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Summary of discussion and conclusions of individual session 2.3
"Which future for S&T specialisation?"

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The issue and context:

In order to have an appreciable impact, R&D efforts must reach some 'critical mass'¹ threshold. For many disciplines, technologies or other 'thematic areas', however conceived, this threshold can be quite low, and in that sense it is quite easy to reach. There are instances, however, where individual regions or countries are unable to reach critical mass in a specific area (e.g. nanotech, biotech) without sacrificing others (often potentially promising areas), or even instances where they can never hope to reach critical mass on their own (e.g. fusion research).

One issue is the spreading of resources. It is frequently alleged that national and regional authorities in EU Member States sometimes allocate their efforts in too many thematic areas, even when the successful development of all these areas is beyond the means of each of them individually. Coordination, networking and, to some extent, consolidation and concentration of thematic priority-setting (by whatever means and at whatever level) are therefore put forward as possible solutions in current policy discussions. These discussions have stirred a lively debate² and raised a number of questions: Does the observable overlap in national and regional specialisation patterns represent fragmentation and duplication or – alternatively – healthy diversity and competition? What are the benefits and risks of specialisation-minded policies? What, if any, governance mechanisms might be used to enact such policies?

Another issue relates to benefiting from emerging knowledge areas - including those that have yet to emerge. Not all thematic areas are equally "fertile": Some, especially novel, paradigm-setting ones such as Information and Communication Technologies (ICT) and biotechnology, present many more opportunities for making significant discoveries than do others. A given investment of R&D efforts in those areas would result in proportionately greater returns - be they scientific, technological, or economic. New knowledge domains emerge all the time and the fact that scientific and technological diversity (or, contrarily, lack of specialisation) is an important predictor of where the new big breakthrough might come from (and where the benefits might accrue to *first*) means that these two, otherwise distinct issues, must be studied jointly and constitute a common policy theme. How can policy re-orient systems and shift

¹ For a similar conceptualisation of the issue see the ERA Rationales Expert Group report (Georgiou, 2008): http://ec.europa.eu/research/era/pdf/eg7-era-rationales-final-report_en.pdf

² see contributions to IPTS workshop on R&D Specialisation in "The Question of R&D Specialisation: Perspectives and policy implications": <http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=2339>

resources to the most fertile areas? How can policy reconcile specialisation with diversity? What instruments and governance mechanisms – and at what level, European, national, regional - become relevant in this setting?

Analysis of the challenges and the European dimension

Thematic priority-setting is still largely developed with national or regional considerations in mind, often failing to reap the full benefits of the opportunities offered by an enlarged ERA. Some commentators believe this is leading to an unnecessary duplication of R&D, which stands as an obstacle to achieving 'critical mass' at a European level.

One of the explanations put forward for this situation is that regional and national policy makers simply imitate the most 'fashionable' thematic priorities – be it biotech, ICT or nanotech – resulting in a European landscape with "enormous uniformity"³. This notion of the problem carries with it the policy prescription of 'particularisation', where regions and countries identify their strengths and focus their efforts in order to match their abilities to contemporary or anticipated demands⁴.

However, records of recent policy discussions on the issue show that there is a lot of uncertainty about the underlying facts, their interpretation and the desirability of possible remedies⁵.

As several participants to the session pointed out, there are often important educational needs which call for maintaining a minimum level of R&D across disciplines. Universities in particular play important roles in regional economies, especially in areas such as health and environmental sciences. One of the session participants posed the challenging question: "*Can a regional university do without a Physics department?*". At the European level too, it is unclear to what extent the currently observable overlap in thematic/disciplinary priorities can be conceived as wasteful duplication or, contrarily, healthy competition. Even in an integrated knowledge area, regional and national authorities may have ambitions that consciously embrace 'duplication' as part of their particular R&D development strategy.

In his presentation, Ramon Marimón pointed out that there are several advantages to being specialised, including full exploitation of comparative advantages and the increasing returns associated with deepening and integration into extensive divisions of labour. Specialisation can be a disadvantage though too, in periods of rapid and unexpected change. He contrasted the case of 'natural' specialisation (of the kind that occurs without policy intervention), with deliberate specialisation strategies. Ramon Marimón suggested that greater integration into the ERA is likely to magnify *ex ante* comparative advantages and introduce commensurate risks of creative destruction⁶. Conscious specialisation strategies could help mitigate some of

³ Dominique Foray and Bart van Ark (2007) "Smart specialisation in a truly integrated research area is the key to attracting more R&D to Europe", Expert Group Knowledge for Growth, Policy Brief No. 1, http://ec.europa.eu/invest-in-research/pdf/download_en/policy_brief1.pdf

⁴ See 'smart specialisation' concept by Prof. Dominique Foray, or the concept of the 'learning region', popular in regional science.

⁵ In addition to the ERA Rationales Expert Group report and work by JRC-IPTS, see policy briefs produced in the frame of the "Knowledge for Growth" Expert Group: http://ec.europa.eu/invest-in-research/monitoring/knowledge_en.htm.

⁶ c.f. the so-called "new trade theory", for instance: Andrew Bernard, Stephen Redding and Peter Schott (2007), "Comparative Advantage and Heterogeneous firms", *Review of Economic Studies*, 74, pp. 31-66

the risks and help regions and countries prepare – but as Ramon Marimón reminded us, carry risks of their own, including betting on the wrong area, crowding out private entrepreneurship and political short-termism.

In his presentation Anastasios Giannitsis⁷ emphasised the numerous challenges facing the EU at present, including the aftermath of the financial crisis and the 'Grand Challenges' in the form of climate change, energy and demographic shifts. Giannitsis argues that there is a clear role for policy in guiding specialisation in those domains. He pointed out that all choices are made with incomplete information, and that policy will, inevitably, have to take some risks. He proposed that specialisation choices can be understood as a special case of risk management, where portfolio approaches that embrace variety, diversification and selection can become valuable tools.

It is often the factors guiding the specialisation decisions that fall outside the policy planner's own domain – such as those of companies and individual scientists – that are the most important. In his presentation Constantin Ciupagea⁸ suggested that the capacity of public authorities to influence the structure of private R&D varies greatly between member states, in most cases being rather limited. In fact, in countries where public decision making on industrial matters is constrained (especially newer Member States) the role of private actors can become quasi-monopolistic – raising an obvious of risk for the long-term development of the economy. Appropriate policies can help minimise this risk – and there may be a role for European interventions there - but one should be wary of top-down industrial plans that leave individual actors little room for manoeuvre.

There is certainly a lot to be said about policy that can tap a region's comparative advantage, strengthen it over time and align it with a fertile paradigm of knowledge production. Martin Hinoul's presentation⁹ of the Eindhoven, Leuven, Aachen (ELA) triangle demonstrated that a strategy that is bottom-up and demand driven combined with a long-term vision and ambition can serve as a potent focusing device. Emily Wise¹⁰ showed how tangible policy initiatives are leveraging "smart specialisation" or "networked specialisation" in pursuit of critical mass and long-term visions. These include Singapore's National Research Foundation Strategy and the Finnish National Centres of Expertise and Centres of Excellence. Approaches of this kind could represent a way for public R&D to become more relevant to the needs of global industry. As pointed out during the discussion though, such approaches do not always work – so universally effective specialisation policy remains elusive.

On a somewhat positive note, there was agreement that specialisation will be promoted as a natural by-product of the on-going construction of ERA. Economic theorists as far back as Adam Smith have postulated that specialisation within a division of labour is a function of 'the extent of the market'. In a European research analogy, greater specialisation will come about as a by-product of increased integration into pan-European divisions of labour: the opportunities offered by an enlarged, open and competitive research space and the guarantees offered by cohesion policies for the redistribution of accruing benefits.

⁷ "Identification of methods and criteria for guiding choices, Overview and main points", paper by Anastasios Giannitsis

⁸ "Identification of the most appropriate governance structures to carry out specialisation policies and make them evolve over time, including stakeholder involvement", paper by Constantin Ciupagea

⁹ "The ELA Triangle Critical Mass through cooperation", presentation by Martin Hinoul

¹⁰ "Policies Supporting Specialisation of Research and Innovation – good practices and policy mixes", paper by Emily Wise

In that respect, the apparent lack of R&D specialisation may be a reflection of slow progress towards (the equivalent to) a common 'market' for knowledge and, as pointed at by several indicators¹¹, an increasingly stagnant process of European integration in R&D. Understood as such, the real problem lies not with lack of specialisation *per se*, but with the extent of true *integration*. This notion essentially questions whether one should be attempting to remedy what may after all be the *symptoms* (overlapping specialisation patterns) of the apparent problem and, perhaps more appropriately, be concerned with the *causes*, including the appreciably slow progress towards the ERA vision.

Specialisation strategies are of importance for the very long-term too. Insofar as they imply a commitment to a choice made sometime in the past, they constrain responsiveness to new challenges. Over the last few decades Europe has been slow to respond to emerging fields of science and technology, leaving other world regions to be protagonists in and reap the majority of the benefits from their emergence and development. Europe's diversity, not only in terms of thematic/disciplinary priority setting, but also of approaches, mentalities and institutional frameworks becomes a particular strength in this setting. The question there is how to mobilise them effectively and how to avoid specialisation policies that may result in, to use a biodiversity analogy, dramatic (and largely irreversible) extinction events.

To that question, participants provided some tentative answers: Anastasios Giannitsis presented an account of the risks carried by specialisation-minded policies and proposed, among other things, an approach of "evolutionary targeting", i.e. the promotion of virtuous co-evolutionary processes between the business sector and public policy. Emily Wise argues that policy makers can nurture shifting capacity by adopting policies that go beyond hi-tech and promoting institutional change. The example of the US "New Biology for the 21st Century", a multi-agency, multi-year and multi-disciplinary initiative is indicative of the kind of interventions that may be needed.

Conclusions/Recommendations:

(1) *An appropriate balance between specialisation and diversity will need to be encouraged depending on strengths, experiences and major goals.*

Much of the discussion was devoted to the right balance between specialisation on the one hand and diversity on the other. *Can you afford not to do some things? Can you be a world-class star in something?* In other words, what extent of specialisation may be considered optimal? These are difficult questions with no straightforward answer. Given a specific context and particular assumptions (of the 'all else constant'-type), policy analysis could provide tentative answers to such questions, which are certainly worth exploring further.

(2) *Strengthening the evidence base will be necessary before a comprehensive EU policy on specialisation is developed.*

In his presentation on the ELA triangle Martin Hinoul used detailed statistical information, the equivalent of which at the European level is, regrettably, unavailable. We need more and better ways to measure R&D and S&T specialisation across EU regions and countries. At present it is still easier to measure the structural composition of outputs than *inputs* – with

¹¹ c.f. Science Technology and Competitiveness Key Figures Report (2008), http://ec.europa.eu/research/era/pdf/key-figures-report2008-2009_en.pdf

R&D expenditures and the skills of researchers of course being of particular relevance, as policy makers are called to take decisions precisely about them. This is somewhat of a paradox, as at least the public side of inputs is within the policy-maker's area of leverage.

(3) Specialisation choices need to be attached to broader political goals, with the notion of 'Grand Challenges' being especially relevant.

As stressed by Anastasios Giannitsis, the identification of governance mechanisms and criteria for guiding choices cannot occur in a policy vacuum. While the discussion in the session has highlighted examples of best practices and governance methods for seeking consensual, long-term strategies, the final choice is a political decision which cannot be pre-empted. There is a need for clear visions and goal packages in framing the discussion.

There was some agreement that the notion of the 'Grand Challenges', that is research oriented at tackling the major risks that Europe and the world are faced with in the form of climate change, energy and demographic shifts, may be an appropriate area to foster specialisation. A common goal on a matter of urgency can act as an umbrella, focusing research not only on the front-line issues, but also uniting a whole ecology of related research topics and capacity building.

(4) Specialisation strategies will apply more to the public side of R&D. Structural changes in the private sector appear best served by promoting a well-integrated, open and competitive ERA, including the changes in the framework conditions that would entail.

Is specialisation, something that policy can change in a way that would produce the desirable outcome in a timely and efficient manner? Constantin Ciupagea's experience of the ability of policy makers to influence industrial structure in various member states gives some hope but leaves ample room for doubt. This is much more contestable ground, as it deals with the limits of government intervention in the research process and - to the extent that research is a means to an end – in the economy at large.

There was agreement that policy has a role in nurturing the framework conditions that allow specialisation to emerge naturally. As Ramon Marimón pointed out these include an open, well-integrated and competitive ERA and pushing forward with the several and in many cases painful reforms that are required to make this happen. Education will have to play a key role, with a special focus on entrepreneurship. Institutional changes that strengthen the responsiveness of research systems to emerging fields of science and technology will also be needed. The different response of national and regional systems to the ERC calls for starting and advanced grants shows how local openness can play an important role in attracting talent and achieving new forms of specialisation.

(5) Special policy provisions will need to be made for catching up countries, with cohesion policies playing a central role in capacity building.

As specialisation strategies imply changes in the distribution of R&D resources, they can give rise to inequality. Specialisation strategies need to be accompanied by policies that help build capacities and level the competition field. More broadly, there was agreement that political choices about specialisation will vary both between levels of governance (EU, national and regional authorities) and between the various members of those levels.