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# Smart Specialisation – The Concept

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*This brief introduces the basic concept of "Smart Specialisation" (SS) which has been a leading idea of the Knowledge for Growth expert group (K4G). The concept is spelled out in more detail in Policy Brief N° 1 in relation to globalisation. Other K4G Policy Briefs that refer to the concept are those on Catching-up Member States (N° 5) and on technology and specialisation (N°8).*

## Rationale for invigorating the R&D specialisation policy discussion

Addressing the issue of specialisation in the R&D and innovation is particularly crucial for regions/countries that are not leaders in any of the major science or technology domains. Many would argue that these regions/countries need to increase the intensity of knowledge investments in the form of high education and vocational training, public and private R&D, and other innovation-related activities. The question is whether there is a better alternative to a policy that spreads that investment thinly across several frontier technology research fields, some in biotechnology, some in information technology, some in the several branches of nanotechnology, and, as a consequence, not making much of an impact in any one area. A more promising strategy appears to be to encourage investment in programs that will complement the country's other productive assets to create future domestic capability and interregional comparative advantage.

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**One simple idea**

It should be understood at the outset that the idea of smart specialisation does not call for imposing specialisation through some form of top-down industrial policy that is directed in accord with a pre-conceived "grand plan". Nor should the search for smart specialisation involve a foresight exercise, ordered from a consulting firm. We are suggesting an **entrepreneurial process of discovery** that can reveal what a country or region does best in terms of science and technology. That is, we are suggesting a learning process to discover the research and innovation domains in which a region can hope to excel. In this learning process, entrepreneurial actors are likely to play leading roles in discovering promising areas of future specialisation, not least because the needed adaptations to local skills, materials, environmental conditions, and market access conditions are unlikely to be able to draw on codified, publicly shared knowledge, and instead will entail gathering localized information and the formation of social capital assets.

This activity poses a public policy problem. The discovery of pertinent specialisation domains has high social value because it helps to guide the development of the region's economy. But the entrepreneur who makes this initial discovery will only be able to capture a very limited part of his investment's social value because other entrepreneurs will swiftly move into the identified domain. Furthermore, entrepreneurial individuals that are well-placed to explore and identify new activities often will not have sufficient external connections to marketing and financing sources and are likely to find themselves in a weak position when negotiating with these external parties for the resources need to expand their young enterprise, reducing their incentives to enter in the first place. Thus there is a potentially serious incentive problem that is not susceptible to resolution by resorting to protection via intellectual property rights. The resulting tendency toward under-investment in this particular type of "discovery process" warrants considering what corrective role can be filled by public policy measures to support greater engagement on the part of locally situated entrepreneurs.

Beyond trying to address this incentive problem, policy makers should accept that their role in "selecting the right areas for specialisation" may be a more modest one than is usually envisaged when support for infant industries and support for technology start-ups are under discussion. Public entities can play an important infrastructural role by providing and collating appropriate information about emerging technological and commercial opportunities and constraints, product and process safety standards for domestic and export markets, and external sources of finance and distribution agencies. Assisting local entrepreneurs to coordinate in forming mutually reinforcing connections and pool generic knowledge that will accelerate this discovery process may also be helpful activities.

**One simple tool**

The specific properties of *General Purpose Technologies* (GPTs) define a framework that helps to clarify the logic of Smart Specialisation (SS). While major innovations often result from the commercialization of a core GPT invention, and its successive technological elaborations – such as the double-condensing steam engine, the electric dynamo, the internal combustion engine, or the micro-processor, there myriads of economically important innovations that result from the « co-invention » of applications (steam-ships and locomotives, arc-lamps and AC motors, etc.) In fact, the characteristics of a GPT are horizontal propagation throughout the economy and complementarity between invention and application development. Expressed in the words of an economist, invention of a GPT extends the frontier of invention possibilities for the whole economy, while application development changes the production function of a particular sector. Application co-invention increases the size of the general technology market and improves the economic return on invention activities relating to it. There are therefore dynamic feedback loops in accordance with which inventions give rise to the co-invention of applications, which in their turn increase the return on subsequent inventions. When things evolve favourably, a long-term dynamic develops, consisting of large-scale investments in research and innovation whose social and private marginal rates of return attain high levels. *This dynamic may be spatially distributed between regions specialised in the basic inventions and regions investing in specific application domains.*

This framework suggests strategies that can be pursued with advantage both by regions that are at the scientific and technological frontier, and by those that are less advanced. While the *leader regions*[4] invest in the invention of a General Purpose technology (GPT) or the combination of different GPTs (bioinformatics), *follower regions* often are better advised to invest in the « *co-invention of applications* » - that is – the development of the applications of a GPT in one or several important domains of the regional economy. Some examples would be biotechnology applied to the exploitation of maritime resources; nanotechnology applied to the wine quality control, fishing, cheese and olive oil industries; information technology applied to the management of knowledge about and the maintenance of archaeological and historical patrimonies. By so doing, the follower regions and the firms within them become part of a realistic and practicable competitive environment -- defining an arena of competition in which the players are more symmetrically endowed, and a viable market niche can be created that will not be quickly exposed to the entry of larger external competitors. The human capacities and resources formed by the region, thanks in particular to its higher education, professional training and research programmes, will constitute « co-specialised assets » – in other words the regions and their

[4] We distinguish between "leader regions" that master the technological frontier, follower regions that are able to catch up to a leader region and laggards who struggle to build up absorptive capacities to apply advanced technologies (see Policy Brief N° 5 on catching-up countries).

assets have mutual needs and attraction for one other – which accordingly reduces the risk of seeing these resources go elsewhere.

**Implementation and policy**

Finally, **there is a role for governmental S&T policies**, but it is not that of bureaucratically selecting areas of specialisation and fostering the development of "national champions" in inter-EU competition. Instead, governments have three main responsibilities:

- Supplying incentives to encourage entrepreneurs and other organizations (higher education, research laboratories) to become involved in the discovery of the regions' respective specialisations. The incentive framework is essential since the social value of the knowledge produced is very high and entrepreneurs who make this kind of discovery are likely to capture only a negligible share of this social value.

- Evaluating and assessing effectiveness so that the support of a particular line of capability formation will not be discontinued too soon, nor continued so long that subsidies are wasted on otherwise non-viable enterprises. The challenge is to prevent the evaluation process from being captured by the interests that are benefiting from the program or by rivals who would like to see it discontinued. So the national agency in charge of this policy should confine themselves to ascertaining whether two criteria are satisfied before initiating the usual policy tools to support R&D and innovation: i) what is the potential of the GPT to regenerate the targeted economic domain (production or services) through the co-invention of applications? ii) Is the size of this domain large enough (the size refers here not to GDP but to the size of the ***relevant*** sectors in the economy, that is, those sectors that could potentially benefit from the knowledge spillovers from the initial development of applications)?

- Identifying complementary investments associated with the emerging specialisations (educational and training institutions, for example) in the case of a region investing in the co-invention of applications of a General Purpose Technology (GPT). Supporting the provision of adequate supply-responses (in human capital formation) to the new "knowledge needs" of traditional industries that are starting to adapt and apply the GPT, by subsidizing the follower region's access to problem-solving expertise from researchers in the leader region, and by attending to the development of a local personnel that can sustain the incremental improvement, as well as the maintenance of specialised application technologies in the region.

It will help to provide an example that illustrates the ways in which national public policy has an important role in supporting and accompanying emerging trends in smart specialisation. The Finnish Pulp and Paper (P&P)

industry views nanotechnology as promising source of valuable applications innovations, and its firms are taking steps to assess this potentiality. Some of the P&P companies are responding to these opportunities by increasing their overall internal R&D investments, which are aimed not only at implementing available technologies but also would explore recent advances in areas of nanotechnology and biotechnology. Analyzing this development along the two criteria mentioned earlier (the potential of the GPT to renew the knowledge base of the industry and the size of the sector that could benefit from the spillovers generated by the initial discovery), there is an obvious role for national policy in enhancing the whole process and mitigating some of the problems (such as lack of human capital) that could impede the full realization of the potential for disruptive technological change in this "old industry".[5]

Many incentive and coordination problems can arise in such a situation, because working with "an old industry" in a remote region is not likely to hold great attractions as a career move for the scientists, engineers and business managers that are in the "leader regions," yet access to their knowledge may be vital in the early stages of the "application enterprise." How does one help solve this problem in a "generic" fashion that does not turn into a government subsidy for the development of a particular industry in a specific region? This is one instance of a class of difficult issues that frequently occupy the attentions of economists and experts from international organizations like the World Bank that work in developing regions. Possibly the resolution in this case lies in the idea that there are phases in smart specialisation where temporary "industrial policy" measures, such as infant industry policies, are warranted.

[5] Nikulaien (2008) shows how patent data can be used to a certain extent to assess the progress of the industry toward smart specialisation by looking at the increase in patent applications by P&P firms related to nanotechnology. See T.Nikulainen, "Open innovatio and nanotechnology - an opportunity for traditional industries", Working Paper, The Research Institute of the Finnish Economy, Helsinki, 11 April 2008