competitive and attractive market for researchers. Some researchers are still leaving the EU. Others cannot enter research careers in Europe.

- Private investment in research is still far too limited. Europe's business-funded research intensity has not increased since 2000, and the gap between the EU and the United States has not been reduced.
- The research policies of the member states have certainly evolved, but the question is whether the pace of national policy reform is sufficient.
- Some convergence in national policy making is materialising, largely through the communicative instruments of the Commission.
- Although transnational cooperation is an element of member state research policy, there is little evidence that national policymakers have taken ownership of the ERA.

The conclusion regarding the results of EU policies with respect to higher education and research is that while some results are visible, the innovation policy objectives certainly have not been reached. The policy instruments can be further developed and the relationships between higher education policy, research policy and innovation policy can be further intensified.

The recent global financial and economic turmoil of course has its impacts on the EU and will require it to increase its innovation efforts. In its 2009 strategy paper the EC indicates that it will continue to pursue its broad-based innovation strategy and to "deepen its European Research Area" (EC 2008a, 4). The EU needs to move up a gear if it wants to reach the ambitious objectives of its Lisbon agenda.

3. Issues in EU Higher Education and Research

3.1 Introduction

Like many other nations and trade blocks around the world the European Union has reacted to the pressures of globalisation by developing a policy strategy focused on innovation. The EU Innovation Agenda (Lisbon Agenda) is the EU's response to the challenges and opportunities of globalisation.

The EU's policy strategy is founded in a "state supervision model" (see section 2.2) in which competition and cooperation are combined. In the EU innovation strategy the supranational authority is bounded by political principles, in particular the "subsidiarity rule" which limits the competences of the European Commission (EC) to intergovermentally agreed upon policy issues. Partly as a result of this, the EC has developed policy instruments that are being used as frameworks for policy design and implementation by other actors (national governments, higher education institutions, business & industry). In this context the EC has increasingly focused on financial and information instruments (see section 2.4).

As the EU and its member states pursue policies designed to jointly react to global competition, it is becoming increasingly clear that higher education and research are critical components to fully realising the potential gains from the innovation strategy. European higher education and research have shown themselves to be no stranger to change: for the better part of three decades higher education and research have been included in broader Western and Central & Eastern European reforms. Since the late 1990s though, the rate of change has accelerated to unprecedented levels, largely on the shoulders of the EU Innovation Agenda (2000) and the Bologna Declaration (1999). The general objectives of both developments are to reform the continent's still fragmented higher education and research systems into a powerful and integrated knowledge based society and to make these systems more attractive and competitive on a global scale.

There is a major challenge for the European higher education institutions to meet society's high and numerous expectations. But is it plausible to expect to have simultaneously mass systems with the widest possible access, and offer high quality preparation for the professions, a humanistic spirit and research excellence? Europe is developing its European Higher Education and Research Areas (EHEA and ERA) but there are several issues remaining as major objects of concern. It is clear that Europe cannot and does not want to compete internationally on the basis of labour costs. It intends to compete in terms of productivity and innovation. Innovation processes are assumed to be founded on both new knowledge and larger numbers of employable knowledge workers. The creation of new knowledge should lead to new products and services as well as to higher levels of productivity. The increase in trained knowledge workers should allow the EU to address the new skill needs of the knowledge economy. The EU innovation strategy thus has a clear impact on the ways knowledge creation processes are organised and on the educational provision structures in higher education.

New knowledge is driven by the search for innovation; education is first and foremost seen as a process of producing relevant professional qualifications for the labour market.

The EU wants to develop its innovation strategy to be able to react to the pressures of globalisation, and it needs higher education and research to contribute to this strategy. But the "European model" is assumed to be special in its search for the combination of competition and cooperation, and its efforts to join innovation with social cohesion.

In the following sections I will discuss a number of issues in the fields of higher education and research that are directly related to this "European model". These issues can be seen as the major challenges of current EU higher education and research policies and are close to the heart of the overall EU innovation agenda.

3.2 Participation and Access

The future demographic situation of Europe will have major impacts on its higher education and research systems. According to UN projections, the EU share of the world population will decline between 2008 and 2050 by almost one third (from 7.5% to 5.2%). The world population will increase from 6.5 to 9.6 billion while the EU population will decrease from nearly 500 million to 470 million. The decades ahead will show decreasing cohorts of the traditional age groups seeking higher education. On average the EU will be confronted with a reduction of 23.3% in the 20 – 24 years age group by 2050, with decreases of more than 50% for countries such as Poland and Bulgaria. The number of European youngsters participating in higher education is likely to decline.

Between 1960 and 1980 the enrolments in European higher education increased by a factor of ten. The rising social demand and the absorption capacity of the labour market created a massification process in higher education, leading to both a substantial expansion of the EU higher education systems and a changing position of these systems in society (from elite training to manpower production). However, regarding the educational attainment level of the adult population (25 – 64 years old), the EU is still outperformed by both the US and Japan (and Australia and Korea) (see Table 6).

Table 6: Higher education attainment of 24 – 65 years old (%) (2005)

EU 27	US	Japan	Australia	Korea
23	39	40	32	32

Source: OECD and Eurostat

The combination of the future decline of the traditional age cohorts enrolling in higher education and the still relatively low educational attainment level of the adult population confronts the EU with a major challenge regarding its innovation agenda. The labour market in industrialised countries shows that the "race between higher education and technology" (Tinbergen, 1977) is still being lost by education: the demand for higher education graduates keeps increasing beyond the increase in supply as a result of the sequence of technological innovations. Like many other nations in the world, the EU member states will have to reduce the gap between the demand and the

supply of graduates. Raising higher education enrolment rates particularly in undergraduate higher education is not only a matter of social cohesion and stability, but also a necessity in a knowledge-based economy. The EU needs more first degree graduates and it needs these graduates to be directly employable on the labour market. So the massification of European higher education will have to continue and the enrolments will have to keep on growing. The recent results of skill needs forecasts at the EU level shows that the demand for skills and qualifications is being driven upwards in most occupations. The total employment increase in Europe between 2006 and 2015 will be around 13.5 million new jobs, comprising more than 12.5 million additional jobs at higher education level and almost 9.5 million jobs at medium education level, whereas the demand for jobs requiring low qualifications will fall by 8.5 million (CEDEFOP, 2008). In 2015 around 30% of jobs in the EU will need higher education qualifications. To address this demand particularly the undergraduate education systems of the EU member states will have to grow and larger numbers of first degree students will have to enrol. However, given the decreasing future traditional age cohort enrolments, the EU also urgently needs to address new recruitment areas (see section 3.6).

In addition to the need to increase higher education enrolments, "access and equity" is another issue that urgently needs attention. Despite the rapid expansion of European higher education, students from lower socio-economic groups continue to be underrepresented. An important dimension of the "European model" is the political wish to make sure that it is not socio-economic background but talent that counts in admission to higher education. While this objective has been kept in mind during the massification of European higher education, the result is that lower socio-economic background under-representation is still a problem. In particular the children of immigrant parents with low or no educational attainment have difficulty in reaching higher education. Higher education participation rates of immigrant children have been on the rise in the EU but are still below those of the original population. Increasing these rates is important for the social model of Europe, but also to address the problem of future shortages of higher education graduates.

3.3 Funding

The political ideal of a higher education system without restrictions on admission and fully publicly financed has been widely shared in Europe in the era after the Second World War. Germany provides a case in point. Article 12 of the German Constitution states the right to choose an occupation and the prohibition of forced labour. This article has often been referred to in order to argue in favour of full public financing of higher education and against tuition fees. However, in 2005 the Germany Federal Constitutional Court decided to overturn a ban on tuition fees, allowing each state to decide whether and how much its higher education institutions can charge for their services.

Private higher education – in the sense of higher education institutions being largely funded from private sources – is politically hardly an issue in the EU. Although private institutions exist, the vast majority of EU universities are predominantly publicly funded. But the ideal of full public financing of higher education – still widely

pursued in many EU member states – has a negative effect on European higher education and research. Government finance simply is unable to provide sufficient funds for the many tasks that the European higher education institutions are confronted with. If European higher education is to contribute to the innovative capacity of the EU and if it is expected to provide first class education for growing numbers of students and to perform world-class research, it cannot only be funded from the public purse. The increasing demands on higher education institutions in terms of numbers and quality on the one hand and the limitations of public finance on the other will not allow the EU to close the present gap between per student expenditures in the US and the EU (2.5 times higher in the US). Hence, the differences in performance and attractiveness between the US and the EU systems will remain. If the EU wants to be a world-class higher education and research performer, it needs to boost its expenditures in these domains. There is only one solution: to increase private finance for higher education and research.

The funding gap between EU higher education and research investment and that of its main competitors (the US and Japan) has become a major concern of EU policy. The European Commission (EC) has pointed out that this funding gap is a serious obstacle to meeting the Lisbon goals, and has particularly emphasised the importance of fiscal rules enabling the increase of private investments in both higher education and research. The EC also points to the need for cost-sharing and suggests that member states critically examine their current mixes of student fees and support schemes in the light of their actual efficiency and equity outcomes. However, the issue of increased private financing largely remains a political taboo in Europe.

In the last 10 or 20 years most EU member states have revised their higher education funding systems. The extent to which the reforms have been implemented varies considerably, but no country has been able to ignore the debate on higher education funding entirely.

There are many common characteristics in EU higher education funding reforms. In general terms, there is a tendency towards increasing spending autonomy leading to full freedom in the internal allocation of resources of higher education institutions; there is a development towards greater transparency and simplicity in the funding mechanisms; and there is a move towards cost-sharing (Kaiser *et al.*, 2002; Strehl *et al.*, 2006; CEGES, 2007; Lepori *et al.*, 2007). More specifically the developments are:

- a shift towards formula based funding
- a change from open-end funding to closed budgets
- a shift from input-based to output-based funding
- a change towards linking basic funding to objectives through performance indicators
- the introduction of funding agreements to link performance to funding
- increasing the share of funding allocated through competition
- increasing the share of private contract funding
- introduction and increase of tuition fees
- increasing reliance on student loans instead of grants

Focusing on the funding of research, recent studies show that in the EU project funding both from public and private sources has become more important. Lepori *et al.* (2007) recently published a comparative analysis on the changes in public project

funding schemes during the past three decades in six European countries. Although there are substantial variations between countries, they found three interesting commonalities or patterns: a strong increase in the volume of project funding; a differentiation of funding instruments (centers of excellence, large programmes within the fields of information technology, genetics, nano-tech and so on); and a general shift towards instruments oriented to thematic priorities.

A relevant question is how the funding reforms influence institutional strategies and behaviour. How do institutions react to the new financial conditions they are confronted with? A recent OECD study by Strehl *et al.* (2006) concludes that funding systems are major influencing factors on institutional strategies. These strategies primarily focus on core outputs, scientific and administrative staff, and organisational structures and processes. The new funding regimes increasingly reflect resource scarcity which increases the awareness of efficiency, performance and effectiveness. An additional trend concerns an increased interest in external funding although most institutions remain to a large extent dependent on public resources.

The autonomy of universities in the use of public funding has increased considerably in the last decade or two. Unlike before, almost all European higher education institutions receive public funds as a block grant.

Furthermore, internal resource allocation models appear to be increasingly used for institutional strategy development. Universities appear to implement policies to encourage research concentration to build competitive strengths. Thus, developments in the national funding environments are mirrored by developments inside the universities – although performance based funding remains a contentious issue.

The overall picture of the impacts of the funding reforms on higher education institutions shows an increasing focus on institutional profiling and strategy development as a result of more spending and internal allocation autonomy. However, the major issue of the private investments in EU higher education and research appears to remain unaddressed. So far funding reforms have not enabled European higher education institutions to increase their non-government funding levels significantly.

3.4 Tuition Fees and Student Support

There still is considerable ambiguity in European higher education over whether tuition should be charged, and, if so, to which students. Proponents of charging tuition fees argue that the often high private rates of return – that is, personal benefits – of higher education justify private contributions from students through tuition. One could argue further that different tuition rates may emerge for different subjects, disciplines, institutions or countries because the educational costs and private benefits may vary between programmes (Johnstone, 2006). In addition, tuition fees function as a market device, stimulating quality in education and guaranteeing that students and governments receive value for money. Finally, it has been pointed out that tuition fees stimulate students to make better enrolment decisions based on their abilities, interests and aims.

Opponents of tuition fees claim that the positive externalities of higher education justify high public subsidies. They stress that tuition costs impede access to higher

education, particularly by preventing students from disadvantaged backgrounds from enrolling into higher education, which may lead to social exclusion.

In many European countries these debates have been widely visible in policy proposals and reforms to introduce, increase or differentiate tuition fees (Jongbloed, 2004). Examples are the introduction of tuition fees in the UK (in 1998), Austria (in 2001) and in many German states since 2006. In other countries tuition fees have been substantially increased, such as in Portugal and the Netherlands. A diversification of tuition levels has been debated in some countries and implemented in England and Wales. Another interesting development is the issue of "dual track tuition fees" where fulltime students or those admitted on government funded student places pay no fees but other students may have to pay cost-covering fees, as in Hungary, Poland, Romania, Slovakia and Slovenia. Finally, tuition fees may remain a taboo subject as in the Scandinavian countries or they may have been abolished, as in Ireland in 1995. Scotland replaced its tuition fees in 1999 by a contribution to be paid by graduates.

All these debates have a strong link with equity of educational opportunity issues, and relate directly to the political debates about the social dimension of the "European model". It should be pointed out, however, that in contrast to the often argued position that tuition fees have a strong negative impact on access to higher education, particularly for those from lower socio-economic backgrounds, most research shows that students' choices are relatively price-inelastic (Universities UK, 2007).

Student financial support is another issue that has been on the policy agenda of both the EU and the member states. The importance of student financial support systems for the development of higher education in Europe is exemplified by various initiatives by the European Commission such as the Erasmus Programme and the increased attention for the portability of student financial support in the Bologna Process.

At the level of the member states particularly student loans have gained policy attention. Student loans have been introduced in the UK (1990), in Austria (2001) and in Hungary (2001). In Germany and Portugal private loans initiatives were started in 2006. In other countries the share of student loans has gradually increased and/or replaced grants, such as in the UK and the Netherlands. Though it is often argued that this changing balance between grants and loans will have a negative impact on access to higher education, so far studies indicate that students' choices are hardly affected by financial consideration, even though students from lower socio-economic backgrounds are often more debt averse (Teixera, 2006).

In the OECD countries private contributions to higher education (household expenditure as a percentage of total higher education expenditure) has on average increased by 5% between 1995 and 2005 (with large increases in Japan and Australia). However, most EU countries remain very hesitant in this respect. At this moment the frontrunner in tuition fees in the EU is the UK (after the second increase in 2006), followed by the Netherlands.

It appears that the political door for tuition fees (in combination with student financial support) is still only ajar in European higher education, and that an increase of private funding is not to be expected in the near future.

3.5 Governance

Higher education governance is a highly contested concept that concerns the exercise of collective control towards common goals in higher education systems and institutions. It relates to arrangements in which public as well as private actors seek to solve problems or create opportunities in these systems and institutions. It is about interest articulation and goal realisation. It raises core questions about who decides when on what. Higher education governance concerns both the (system) governance of higher education and research systems and the (institutional) governance of higher education institutions. System governance refers to the arrangements on the macro- or system-level (e.g., laws and decrees, funding arrangements, evaluations). Institutional governance regards to the arrangement within higher education institutions (e.g., lines of authority, decision-making arrangements). Higher education governance is thus understood as the external and internal coordination of higher education and research and has both formal and informal components. In higher education and research governance refers to "the formal and informal exercise of authority under laws, policies and rules that articulate the rights and responsibilities of various actors, including the rules by which they interact" (Eurydice, 2008, 12).

In the EU until recently the higher education governance policy focus has largely been on the relationship between institutions and the state. However, since the 1990s shifts in system governance are evident. In terms of system governance there is a growing recognition that relationships are not only more complex and dynamic but involve more actors from various levels. This overall shift has been termed "from government to governance", which reinforces the view that it is not just the state that rules. Authorities and powers have been redistributed across the various policy levels. In many EU countries, coordination has changed from a classical form of regulation dominated by a single actor (government) to forms in which various actors at various system levels coordinate the system. Coordination increasingly takes place through interconnected policy levels with a substantial number of actors influencing agenda setting, policy development, policy determination, policy implementation, and evaluation. A recent study on higher education governance across the EU member states reveals the emergence of "multi-level and multi-actor governance" with an increased emphasis on competition, performance assessment, quality assurance and new funding arrangements (CHEPS, 2006). The changing model of higher education system governance in the EU shows a dissipation of traditional national government authority in three directions (Pierre and Peters, 2000). One is the upward shift of policy agendas, strategic choices and policy frameworks to the supranational level of the EU. A second is a downward shift as provinces, local governments and higher education institutions themselves are granted greater operating autonomy. The third shift has been outward: traditional government tasks are moved to external actors, such as agencies, NGOs and foundations.

Deregulation in the form of enhancing institutional autonomy has probably been the overarching system governance trend in European higher education over the last two decades. The prevailing policy belief is that higher education and research in Europe should be freed from overregulation and micro-management while accepting in

return full institutional accountability to society at large. A related view is that more autonomy within the higher education institutions will improve the performance of those institutions and of higher education systems overall. The rationale for this rests on the autonomous higher education institution being able to control and steer its outcomes and performance.

Looking at the changing degree of autonomy of the higher education institutions in the European higher education systems two remarks must be made. First, there are countries where autonomy has been granted to the individual faculties instead of the institutions. In these cases, such as in the Balkans, growing institutional autonomy has had a different meaning. Second, in some countries the state used to play a less visible role in steering higher education institutions. In these cases, with England as the obvious example, institutional autonomy has traditionally been higher than in the continental European countries.

Nevertheless, the most significant trend in higher education governance in the EU has been the widening of institutional autonomy, offering the higher education institutions increased institutional discretion over the use of financial and physical capital and greater authority over personnel matters. However, this increase of institutional autonomy has been accompanied with a growing emphasis on institutional accountability. A new precarious balance between autonomy and accountability appears to be developing with a reduction of traditional governmental control, but with the introduction of new regulatory supervision and decision-making frameworks, in the form of the formal strengthening of the authority of executive functions, a loss of influence of collegial bodies and an increase in the influence of external stakeholders (OECD, 2008).

As a consequence of the governance changes at the system level, some significant institutional governance changes can be identified at the level of the European higher education institutions. Enhancing institutional autonomy – a governmental policy in many EU member states – leads to the increase of authority of institutional leadership and important changes in the decision-making processes in the institutions. Traditional notions of collegiality and consensus-based decision-making are increasingly coming under pressure, making room for "business-like" management and the "professionalisation" of administrative structures. Borrowing instruments from the private sector, institutions try to enhance their possibilities to streamline the organisation in order to become more effective and efficient. Developing institution-wide policies, – always problematic because of higher education institutions' fragmented character – strategic planning and "profiling" are other trends in institutional governance. Higher education institutions nowadays behave as "corporate actors" increasingly pro-actively engaging in dialogue with their external environment, creating strategic partnership and alliances with other organisations (public and private) and building networks and consortia with colleague institutions both nationally and internationally.

The trends in both system and institutional governance in higher education in Europe appear to have a major and largely unexpected effect. The increased institutional autonomy and the resulting corporate behaviour of higher education institutions appear to have amplified the processes of academic mimicry and drift in European higher education. Autonomous institutions increasingly try to create attractive and respectable images of themselves hoping that such images will increase

their financial and other resources and particularly their international academic prestige. The dynamics of European higher education is increasingly the result of an inter-institutional competition for reputation. European higher education appears to be more and more engaged in a "reputation race" (Van Vught, 2008) in which higher education institutions try to create the best possible images of themselves, preferably as highly regarded research-intensive universities. The recent international attention given to rankings of "world-class" universities has only reinforced this process (see section 2.5.3).

The reputation race has triggered a new discussion in European higher education about diversity and differentiation. Policy-makers begin to wonder whether institutional autonomy should perhaps be combined with an increased transparency of the missions and roles of different types of institutions, in order to allow them to meet the needs of different stakeholders. I will return to this topic in section 3.7.

3.6 Internationalisation

In the EU, internationalisation is seen to serve two strategic European policy goals. In the Lisbon agenda and the Bologna Process internationalisation is assumed to be an effective instrument both to ensure the employability of graduates on the integrating European labour market and to promote European higher education worldwide.

Employability has become a rather ambitious as well an ambiguous concept in the framework of debates about European higher education. The shift in meaning connected to this concept should be emphasised here. Originally, the European Commission established support programmes to improve the (re-)integration into the labour market of unskilled or low skilled persons and of persons who had been unemployed for an extended period. In contrast to these previous target groups, employment of higher education graduates was never a serious concern and statistics showed that unemployment among higher education graduates was considerably lower than for persons not having participated in higher education.

Why then has the debate about "employability" extended to now encompass higher education graduates? Haug (2005: 204) suggests that the Bologna Process has had a major impact on this debate: "The Bologna Process has had a strong and positive effect on the debate about the relationship between higher education and professional life, in particular concerning the preparation of graduates for the labour market. It has raised the profile of the issue and increased the awareness that the employability of graduates has become an increasingly important and shared concern all over Europe". The debate about employability forces all higher education institutions to elaborate the consequences of higher education for the professional life of their graduates and reshape curricula and study provisions accordingly. In all Bologna signatory countries (including in those in which "professional higher education" has been institutionally separated from "academic higher education") the systems logic of a three-cycle degree structure forces the higher education institutions to think about the shape and content of in particular their undergraduate programmes in terms of professional relevance. The graduates of these programmes are assumed to have the qualifications and skills of the modern knowledge intensive labour market. In this sense undergraduate higher

education in the EU is becoming more professional as a result of the Bologna internationalisation process.

The other strategic goal of internationalisation (the promotion of European higher education) has to do with the European dimension in higher education curricula, national mixes of students and of teachers/scholars, mobility, etc. On a practical level, it is further connected to immigration policies of the individual European countries (and, where applicable, of the EU), and to the tools of those policies such as visas. A link with funding issues lies in the question of portability of student grants and loan schemes across the "Bologna countries".

Increasing international competition between higher education systems and institutions is discussed widely in the EU. Crucial in these discussions is a change in the paradigms of internationalisation, which has been described as a shift from cooperation to competition (Haug, 1999; Van der Wende, 2001; Van Vught, *et al.*, 2002).

In Europe, comparisons with US higher education appear to be an issue of growing concern. More generally, a strong threat is felt from the Anglo-Saxon higher education systems and their strong position in the world-wide higher education market. With the advantage of English as the *lingua franca*, flexible degree structures, strong traditions in distance learning, off-shore delivery strategies, (differential) fee systems providing incentives to institutions to actively market themselves, also overseas, and governments that actively support such international marketing strategies, they have an undeniably strong foothold in the world-wide market. Higher education institutions in several Anglo-Saxon countries such as the US and Australia have embarked on explicit (and sometimes even aggressive) competitive approaches to the internationalisation of higher education. In contrast, most continental European countries seem to pursue a more cooperative approach. Although various countries are developing a certain market orientation in higher education, in general continental Europe tends to stay away from an actual market and trade perspective on higher education. This can mostly be explained from a political and value-based perspective; in many countries free access to higher education is seen as a (social-) democratic attainment. A view on higher education as a commodity that can be traded on a (world) market is perceived to be in conflict with this. As a consequence, the motivation or rationale to compete internationally may be absent, or found undesirable at national and institutional levels. Moreover, in cases where higher education funding is virtually completely provided by the state and no fees are charged to students, few incentives and no real options for competing internationally exist.

Consequently, the European higher education and research systems are not attracting world-wide the most talented students and researchers. On the contrary, in terms of talent, Europe appears to still be suffering from a brain drain.

In 2005, world-wide 2.7 million students were enrolled outside their country of citizenship (this is slightly more than 2% of all students). Of these 84% were studying in the OECD area. The US received most foreign students (22% of the total), the UK 12%, Germany 10%, France 9%, Australia 6%. More than twice as many students go to the US from the EU as from the US to the EU. More than 20% of outgoing students from the Czech Republic, Sweden and the UK study in the US.

Student mobility amongst member states is an important policy goal of the EU higher education policy and is particularly stimulated through the Erasmus programme. In 2006/07 0.8% of the EU student population participated in this programme. The

programme would have to more than double to include 2% of the EU student population per year.

As was argued before (section 3.4) the European higher education institutions will have to increase their attractiveness for talent because of demographic reasons. European higher education will be under pressure to raise participation rates from outside Europe to compensate for its own supply deficit. But the Lisbon ambition to become the most competitive economy in the world also forces the European higher education and research systems to rethink their internationalisation strategy. An explicit joint strategy to recruit the best and the brightest from outside Europe will be a necessary condition to reach the ambitions of the Lisbon agenda.

3.7 Diversity

The EU Lisbon ambitions have triggered a number of reactions in European higher education and research that may eventually have a crucial impact in terms of the institutional diversity of these systems. Institutional diversity refers to the differences between higher education and research institutions, in particular regarding their missions and profiles.

The EU research policy has a clear impact on European universities. The 6th and 7th Framework Programmes are among the largest R&D funding programmes in the world and provide vital opportunities for universities with limited research funding. In addition, for many universities EU funding for collaborative research is a key element in their pursuit of international academic repute. In the context of research, there is a growing importance of the supranational EU policy echelon and a slowly increasing alignment between the EU policies and those of the member states. The EU research policy challenges European universities to increase their quality and reputation and to act at a global scale. European universities are being stimulated to respond to the growing international academic competition and to contribute to economic growth and social cohesion.

In the higher education policy context, the EU calls for a "modernisation strategy". The European Commission wants European higher education institutions to become more attractive, increase their academic quality, intensify their relationships with business and industry, strengthen their human resources and compete internationally. The EC sees the diversity of European higher education as a strength but also suggests that this diversity needs to be combined with increased compatibility.

As a result of the EU's higher education and research policy focus the "social contract" between society and European higher education appears to be changing. In their educational programmes higher education institutions are urged to develop closer links with industry and society at large. In their research programmes they are prompted not only to address knowledge creation but also knowledge diffusion processes.

In addition, as has been discussed before, the overall system governance model of European higher education institutions also appears to be changing. The move to more accountability has brought with it recognition of stakeholders' needs and interests, and hence the acceptance by higher education institutions of their social embeddedness and their relationships with and dependencies on various societal organisations.

However, the effects in terms of institutional diversity are still hard to assess. The EU policy ambition appears to be to combine diversity with compatibility, and to create an integrated European higher education system that can become a competitor to the dominant US system. In this integrated system a diversity of institutional roles and missions can possibly be seen as an important characteristic, or even as a condition to combine global academic competiveness with socio-economic relevance and regional impact. But so far, the EU policy programmes remain relatively quiet on this issue, giving the impression that institutional diversity is not a major issue in the EU policy context.

Nevertheless, there appear to be two diversity effects of EU *research* policy in particular that deserve attention. Both may be unintended "by-products" of EU policy, but both are real and increasingly visible.

The first of these two effects can be described as the academic stratification of the overall European higher education system, a process of increasing vertical diversity. This effect is the combined result of the changing participation processes of European higher education institutions in the research Framework Programmes (FPs) and the occurrence of a counterproductive consequence of the reinforcement policy regarding the interaction between higher education and industry. With regard to the former, it has been noted that past success in the FPs appears to be an indicator for successful future participation in these programmes (David and Keeley 2003). What appears to be happening is the occurrence of the well-known Matthew Effect. Research groups that have been successful in obtaining funding appear to increase their chances of getting funds in the future as well. The other process is the counterproductive effect of the EU's push towards closer links between higher education and industry. It appears that particularly those higher education institutions in a relatively weak financial position are increasingly forced to accept industrial funding for often routine contract research. Faced with the impossibility of charging real research costs, these institutions are often confronted with a further weakening of their financial situation and a decrease in their capacity to undertake academic research. (Geuna 1999). The combined outcome of both processes is an increasing differentiation between academically and financially stronger and weaker institutions, and hence a growing vertical diversity in the overall European higher education system.

The second unintended effect is a growing regional diversification in European higher education. This appears to be the outcome of three interrelated processes emerging from EU research and innovation policies (Frenken et al. 2008). The first is the preference of researchers in "excellent regions" to collaborate with each other, rather than with colleagues in lagging regions. EU research policy appears to stimulate the concentration of talent in the richer and academically better-equipped regions of Europe. Lagging regions find it difficult to participate in successful European research networks and appear to have to cross a threshold of quality and size before they can do so. Secondly, the EU policy objective of free movement of people appears to not only lead to an increased mobility of researchers but also to the concentration of talent in a selected number of excellent regions. The most talented researchers compete for positions at the most prestigious universities, rendering it difficult for the lagging regions to retain talent within their borders. Thirdly, the sectoral structure of the poorer European regions is usually characterised by a dominance of low-tech and

medium-tech activities that do not fit the thematic priorities of EU research policy. The FPs almost exclusively concern high-tech sectors, thus creating a situation in which the research subsidies are becoming concentrated in the richer regions. The result is an unintended but nevertheless real effect of regional diversification. The geography of European higher education and research is changing from one based on the priority of national borders into one based on the clustering of talent. Wealthier regions are increasingly able to profit from the general European innovation policy, while poorer regions are left with the resources of the cohesion policy. This process also appears to lead to a growing vertical diversity in Europe's higher education system. In wealthier regions the academic reputation of higher education institutions increases, leaving poorer regions with the academically weaker institutions.

Both processes, of academic stratification and regional diversification, are diversity effects of the EU's higher education and, especially, research policies. Both processes are indications of an increasing institutional diversity in the European higher education and research areas. But both also are largely unintended "by-products" of policies that so far have not clearly and intentionally addressed the issue of diversity in European higher education.

Partly as a result of the processes described and influenced by the growing attention for world-wide rankings, a debate has started in Europe regarding the need to create more transparency about the institutional diversity of European higher education and research. New tools for evidence-based transparency are being called for in which diversity can be made visible and comprehensible. The European Commission is currently supporting the development of a European higher education classification (Van Vught, 2009) and has published a call for tender for the development of a European multi-dimensional ranking instrument that can be an alternative to the existing international rankings and become a transparency tool for institutional diversity.

A major future policy challenge for European higher education and research is to create a diversified system of different types of higher education and research institutions, addressing a variety of stakeholders needs and jointly but differently contributing to the ambitions of the EU innovation agenda. The diversity in European higher education and research will have to increase and policies will have to be developed to stimulate this process. The EU will need world-class research intensive universities, but also regionally engaged professional institutions. It will need comprehensive universities offering a wide range of disciplines and programmes, but also highly specialised institutions focusing on only one or two knowledge fields or professional training programmes. In the next phase of the Lisbon agenda (from 2010 on) the EU will need a variety of higher education and research institutions. In the coming years the EU higher education and research system will be extremely important for the further development of the European knowledge society. European higher education and research will become even more central dimensions of the EU innovation agenda. The future policy strategies and instruments related to this agenda will have major impacts on European higher education and research. One of these will almost certainly be a pressure towards a more transparent, highly diversified system of institutional roles and profiles.

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