

Smart specialization

From academic idea to political instrument, the surprising career of a
concept and the difficulties involved in its implementation

Dominique FORAY* Paul A. DAVID ** & Bronwyn H. HALL*** ...

**College of Management, EPFL (Lausanne)*

***Stanford University & UNU-MERIT (Maastricht) & Chaire Innovation et Régulation (Paris)*

****U.C. Berkeley & UNU-MERIT (Maastricht) & NBER*

MTEI Working Paper

November, 2011

MTEI-WORKING_PAPER-2011-001

Abstract

Smart specialisation is a policy concept that has enjoyed a short but very exciting life! Elaborated by a group of academic “experts” in 2008, it very quickly made a significant impact on the policy audience, particularly in Europe. Such a success story in such a short period of time is a perfect example of “policy running ahead of theory”: while smart specialisation seems to be already a policy hit and policy makers show some frenetic engagements towards smart specialisation, the concept is not tight in particular as an academic concept. Many statements and arguments about smart specialisation have not been yet based on a sound base of empirical work so that the plea in favor of smart specialisation and the tools and instruments to support a smart specialisation strategy are made of more wishes and hopes than of empirical (stylized) facts. There is therefore a growing gap between the policy practice and the theory. In this paper, we expose and explain the minimal set of arguments and statements that have created this situation of smart specialisation having “political salience” which makes policy makers eager to “do it” in spite of a modest theoretical framework to guide its application or an adequate evidence base to help regulate its implementation. Then we will define a research agenda that addresses issues of fundamental understanding, empirical observations and measures and operationalization of the assessment of potential for smart specialisation and of the tools to realize the potential of the concept.

Table of contents

1 - From taboo concept to policy hit.....	3
2 - The economics of smart specialisation: a primer.....	5
3 - The anatomy of smart specialisation	6
3.1 - A short (hi)story.....	6
3.2 - Entrepreneurial discovery	7
3.3 - Imitative entry and imperfect appropriation of the initial discovery	8
3.4 - Structural evolution.....	8
4 - Information and coordination failures and policy.....	10
4.1 – “Top- down” vs. “bottom-up”: a false dichotomy.....	10
4.2 – The three main phases of the smart specialisation policy process.....	10
Identification and reinforcement of entrepreneurial discovery:	11
Assessment:.....	13
Coordination and complementary investment:.....	13
5. Conclusion: “Focussing change by developing unique experience-based knowledge”	15

1 - From taboo concept to policy hit

Smart specialisation is a policy concept that has enjoyed a short but very exciting life. Developed by a group of academic “experts” in 2008, it very quickly made a significant impact on the policy audience, particularly in Europe.¹ In fact the concept is now a key element of the EU 2020 innovation plan² - the Commission has decided to build a platform of services (S3) to support regions in their efforts to devise and implement a smart specialisation strategy;³ discussions are currently under way about introducing smart specialisation as a conditionality clause for structural fund attribution; and the OECD is launching an activity for measuring smart specialisation.⁴

Such a success story in such a short period of time naturally represents a very pleasing result for the academics at the origin of the concept. But it also suggests something that, in a sense, helps us to maintain a certain degree of modesty regarding our academic contribution to policy discussion. It suggests that the idea had been in the air for some years, decades even. But that idea was stifled and repressed as a result of the enormous conformity that has characterised innovation policy research and practices over the last decades in many international policy forums. The dogma stated that a good, tolerable and honourable policy aims to address market failures while not favouring any particular sector or technology based on certain “priorities”. According to the dogma, departing from such neutrality is always dangerous since it implies guessing the future developments of markets and technologies and this opens the door to all those little monsters that economists like to eradicate: wrong choices, picking winners, market distortions. According to the dogma, it is much better to leave any issue concerning sectoral strategies, specialisation, or direction to the “magical chaos of the blind watchmaker”. Any notion of specialisation policy was a taboo in policy discussion, particularly in the main policy institutions.

However, the last two years of crisis that have left many regions and countries with very few opportunities for economic recovery and restart and observation of the persistence of many coordination failures in systems of innovation as well as huge capacity asymmetries between regions and countries have exerted a certain amount of pressure to revise the dogma. Today we are witnessing a renaissance of “industrial policy” (of “a competition-friendly sectoral policy” to paraphrase P. Aghion). And so the idea of smart specialisation has suddenly become very obvious: the simple idea that i) regions cannot do everything in science,

¹ D. Foray, P. A. David and B. H. Hall, “Smart specialisation: the concept”, Ch .3 in *Knowledge for Growth: Prospects for science, technology and innovation*, Report, EUR 24047, European Union, 2009. Also Available as K4G Policy Brief No. 9, EC (DG-Research). [Available at:http://ec.europa.eu/invest-in-research/monitoring/knowledge_en.htm.]

² See Europe 2020 *Flagship Initiative Innovation Union: Transforming Europe for a post-crisis world*, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, European Commission, COM(2010)

³ See *Regional Policy contributing to smart growth in Europe 2020*, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, SEC, 2010, 1183.

⁴ See Comparative advantage through “smart” knowledge-based specialization: implications for science, technology and industry policies, TIP project, STI, OECD, 2011

technology and innovation and ii) they need to promote what should make their knowledge base unique and “superior”. The idea of smart specialisation has in fact two facets:

First, it is important to focus on certain domains in order to realise the potential for scale, scope and spillovers in knowledge production and use, as these are important drivers of productivity in the domain of R&D and other innovation-related activities. Second, it is important to focus on certain domains in order to develop distinctive and original areas of specialisation for the future. Strongly mimetic regional programmes to promote export capacity expansion in certain fashionable high-tech domains or foster industrial agglomerations of high-tech firms that duplicate what’s happening in neighbouring states or provinces have the effect in the EU setting (and that of other integrated regional systems) of dissipating potential gains from agglomeration economies, and vitiating efforts to create multiple lines of regional and national specialisation that are sustainably profitable.⁵

This very simple idea was already in the air and perhaps all that was needed was just for a few academics to lend it some academic legitimacy, which was done in 2008.⁶ However, the simple idea of smart specialisation implies a very complex process in practice, and it is this complexity that academics have tried to better analyse and comprehend in order to help policy makers understand what is possible, what is feasible, what should be a useful and effective policy towards smart specialisation, what are the objectives and what are the tools. No less important is how to avoid having such a policy degenerate into the creation of a set of rent-capturing entities that prevent (via lobbying, etc.) the useful evolution of the policy over time.

The complexity of the process resides both in discovering the right domains of future specialisation and fixing the many coordination failures that can prevent emerging trends from becoming real and solid drivers for regional economic growth. Discovering the right domains is by no means trivial and technology foresight exercises or critical technology surveys ordered by administrations tend to produce the same ranking of priorities, without any consideration of the context and specific conditions of the “client” for whom the exercise is carried out. Too many regions have selected the same technology mix – a little bit of ICT, a little bit of nano and a little bit of bio – showing a lack of imagination, creativity and strategic vision. The discovery process is thus an issue in its own right. If accomplished properly through an entrepreneurial process of discovery (see below), such a process should logically identify not necessarily the hottest domains in nanoscience or biotechnology but rather the domains where new R&D and innovation projects will complement the country’s other productive assets to create future domestic capability and interregional comparative advantage. To put it bluntly, a successful smart specialisation strategy will not be found by reading the tables of contents of the most recent issue of *Science* or *Nature* but rather by observing the structures of the economy and supporting the processes of discovery undertaken by the firms and other organisations operating in this economy.

⁵ For analytical development of this argument, see: P.A. David, “Krugman’s economic geography of development: NEGs, POGs and naked models in space”, *International Regional Science Review*, 22, 1999.

⁶ D. Foray, P.A. David and B. H. Hall, op. cit.

Fixing coordination failures is another difficult policy challenge. The emergence and growth of a new activity, or the transition from an existing activity to a new one, or the extension of an existing activity through some kind of diversification, are processes that can be blocked by many types of coordination failures among economic agents (suppliers, users, specialised services, banks, basic research and training institutions, etc.).⁷

2 - The economics of smart specialisation: a primer

Smart specialisation must not be associated with a strategy of the simple industrial specialisation of a particular region in tourism or fisheries (to take two fairly low tech sectors as an example). Instead, smart specialisation is about R&D and innovation and it might suggest that such a region should specialise in R&D and innovation related to the sector of tourism or fisheries. This means that smart specialisation is a process addressing the missing or weak relations between R&D and innovation resources and activities on the one hand and the sectoral structure of the economy on the other.

A key point is that smart specialisation is not just for the “best” regions and technology leaders. On the contrary, this concept provides strategies and roles for any region. Indeed, the concept is built on the fact that there is not only one game in town in terms of R&D and innovation; i.e. there are many other kinds of productive and potentially beneficial activities apart from the invention of fundamental knowledge needed for the development of general purpose technologies and tools (GPTs). There are in fact different logics or orders of innovation⁸.

Some regions can indeed specialise in the invention of the GPT while others will invest in the co-invention of applications to address particular problems of quality and productivity in one or a few important sectors of their economies. Co-invention is here an important notion because it means that the very act of adopting some ICTs (or any other generic technology) to improve operational efficiency or product quality in a given sector of industry or service is by no means a simple task. ICT applications are not ready and waiting on the shelf for new users. The co-invention of applications actually involves a great deal of R&D, design and redesign, i.e. a collection of knowledge-driven activities. Smart specialisation therefore implies rejecting the principle of a sharp division of labour between knowledge producers and knowledge users. Any region is facing at least some challenges in terms of improving the operational efficiency and product quality of “something” and this is a matter of R&D, capabilities, innovation, etc.

⁷ P. Aghion, P. A. David and D. Foray, “Science, technology and innovation for economic growth: linking policy research and practice in ‘STIG systems’” *Research Policy*, vol.38, issue 4,

⁸ T. Bresnahan and M. Trajtenberg, “General purpose technologies: engines of growth”, *Journal of Econometrics*, 65, 1995

3 - The anatomy of smart specialisation

3.1 - A short (hi)story

By starting with an historical case describing a successful story of smart specialisation, we simply want to stress that the phenomenon of smart specialisation is not at all new; what is new is the analytical description of the phenomenon which generates a few insights and directions concerning policy making.

In 1796, Pierre-Hyacinthe Caseaux, a merchant and blacksmith in Morez (French Jura), “discovered” that he could shift from the production of hob-nails to the production of thin metal frames for spectacles, using essentially the same wire-drawing and finishing techniques and capabilities upon which his successful business was based. Because eye-glasses of the fashionable English type at that time had become a product with a very high potential for market growth, many others in his former line of business followed Caseaux into the production of spectacle-frames, and then into the manufacture of “reading-glasses”; numerous small factories specialising in the manufacture of spectacles sprang up in the locale during the next 20 years. By the end of the 19th century, Morez was considered one of the few world-class centres for the production of eye-glasses and it still holds a considerable share of the global market. The regional authorities had helped the process by funding a technical school to train apprentices in this new branch of industry.

This story exhibits all the ingredients of a successful smart specialisation strategy. Firstly, it is a tale of entrepreneurial discovery of a potential specialisation in which the knowledge contributed by the entrepreneur does not concern a technical invention; rather, it relates to the fact that a new domain of specialisation might be very beneficial for the locale, given its existing productive assets. Secondly, this is a story about imitative entry: when the initial experiment and discovery are successful and diffused, other agents are induced to shift investments away from the old domain to the new one. Thirdly, the story concerns policy objective and practice, which is not about telling people what to do, what are the right specialisations but accompanying emerging trends and improving coordination by providing the necessary public goods (education, training) and creating additional incentives at certain critical bottlenecks to help the new activity to grow. Fourthly, the outcome of the process is much more than a “simple” technological innovation but rather a structural evolution of the whole regional economy – in this case the transition from one old, perhaps declining activity to a new one offering superior commercial prospects.

We have simplified the Morez story in order to give salience to the foregoing generic features of smart specialisation in practice.⁹ The historical process, of course, was considerably more intricate, and, like the previous business career and decisions made by P.-H. Caseaux, less obvious than what has been has been sketched here. The eventual industrial success enjoyed by the region therefore should not be thought to have been a high probability event that could have been confidently predicted at the end of the 18th century. Nonetheless, it is useful to consider the following stylized rendering of the narrative, which illuminates three

⁹ In 2010 Morez produced some 9 million pairs of glasses, and held approximately 5 percent of the world market. For further details about the region and its pioneering entrepreneurial innovator, see, e.g., “Morez, Capitale des lunettes...” at <http://lunetterie.free.fr/morez.htm>; J.-M. Olivier, *Des clous, des horloges et des lunettes. Les campagnards moréziens en industrie (1780-1914)*, Paris, CTHS, 2004; http://fr.wikipedia.org/wiki/Pierre-Hyacinthe_Caseaux.

important structural elements of a smart specialisation process. From it several policy insights can be derived

3.2 - Entrepreneurial discovery

Smart specialisation involves an entrepreneurial discovery process that reveals what a country or region does best in terms of R&D and innovation. This principle is so important that any model that did not include this provision would have an entirely different character. It is important in order to make a clear-cut distinction between the smart specialisation approach and some older policy approaches involving centralised planning procedures as the main way to identify industrial development priorities. Although these old approaches to the problem of prioritisation and resource concentration involved formal exercises based on rationalist and robust theories (inter-sectoral matrixes, technological interdependencies and hierarchical structures, technological complexities), they were by their very nature largely technocratic. Such approaches, which claimed to be very scientific and rational in their ways of identifying priorities, targets and objectives, were actually very irrational in their quasi-ignorance of essential knowledge in this matter, which is entrepreneurial knowledge.

Entrepreneurial knowledge involves much more than knowledge about science and techniques. Rather, it combines and relates such knowledge about science, technology and engineering with knowledge of market growth potential, potential competitors as well as the whole set of inputs and services required for launching a new activity. The synthesis and integration of all this knowledge which is initially dispersed and fragmented create a vision and drive the decision « to go ». It is this type of knowledge that needs to be activated, mobilised and supported as the main ingredient of a process of smart specialisation.

Smart specialisation fundamentally is based on a process of entrepreneurial discovery. Entrepreneurs in a broad sense (firms, higher education institutions, independent inventors and innovators) are in the best position to discover the domains of R&D and innovation in which a region is likely to excel given its existing capabilities and productive assets.¹⁰ For many regions and countries it may be the case that the most important « innovations » are not technical but instead consist in the revelation of the particular business orientation that currently should be pursued in directed inventive and innovative activities.¹¹ Thus, it may entail a novel matching of existing scientific and technical knowledge with the industrial resources and capabilities of a specific region in a way that advances the former in regionally relevant industrial direction.

For example, some entrepreneurs in the Finnish pulp and paper industry considered nanotechnology to be a promising source of valuable application innovations, and firms in this industry were taking steps to assess this potentiality. Some pulp and paper companies responded to this perceived opportunity by increasing their overall internal R&D investments, which were aimed not only at implementing available technologies but also exploring recent

¹⁰ The first economists who highlighted the process of entrepreneurial discovery to identify potential specialisations were Hausmann and Rodrik in development economics. See R. Hausmann et D. Rodrik, "Economic development as self-discovery", *Journal of Development Economics*, vol.72, December 2003

¹¹ *Ibid.*, see note 10

advances in areas of nanotechnology and biotechnology.¹² Here the process of “discovery” achieves locally directed private sector R&D due to the initiative of entrepreneurs who identify and reveal a novel approach to modernising their industrial processes.

Because of the importance of entrepreneurial experiments and discovery, there is no contradiction between a smart specialisation policy and a policy oriented towards entrepreneurship, young innovative firms and the openness of society. On the contrary, these two policies are mutually reinforcing: without strong entrepreneurship, the strategy of smart specialisation will fail because of a deficit of the entrepreneurial knowledge needed to feed and nurture this strategy.

But another extremely important point is that such emphasis on entrepreneurial discovery should not result in narrowing the scope of policy intervention that is needed to address market and coordination failures that otherwise are likely to impede the transition from an initial discovery to a cluster of activities giving rise to a new domain of R&D and innovation specialisation. Emphasizing the role of entrepreneurial discovery is not, as we see it, a plea in favour of a *laissez-faire* philosophy.

3.3 - Imitative entry and imperfect appropriation of the initial discovery

Market failures restrict the process of entrepreneurial discovery due to the imperfect appropriation of the knowledge produced by these entrepreneurs. Indeed, imitative entry is a key ingredient of smart specialisation so that agglomeration externalities can be realized: a discovery like that of Pierre-Hyacinthe Caseaux may very quickly result in a multiplication of « entries » into the new activity. This raises a “knowledge appropriation” issue: unless there are great competitive advances of taking the lead, pioneer entrepreneurs will not be able to capture a significant fraction of the social value of their initial investment because others will be free to follow. Consequently, there is a risk that not enough agents and organisations will imitatively invest in this particular new line of enterprise to realize social efficiencies of industrial scale and agglomeration externalities. Since imitative entry is desirable for its competitive effects in pushing market prices towards marginal costs, the correction of imperfect appropriation raises well recognized and difficult policy problems that we address below.

3.4 - Structural evolution

As already stressed, the discovery that drives the process of smart specialisation is not about a simple innovation but generates knowledge about the future economic value of a possible structural change. In the Morez story the whole process gives rise to a transition from an old, declining activity to a new one. Transition is one pattern of structural changes that a smart specialisation strategy is likely to generate: it is discovered that a new domain can emerge from the existing industrial commons (the collective R&D, engineering, and manufacturing capabilities that sustain innovation).

¹² T. Nikulainen, *Open innovation and nanotechnology – an opportunity for traditional industries*, Vision ERA.NET, 11 April 2008

But other patterns of structural changes are possible as the outcome of the smart specialisation process. “Modernisation” is a familiar one: it is discovered that the development of specific applications of a general purpose technology can have a significant impact in terms of efficiency and quality in an existing (perhaps traditional) sector. The Finnish pulp and paper industry already was cited as a case in point. But there are many others, such as the fishery industry’s development of ICT applications, and the agro-food sector’s adaptations of nanotechnologies. In all these instances, the intersection between the available resource base of a mature activity within a region’s economy and the potentiality for the modernisation and “renewal” of that industry -- by applications of GPT application that enhances its efficiency and productivity quality, defines feasible spaces to pursue smart specialisation strategies. In such “spaces of opportunity” entrepreneurial experiments and discoveries can be expected to produce socially useful knowledge, the commercial application of which may need to be induced, initiated and supported by public action.

A third pattern of structural changes is about regional diversification through the development of a new line of productive activity. Here the “discovery” is concerns potential synergies (economies of scope, spillovers) that are likely to materialise between an existing branch of economic activity that is already well-established and another that is new and still under-developed. Synergies between them generally will render the flux of resources towards the new activity attractive and profitable, and private entrepreneurial initiatives supported by existing financial intermediaries therefore may be sufficient to successfully exploit the economic opportunities through R&D and the launching of start-ups. In the absence of connections with sophisticated and technologically informed universal banks in the region, or links to external venture capital firms, the already established activity in the synergetic pair would need, directly or indirectly to be the source of finance for the necessary investments. But, if a national or regional government is drawing heavily upon the firms in that industry for general tax revenues, a smart specialisation strategy might require new fiscal measures in support of private-public partnership arrangements to find the capital need to realize the socially beneficial synergies.

A fourth pattern involves the radical formation within the region of an entirely new and distinct domain of enterprise. Here the “discovery” is that R&D and innovation in a certain field have the potential to create activities that will be progressive and commercial attractive within the content of the regional economy, whereas previously they were not so. Such radical foundation involves the co-emergence of an R&D/innovation activity and the related (and future) business activity. Although some relevant assets exist and might be mobilised by the prospect of exploiting a highly profitable market niche that is unlikely to attract entrepreneurial attention from other quarters, the absence of an adequate industrial base supporting private sector R&D makes it difficult for a knowledge-intensive activity related to those assets to emerge spontaneously. The “innovative revelation” in such seemingly unpromising circumstances is that R&D resources and management experience from outside the region may be combined with local expertise to form a new node of activity based on indigenous assets, and that the new line of business could become commercially viable and beneficial for the entire regional economy. A good case in point here is the development of IT applications for the management and maintenance of archaeological, cultural and environmental patrimonies, and the diffusion of knowledge about them as salient attractions for a sustainable tourist industry.

4 - Information and coordination failures and policy

As stressed above, the short story of Morez should not be taken as a plea in favour of a *laissez-faire* policy on the grounds that governments cannot pick winning locales. Certainly the main issue to be addressed by policy is not “what to do” but “how to help agents to discover what to do and how to implement the policy according to what has been discovered”. Policy makers have to allow and help economic agents to find their own ways in a decentralised and bottom-up process and then carefully observe what is happening. They have to aggregate the decentralised information generated by entrepreneurial experiments and discoveries, assess the outcome and help the most promising projects to grow. We have qualified the Morez story -- which is about a small town becoming a world-class centre for the design and manufacture of eye-glasses -- as a low probability event. This means that the main policy issue is to identify which structural conditions and policies in a specific region would increase the likelihood that there would be one or more new industrial (and/or service) localisations appearing and surviving within the next 20 years.

4.1 – “Top- down” vs. “bottom-up”: a false dichotomy

The policy process is complex: on the one hand, the principle of entrepreneurial discovery is essential, but on the other hand the constraints this imposes should not be used to justify a shrinking of policy scope to exclude all governmental actions as being “top-down directions,” inimical to the “bottom-up” logic of entrepreneurial discover. This familiar “top down” versus “bottom up” dichotomy is itself the source of crippling policy constraints, because it is utterly fails to capture either the economic requirements or the political logic of smart specialisation as a developmental process. Policy programs fostering smart specialisation need to be more sophisticated than thinking within the confines of this dichotomy will allow; they call for a bi-directional iterative dynamic, in which public measures are taken to

- (i) identify entrepreneurial discoveries;
- (ii) support, and possibly channel those initiatives in certain directions through a variety of incentive mechanisms, including conditional subsidies;
- (iii) monitor and assess -- in interaction with private sector stake-holders and independent parties -- the progress of the “the experiments,” and thereby;
- (iv) disseminate and guide the formation of a shared strategic vision of the future course of exploitation of the region’s emerging opportunities for specialisation;
- (v) identify and address potential coordination failures, so that a few discoveries are likely to become real and solid drivers for regional economic growth;
- (vi) monitor and reassess the degree to which the shared strategic vision is being realized, the effectiveness of measures addressing coordination failures, the impacts on the region’s economy, and the sustainability of the development without continuing public support.

4.2 – The three main phases of the smart specialisation policy process

In the foregoing schema there are three main phases of policy focus, each of which is associated with the deployment of a distinctive array of policy instruments. We elaborate on

these under the following sub-headings: identification and reinforcement of entrepreneurial discovery, monitoring and assessment, coordination and complementary investment.

Identification and reinforcement of entrepreneurial discovery:

The first phase involves facilitating development in the economy of knowledge-intensive activities that generate experimentation and discoveries by entrepreneurial agents. Markets characterised by economic and regulatory barriers to entry and by lengthy and punitive bankruptcy proceedings, and judicial and political contexts that militate against neutrality in the legal enforcement of private contracts, are climates that are inimical to the translation of entrepreneurial discoveries of profit opportunity into bases for sustainable legal enterprise. Only when those fundamental impediments are removed will it be sensible to move on to deal with the more subtle problem of the weakening of entrepreneurial incentives that can result from the prospect that those discovering new opportunities for commercially viable lines of business are not likely to be able to completely appropriate the social benefits that flow from exploitation of such discoveries.

This, however, is not an impediment to entrepreneurial discovery that should be removed by extending statutory or other blanket forms of legal protection to entrepreneurial ideas, and such suggestions can be no part of smart specialisation policies. Encouragement of imitative entry, after all, constitutes a key ingredient of smart specialisation, and the sooner the better in order that agglomeration externalities can be realized: the discovery of a potential domain in which a region could become a leader should quickly result in a multiplication of « entries » in the new activity. It is thus important to provide incentives to compensate for the risky nature of entrepreneurial search and discovery activities without granting the “discoverers” monopolies in the rights to use (and/or prevent others from using) the new business opportunities that they may uncover.

Indeed, an important function of public policy should be to assure diffusion of the knowledge regarding the value of a new activity for future specialisation, and thereby hasten to generate collective emulation and imitative commercial exploitation of the growth potentialities of the region's new domain of specialisation.¹³ The policy instruments that are likely to prove effective here involve various forms of public-private partnership, ranging from direct public funding of entrepreneurial projects to collaborations at national laboratories between firms and government scientists as well as prizes and bonus mechanisms.¹⁴ It may prove useful to draw inspiration from some historical examples where a prize was awarded to inventors, the amount of which was calculated according to the importance of the diffusion (imitative entry) of the invention.¹⁵

¹³ Moreover the discovery does not concern a technical invention but involves the identification of a domain of future specialisation. This type of discovery is normally not subject to legal protection, whatever its social return may be (see Haussmann and Rodrik, *op. cit.*: above at note 9).

¹⁴ J. Stiglitz et S. Wallsten, “Public-private technology partnerships”, *American Behavioral Scientist*, vol.43, 1, 1999

¹⁵ D. Foray et L. Hilaire Perez, « The economics of open technology : collective organization and individual claims in the ‘Fabrique Lyonnaise’ during the old regime, in C. Antonelli, D. Foray, B. H.Hall and W.E.Steinmueller (eds.), *Frontiers in economics of innovation: Essays in Honour of Paul A. David*, Cheltenham, Eng.: Edward Elgar, 2005.

But building such an economy of intensive activities regarding entrepreneurial experiments and discoveries requires not only combatting the so-called “incomplete appropriability problem” that confronts pioneers, but also creating conditions for multiple micro-systems of experiments and discoveries to emerge. To use the argument advanced by David and Metcalfe,¹⁶ the performance of entrepreneurs and leading firms in creating new business enterprises depends principally upon the extent and quality of the web of connections they form with counterparties within established complementary organisations – research universities, specialised suppliers of materials and equipment, financial intermediaries, prospective “lead users”, and reliable candidate firms to provide a “second source” in filling significantly large contract orders. Taking view, the central task, indeed, perhaps the central challenge for smart specialisation policy is to assist in the formation and effective alignment of these crucial inter-organisational connections, and to developing public sector capabilities and mechanisms that support the coordination of complementary early efforts by private agents in the sphere of experimentation and discovery.

An illustration of a proactive policy to boost experiments and discoveries while encouraging connections among economic agents is one that would use of “research service vouchers” as an incentive mechanism. Vouchers (credit notes) could be provided to firms to commission an R&D project from a public research institution or any specialised R&D organisation. Depending on sectoral contexts and local circumstances, the allocation of vouchers could be made conditional on projects that undertook to explore the commercial viability of certain line of business that had been identified *ex ante*, through a formal “foresight” process. That process would involve members of the region’s business community, and public institutions and local governmental agencies. By means of this incentive and an evaluation of the appropriateness of the match between particular projects and the alternative structural modes of evolution that have been described above (modernisation, transition, diversification, radical foundation, see sect. 3.4) policy-makers considering the region’s resource strengths and deficiencies and pursuing a smart specialisation strategy could elicit the emergence of a focused portfolio of particularly promising entrepreneurial explorations. Subsequent decisions and choices -- such as whether to provide public guidance and material support the further development of one or another particular domain of future specialisation – should of course be made with reference to the quality of the entrepreneurial “discoveries” that ensue (assisted by the use of the R&D

¹⁶ P. A. David and S. Metcalfe, *Universities and public research organisations in the ERA*, Draft Report (v.3) prepared for the *Knowledge for Growth* (K4G) Expert Group, EC (DG-Research), June 8, 2007. [Available on request from P. A. David.] This document, and other derived from it (see below) emerged in the same context as the K4G Policy Brief on “Smart Specialisation.” David and Metcalfe suggest that the term “innovation systems” has been misleading in directing attention to static and durable institutional structures, and argue for the greater empirical and policy relevance of their conceptualisation of “ecologies of innovation” as emergent properties of systems formed (often only transiently) by densely connected and flexibly interactive organisational entities that are themselves quite specialised in their functional capabilities—and are best allowed to remain so. See J. S. Metcalfe, “Innovation Systems, Innovation Policy and Restless Capitalism”, in F. Malerba and S. Brusoni (eds.), *Perspectives on Innovation*, Cambridge, Cambridge University Press, 2007; P. A. David and J. S. Metcalfe, ““Only Connect”: Academic-Business Research Collaborations and the Formation of Ecologies of Innovation,” *The Capitalization of Knowledge: A Government-Universities-Business Triple Helix*, R. Viale and H. Etzkowitz, eds., Cheltenham, Eng.: E. Elgar, 2010. [Available as SIEPR Discussion Paper No.07-033 (January 2008) at: <http://www.siepr.edu/papers/pdf/07-33.html> .]

vouchers), and the social marginal opportunity cost of the resources that were being committed.¹⁷

Assessment:

The second phase involves assessing the outcome so that the support of a particular line of business will not be discontinued too early nor continued so long that subsidies are wasted on non-viable projects. Of course, *ex ante* assessment of the future value of any regional R&D specialisation is a quasi-impossible task. But simple criteria at least should be considered, including the potential magnitude of the new branch of production (i.e. the relative importance in the economy of the direct and indirect resource inputs from both the private and public sector suppliers), its likely effects upon the region's trade balance, aggregate employment and professional and skilled workforce, and its finance requirements. The extent to which the proposed domains of enterprise will stimulate R&D activities that overlap with one another, and link with the scientific and technical knowledge base of existing lines of activity in the region and those of its close trade partners, also is an important dimension to be considered in evaluating its potentialities to create beneficial "spillovers" and opportunities for future structural change.¹⁸

Once such an assessment has been made, pursuit of smart specialisation policy calls for the rapid formulation and dissemination of a strategic vision of the key directions for near-term development of the regional economy; a vision that is to be elaborated more concretely on the basis of decentralised, market-driven experiments and discoveries and shared among all the actors in the economy. While it is critically important in avoiding coordination failures to have created shared positive expectations concerning the new directions in which investment will flow, realistic appraisal of what can be achieved, and avoidance of excessive optimism is perhaps even more important in preserving the longer-term credibility of the process. On the first few implementations of the smart specialisation process especially, to have over-promised and neglected to disseminate explicit appraisals of the risks and potential economic losses and then fallen far short of expectations in the realisation of "the vision," would leave a burdensome legacy for any future efforts.

Coordination and complementary investment:

The third phase involves the support and strengthening of the emerging trends so that the most promising projects can grow and become solid drivers for regional economic growth.

¹⁷ A point of policy deserving explicit notice here is that being granted an R&D voucher by such a scheme should set a short duration for such investigations, and carry with it the obligation thereafter to quickly make the findings known to the voucher-granting agency, allowing only time for interpretation and assessment of the case for further public support. Such disclosures should precede decisions (whether positive or negative) regarding further support for development of the proposed domain of specialization. The rationale for this requirement is not only transparency in the use of public monies, but the value of full disclosure of findings – both positive and negative -- obtained from publicly supported R&D. The argument for this proceeds from the observation that information about searches that fail to obtain the desired result nonetheless can be socially useful in guiding subsequent search activities, and so would yield positive externalities. See, e. g., P. A. David, D. R. Mowery and W. E. Steinmueller, "Analyzing the Payoffs from Basic Research," *Economics of Innovation and New Technology*, vol. 2 (4), 1992, pp. 73-90. A collateral, and someone more difficult policy issue arises at the next stage in regard to information about publicly assisted "discoveries" of new business models (see note 20,below).

¹⁸ B. Klinger and D.Lederman, "Discovery and development: an empirical exploration of "new" products," *World Bank Report*, August 2004.

But most projects with the potential to give rise to a new activity require simultaneous large-scale investments to be made in order to become profitable.¹⁹ All the necessary services and complementary activities have fixed costs and are unlikely to start unless service and other input providers have enough positive expectations regarding the future of the smart specialisation strategy. Profitable new activities can fail to develop unless upstream and downstream investments are made concurrently.

How does one help solve this problem in a “generic” fashion that does not turn into a government subsidy for the development of a specific industry in a specific region? This is one instance of a broader class of difficult issues that often vex development experts at international organisations like the World Bank. Possibly a useful resolution in this case is to be found in relinquishing the idea that good policy lies in finding a “golden mean” (or, “an interior optimum”, as economists might put it) that would avoid both the extreme of planning and that of *laissez faire*. Instead, one might look for temporary phases in the process of smart specialisation where pro-active “industrial policy” measures are warranted in the tradition of classic infant industry protection aimed at altering a region’s comparative advantage before resuming trade liberalization. An implication of that approach is that careful attention should be given to designing accompanying mandatory periodic reviews of the subsidies provided under such measures, and an irrevocable “sunset” date for entire program.

The most obvious coordination measures to consider are those that would provide specific complementary public goods – such as programs of further education, pre-competitive R&D and tax credits or other subsidies for on-the-job training in relevant skill domains where these are not present elsewhere in the regional economy. Also included under this heading is public support for the provision of adequate supply-responses (in human capital formation and research) to the new “knowledge needs” of traditional industries that are starting to adapt and apply a GPT, which might take the form of subsidising expenditures to gain access to problem-solving expertise from researchers in an external, technologically leading region. Local firms that have been deemed eligible for such subsidies on the basis of their business plans to pursue opportunities in the new line of regional specialisation should be under some obligation to disclose (for publication by the government authority administering the subsidy programs) the principle generic features of their respective business plans.²⁰

Not all regions would need to go through all three phases. A few (leading) regions already have attained “supercritical” density levels in their endowments of entrepreneurial talent and R&D capabilities so that the exploration and “discovery” processes are ongoing, and a sufficient stream of up-to-date information about the value of future opportunities for the

¹⁹ See Haussmann and Rodrik, *ibid.* see note 10.

²⁰ The timing of such disclosures is a delicate matter that should be declined in (early) consultations with all the relevant stakeholders, and not only with the firms selected as eligible for the subsidies. That a uniform disclosure requirement and minimal publication lag should be established goes without saying. As the date a number of schemes may be considered to create incentives for firms to bring products to market as rapidly as possible and deter strategic withholding of business plans and capabilities developed with public subsidies. One such mechanism would fix the uniform date of mandatory disclosure for all participating firms in business at the time of the first firm’s launch of its first product in the new smart specialisation line; this might be supplemented by require disclosure by firms still in the pre-product launch stage at the time of their being acquired by or merged with another private entity, or on the date of their filing for bankruptcy protection. The logic here follows that set out above, in note 17.

region already is percolating through the region's business communities. In other regions, "the industrial knowledge commons" (the local collectively shared knowledge about relevant technologies and engineering practices associated with the conduct of existing industries and services) will be rich, generating a basis for assessing resources that may be deployed in a transition to, and evolution of new possible lines of specialization. In such conditions, the policy process can be initiated with tasks associated with phase 2. Entrance into that phase, however, may not be so easy, because since so many experiments and discoveries are already underway spontaneously that to identify and taking stock of them, let alone to properly filter and assess the outcomes and compose a strategic vision, will require strong capacities of observation, aggregation and interpretation by the agency responsible for those tasks.

In many other cases – where the region in question is relatively poor in its capacities for entrepreneurial discovery, the process of smart specialization needs to start in phase 1. But it cannot be supposed that the locally available experience base and the public sector's human resources will automatically be available to initiate it, or to access the most useful sources of external expertise. Consequently, individual regions should not be left entirely on their own to embark upon this new policy approach. As much as one wishes to discourage blindly mimetic procedures and "group think" among policy-makers across the communities of the EU, or within the strata of the OECD members that are at similar stages of industrial development, there does appear to be some useful role that could be served by creating information platforms on which regional and local policy-making experiences could be shared, and searchable, up-to-date rosters of expertise could be provided by trans-national agencies and international organizations such as the World Bank.

5. Conclusion: "Focussing change by developing unique experience-based knowledge"

A specialisation strategy is *smart* in two senses:

- The specialisation is about knowledge resources and seeks not only the concentration of resources but also to direct and focus it upon an area of knowledge acquisition an experience-based expertise that complements other relevant regional resources. Smart specialisation thus involves both a logic of concentration and a logic of particularisation of a region's knowledge assets. Fortunately, the peculiar properties of GPTs such as information technologies greatly facilitate the opportunities open to regions to develop productive, particularised niches for themselves in the global knowledge economy -- including "followers" in industrialisation that are equipped with the basic technical tools and human skills in how these can be used, if only to begin the process by accessing external expertise.
- The policy process follows a complex and iterative logic that cannot be described either as essentially "top down" or essentially "bottom up". This bi-directional dynamic process is one in which the principle of entrepreneurial discovery plays an essential role and yet does not minimise the importance of public policy interventions at several distinct stages in the identification, evaluation and targeted support for new, emerging lines of regional specialisation.

Finally, some explicit closing words may be in order about *what smart specialisation is not*. It is not the same thing as a *cluster policy*. Of course, generating a vibrant innovative cluster is a classic outcome; one might say “an emergent property” of a smart specialisation policy applied to a particular region for purely local economic interests (especially those of the owners of immovable assets in the locale). Smart specialisation as a policy process, however, also exhibits “efficiency properties” at the system level --i.e. for an integrated regional system as a whole, such as the EU. By contrast, regional cluster policies generally resist fundamental change and reorientations, and, when promoted and initiated with support from a central development agency they are likely even to accentuate strongly mimetic programs of local and national industrial development. The latter results tends to foster knowledge base standardisation, wasteful duplication of R&D efforts and dissipation of the potential agglomeration economies at the system level – as a multiplicity of imitative local government authorities compete to attract the small finite pool of mobile capital, management and knowledge resources.

Smart specialisation, on the other hand, involves the discovery of what makes a local knowledge base original and somewhat unique. Therefore, a commitment to smart specialisation strategies can promote greater diversity of areas of knowledge and expertise within the system, thereby rendering the entire economy more able to enjoy the benefits of distinct local agglomeration economies and less vulnerable to both supply and demand shocks emanating in global markets.