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Devising futures for universities in a multi-level structure: A methodological experiment

Attila Havas

Institute of Economics, Hungarian Academy of Sciences, Budaörsi út 45., H-1112, Budapest, Hungary

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Abstract

Universities have traditionally been key players in producing and validating new scientific knowledge, but other actors have also become major research performers. Meanwhile, the notion of research has been extended considerably, and the environment of universities is also undergoing fundamental changes. Thus, it is timely to consider alternative futures for them, to be better prepared for their new roles. A review of recent works on the future of higher education shows that the starting point in these exercises is either an existing or an abstract university. This approach has three major shortcomings: (i) the broader socio-economic systems, in which universities operate, are not addressed in these analyses, and thus neither the potential changes in these broader settings, nor their impacts on higher education can be explored; (ii) the huge diversity of higher education systems and individual universities cannot be reflected; (iii) the role of other research actors, and more importantly, the links among universities and those other research players are often disregarded.

This article offers an alternative approach, using the case of EU universities as an example, to rectify these shortcomings. A set of 'cascading' visions are devised to demonstrate the close links between three levels. First, alternative futures are developed for the EU by considering (i) the overall rationale of EU policies; and (ii) the standing of the EU vis-à-vis the Triad. Second, the different directions are identified, in which the European Research and Innovation Area can evolve. Third, skipping the national level, futures are built for the universities themselves, focussing on their research activities.

The modest intention of the futures presented in this paper is to demonstrate how to use the proposed new approach, and initiate meaningful and lively dialogues among stakeholders. Their diverse accumulated knowledge and experience, as well as distinct viewpoints are indispensable for building policy-relevant visions. The proposed three-level structure of futures – or 'cascading' visions – offers several advantages for policy-makers at various

E-mail address: havasatt@econ.core.hu.

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levels, the stakeholders of universities, as well as academics interested in prospective analysis of innovation systems.
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1. Introduction

The first universities emerged as "responses to the need to harness the expanding intellectual forces of the era to the increasingly demanding knowledge requirements of the surrounding society and economy" in the 12th to 15th century in Europe — as this major institutional innovation is described by P.A. David, "masked in the language of our contemporary discussions of university research and training policies" [1, pp. 3–4]. Although there might be some heated disputes among various observers if universities are still largely 'medieval organisations'[1] or have undergone a series of major changes in the last 700–800 years, there appears to be a strong consensus on the need for a new round of fundamental reforms from all corners: policy-makers, analysts, and universities themselves (see, e.g. [2–8]). The reasons for that are manifold — and becoming almost commonplaces, thanks to the richness of literature and the number of projects and workshops analysing the future of universities: globalisation of the economy and research; emergence of new research players; changing science–society links and societal demands towards universities; demographic changes, 'massification' of higher education, and student 'consumerism'; technological development (offering new opportunities, and in the meantime putting extra burdens on the already tight budgets of universities); tensions in the national/regional budgets financing higher educations, and the concomitant requirements of the so-called new public management (accountability, transparency, efficiency and effectiveness, responsiveness, as well as forward looking); and finally the new methods, approaches and norms to organise, manage, validate, legitimate and evaluate research activities.

Given the complexity of these factors, it is of crucial importance to underpin the proposed new round of reforms by thorough and systematic prospective analyses, e.g. by developing 'futures' ('visions' or 'scenarios').[2] Yet, a number of important – and potentially influential – proposals or policy documents do not discuss the future at all [2,6], while other documents only discuss a single vision, i.e. do not consider alternative futures; a striking example of that approach is the recent EU Green Paper on the European Research Area [3].

Georghiou and Cassingena Harper [9] have reviewed recent works on the future of higher education, and found extensive discussion and study of this topic, but limited instances of clearly documented FTA[3] activities (p. 2). Although the 'sponsors' of the reviewed exercises range from a single university to international organisations (the EU, OECD and UNESCO), in all these cases the

[1] See, e.g. the harsh critique by a former British minister of Education and Skills published in *The Guardian* on 10 May 2003, cited in [1, p.4].

[2] These terms are often used as interchangeable ones in the literature — a simple, pragmatic distinction among them is offered in Section 4.

[3] FTA stands for Future-oriented Technology Analysis, one of the terms to denote systematic prospective analysis.

starting point – the 'unit of analysis' – is either an existing or an abstract (hypothetical) university. This approach has major shortcomings, as three important fact(or)s cannot be considered in these exercises. First, universities – like all the other research players – operate in broader socio-economic systems, and thus it is crucial to set the scene, when devising futures for them. Yet, the likely impacts of potential changes in these broader systems are not analysed at all in the reviewed FTA activities. Second, a huge diversity can be observed among continents (note the differences among the "broad models" of higher education e.g. in the US, Asia and Europe), across countries on the same continent, and even inside countries concerning the performance, funding and governance models of their higher education organisations, as well as their efficiency (whatever metrics is used). When a particular or an 'abstract' university is taken as a unit of analysis, this diversity simply cannot be reflected. Third, the role of other research actors, and more importantly, the links among universities and those other research players are often disregarded.

This article offers an alternative approach, using the case of EU universities as an example, to rectify these shortcomings. As the above list of factors that shape the future of universities reveals, a number of trends or challenges are international in their very nature, while the legal competences to set policies are with the national or (sub-national) regional governments. The European Commission has launched several initiatives to align these regional and national policies, so as to join forces when facing these challenges and thus find (and fund) more appropriate answers.[4] Moreover, the EU itself is still evolving; in part due to a number of internal factors – e.g. the recently initiated strategic processes and enlargement are the most visible ones –, and in part as a reaction to external factors, such as globalisation, competition among the Triad regions, etc. The strategic responses of the EU would also determine the range and 'relative weight' of stakeholders to be involved in a participatory prospective analysis on the future of universities: the role of university staff, students and the civil society at large, policy-makers or businesses might differ significantly in distinct 'futures' for the EU. Hence, the starting point here is the EU, as the broadest socio-economic context for universities, with its own science, technology and innovation (STI) policy tools, and to some extent influencing the rationales of regional and national STI policies, all affecting the activities of universities. It is followed by futures for the European Research and Innovation Area (ERIA),[5] as the more immediate surroundings for universities, and also the framework in which they co-operate and compete with other research actors active inside the EU.[6] Finally, futures are devised for universities.

[4] The most visible ones are the so-called Bologna process, the regular meetings of education ministers, as well as the other channels of the so-called "open method of co-ordination". The Spring European Council meetings, assessing the progress towards the Lisbon strategy, using several indicators on HE performance, can also influence national and regional HE policies. Also indirectly – and less manifestly – the various EC funded projects and expert groups on higher education can also shape these policies.

[5] ERIA is understood throughout this paper as the set of all relevant actors of RTDI processes in the EU, as well as their interactions. In other words, 'ERIA-policies' of the EU are just one element of ERIA, as it is composed of all other EU, national and regional policies affecting RTDI processes and performance, the activities of firms, various types of R&D units and institutes, higher education organisations, financial intermediaries, as well as a host of supporting, bridging and service organisations, and most importantly the systemic features, i.e. the interactions (competition, communication, networking, co-operation, etc.) among these actors.

[6] Non-EU universities and business R&D units are already operating in the EU, and given the intense internationalisation of research and innovation activities, their presence is likely to be more pronounced.

This is a sort of 'top-down' approach, and hence a number of 'micro-level' factors might be missing, but those can be added during an actual foresight process.[7] In any case, this article does not report on the results of an actual foresight process on universities: it is a proposal to apply the foresight toolkit in this field by following a new approach. The futures developed here are just to demonstrate how to use these proposed methods, and its potential benefits for various stakeholders.

From a different angle, there are fundamental differences between foresight programmes, on the one hand, and future-oriented academic or consultancy projects, on the other. The very idea behind participatory programmes is to bring together different stakeholders with their diverse sets of accumulated knowledge and experience, as well as distinct viewpoints and approaches so as to enrich the discussion and analysis. Further, the shared visions and policy recommendations, stemming from the dialogue among participants, offer a basis for faster and more efficient implementation. In contrast, futures developed by individuals can only experiment with new methods, or spark dialogues, by offering food for thought, at best.

The theoretical framework of this article rests on the innovation systems school [10–15]), and especially its emphasis on the importance of academia–industry co-operation [16,17]). The remainder is organised as follows. First, the current and emerging roles of universities are analysed (Section 2), followed by an account of key trends and the drivers for changes (Section 3). Then, in Section 4 alternative visions are devised at three levels, with the time horizon of 2020–2025. At the first level the overall rationale of EU policies, and its standing vis-à-vis the Triad regions are considered as major 'variables' of the alternative futures for the EU. At the second, it is assumed that the European Research and Innovation Area can evolve in different directions, depending on the main features of the EU to a significant extent, but obviously having its own dynamics, too.[8] Finally, at the third level, the diversity of universities can be explored by devising futures for different ideal types of universities, taking into account the relevant ERIA visions. In other words, this third level, itself, is consisted of a set of futures. Finally, methodological and policy conclusions are drawn.

A few remarks are in order to indicate the limitations of this paper. As it is aimed at a prospective analysis, it does not offer an exhaustive academic treatment of the current situation of universities.[9] Further, to reduce complexity, the futures devised for universities (Section 4) only consider their research activities. No doubt, it is a somewhat artificial 'partitioning', but the main purpose of this paper to experiment with the proposed 3-level structure for building futures, rather than to offer fully-fledged visions, covering all aspects. If this approach proves to be useful, the aspects of education activities can easily be added.[10]

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[7] Foresight processes (programmes, projects, exercises) are part of the broader 'family' of prospective analysis or FTA activities. They have three distinguishing features: they consider alternative futures (as opposed to e.g. forecasting exercises); they are action-oriented (unlike e.g. academic papers in the tradition of futures studies); and participatory, that is, they involve the representatives of relevant stakeholders, disseminate their results among the wider public affected by the changes/actions in the field/theme analysed, and seek feedback from this wider community when finalising their reports, policy recommendations, etc.

[8] Several ERA visions have been devised by putting governance issues into the centre, see e.g. [18–20] — the ones developed in this paper follow a different logic.

[9] The term 'universities' is used as shorthand for all sorts of higher education organisations.

[10] The first attempt to do so can be found in a previous report [21].

2. The role of universities in knowledge production

2.1. The changing landscape of research systems

Universities have traditionally been key players in producing and validating new scientific knowledge.[11] From the point of view of R&D and innovation (RTDI) processes, they have focussed on two main activities:

- training the future generation of researchers, engineers, managers (including R&D managers), experts, and policy-makers (among many other fields, for STI policies);[12]
- conducting various types of research.[13]

Academies emerged in some countries as early as the end of the 16th century [1, pp. 5–6], while further research actors became strong players in the 19th century, notably firms (often – but not exclusively – in the form of R&D units) and public labs [12]. More recently, some patient groups and other types of NGOs are also engaged in research activities. The role of users in the innovation process is also recognised now, and become much better understood [26]. Moreover, the notion of research has been extended/revised considerably, and the discussion moved on to analyse broader issues, like knowledge (types and sources of knowledge), knowledge production and use, new players in producing, using and validating knowledge, learning, learning capabilities, and learning systems, etc. [13,14,27–30].

Notwithstanding the above general considerations on the principal role of universities in creating knowledge, one should not overlook the significant diversity across the EU at least in three aspects:

- the balance of research activities between universities and other players;
- the competence of national vs. regional governments to regulate and fund universities;
- the outputs (outcomes, impacts) of research efforts by universities.

Only the first aspect is treated in some detail below. As for the second one, suffice it to say that in some bigger EU countries – e.g. in Germany and the UK – the regional authorities have competences to devise policies on higher education, as well as to fund higher education organisations.[14]

[11] The role of inventors is not to be discussed here, although they have advanced technologies to a very significant extent, and several major inventions have long preceded the proper theories of their underpinning scientific principles, such as the steam engine, the first airplanes, semiconductors, etc. In other words, the links between science and technology are far from being (uni-)linear. Contrary to the widespread belief that technologies are, in essence, applied sciences, a number of scientific disciplines evolved from the puzzles why certain technologies work as they do [22].

[12] This list is far from being exhaustive: to keep it short, many professionals are not mentioned here, whose activities are also of crucial importance for successful RTDI activities, either directly (e.g. legal, financial, and marketing experts) or indirectly (e.g. teachers).

[13] A number of typologies could be used to define/classify research activities, e.g. the ones developed by [23–25]. For a proper policy dialogue it is crucial to use appropriate terms, but it would go beyond the scope of this paper to discuss these competing terminologies in detail. Suffice it to say that the still pre-dominant 'holy trinity' of "basic and applied research, plus experimental development" is not providing any meaningful guidance for devising policies, and can be even seriously misleading. It is also obvious that (i) not only universities conduct academic research (see Section 2.2. on the role of other research actors); and (ii) university research and basic research should not be taken as synonyms.

[14] Clearly, the significant differences in the responsibilities of national and regional governments in funding and regulating higher education have to be taken into account when formulating policy recommendations or actual policy decisions. Yet, it is simply not possible to reflect on this diversity in a single paper. For a more detailed discussion, see, e.g. [31].

As for the third aspect, the very fact that universities' research efforts lead to rather diverse outputs (outcomes, impacts), both in terms of quality and quantity, prevents any meaningful analysis at the EU level. The sheer number of universities, together with the diversity in their performance, implies that a thorough, micro-level discussion would be needed, and on that basis comparative analyses can be conducted either at regional/national level, or across countries, but then taking only universities belonging to the same 'league', e.g. those aspiring world-class research and education, or those who cater for the regional needs. Further, empirical research does suggest that diversity prevails even inside universities: the performance of faculties or individual institutes/departments varies a lot. No doubt, there are various efforts to rank universities in spite of these methodological difficulties, but none of these 'league tables' is generally accepted.[15]

2.2. Where research is located: universities vs. other players

There is a rather strong consensus in the literature on the rationale to spend public money on basic science: training of future generations of researchers is understood to have overriding importance among the other benefits of basic science, implicitly assumed to be conducted (almost exclusively) at universities [33–35]. From a different angle, this consensus suggests a very close link between higher education and research. Indeed, for centuries universities had been elite education institutes for the elite in two respects: (i) only the elite of a given age cohort was offered higher education;[16] and (ii) the 'output' was the next generation of the elite: higher education meant to reproduce academic staff and societal leadership. It was important, therefore, to offer the highest possible level of education, which, in turn, required high quality research. To further strengthen the link between education and research, when training the next generation of the academic staff it was a must to teach them how to conduct research, too, i.e. to involve them in research activities while they were students. In short, that was the Humboldtian model of universities: assuming a unity of teaching and research, based on the idea of higher education through exposure to, and immersion in, research activities [36].

The last few decades, however, saw a major change: with 30–48% of the relevant age cohort attending tertiary education in most OECD countries, we cannot speak of the same 'higher' education (HE) system. It is neither exclusively the 'elite', who participates in it, and nor the only aim is to reproduce the academic and societal elite.[17] Thus, an increasing number of HE institutes are mainly – or only – teaching organisations, and overall we can see, therefore, a growing number of 'teaching-only' positions in the HE sector. In the meantime, the number of 'research-only' positions is also increasing at certain universities, plus other research performers do play a major role in producing knowledge. In other words, teaching and research nowadays are only 'intertwined' at a fewer number

[15] Obviously, it would be pertinent to conduct thorough empirical analyses to compare the performance of universities among the Triad regions, as well as across EU countries, by taking into account the 'quality' and 'efficiency' of their research and education activities. First, though, a sound methodology should be developed to establish appropriate metrics and evaluation criteria. A recent, major attempt to analyse the performance of EU universities is [32].

[16] The term itself – higher education – clearly reflects this feature. Nowadays, however, we tend not to pay attention to the contradiction between the level of quality what this very name would imply and the repercussions of the 'massification' of the 'third level' education.

[17] Just to illustrate this with the example of the UK in the mid-1990s: "Today one in three young people go to university, a proportion which is continuing to rise. Where it was once thought exceptional to win a place at university, was a guaranteed sign of academic and social advance and a just occasion for celebration, today it merely marks a stage in life, requiring no special academic merit, signalling in itself no great likelihood of later worldly success." [37].

of universities, and usually only at the post-graduate level. The Humboldtian model has thus become an exception, rather than the rule.

The average share of universities in performing basic research was 54% across the OECD in 2003, but individual country figures varied in the range of 28–76% [5]. Thus, universities do play a leading role in a number of countries, while public labs have a non-negligible weight in several other countries.[18] Thus, the role of these latter types of research organisations should not be ignored in policy discussions.[19]

In sum, there are two reasons to revisit the aforementioned, widely held, consensus on the rationale for funding 'basic' science by public money: (i) the very notion of 'basic' science is questionable, (ii) even if we continue using this doubtful term, higher education and 'basic' science are not that closely interconnected nowadays as they used to be, partly because of the changing nature of higher education, and partly because the crucial role of other research actors in producing knowledge.

To understand the role of universities, it is worth summarising some basic 'stylised' facts of the overall research landscape.[20] First, a huge variety can be observed among the EU (and OECD) members both in terms of their 'pool' of researchers, i.e. their absolute numbers, and 'research-intensity' of employment, i.e. the number of researchers per 1000 labour force. Second, both employment and financial data, that is, spending on R&D activities by research performing sectors, suggest a great diversity in terms of the 'weight' of these sectors. Yet, a clear finding is that the business enterprise sector is a dominant one in the majority of OECD (and EU) countries, and all the advanced ones share this feature. From a different angle: the relative weight of higher education, and especially that of the government sector, is higher in the less developed countries (Figs. 1–2). Third, output indicators, such as publications, citations, patents awarded, spin-off firms established, etc. are not readily available by research performing sectors, and thus their relative weight cannot be compared this way.

3. Recent key trends and driving forces for future changes

Several recent key trends, as well as driving forces can be identified that are likely to influence universities' research activities, and thus will be used to underpin the futures for universities, presented in Section 4.[21] The order, in which they are listed below, does not reflect their significance.

[18] The well-known examples are the institutes belonging to Max Planck Gesellschaft (Germany), CNRS (Centre National de la Recherche Scientifique, France), CNR (Consiglio Nazionale delle Ricerche, Italy), CSIC (Consejo Superior de Investigaciones Científicas, Spain), Ludwig Boltzmann Gesellschaft (Austria), and the Academies of Sciences in a number of Central and Eastern European countries.

[19] For a more detailed description of public research centres, especially on the variety of players in this sector, e.g. in terms of organisational forms and changing ownership (public, semi-public) profiles, missions, size, and performance, see [38], pp. 65–74. The report also signals a similar warning: "Relatively speaking, this sector has received less attention than the business and higher education sectors. One barrier to understanding is the wide range of structures existing in Europe, which vary by country, nature of mission and type of research. Furthermore, this sector is often less visible in public indicators (such as the number of scientific publications and patents) because the principal outputs of its scientific and technological activities are consumed by government itself in terms of advice, or by private clients for technological consultancy." ([38], p. 65).

[20] Space limits prevent presenting data here; an extensive statistical annex can be found in the original report for the DG Research, EC, on which this article draws. This section, in turn, relies on OECD data, published in [39]. A detailed analysis of some recent trends in universities' research activities can be found in [5].

[21] Other key trends and drivers for change, affecting the education activities at universities are discussed, e.g. in [2,3,7–9,21,28–30,36,40,41]. This section also draws on these sources, as well as the findings presented at workshops organised by EC JRC IPTS on the Future of European University.

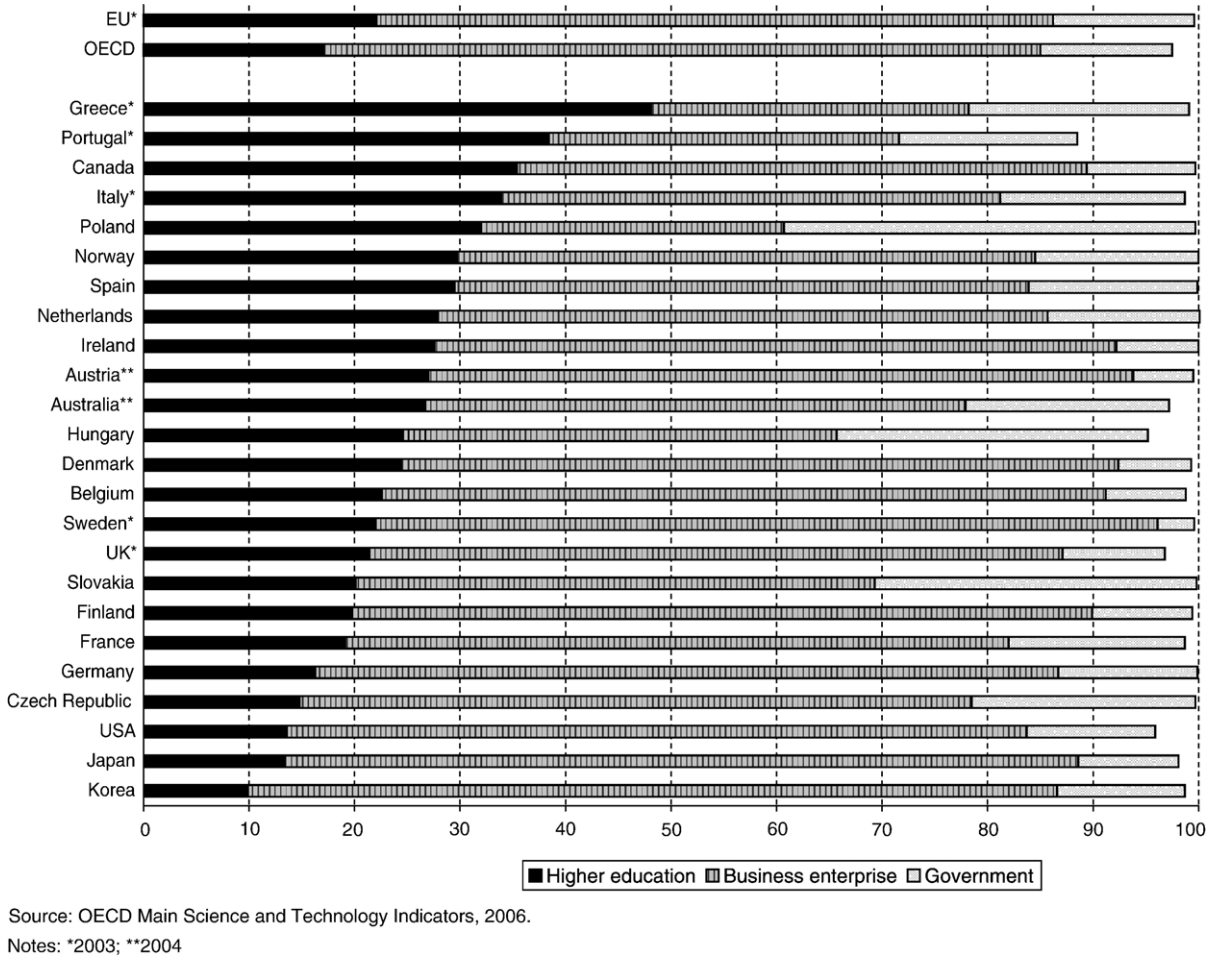

Fig. 1. The distribution of GERD by R&D performing sectors (per cent, 2005).

The most important recent key trends concern the roles/responsibilities of universities. First, *the balance of various roles* — teaching; academic research; joint RTDI projects with businesses (including trouble-shooting); consultancy for NGOs and policy-makers at national/regional/local levels — is changing. Second, *new roles* are emerging, e.g. universities are assuming essential responsibilities in shaping local, regional, sectoral, national and international production and innovation systems.[22]

[22] A further recent key trend is triggered by the so-called Bologna Process. Its original goals are of direct relevance for the teaching role of universities, i.e. not directly for their role played in the research arena. At the Berlin Conference, held on 18–19 September 2003, however, the need to incorporate doctoral studies into the Bologna Process was specifically mentioned [41], and that dimension is obviously closely interconnected with the research activities of universities, both in terms of the present research projects (in which PhD students are usually participating), and as the training of the future generation of researchers.

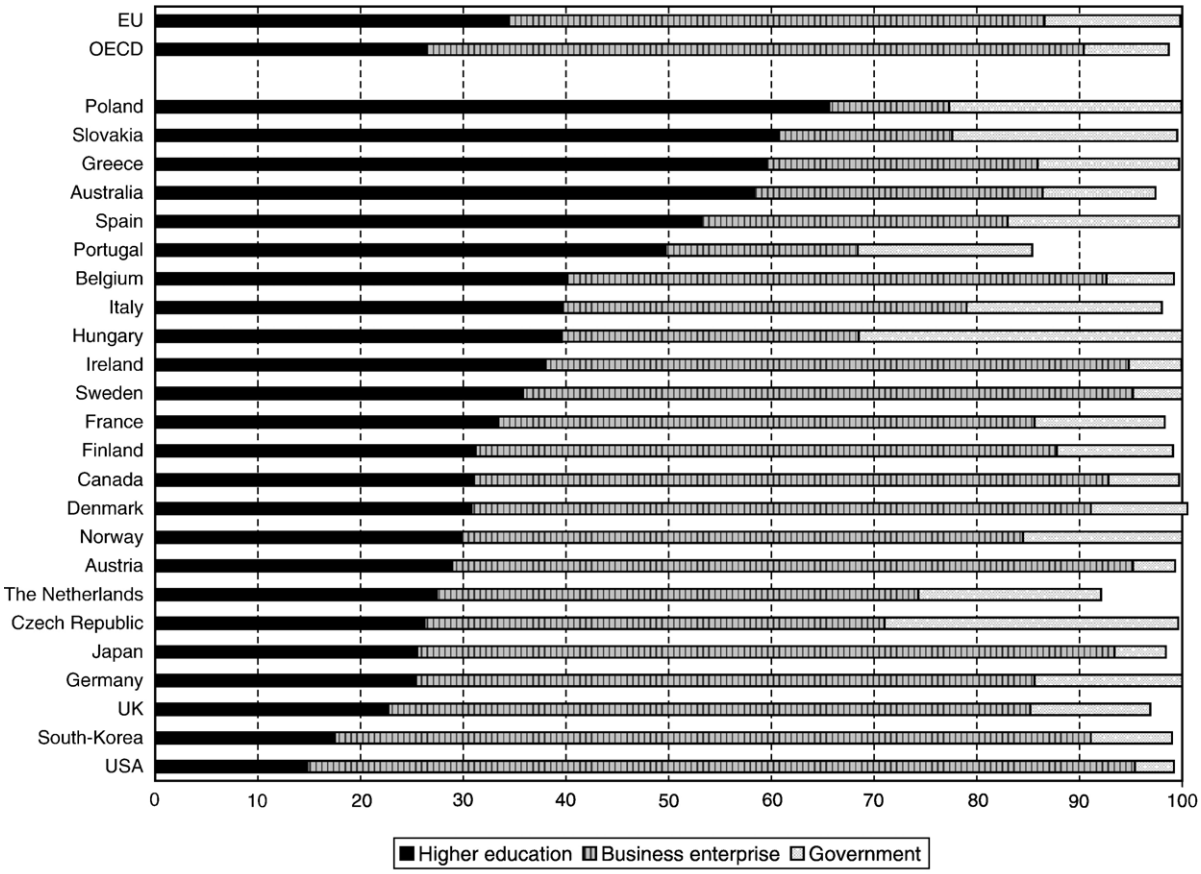

Fig. 2. The distribution of researchers by R&D performing sectors (FTE, most recent years).

The most important driving forces can be derived by considering the increasingly intense global competition in research activities; technological, financial and societal factors; and the changing rules to govern research.

There is *an ever more intense quest for excellence in research* in order to improve academic recognition and thus being able to raise funds, either from public or private sources, as well as for *speedier completion of projects*: new results should be achieved faster to stay ahead of rival research groups. This is adding thrust to the already strong pressure for intense international collaboration, and in the meantime a fierce competition for talents (PhD students and researchers) among universities, as well as between universities and other research actors.

New players are likely to enter the global research arena in two respects. First, a large number of research organisations (universities, public and private labs, firms, etc.) located in currently laggard countries likely emerge as major players. In other words, the number of the already existing types of research organisations can increase significantly, hence adding to the intensity of global competition, and given their specific feature, to a somewhat limited extent adding to the diversity of the 'ecology' of research actors, too. Second, new types of – currently 'unthinkable' – research players might also

evolve,[23] and that could change the 'ecology' quite radically, e.g. in terms of more pronounced variety, as well as new opportunities and rules for co-operation and competition. As a result of selection, not only certain research actors, but even types of research actors might disappear, as they are becoming 'unfit' to the radically changing environment.

Technological changes offer more sophisticated and thus more expensive equipment for conducting research, but in the meantime it also becomes a must to purchase these pieces of advanced equipment, given the intense international rivalry among research actors. That is putting extra burdens on the already tight budgets of research organisations, including universities.

Tighter funding opportunities lead to *increased competition* among higher education and other public research organisations *for restricted funds*.

Cost-efficiency of research becomes a major objective: the combined effects of technological changes, together with the pressure on public funding, open a gap between rapidly increasing research costs and public budgets allocated to research conducted at universities. Thus research projects are to be closely scrutinised in terms of their cost-efficiency, too.

New methods, approaches, and norms are likely to be applied when organising, managing, validating, legitimating, and evaluating research activities.

Regional, national or supra-national *policies* can toughen some of the above driving forces, slow down or divert their impacts, or create new drivers for change by introducing far-reaching and resolute goals for research. A prime example of a potential major impact of public policies is the current initiative in several countries to 'strongly encourage' universities to patent their research results, following the Bayh-Dole Act of the US.[24]

These S&T, societal and economic factors – coupled with various policies and regulations – may give rise to a number of future trends, some of which are briefly summarised below.

1. Intensifying international mobility of post-graduate students and researchers.
   Currently, post-graduate courses offered by US universities are particularly attractive for foreign students, including those from the EU. Nearly 60% of science and engineering doctoral students coming from EU countries have firm plans to stay in the US upon the completion of their studies, instead of returning to the EU. This proportion has risen notably over the past decade: from 44.5% at the beginning of the 1990s to 57.5% at the turn of the millennium ([43], p. 57).
   Competition for talents – both intra-EU, and globally – is likely not merely to continue, but intensify significantly.
2. Increasingly stronger international co-operation in research (and innovation) projects at a global level and an EU level, as none of the Triad regions – let alone individual countries – can be self-sufficient. A possible backlash against globalisation can slow down this trend, however, given a growing scepticism among the population regarding internationalisation [4]. It can be fed by fears of terror attacks and wars, concerns about the increasing immigration, loss of national identity and pride. That might lead to a much larger share of research classified by governments as military R&D.

[23] A few decades ago no one would have thought of e.g. NGOs and patient groups as research players.

[24] These policy initiatives are heavily criticised by researchers on various grounds. In brief, too much emphasis on 'forcing' appropriability of publicly financed research is likely (a) to slow down the rate of knowledge generation; (b) might also distort the direction of search by closing promising avenues and/or decreasing variety in research; and (c) can hamper innovation efforts of firms; see, e.g. [1,22,42].

3. Stronger, better articulated needs for multi- (trans-; inter-) disciplinary research.
4. New players might emerge and new norms might be applied when legitimating and validating knowledge.
   Besides conventional academic researchers, knowledge is produced by a wide variety of players, e.g. think tanks, private research organisations, non-profit organisations, government agencies, consultancy companies, market research organisations, patients' groups, various NGOs, trade associations, interest groups. These pieces of knowledge are used by some of these organisations themselves (government agencies, firms' labs), sold to other parties (contract research organisations, consultancies) or exploited in political/societal processes for advocating/pursuing certain views or interests (NGOs, trade associations). From a different angle, these pieces of knowledge are also diffused, and thus subject to different types of validation procedures (formal/informal; explicit/implicit). Currently the rules of validation seem to be in flux, i.e. the traditional peer-review process seems to lose its long-established monopoly. As the roles of different players, and hence 'the rules of the game' are changing in legitimating knowledge, different possible future states can be considered: (a) non-academic sources of knowledge are considered fully legitimate, i.e. academic research loses its power to validate knowledge; (b) knowledge – either from academic or non-academic sources – is only accepted in society if validated by conventional academic rules and players; (c) a clear separation between knowledge created by credible academic organisations and non-academic ones, the former enjoying a higher status [28].
5. Changing set of evaluation criteria.
   Depending on the speed and extent of changes envisaged above, especially (1)–(3), universities are likely to be evaluated by using new metrics, besides the conventional criteria of academic excellence (notably publications, citations). In particular: to what extent do they fulfil their various societal roles; what types of courses are offered to whom, at what level of quality; are they attractive for foreign staff and students; are they active in international co-operation; to what extent are they engaged in multi- (trans-; inter-) disciplinary training and research; are they using various resources in an efficient way? Various types of universities (e.g. ones focussing on vocational training as opposed to post-graduate teaching and research; or meeting local needs vs. acting as a global player; etc.) are likely to be evaluated by different sets of criteria.
   The overall rationale of ERIA, in which EU universities operate, is also likely to have an impact on devising evaluation criteria and methods. (See Section 4.1 on different possible rationales for ERIA.)
6. Further proliferation of the already existing diversity of governance and management models, and more pronounced professionalisation of university management.
   There is already a wide variety of governance models (different ways and weights of involving stakeholders: national and regional policy-makers, businesses, societal groups, students, academic staff, etc.) as well as management models (collegial vs. professional, and their different 'blends') [36]. The inherent tension between the interests, values, and goals of different stakeholders, and the one between the need to monitor and control the various activities of universities for managerial purposes and the nature of academic activities would most likely be resolved in different ways by different players. The emergence of new players – and new business models for universities – is likely to add 'more colours' to this picture. The diversity of governance and management models, therefore, is likely to further proliferate, even inside the group of similar universities, let alone among different types of them.

4. Futures for universities

Vision-building requires an intense dialogue among stakeholders for two reasons: (i) different approaches/perspective need to be taken into account when contemplating about the future; (ii) the links, communication, interactions, and co-operations among the various players are key aspects of the future shape and performance of universities. The ideas presented here, therefore, can only be taken as points of departure for two types of activities. First, they are aimed at triggering a debate among experts on the relevance of the proposed method, that is, the 3-level structure for devising futures. Second, the content – or some elements – of the futures drafted here can be used as one of the inputs for dialogues among stakeholders in actual foresight processes.

An actual foresight process, in turn, might have many different outcomes. Following the usual distinction in the literature, we can think of 'process benefits' and 'products'. The first would include more intense, regular communication among the stakeholders even when the process is completed; stronger co-operation; shared visions and consensus on the actions need to be taken; commitment to act upon the recommendations emerging from the process. The second refers to lists of priorities and proposed actions (for different stakeholders, in this case e.g. university rectors and deans, regional, national and EU policy-makers, businesses and local communities as partners of universities), inputs for strategic planning (again, at different levels). The type of intended outcomes always depends on the design (objectives) of a foresight programme, i.e. if it is mainly a process-oriented exercise, a product-oriented one, or a mixed approach is taken. The use of the recommendations — e.g. strategy formation for a specific university, strategies for the higher education sector in a region, a country or the EU — is up to the decision-makers.

Futures for universities can be devised by using various starting points. One possibility is to take the perspective of the sector, that is, keep universities as the 'unit of analysis' when conducting a foresight process. Another one is to emphasise the importance of several driving forces, factors, structural, and policy variables arising from the broader systems, in which universities are embedded in. As already argued, this paper takes the latter approach, and thus first visions are devised on the EU as a whole. Then the European Research and Innovation Area (ERIA) is taken into account as a 'mezzo level' system. Finally, the most important trends and drivers are addressed at the level of universities.[25]

These futures ("visions" or "stories of a future world") are meant to present a number of different possible future roles, missions, organisational forms, strengths and weaknesses for universities. These visions offer a description of future states in 2020–2025 rather than "fully-fledged" or "path scenarios", which would develop detailed causal stories of how universities might be transformed between now and then. Furthermore, it is beyond the scope of this paper to enter into a detailed consideration of the degree of probability of specific visions. The modest aim is to sketch "consistent and coherent descriptions of alternative hypothetical futures that reflect different perspectives on past, present, and future developments, which can serve as a basis for action. They are tools for thinking about the future, which will be shaped partly through deliberate strategies and actions, partly by factors beyond the control of decision-makers." [4, p. 1]. In brief, visions should highlight the role of policy in realising the desired and feasible future.

[25] Note that the national – and sub-national regional – level is "skipped" in either approach, given the huge diversity of the national (regional) education systems. Skipping these levels from the current exercise, however, does not imply that national (regional) factors can be neglected in actual prospective analyses (e.g. strategic planning or foresight programmes).

Futures developed in genuine foresight processes can be direct (or "positive") inputs for policy preparation or strategy-building processes: once a favourable future (future state) is identified among the feasible ones, the path(s) leading to that specific future state can be designed, e.g. by using backcasting methods. More precisely, a series of actions can be determined, which are likely to increase the probability of achieving the desired future. Equally, futures developed by foresight processes can be indirect (or "negative") inputs, a sort of wake up call: in case the current trends continue – because no actions are taken to change the course –, we arrive at such an undesirable future state.

The major underlying assumptions for building visions for EU universities should be spelt out before addressing the more detailed issues, to avoid some potential misunderstanding or misinterpretation. First, as already stated, policies can modify – e.g. speed up, slow down or 're-direct' – the existing driving forces for change, and can trigger changes themselves, too. Second, universities – just as other research actors – cannot operate fully isolated from their socio-economic environment.[26] For these two reasons, various EU polices under the label of the Lisbon Process, especially concerning the relative weight of competitiveness[27] and cohesion objectives, as well as the more specific ones on the ERIA are considered here.[28] Third, the interrelations between competitiveness and cohesion can be thought of in different ways: (i) as mutually exclusive goals (a 'zero-sum game', as these policy fields are competing for the same set of scarce political, intellectual, organisational and financial resources); or (ii) as mutually reinforcing ones (a competitive, thriving EU can set aside resources to promote cohesion regions, while narrowing the gaps between advanced and laggard regions would enhance the competitiveness of the EU as a whole). This paper takes the latter view, and thus attributes a great significance to innovation processes in the cohesion regions/countries, as well as to the wide range of policies required to promote innovation. Fourth, cohesion is an issue for (a) large, advanced EU member states (given the significant differences among their regions), (b) for the four 'classic' cohesion countries, and (c) for the 12 new member states. Thus, it is a major political and policy issue — and not only because of the recent enlargements, as it has been issue for a non-negligible part of the EU15, too, for long. Moreover, the forthcoming enlargement(s) would add more countries and regions to this list. Fifth, promoting RTDI efforts in cohesion regions via joint research projects (funded e.g. by RTD Framework Programmes) does not mean that scientific excellence is compromised [45]. Sixth, a pronounced policy emphasis on cohesion does – and should – not preclude competition among universities.

4.1. Futures for the EU and ERIA

The point of departure is a highly selective set of fundamental features of the EU: (i) its main strategic intention/orientation in terms of putting the main emphasis on cohesion (societal issues)

[26] The degree, to which they can or should be 'protected' from their broader context, in itself would be a subject of an intense discussion: different parties are likely to have rather diverse views on this question. Clearly, even a superficial treatment of this issue would be way beyond the scope of this paper.

[27] There is no widely accepted definition of competitiveness; economists have different views even on the "appropriate" level of analysis: products, firms, value chains (production networks), (sub-national) regions, nations, or even larger entities. This problem obviously cannot be solved here.

[28] In launching the discussion on the priorities for the new generation of cohesion policy programmes, in July 2005 the European Commission published a draft document on "Cohesion Policy in Support of Growth and Jobs: Community Strategic Guidelines, 2007–2013" [44]. One of the specific guidelines is to improve the knowledge and innovation for growth. More specific areas of interventions include: improve and increase investment in RTD, facilitate innovation and promote entrepreneurship.

Table 1
Visions for the EU

EU vs. Triad	Internal strategy	
	Cohesion (societal issues)	Competitiveness ('multi-speed EU')
Successful EU	A) *Double success*: A carefully balanced development strategy of the EU, keeping the 'welfare' elements, too, at an EU level – but pursuing these cohesion/welfare policies in a more flexible way, and using more appropriate, refined policy tools [a] – leads to an 'externally' successful and cohesive EU. [b]	B) *Successful multi-speed EU*: A number of the already successful EU regions are heavily promoted by EU policies (funds) as 'engines of growth', making them even stronger, leading to enhanced competitiveness of the EU vis-à-vis the Triad regions. In the meantime, the gap between these successful EU regions and the less developed ones significantly widens, even inside the big, advanced member states. [c]
Laggard EU	C) The EU development strategy is incapable of harmonising the requirements of competitiveness and cohesion; policies meant to support the latter are not modernised, and thus take up too many resources, and hamper the processes required for an enhanced competitiveness.	D) *Failed multi-speed EU*: A multi-speed EU strategy – in spite of ignoring cohesion – fails to close the gap with other Triad regions, while it widens the gap between the advanced and less developed EU regions.
	Ca) *Shaky cohesion*: At least temporary achievements in terms of stronger cohesion (at the expense of external competitiveness, and thus being "shaky").	The reasons for this failure can be numerous: e.g. internal (inappropriate policies and/or poor implementation), external (improving EU performance, but an even quicker development of the other Triad regions). In other words, we can regard the former case an 'absolute' failure, while the latter one a 'relative' failure.
	Cb) *Double failure*: Inappropriate strategies, insufficient co-ordination of various policies, poor implementation and/or external factors lead to an overall failure both in terms of cohesion and performance vis-à-vis the other Triad regions.	In any case, it is highly likely that key players of strong EU regions would act together both at an intra-regional and an inter-regional level — probably also with their counterparts outside of the EU.

[a] The current success of Denmark, Finland and Sweden points to the possibility of a 'reformed European socio-economic model' [46,47].

[b] This vision requires an efficient co-ordination of a number of policies, in three ways: horizontally, i.e. across policy fields, vertically, i.e. across governance levels; and along the time dimension, too, i.e. short-, medium- and long-term policies also need to be harmonised [48]. The vision itself, however, makes no assumption if this co-ordination is achieved via heavy-handed top-down mechanisms, or as concerted actions of member states and other key players, without a strong centre. This is the well-known issue of having or not a 'federal EU'. (See also two visions of the EUROPOLIS project, coined "Federal Europe", and "Roundtable Europe", respectively [18].)

[c] Two types of EU behaviour can lead to this future state: (i) a conscious strategic choice to use available funds and other policy tools (e.g. regulation) exclusively or excessively for boosting competitiveness, and thus ignoring cohesion on purpose (as a perceived necessity); (ii) incapability to devise strategies and policies, and/or general inaction, inertia, inefficiency to implement policies. (In a radical scenario, not to be discussed here, the loss of most/all EU policy-making power to national, regional, and local authorities would also result in widening gaps among regions. For a largely similar scenario, called "Swiss Europe", see [18].)

vis-à-vis competitiveness; and (ii) its overall performance compared to the other Triad regions (Table 1).[29]

None of the five visions presented in Table 1 can be dismissed on logical grounds, i.e. any of them can occur. Their likelihood (plausibility) might differ a lot, of course, but only subjective judgements could

[29] Emerging countries, e.g. China and India, might also become important competitors, but a flexible interpretation of the Triad regions can easily include any relevant countries.

Table 2
Features of the ERIA in two EU visions: "Double success" vs. "Successful multi-speed EU"

ERIA	EU	
	"Double success"	"Successful multi-speed EU"
Rationale for EU RTDI policies	"Double-track": tackle societal challenges, promote cohesion and enhance competitiveness	Excessive emphasis on enhancing competitiveness
Co-ordination of policies	Intense and successful policy co-ordination among regions, consciously supported by harmonised national and EU policies, with a specific aim to enhance competitiveness and advance cohesion	'Multi-speed' policy co-ordination: intense and successful among advanced regions, supported by national and EU policies; ad hoc and weak co-ordination among laggard regions, between laggard and advanced regions, at best with half-hearted, reluctant EU efforts
Location of major HE/R centres	Widely distributed across the EU, weaker centres are strengthened, and new ones are set up in laggard regions with a specific objective to promote cohesion	Concentrated in already strong, successful regions
Research agenda	An appropriate balance between societal and techno-economic issues	Focus on techno-economic issues; some (minimal) research efforts to tackle social challenges stemming from the widening gaps between flourishing and laggard EU regions
Mobility of researchers, university staff and students	"Two-way traffic": gaining experience, building contacts in more advanced regions across the Triad, and then exploiting these contacts upon return to 'cohesion' regions via intense, mutually beneficial co-operation Mobility grants explicitly aim at both nurturing talents (for excellence in RTDI and competitiveness) and fostering cohesion	"One-way street": brain-drain from laggard regions to booming ones Policy schemes aim at further strengthening strong regions via mobility grants "Two-way traffic" with strong Triad countries/regions
Integration of RTDI activities (across national borders)	Widely occurring across the EU and globally; policies aimed at promoting the integration of RTDI activities have an explicit aim of fostering cohesion, too, among other EU-wide issues	Mainly among strong, successful regions across the Triad, driven by businesses, supported by policies; laggards are left out for not having sufficient financial and intellectual resources, lacking modern infrastructure
Research infrastructure	Up-to-date equipment, including joint large and medium-sized RTD facilities, are distributed across regions, equal access to these facilities for all regions; EU funds earmarked for RTD infrastructure have an explicit aim of fostering cohesion, too	Up-to-date equipment is concentrated in strong regions, joint large and medium-sized RTD facilities are hosted mainly by them, limited access to these facilities for laggard regions; EU funds for RTD infrastructure do not pursue cohesion objectives
Innovation systems, co-operation among key players [a]	Strong, flexible innovation systems in a large number of regions (with their own specific strengths), capable of renewal and adaptation to the external environment, underpinning both cohesion and competitiveness	Strong, flexible innovation systems in the advanced regions, capable of renewal and adaptation to the external environment, underpinning sustained competitiveness

Table 2 (*continued*)

ERIA	EU	
	"Double success"	"Successful multi-speed EU"
Innovation systems, co-operation among key players [a]	Intense communication among businesses, academia, policy-makers, and the civil society to set RTDI priorities – relevant for cohesion and competitiveness –; strong academia–industry co-operation, mutually beneficial, intense links among large firms and SMEs in a large number of regions (gradually increasing over time) Co-ordinated, joint efforts – supported by EU funds – to strengthen weaker innovation systems, including communication, networking and co-operation among key players inside those regions and across regions	Intense communication among businesses, academia, and policy-makers to set RTDI priorities relevant for enhancing competitiveness; strong academia–industry co-operation, mutually beneficial, intense links among large firms and SMEs both inside and across flourishing regions Ad hoc, weak communication and co-operation among the key players in laggard regions; weak RTDI policy constituencies Insufficient, half-hearted EU-supported efforts – at best – to strengthen weaker innovation systems of laggard regions/countries
RTDI services (information, consultancy, incubation, etc.)	Widely distributed across the whole EU, sharing experience across stronger and weaker regions, geared towards specific needs [not pursuing to diffuse 'one size fits all' type practices], supported by an appropriate, co-ordinated mix of regional, national and EU policies	Mainly in the successful EU regions, sharing experience among themselves and with their partners in Triad regions, geared towards specific needs, supported by an appropriate, co-ordinated mix of regional, national and EU policies
Financial infrastructure	Conscious EU efforts (policies, guidelines, networking, exchange of experience) to improve financial infrastructure across the EU	No conscious EU efforts to improve financial infrastructure in the laggard regions
Policy-preparation methods, practices	Conscious EU efforts (guidelines, networking, exchange of experience) to improve policy-making practices across the EU	No conscious EU efforts (guidelines, networking, exchange of experience) to improve policy-making practices in the laggard regions

[a] Co-operation with the relevant Triad partners is taken for granted, i.e. not discussed here as a distinguishing feature.

be made concerning the probability of these visions. In other words, we do not have any sound, reliable method to predict which of these visions is most likely to materialise. The actual relevance and use of them is to present stark choices in terms of strategies, and project the future repercussions of the strategic choices made now. In that way, these visions can inform present-day decisions, and also show the possibilities to shape our future. From a different angle, it is both an opportunity for, and a responsibility of, decision-makers to act strategically.

These different visions for the EU as a whole have strong implications for the ERIA, too. In principle, therefore, different types of ERIAs can be derived from the above five visions.[30] In practice, however, not

[30] As already stressed, ERIA is understood throughout this paper as the set of all relevant actors of RTDI processes in the EU, as well as their interactions. Therefore, by making a strong link between the EU structures and strategies on the one hand, and the ERIA, on the other, does not deny the possibility that 'ERIA policies' of the EU can enjoy some level of independence from the overall strategy of the EU. Yet, it would go beyond the scope of this paper to discuss when this potential 'discrepancy' (or 'mismatch') can be seen as a 'healthy, creative' tension, i.e. ERIA policies take the lead into the 'right' direction, and pull other policies, too; and when it is 'destructive' by hampering development and/or leading to waste of public resources.

all five of them are equally relevant from a policy (strategy) point of view. Moreover, devising 10–15 visions for the ERIA (2–3 ERIA visions times 5 EU visions) would introduce an unmanageable complexity into this exercise. Thus, two cases have been selected to be considered when building ERIA visions: A) *Double success* and B) *Successful multi-speed EU*.

What sort of ERIA would be needed to support an 'externally' successful, cohesive EU (*Double success*)? What sorts of policies are needed to bring about that type of ERIA (EU vs. national policies; STI and other policies, co-ordination of these polices)? What resources are needed to finance that type of ERIA? In other words, how to set in motion a virtuous circle of 'external' success (competitiveness) of the EU and RTDI efforts? What are the interrelations between cohesion and RTDI efforts? Can we trigger a virtuous circle in this respect, too, or should we see it as a trade-off? The former policy approach is based on the consideration that Structural Funds used for promoting improved innovation capabilities can lead to faster, more efficient cohesion processes, and eventually enhanced external competitiveness of the EU as whole; that is part of the *Double success* vision.[31] The alternative approach would favour using the EU funds exclusively or excessively for boosting already successful EU regions, which would diminish, or even 'dry', the Structural Funds, and that would lead to a *Successful multi-speed EU*.

Not all of these questions can be discussed here – as appropriate answers to them would require a dialogue among the key players, i.e. any individual effort to come up with relevant replies is bound to fail almost by definition –, but the main features of the types of ERIA 'fitting' to the broad visions of *Double success* and *Successful multi-speed EU* are presented in Table 2.

4.2. Futures states of universities

Taking into account the trends and drivers identified in Sections 3, several future sates of universities can be elaborated, depending on the extent to which the diversity of universities – e.g. in terms of the composition of various roles they play, their attitudes, norms and strategies, as well as their performance – is taken into account. A relevant method to deal with diversity is to identify ideal types. To keep the discussion relatively simple and short, only two types of universities are considered here:

- Universities remain largely unchanged, performing the same functions in roughly the same organisational attributes (allowing for efficiency improvements);
- Universities reform themselves – or are reformed [this is not the same!!] – radically by transforming their main functions and/or organisational attributes.

In other words, a sort of 'average' university is assumed in the following sub-sections, when discussing *unchanged universities*: not an extremely inward-looking, inflexible, 'sclerotic' one, further characterised by inertia and poor performance, and not a particularly active one in various networks, a flexible, dynamic, highly successful university, either — although we can find such universities at the extreme. *Radically reformed universities*, by contrast, are highly flexible, and thus adapt their courses, teaching and research approaches, as well as their organisational structures, managerial practices and

[31] A closely related question is whether the emphasis put on cohesion goals would convince laggard EU countries/regions to consider RTDI as an important enabler of more efficient and faster catching-up, and thus devote more intellectual and financial resources to it.

other internal processes to the ever changing external environment, expressed by the needs of their 'clients': students, the wider research community, businesses, policy-makers and the civil society. They possess excellent 'navigation' skills to find their way in this complex world, often characterised by conflicting requirements of the various stakeholders.

In this logic, a third option – to emphasise the possibility for fundamentally different futures, and thus encourage 'outside the box' thinking – could be that universities disappear and their functions are assumed by new players, who perform their tasks/roles in radically novel and diverse ways [21].

For an actual foresight process, aimed at assisting decision-making either at the level of universities, regional, national or EU (ERIA) policies, a much more refined set of ideal types should be developed, based on a thorough understanding of the main features of existing – and hypothetical future – universities. The aim of the above 'crude' typology is just to demonstrate that (a) different types of universities would act in different ways in the framework of the same ERIA; and (b) the same type of universities would behave differently – at least to some extent – when they are embedded in different socio-economic systems.[32] In other words, this method can be understood as a sort of qualitative simulation. Thus, the method itself should not be judged by the choice of these simplified types of universities, taken as somewhat arbitrary 'inputs' for 'modelling'.

As already mentioned, visions for universities are built on alternative futures for the EU and ERIA, that is, *Double success* and *Successful multi-speed EU*, respectively. Tables 3–4 identify major changes in the external environment of universities, and explore the likely features of unchanged and radically reformed universities under those conditions, focussing on their research activities.[33]

There are important driving factors, which can affect universities regardless of the logic followed here, that is, the alternative futures devised at EU and ERIA levels. Thus, their impacts should be discussed separately. As for legitimisation and validation of knowledge, largely unchanged universities would push hard to maintain their centuries-old monopoly to validate knowledge; yet, a number of other organisations – e.g. think tanks, private research organisations, private non-profit research organisations, government laboratories, consultancy firms, patient organisations, various NGOs, trade associations and interest groups – increasingly produce knowledge. Four options can be envisaged for unchanged universities, following the considerations presented in [28]:

a) they progressively lose their power to validate knowledge produced outside their domain
b) they maintain their power to validate knowledge produced outside their domain
c) a new public authority is set up to validate knowledge produced by a large variety of actors
d) a clear separation of knowledge produced by universities (and other credible research organisations), on the one hand, and knowledge produced by other sources with a 'lower status', on the other.

Radically reformed universities, in contrast, would seek partnerships with other knowledge producers, as well as government agencies and NGOs to establish new rules – and organisations, if necessary – to validate knowledge jointly, and a mutually acceptable way.

[32] Universities, obviously, have a certain level of autonomy in choosing their strategies.
[33] Teaching activities of these two types of universities, using the same structure, are considered in [21].

Table 3
Driving forces and their likely impacts on universities: "Double success" case

Trends, driving forces	Universities	
	Largely unchanged universities	Radically reformed universities
The role/mission of universities	The main emphasis is on teaching and 'basic research' (science for the sake of science), not much interaction with other players in (regional, national, sectoral, international) innovation systems and with the society Universities do not understand/take on their role in addressing societal issues Increasing tensions between these 'traditional' universities and the societal and techno-economic requirements of an ERIA in the *Double success* EU	A new balance of the main activities; and a new way to conduct them: intense interactions with other players in (regional, national, sectoral, international) innovation systems and with the society New activities to promote cohesion among EU regions and enhance competitiveness in the meantime Universities understand the societal and techno-economic requirements of an ERIA in the *Double success* EU, and able to adapt to this new environment
Mobility of researchers, competition for talents	Only a few 'world-class' EU universities can attract talents from advanced Triad regions Inside the EU, mobility is mainly a 'one-way street': brain-drain prevails from laggard regions to booming ones, promoted by grants offered by universities located in the advanced regions Mindsets are against competition, measurement and evaluation — beyond the traditional academic indicators Inferior performance and a weakening position vis-à-vis the leading Triad universities	A large(r) number of EU universities become attractive for talents from advanced Triad regions Universities located in advanced and laggard regions of the EU actively co-operate in promoting 'two-way traffic': gaining experience, building contacts in more advanced regions, and then exploiting these contacts upon return to 'cohesion regions' via intense, mutually beneficial co-operation Grants offered by universities are designed both to nurture talents and foster cohesion Diversity among universities: some of them focus on serving regional/local needs, and do not pay attention to attract talents from other countries, not even from the EU
Integration of RTDI activities (across national borders)	Only a few 'world-class' EU universities can join global networks at the forefront of RTDI activities The majority of universities are only interested in 'basic research' projects, isolated from innovation processes	Widely occurs across the EU and globally; policies aimed at promoting the integration of RTDI activities have an explicit aim of fostering cohesion, too Reformed universities actively participate in these co-operations
Multi-disciplinary research	A widely used practice, but conducted in the rationale of 'pure science': the complexities of societal issues and competitiveness are not addressed; the full potential of multi-disciplinary research is not exploited	A widely used practice at universities across the EU; particularly relevant for universities to play their societal role by better understanding the close relationships between societal and techno-economic issues, as well as by offering these new types of insights for other actors

The methods, approaches, norms to organise and manage universities would also differ. At largely unchanged universities an overall 'inward-looking' (passive, 'traditionalist') attitude would prevail; albeit modern management techniques are taught, not applied for themselves; and evaluation of the efficiency and impacts of their activities would be perceived as a burden. Radically reformed

Table 4
Driving forces and their likely impacts on universities: "Successful multi-speed EU"

Trends, driving forces	Universities	
	Largely unchanged universities	Radically reformed universities
The role/mission of universities	The main emphasis is on teaching and 'basic research', not much interaction with other players in innovation systems and with the society Some of the 'elite' universities are already well adapted to this model, putting emphasis only on enhancing competitiveness	Excessive emphasis on enhancing the competitiveness of EU businesses; all activities serve this goal; close co-operation with businesses
Mobility of researchers, competition for talents	Same as in the *Double success* case	A large(r) number of EU universities become attractive for talents from advanced Triad regions Conscious efforts on a 'one-way street' type mobility inside the EU; brain-drain from laggard regions to flourishing ones, promoted by grants offered by universities located in the advanced regions
Integration of RTDI activities (across national borders)	Same as in the *Double success* case, except: Some EU universities actively participate in cross-border RTDI activities, aimed at further enhancing the competitiveness of the advanced regions	Mainly among strong, successful regions across the Triad, driven by businesses, and supported by EU policies; laggards are left out 'Elite' universities are active partners in these processes, the ones located in laggard regions seek partners in the advanced regions (not paying attention to the cohesion needs of their own home region)
Multi-disciplinary research	A more widely used practice, but conducted in the rationale of 'pure science': 'cross-cutting' issues relevant to enhancing competitiveness are not addressed; the complexities of societal issues and competitiveness are not addressed; the full potential of multi-disciplinary research is not exploited	Multi-disciplinary research is pursued in a limited sense: mainly integrating disciplines relevant for tackling techno-economic (competitiveness) issues (i.e. somewhat neglecting societal issues)

universities, on the contrary, would be characterised by outward-looking, pro-active attitudes. They would seek new partners, new funding sources, new ideas for their curricula and research, as well as new roles and responsibilities. They would also apply modern management techniques to improve performance, together with evaluation methods, understood as a useful tool, which would also enhance their visibility and social esteem.[34]

5. Conclusions

This article considered alternative futures for EU universities. Its first conclusion, however, concerns the present, rather than the future: several commonly used notions – and widely held beliefs – are out of

[34] The likely impacts of further drivers, not directly related to research activities of universities, are discussed in [21].

touch with reality. For sensible future-oriented public policies and sound university strategies a better understanding of the current situation is needed, and, in turn, an appropriate terminology should be used.

The Humboldtian model of universities – higher education and basic research as almost inseparable 'Siamese twins' – is still a prevailing notion in many professors' and policy-makers' mindsets. A closer look at various R&D indicators clearly shows, however, that universities are not predominant research performers in the developed OECD (and EU) countries. Not only several other players conduct research, but in the advanced countries business R&D units have even a bigger weight than universities. Further, as nowadays 30–40% of the relevant age group attend higher education courses, an ever larger number of higher education organisations offer mainly – or only – teaching. Meanwhile, 'research-only' positions have become widespread practice at leading universities. Thus, it is neither exclusively the 'elite', who participates in university education, and nor its only aim is to reproduce the academic and societal elite. Data also indicate that universities not only conduct basic research, and it is not only universities who conduct basic research (on average, 54% of basic research expenditures are spent at universities in the OECD countries). Yet, the widely held consensus in the literature on the rationale for funding 'basic science' by public money still rests on the Humboldtian model: training of future generation of researchers is of overriding importance among the benefits of basic science, implicitly assumed to be conducted at universities. Given the fact that higher education and 'basic research' are not that closely interconnected as they used to be, the rationale for funding basic research needs to be revisited.

To reflect on recent changes, the very notion of research has also been substantially broadened/reconsidered, and new issues are now in the centre of analysis, such as knowledge, knowledge production and use; learning, learning capabilities and learning systems; the role of new players in producing, using and validating knowledge; etc.

As both the activities of universities and their environment are undergoing fundamental changes, it is timely to think systematically about their new roles, as well as to consider strategic issues, e.g. how to meet the new social and economic requirements; how to take advantage of major technological, demographic changes and opportunities stemming from globalisation; how to respond to intensifying and globalising competition in research and higher education.

Prospective analyses can be conducted at various levels: individual universities, group of universities (e.g. associations of universities), regional, national or international levels. The main advantage of taking existing or hypothetical universities as a starting point – unit of analysis – is that a wealth of micro-level factors can be considered. As long as the socio-economic system, in which a particular university operates, can be supposed to be stable, this approach can be satisfactory for strategy-building.

Given the fundamental changes occurring in the surroundings of universities, it is highly relevant – although not a trivial task – to start this exercise by devising alternative futures (visions) on their broader socio-economic context. The paper has shown an example – or a starting point for actual policy preparation or strategy-building exercises – by considering different future states first for the EU and the European Research and Innovation Area, and then for universities themselves. In other words, a set of 'cascading' visions have been developed to demonstrate the close links between these three levels.

This approach has a main drawback: given its complexity, it can be rather demanding, especially in terms of time needed for background analyses and then discussions among the participants. It has several advantages, too; hence, before being used in a real-life case, its costs and benefits need to be analysed. The benefits of this proposed method are discussed by using the example of the EU, ERIA and EU universities.

For *citizens*, as well as for *decision-makers in general*, a main advantage can be that major strategic decisions – in our case on the overall rationale of the EU policies and on the 'mission' of the European

Innovation and Research Area – are made in a transparent and conscious way. No doubt, the 'small-scale' decisions – made every day, without taking into account the 'broader picture' – would shape the EU, as well as the ERIA. This 'muddling through' might seem to be preferable for those, who do not want social dialogues on clearly formulated alternative strategies, given the time needed for these processes, as well as the potential tensions occurring while discussing the actions and their consequences. The genuine cost, however, can be a missed opportunity: conscious, well-articulated and broadly shared strategic actions might lead to a completely different, much more favourable future state, as opposed to the outcome of 'muddling through'. What is striking in this respect is the sheer lack of alternative visions in the 2007 Green Paper on The European Research Area [3].

A major benefit for *policy-makers* (at the EU, national and regional levels) could be to 'simulate' the likely impacts of their decisions, by changing the various 'parameters', e.g. the overall rationale of the EU or national policies (i.e. 'switching' between different EU futures), or the actual STI policy tools, as well as the links between STI policies, *per se*, and other policies affecting RTDI processes (that is, considering the rows in the ERIA visions, e.g. exploring the impacts of given polices on the mobility of researchers and students inside the EU or globally). As stressed in the paper, a number of drivers are global (or EU-wide) in their character, while decision-making competences are usually with the national or regional authorities. Thus, the issues of multi-level governance should be analysed, and hence the need for a set of structured futures, representing the various levels of governance. Further, the diversity of universities can also be taken into account, provided that the appropriate 'ideal types' of universities are identified – and used as 'input data' for this qualitative simulation – for a specific policy design task. EU policy-makers might also use this structured way of futures-building as one of the tools assisting their initiatives to align national policies; in that case, however, another level needs to be introduced, namely the national one.

For the *stakeholders of universities* – their leaders, staff, students, businesses, the relevant community around them, be it local, regional or national – a potential gain would be to obtain a better understanding of the context in which they operate, including the alternative future states, towards which these broader systems might evolve, and hence they might be better equipped to devise 'future-proof', robust strategies. In brief, they can 'hold' their own strategic parameters fixed, and juxtapose that set of features with different environments. In case they want to change the major features of their university, they can also explore how these envisaged 'variants' would fit into a 'fixed' setting. In other words, that would mean keeping the environment as given, and changing their university's own characteristics.

Finally, for *disciples of innovation studies*, this approach offer three advantages, as opposed to the case when universities are chosen as the unit of analysis: (i) the likely impacts of potential changes in the broader socio-economic systems, in which universities operate, can be analysed by devising appropriate visions for these broader systems; (ii) the observed diversity of higher education systems and individual universities can be reflected by identifying appropriate ideal types (which, in turn, can and should always be tailored to a specific research question); (iii) the role of other research actors, and more importantly, the links among universities and those other research players can be discussed properly.

This sort of analysis – a structured set futures, taking into account the links among systems operating at different levels – can be of relevance in other Triad regions, too, considering their own salient features. It can be extended to public research organisations, too, operated either in the EU or other Triad regions.

Given the importance of strategic thinking in this field, prospective activities of universities should be promoted by organising awareness-raising events at regional, national and international levels; exchanging these sorts of experience among the concerned actors is desirable, as are promoting strategic dialogues among the stakeholders, initiating pilot foresight (prospective) projects; etc. The national

governments, international organisations and associations of universities can provide methodological and financial support for these initiatives.

As for the choice among types of prospective analyses to support strategy-building for universities, several of them can be useful, namely those, which consider alternative futures in a transparent and systematic way. Foresight is among these techniques, and it offers additional advantages, too, and thus it is recommended to use this particular approach to underpin strategies for universities. By definition, foresight is a participatory process, and thus the accumulated knowledge and experience, as well as distinct viewpoints and approaches of the major stakeholders involved in these strategic dialogues, enrich the prospective discussion and analysis. Participation is particularly important in the case of universities: given their vital roles in generating, transmitting, disseminating and applying knowledge, and hence their contribution to socio-economic development, major stakeholders need to be involved when strategic decisions are to be made on universities. Further, foresight process aligns the participating actors around emergent agendas, resulting in a co-ordinated mobilisation of people, resources and actions. In other words, implementation of various policy proposals and strategies can be more effective, given the commitment of the participants.

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References

[1] P.A. David, Europe's Universities and Innovation — Past, Present and Future, SIEPR Discussion Paper No. 06-10, 2006.
[2] EC, The role of universities in the Europe of knowledge, Communication from the Commission, COM(2003) 58 final, Brussels, 5 February 2003.
[3] EC, The European Research Area: new perspectives, Green Paper, COM(2007) 161, 4 April 2007.
[4] OECD, Four Futures Scenarios for Higher Education, OECD CERI, presented at the meeting of OECD Education Ministers, Athens, 27–28 June 2006.
[5] S. Vincent-Lancrin, What is changing in academic research? Trends and futures scenarios, Eur. J. Educ. 41 (2) (2006) 169–202.
[6] P.H. Aghion, et al., Why Reform Europe's Universities? bruegelpolicybrief, issue 2007/04, available at: http://www.bruegel.org.
[7] STRATA-ETAN EXPERT group, Higher Education and Research for the ERA: Current Trends and Challenges for the Near Future, Final Report, EC DG Research Unit RTD-K.2, October, 2002.
[8] LERU, Universities and Innovation: the Challenge for Europe, League of European Research Universities, November, 2006.
[9] L. Georghiou, J. Cassingena Harper, The Higher Education Sector and Its Role in Research: Status and Impact of Future-Oriented Technology Analysis, Anchor Paper for the Second International Seminar on Future-Oriented Technology Analysis: Impact of FTA Approaches on Policy and Decision-Making, Seville, 28–29 September, 2006 available at: http://forera.jrc.es/documents/papers/anchor/HigherEdAnchorPaper.pdf.
[10] G. Dosi, C. Freeman, R.R. Nelson, G. Silverberg, L. Soete (Eds.), Technical Change and Economic Theory, Pinter, London, 1988.
[11] C. Edquist (Ed.), Systems of Innovations: Technologies, Institutions and Organizations, Pinter, London, 1997.
[12] J. Fagerberg, D.C. Mowery, R.R. Nelson (Eds.), The Oxford Handbook of Innovation, Oxford UP, Oxford, 2005.
[13] C. Freeman, The economics of technical change: a critical survey, Camb. J. Econ. 18 (5) (1994) 463–514.
[14] B.-Å. Lundvall, S. Borrás, The Globalising Learning Economy: Implications for Innovation Policy, Office for Official Publications of the European Communities, Luxembourg, 1999.

[15] OECD, New Rationale and Approaches in Technology and Innovation Policy, *STI Review*, No. 22, 1998.
[16] OECD, Benchmarking Industry–Science Relationships, OECD, Paris, 2002.
[17] W. Polt, C. Rammer, H. Gassler, A. Schibany, D. Schartinger, Benchmarking industry–science relations: the role of framework conditions, Sc. Public Policy 28 (4) (2001) 247–258.
[18] EUROPOLIS, The European Research Area: a New Frontier for Europe? *la lettre OST*, No. 22, 2001.
[19] L. Georghiou, Evolving frameworks for European collaboration in research and technology, Res. Policy 30 (6) (2001) 891–903.
[20] S. Kuhlmann, Future governance of innovation policy in Europe — three scenarios, Res. Policy 30 (6) (2001) 953–976.
[21] A. Havas, Futures for Universities, paper presented at the Second International Seminar on Future-Oriented Technology Analysis: Impact of FTA Approaches on Policy and Decision-Making, Seville, 28–29 September 2006, available at: http://forera.jrc.es/documents/papers/Futures%20of%20universities_paper.pdf.
[22] Richard R. Nelson, The market economy, and the scientific commons, Res. Policy 33 (3) (2004) 455–471.
[23] EC, Frontier Research: The European Challenge, HLEG report, DG Research, Office for Official Publications of the European Communities, Luxembourg, 2005.
[24] OECD, Frascati Manual: Proposed Standard Practice for Surveys on Research and Experimental Development, OECD, Paris, 2002.
[25] D.E. Stokes, Pasteur's Quadrant: Basic Science and Technological Innovation, Brookings Institution Press, Washington, D.C., 1997
[26] E. von Hippel, The Sources of Innovation, Oxford UP, Oxford, 1988.
[27] M. Akrich, R. Miller, The Future of Research Actors in the European Research Area, Synthesis Paper, HLEG on *The Future of Key Research Actors in the European Research Area*, 2006.
[28] A. Bonaccorsi, The Changing Role of Researchers in Europe, 2020, Contribution to the HLEG on *The Future of Key Research Actors in the European Research Area*, 2005.
[29] H. Etzkowitz, L. Leysdorff, The dynamics of innovation: from National Systems and 'Mode 2' to a Triple Helix of university–industry–government relations, Res. Policy 29 (2) (2000) 109–123.
[30] M. Gibbons, C. Limoges, H. Nowotny, S. Schwartzman, P. Scott, M. Trow, The New Production of Knowledge, Sage Publications, London, 1994.
[31] L. Sanz-Menéndez, The Future of Key Actors in the European Research Area: Regional Governments, Contribution to the HLEG on *The Future of Key Research Actors in the European Research Area*, 2005.
[32] A. Bonaccorsi, C. Daraio (Eds.), Universities and Strategic Knowledge Creation: Specialization and Performance in Europe, Edward Elgar, Cheltenham, 2007.
[33] K. Pavitt, What makes basic research economically useful? Res. Policy 20 (2) (1991) 109–119.
[34] K. Pavitt, The social shaping of the national science base, Res. Policy 27 (8) (1998) 793–805.
[35] A.J. Salter, B.R. Martin, The economic benefits of publicly funded basic research: a critical review, Res. Policy 30 (3) (2001) 509–532.
[36] B. Kehm, Governance and Strategy, Presentation at a Workshop on "*Driving Forces and Challenges for the European University*", Brussels, March 23–24 2006.
[37] A. Smith, F. Webster, Changing Ideas of the University, in: The Postmodern University? Contested Visions of Higher Education in Society. A. Smith and F. Webster eds., Open University Press, Buckingham; reprinted in: Universities in the Future. M. Thorne, ed., Foresight, OST, DTI, London, 1999.
[38] EC, Third European Report on Science & Technology Indicators 2003: Towards a Knowledge-Based Economy, Office for Official Publications of the European Communities, Luxembourg, 2003.
[39] OECD, Main Science and Technology Indicators, OECD, Paris, 2006.
[40] M. Thorne (Ed.), Universities in the Future, Foresight, OST, London, 1999.
[41] B. Alesi, S. Bürger, B. Kehm, U. Teichler, Bachelor and Master Courses in Selected Countries Compared with Germany, Federal Ministry of Education and Research, Bonn, 2005.
[42] G. Dosi, P. Llerena, M. Sylos Labini, The relationships between science, technologies and their industrial exploitation: an illustration through the myths and realities of the so-called 'European Paradox', Res. Policy 35 (10) (2006) 1450–1464.
[43] EC, Key Figures 2005, Towards a European Research Area, Office for Official Publications of the European Communities, Luxembourg, 2005.
[44] EC Cohesion Policy in Support of Growth and Jobs: Community Strategic Guidelines, 2007–2013, COM(2005) 0299, available at: http://www.europa.eu.int/comm/regional_policy/sources/docoffic/2007/osc/index_en.htm.

[45] M. Sharp, Competitiveness and cohesion — are the two compatible? Res. Policy 27 (6) (1998) 569–588.
[46] K. Aiginger, Copying the US or developing a New European Model — policy strategies of successful European countries in the nineties, paper presented at the UN-ECE Spring Seminar 2004: Competitiveness and economic growth in the ECE region, Geneva, 23 February, 2004
[47] K. Aiginger, A. Guger, The European Socio-economic Model: Differences to the USA and Changes Over Time, WIFO, 2005.
[48] J. Romanainen, National Governments, Contribution to the DG Research Expert Group on *The Future of Key Research Actors in the European Research Area*, 2005.

Attila Havas (MA 1983, PhD 1997) is a Senior Research Fellow at the Institute of Economics, Hungarian Academy of Sciences (e-mail: havasatt@econ.core.hu). His academic interests are in economics of innovation, theory and practice of innovation policy, and technology foresight. In 1997–2000 he was Programme Director of TEP, the Hungarian Technology Foresight Programme. He has participated in a number of international research projects on STI policies, innovation and transition, as well as on foresight and prospective analyses, been a member of several EU expert groups on foresight, and given invited lectures at international conferences and workshops. He has advised national governments and international organisations on the above issues.