



FOSTERING INNOVATION IN LESS-DEVELOPED AND LOW INSTITUTIONAL CAPACITY REGIONS:

Challenges and
opportunities



Broadening innovation policy: New insights for cities and regions

Fostering innovation in less-developed and low institutional capacity regions: Challenges and opportunities

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This paper uses the neo-Schumpeterian framework to explore differences in innovation policy that arise from or relate to differences in technological levels among countries and regions. The core of the paper is about specifics of innovation policy in less developed countries/regions, which, as a rule, are characterised by low institutional capacities for design and implementation of innovation policy. So, two features – different nature of innovation activities and the undeveloped institutional context for designing and implementing appropriate innovation policy – are the primary analytical focus of the paper. Non-R&D and production related knowledge activities, as well as the interaction between own and imported embodied knowledge, are the core of innovation activities in LDC/LDRS. This requires broadening of the scope of innovation policy, which should go well beyond R&D driven innovation. In the conditions of the low implementation capacity, ‘the best practice’ policy solutions will not work. Instead, policy should focus on ‘best matches’ which would require external assessment of institutional and implementation capacities. We recognise the incompatibilities between the need to embrace experimental approach in innovation policy and low institutional implementation capacity with the accountability requirements of the conventional public policy. We propose to introduce principles of ‘action learning’ and ‘learning networks’ as governance mechanism which could resolve these incompatibilities.

Technology transfer via GVCs is an indispensable mechanism of technology upgrading in less developed countries/regions. We point to trade-offs of GVC based integration and propose establishing European GVC oriented industrial innovation policy as a mechanism to reduce regional imbalances within the EU and Europe broadly.

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Background information

This paper was prepared as a background document for an OECD/EC high-level expert workshop on “Developing strategies for industrial transition” held on 15 October 2018 at the OECD Headquarters in Paris, France. It sets a basis for reflection and discussion. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the OECD or of its member countries, or of the European Union. The opinions expressed and arguments employed are those of the authors.

Broadening innovation policy: New insights for regions and cities

The workshop is part of a five-part workshop series in the context of an OECD/EC project on “Broadening innovation policy: New insights for regions and cities”. The remaining workshops cover “Fostering innovation in less-developed/low-institutional capacity regions”, “Building, embedding and reshaping global value chains”, “Managing disruptive technologies”, and “Experimental governance”. The outcome of the workshops supports the work of the OECD Regional Development Policy Committee and its mandate to promote the design and implementation of policies that are adapted to the relevant territorial scales or geographies, and that focus on the main factors that sustain the competitive advantages of regions and cities. The seminars also support the Directorate-General for Regional and Urban Policy (DG REGIO) of the European Commission in their work in extending the tool of Research and Innovation Strategies for Smart Specialisation and innovation policy work for the post-2020 period, as well as to support broader discussion with stakeholders on the future direction of innovation policy in regions and cities.

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Table of contents

1. Introduction	4
2. The nature of innovation activities in less developed regions and countries.....	5
2.1. Drivers of growth and different levels of development	6
2.2. The broad notion of innovation.....	7
2.3. The region as the locus of multiple modes of innovation;.....	9
2.4. Upstream vs downstream innovation value chain and policy focus	10
2.5. Policy implications	16
3. Institutional capacity for implementation of innovation policy in less developed countries and regions	17
3.1. Quantitative assessment of institutional capacities	18
3.2. Assessing Technical-Operational-Political (TOP) and Monitoring & Evaluation (M&E) capacities.....	19
3.3. From the “best practice” to the “best matches”	20
3.4. Policy implication	22
4. The trade-off between accountability and experimentation: learning networks as a solution. 23	
4.1. Balancing experimentation with accountability: Experimental nature of innovation policy and how to reconcile it with public policy accountability?	24
4.2. “Action learning” and “Learning networks” as a missing tool of the Entrepreneurial Discovery Process, Implementation and Adaptation of innovation policy	27
4.3. Policy implications	32
5. Inter-regional value chains: linkages, leverages and learning.....	33
5.1. Towards European GVC oriented industrial innovation policy.....	35
6. Conclusions: the role of regions	38
References.....	40

Tables

Table 1. Different approaches to the issue of experimentation in innovation policy: Strength and weaknesses	25
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Figures

Figure 1. A linear innovation model.....	11
Figure 2 An alternative two-way model of technology upgrading of relevance for the less developed countries and regions	12
Figure 3. Patterns of RTD upgrading	13
Figure 4. Direct R&D and indirect R&D/embodied in inputs and capital goods.....	15
Figure 5. Share in total R&D content of R&D and embodied R&D in inputs or capital goods.....	15
Figure 6. Strategic and operational challenges of innovation policy.....	30
Figure 7. Areas of the potential implementation of Learning Networks in the Smart Specialization policy process.....	31

1. Introduction

1. The paper aims to explore how innovation policy should be adapted to stimulate innovation in less developed regions. The paper draws on author's experiences in less developed EU and neighbored countries and regions, but the issues that it addresses are relevant for a large number of broadly defined middle-income countries and regions. First, we examine the specific nature of innovation activities in LDC/LDRs¹ which go beyond R&D driven innovation activities. We point to non-R&D and production related knowledge activities as well as to the interaction between own and imported embodied knowledge as the core of innovation activities in LDC/LDRS. This requires broadening of the scope of innovation policy, which should go well beyond R&D driven innovation. Secondly, we explore the issue of low institutional capacities for implementation of innovation policy in LDC/LDRs. We recognise that in the conditions of the low implementation capacity 'the best practice' policy solutions will not work but the 'best matches' solutions might. For these solutions to work, they would require an external assessment of institutional and implementation capacities. Thirdly, we address the challenge of experimentation in innovation policy. We recognise the incompatibility between experimental nature of innovation policy and requirements for accountability of conventional public policy. As a solution to reconcile these competing requirements, we propose the introduction of 'action learning' principles and of 'learning networks' as a governance mechanism. Fourth, we discuss the role of global value chains (GVC) and inter-regional value chains as one of the potential drivers of technology upgrading in EU LDCR/LDRs. We propose establishing European GVC oriented industrial innovation policy as a potential mechanism to reduce regional imbalances in Europe. Brief summaries of each of the four themes conclude the paper.

¹ We refer interchangeably to LDCs and LDRs except when specifically, the policy issue is relevant only for one of these two levels.

2. The nature of innovation activities in less developed regions and countries

Innovation in LDC/LDRs is primary about the acquisition of machinery, not about intangibles like R&D. For example, innovation in EU CEE and EU South consists more of acquisition of new machinery, equipment and software, and relatively little R&D activities. Much of technology activity in LDCs/LDRs is about production capabilities which are poorly captured by conventional statistics.

Given weaknesses of approaching growth in LDC/LDRs as R&D based there is a need for an alternative perspective. By taking into account broad notion of innovation which goes well beyond R&D into non-R&D activities and also includes indirect R&D embodied in imported inputs and machinery we have to consider a variety of modes of innovation which take place in the region. Within this perspective, a region is a place not only of R&D-based innovation but also a variety of 'doing-using-interacting' type of innovations which are experience-based. Accordingly, regional innovation policy cannot be reduced to R&D-based innovation but needs to recognise and address the diversity of innovation modes and productivity-enhancing activities in the region. The primary challenge for LDC/LDRs is how to couple its R&D and innovative activity with absorption and adaptation of foreign knowledge.

In a nutshell, the broader notion of innovation which captures both upstream and downstream parts of innovation chain as well as the interaction between own R&D and imported (R&D embodied) technology is essential as a framework for innovation policy in less developed countries/regions.

2. The most appropriate current theoretical perspective on R&D, innovation and growth is the Schumpeterian growth theory (Aghion & Howitt, 1992; Aghion, 2004). Unlike in endogenous growth theory (Romer, 1993) what matters is not only the intensity of R&D but also the probability of R&D leading to innovation, and the extent to which innovation is likely to contribute to productivity growth (Aghion, Harmgart & Weisshaar, 2011). A paradigmatic example of the intricate link between R&D and growth are the debates about the so-called 'paradoxes': situations where a country has a high R&D input but low innovation output such as the European paradox (Dosi, Llerena & Labini, 2006) or Swedish paradox (Bitard et al., 2008). Other examples of so-called 'paradoxes' include Norwegian puzzle or mismatch between poor innovation effort and good economic performance (OECD, 2007; Koch, 2007) or Scottish conundrum (Coad and Reid, 2012²). We should add to these examples of countries with good science and poor economic performance (e.g. UK) or vice versa (e.g. Japan before its structural crisis of the 1980s).

3. Given so-called 'paradoxes' in developed countries or idea that R&D investment does not necessarily lead to growth in some kind of linear fashion we can expect even bigger 'paradoxes' in less developed countries and regions where R&D plays a much less important role as a driver of innovation. The relationship between R&D and growth and

² Coad and Reid (2012) defined the 'Scottish conundrum' as a country with a strong higher education research sector but poor R&D innovation output and with 'hidden innovation' but without dynamic growth. These examples suggest that the links between R&D, innovation and growth are not trivial and certainly not linear.

productivity is equally non-linear in the case of less developed countries and regions for two additional reasons.

4. First, nature of technology innovation activities differs between developed and developing countries and regions. There are significant structural differences in the nature of innovation activities between low-, middle- and high-income countries and regions (Lin, 2012, 2015; Lee, 2013; Aghion et al., 2013). The lower the labour productivity (GDP per capita) the lower is the share of R&D or higher is the share of embodied investments³. In short, innovation at behind the frontier is primary about the acquisition of machinery, not about intangibles like R&D. The structure of innovation expenditures across the EU shows significant differences across the three EU regions. Innovation in EU CEE and EU South consists more of acquisition of new machinery, equipment and software, and relatively little R&D activities (Radosevic, 2017). This is expected given the lower share of continuously active R&D firms in EU CEE and EU South. It also suggests that demand for external R&D and, thus, for public R&D is relatively less intensive in the EU periphery compared to EU North (Radosevic, 2016, figure II-1-9).

5. Second, the interactions between R&D, innovation and productivity are affected by institutional context which differs depending on the position of the country in relation to the technology frontier. Policies and institutions that favour imitation are not the same as those that favour leading-edge innovation (Aghion and Howit 2005), (Aghion, Harmgart & Weisshaar, 2011). Market failures, system failures and capability failures are much more abundant in LCD/LDRs, and hence the probability of gaps between R&D and innovation activities and between innovation activities and productivity are significantly higher.

2.1. Drivers of growth and different levels of development

6. Schumpeterian growth theory points to differences in drivers of growth of economies or regions of different levels of development and suggests that R&D does not play an identical role in economies at different levels of development. For example, middle-income economies tend to grow more on imitation activities while transition towards high-income group requires a shift towards technology frontier activities. This has been recognised by the WEF *Global Competitiveness*' Reports which classifies countries regarding driving factors of growth on Efficiency driven; in Transition, and Innovation-driven. For example, growth in eastern Europe has not been driven by R&D and technology but by production capability (Majcen, Radosevic and Rojec, 2009; Kravtsova and Radosevic, 2012). Technology transfer activities in EU new member states are more important drivers of innovation along with non-R&D-based innovation activities. Reinstaller and Unterlass, (2010) show using CIS micro-data for 17 EU countries that the determinants of successful product innovation of innovative European firms vary across countries depending on how far they are from the technological frontier. Farther away from the technological frontier technology transfer is more important than own R&D; close to the frontier the cooperation with universities, own research, highly skilled personnel and intellectual property rights are critical (ibid).

7. Such evidence suggests that growth may be driven mainly by innovation but also by imitation in different national sectoral and regional proportions. Also, empirical surveys like *European Innovation Scoreboard* (EIS), *Community Innovation Survey* (CIS), *Global Innovation index* and various academic metrics conceptualise and monitor innovation as a

³ For evidence in the context of Central and Eastern Europe (CEE) see Radosevic (2016).

multidimensional concept which is driven not only by knowledge generation but also by diffusion, linkages, absorption and demand. The downside of these approaches is that by necessity they all concentrate on directly measurable financial variables or human capital variables of the resources used for innovation such as R&D-expenditures, innovation expenditures, early-stage venture capital, expenditures on information and communication technologies, expenditures for employee training and qualification, etc. Although being useful, these indicators measure only a small part of the overall innovation activities which are contained in firms' latent resources and activities like management innovation, knowledge management, engineering, software, supply chain management, learning by doing or using, and quality. So, drawbacks of the standard metrics are that they are biased towards visible or explicit part of technology effort mostly related to R&D activity. In that respect, they are capturing an only smaller share of technology activities of economies behind the technology frontier.

8. It is only recently that some of these activities like management practices have been measured by surveys (Bloom and Van Reenen, 2007⁴). Management practices can also be considered as a subset of production capabilities, and these have been explored in the CEE region (see EBRD *Transition Report 2014*). Results show that management practices need to be improved before new processes can yield substantial productivity gains (EBRD 2014). This is further confirmed by regression on determinants of innovation and R&D where staff training and quality certificates have the most significant impact (ibid)(also Bartz, 2016).

9. These results suggest that much of technology activity in less developed countries and regions is about production capabilities which are poorly captured by conventional statistics.

2.2. The broad notion of innovation

10. The R&D paradigm of innovation was critiqued a long time ago by Kline, J. and Rosenberg, N (1986) who argue that "*the central process of innovation is not science but design. [...] Thus, the notion that innovation is initiated by research is wrong most of the time. [...] It would be done utilising primarily what the people in the innovation organisation already know, not only about science, but also about the infrastructure of the technologies of their time, the way their organisation works, and the nature of the ultimate market to the extent it is known*" (p2880).

11. A firm focus on R&D as the significant innovation activity overlooks the fact that a significant number of firms does not invest in own R&D. For example, Som (2012) summarise evidence which shows that 24% of large US firms did not invest in formal R&D (Cohen et al., 1987), 40% of U.S. firms did not report R&D expenditures (Bound et al., 1984), 71% of Spanish firms did not undertake formal R&D (Galende and Suarez, 1999)(all cited in Som 2012). Also, a slightly over half of all innovative firms in Europe do not perform R&D (based on CIS), and about 44% of all innovative German manufacturing firms did not perform internal R&D (Som, 2012). However, the most

⁴ However, we should bear in mind that focus only on general management as the proxy of innovation activities ignores a wide variety of other mentioned important firm activities that may also be important for firm performance. Also, it is not quite clear the extent to which the survey of management practices captures organisational and management forms like team work in production, task integration, temporary cross-functional project teams, internal zero-buffer principle, quality circles, knowledge-base systems, personnel training programmes etc.

relevant finding is that there are no differences in the economic performance between innovative firms with and without in-house R&D (Arundel et al. 2008, Rammer et al. 2011) or levels of productivity (German manufacturing) (Kirner et al. 2009a, 2009b)(all cited in Som, 2012).

12. Innovation policies systematically aim to stimulate firms' R&D activities while overlooking that R&D is not the only source of innovation. At least based on evidence from Germany, there are no true "non-R&D-intensive sectors". Instead, what we observe is a significant share of non-R&D-intensive or non-R&D-performing firms which permeate to varying degrees into sectors with high or very high R&D (Som 2012 data from German manufacturing survey 2009). In fact, the sectoral classification of R&D intensity does not provide a consistent picture of the actual distribution of non-R&D-performing firms. Namely, 17% of firms in high tech sectors, 27% in the medium-tech sector and 58% in low tech sectors do not do any R&D (ibid). So, as argued by Som (2012) in reality, there are no true "non-R&D-intensive sectors". Instead, what we observe is 'a significant share of non-R&D-intensive or non-R&D-performing firms which permeate to varying degrees into sectors with high or very high R&D'.

13. Many innovative activities are based on new uses of existing knowledge and are not covered by the definition of R&D. R&D embedded in purchased manufacturing equipment gives the customer access to all the embedded knowledge that was necessary to produce it but is not captured by R&D definition. Dedicated survey to non-R&D innovators like those analysed by Som (2012) shows richness and diversity of innovation patterns of non-R&D performing firms. In fact, it is quite limiting to assume that innovation output (e.g. process efficiency, time to market) can be obtained based only on R&D as the only innovation resource. The innovation output would also require operating or production capabilities and design, engineering and associated management capabilities which are usually out of the scope of statistical surveys (Bell, 2007)

14. The absence of R&D does not imply the absence of knowledge, innovation, or competitive success. It can be stated that R&D is just one resource within a broad variety of other sources of firms' competitive advantage. Firms which are knowledge intensive product developers or customer driven technical process specialists undertake knowledge-intensive, not R&D intensive activities (Malerba et al., 2015, Som, 2012). The increasing importance of knowledge-intensive while not necessarily R&D intensive activities possibly stems from the increasing importance of open innovation or multiple external sources of knowledge for firms' innovation. If so, the innovativeness of firms should be seen less in terms of its R&D capacity but 'more in terms of the ability to systematically exploit the effects produced by new combinations, uses of components in their existing stock of knowledge, and (...) the ability to purposefully tap new sources of knowledge inside or outside the firm' (Som, 2012, p355).

15. Given weaknesses of approaching growth in less developed countries and regions as R&D or innovation based there is a need for an alternative perspective. One possible approach is to analyse growth through the perspective of technology upgrading (Radosevic and Yoruk, 2016). The underlying idea behind this approach is that growth is not driven by capital accumulation but inherently should contain significant learning or assimilation of technological knowledge component. Technology upgrading denotes substantial changes in a country's specialisation and knowledge base that increase its capacity for value generation (Ernst 1998). This process is the outcome of interactions of 'a set of institutions, incentives and policies that can mobilise huge savings and put them to productive use, while at the same time promoting learning efficiency and a broad domestic knowledge

base' (Ernst, 1998). Gereffi (1999: 51-2) defines it as "a process of improving the ability of a firm or an economy to move to more profitable and/or technologically sophisticated capital and skill-intensive economic niches". Technology upgrading is 'a shift to higher value-added products and production stages through increasing specialisation'. However, while being very relevant, this approach is entirely undeveloped regarding economic theory. For the time being, there is no theory of industrial/ technological upgrading but only a few vague stylisations. Radosevic and Yoruk (2017) review the literature and offer measurement framework of technology upgrading.

16. The broad notion of innovation should include the adoption of imported equipment and knowledge. The evidence shows that the catching up of lagging countries depends very largely on the import and transfer of technology and knowledge (Fagerberg, 1991 and Verspagen, 1991). If we take the broader notion of R&D and distinguish between direct (own R&D) and R&D embodied in imported equipment and machinery direct R&D is a small component of R&D in countries and regions that operate behind technology frontier. Instead, the broad notion of R&D is dominated by indirect RD or R&D embodied in imported inputs and equipment (Hauknes and Knell, 2009).

17. The importance of R&D embodied in imported inputs and equipment and of production capability puts in the forefront the role of trade, subcontracting and FDI as closely related drivers of growth. Indeed, the role of international industrial networks in Central Europe has been recognised as one of the critical drivers of a different path of growth in CE when compared to the rest of CEECs (see IMF, 2013). IMF study concludes that German the Central European Supply Chain not only provided vital funding but led to technology transfers which then led to 'durable longer-term growth more generally'.

2.3. The region as the locus of multiple modes of innovation;

18. By taking into account broad notion of innovation which goes well beyond R&D into non-R&D activities and also includes indirect R&D embodied in imported inputs and machinery we have to consider a variety of modes of innovation which underlie this notion. Within this perspective, a region is a place not only of R&D-based innovation but also a variety of 'doing-using-interacting' type of innovations which are experience-based (Jensen et al, 2007). The growth and productivity of EU periphery regions rest on a variety of other activities which are not innovation activities in the narrow sense or are incremental innovations (product and process engineering improvements). Regions are also places where a variety of productivity-enhancing activities take place, such as quality-related activities, and other activities like management practices focused on production capabilities (Bloom and Van Reenen, 2010). These activities are often much more important for productivity growth, competitiveness and employment in less less-advanced regions than R&D activities proper.

19. The view of the region as a locus of multiple modes of innovation stands in contrast to EU regional innovation policy which is too often focused on R&D-based innovation and does not address alternative modes of innovation and productivity-enhancing activities⁵ (Foray, Morgan and Radosevic, 2017). The doing – using – interacting (DUI) mode of innovation is essential both in developed and less-developed regions, yet it is a much-

⁵ It is true that more funding goes to TO3 - SMEs competitiveness than to TO1 - Research and innovation. However, technical modernisation of SMEs through sole purchasing of new equipment does not necessarily lead to own innovation activities and higher productivity. For persuasive evidence on this for Poland see Breznitz and Ornston (2017).

neglected mode. The productivity of EU peripheral regions is driven much more by a variety of non-R&D activities. The three most important are: engineering, production capability and management practices. However, it is essential to recognise that these activities are mutually complementary and cumulative. Successful firms are those that couple R&D-based and DUI modes of innovation.

20. Developed production capabilities and engineering improvements (incremental innovations) are prerequisites for more ambitious innovation efforts. Improved management practices are also strongly correlated to firms' and economies' level of productivity (Bloom, N. and Van Reenen, J. 2007, 2010).

21. So, regional innovation policy cannot be reduced to R&D-based innovation but needs to recognise and address the diversity of innovation modes and productivity-enhancing activities in the region. Hence, the links between regional and research policy in peripheral regions need to be complemented by a variety of other equally important sources of innovation and productivity growth (e.g. user-based innovation, process and product engineering, organisational productivity-enhancing improvements, etc.).

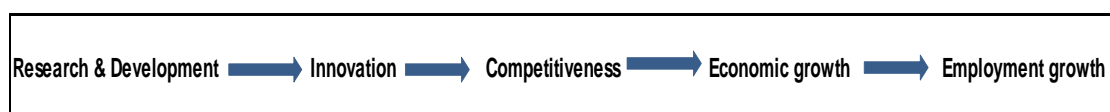
2.4. Upstream vs downstream innovation value chain and policy focus

22. A conventional policy model of technology upgrading assumes that R&D is the primary source of growth⁶. This model is the basis of the new (endogenous) growth theory. Endogenous growth models assume that R&D is essentially a probabilistic process, which has partly public nature and thus leads to technology spillovers, which in turn lead to increasing returns to scale. In these models, technology is reduced to ideas which are non-rival and thus by definition lead to increasing returns and imperfect competition. The advantage of these models is that they are sensitive to policy decisions like a number of researchers, utilization of new ideas and public subsidy for R&D.

23. Figure 1 shows a stylized policy model of technology upgrading which is implicitly based on these ideas. R&D leads to growth, which in turn leads through spillovers and imperfect competition to innovation, which in turn improves the competitiveness of firms and countries, which in turn generate growth and (hopefully) employment. This reflects a generally accepted view that R&D and innovation are among the primary drivers for sustained economic growth and which are seen as the central concern of public policy. For example, the OECD Growth Study (OECD, 2003) has identified a clear positive linkage between private sector R&D intensity and growth in per capita gross domestic product (GDP) for OECD economies⁷.

⁶ At micro level dominant workhorse model of the link between R&D-Innovation and productivity is so called CDM model (Crépon, Duguet and Mairesse, 1998) which basically follow similar logic but framed within the knowledge production function

⁷ The analysis could find no clear-cut relationship between public R&D activities and growth, at least in the short term, which by itself would require extensive elaboration (see OECD, 2003) and further research.

Figure 1. A linear innovation model

24. The mainstream model of R&D based growth like Crépon, Duguet and Mairesse (1998) or CDM model, which establishes the link between RD, innovation and productivity is theoretically grounded, but it seems much less relevant for less developed countries⁸. The CDM model which is based on RD>Innovation>Productivity sequence ignores the distinction between production capability and technology capability and ignores production capability as the primary source of productivity improvements in less developed economies/regions. Productivity not only in LDRs depends not only on R&D but also on absorptive capacity; diffusion and demand. Innovation literature does not support such a narrow approach to the relationship between innovation and growth.

25. The counterpart of the conventional R&D based model is heavy policy focus on science – industry links and on Holy Grail of ‘commercialisation’. It is presumed that in LDRs these links are less developed. However, the usual argument is that science-industry links in less developed regions of the EU are less intensive does not bear scrutiny (see Radosevic, 2016). Similar results apply to other catching up countries (see Albuquerque et al., 2015) and evidence from the EU would tend to disprove this assumption. Evidence from innovation surveys in catching up economies shows that innovative firms regard universities as highly important sources of information, to a similar or even higher extent than in developed countries. For example, in the 2008 Brazilian innovation survey, 6.8% of innovative firms regarded universities as highly important sources of information (Albuquerque et al., 2015), which is very close to the median value of 7% for the three EU regions. Also, there is no significant difference between developed and developing countries in the ranking by firms of the importance of sources of innovation. For example, correlation of the importance of sources of information for innovation between the US and India is 0.886 (Albuquerque et al., 2015, Table 5.6).

26. Such evidence questions the notion that in catching up countries public-business R&D links are missing or weak. In our view, this assumption arises because the relationship between public R&D and the business sector has been reduced to the mere commercialisation of R&D. Radosevic (2016) argues that science industry links in less developed parts of the EU are not less intensive, but they are different as they are more downstream oriented. This conclusion is similar to innovation surveys where the significant difference is not in the commercial importance of innovation activities but their different nature between developed and less developed regions.

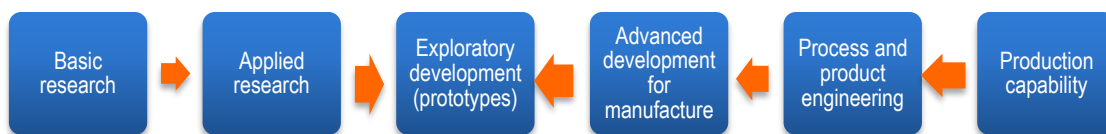
27. Science-industry links are essential at all stages of economic development, but similarly, intensive links should not blind us to see differences in their nature. As a result of this misunderstanding commercialisation and the aim of the creation of new firms through public R&D has been overestimated as growth enhancing factor in the less developed EU economies, compared to other channels (Brown and Mason, 2014). Similar to other emerging economies (Albuquerque et al., 2015), the policy focus on commercialisation is too narrow in the context of CEE and South EU. The establishment of technology transfer offices to promote the commercialisation of present inventions

⁸ For research based on CDM model for eastern Europe see EBRD 2014, Bartz et al 2016, Hashi and Stojcic, 2013, Tevdovski et al, 2017, for Latin America see Crespi et al, 2010.

linearly should not be the primary policy focus in this area. Such programmes, which are modelled in different contexts, ignore the needs of local firms and the capabilities of local public R&D organisations, which are much more focused on S&T problem-solving.

28. The intense focus on upstream parts of innovation chain or R&D ignores the primary challenge for less developed countries and regions which is how to couple its R&D and innovative activity with absorption and adaptation of foreign knowledge. Figure 2 depicts an alternative policy-relevant model of technology upgrading.

Figure 2 An alternative two-way model of technology upgrading of relevance for the less developed countries and regions



29. This alternative model recognises that growth based on innovation requires R&D like fundamental and applied research which are necessary inputs for exploratory development or prototypes as small scales examples of product innovation. However, the further countries are beyond the technology frontier their technology activities are focused around production capability. Improvements in production capability are followed by expansion of process and product engineering activities which do not fall into the definition of R&D. These, in turn, are followed by advanced development for manufacture. So, the model above is not linear, but the two-way model as growth is based not only on Research>Development> Innovation or (R>D>I) sequence but also on production capability > Engineering> Development > Innovation or (PC>E>D>I) sequence.

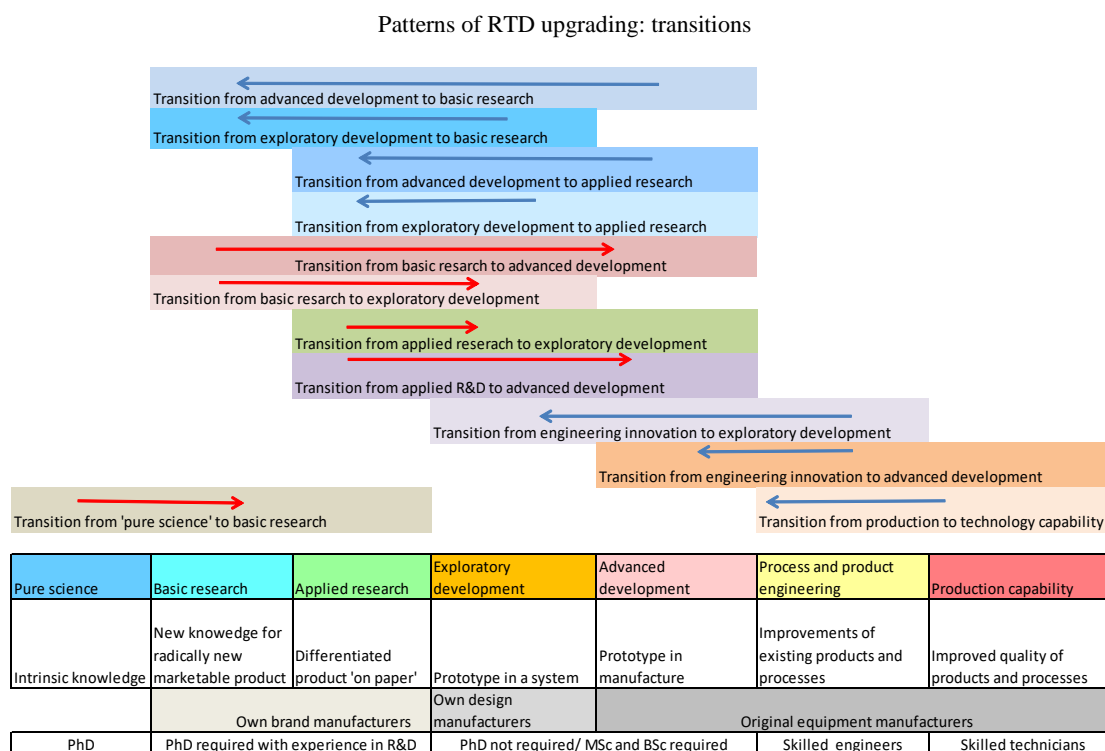
30. Figure 3, which represents an extension of the seminal paper by Amsden and Tschang (2013) shows various transition or upgrading patterns in the extended framework of R&D and innovation. It presents in more details the basic idea of an alternative model of technology upgrading of relevance for the less developed countries/regions (Figure 2). It shows that patterns of technology upgrading are taking place both in upstream and downstream RDI activities.

31. A mainstream view on this is that RDI processes are primarily dominated by transitions from basic research to applied research, from basic research to exploratory development or from applied research to exploratory development or advanced development. These are areas of 'commercialization of R&D' which are the most often focus of science and innovation policies. Amsden and Tschang (2003) also recognise that there are transitions from 'pure science' towards basic research which underpins specific technology area. Also, mainstream, view recognises transitions which go from downstream to upstream areas. These are activities usually initiated by business sector which needs organised, very often public R&D, to complete initiated or planned developments. These are processes whereby exploratory development or advanced development requires further investments in the area of applied research or sometimes their completion requires entirely new knowledge within the area of basic research. This increase in R&D ambition is also recognised by policy, especially in demand focused innovation policy programs. On the

other hand, programs that support the transition from upstream to downstream activities are more ‘R&D push’ programs while transitions from downstream to upstream activities require ‘demand pull’ programs.

32. Areas that usually are not recognised as areas for science and innovation policy are improvements within production capability, transitions from production capability towards process and product engineering activities, and improvements from these two areas towards advanced (prototype in manufacture) and exploratory development (prototype in a system). However, these are precisely the areas, which are vital to the technology upgrading of the less developed countries/regions.

Figure 3. Patterns of RTD upgrading



Source: Extended and adapted by the author, based on Amsden A. and F. T. Tschang, Research Policy 33 (2003).

33. There are mainly three points that follow from this conceptualisation of RDI and innovation.

34. First, ‘commercialisation of RD’ activities are usually activities taking place within own brand manufacturers or large companies, especially those activities, which stem from results of own or public basic and applied research. A range of improvements in quality and features of products and processes are today also being undertaken by subcontractors or firms that are often labelled as ‘original equipment manufacturers’, i.e. firms that produce for another label. An intermediate or in between these two extremes are ‘own design manufacturers’ or firms that are involved in the exploratory development and can produce prototypes on a pilot scale. Domestic firms in less developed countries/regions are mostly OEMs. Some FDI affiliates in CEE are examples of ODM companies. We find comparatively a few examples in each CEE country of domestic or foreign ODMs. So, the

majority of technology activities in LDR like in CEE are around activities, which regarding innovation chain are conducted by OEMs or sometimes by ODMs. OEM is required to reduce the costs and uncertainties of manufacturing while ODM must produce a prototype of a fully engineered system based on the basic design platform of the product provided by the foreign OBM (Amsden and Tschang, 2003). It is paradoxical that usually attention of the public is focused on a few high profiles cases of local or foreign OBMs, which are effectively just top of the iceberg whose basis is formed of OEMs involved in mundane non-R&D activities.

35. Second, each of the areas within this spectrum of RDI activities requires a different type of knowledge. Pure science, basic and applied research require as a matter of routine PhD level of knowledge. On the other hand, improvements in quality and features of products and processes require either skilled engineers or skilled technicians working together. Area in between – exploratory and advanced development do not necessarily require PhD but MSc and BSc levels of knowledge. However, these knowledge levels are not necessarily hierarchical regarding the level of complexity but are based on different types of knowledge bases. The knowledge base in advanced or exploratory development is mainly around the engineering and is oriented towards solving concrete problems. Knowledge in the applied research area is more about science and of experimental nature.

36. Third, Amsden A. and Tschang (2003) show that there is not automatic upgrading which would go upstream or downstream. In other words, each of areas has its distinctive set of knowledge and organisational requirements. In particular, they point to **a threshold or sharp division as R&D moved from applied research to development**, which they see as the major hurdle for latecomer firms.

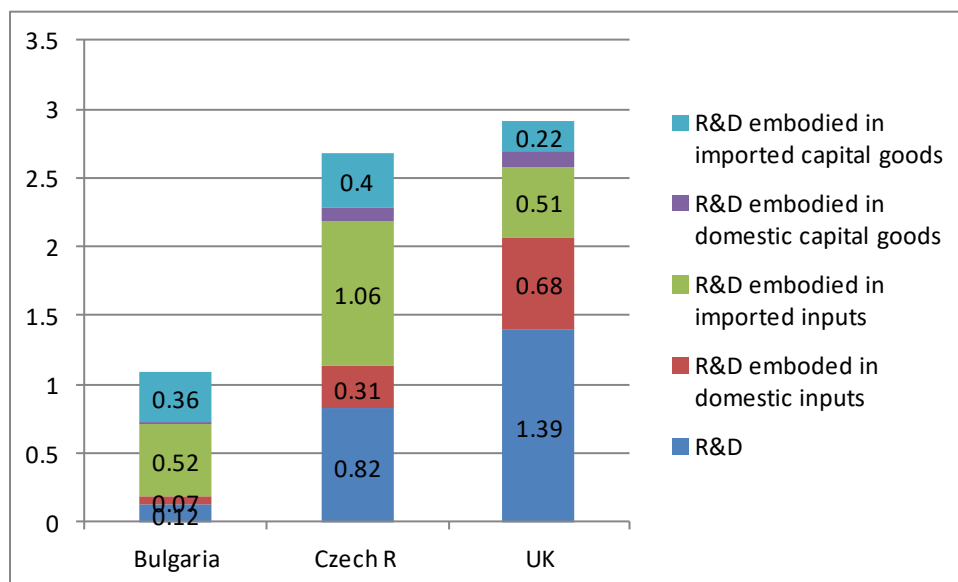
“The techniques employed in applied research tended to involve more science than engineering, the qualifications of researchers required a PhD and not just a master’s degree, the performance criteria according to which research was evaluated were based on IP instead of simply immediate market returns, and output required a differentiated product rather than just a more detailed design. Overcoming this hurdle, we would predict, is the major challenge that other latecomers will also face” (Amsden and Tschang, 2003: 571).

37. However, their very detailed empirical evidence is from East Asia and mainly from the electronics industry. The EU LDRs firms’ are on the other hand comparatively weak in development activities so their gap is not only between development and applied R&D or own product innovation but even more in the **transition from production capability and process and product engineering to advanced and exploratory development**. Data on business enterprise sector (BES) R&D shows on average very weak RD intensity though the overall innovative activities are present but confined to incremental improvements in product and process engineering.

38. Below we corroborate these conceptual issues with the statistical evidence by using the notion of broad R&D which includes direct and indirect R&D or R&D embodied in inputs and equipment. Figure 4 shows shares of broad R&D and its components in value added for Bulgaria, Czech R and UK. Figure 5 shows the same data but in relative terms, ie, using broad R&D as 100.

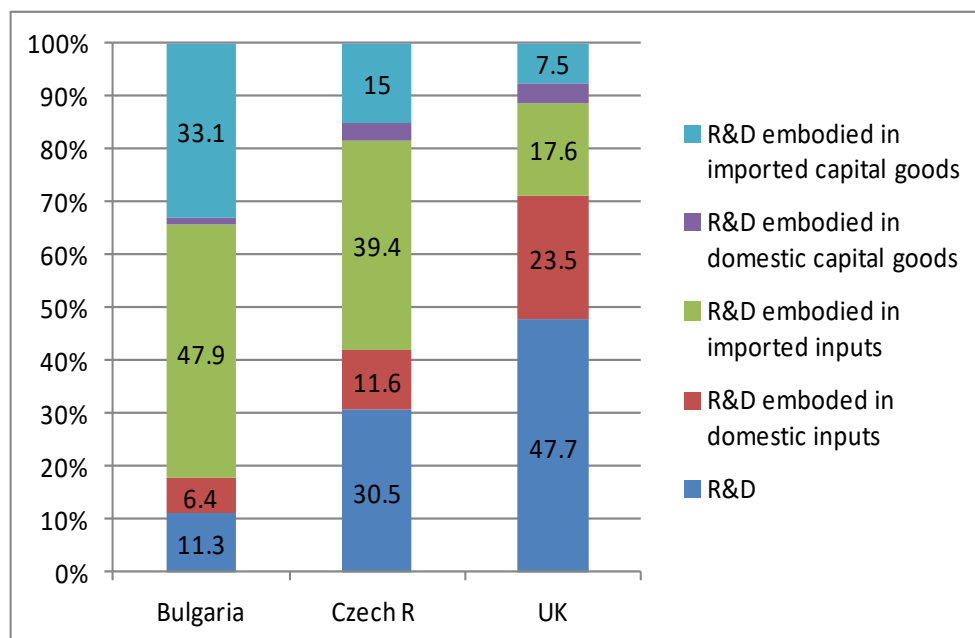
Figure 4. Direct R&D and indirect R&D/embodied in inputs and capital goods

R&D intensities in value added in Bulgaria (2001), United Kingdom (2000) and Czech Republic (2000)



Source: Own calculations based on Knell, M. (2008), 'Embodied technology diffusion and intersectoral linkages in Europe', Europe Innova Sectoral Innovation Watch deliverable WP4, Brussels: EC.

Figure 5. Share in total R&D content of R&D and embodied R&D in inputs or capital goods



Source: Own calculations based on Knell, M. (2008), 'Embodied technology diffusion and intersectoral linkages in Europe', Europe Innova Sectoral Innovation Watch deliverable WP4, Brussels: EC.

39. These data show the importance of indirect R&D or R&D embodied in imported technology and inputs in countries whose firms operate behind the technology frontier. The difference in overall or broader concept of R&D between developed and less developed

economies stems from own R&D, not from R&D embodied in imported inputs and capital goods. R&D intensity embodied in imported capital goods and imported inputs in less developed countries is quite comparable to developed, i.e. less developed countries import similarly sophisticated equipment and inputs as developed. So, their challenge is how to generate value added on similarly sophisticated equipment and inputs at least regarding R&D intensity. Their technology effort is focused on how to achieve world levels of productivity by assimilating and adopting foreign technology but in the absence of their own R&D.

2.5. Policy implications

40. In this section, we pointed to the specific nature of innovation activities in less developed countries/regions, and in particular to the broader notion of innovation which captures both upstream and downstream parts of innovation chain as well as the interaction between own R&D and imported (R&D embodied) technology. We consider this broader perspective on innovation in LDC/LDRs essential as a framework for thinking about the design of innovation policy in these economies.

41. First, policy implication is that different levels and patterns technology upgrading require different innovation policies. In a nutshell, one could argue that two-way innovation model requires two-way policies, i.e. not only standard R&D push policies but equally or even more policies focused on non-R&D and production capabilities. Current policy focus in the EU LDC/LDRs can be described as strongly R&D driven innovation policy. There is much less or is missing altogether policy focus on design, engineering, management and production capabilities (DEMP).

42. Second, the framework and evidence point to the importance of coupling of own R&D effort with the inward and international technology transfer. Coupling of own R&D effort with the inward and international technology transfer requires de facto merging R&D/innovation policy and FDI/GVC policy.

43. An example of Polish innovation policy represents a good example of what we would describe as ZigZag⁹ innovation policy which reflects issues discussed in this section¹⁰. The 2007-13 financial perspective focused in Poland focused excessively on the import and adoption of foreign technology. Regarding figures 4 and 5, one could argue that policy was strongly focused only on technology use confined on the purchase of the latest equipment and machinery. 2014-2020 financial perspective (labelled by Breznitz and Ornston, 2017 an “innovation tsunami”) focused narrowly on early-stage risk capital and R&D expenditure in SMEs. Regarding figures 4 and 5, we observe a strong shift from technology use towards own R&D while the critical challenge of innovation policy should be how to combine or couple these two types of technology effort. In a nutshell, the challenge for 2020-2027 financial perspective is how to couple investments in enterprise R&D with significant investments in human capital (both university and vocational education) and technology upgrading or investments in DEMP (Design, Engineering, Management, Production capabilities).

⁹ ZigZag: a situation in which actions, plans, or ideas change suddenly and completely, and then change back again equally suddenly (Cambridge Dictionary).

¹⁰ For full account and assessment see Breznitz and Ornston (2017).

3. Institutional capacity for implementation of innovation policy in less developed countries and regions

In less developed countries and regions institutional capacities for implementation of innovation policy are considered as one of the major, if not the primary constraint. Required technical, operational and political (TOP) and monitoring & evaluation (M&E) capabilities to implement individual policy measures are much less available than in developed countries. In conditions of limited institutional implementation capacities, the recent alternative thinking is not to aim for the best policy solutions aka institutional requirements of developed regions but try to design policies which correspond to the weak institutional capacities of LDRs. In the absence of institutional preconditions for innovation policy, the solution is to be found in the 'best matches'. Although this solves part of the problem, the key challenge remains: who can assess what are the 'the best matches' policy solutions. This requires external assessment of institutional and implementation capacities which does not represent magic solution but is a possible way to address the issue.

44. Innovation policy requires developed institutional capabilities that go well beyond those required for macroeconomic policies. These include capabilities that go beyond government capacities proper and require the ability to engage with the private sector, coordinate across several public agencies and ensure continuity of policy whose effects are usually felt beyond the electoral cycle. Some of these capabilities are the outcome of different historically rooted roles of the state and business in various economies and cannot be built by a small team of 'modernisers'.

45. Institutional capacities for innovation policy are not confined to the administrative capacities of governments. The state cannot be useful in innovation policy as an autonomous entity without being enmeshed in rich knowledge networks with the private sector through which it can enter into dialogue about growth challenges (Evans, 1995). Hence, policy coordination capabilities are as crucial as in-house government capacities. Capacity to coordinate actions across public sector agencies and to effectively engage in collaboration with private sector actors is essential to successful innovation policy.

46. The systemic nature of innovation policy requires collaboration with the private sector, where often the private sector has a better in-depth understanding of the issues involved. They also require cooperation across several public agencies or bodies which are not always easy to achieve. So, again unlike application of macroeconomic policy innovation policy is by definition inter-ministerial, inter-sectoral and multiple stakeholders' affairs.

47. The importance of the relationship between state and business community has been well recognised in UNIDO GIZ EQuIP manual on industrial policy (<http://www.equip-project.org/toolbox/>) which consider the assessment of the institutional set-up as an integral part of the design of industrial policy. This has been recognised through the assessment of embedded autonomy or degree to which the state is 'independent of and yet responsive to civil society actors and particularly private sector actors by providing institutional channels

for an ongoing negotiation process on goals and policies' (p.7)¹¹. So, government capacities are essential, but equally, it is crucial to consider the nature of the relationship between government and the private sector.

48. The bottom line is that the political economy of state – business relationship plays a decisive role in innovation and industrial policy outcomes. Implementation failures are not only technical and operational but also political. 'It is not sufficient to just propose good economic policies; one must propose a way in which they will be endogenously chosen by those with the political power to do so' (Robinson, 2009). So, the key challenge of implementation is also how to align the incentives of the powerful stakeholders with those of society/region? The endogenous nature of industrial/innovation policy does not lend itself to simple policy proposals (ibid). In essence, this means that thinking about innovation policy in a new way requires an understanding of the 'politics of policy'.

49. Institutional capacity for innovation policy in less developed countries/regions is far too often either assumed that exist or is ignored as an issue. However, the reality is that knowledge and technical skills requirements for innovation policy are demanding, often above competencies in the public sector in less developed countries/regions (Rodríguez-Pose and Di Cataldo, 2015). A selection of appropriate instruments, design and implementation of a variety of measures that are compatible with a market economy while also promoting structural change and having a sectoral or macro impact is a nontrivial task.

50. Assessment of institutional capacities for implementation of innovation policy is indispensable to check whether proposed policy measures can be carried out as intended. So, in some sense, the issue of 'what' or choice of priorities and instruments may be secondary to the issue of 'how' or what is the institutional and implementation context of innovation policy. Why is this important? We can think of situations where there is a significant incompatibility between the type of policy which is, for example, selective and top-down in the political context which favours bottom-up and sector-neutral approach (Karo et al., 2017). EU SS strategies offer a range of cases where the political context of the country was wholly inimical to any prioritisation in the style of smart specialisation approach (Radosevic and Walendowski, 2016). However, in addition to the style of policy which should be compatible with the underlying institutional context equally important is the required level of institutional implementation capability for specific types of policies and programs.

3.1. Quantitative assessment of institutional capacities

51. It is not yet possible to quantify the institutional capacity for innovation policy. However, as a first approximation, it is possible to assess general administrative preconditions for implementation of innovation policy indirectly through established international indicators like World Bank Governance indicators, and institutional indicators of WEF GCR or *Transparency International index*. Among new such monitoring, indexes are the *Bertelsmann Stiftung Transformation Index* which is focused on developing and transition countries and their transition towards democracy and market economy. These indices could be used as the first approximation and background for an assessment of the capacities for implementation of innovation policy.

¹¹ GIZ-UNIDO (2017) Development of a Manual on the Selection of Institutional Setups for Industrial Policies, Toolbox module: Institutional Setup, UNIDO Vienna

52. At the regional level, while these metrics are excellent general proxies, they are all bit too far from measuring the quality of governance for innovation policy and the degree to which country or region has developed embedded autonomy. So, there is a need for further exploratory work along these lines. EC (2018) is publishing *European Quality of Government Index*¹² which is based on average citizens' perceptions and experiences with corruption, and the extent to which they rate their public services as impartial and of good quality in their region of residence.

53. The assessment of institutional capacities which would go beyond first approximation should specifically explore administrative capacities for implementing innovation policy. For example, is public administration personnel engaged in the implementation of policy measures sufficiently skilled and comparatively well remunerated? Staff turnover in public administration or their salaries compared to private sector employees of similar skills can be used as a proxy for this capacity.

54. A semi-quantitative indicator is the non-existence of public-private, public- public and private – private consultation bodies. For example, Association of Business Incubators, technology parks, special economic zones, public-private councils; Business councils; Industry associations, Chambers of Commerce, Supplier associations, Professional associations are those bodies that organise stakeholders and bring them into the policy consultation process. So, the scope and the range of these intermediary organizations are essential proxies of the extent of capacities for implementation of innovation policy.

3.2. Assessing Technical-Operational-Political (TOP) and Monitoring & Evaluation (M&E) capacities

55. The capacities for implementation of innovation policy can be grouped into strategy setting capabilities; policy coordination capabilities, implementation capacities – technical, operational, political (TOP); and monitoring & evaluation capacities. Here we focus on TOP and M&E capacities as the most critical in less developed countries/regions.

56. The core of institutional capacities for innovation policy are implementation capacities – operational, technical, political (TOP). Technical capabilities comprise all the knowledge and expertise required to implement industrial policy instruments. Examples of technical capacity are a selection of the best business plans, the design of R&D tax incentives or to manage cluster development. Operational capabilities include managerial skills, that is, the ability to run an organization with high professional standards, efficiency and results. Political capabilities include the ability to both secure political support to accomplish the mission and safeguard against political capture (Crespi et al., 2014). The key to political capability is to secure the continuation of the support of the relevant authorities.

57. In less developed countries, required technical capabilities to implement individual policy measures are much less available than in developed countries. Technical capabilities are lacking so agencies or ministries are required to collaborate with the external public and private organisations which can provide such services.

58. The quality of innovation policy is significantly determined by how well monitoring and subsequent retrospective evaluations are organized as this is the only way

¹²European Commission (EC) (2018), European Quality of Government Index 2017, available at http://ec.europa.eu/regional_policy/en/information/maps/quality_of_governance#3

to embed into policy the experiential learning (Pritchett, Samji, and Hammer, 2012). In this respect, monitoring and evaluation are essential aspects of institutional setup and implementation capacity of innovation policy. In LDCs/LDRs, M&E is not developed and even when M&E units exist they are understaffed, lacking technical capacities and of low stature in the machinery of innovation policy. Very often M&E is adequately done only when funded as part of international organisations programs.

3.3. From the “best practice” to the “best matches”

59. On average the less developed regions have weaker governance capacities than more developed regions (for evidence in the EU context see EC, 2018). The usual approach is to try to improve institutional and implementation capacities using the best practice as a reference case. However, copying of the best practice does not necessarily represent the best response to the local context but more compliance to external requirements.

60. The developed institutional capacity is required to overcome trade-offs of ‘embedded autonomy’, an i.e. situation where policymaker needs to have a detailed understanding of the sectoral situation but should not be captured by particular interests? (Evans, 1995; UNIDO/GIZ, <http://www.equip-project.org> ; see OECD Recommendation of the Council on effective public investment across levels of government, 2014, p18).

61. Although a high degree of embedded autonomy is a desirable precondition for effective innovation policies, it is unrealistic to expect that it can often be met. In fact, the degree to which ‘embedded autonomy’ is required may vary across different types of innovation programs. As Crespi et al. (2014) point out ‘the modality of interaction with the private sector depends on the type of policy it is meant to support’. Also, countries have different degrees of ‘embedded autonomy’ due to policy legacies and path dependencies. These can vary from one where the public sector enjoys considerable independence from the private sector as in Korea to one where social consensus is embedded as in Ireland (Crespi et al., 2014). Within this range, we can find a variety of situations with very different degrees of propensity and capacity of the public sector to interact with the private sector. For example, only some actors within the state sector can have the ability to interact.

62. Also, we may not expect that the public and private sectors themselves will be organised. The public sector may not be organized in the way that it can interact with the private sector. In that case, private sector-led institutions can take a mediating role in public-private interactions. In other cases, the private sector may be very poorly organised so that the public sector needs to improve private - private coordination. Business associations may be a poor representation of real stakeholders, or they may be weak in inducing its members to commit resources and abide by association rules and decisions (Crespi et al., 2014). If newly, emerging sectors should play a significant role in SS than we may expect that they will have inadequate representation and low visibility, which puts the onus on the public sector to improve its visibility.

63. The public sector organizational structure may be not conducive to complex coordination that innovation policies require (Crespi et al., 2014). For example, the public sector may operate under very inflexible rules, which prevents it from engaging in the entrepreneurial discovery process. This may require that some public agencies operate under flexible rules or even under rules of the private sector, which should also be involved in its governance structure. In other cases, public agencies may need a separate remuneration system as the only way to attract highly skilled personnel. In some cases,

these agencies should be established by the law so to give them organisational stability but also the freedom to convene and engage the private sector.

64. When public – public sector coordination is weak it calls for specialized inter-ministerial cabinets and high-level task forces, or enabling the organization in charge of the policy to purchase the services of other agencies via dedicated budget (Crespi et al., 2014; see also Hausmann, Rodrik and Sabel, 2008 for in this respect illustrative example of South Africa).

65. Policy design should be tailored to the coordination capacities in innovation policy. The absence or presence of coordination capabilities within public or private sectors should determine the appropriateness of specific policy types. Horizontal policies will be more appropriate as compared to vertical when public-private coordination is weak. Also, single agency based policies will be preferred when intra-public sector coordination is undeveloped.

66. In summary, while it is commonly accepted that innovation policy portfolio should correspond to countries' institutional capacities for implementation of innovation policy, we do not see it as a rule in practice. When deciding on specific policy measures countries should assess their institutional implementation capacities, and especially their TOP capacities. Far too often, by aiming for best practices policies less developed countries are overlooking to assess whether they have required TOP capacities.

67. Innovation policy in less developed countries abounds in copying 'the best practice' measures¹³. For example, our exploration of EU innovation policy measures (Kincso et al., 2014) has shown that the diversity of countries regarding their innovation performances is not reflected in their policy mixes. The range of policy mixes is only partly due to real differences in the technological positions of countries and is much more shaped by transnational policy learning and path dependencies. There seems to be 'too much' similarity in policy practice, especially when accompanied by misunderstandings of country-specific technological and policy challenges, which lead to ineffective R&D and innovation policies. Transnational policy learning can be characterised as 'shallow' and boils down to copying instruments disregarding whether they are the best matches to the local environment. The similarity in policy mixes assumes similarity in institutional implementation capacities which is rarely the case.

68. So, what would be a desirable solution when implementations capacities do not meet the requirements of ambitious and demanding policy instruments.

69. A first view is that we should hope that even with the low quality of governance we may expect improvements as results of favourable matching interests of regional stakeholders. For example, even within the limited experience of SS, there is evidence that SS processes can improve governance of the R&I systems despite the low baseline quality of governance (see Cvijanovic et al., 2018). However, we can also notice that the number of cases where we have not seen such improvements is even higher.

70. An alternative view is that if these capabilities are absent 'the focus ought to be not on policy 'best practice' but policy 'best matches' with institutional capabilities (Crespi et al., 2014: p. 29, 347, Ang, 2017). As Crespi et al. (2014) point out, going for the best practices lead to tasks that may widely exceed public sector capabilities. So, the aim is not

¹³ For example, see questionnaire survey to policy makers in transition economies conducted by EBRD as part of EBRD 2014 Transition report.

to try to turn weak institutions into strong institutions as this is ‘chicken and egg’ problem but instead take the existing institutions as given and select ‘the best matches’ policy instruments. This requires assessment of institutional and implementation capacities and matching appropriate instruments to the existing capacities.

71. However, how do we find out what is the best match policy mix? If institutional implementation capacities are weak, it is highly likely that they will also be weak in assessing its own policy capability. In the absence of developed institutional capacities, the solution is to regard institutional preconditions as an *ex-ante* conditionality for delivery of specific programs and instruments. For example, if SS requires developed mechanism of public-private cooperation, and LDRs do not meet these requirements it may be logical to require that these institutional conditions be met before embarking on the process of SS. This would require revising *ex-ante* conditionalities and governance arrangements so as to embed EDP as a continuous process in national and regional governance systems. However, the experience shows that externally imposed governance requirements can be very often formally met without meeting the functional requirements of such governance. Hence, this could be one more opportunity for exercising isomorphic mimicry. Yet, alternative i.e hope that implementation capacities will improve by itself is not a solution either.

3.4. Policy implication

72. Whether policy accepts the existing institutional and implementation capabilities as given and adjust goals to the lowest common denominator or opt for the best policy solutions will ultimately require assessment of the implementation capacities for innovation policy. Given the endogenous nature of the problem, the only solution is an external assessment of implementation capacities. This is not a magic solution but inevitably compromise solution which can suffer from problems similar to all externally designed assessments: limited relevance and packaged approach which does not capture the specificity of the regional or country context.

4. The trade-off between accountability and experimentation: learning networks as a solution

The exact nature of the innovation policy problems and the best way to address them are not known ex-ante. This requires a degree of experimentation which is challenging to fit in the context of an accountable Weberian public administration whose room for discretionary behaviour is minimized to avoid state capture by an individual or private interests. So, how to reconcile the experimental nature of innovation policy with weak institutional capacities in LDC/LDRs?

We identify several distinct approaches to the issue of experimentation in innovation policy each with its strengths and weaknesses. These are Smart Specialization Entrepreneurial Discovery Process of Foray, Experimental governance by Sabel and Zeitlin; Problem-driven iterative adaptation of Andrews et al.; Experimentation- feedback – adaptation by Crespi et al., and Directed improvisation (variation- selection – niche creation) by Ang. Also, we recognise that all approaches face the challenge of how to reconcile the experimentalist approach with requirements for accountability of public policy.

However, the weakness of experimental approaches is that like in conventional public policy the existing power structure can be transposed into the policy process. When that happens, the whole process may turn into pro forma exercise rather than being transformative practice in the governance of innovation systems We propose a principle of ‘action learning’ and governance mechanism of ‘learning networks’ (LN) which may overcome some of the challenges of implementation of experimental governance in the conditions of the conventional public policy and low institutional implementation capacity. This proposal is based on the insight that experimental innovation policy will have the most significant effect when connected to action (experimental) learning as this is the best way to ensure immediate feedback of lessons what works and why.

73. As argued earlier, the exact nature of the innovation policy problems and the best way to address them are not known *ex-ante* (Crespi et al., 2014). Given that it seems necessary to establish ‘search networks’ or mechanisms which will be engaged in ‘discovering’ new opportunities or ‘Experimental Policy Engagements’ (Torrens and Schot, 2017). Equally, once problems are defined generic solutions are difficult to agree while specific policy instruments will be most often country or region specific. This indeterminacy of industrial (or innovation or regional) policy makes its design and implementation a search process (Crespi et al., 2014, p 322) which has also been described by Rodrik (2007) as ‘policy as discovery process’. So, innovation policy from the outset requires policy process to be organised as *policy discovery process* (ibid) which requires a degree of experimentation. However, experimentation is challenging to fit in the context of an accountable Weberian public administration whose room for discretionary behaviour is minimized to avoid state capture by an individual or private interests.

74. In less developed regions the uncertain (experimental) nature of the policy problem is compounded by the lacking institutional preconditions for the best practice policies or governance arrangements and supporting instruments. We cannot merely assume that the institutional or implementation capacities exist in less developed regions though this is often implicitly assumed. Instead, we find that system formally comply with institutional

requirements of the best practice but without functional change. This is situation described as 'isomorphic mimicry'¹⁴.

75. So, it seems that we have conundrum problem as it seems that in conditions of conventional public programs we do not have an organisational solution to experimental governance. Organisational solutions are either confined on individual pockets of excellence (cf. autonomous 'Schumpeterian development agencies') or on the specific institutional setups (the most notable example being Chinese economy, see Ang 2016) which can combine experimentation with centralised selection followed by diffusion of newly discovered practices.

76. In this section, we address this challenge of implementation of innovation policy in LDRs: how to reconcile the experimental nature of innovation policy with weak institutional capacities.

4.1. Balancing experimentation with accountability: Experimental nature of innovation policy and how to reconcile it with public policy accountability?

77. Experimentation in innovation policy is about creating a variety of policy solutions that may fit local contexts. This approach stands in stark contrast to the idea of the policy packages which are universally relevant, and the only challenge is in poor implementation capacity, not their local relevance. There are several distinct approaches to the issue of experimentation in innovation policy each with its strengths and weaknesses (see Table 1 for an overview of approaches for experimentation in innovation policy).

78. As a response to inadequacies of conventional logic what has emerged quite recently is alternative policy thinking which is rooted in complexity and evolutionary paradigm and which offers a new way of thinking about these issues. Approaches listed in the table above try to address the issue that in innovation policy challenges and solutions are not apparent so that sensible policy would require a degree of experimentation in both design and implementation. We briefly explain each of these approaches but would suggest the reader to consult each of approaches.

79. A solution implicit in SS approach is that EDP stakeholders should figure out what is the regional challenge and what are priorities to address them. The approach has EDP as a conceptual solution, and SS manual has outlined the linear process which leads user from design to implementation.

¹⁴ Isomorphic mimicry is defined as the tendency to introduce reforms that enhance the entity's external legitimacy and support, even when they do not demonstrably improve performance (Andrew, Pritchett, Woolcock, 2012).

Table 1. Different approaches to the issue of experimentation in innovation policy: Strength and weaknesses

Approach	Strength	Weakness
Smart Specialization Entrepreneurial Discovery Process (Foray, 2015)	Stakeholders engagement through structured consultation process but confined on the design stage of the policy process	Broad-based engagement does not always lead to effective adaptation. Who of stakeholders defines what the problem is? Who defines criteria of success for solving the problem? EDP may reflect the existing power and discourse structure. A separation between design and implementation. EDP by and large confined on design. Implementation follows the planned script. Weak feedback loops. Monitoring focused on process compliance and disbursement evaluation. Long feedback on output and possibly on outcomes
Experimental governance (Sabel and Zeitlin, 2010)	Not separation between design and implementation. The policy is designed as a process	It requires 'Schumpeterian development agency' (Sabel and Kuznetsov, 2017) Incompatible with conventional accountability rules of public policy
Problem-driven iterative adaptation (PDIA)(Andrews et al., 2012)	The focus is on discovering what the real local problem is. Different solutions and adaptations outlined. Requires stakeholders' engagement by definition Experiential learning effects	Appropriate as a solution to specific tractable problems but challenging to embed as the overall policy solution and especially for ill-defined problems like innovation policy
EFA (Experimentation-feedback – adaptation)(Crespi et al., 2014)	Feedback is an essential mechanism of experimentation which requires adaptations	Not limits to experimentation It requires competent agencies with technical, operation and political capabilities
Directed improvisation (variation- selection – niche creation)(Ang, 2016)	Bounded experimentation. Vague guidelines allow for policy experimentation Selection after experimenting with a variety of approaches	Requires specific institutional setup, which can limit experimentation, select the viable options and facilitate 'niche creation.'

80. Unlike new public management approach, experimentalist governance does not rest on the principal-agent relationship but describes the emergence of policy as the process based on '*recursive learning mechanism and dynamic accountability through peer review*' (Sabel and Zeitlin, 2010). When applied to the innovation policy this form of governance rests on four principles (Sabel and Zeitlin, 2011). First, policy goals are established in interaction with the affected stakeholders. Second, stakeholders have a significant degree of autonomy in pursuing different programs or projects ideally through a portfolio of projects or programs. Third, their performance is monitored through the system of 'diagnostic monitoring' which discovers unforeseen events in the portfolio of projects and which tries to correct them or use as new opportunities rather than through ex-post evaluations on a project-by-project basis. Fourth, the goals, metrics, and decision-making procedures are reviewed in light of new problems and possibilities. In the 'experimentalist governance,' there is not a clear separation between policy design and implementation. Learning takes place in the process of the application during which capabilities are upgraded, and policy design adapts.

81. Problem-driven iterative adaptation approach (PDIA) of Andrews, Pritchett and Woolcock (2012) and Pritchett and Woolcock, (2004) focuses on discovering what is the real local problem which then requires different solutions and adaptations.

82. Crespi et al. (2014) have merged experimentalist governance with PDIA approach into so-called EFA Cycle (experimentation – feedback loops – adaptation) which begins

with experimentation as Sabel and Zeitlin (2012) and end with adaptation as in Pritchett et al. (2010). They define *experimentation* as a space in which different approaches to solving a given problem are allowed and their results systematically evaluated. *Feedback loops* are necessary for the process to figure out which of approaches are workable and which are not. The final activity is to *adopt* a policy to a particular institutional context.

83. Ang (2016) has shown that beneath extraordinary Chinese growth lies ‘directed improvisation’ approach or strategy of vague policy guidelines which enable generation of various local solutions (experiments) followed by selection and diffusion of successful policy models.

84. Each of these approaches also has noticeable weaknesses. The most common weakness is that it is difficult to reconcile the experimentalist approach with the conventional public policy governance regime based on accountability. SS is based on the broad-based engagement of stakeholders which does not necessarily lead to effective adaptation as EDP can *de facto* reflect the existing power and discourse structure. So, in reality, its inclusiveness and interaction depend on the organisers of the EDP, which are often public authorities (Cvijanovic et al., 2018). What we find in reality is truncated multi-stakeholder approach where only some stakeholders are involved, and also EDP is reduced to the design stage. The experimental nature of the design stage is followed by implementation according to the planned script with very weak or no feedback loops. These weaknesses stem from critical inconsistencies of SS. The crucial first inconsistency in SS approach is that the implementation is executed through programme-based calls rather than through strategic partnerships or ‘innovation platforms’ of key actors. If SS is about the creation of local innovation system or innovation ecosystems their creation cannot be supported as a series of standalone but as a portfolio of related projects. Crucial second inconsistency is that the design stage is separated from the implementation which is done through Operational Programs (Cvijanovic et al., 2018). Also, administrative processes and the risk that policy-makers may retroactively demand repayment discourage experimentation by civil servants and entrepreneurs (Breznitz and Ornston, 2017)

85. Experimentalist governance requires a new institution ‘Schumpeterian development agency’ which is difficult to fit into the conventional accountability rules of public policy. PDIA does not set limits to experimentation, and thus it is difficult to standardise it within multi-regional context. It is an appropriate solution to specific tractable problems, but it is difficult to embed it as the overall policy solution and especially for ill-defined problems like innovation policy¹⁵.

86. EFA approach does not set limits to experimentation, and it requires competent agencies with technical, operation and political capabilities for implementing EFA cycle. Directed improvisation approach requires specific institutional setup, which limits experimentation, select the viable options and once successful model has emerged can facilitate its diffusion.

87. In overall, we recognise that all approaches face the challenge of how to reconcile the experimentalist approach with requirements for accountability of public policy. There is a disconnect between the rhetoric which calls for a more experimental public sector, and the reality of a public-sector compliance culture that is intolerant of mistakes and failure

¹⁵ A paradigmatic case analysed within the PDIA approach is about the causes of costly purchase of textbooks, an example where the nature of the problem is unlike in innovation policy quite clearly defined.

(Morgan, 2016). Experimentalist governance and directed improvisation assume either specific organisation, which operates, based on the system of rules different from conventional public policy or specific governance regimes specific to Chinese political system, which allows competition among regional administrations but also assumes strong central power. The second challenge is whether experimentation is bounded or unbounded. In the case of SS, experimentation is confined on design stage while in ‘directed improvisation’ case it is a central government which makes selection recognising those experimental models which have shown to be successful. In experimentalist governance approach, Schumpeterian development agency is managing a portfolio of projects and thus is ultimately responsible for producing the portfolio with the best outcomes and synergies. PDIA and EFA approach do not have clear views on this issue but implicitly assumes the existence of competent public agencies, which can engage in experimentation/implementation cycle.

4.2. “Action learning” and “Learning networks” as a missing tool of the Entrepreneurial Discovery Process, Implementation and Adaptation of innovation policy

88. We argued that so far, we do not have a satisfactory organisational solution to experimental governance. In this section, we elaborate solution which is based on the insight that experimental innovation policy will have the most significant effect when connected to action (experimental) learning as this is the best way to ensure immediate feedback of lessons what works and why. The point is that such learning is active and is happening in the process of real implementation. However, governance mechanisms to facilitate and capture such learning are not in place except in approaches which are not fully compatible with conventional public policy. Here we introduce the idea of learning networks as formal mechanism purposefully built to support the practical learning of its members.

89. The basic idea is that mechanism of learning networks based on principles of ‘action learning’ could represent appropriate governance structure which may ensure work on designing the best local solutions but also ensure that issues which arise during implementation can be corrected in time and feedback to design¹⁶¹⁷. The second feature of learning networks is that they may be suitable governance form to overcome vested interests by democratizing EDP and minimizing the impact of active and influential actors and give space to weak and potentially promising actors.

90. In continuation, we first explain principles of action learning and organisational features of learning networks.

91. The motivation for learning networks (LN) originates in the idea that significant knowledge benefits can be captured when ‘communities of practice’ develop across different stakeholders in a sector or between sectors. SS is such type of activity which through EDP establish new ‘communities of practice’ consisting of stakeholders from

¹⁶ Learning network is the action research framework developed by CENTRIM University of Brighton. It has been applied in several EU funded projects and is successfully functioning through PROFIT Network that operate in Sussex, UK. <https://www.brighton.ac.uk/centrim/professional-services/profitnet/index.aspx>.

¹⁷ PDIA approach implicitly contains some of ideas of learning networks by pointing to issue driven nature of policy problem and different roles of network participants.

different organisations and sectors. EDP becomes a specific form of collective learning and entrepreneurship.

92. Learning by networking with other stakeholders -firms, as well as academics and policymakers, gives the opportunity not only to share resources but also more significantly, to listen to new ideas, challenge one's assumptions and embrace new perspectives.

93. LN methodology rests on principles of action learning which are derived from problem-based learning approach to training. Action learning originates from the business sector and is defined as: “[...] a continuous process of learning and reflection, supported by colleagues, with the intention of getting things done. Through action learning, individuals learn with and from each other by working on real problems and reflecting on their own experiences.” (McGill and Beaty, 1995: 11)

94. Action learning is a straightforward form of ‘learning by doing’ based on teams of participants who offer each other advice and encouragement and challenge each other to think and act. It is focused on problems where there is no single solution as problems are either complex or ill-defined. For such problems, it is difficult to establish uniform behavioural and problem-solving procedures. The lack of fixed form and procedure means that the practice of action learning is ‘highly situational’ (Gifford, 2005). These are all conditions wholly relevant for the experimental nature of innovation policy.

95. Participants learn from others’ experiences in dealing with similar issues. By working with other participants, they gain new insights, and this also offers them opportunities to broaden their awareness through hearing others’ views. In that respect, the diversity of participants and topics of their projects is *de facto* considered an advantage. Participants can benefit from others’ views, and experiences and thus complementarities rather than commonalities and ‘group think’ are valuable features of the method.

96. It is crucial that LN projects focus on real-world policy issues like improvements in specific areas of innovation policy and its implementation rather than on general and conceptual or only operational issues. For example, the focus should be on the design of new policy instruments, improvements in the implementation of the existing instruments or joint new projects or programs to be developed among participants. In this way, the project can benefit from a multiplicity of experiences and knowledge of the group members.

97. The mechanism of Learning Networks (LN) has been developed to operationalise the latent opportunity which lies among network members given a diversity of their experiences and types of knowledge accumulated. Learning Networks do not refer to networks of organisations where learning happens by virtue of business or policy process, but rather to inter-organisational networks where structures have been established with the primary purpose of enhancing the knowledge of its members. These networks:

- Include representatives of different organisations (mainly but not exclusively, private firms);
- Are formally established with clear and defined boundaries for participation;
- Have an explicit structure for operation with regular processes and actions;
- Have a primary target – some specific learning/new knowledge that the network is going to enable;
- Can assess the “learning” outcomes that feedback on the operation of the network (Tsekouras, G., and D. Kanellou, 2018).

98. The formal character of the learning network provides an ‘institutionalised organizational platform’ which represents a permanent structure for identifying knowledge gaps and satisfying knowledge needs, allows evaluation and accumulates experience regarding the support required by learners. The permanent character of membership in learning networks facilitates the development of trust relationships among participants.

99. The learning network mechanism differs significantly from traditional monitoring and evaluation mechanism that focus on compliance with a linear process of design followed by implementation and allow ‘lessons’ only at the end project. LN aims to allow people working on the design and implementation of different programs to find new solutions. Hence, LN are very suitable mechanisms for improving and adapting previously agreed processes and procedures as challenges become obvious and new solutions are needed.

100. In addition to being a mechanism of the search for solutions that fit local context learning networks could be a governance mechanism to overcome or significantly reduce the power of vested interests that can bias the search process. The LN represent a link between people and bodies with the power to those facing problems of implementation. In that respect, LN are a potential tool of democratizing policy process by acknowledging individual (vested) and common interests.

101. The learning, design and implementation potential of LN lies in the diversity of stakeholders and participants involved. Some participants could provide power and other awareness of the problem, some ideas or resources, while others act as connectors or bridgers (Andrews et al., 2012). It is essential that in the SS process LN participants recognise a variety of their individual but also public interests. Participation should not be mandatory but only voluntary. Participants involved should share a common understanding that change is needed or that the agreed solutions are appropriate.

102. The weakness of experimental approaches is that like in conventional public policy the existing power structure can be transposed into the policy process. When that happens experimental policy like SS EDP can be ‘instrumentalised’ as a means to maintain the authority of one or more stakeholders instead to be run as an open and inclusive multi-stakeholder process. So, the whole process may turn into pro forma exercise rather than being transformative practice in the governance of innovation systems (Cvijanovic et al., 2018).

103. It should be hoped that two critical inconsistencies of SS could be overcome or reduced through LN. LN which would involve administrators, as well as firms and strategic partnerships, could help in finding solutions to maintain these partnerships even through program based calls. By bringing together into LN civil servants involved in Operational Programs and those involved in SS design and implementation could help to overcome often disjointed nature of strategy and operational programs.

104. An LN should be set up for the primary purpose of sharing & increasing capability to do things. Hence, LN should be formally established and defined; have a structure for operation, with boundaries defining participation; have a primary learning target (e.g. S3); and practical learning outcomes that could be measured (Tseokuras and Kanellou, 2018). The promise is that a formalised structure of LN which erases the power structure among participants could significantly reduce the power of vested interests.

105. As formalised structure LN should have the following vital actors (Tsekouras and Kanellou, 2018):

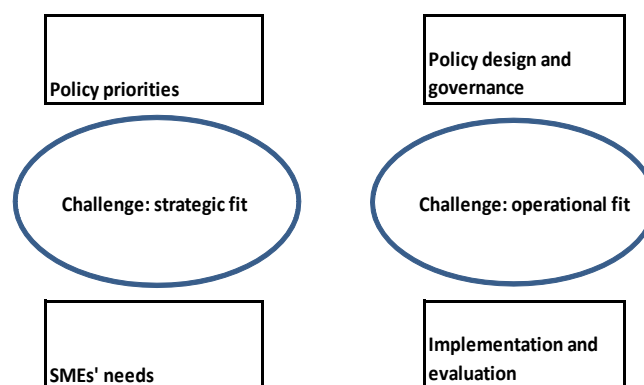
- **Network moderator** who manages and coordinates activities, people and time, matches learning needs with knowledge resources, and monitor the relationships between members
- **Peer group facilitators** who assist groups of practitioners in their structured reflection. The facilitators are trained and accumulated experience over time.
- **Network members** are individuals representing an organisation - with executive power.
- **Invited experts** are non-network members invited to participate in the network for a specific reason (such as the presentation of a topic) and a defined period.

106. We can think of LN as formally coordinating bodies which operate based on principles of ‘shared responsibility’ and ‘joint problem-solving’. For example, within the context of EU SS learning networks could be established between policymakers and stakeholders or between policy makers and implementation agencies, or between SMEs that participate in the same programs or between SMEs that are involved in specific technology priority areas.

107. Actors involved in conventional policy processes learn about weakness in either policy design or process only ex-post.

108. LN would aim to address two critical challenges of experimental innovation policy. The first challenge is strategic fit, or consistency between policy priorities and SMEs needs which is about the issue of appropriateness and relevance of strategy. The second challenge is operational fit between policy design and governance and implementation and evaluation, see Figure 6 for an overall context. (Tsekouras, G., N. Marshall and D. Kanellou. 2017).

Figure 6. Strategic and operational challenges of innovation policy



Source: Adapted from Tsekouras and Kanellou (2018).

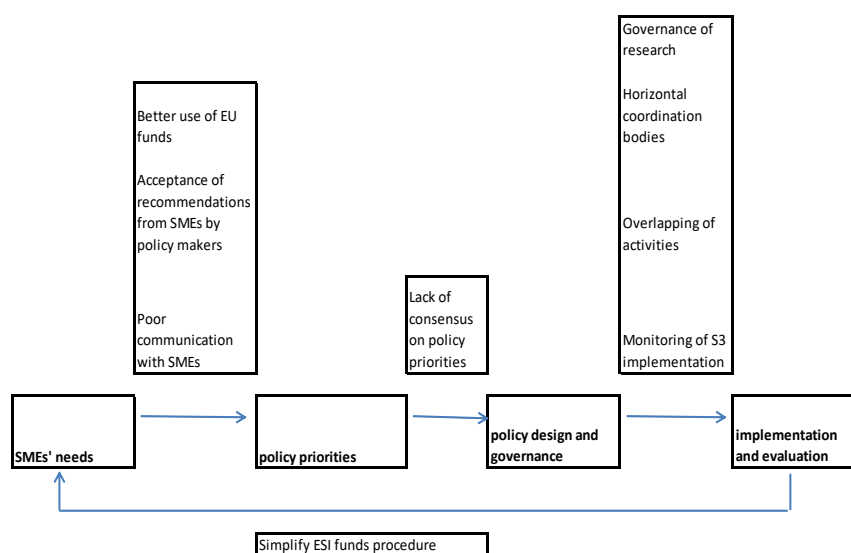
109. Based on the training workshop on LN for Croatian stakeholders in SS it turned out that there are several typical situations where participants could observe the lack of strategic and operational fit (Tsekouras and Kanellou, 2018):

- **Lack of Strategic Fit** emerges when beneficiaries apply on the basis of current, not future, needs, ignoring the potential of innovation; when call for proposals open later than announced and SME needs change in the meantime; when offered services are influenced by models in developed regions e.g. focus on high-tech and ignore low absorptive capacities of SMEs in LDRs; when application system focuses on the ‘tick the box’ syndrome where procedures are followed but little value generated for beneficiaries;
- **Lack of Operational Fit** is present when procurement rules are not followed-up properly, when it is difficult for SMEs to find relevant information (the ‘spaghetti’ problem); when bureaucratic procedures and forms are excessively formal serving no real purpose; when beneficiaries are different from targeted firms; when SMEs are not explaining well why extensions to projects are needed.

110. In this context, LN would aim to allow the strategic and operational fit to emerge and to receive continuous feedback on implementation challenges.

111. Based on Training Workshop mentioned earlier (Tsekouras and Kanellou, 2018) a scheme below indicates specific areas of SS policy processes where LN can be deployed to facilitate improvements in design and implementation.

Figure 7. Areas of the potential implementation of Learning Networks in the Smart Specialization policy process



112. For successful implementation of LN it is essential that participants have the support of organisations in participation but even more in the implementation of the proposed solutions and modifications in innovation policy design and implementation. Hence, negotiation of the original brief for the topics of LN (sets) and for individuals involved is essential (McGill and Beaty, 1995). This includes an explicit commitment for a certain number of meetings before the activities and outcomes are reviewed. The topics of LN or ‘sets’ can be anything that participants’ involved have experienced in the process

of design and implementation of innovation policy or SS specifically in order to generate action points. Ideally, topics should not be trivial but should be ones on which participants are working, but the steps to progress are unclear. The aim is for each participant to leave the meeting with specific action points for their issue (project) that they have decided to do before the next meeting (McGill and Beaty, 1995). However, the ultimate goal is changing not only individuals but also organisational cultures and inter-organisational linkages towards problems solving in design and implementation of innovation policy.

4.3. Policy implications

113. As a way to overcome trade-off between accountability and experimentation, we offer learning networks as a governance solution. Benefits of Learning Networks are that they can represent structured critical reflection from different perspectives as they bring different stakeholders. By bringing different perspectives solutions to joint problems can be identified and implementation facilitated.

114. Shared experimentation can reduce perceived and actual costs of risks in trying new things. By sharing experiences, LN can provide support and open new lines of inquiry or exploration. Shared learning helps separate ‘the wood from the trees’, i.e. identifying causes and consequences, primary from derived problems (Tsekouras and Kanellou, 2018). We are aware that the SS method and other approaches have implicitly assumed some learning network dimension. However, we believe that the formalised approach and use of LN as governance and learning mechanism would significantly resolve contradictions between experimental innovation policy and the administrative requirements for conventional public policy.

5. Inter-regional value chains: linkages, leverages and learning

Place-based policies including conventional cluster policies alone are an insufficient response to the structural and technology upgrading challenges. GVCs are the potentially important driver of technology upgrading of the countries and regions. However, from the perspective of catching up countries and regions, we depict important trade-offs of GVC integration. In order to overcome these tradeoffs, policy imperative is to nurture complementarities between GVCs and local clusters. Support to LDRs needs to involve support to GVC linkages as a mechanism of learning and leverage to regions. We propose as a policy solution to set-up and support large-scale demonstrators at European level to accelerate market uptake - through interregional collaboration and funding. In essence, the issue is developing cooperation, and funding mechanisms for European GVC oriented clusters. This would be an opportunity to link up European regions of different technological and costs levels through GVC based industrial innovation policy.

115. Technology transfer and knowledge inflows are essential in all stages of development of innovation ecosystems. GVCs are essentially a new form of integration of economies and mode of knowledge transfer. A proliferation of GVC has led to a new mode of globalisation, which leads to the functional integration of countries and regions into international flows of goods, services, data and knowledge (Henderson et al., 2002). This poses new challenges to innovation policy, which has to combine a focus on endogenous technology capability building and learn how to use MNEs as ‘global reservoirs of knowledge’ and levers in that process. A solely place-based approach or reliance on endogenous sources of knowledge has become insufficient as a mode of growth since GVC integration processes have changed the nature of places today.

116. The extent of proliferation of value chains is specially developed within Europe which in absolute terms of intra-regional value chain trade is by far the largest of the three regional ‘factories’ (North America, Asia, EU) (Stollinger et al., 2018).

117. Current period can be characterised as GVC based integration which contains essential trade-offs which innovation and regional policy should acknowledge and try to address. From the perspective of catching up countries and regions there are several favourable trends that GVC have generated:

118. First, GVC integration reduces barriers to entry into international trade and knowledge networks by providing access to complementary resources that can accelerate development. This enables countries/regions to ‘insert’ themselves based on their comparative advantages. Second, GVC enables local firms’ access to distribution networks and new markets, and create opportunities for fast technological learning and skill acquisition. Third, product innovation within GVC enhances separation of R&D from production as it fragments manufacturing and innovation value chains. Fourth, GVC integration enables initial fast learning which is reflected in initial significant productivity improvements but which are usually confined to production capability. Fifth, through intra-MNC networks GVC integration enables involvement in leading-edge technologies, standards, and industry best practices.

119. However, GVC integration also poses several challenges to countries and regions. First, production systems have become dis-integrated and geographically dispersed which

has damaged coherence of industrial and social fabric of regions. Second, GVCs have substantially eroded the vertically and nationally integrated production systems. Third, a new mode of production has led to ‘modularity trap’ where local firms earn thin profits despite massive increases in labour productivity. Fourth, as the outcome, many traditional locally-integrated regions have declined or evolved into more narrowly stage-specific focus. Fifth, significant inequalities in profitability between the “lead firms”/ the “platform leaders” and contract manufacturers/ subcontractors lead to erosion or depletion of regional industrial ecosystems, which raises the challenge of how to re-build local industrial and social fabric. Sixth, the entire value chain may never be captured which leads to fragility and dependence of local economies on vagaries of global markets.

120. The outcome of these processes has been the emergence of several different economic clubs of regions in Europe, each with different development challenges and opportunities (Iammarino, Rodríguez-Pose and Storper, 2017). From an innovation perspective, we can differentiate between three types of regions in Europe. First are rich and diverse regions in countries like Germany, Austria, Sweden etc. For example, Germany has a vibrant industrial ecosystem with a diverse set of complementary capabilities suppliers, trade associations, industrial collective research consortia, industrial research centres (See Berger, 2014). Second, the emergence of depleted regional ecosystems in EU South where since 2008 almost 2mn jobs have been lost in manufacturing (Cirillo et al., 2014). Thirdly, parts of CEE are either narrowly integrated (through branch plants), or have depleted regional innovation ecosystems.

121. The CEE economies have shared a broadly similar growth model based on foreign capital inflows (Grela et al. 2017). Hagemeyer and Mućk (2018) show that the rate of convergence within the CEEC due to exports was twice as large as the one due to supply to the domestic market and that exports was mainly driven by the capital deepening (including imports of investment goods) as well as increased participation in GVC and to a smaller extent FDI. A success story of EU integration is Central Europe, which has become part of the newly established European and in particular German industrial system. Other CEECs and West European regions are mainly outside of this supply chain or have not further ‘globalized’ (Dulleck et al., 2004). For example, the global market share of Germany and Austria has declined in between 1995 and 2001, but their share in EU27 exports has significantly increased while the share of CEE-5 economies (Visegrad countries and Slovenia) has increased both on the global market and in EU27 exports.

122. Marin (2011) shows that Central Europe has become an integral part of the German/Austrian industrial system. Germany’s MNCs relocations to CEE have boosted productivity improvements in the region but also decreased unit labour costs in Germany. As a result of productivity gains from offshoring to CEE, Germany and Austria experienced only minor job losses. German offshoring to CEE boosted not only the productivity of its subsidiaries in CEE by almost threefold compared to local firms, but it also increased the productivity of the parent companies in Germany by more than 20% (Marin, 2011). Dulleck et al., (2004) also identify a process of quality upgrading of Central Europe (CE) but much less so in South East Europe and Baltics. This ‘foreign-led modernization’ model of CE is characterised by fast initial productivity convergence but within structurally weak innovation systems. As Dulleck et al., (2004) show there is improved export competitiveness and trade upgrading but very limited technology upgrading in CEE. Scepanovic, (2013) defines it as ‘hyper-integrationist’ variety of late development in which FDI advances growth in the host economy not so much by stimulating the growth of local capabilities but by substituting them. The sectoral evidence is broadly in line with these assessments and points to weak linkages to build up local industrial structures (for example

of electronics see Plank and Staritz, 2013). This resonates well with the argument that that knowledge spillovers are far from a panacea for the development of declining and lagging areas (Iammarino, Rodríguez-Pose, Storper, 2017). Explanatory factors for this are twofold. First, exports channelled through GVCs, which also act as conduits for new technologies may be a small part of the domestic economy and new capabilities and productive employment remain limited to globally integrated firms. Second, GVC integration requires complementary skills and capabilities like IT and other engineering infrastructure, developed education system and vocational training if the potential of trade and GVC participation is to be transformed into reality (Rodrik, 2018).

123. For regions that have been negatively affected by GVC integration like South EU the loss of companies that can make things has ended up in the loss of innovation capabilities. As Berger (2013) points out ‘when production moves out, the terrain for future learning shrinks’. In the EU context, we observe the loss or absence of ‘industrial commons’ and the presence of public infrastructure not geared to new needs of enterprises. The challenge is how to re-build inter-regional ‘industry commons. Individual projects are an insufficient basis for further technology upgrading without some durable joint infrastructure (‘industry commons’)

124. Place-based policies alone are an insufficient response to this structural issue including conventional cluster policies. Instead, policy imperative is to nurture complementarities between GVCs and local clusters. Examples in emerging sectors show largely disconnected and fragmented value chains in Europe due to fragmented efforts in technology deployment and a lack of connection between technology suppliers and potential lead-users. The policy imperative is to enhance co-location synergies as part of a growth strategy that maximises domestic value added.

5.1. Towards European GVC oriented industrial innovation policy

125. The idea of European GVC oriented industrial innovation policy is based on the assumption that the nature of the EU’s membership and its competitiveness issues has fundamentally changed, while the EU’s approach towards enhancing competitiveness has not (Ketels and Porter, 2018.). The challenge is to transform the EU’s approach towards upgrading microeconomic assets and capabilities by focusing on cross-regional collaboration. As European regions are so diverse, there is an increasing need to assist them to develop their specific technological capabilities. The EU is the right level to assist regions in collaborating in areas with cross-border spill-overs as well as in innovation and infrastructure.

126. A possible solution to EU regional imbalances is connecting and upscaling regional efforts in technology deployment. The example of EU Vanguard initiative as an example of successful partnership building and networking but which is yet to deliver investment projects on the ground is a case in point. If there were funding and institutional mechanisms for GVC based industrial innovation policy such bottom-up initiatives could be supported. Generally, policy solution would be to set-up and support large-scale demonstrators at a European level to accelerate market uptake - through interregional collaboration and funding. In essence, the issue is developing cooperation, and funding mechanisms for European GVC oriented clusters. This would be an opportunity to link up European regions of different technological and costs levels through GVC oriented industrial innovation policy.

127. Why would such policy be required? Macroeconomic solutions do not suffice. Neither an increase in domestic demand in the North nor the decrease of it in the West and South EU can reduce the existing imbalances entirely. Domestic production still contributes the lion's share to a country's final demand. On the other hand, the inward orientation of clusters without levers and linkages will fail. So, North - West and South EU countries would need financial means to support their industrial sectors to reposition themselves in the value chains. The challenge is how?

128. The aim for LDRs would be to assist supply chain integration coupled with the cluster support to reach standards of GVCs. The idea is to support companies that can play the role of integrators (EU Integrator) and co-develop with regions programs of firms' upgrading. These activities can be about the creation of new value chains but also support to upgrading within and access to the existing VCs. Establishing new and expanding access to the existing VCs could be done via twinning projects to develop networks of local suppliers (in cooperation with the lead firms). Stimulating upgrading within the existing VCs could be done via joint public-private programs to assist local firms climbing the VC ladder in the specific technology areas (in cooperation with the lead firms).

129. The aims are twofold. First, to assist larger companies to expand their supply chains with innovative SMEs across Europe. Second, to enhance the innovation capabilities of SMEs to prepare them to establish long-term supplier relationships with medium-sized or large enterprises (cf. integrators). The tool to promote these strategic partnerships would be co-operation in near market innovation projects in selected sectors/technology areas

130. The overall aims should be to:

- increase the share of indigenous suppliers in the supplier networks of medium-sized and large enterprises;
- motivate the "integrator" companies to increase the number of indigenous suppliers;
- improve co-operation between integrators and suppliers in the field of technological innovation;
- promote the growth of SMEs.

131. In the first phase of the projects, the medium-sized and large size companies should select SMEs that wish to become their suppliers, identify the aims of the project, and co-operate in product and process innovation tasks. The partners should develop a medium-term business plan, explaining how the suppliers and the integrator would exploit the project's results. The integrators should monitor the progress of innovation activities of the selected partners, who should co-operate with each other. The integrators must also provide a statement that upon the completion of the project; they shall audit the participating SMEs, and in case of a successful audit, issue a supplier certificate.

132. In a nutshell, we argue that support to LDRs in the conditions of GVC need to involve support to GVC linkages as a mechanism of learning and leverage to regions. The constraints to this are not only financial but also political. However, it is encouraging to see that the EC has taken on board this issue. Its latest Working Document foresees Financial and advisory support for investments in interregional innovation projects and

Financial and advisory support to the development of value chains in less developed regions¹⁸.

¹⁸ WORKING DOCUMENT OF THE COMMISSION SERVICES, Subject: Interregional innovation investments - Articles 3(5), 9(2), 16(1) and 61 Interreg proposal

6. Conclusions: the role of regions

133. This paper has examined several issues which are crucial to improving innovation policy in less developed and low institutional capacity countries/regions. In conclusions, we outline the ‘division of labour’ in innovation policy between national and regional authorities that follows from our analysis.

134. **First**, we examined the specific nature of innovation in LDC/LDR by pointing to a broader notion of innovation which goes well beyond R&D based innovation and expands to production capabilities; we then explored the relationship between the nature of innovation process and technology upgrading in LDC/LDRs and derived policy implications. Current policy focus in the EU LDC/LDRs can be described as strongly R&D driven innovation policy. There is much less or is missing policy focus on design, engineering, management and production capabilities (DEMP) altogether. A focus on upstream or R&D oriented innovation policy seems more appropriate at the national level given the centralised nature of R&D funding in LDCs and the focus on R&D excellence. On the other hand, differentiated nature of regional innovation systems calls for regions to focus on design, engineering, management and production capabilities (DEMP) which are often sector and thus also region specific.

135. **Secondly**, we explore the issue of weak institutional capacities for implementation of innovation policy in LDC/LDRs as well as incompatibility of innovation policy with their institutional implementation capacities. Whether policy accepts the existing implementation capabilities as given and adjust goals accordingly (‘best match’) or opt for the ‘best policy’ solutions will ultimately require assessment of the implementation capacities for innovation policy. Given the endogenous nature of the problem, the only solution is an external assessment of implementation capacities. In multi-regional countries, (Poland, Spain, Italy, Romania) assessment of regional implementation capacities can be organised at the national level. In small countries, assessment of implementation capacities should be foreign-led.

136. **Thirdly**, we reviewed how the current approaches address the challenge of experimentation in innovation policy. We recognise the incompatibility between experimental nature of innovation policy and requirements for accountability of conventional public policy. As a solution to reconcile these competing requirements, we propose introduction into innovation policy like SS of ‘action learning’ principles and of ‘learning networks’ (LN) as a governance mechanism. It is hoped that LN as the structured mechanism can be accommodated within the public policy and can reconcile requirements for experimentation and broad and participatory engagement of all stakeholder with requirements for accountability of conventional public policy. Again, the national level should provide broad orientation for conducting experimental innovation policy, operating as a facilitator and methodological supervisor while regions could focus on the actual practice of implementation of experimental innovation policy including establishing learning networks as governance mechanisms in this process.

137. **Fourthly**, we discussed the role of GVC and inter-regional value chains and challenges for innovation policy to integrate GVC perspective into its policy discourse. Coupling of own R&D effort with the inward and international technology transfer requires de facto merging R&D/innovation policy and FDI/GVC policy. For that purpose, we propose establishing European GVC oriented industrial innovation policy as a way to assist

technology upgrading of LDC/LDRs. This would require close collaboration between regions and EU and national authorities and expansion and modification of INTERREG type of programs and activities.

138. Last but not least, it is essential to recognise that the four issues addressed are tightly interconnected. For example, in new member states, regions have fragile mechanisms of institutionalised cooperation due to a short history of inter-regional cooperation. Hence, the main constraint to developing and implementing GVC oriented industrial innovation policy will be institutional implementation capacities (section 3). Instead of going for uniform solutions the key to success is to learn and experiment in applying solutions specific to different contexts (section 4). This, in turn, requires a good in-depth understanding of differences in drivers of growth in different regions (section 2).

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