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Economic specialization and diversification at the country and regional level: introducing a conceptual framework to study innovation policy logics

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ABSTRACT

While there has been a shared understanding that innovation policy is about rendering institutional change, there has been an emerging interest in identifying the institutional logics underlying innovation policy. To date, few studies have attempted to conceptualise these logics. This paper develops a novel conceptual framework for understanding innovation policy logics based on seminal contributions from organizational and economic theory. The framework distinguishes four logics, namely, specialized exploitation, diversified exploitation, specialized exploration, and diversified exploration. It is illustrated in the empirical analysis of innovation policies and development on both national and regional levels in Norway and Finland. The findings reveal that in both countries there is a movement towards increasingly diversified innovation strategies, despite differences in logics underpinning the policies.

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There has been a burgeoning interest in bringing the institutional theory perspective into studies of innovation systems, focusing, for example, on the institutional context (Cai, 2015; Leydesdorff, 2002), agency and institutional change (Benneworth, Pinheiro, & Karlsen, 2017; Isaksen, Jakobsen, Njøs, & Normann, 2018; Sotarauta & Pulkkinen, 2011), the dynamic interplay between institutions and organizations (Edquist & Johnson, 1997), and the effects of institutional constellations on technology innovation (Sánchez-Barrio-luengo, 2014). All these studies imply that the success of a given innovation system depends on the appropriate institutional context. In most cases the introduction of an innovation system often challenges traditional legislations, norms and routines locally.

Innovation policy is considered crucial in determining the direction of innovation system development, and bringing about institutional change (Cai, Pugh, & Liu, 2017). Nevertheless, few studies to date have attempted to conduct institutional analysis of innovation policy, especially from the institutional logics perspective. We believe that the understanding of the underlying institutional logics of innovation policy (hereafter we

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simply call it ‘innovation policy logics’) helps to account for the effects of innovation policy at the level of the national innovation system. In an effort to address this research gap, we develop a conceptual framework for identifying innovation policy logics and for discussing their manifestations at the innovation system level. We demonstrate the conceptual framework by using two Nordic countries, Finland and Norway, as cases in point.

In the early 1990s, Finland was among the first countries in the world, if not the first, to adopt the concept of a national innovation system to frame its science and technology policies (Lundvall, Johnson, Andersen, & Dalum, 2011; Sharif, 2006), and it operationalized it in the spirit of emerging conceptual frameworks and recommendations (see Sotarauta, 2012). Also in Norway, innovation policy gradually emerged as a policy concept with a distinct content emphasizing the distinction and transition from linear to interactive modes of innovation. New concepts such as regional innovation system, learning regions, learning economy, triple-helix emerging in academic circles the latter part of the 1990s was soon thereafter manifested as experimental later in more institutionalized innovation policy programmes such as cluster programmes and centres of excellence. Further, the two cases provide contrasting innovation policy approaches within the context of a shared Nordic socio-economic welfare model. In so doing, to construct and test the conceptual framework, we address the following research question: ‘What are the underlying institutional logics underpinning national and regional innovation policies in Norway and Finland?’ The first part of the article focuses on policy at the national level, whereas the manifestations and effects observed, constituting the second part of the article, are assessed at the regional level, by discussing two case regions (one in each country) that illustrate the dilemmas and trade-offs facing policy makers.

1. Analytical framework

1.1. Conceptual points of departure

Before our analytical framework is presented, a clarification of two key concepts (building blocks for the framework) underpinning the paper is warranted, namely: institutional logics and innovation policy.

1.2. Institutional logics

The concept of institutional logics was first introduced by Alford and Friedland (1985). Thornton (2004b) and colleagues have further elaborated the concept and developed it into a more nuanced theoretical approach to conduct institutional analysis. The institutional logics perspective sees institutionalization as a process of reconciling different institutional logics and draws particular attention to institutional compatibility and the role of agency in the process of institutional changes or the institutionalization of innovation. One pervasive argument is that multiple and contending logics provide the dynamic for potential change in both organizations and societies (Thornton, Ocasio, & Lounsbury, 2012).

Drawing on Friedland and Alford (1991) and Thornton (2004a), Thornton et al. (2012) propose seven institutional logics to understand western societies, namely; the state, the market, the family, religion, the professions, the corporation and the community. These

logics have been largely used in empirical studies on societal and organizational issues in a variety of fields (e.g. Cai & Zheng, 2016; Greenwood, Díaz, Li, & Lorente, 2009), but rarely when it comes to innovation policy. In innovation studies, scholars often expand the range of institutional logics or use other kinds of logics, for instance, the three logics of market, network and hierarchy as applied in the study by Lazer, Mergel, Ziniel, Esterling, and Neblo (2011) on how decentralized systems deal with innovation, and/or the seven logics aligned with the ideal Triple Helix system identified by Cai (2015). Despite their differences, all these studies tend to share a basic understanding of institutional logic as ‘a set of material practices and symbolic constructions’ that constitute the organizing principle of an institutional order and are ‘available to organisations and individuals to elaborate’ (Friedland & Alford, 1991, p. 248).

Given the research question posed at the onset, in this paper we use key insights from the institutional logics perspective as a means of interpreting the prevailing rationales underpinning innovation policy in Norway and Finland. In both countries, the institutional order of the state is rather prevalent, yet national policy also takes into consideration a variety of stakeholder interests and demands in the form of a corporate-pluralistic model (Olsen, 1988). These include, but are not limited to, firms, knowledge-intensive organizations such as universities and regional actors across the public and private sectors (Normann & Pinheiro, 2018). Needless to say, and as is the case with most European nations, Norway and Finland have in recent decades resorted to both the market as well as network arrangements as a means of addressing critical issues pertaining to national and regional policy making – in the innovation realm and elsewhere.

1.3. Innovation policy

Innovation policy can generally be defined as a means through which governments at different levels set priorities and define approaches to foster innovation and economic growth (Howells, 2005). It builds upon previous policy areas that introduced many of the themes which characterize it today (Lester & Sotarauta, 2012; Nauweleers & Wintjes, 2003). A recent iteration within innovation policy studies is that of ‘broad based innovation policy’ (Edquist, Luukkonen, & Sotarauta, 2009) as a systematic phenomenon (Smith, 2000). The former improves upon traditional R&D based approaches by incorporating non-technological innovations as policy targets (Arnkil, Järvensivu, Koski, & Piirainen, 2010). This, in turn, has led to a recent inclination to comprehend of understanding innovation policy as a ‘policy mix’, implying ‘a focus on the interactions and interdependencies between different policies as they affect the extent to which intended policy outcomes are achieved’ (Flanagan, Uyarra, & Laranja, 2011, p. 702).

In recent decades, there has been a growing realization that national innovation policies must be supplemented with regional innovation policies. Regional innovation policies are specifically aimed at creating development trajectories based on specific capabilities, characteristics and the needs of regional and local industries (Asheim et al., 2006; Tödtling & Trippel, 2005). Regions may also have different configurations of regional innovation systems differing in their capacity to initiate new industrial growth paths (Isaksen & Trippel, 2016). For instance, smart specialization policies (Foray, 2015; Foray, David, & Hall, 2011) may be considered a policy strategy aimed at developing regions based on the transformation of the existing economic structures through R&D and innovation

through the specific prioritization of given technologies or industries based on informed assessments of regional needs and opportunities.

Acknowledging the characteristics mentioned above, we conceive of innovation policies ‘as those governmental policies and programmes, on various levels and in different fields, which could either intentionally or by coincidence enhance enabling conditions of the innovation systems of the region’, (Cai et al., 2017, p. 240).

1.4. Innovation policy logics: towards a new framework

In this section, we develop an analytical framework to understand the institutional logics underpinning innovation policy in Norway and Finland. Policy can be driven by different sets of institutional logics (Heiskanen, Kivisaari, Lovio, & Mickwitz, 2009; Jørgensen, 2012; Richardson, 2006). Hence, institutional logics are here understood as ‘broader cultural rules and beliefs that structure cognitive ideas and guide decision-making as well as the behaviour of actors in the policy field’ (Jørgensen, 2012, p. 247). When investigating innovation policy design, we distinguish between two broader strategic approaches. One approach focuses on the balance between ‘specialization’ and ‘diversification’, and the other on the interplay between ‘exploration’ versus ‘exploitation’. When combined, these constitute four quadrants representing four distinct innovation policy logics, each with their own rationale and intended and unintended effects.

The strategies of exploration and exploitation are based on James G. March (1991), who stresses the importance of achieving a balance between the exploration of new possibilities, through risk-taking, play, discovery, innovation, etc., and the exploitation of old certainties in the form of refinement, choice, selection, implementation, etc., when discussing the critical aspect of organizational adaptation to changing realities in the context of learning. Although March’s (1991) focus is on the organizational level, the two logics of exploration and exploitation respectively reflect different aspects of the ‘adaptability’ and ‘learning’ nature of innovation policy design (Edquist, 2011). According to James G. March (1991, p. 71).

‘Adaptive systems that engage in exploration to the exclusion of exploitation are likely to find that they suffer the costs of experimentation without gaining many of its benefits’ (March, 1991, p. 71). They exhibit too many undeveloped new ideas and too little distinctive competence. Conversely, systems that engage in exploitation to the exclusion of exploration are likely to find themselves trapped in suboptimal stable equilibria. As a result, maintaining an appropriate balance between exploration and exploitation is a primary factor in system survival and prosperity.

The strategies of specialization and diversification reflect different conceptions of the optimal level at which to leverage resources and boost economic growth (Imbs & Wacziarg, 2003; Kaulich, 2012a; Neffke, Henning, & Boschma, 2011). The rationale underlying industrial specialization mainly follows the theory of Ricardo (1971), which considers that when a county or region specializes in certain goods and services in which they have comparative advantage by way of resource endowments and/or superior value added techniques, the allocation of resources becomes more efficient, thus enabling overall welfare improvements (Kaulich, 2012a; Krugman, Obstfeld, & Melitz, 2015). The assumption underpinning (industrial) diversification is mainly based on the work of Nobel laureate Simon Kuznets (1971, p. 87), who states that: ‘[a] country’s economic growth may be

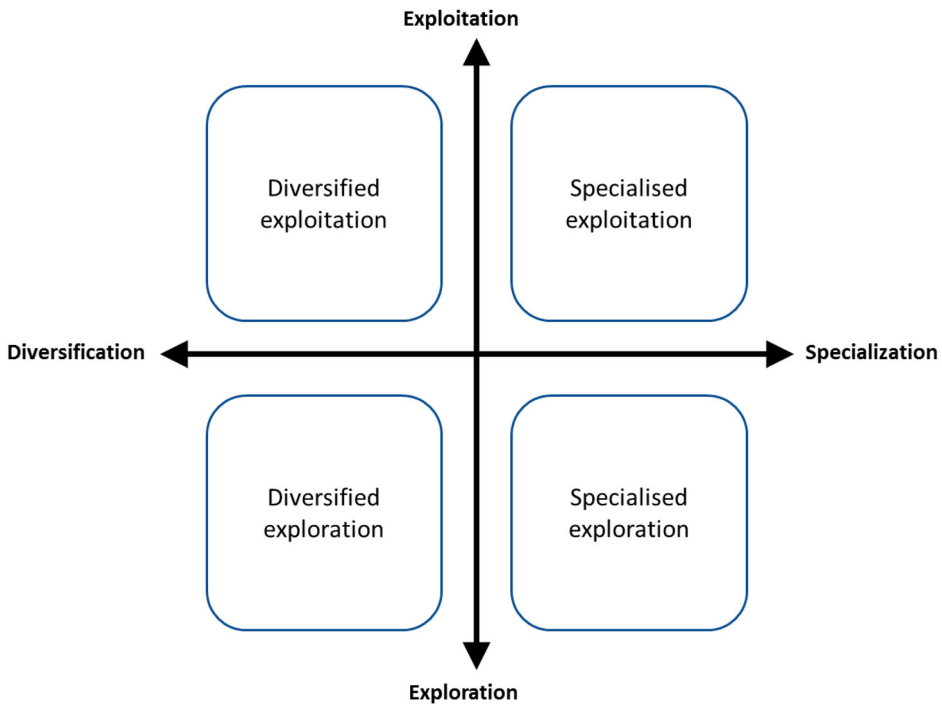


Figure 1. Institutional logics in innovation policy. Source: authors, applying (Kaulich, 2012b; March, 1991; Ricardo, 1971).

defined as a long-term rise in capacity to supply increasingly diverse economic goods to its population [...]’ (Figure 1).

The four types of innovation policy logics are permeated in specific rationales (means-ends rationality) and result into multiple effects on innovation practices, both intended and unintended (Table 1).

2. Innovation policy logics in Norway and Finland

In this section we provide empirical insights on how the dominant innovation policy logics in Norway and Finland have manifested themselves both at the national and regional

Table 1. Innovation policy logics: rationales and effects.

Innovation policy logics	Rationale	Effects
Specialized exploitation	Excel at making use of existing resources, knowledge and technology	Intended: Continuity. Unintended: Lock-in (concentration)
Diversified exploitation	Excel at making use of a multiplicity of related resources, knowledge and technology	Intended: Moderate levels of change (gradual). Unintended: Reduced resilience
Specialized exploration	Excel at introducing new knowledge and technology around selected areas	Intended: Moderate to high levels of change (new and old elements combined). Unintended: Hybridization
Diversified exploration	Excel at introducing new elements across a multiplicity of knowledge and technology areas	Intended: Radical change (disruption with past). Unintended: Lack of focus (dispersion)

Source: Authors own.

levels. Norway has over the last four decades developed into one of the most specialized economies in the OECD area, while Finland has developed into one of the most diversified economies. In both 2000 and 2010 Norway was the second most specialized economy in the OECD area, while Finland ranked among the most diversified ones (OECD, 2013). This picture has not emerged at random, but it is a consequence of both deliberate political process and market exploitation of emerging opportunities. Important for understanding the innovation policy logics in the two countries is their industrial structure. Finland and Norway represent almost opposite ends of the spectrum among the top tier advanced OECD economies. Whereas Norway is among the top ten exporters of primary goods in the world, Finland is a top ten exporter of manufactured goods (OECD, 2013). Finland produces a wide range of manufactured goods to the international market place, while Norway is one of the world's leading producers of petroleum and gas. In 2014, close to 60 percent of Norwegian exports were linked to petroleum-related products (Simoes & Hidalgo, 2017). As shown in more detail below, there is a distinct innovation policy logic driving and reinforcing a specialized economy in Norway in contrast to a more diversified economy in Finland. This is apparent if we view how the two countries utilize their Research and Development (R&D) resources (Figure 2).

Figure 2 shows that in Finland large firms, particularly those in non-resources based and high-tech manufacturing industries, contribute significantly to domestic R&D expenditures. By contrast, services, primary and resource based industries and SMEs are the main contributors to Norway's Gross domestic expenditure on R&D (GERD). In 2014,

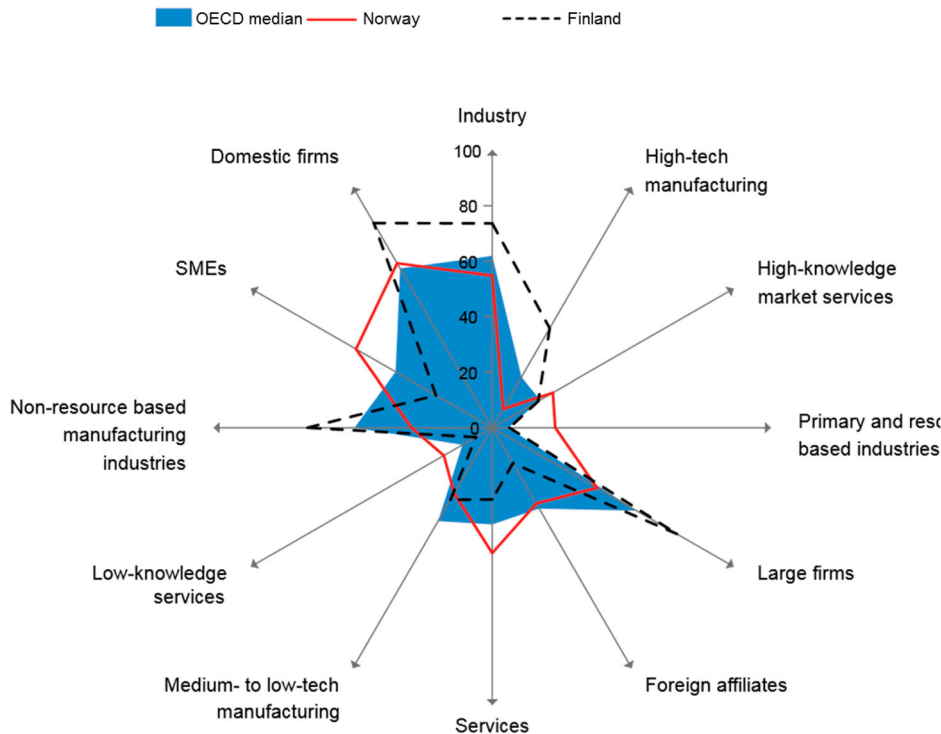


Figure 2. Structural composition of business R&D – in 2013 (IPP, 2017).

GERD as a percentage of the Gross Domestic Product (GDP) was 1.71 in Norway and almost twice that (3.17) in Finland. Between 2009 and 2014, GERD's annual growth rate was +2.3 percent for Norway and -2.78 for Finland. As regards publicly financed GERD as a percentage of GDP, in 2013 Norway had 0.77 while the value for Finland was -0.5; with the growth rate in the period 2008–2013 being +2.38 percent for Norway and -0.5 percent for Finland (IPP, 2017).

The data also reveals an overall decline in the growth of R&D investments in both countries. In 2012 Norway spent roughly NOK 48 billion (equivalent to 4.8 billion Euros as of 18 July 2018,) on R&D investments, with the business sector accounting for 44 per cent of the total and the higher education and the institute sectors contributing with roughly 25% each. In 2013, R&D expenditure in Finland totalled 6.7 billion Euros, with the share of the business sector being 69% (Statistics Finland, 2017), 25% more than in Norway. Expenditure peaked in 2011 (Euro 7.2 billion in total), and has been decreasing since, below Euro 6 billion during 2016. The data shows that after the 2008 financial crisis both the public and the private sectors in Finland experienced a dramatic cut in R&D expenditures (The Research Council of Norway, 2015).

Following the 2008 crisis, R&D expenditures in Norway increased, but almost exclusively in the public sector. Even after the cuts, R&D expenditures in Finland are twice as large as in Norway. This is indicative in Norwegian industry of a lack of reliance on formal R&D for stimulating in-house innovation (Fagerberg, Mowery, & Verspagen, 2009). It is also illustrative of a more general picture where, as a Northern European economy, Finland is characterized by an industrial structure dominated by high and medium-high technologies and with a strong level of specialization within ICT. In Finland, the historical role of Nokia has been crucial in economic development and R&D expenditures in general and specifically in ICT. During its heyday in 2001, Nokia held a 40% share of the world's mobile phone market, accounting for 4% of Finnish GDP. Further, Nokia alone accounted for approximately one third of the total Finnish R&D expenditure and for roughly half of business R&D (Ali-Yrkkö & Hermans, 2002). As Ali-Yrkkö and Hermans (2002) observe, if Nokia's share were removed from the national figures, Finland's R&D spending in 2001 would have been 2.4% of GDP; only slightly above the European average.

R&D expenditure might not be synonymous with innovation activity. This can be seen in the case of Finland and also Sweden. Since the 1990s two of the strongest so-called 'R&D nations' in the world, Sweden and Finland, have invested heavily in R&D, but have shown fairly low levels of commercially successful innovations. This phenomenon is known as the 'Nordic paradox' (Bitard, Edquist, Hommen, & Richne, 2008). For its part, Norway represents a situation reminiscent of a 'reversed Nordic paradox' with strong GDP growth but significantly lower investments in R&D, far behind Finland and the average for both the EU and OECD areas. The main reason for Norway's reversed Nordic paradox is that Norway's industrial structure is characterized by high value-added in industries with low R&D intensity, most notably around natural resources such as gas and oil as well as fisheries (Forskningsrådet, 2014). In contrast to its Nordic counterparts, Norway lacks leading international high-tech firms. Some of the leading Finnish firms and industrial sectors are acknowledged for their innovativeness and global competitiveness.

More generally, some of the differences between the Finnish and Norwegian economies are illustrative of some of the features associated with the STI (Science, Technology, Innovation) and DUI (Doing, Using, Interacting) modes of innovation respect. STI is 'explicit' (e.g. scientific) knowledge, capable of being written down and thus transferred easily from one context to another. Following Järvinen (2007), STI and DUI modes corresponds to an attempt, at the national policy level, for finding an adequate balance between formal R&D processes to produce explicit and codified knowledge and processes focusing on learning from informal interaction within and between firms resulting in competence development (Isaksen & Karlsen, 2010; Järvinen, 2007). Norway's innovation approach relies typically more on DUI (Fagerberg et al., 2009) when compared to Finland which is more STI oriented (Lemola, 2007).

Norway and Finland are among the leading nations in terms of human resources, with the proportion of the population with a higher education degree being above average for both the OECD and the EU (OECD, 2017a). What is more, Norway has a high and rising proportion of researchers in the population, and in Finland the share of R&D employment has for some time been the highest among the OECD countries (High-tech statistics – employment, 2016). In recent decades both countries have experienced a marked growth in the number of doctorates (The Research Council of Norway, 2015). Recent studies show that Norwegian adults have a fairly high level of basic skills (OECD, 2014), yet there is still a difference when compared to Finland, where the adult population is at the top across all categories; reading, writing and problem solving (The Research Council of Norway, 2015).

In international comparisons of innovation (IUS/EIS), Norway typically ranks below among the leading innovation countries in Europe, alongside Denmark, Germany and Sweden. The reason for this is as showed in Figure 1, related to the industrial structure in Norway where Norwegian firms typically are less research intensive and on average more characterized by DUI modes of innovation than their Finnish counterparts. Norwegian firms are typically on average only slightly less innovative than the Finnish firms but much less R&D-intensive, a tendency that is strengthened by Finland having more large firms with formal R&D-capacity than Norway.

3. Dominant innovation policy logics

3.1. Norway: in search of a diversification approach

In the 1990s, Norway was already highly specialized in the petroleum sector. Domestic innovation policy measures since then seem, by and large, to have strengthened and reinforced existing specializations ('specialised exploitation logic'). An indication of this is that basic research efforts are still concentrated around national industrial specializations; economic areas where Norway is strongest industrially. When we compare scientific publications from Norway to those produced in other countries, we can observe a very strong specialization in geoscience and related subjects (The Research Council of Norway, 2015), which is closely associated with oil and gas operations. This reflects an innovation policy orientation aimed at exploiting existing resources and knowledge bases and, thus has the direct effect of increasing the country's overall economic specialization profile. The development of the national innovation system in Norway has therefore been

described as path dependent, and to a limited extent adapted to emerging and more knowledge intensive sectors of the economy (Fagerberg et al., 2009; Narula, 2002). R&D-driven policies which in the 1960s were key to the development of the petroleum industry (Wicken, 2009), have later been described as a failure of the Norwegian government to reinvest in R&D in new areas (Wicken, 2009). A moderating element in Norwegian innovation policy is the relatively strong tradition for the regionalization of innovation policy (Spilling, Asheim, Langfeldt, & Thune, 2012). The dominant picture of a centralized and specialized innovation policy is to a moderate extent counterbalanced by cluster policy, regional R&D programmes and funding mechanisms (Herstad & Sandven, 2017).

Turning now to Norway's diversified exploitation approach, the Government's long-term plan (2015–2024) for research and higher education prioritizes six strategic thematic areas, including 'Sea', 'Climate, Environment and green energy' and 'Enabling technologies'. The innovation indicator report shows that these are the areas where Norway already has sizeable investments (The Research Council of Norway, 2015). In technology, ICT-related research dominates, not least because ICT is clearly the largest research area in Norwegian industry. Oil and gas is another important R&D industry, but high value creation makes R&D investments only a small part of the industry's total resources. Geographically, Norwegian R&D activities are centred around large cities, leading universities and technology environments. Oslo and Akershus, Norway's capital region, accounts for nearly half of all R&D investments. In addition South Trøndelag, with institutions such as NTNU and SINTEF, is a national hub for corporate R&D activity. Although Norway performs somewhat poorly on various innovation indices, the country is often among the top three countries in terms of social institutions, legislation, political stability, public sector efficiency, as well as infrastructure and use of ICT (The Research Council of Norway, 2015). Norway also scores rather well when it comes to creativity and human capital, but it is lagging behind on competitive(-related) indicators such as technological research, patents, licences, access to venture capital and exports of high-level technology (The Research Council of Norway, 2015). Last, the OECD has identified that Norway's highly sectorized science, technology, innovation policy is a significant reason for Norway slow pace in diversifying its economy (OECD, 2017b). The above mention Long-Term Plan is meant to counter the sector principle, but limited funding and top-tier governance has limited manifestation into industrial structural change.

3.2. Finland: in search of new innovation policy logics

In Finland, the 1990s were characterized by the exponential growth of the Nokia-led ICT cluster. There was a clear policy shift towards emphasizing innovation policy. If the industrial policy logics in the 1980s highlighted the idea of picking winners, currency devaluations and to some extent direct interventions in product markets, the 1990s saw a shift to indirect measures, and the concepts of cluster and innovation system became key organizing policy principles (Hermans, Kulvik, & Ylä-Anttila, 2005; Sotarauta, 2012). This reflected the new belief that innovation and related policies needed to be seen from a systemic perspective extending from education and science to innovative activities of firms and the commercialization of technological innovations (McCann & Ortega-Argilés, 2002). However, the Finnish innovation policies focused extensively

on technologies, and more or less ignored social and organizational innovations (Lähteenmäki-Smith et al., 2002). The Innovation Strategy of 2008 aimed to balance the policy portfolio by emphasizing the need to sharpen STI related policy instruments while simultaneously calling for measures that would reach beyond technological orientation by adding demand side instruments into the portfolio (Miettinen, 2008).

For more than two decades, collaborative development programmes as well as the Finnish Funding Agency for Innovation¹ (TEKES) with its technology programmes and many other funding mechanisms were the core in the implementation of Finnish innovation policy. The largest and most prominent programmes were the Strategic Centres of Excellence for Science, Technology and Innovation programme (SHOK, launched in 2007) and the Centre of Expertise Programme (CoE 1994–2013). They provided a national and local context for increasing collaboration between the main parties and aimed at improving specialization. The selected areas of the SHOK programme reflected the identified strongholds of the Finnish economy, and revolved around bio-economy, energy and environment, metal products and mechanical engineering (intelligent machinery), health and wellbeing, the built environment, and the information and communications industry. The last phase of the CoE programme included 13 national competence clusters, each involving several regional centres of expertise. The competence clusters were co-ordinated by selected regions, and they ranged, for example, from HealthBio to Tourism and Experience Management, from Ubiquitous Computing and Cleantech to energy technology, food, forest, and so on. As in Norway, scientific activity in Finland reflects the strengths of the economy. Computer and information sciences receive approximately 25% of the overall research funding granted to the natural sciences. Similarly, electronics, automation and communication represent approximately 30% of the engineering and technology field.

As of the time of writing (summer 2018), Finnish innovation policy and the entire innovation system are in flux. After the expansive phase, Finland has moved to a no-growth era in its R&D. Both public and private R&D expenditure has been in decline since 2010, and it seems that Finland's innovation policy community is aiming to reach beyond the R&D oriented STI-dominated policy. It is seeking inspiration from such concepts as innovation platform and innovation ecosystem, and focus on such porous thematic areas that would allow new surprising combinations of knowledge and actors. There also is an increasing emphasis to boost start up activities.

The economic crisis has clearly influenced the innovation policy logics in Finland, and the Government has revealed its disappointment to the effectiveness of innovation policies. At the Summer Conference of the Finnish Union of University Professors and the Finnish Union of University Researchers and Teachers (2016), prime minister Juha Sipilä expressed his doubts about the long-held innovation policy logics by asking: '*... how in the world this happened? Why weren't we better able to exploit global economic growth in spite of exceptional investments in expertise and R&D*' (free translation from Finnish; (Sotarauta, Suvinen, & Goddard, 2017, my emphasis)). In a way, the Finnish innovation policy became locked into its internationally recognized past (1990s and 00's), and thus continued to draw upon the earlier successful policies and related practices. As Sabel and Saxenian (2008) provocatively argued already in 2008, Finland became trapped by its past success, which made it more difficult to introduce novel policies to support exploration.

All in all, it is too early to assess where the policy thinking is heading and what kind of institutional logic is in the making, but it is fairly clear that Prime Minister Juha Sipilä's government is carrying out major reforms at the programme level. It has ceased funding for the SHOK programme, abandoned the entire innovative cities programme and introduced additional budget cuts. In 2009, TEKES operated with an annual budget of approx. 600 million Euros, a figure that was reduced to 320 Euros million in 2017 (Official Statistics of Finland [OSF], 2018). All this is reflected not only in decreased innovation activity on all fronts but also in the fact that there will be fewer strategic and organized forums for collaboration between firms, the university and the public sectors. New policy avenues are sought from experimentative modes of policy, open innovation inspired policy platforms and ecosystem thinking. The many changes in policy logics reflect; (a) the ten year sluggish economic development period in Finland, (b) the consequent need to cut public expenditure, (c) many evaluations that have raised several critical issues calling for reforms in the innovation system (Veugelers et al., 2009), (d) a need to find policies to support more radical changes but also tangible short term measurable gains, and (e) perhaps also a changing political landscape.

3.3. Economic specialization at the regional level in Norway and Finland

Even though Norway's economy is more specialized than Finland's, both countries have geographical areas (regions) that are much more specialized than the country as a whole. In recent decades regional specializations in both countries have been accentuated through innovation policy measures. These specialized regions have, in recent years, faced economic hardship and job loss. In Finland, this has been the case in regions with many jobs in the ICT industry, while in Norway this has occurred in regions with workplaces associated (directly and indirectly) with oil and gas extraction. In Finland, innovation policy initiatives and practices have been changing more than in Norway, and it seems Finland is searching for new innovation policy logics while Norway is continuing to build on the previously selected policy logics. Therefore, in this section we discuss slightly more Finnish regional innovation policy than Norwegian one.

Prior to the 2014 decline in oil prices there were approximately 330,000 employees in petroleum-related industries in Norway. The counties representing the highest share of oil-related employment are located along the coast, in particular in the south-western parts of the country. Rogaland County, where the de facto Norwegian oil capital, Stavanger, is located, is by far the most economically specialized region in Norway (Blomgren et al., 2015). As shown earlier, at the national level Norway is much more specialized than Finland, with 13% of the Norwegian workforce employed in industries related to petroleum. Blomgren et al. (2015) estimated the total employment effect of the petroleum sector in Norway at about 333,000 employees directly and indirectly employed. This means that Rogaland could be 3–4 times as specialized in the petroleum industry as Norway as a whole. As discussed above, the extent to which the dominating picture of a centralized and specialized innovation policy in Norway is counterbalanced by regional innovation policy measures such as cluster programmes, regional R&D programmes and regional funding mechanisms has been a subject of debate.

In regions such as Rogaland, regional innovation policy should be directed towards ensuring knowledge spillovers between the dominating petroleum sector and the

economy more generally, thereby benefitting industries and entrepreneurial activity beyond oil and gas. (Herstad & Sandven, 2017). At the present time national level innovation policy, by and large, continues to contribute to furthering economic specialization, while regional innovation policy measures that potentially could be aimed at knowledge transfer, regional branching and entrepreneurship are still limited by scale of measures and binding to the sectoral principle to counter this effect. In its regional innovation policies, Norway politicians, policy experts and academics alike speak and write of a need for structural change, but policies that in practice lead to industrial structural change are not implemented, *ref. above discussion of the governments long-term plan (2015–2024)*. This means Norway still is locked into its traditional petroleum dominated development path.

In the 1990s, several city-regions in Finland were quick to exploit the emerging supportive national institutional arrangements for science, technology and innovation as well as continuously expanding R&D funding, and to adjust their own policies accordingly. According to Sotarauta and Kautonen (2007) the many local efforts to strengthen institutions for research and education already in the 1980s and early 1990s later proved an important factor in the implementation of national innovation policies. Additionally, many national policies were reinterpreted locally so as to serve a specific locality better. The formulation of Finnish innovation policies and their implementation have therefore not been solely dependent on national finances or top-down thinking, as the relatively large autonomy, taxation rights and proactive local economic development policies have left their mark in the national innovation system (Sotarauta & Kautonen, 2007).

Especially Tampere Region, Northern Ostrobothnia, Southwest Finland and Uusimaa were able to tap into the Nokia-led ICT growth. This was partly due to their strong educational and research bases in related fields, and consequent ability to grow in tandem with Nokia, especially in the mobile phone business (Kostiainen & Sotarauta, 2003; Lemola, 2016; Männistö, 2002; Pelkonen, 2008; Tervo, 2002). The local economic and innovation policies were also geared to support this line of development, and all this was reflected in R&D expenditures. The volumes grew all over Finland but the relative shares of the city-regions of Tampere and Oulu grew fastest. By 2010 their shares of national R&D were 16% and 13% respectively, with the Helsinki metropolitan region dominating the national scene with its 42% share.

The many development programmes mentioned above (most notably the SHOK-programme) were intended to serve as a multi-level platform for interaction between the main stakeholders and thus to shift Finnish innovation activities towards specialized exploration. The jury may still be out, but the critics have argued that instead of diversifying the economy or supporting specialized exploration, SHOK-programme ended up supporting more specialized exploitation than anything else. Of course, due to the extensive nature of the SHOK programme the overall picture is more varied (Edquist et al., 2009; Lundvall, 2013).

At in all, the programmes enhanced dialogue between: (a) national and local policy actors; (b) the public sector, firms and universities across the governance levels; and (c) the public sector, firms and universities locally. As Sotarauta and Suvinen (2018) conclude, they might be labelled as focused and co-ordinated ‘multi-scalar triple helix policies’ to support clustered specialization, be it exploitative or explorative. For its part, the City of Tampere, for example, launched a series of local development programmes to promote economic development and innovation in selected areas of economic activity, and to

provide platforms for collaboration and collective efforts. The local programmes focused on open innovation (2012–2018), creative economy (2006–2011), biotechnology (2003–2009) and information society (2001–2005).

The R&D landscape started to change rapidly after Nokia reorganized its mobile phone division, and eventually sold it to Microsoft. Following Nokia's restructuring and government cuts the relative share of Helsinki's Metropolitan Region of Finnish R&D has increased (in 2015, 47%), while in all the other specialized ICT city-regions it has declined. The distribution of Finnish R&D is once again becoming more centralized. In Tampere, Nokia Ltd and Nokia Siemens Networks employed approximately 4,000 people in 2009. This figure gradually declined to 2,650 in 2011 and to only 800 in 2016. In 2007, the share of the ICT sector was 10.7% of all employment in Tampere Region (Finland 6.3%), falling to 7.0% (Finland 5.6%) by 2015. However, the relative significance of the ICT sector as a whole remains high, especially in the Tampere Region (Kurikka, Kolehmainen, & Sotarauta, 2018). Interestingly, according to Kurikka et al. (2018), the local ICT business structure has started to change. There are now more SMEs than before in Tampere, and their focus is more on software than hardware development, as was earlier the case.

In the 1990s and 2000s, one of the core areas of the Finnish innovation policy coevolved with the Nokia-led ICT sector at all levels of governance. The dominant policy logic was to support rapidly emerging field of specialization in order to exploit (and renew) existing knowledge base and expertise as well as remove bottlenecks hampering growth. In a way, from a national and regional development point of view, it was a matter of 'specialized exploitation' as well as 'specialized exploration', drawing upon a long history in radio and other ICT relevant technologies (see Boschma & Sotarauta, 2007).

4. Discussion

The constructed conceptual framework to understand innovation policy logics proves useful, as it reveals how, historically, Norway and Finland have followed different innovation policy logics. Norway has relied on the exploitation of existing natural assets, largely focusing both on a strategic posture towards specialization and moving to a more diversified exploitation posture (selected areas) following the decline in global oil prices in 2014. Even if the Finnish economy has, relatively speaking, gradually become more diversified than its Norwegian counterpart, it too has traditionally been dependent on natural assets, namely forests. Paper and pulp industry has been, and still is, one of the cornerstones of Finnish economy and related policies. Indeed, the small Nordic countries - Sweden, Norway, Denmark and Finland - have prospered, as their innovation system is geared to absorb and use new technology developed elsewhere. The Nordic countries have introduced their share of novel inventions to the world market, but, as Lundvall et al. (2011) state, the core of the prosperity has not been in the capacity to develop a continuous stream of unique innovations for the world market. In other words, the specialized exploitation has served Norway and Finland well but both countries clearly are searching for the next phase in their innovation policy; a way to move to a more explorative and diversifying policy logics.

In Norway, at the regional level, and due to high levels of specialization, many regions are currently 'locked-in' in a situation of 'specialized exploitation' to move towards

diversification, which takes time, effort and resources. In contrast, Finland's national innovation policy has been characterized as one focusing, to some extent, on both specialized exploitation and specialized exploration, with some recent efforts to boost also diversification. In Finland too, many regions have witnessed the risks of excessive specialization, and struggled with fluctuating demand in forest-related products and the effects of Nokia's reorganization. However, in the late 2010's, there are clear signs that both forestry and ICT industries are bouncing back (Jensen, Johnson, Lorenz, & Lundvall, 2018). There is, however, no evidence of diversification of the economy, but the lead industries have been able to upgrade their offerings and to diversify within their specializations. For example, some city-regions, such as Tampere, earlier adopted a strategic posture oriented towards specialized exploration and exploitation given the strong emphasis attributed to the ICT sector and the role of Nokia more specifically but also biotechnology, and automation and mechanical engineering. Nokia's mobile phone division's decline has led to a strong impetus towards the search for new specializations, manifested in the rise of new ICT-related businesses emerging out of Nokia's demise and taken advantage of the high level of human capital (engineers) present in specific localities, and also supported by innovation policy platforms (inspired by open innovation thinking) (Figure 3).

Interestingly, none of the case countries or regions seem to have pursued a clear strategy focusing on 'diversified exploration' (Finland may be taking steps towards with platform policies), which one could argue would represent a less risky strategy (at least in theory) and, in the long run, ensure the overall resilience of regions and the national innovation system as a whole. Resilience might be strengthened by reducing the risk of over-

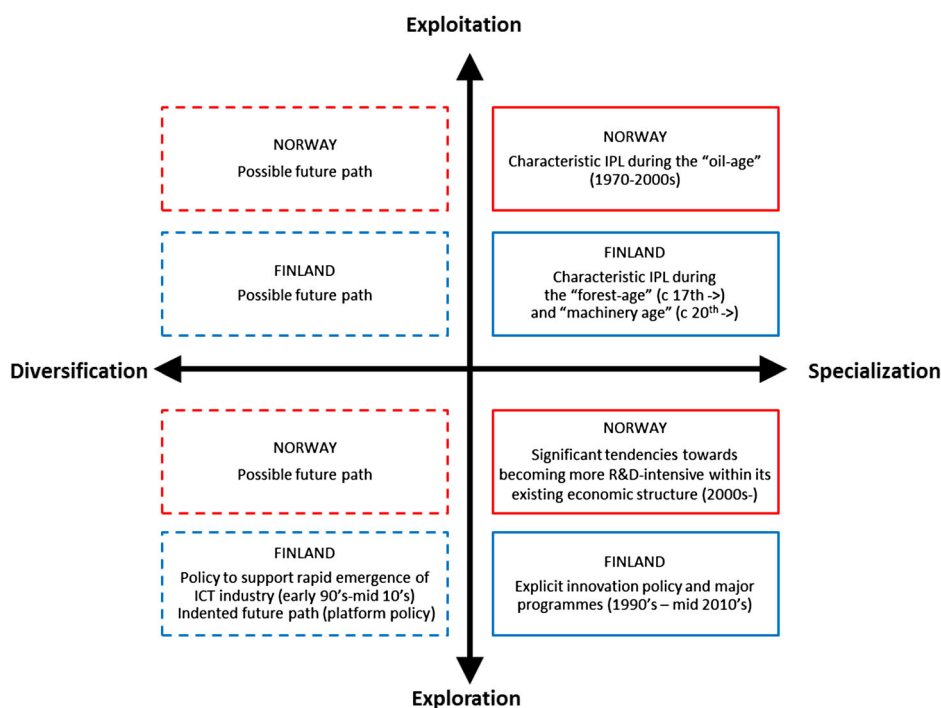


Figure 3. Innovation policy logics reflected in the cases of Norway and Finland.

specialization and/or external shocks like energy crisis, company failures, etc. (Boschma, 2015). This national posture could, in part, be a function of the strategic emphasis across Europe (EU level) towards a strategy of ‘smart specialisation’ (European Commission, 2014), which tends to prioritize entrepreneurial discovery processes and thus smart diversification (Männistö, 2015).

5. Conclusion

This study adds to the literature on innovation policies by specifically focusing on institutional logics providing policies with a meaning and direction. It introduces a stylized conceptual framework to study the institutional logics underlying innovation policies. Conversely, it contributes to the institutional logics literature by exploring the important but understudied link between institutional logics and innovation policies. We join earlier studies that call for a more nuanced understanding of diversification/specialization, policy contents and policy processes as well as path development (Flanagan et al., 2011; Isaksen & Trippel, 2016).

Most importantly, this study links institutions into the literature of national and regional innovation policies that has been criticized for not being able to operationalize institutions in a robust manner. This is important, as, in innovation studies, institutions are more often than not studied more instrumentally than what is the case in sociology or political sciences, for example. This may be a combined result of more pragmatic ambitions and the abstract nature of institutional theory (Rodríguez-Pose, 2013). The conceptual framework introduced in this paper may prove useful in future endeavours to shed additional light on the ways institutions frame the policy logics, and how, in turn, innovation policy is constrained and/or enabled by institutional logics. It can also serve as a useful analytical tool to compare innovation policies and practices across nations and regions. However, one should be cautious when applying the framework in empirical analysis to avoid simply associating one specific innovation policy logic with a country or region in a given period. This could indeed be the fact, but in many cases there are mixed and even competing logics underlying the debates of innovation policymaking as demonstrated in the paper, especial in the case of Finland.

Note

1. In 2018 the Finnish Trade Promotion Organization (Finpro) and Tekes were merged, and the new organization was named Business Finland.

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