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Situation with regard to research and innovation in Europe in relation to United States, Japan, China…

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Introduction

It is an honour to address this meeting immediately after Commissioner Potočnik. I think we all recognise his tremendous contribution to European research policy. He has given considerable momentum to achieving a strong European Research Area, and I really hope that Member States will take rapid action to achieve the desired results.

Some words of explanation [1]: I want to look beyond research and at the link with innovation and our competitiveness in the global economy. Evidently, companies depend upon supportive environments, and this is particularly so for the innovative SME which must also compete globally. The main points I want to discuss are about:

1) Developing the local environments that will engage enterprises of all sizes; enable them to grow; and usefully concentrate relevant knowledge and skills;

2) Obtaining stronger customer and societal demand for innovation; and

3) Providing consistent, appropriate, simple regulation and policy support. This is about securing a broad-based strategy for innovation that is also relevant at the level of the local community.

It is important to focus on this outcome, and not assume that initiatives will individually add up to produce a desired result. The aim that industry will invest the equivalent of 2% of GDP in research and development depends upon achieving more demand for innovation and a larger number of successful firms operating in sectors that require a high investment in R&D; as well as ensuring that Europe is the right place to do this R&D.

Innovation Ecologies and Company Growth

Company growth is the first serious concern. Much of the gap between Europe and the US in terms of overall research intensity is related to the growth of American firms that were not large fifty years ago. In Korea, Taiwan and now China, we see similar examples of firms that are growing rapidly to dominate key parts of their value chains.

The equation "New Companies = New Jobs" is very familiar. Much public policy has concentrated on cutting the red tape involved in starting new companies and encouraging more dynamic investment in new firms. All this of course is good. However, helping companies to start is not the same as ensuring that they prosper.

Several recent reports have asked for European innovation policy to pay more attention to helping small companies grow in size. Leading economists [2] at the recent French Presidency conference in Toulouse gave the same message, with a proposal, repeated at the Versailles Competitiveness Council in July, to use the proportion of business R&D conducted by new firms as a metric of progress. This metric can only be met when a much higher proportion of our firms achieve world-scale and remain R&D intensive in Europe.

The American economist David Birch first put together datasets that suggested that most net new jobs in the USA in the 1970s and 1980s came from new establishments and firms with fewer than 100 employees, and this gave rise to the focus on "gazelles". An extensive new study [3] has confirmed that 3% or so of firms do account for the lion's share of growth in both sales and employment in the US economy.

What looks fresh is evidence that "high-impact" firms are typically around 25 years old, with job creation split almost evenly among firms with more and less than 500 employees. These firms have been around for quite a long time before making a significant impact on the economy. They are found in roughly equal proportion across many industry sectors, and there are no obvious clues to predict which will become "high-impact."

Few European policies have so far sought to utilise and amplify natural pathways within sectors as a tool for supporting company growth, or attended to the large-scale market demand that is required for company growth to happen. The tendency has been to tailor policies and initiatives according to firm size and the functional responsibilities of ministries and European programmes.

Global Value Chains, Open Innovation and Business Models

So, what do these pathways look like? In general, small and large firms' prospects are interdependent. The principal customers of many small firms, high-tech or otherwise, are larger firms, and they need good connections at an early stage of innovation. Larger firms in turn rely upon SMEs for their supply chains and increasingly as a means of knowledge acquisition. Medium-sized firms play key roles, and are often overlooked.

Many firms are adopting more open styles of innovation, with more attention to the business model, while knowledge-intensive elements like R&D are globalising. The main drivers [4] are markets, value chains and access to knowledge.

As companies develop, they seek to retain a core of internal capabilities. This determines what to outsource and with whom to collaborate. There is a price to pay for collaboration: it increases dependence on others and requires particular skills: partnerships can be expensive to manage.

Consequently, companies prefer their partners to be "close by" so-to-speak, and inventive activity tends to remain concentrated. Suppliers and customers are the most sought-after partners for innovation. Public research is an important source of knowledge, especially in more upstream research activities, but, for good reasons which I will discuss, it represents only a small share of collaborations for innovation.

The main reason that companies cite for locating research and development facilities abroad is proximity to large and growing markets. Other important factors include availability of talented engineers and researchers and proximity to production and sales.

In the process, firms are developing their own global networks. The benefit of an "open" approach to innovation comes from the possibility to extend and reinforce these networks with a larger base of ideas, technologies and corporate synergies, and share and reuse knowledge, increasing the power of innovation beyond what is possible in-house.

There are significant differences among industrial sectors. In ICT and telecommunications, characterised by rather short technology life cycles, partners work collectively so that they all stay at the forefront of new developments.

In chemicals and pharmaceuticals, technology life cycles are longer and strong protection of intellectual property rights is the norm, and companies look outside mainly to keep up with research.

In the fast-moving consumer goods industry, patents are important but more easily circumvented, and companies look for technologies or products with proven market potential to improve and scale up.

The word "open" is misleading. The aim is to do good business. Effective open innovation requires mutual trust based on clear rules: risks such as theft of intellectual property are an evident concern. The fear is that unique knowledge may be revealed to partners that later become competitors.

Today's bogeyman in this respect is, of course, China, but there is evidence that larger Western companies have learned to manage the risk, and that Chinese regulation is improving. It is hoped that such regulations will be enforced.

By comparison, SMEs face a double burden. Working outside the home region is more difficult, but even a collaboration near-to-home can be problematic for companies with fewer resources and limited expertise in IPR issues. They need support that integrates smoothly with their own business development processes.

When the CEOs of global companies speak about innovation, they often mean something other than technological innovation. Innovation in the enterprise model or business model is crucial, and around 70% of American CEOs report that they plan fundamental changes in the next 5 years [5].

One of my US colleagues goes further; reports that future of innovation will be about the collective enterprise model; and uses the word "Endeavours" as unifying concept for activities driven by common sets of interests, goals and values.

The empirical evidence seems clear: the greater the level of well-managed collaborative innovation, the greater the financial performance in terms of revenue growth, operating margins and sustained profitability.

The consequences are neatly illustrated by the example of Apple's iPod [6]. Much of the science is European in origin. Most components come from suppliers in Asia. But the largest proportion of economic value added is retained in the United States and the premium comes from innovative design and usability: better "stuff" rather than just more "stuff".

However, public policy worldwide still tends to focus on scientific R&D and technology rather than the people and value chains that support user-oriented, often non-technological innovation. More attention needs to be given to the demand for innovation and to how

innovation happens. When you consider that around 70% of the European economy is in the service sector (including services that provide added value for manufacturing), there seem to be some gaps here.

I mentioned that collaboration in innovation mainly occurs between companies, rather than with universities, and with good reasons. What is being transferred are finished components and services, not "raw knowledge," and there is a common business language for managing the process.

Nonetheless, interactions between companies and universities are also becoming more extensive and important. As Europe reforms its university systems and gives more emphasis to knowledge transfer and other "third-mission" activities, it is important to enable those forms of knowledge transfer that are actually effective.

Industry-university collaborations are particularly effective when they achieve a deep understanding of complex, yet tightly-focused problems. It must also be easy to design and launch programmes that really address partners' interests and strengths, rather than trying to shoe-horn into something less focussed. Rolls Royce's "University Technology Centres" show how this can be achieved. There are more good examples to be found.

There is then the problem of translating industrial questions and raw academic knowledge. Larger companies can deal with this, but the vast majority of smaller companies are not intrinsically science-based and lack the resources. Translational support is needed, perhaps for extended periods.

This has been an objective of many programmes around the world, but the record is mixed. By and large, companies that participate in the Framework Programme gain access to valuable networks but, almost without exception, believe that contractual arrangements involve too much effort given the size of the projects.

A Swiss colleague summed this up: "Participation in FP6 provided the only way to build up a network we needed in Europe. But it was much simpler for us to set up an equivalent network in the United States by working with NIST (one of the government agencies), even though we are quite a small Swiss-based firm." Although Eureka has suffered from unpredictable funding, smaller companies have found that some of its clusters offer very effective platforms for their own development.

By comparison, one of the reasons why pharmaceutical research has been moving from Europe to the United States derives from the scale and effectiveness of research partnerships in the biomedical sciences. The Joint Technology Initiative on Innovative Medicines is part of Europe's response.

Yet it is also evident that university-industry relations can be fragile. The total research funding that American universities obtain from industry grew steadily after 1972 to around 8%, but has fallen back to just over 5%, which is less than Europe's 6.5% [7]. Some point at a growing misalignment of company and university objectives, exacerbated by over-zealous approaches to technology transfer that only work well for certain sectors.

Asian governments are also encouraging universities to develop stronger ties with Western firms. In some cases, the emphasis is on "contract research," arrangements can be made by purchase order, with the paperwork finished in a few days and all IP belonging to the

company. For joint research, the home government will often pick up a substantial part of the costs and the paperwork will take a few weeks to complete.

These signals reinforce the belief that successful regions concentrate knowledge by creating the conditions where firms establish enduring partnerships. It is not just that these regions have stronger absorptive capacity. They act as magnifying lenses, sustain value chains, and cross-fertilise into new activities in related areas.

Lead Markets and Public Markets

Finally, I turn to markets for innovation. Without customers, the best ideas and skills produce little, and the home market remains important. Today, other parts of the world have an advantage: Asian growth and efficient North American markets outstrip what Europe can provide. The question is "How to stimulate more large-scale demand for innovation in Europe that will also create economic value for Europe?"

As example, Europeans feel passionate about environmental quality. Can we leverage these passions in order to become natural world leaders in environmental innovation?

One suggestion is to use standards and public procurement to shape demand and act as demanding customer. The Commission has made such a proposal in respect of pre-commercial procurement, and the recent evaluation of IST activities with FP6 also highlights governments' role in stimulating innovative solutions to societal demands.

The problems are that procurement tends to emphasise price and proven technology and in any case is not high on many political agendas; while stimulating innovation leads to higher initial costs and uncertain risks. Standards are very effective for well-defined items using a reasonably well-established range of technologies, but untested for innovations which are expected to be long-term and often systemic in nature.

As example, decarbonising the economy will require massive deployment of many new technologies to mitigate impact, provide new options, and generally bring down costs of the alternatives; as well as extensive research and development in areas like safe carbon capture and storage. Yet, even the rate of deployment of relatively well-known "clean technologies" is considered disappointingly slow by those who are unfamiliar with the general process of technology adoption.

One approach is to better connect policy areas. This is perhaps easiest when relevant ministries have broadly-based responsibilities. The US Department of Energy funds energy research while implementation is a State responsibility. It seems that Danish companies gained more long-term benefit than Americans from early US investments in wind power. Water supply is handled at the municipal level, which does not fund demonstrations of new desalination technologies. The Department of Health and its National Institutes of Health operate at federal level, and the positive outcome is clear.

In Europe, the Lisbon and Gothenburg processes were established at essentially the same time, and both are commanding enormous attention. But the follow-up activities, such as the Environmental Technologies Action Plan, often seem disconnected, both from one another and from broader economic goals, both at national and European levels.

So What Can Be Done?

New challenges are appearing in Europe, connected with the economy, security, energy, migration, and the environment, but these are precisely the reasons why research and innovation were given a high profile for the last decade. It is not the time to say that the "job is done": innovation and competitiveness must stay at the forefront of public policies and the public must understand the reasons. This requires dynamic and broadly-based innovation strategies with ambitious trans-national objectives. Yet these strategies must also be realistic in terms of the outcomes that are desired and meaningful to the public's priorities.

One suggested approach is for European governments to agree on a small number of Grand Challenges, based on ambitious outcomes and objective targets that are relevant to European aspirations, depend on significant research, and provide meaningful demand for innovation.

It is possible to see how this approach can be connected to the trends of concentrated networking that I have discussed, and successfully engage large and small firms and public institutions. But it will require a very significant change in mindset at many levels, based on understanding how global networked innovation works and a philosophy of "making things simple" here in Europe.

There is widespread awareness that the complexities of European integration have got in the way of achieving the outcomes we want. There are so many initiatives, but collectively it is unclear how they will play out. To meet combined goals such as growth, innovation and environmental improvement requires an order of magnitude improvement in the effectiveness and coherency of European and national initiatives and regulation.

We can help this process by looking for better ways to inform policy formulation about innovation and the operation of value chains in connected global economies: how different sectors are structured; what we continue to do better in Europe that creates value for Europe; and the barriers that are hindering our success at the regional and global levels.

As just one illustration, I mention the new European rules on allowable state aid to enterprises. These are very necessary rules and a substantial improvement as far as R&D is concerned. But, with grass-roots-led public-private partnerships becoming increasingly important, the rules need to be clearly-understood and easy-to-implement, and this is not yet the case. Innovative partnerships never get started when people are imagining non-existent regulatory risks. They need clarity and predictability.

I have described a world in which business development and innovation are increasingly networked and global processes, and require that players can easily find one another and work according to their own objectives and strengths. Company growth should be viewed as a good thing and a measure of the effectiveness of public policy.

This means not just recognising SMEs as vital parts of a strong knowledge-based economy, but understanding that their main success and contribution is likely to occur many years after formation. Along the way, many SMEs will require support for knowledge transfer. The way this is provided will differ by sector but I wonder whether our public research organisations can play a greater part. Only a few seem to be thinking this way and are sufficiently international in outlook.

The link with education is also vital. When investing in people, emphasis should be on fostering in-depth knowledge combined with cross-functionality, mobility and a "culture of

innovation." And it is correct also to implement the European Research Area. We need strong public sector research and stronger universities. I believe that public research has
240 nothing to lose and everything to gain by being more visible and more evidently connected with public concerns and priorities. But we need to keep in mind, as our major competitors understand [8], that beneficial innovation depends upon much more than new science.

Global, open innovation enables us to produce "better stuff" and it requires people, companies and organisations who work well in networks and at interfaces. We must help them by making it easy to do so. In the words of Elvis Presley, "A little less conversation, a little more action."

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