Decentralisation of science and innovation policies in emerging countries: three key challenges that deserve further attention

José Guimón
Department of Development Economics,
Autonomous University of Madrid,
28048 Madrid, Spain
Email: jose.guimon@uam.es

Abstract: Previous research analysing the decentralisation of science and innovation policies has focused on the experiences of developed countries. The objective of this article is to explore the implications for emerging countries, which have decentralised innovation policies more recently than high-income countries, but face more acute shortages of critical mass and institutional capacities. Building on the notions of multilevel governance, policy mix and smart specialisation, the aim of this exploratory study is to discuss three key challenges associated with the decentralisation of innovation policies in emerging countries: 1) finding the right division of responsibilities between levels of government; 2) implementing national-regional coordination mechanisms; 3) using regional innovation policy to reduce cross-regional income gaps. These challenges are illustrated through several examples and short case studies from different emerging countries.

Keywords: decentralisation; innovation policy; multilevel governance; policy mix; smart specialisation; regional innovation systems.

Reference to this paper should be made as follows: Guimón, J. (2018) ‘Decentralisation of science and innovation policies in emerging countries: three key challenges that deserve further attention’, Int. J. Technological Learning, Innovation and Development, Vol. 10, No. 1, pp.69–87.

Biographical notes: José Guimón is an Associate Professor at the Department of Development Economics of the Autonomous University of Madrid.

1 Introduction

During the last decades regions and cities around the world have become more active in developing their own science and innovation policies. In the words of Florida (1995, p.528): “Despite continued predictions of ‘the end of geography’, regions are becoming more important nodes of economic and technological organisation in this new age of global, knowledge-intensive capitalism.” Building on the ‘national innovation systems’ framework (Freeman, 1987; Lundvall, 1992), the literature on ‘regional innovation systems’ underscores the importance of subnational governments as catalysts and coordinators of regional actors’ innovative activities and interactions (Cooke, 2001; Howells, 1999). The regional innovation systems approach is inspired by
ina-Marshallian theories of industrial districts and clusters, in which regional policy is deemed to be critical to foster ‘agglomeration effects’ and ‘interactive learning’ while bringing scientific knowledge closer to local industrial needs (Laranja et al., 2008; Rip, 2002). Meanwhile, the literature on innovation and development has emphasised the challenge of building innovative capabilities in latecomer firms (Bell and Figueiredo, 2012) and recent contributions have suggested that efforts to build capabilities should aim to solve problems in the local context with direct participation of local actors in priority setting and implementation (Cirera and Maloney, 2017).

Recent research on regional innovation systems has analysed the uneven geography of innovation (Asheim et al., 2016) and the challenges facing regions with less developed regional innovation systems (Trippol et al., 2015). But this literature concentrates on backward regions in developed countries, rather than on developing and emerging countries. Indeed, with a few exceptions (e.g., Abrahams and Pogue, 2012; Cassiolato and Martins, 2000; Chaminade and Vang, 2008; Plechero and Chaminade, 2016), the existing literature dealing with the decentralisation of innovation policy has focused on the experience of high-income countries. In view of this gap, the objective of this paper is to further explore the challenges associated with the decentralisation of innovation in the specific context of emerging countries. The theoretical contribution consists in discussing the notions of multilevel governance, policy mix and smart specialisation, with a particular focus on the challenges faced by emerging countries. The discussion is illustrated with several examples and short case studies taken from the recent experience of different emerging countries.

2 Conceptual framework

While a regional approach to science and innovation policies can be positive in many respects, aggregate empirical studies have failed to find a significant relationship between decentralisation and a nation’s innovative performance (Taylor, 2007). In addition, despite the growing trend toward decentralisation, it would be misleading to conclude that regional level policy is replacing policy at the national level. The two tiers should be conceived, rather, as interdependent and complementary. The notion of ‘multilevel governance’ refers to sharing responsibility over policy design and implementation between different administrative and territorial levels (Benz and Eberlein, 1999; Koschatzky and Kroll, 2009). A major challenge for policy-makers is to streamline the interaction of different levels of government in order to improve the efficiency of innovation policy.

Another dimension to consider when analysing the decentralisation of innovation policy is the ‘policy mix’ dynamics, which places the focus on the interactions and interdependencies between different policy instruments that affect the overall efficiency of policy intervention to achieve its expected outcomes (Flanagan et al., 2011; Howlett and Rayner, 2003; Martin, 2016). Bringing together the policy mix and multilevel governance dimensions, previous research has convincingly argued that some aspects of the innovation process can more effectively be addressed by policy designed at the
Decentralisation of science and innovation policies in emerging countries

71

regional level than others (Karo, 2012; Koschatzky and Kroll, 2007). These different levels of complexity in innovation policy – multilevel governance and policy mix dynamics – may give rise to 'coordination failures', such as duplication and overlap, policy inconsistencies and incoherence, bureaucratic and political conflict, and lack of consensus when setting priorities (Magro et al., 2014).

The scale and scope of decentralisation of science and innovation policies differ markedly from country to country (and even from region to region within a country) depending on their particular technological profiles, institutional frameworks, and historical trajectories (OECD, 2011a). Note also that budget allocation (fiscal decentralisation) does not necessarily coincide with decision-making power (political decentralisation), because even when budgets remain centralised, regions can increase their involvement in designing and implementing innovation policies. The role of regions can be a passive one, limited to the implementation of nationally defined policy initiatives, or an active one, with regions acting as participatory partners in national policy processes and co-financing policy initiatives, or even serving as independent policymakers that develop their own strategies and devote their own resources to projects that they select. In support of the latter, the increasingly popular notion of 'smart specialisation' advocates for a strong involvement of regional governments in developing their own innovation strategies. Although smart specialisation is a somehow ambiguous concept, it is generally based on two premises:

1. concentrating limited resources in a set of priority areas clearly aligned with regional strengths and competitive advantages

2. setting the conditions to enable an ‘entrepreneurial discovery’ process to modulate specialisation pathways (Foray, 2014; McCann and Ortega-Argiles, 2015).

While regional innovation systems and multilevel governance are well-established theoretical constructs with universal applicability, smart specialisation is a more emerging policy concept originating in the European context that is still missing wide acceptance and lacks a solid theoretical anchoring.

The vast literature on regional innovation systems, multilevel governance and smart specialisation has underscored the challenge of finding the right division of responsibilities between levels of government (Hassink, 2001; Ritzén and Soete, 2011; OECD, 2011a); the challenge of implementing national-regional coordination mechanisms (Cooke et al., 1997; Magro et al., 2014; OECD, 2010); and the challenge of using regional innovation policy to reduce cross-regional income gaps and foster a more balanced territorial development (Crespy et al., 2007; Mercado, 2012; Oughton et al., 2002). However, as mentioned in the introduction, this strand of the literature has mostly focused on the experience of developed countries, partly because developing and emerging countries have only recently decentralised their innovation policies. While many of the challenges of decentralisation of innovation policy do not depend on a country’s level of development, some authors have argued that such challenges become more acute in developing and emerging countries given that their regional innovation systems often face higher levels of diversity, income inequality, and institutional instability than in developed countries (Cassiolato and Martins, 2000).
3 Research questions and method

Against the background discussed in Section 2, the objective of this paper is to explore the challenges associated with the decentralisation of science and innovation policies in emerging countries. This general objective can be split into the following three research questions which guide the structure of the rest of this paper:

- What is the appropriate division of competencies in science and innovation policy between the national and subnational levels in emerging countries?
- What kind of national-regional coordination mechanisms can be used to improve the multilevel governance of science and innovation policy in emerging countries?
- How can the decentralisation of science and innovation policy contribute to closing cross-regional income gaps and addressing broader societal challenges in emerging countries?

It would be unrealistic to search for deterministic answers to these complex research questions. Indeed, the existing literature provides strong arguments against a ‘one-size-fits-all’ approach to regional innovation policy, given the large variety of technological and institutional profiles across regions (e.g., Holbrook and Salazar, 2004; Todtling and Tripl, 2005). Thus, rather than adopting a positivist approach, this paper addresses those research questions from an exploratory approach aimed at providing new insights for emerging countries, but without attempting to corroborate any predefined hypothesis. Findings from the existing literature are used to elaborate further on the specific challenges for emerging countries, which combined with insights from the experience of different emerging countries provides the basis to move from exploration to (cautious) prescription. In addition to brief references to a myriad of examples, three case studies are developed further with the objective of offering empirical evidence that contributes to addressing each of the aforementioned research questions. Instead of opting for a cross-country comparative analysis, the case studies were selectively linked to each of the research questions.

In particular, the analysis relies on case studies of the recent challenges faced by Colombia, Poland and Russia as they adopted an increasingly decentralised approach to innovation policy. First, the case of Poland is useful to better understand the challenge of finding the right division of competencies between national and regional governments within the context of the development of regional smart specialisation strategies. Second, the case of Colombia is used as an example of possible national-regional policy coordination mechanisms and of the associated challenges. Finally, the case of Russia serves to illustrate the ‘equity/efficiency’ challenge that arises when attempting to use regional innovation policy to close income gaps and address societal challenges. Although these three countries represent very different contexts as it relates to innovation policy and governance, all share an increasing interest in innovation as a lever for economic growth and all three have adopted a more decentralised approach to innovation policy design and implementation during the last decade. They are also relatively big countries where the potential for further decentralising innovation policies is clear. The cases were developed building on secondary sources (mainly policy oriented reports) and on the author’s own experience while working as a consultant for the World Bank (‘Innovation Policy Platform Project’, 2011–2013) and the OECD (‘Review of the local innovation system of Medellin, Colombia’, 2014–2015). Following the elaboration of a
first draft, interviews with at least one key informant for each of the case studies were held to validate the results.

4 Decentralisation of innovation policy in emerging countries: three key challenges

4.1 What is the appropriate division of competencies between levels of government?

The articulation of a policy mix to promote innovation is complex not only with regard to policy domains and instruments but also in terms of levels of governance (Flanagan et al., 2011; Magro and Wilson, 2013). Sometimes the division of power between national and regional governments is clear; in other instances, those powers are shared. For example, in most countries, the national government wields exclusive power over the intellectual property rights regime, while both the national and regional levels share responsibility over developing scientific infrastructure. The existing literature suggests that subnational governments normally focus on the more applied side of the innovation spectrum (e.g., technology commercialisation, networking and start-up support), without interfering with national policies aimed at building critical mass in basic research (Koschatzky and Kroll, 2007; Perry and May, 2007; Ritzen and Soete, 2011). This general division of competencies is also observed in emerging countries.

For example, in China, the division of policy responsibilities between the subnational and national levels is not clearly defined by law. In practice, the central government controls basic research and areas of national interest (e.g., national defence, health and security) while subnational governments oversee technological development and diffusion of existing technologies (OECD, 2009b). Notably, over the last decades several Chinese regions and cities have launched new science parks, incubators, and technology extension services. The national government has supported this process by selecting the most promising science parks around the country and providing them with additional funding and support. However, in addition to those science parks designated at national level, the proliferation of provincial and local initiatives has given rise to a ‘race-to-the-bottom’ characterised by increasing competition among regions based on tax incentives and subsidies. Li (2003) argues that China’s unclear division of labour among the different levels of government has sometimes resulted in inconsistencies between regulations adopted at different levels as well as in a less coherent implementation.

Similarly, although regions in Russia have very limited policy competences and resources available for R&D, their relevance in innovation related support has increased substantially, with a focus on technology parks, incubators and venture funds (Spiesberger, 2013). Meanwhile, in Brazil, the decentralisation of innovation policy began in the mid-1980s with the establishment by the National Research Council of 12 science parks in cooperation with state and municipal governments and universities. Later on, with the development of networks of business incubators, innovation policy shifted further from a centralised approach to more bottom-up, regional and local initiatives in cooperation with universities (Etzkowitz et al., 2005; Torres-Freire et al., 2013).

Building on these examples from emerging countries and on a broader review of the existing literature, Table 1 provides a tentative framework to assess a country’s multilevel division of innovation policy competences. Note, however, that in light of the
large differences across countries, this classification does not intend to be prescriptive or indicative of the most efficient approach. It is also important to stress that a specific type of policy instrument, such as matching grants for innovation projects, can be used simultaneously at both levels, but should ideally have different targets to avoid overlaps. For example, the national level could target large-scale projects that involve the production of new knowledge, and the regional government could target smaller programs that focus on technology diffusion. In any case, drawing clear lines of separation between national and regional innovation policy competencies would be counterproductive, since certain policy instruments are best executed if they are shared among different levels of government. This marks a more cooperative approach that can benefit from complementary strengths around a single public policy issue. In practice, a survey of OECD countries revealed the lack of a clear division of powers between national and regional innovation policies and a large overlap in the kinds of instruments used (OECD, 2011a). Overlapping national-regional policy instruments creates synergies if both levels complement one another. This complementariness can arise in the way the instruments are structured in terms of their target actors or across the range of service needs. Overlapping instruments leads to negative results, however, if they create redundancies by failing to distinguish among target groups or topics. The proliferation of public support programs at different levels can lead to higher transaction costs, more bureaucracy, and confusion among target firms; a problem that might be especially acute in developing and emerging countries where firms lack the capabilities and resources to navigate complex administrative systems in the search for innovation support.

### Table 1 National vs. regional responsibilities in innovation policy

<table>
<thead>
<tr>
<th></th>
<th>More often national</th>
<th>More often regional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of innovation</td>
<td>Knowledge generation</td>
<td>Knowledge diffusion and exploitation</td>
</tr>
<tr>
<td>Target groups</td>
<td>Public research labs, universities,</td>
<td>Small firms, start-ups, spinoffs</td>
</tr>
<tr>
<td></td>
<td>large firms</td>
<td></td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Universities, public R&amp;D labs</td>
<td>Incubators, science parks, special</td>
</tr>
<tr>
<td></td>
<td></td>
<td>economic zones</td>
</tr>
<tr>
<td>Regulations</td>
<td>Intellectual property rights</td>
<td>Building permits, infrastructure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>development</td>
</tr>
<tr>
<td>Financial instruments</td>
<td>Tax deductions, large grants to new</td>
<td>Smaller grants to fund business</td>
</tr>
<tr>
<td></td>
<td>R&amp;D projects</td>
<td>innovation</td>
</tr>
<tr>
<td>Soft instruments</td>
<td>Standardisation, codes of conduct</td>
<td>Networking and brokerage services</td>
</tr>
<tr>
<td>Human capital</td>
<td>Higher level education, postgraduate</td>
<td>Technical training, lifelong learning,</td>
</tr>
<tr>
<td></td>
<td>scholarships</td>
<td>internships</td>
</tr>
<tr>
<td>Linkages</td>
<td>International linkages, scientific</td>
<td>Public-private partnerships, cluster</td>
</tr>
<tr>
<td></td>
<td>collaboration</td>
<td>development</td>
</tr>
</tbody>
</table>

4.1.1 Aligning decentralisation with administrative capacities and financial resources

As discussed above, the appropriate level of intervention for a given innovation policy instrument depends on several different factors, including the type of targeted actors, the efficiency of the innovation delivery mechanisms and the strategic scale of the instrument. The appropriate demarcation of innovation policy also depends on the available financial resources at different levels. Along these lines, Koschatzky and Kroll (2007) posit that science policy aimed at creating new centres of excellence with high budgetary demands is a more appropriate policy domain for the national level, while subnational governments with limited resources should focus on innovation policy aimed at improving networking in existing areas of technological specialisation. As discussed by Cooke et al. (1997), regional innovation strategies need to be grounded on a realistic assessment of financial resources available at regional level, ensuring a stable budgetary framework for implementation that relies on different sources of finance including decentralised funding (i.e., administrative decentralisation of allocations in centrally developed programs), autonomous funding (i.e., allocation of a certain budget to the region that it can spend at its own discretion), and the right to levy their own regional taxes.

Moreover, different regions have different capabilities and administrative capacities to implement innovation policies (Karo, 2012; OECD, 2011a; Walendoski et al., 2011). Even if regions have sufficient budgets and competences, some can still lack public employees with the necessary skills and experience. Conversely, central governments tend to operate closer to the knowledge frontier due to their size, international networks, and capacity to attract qualified workers. However, returns to scale could also decrease and, especially in large countries, the centre could get overwhelmed. The key, then, is to match allocation of authority with administrative capacities. In particular, regions in emerging countries often face a lack of capacity to implement innovation policies given their ‘organisational thinness’, that is, the lack of innovative firms, efficient public agencies, and adequate knowledge infrastructure to support collective learning (Asheim and Isaksen, 1997).

Under these circumstances, it could be argued that national governments in developing and emerging countries need to make greater efforts to accompany the devolution of competences with measures to build regional capacity. Firstly, central governments can offer regional government’s information, technical assistance, and training and advice. Secondly, the national government can establish mechanisms identifying best practices at the regional level and disseminate them across other regions. Thirdly, they can foster collaboration among regions, especially where the regions face problems of critical mass or in the case of counter-productive inter-regional competition. In this context, the central government can encourage collaboration by providing incentives to joint regional initiatives. For example, in Mexico, the National Science and Technology Council launched the FORDECYT program to provide funds to groups of states that face common thematic challenges or a functional geographic need (OECD, 2009a). In Poland, during the country’s accession to the European Union, the government formed a macro-region called Eastern Poland, bringing together the five poorest regions of the country as an instrument to secure additional European funding. However, despite the common challenges facing these regions, they have failed to collaborate efficiently
and could not agree on a common innovation strategy, so the government decided to abandon the program in 2014 (Piatkowski et al., 2014).

4.1.2 Coupling regional innovation strategies with the broader national strategy

To achieve their goals, regional innovation strategies comprise a set of specific policy instruments (i.e., a ‘regional innovation policy mix’). The choice of a policy mix is a complex process that involves selecting several complementary policy instruments to address the binding constraints identified in the regional innovation system. The objective is to unveil and maximise synergies or positive interactions between policy instruments, while avoiding duplication and negative interactions. However, in practice policy instruments are often selected based on a continuation of previous schemes or based on pressure from specific lobbies or interest groups rather than on visionary considerations of policy mix interactions and critical assessments of the most acute problems that need action (Borras and Edquist, 2013). Also, as emphasised by Howlett and Rayner (2007), the successful selection and implementation of policy mixes is constrained by previous policy choices which have become institutionalised.

Moreover, as regions try to determine pathways for smart specialisation, it is critical that they connect with the national vision and that they consider the specialisation choices of other regions in the country, so as to build synergies and avoid duplications (European Commission, 2012; Foray, 2014). This implies that the selection of the regional innovation policy mix should be grounded on an assessment of what is being done at the national level, what else is needed, how to tailor national programs to the regional context, and opportunities to complement national programs with regional initiatives. Indeed, regional innovation policy does not occur in a vacuum, but rather within the context of a wider multilevel governance system. Yet it is evident that many regions, especially the leading regions within a country, tend to design policies aimed at taking over other regions in the development ladder and at improving their positioning in global innovation networks. Therefore, there is an inherent conflict in national-regional innovation strategies driven by inter-regional competition which makes top-down coordination a challenging task.

Still, central governments should attempt to improve the coherence of regional innovation strategies by seeking economies of scale and avoiding fragmentation. In the absence of an appropriate central oversight, decentralisation can result in inefficiencies and coordination failures. In this sense, Ritzen and Soete (2011) argue that if all regions strive to achieve research excellence, the majority will miss the mark, often leading to the creation and subsequent decline of overambitious research infrastructure in locations with weak endowments (i.e., the ‘cathedrals in the desert’ syndrome). In addition, the central government should be attentive to possible gaps in combined regional strategies that could result in neglected policy areas at any level of government. In particular, investments with benefits that expand beyond the regional constituencies will tend to be underfunded without central government intervention. The so-called ‘subsidiarity principle’ refers to the intervening role of the next higher level of government in the case that the lower level in the federal system does not intervene to address a societal need (Bermann, 1994). For example, if no region sets out to specialise in medical technology, the central government may consider necessary the creation of at least one public research centre in this field and launch a national competition to fund it.
4.1.3 Case study 1: smart specialisation and national-regional coordination in Poland

Poland is a unitary state divided into 16 regions (‘voivodships’) with substantial regional autonomy. To receive funds for innovation during the current 2014–2020 European Union (EU) financial perspective, the country had to design new Research and Innovation Strategies for Smart Specialisation at both the regional and national levels in compliance with the new framework set forth by the European Commission. A team from the World Bank assisted the Polish Government in this process, and its report provided a useful illustration of the challenges associated with national-regional coordination of innovation policy (Piatkowski et al., 2014). In general, there was considerable overlap and lack of coordination across regions as well as between the regional and the national strategies. Part of the problem can be ascribed to the fact that many of the regional innovation strategies were developed before the national innovation strategy was finalised. As argued in the World Bank report, ‘system consistency requires some general structure and sequencing, allowing lower documents enough time and space to adjust to hierarchically senior documents’ [Piatkowski et al., (2014), p.35]. In addition, it became apparent that national level leadership should be further strengthened by adopting a more active coordinating role, providing enhanced support to regional governments in the process, and mapping out potential specialisations throughout Poland as a tool to avoid duplication and exploit synergies.

In many cases, regions were unable to design strategies that differentiated themselves from other regions. Their strategies tended to be very generic and lacked a clear link to the region’s specific characteristics and endogenous potential. According to Klincewicz (2014, p.22), “the regions selected similar specialisations, related to the most popular, broadly defined technology areas, without major intra-regional differentiation.” In some instances the reason behind this was an attitude of ‘mechanical fulfilment’ of smart specialisation strategies in compliance with the requirement for receiving EU funds, rather than a true exercise in constructing regional advantage for socio-economic transformation. Moreover, innovation strategies have been aligned with capacities in implementing agencies rather than with firm needs, leading to an excessive focus on the agenda of public research institutions rather than on market demands (Kapil et al., 2014).

To improve national-regional coordination, Poland relied on territorial contracts signed between the central government and the individual regions in 2014. The aim was to define the region’s tasks and objectives as well as the mechanisms for disbursement of EU funds allocated to the region for 2014–2020. Importantly, these contracts strive to delineate a clear line of demarcation between the responsibilities of the central and regional governments, and thus set the framework for regional intervention.

Although ideally regional innovation strategies should be coherent with the wider national context and seek opportunities for joint programming with the central government and neighbouring regions with similar objectives, the recent experience of Poland illustrates that this is often hard to achieve in practice. The necessary search for coherence requires a complex iterative process whereby regional governments link their strategies with those at the national level, while the central government also designs its national strategy after jointly considering the strategies of the regions.
4.2 What kind of national-regional coordination mechanisms are available?

The complexity of multilevel governance may give rise to coordination failures, which need to be addressed through different types of ‘coordination mechanisms’ at all stages of the policy cycle, from strategic formulation to policy design, implementation, monitoring and evaluation. Coordination mechanisms are defined by Magro et al. (2014) as the instruments and institutions created in order to address the coordination failures that are derived from a complex policy setting where multiple instruments from different domains, levels, and actors coexist. In this section we further discuss some of the main coordination mechanisms in use and provide country examples to illustrate the policy options available to emerging countries.

4.2.1 Consultation bodies, territorial representatives and agencies

The decentralisation of innovation policy is often accompanied by the creation of new national-regional institutions for dialogue and agenda-setting that are adapted to specific circumstances within each country and that build on existing institutional frameworks. These may take the form of policy councils made up of high-level representatives from the national and regional governments or territorial representatives from the relevant ministries and national agencies. For example, in the Czech Republic, the national innovation agency CzechInvest has established regional offices that support innovation policy implementation. These agencies have played an important role over the past few years in supporting the development of science parks and cluster initiatives across the country’s regions. Similarly, in Chile, the central government’s innovation agency, CORFO, has established regional offices across the country and is currently embraced in a plan to provide them with more autonomy, building on the development of regional smart specialisation strategies. In Mexico, formal national-regional consultation occurs via the National Conference of Science and Technology. Moreover, the National Council for Science and Technology (CONACYT) has established regional delegations that liaise with subnational governments and oversee the implementation of federal programs (OECD, 2009a).

Regions and localities in emerging countries are also increasingly creating their own autonomous innovation agencies to implement regional innovation strategies that act as counterparts to the national agencies and ministries responsible for innovation policy. Some regions have established new, autonomous agencies, while others rely on the evolution of pre-existing structures, like regional development agencies. An example of the former is Ruta N, a local agency established in 2009 in Colombia’s second largest city, Medellin, in order to execute the city’s new Strategic Plan for Science, Technology and Innovation 2011–2021, which seeks to boost entrepreneurship, business innovation, and cluster development (OECD, 2015a). An example of the latter is the Agency for Economic Development of the Greater ABC Region in Brazil, which was created in 1998 with a broader regional development mandate, but has adopted a stronger focus on promoting innovation in recent years (Zhang, 2010). In particular, the agency has established two business incubators and several programs to promote innovation and to upgrade the regions’ automobile parts, computer hardware, and plastics clusters. The agency’s board of directors is comprised of representatives of the regional governments, the seven regional municipalities, business associations and firms, higher education institutions, and trade unions. This helps improve not only vertical coordination, but also
public-private partnerships and horizontal coordination among the different stakeholders of the regional innovation system.

4.2.2 National-regional contracts, project co-financing and joint funds

Many countries rely on contracts or bilateral agreements between central and regional governments with regard to their mutual commitments, the assignment of decision-making powers, the distribution of financial contributions, and mechanisms to monitor and enforce contracts. Contracts are used for co-financing and joint programming innovation policy instruments. If properly designed, they can commit different levels of government beyond political mandates, which contributes to the continuity and stability of innovation policy strategies regardless of the political cycle. The OECD has highlighted the ‘relational’ nature of contracts, which means that they can play an important trust-building, information-sharing, and capacity-building role that facilitates multilevel governance (OECD, 2010).

Much of the push for decentralisation in emerging countries in recent decades has been primarily on the expenditure side, while local revenue capacity remains weak (Gadenne and Singhal, 2013). This is a source of tension between the national and regional levels of government, which requires new systems of co-funding. Project co-financing is a widely used instrument to develop strategic investment projects and infrastructure whose benefits span beyond the regional constituencies. For example, a public research centre in a region can collaborate with firms from other regions in the country. Similarly, a university from one region can accept students from another region and their graduates can end up working in different regions. As referenced earlier, such initiatives tend to be underfunded without central government investment. Under these circumstances, project co-financing addresses fiscal imbalances and encourages convergence of objectives. The decision of the central government to co-finance projects is often the result of a national competitive solicitation open to all regions. In China, for example, the National Science and Technology Infrastructure Program provide a roadmap for investing in research infrastructure by fostering inter-regional integration and sharing infrastructure. During the 11th five-year-plan period (2006–2010), the government invested around $US275 million out of which 20% came from subnational governments (Li, 2013).

In some instances, co-funding mechanisms are associated with individual, large-scale projects, such as scientific infrastructure; whereas, in other cases, they have a more open and longer-term scope. There are many possible design options, but the general idea is to share responsibility over the selection and funding of science and innovation programs in order to create synergies and strengthen policy coherence. In recent years, some emerging countries have created joint national-regional trusts to fund innovation projects for regional actors on a competitive basis. For example, Mexico’s ‘mixed funds’ were jointly established in 2002 by the central and regional governments as a trust fund for science and innovation projects. As of 2013, more than 35 mixed funds had been established across the Mexican States and also in some municipalities. This system was meant to foster innovation capacity at regional level and to better articulate federal and regional support for innovation. Each fund has its own technical committee and evaluation commission to issue calls for proposals and select projects for funding within their respective regions. The total budget for the 2001–2012 periods was around $US580 million, of which 45% came from the regional governments and 55% from the central
government. However, according to a review of this program by the OECD, the system suffered from a lack of well-articulated demand from the states, especially from the less developed ones (OECD, 2009a). Other governments have created new funds to finance the implementation of regional innovation strategies in a broader sense, as in the case of Colombia’s royalties fund discussed below.

4.2.3 Informal coordination mechanisms

In addition to those kinds of formal institutional processes, most countries also rely on national-regional working groups and ad hoc meetings as informal mechanisms to foster dialogue and coordination. For example, a frequent practice is to invite regional representatives to national innovation strategy development consultation processes, which provide a forum for building consensus and strategic alignment. Informal coordination is also shaped by more spontaneous personal interactions, including ongoing personal meetings and communication through phone or email (Hessels, 2013). Some qualitative studies have found evidence from interviews with regional policymakers indicating that informal coordination mechanisms are perceived as more effective than the more formal ones (Magro et al., 2014). They are, however, more difficult to address, as there may be cultural barriers that lead to lack of trust and misunderstandings. It could be hypothesised that these kinds of informal mechanisms can be of greater importance in developing and emerging countries with weaker institutions and more fragmented societies.

4.2.4 Case study 2: Colombia’s royalties fund for Science Technology and Innovation

Although some of Colombia’s 32 regions (‘departamentos’) were already engaged in the design and implementation innovation policy, the scale and scope of regional involvement in this area has increased substantially since 2012, following the creation of a new fund for Science Technology and Innovation (STI) (OECD, 2015a). New 2011 legislation governing state royalty administration from national mineral resource exploitation (including oil) contains a provision to allocate 10% of the royalties to the new fund for STI. Currently, this represents around $US500 million annually. The royalties fund for STI is distributed to regions based on a formula that considers population, unemployment and poverty indicators, so that poorer regions get more funding per head than richer ones. The fund is administered by Colciencias, the research funding agency of the central government, but the regional governments select the projects they would like to fund in their regions.

A committee established by Colciencias approves selected projects after ensuring that they conform to the rules, expected quality, and feasibility. Ultimately, regional governments need to develop their own innovation strategies to better select the most likely projects to be awarded monies from the royalties’ fund. This new system has strengthened regional autonomy in innovation policy and has promoted a more systematic design of regional innovation strategies.

However, early experience also points to a number of challenges (Cuervo and Lopez, 2013; OECD, 2014). The first problem is that even though less advanced regions receive a larger part of the funds, they lack the absorptive capacity required to design and develop the right kind of projects to promote innovation. In order to address this issue,
Colciencias has established an Office of Regionalization that has supported so far the drafting of 27 regional development plans for STI, which serve as a reference for project formulation. A more profound challenge of this new fund is its charge to balance two conflicting strategies: the first is oriented around scientific excellence and performance, and the second aims to reduce regional disparities. Another problem is associated with the lack of thematic coordination across regions and between regions and the state in which each region pursues its own strategies in a rather isolated manner.

To address these coordination failures, Colciencias is currently trying to stimulate collaboration among regions as a way to better align regional strategies and to help underdeveloped regions to catch-up by learning from more advanced regions. However, up until now, the results have been disappointing because the central government cannot practically impose interregional collaboration, and regions have a tendency to allocate all of the available funds only within their own boundaries (i.e., to local firms and universities, without involving partners from other regions).

This experience from Colombia illustrates well how the establishment of joint funds can provide a useful platform for national-regional coordination of innovation policies. However, it also helps underscore the risks of fragmentation, wasteful duplication, and other inefficiencies that may appear in the context of multilevel governance of innovation policy in emerging countries.

4.3 How can decentralisation contribute to close cross-regional income gaps and address societal challenges?

National governments often struggle to create innovation policy that promotes balanced technological development across regions. The positive link between technological innovation and economic growth implies that in order to close income gaps across regions, policies should seek to close innovation gaps (Lee and Rodriguez-Pose, 2013). The problem is that most national innovative efforts tend to be heavily concentrated in a few core regions. And this concentration is nearly insurmountable due to the cumulative nature of technological capabilities, economies of scale, agglomeration effects, and indivisibilities. This self-reinforcing process often aggravates regional divergence, which comes with important economic and political implications, particularly for developing and emerging countries (OECD, 2015b).

Moreover, innovation policy in emerging countries needs to align more closely with the broader development agenda for fulfilling the basic needs of citizens, given that a large share of the population faces acute shortages of food, water or electricity, as well as inadequate education and healthcare. Involving regional governments in priority setting and policy implementation is an important condition for ‘inclusive innovation’ (Paunov, 2013). If properly managed, decentralisation of innovation policy can contribute to this agenda, fostering bottom-up, participatory approaches that promote social innovation (Mercado, 2012).

In any case, central governments charged with allocating innovation funding must balance promoting scientific excellence through regional competition and concentrating resources in the core regions, on the one hand, and encouraging convergence and equality among regions by nurturing lagging regions, on the other (Crespy et al., 2007). This challenge can be characterised as an ‘equity/efficiency dilemma’, given that concentrating public resources in the most advanced regions would help to build critical
mass, and this might lead to larger aggregate innovation outcomes than the alternative strategy of concentrating public support in the lagging regions. A second challenge is what Oughton et al. (2002) call the ‘regional innovation paradox’, which refers to the contradiction between the comparatively greater need to spend resources on innovation in lagging regions and their relatively lower capacity to absorb public funds as compared to more advanced regions. As discussed above, this was recently observed in the Mexican mixed funds and in the Colombian royalties fund cases. Thirdly, an additional challenge lies in the potential mobility of innovative actors from the periphery to the core in order to benefit from the agglomeration effects that the more advanced regions can offer (McCann and Ortega-Argiles, 2015). For example, investments in advanced training and support for entrepreneurs by lagging regions could end up moving away toward core regions.

Addressing these challenges requires policies that increase the capacity of regions to absorb funds for innovation-related activities, building on a closer interaction between government, industry and universities (Oughton et al., 2002). Stronger collaboration between regions can also be a powerful tool to build absorptive capacity in lagging regions and reorient the agenda of leading regions toward the larger development challenges facing both the country as a whole and the most lagging regions (e.g., health, education, rural development, etc.). This is a particularly important agenda in developing and emerging countries. However, barriers to cross-regional collaboration need to be carefully addressed, such as political pressure facing regional policy makers to ensure that investment benefits are captured in the region, as in the case of Colombia’s new royalties fund discussed above.

4.3.1 Case study 3: balancing excellence with regional convergence in Russia

Russia is a large and highly heterogeneous country with a wide variety of income levels, industrial specialisations, and innovation capacities across its 83 regions (or ‘federal subjects’). Innovation activity is highly concentrated around Moscow and St. Petersburg (Crescenzi and Jaax, 2017; Mikhaylova and Mikhaylov, 2016). Traditionally, regions were not involved in R&D and innovation policy. But following the deep restructuring of Russia’s national innovation system in the post-Soviet period (Radosevic, 2003), in recent years some regions have started to develop their own innovation strategies, often with a focus on promoting business innovation through regional venture funds, technology parks and incubators. The sub-regional level of governance is also an important element, given the tradition of ‘science cities’ inherited from the Soviet era, which have been streamlined in recent decades and enhanced with the establishment of new projects such as the ambitious Skolkovo science city launched in 2010 in the vicinity of Moscow (OECD, 2011b; Rowe, 2014).

At the strategic level, federal government efforts to support decentralisation and further empower regional governments appear explicitly in the 2011 ‘Strategy for Innovation Development’ and in the innovation policy chapter of its 2020 strategy (Gokhberg and Roud, 2012). At the operational level, a relevant illustration of the move towards a more decentralised approach is the cluster initiative launched in 2012, through which the federal government provides matching funds to the most promising and technologically advanced regional clusters in order to resolve infrastructure bottlenecks. In parallel, the R&D funding allocation system continues to shift from block funding based on Soviet-era central planning decisions towards a competitive, project-based R&D
Decentralisation of science and innovation policies in emerging countries

funding system (Spiesberger, 2013). However, concerns have been expressed with regard to the weak implementation of policies, as illustrated by under populated science and technology parks, unclear regulations, and lack of transparency in funding schemes (Klochikhin, 2012).

These policy developments are leading to a more competitive allocation of science and innovation funds across regions, which have resulted in a tendency toward the most advanced regions absorbing a larger share of federal funding (Klochikhin, 2012). While the government is aware of the advantages of concentrating resources in ‘regional engines’ of national innovation performance for the sake of overall efficiency, it is also concerned with mounting regional inequalities (OECD, 2011b). Indeed, the federal government has reaffirmed its primary objective of promoting balanced regional development as stated in its current ‘Strategy of Diminishing Disparities between Regions until 2015.’ In the same vein, the Council for Research for Productive Forces has developed four new programs targeting innovation in less developed regions.

However, it has been argued that innovation policies designed at federal level to support the accumulation of innovative capabilities in lagging regions are flawed, since they are often oriented towards technologies that do not match the regions’ capabilities and industrial needs, focussing instead on national priorities (OECD, 2011b). This is aggravated by ‘high-tech myopia’ in national innovation strategies that results in little attention payed to other forms of innovation outside research labs and high tech industries, which are critical for accumulating innovative capabilities in lagging firms. For these reasons, OECD (2011b) recommends the federal government to give more autonomy to regions in their choice of innovation strategies and projects. Moreover, according to Crescenzi and Jaax (2017) new policy efforts are needed to promote the diffusion of knowledge generated in leading regions towards peripheral regions, for example through the establishment of specialised agencies designed to disseminate research findings.

These kinds of multi-level governance challenges faced by Russia are a good illustration of the ‘equity/efficiency dilemma’ described earlier. Indeed, it becomes a daunting task for policy-makers to find the right balance between concentrating public resources in the most advanced regions to build critical mass and reward excellence, on the one hand, and supporting backward regions to promote a more balanced territorial development, on the other.

5 Conclusions and policy implications

Regional economic development across many developing countries can be characterised by an increasing polarisation, with nodal centres accumulating most of the innovative capabilities, to the detriment of lagging regions. Moving towards a decentralised, bottom-up approach to innovation policy can contribute to fostering a more balanced accumulation of innovative technological capabilities at the level of firms and industries. But, while innovation policy is increasingly conceived as the shared responsibility of national and subnational governments, emerging countries are struggling with this multilevel governance even more so than developed countries, since they are often confronted with higher levels of regional diversity, income inequality, and institutional shortcomings.
Building on the notions of multilevel governance, policy mix dynamics, and smart specialisation, this article has contributed to the existing literature by exploring the main challenges associated with the decentralisation of innovation policies in the specific case of emerging countries, and suggesting a set of relevant policy implications for developing countries.

First, it has been argued that those challenges call for a sequential and cautious approach to decentralising innovation policy. As illustrated in this paper through several recent examples from emerging countries, national governments still need to take a strong role in innovation policy by defining a national strategy, seeking coherence, searching for economies of scale, and building the institutional framework that allows for an efficient integration of the innovation policy mix in multilevel governance structures. Despite the trend toward decentralisation of innovation policies, an excessive enthusiasm toward the devolution of competences to regional governments would be especially risky in the context of emerging countries.

In any case, the unavoidable greater regional involvement in innovation policy also requires a shift in the orientation of central governments from control to facilitation, capacity building and support. Along these lines, this paper has suggested that national governments in emerging countries need to make greater efforts to ensure that devolution of power is accompanied by capacity building in regional governments. A possible means to achieve this is by fostering collaboration among regions and sharing good practices.

Finally, this article has suggested that governments of developing and emerging countries should be cautious when using a regional innovation policy approach as a tool to reduce cross-regional income gaps. This is because policy efforts to counterbalance the natural trend toward agglomeration of innovative activities in core regions might lead to inefficient allocation of public funds. Collaboration among regions is also an important mechanism to address this equity/efficiency dilemma, by building absorptive capacity in lagging regions and reorienting the agenda of leading regions toward the larger societal challenges facing the country as a whole.

Given its exploratory scope and the complexity of the research questions addressed, this article falls short in developing sound theoretical propositions that can be generalised to developing countries across the board. Inevitably, this study suffers from a lack of conclusive evidence regarding the positive results of different policy options, partly because the examples reported here are still young, and partly because of the inherent difficulty of measuring the outcomes of innovation policies in a multilevel governance context. Moreover, the ambiguity of our results also reflects that there is no such thing as a ‘one-size-fits-all’ approach to multilevel governance of innovation policy (Todtling and Trippl, 2005).

References
Decentralisation of science and innovation policies in emerging countries


Decentralisation of science and innovation policies in emerging countries  


