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Place-based entrepreneurship and innovation policy for industrial diversification

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Keywords: economic diversification; new industrial path development; innovation; entrepreneurship; entrepreneurial ecosystems; place-based policy

JEL: O10; O30; O38; L50; R10; R58

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1 Introduction

The objective of this paper is to develop a conceptual and analytical framework aimed at supporting the design of place-based entrepreneurship and innovation policies that contribute to regional industrial diversification and economic growth. The document is written for OECD, which has used the entrepreneurial ecosystem concept for assessing and providing recommendations for SME and entrepreneurship policies. The entrepreneurial ecosystem concept is one of several in the field of entrepreneurship that emphasize the importance of a systemic perspective (Isenberg 2011; Ács, Autio, and Szerb 2014; Qian, Acs, and Stough 2012; Lindholm-Dahlstrand, Andersson, and Carlsson 2016). Of the various concepts, the entrepreneurial ecosystem concept has gained most traction in policy circles (Alvedalen and Boschma 2017).

The natural starting point for this paper is therefore the entrepreneurial ecosystem concept. This concept foregrounds characteristics of the regional environment, in which high-growth start-ups and ambitious entrepreneurship strive (Isenberg 2011; Mason and Brown 2014). The entrepreneurial ecosystem shapes entrepreneurial activities and thereby contributes to aggregate value creation (Stam and Spigel 2016). Typically, the concept proposes a long list of variables (elements) that influence entrepreneurship. This is related to what Harvard economist Ricardo Hausmann calls "high bandwidth" nature of policy, namely that effective policy has to deal with a large number of variables

interacting in highly complex and specific ways' (Isenberg 2011, p. 7). Stam (2015), for instance, differentiates between systemic and framework conditions. The former cover networks, leadership, finance, talent, as well as knowledge and support services/intermediaries. Framework conditions refer to formal institutions, culture, physical infrastructure and demand.

Mason and Brown (2014) carve out the distinguishing features of entrepreneurial ecosystems. First, entrepreneurial ecosystems rest on place-specific assets. This implies that policies need to be sensitive to regional particularities. Second, the role of large and established businesses is highlighted. These businesses form the talent and capabilities required for entrepreneurial ventures. Third, the concept foregrounds 'the law of small numbers', which suggests that few, highly successful ventures (high-growth firms) are propelling aggregate income and job creation. Fourth, the process of 'entrepreneurial recycling' is a key mechanism through which successful entrepreneurs support new ventures with their experience, networks and resources. Fifth, the role of finance and in particular risk financing and smart money is highlighted. Sixth, universities contribute through building a qualified labor pool and are a source for university spin-offs that commercialize research-based knowledge. Seventh, entrepreneurs with strong growth ambitions often require knowledge-intensive support services (legal, accounting, marketing, finance, recruitment, consultants, etc.) provided in the ecosystem.

It remains an open question, however, how the entrepreneurial ecosystem concept can be applied to industrial diversification in different types of regions. On the one hand, the concept focuses on the conditions for ambitious entrepreneurship, which in turn contributes to economic growth, but does not specify the causal link to industrial diversification. Industrial diversification comes in many shapes and a differentiated perspective on this desired policy outcome is needed (Isaksen and Trippl 2016; Martin and Sunley 2006; Grillitsch and Trippl 2016). On the other hand, even though the entrepreneurial ecosystem concept highlights that regional specificities need to be taken into account, its applicability to different regional contexts remains largely unexplored. For instance, what relevance does the concept have to explain regional industrial diversification in regions that are not endowed with many of the crucial elements identified in the entrepreneurial ecosystem concept?

This paper thus aims at developing a place-based entrepreneurship and innovation policy framework for regional industrial diversification. This framework will help to identify opportunities for regional industrial diversification in different types of regions, main barriers for growing new industrial growth paths, and policy recommendations to strengthen the regional environment for entrepreneurship and innovation. The paper progresses in three sections. Section 2 develops the conceptual framework. Section 3 discusses the policy implications that can be derived from the conceptual framework. Section 4 concludes with reflections about the analytical process leading to the design of or recommendation for entrepreneurship and innovation policies.

2 Conceptual framework

The conceptual framework aims at identifying the relationships between regional characteristics, barriers for industrial diversifications, and most promising forms of new industrial path development (Table 2). In order to achieve this, Section 2.1 introduces a differentiated perspective on new industrial path development and Section 2.2 discusses the regional pre-conditions for such processes to happen.

Based on these foundations, Section 2.3 elaborates on place-based opportunities and barriers for regional industrial path development.

2.1 Typology of industrial path development

Industrial path development and regional diversification have recently become a core theme in the literature (Boschma et al. 2017; Isaksen and Trippl 2016; Neffke, Henning, and Boschma 2011; Martin 2010). Industrial path development comes in many shapes, which renders futile a 'one policy fits all' approach to industrial path development (Grillitsch and Trippl 2016; Isaksen, Tödtling, and Trippl 2016). Three broad categories of new industrial path development can be distinguished: upgrading, diversification, and the emergence of new regional industrial paths (see Table 1).

Upgrading of existing industrial paths makes a qualitative change to existing industries and is in some regional settings the most feasible way to enhance competitiveness and foster economic growth. Upgrading can take several forms. Climbing the hierarchy in global production networks (GPN) refers to enhancing the position of the regional industry towards higher value added activities through upgraded skills and production capabilities. Renewal refers to a major change of the existing industry due to the introduction of new technologies, change of business models, or organizational innovations. Industries can also enhance growth by moving into higher value added niches based on symbolic knowledge. This refers, for instance, to the generation of value through design and branding of traditional products, which makes it possible for high-income regions to compete in low-tech industries (e.g. design furniture from Denmark).

Diversification refers to firm-level processes where knowledge and resources from existing industries are used in new industries. In this regard, the literature differentiates between related and unrelated variety (Frenken, Van Oort, and Verburg 2007). Related variety refers to different industries that build on similar types of knowledge. Diversification based on related variety is a process where entrepreneurs re-use core competencies in new industries. Diversification based on related variety is seen as fundamental mechanism in evolutionary economic geography (Frenken and Boschma 2007). For instance, the maritime industry may re-use competences about the installation of oil platforms to the installation of offshore wind parks and thereby move into the renewable energy sector.

Diversification based on unrelated variety implies that entrepreneurs from existing industries combine their knowledge with dissimilar knowledge from other industries or knowledge providers (Grillitsch, Asheim, and Trippl 2017). A conceptual basis for unrelated knowledge combinations can be found in the differentiated knowledge base approach, which distinguishes between analytical (science based), synthetic (engineering based), and symbolic (design based) knowledge (Asheim 2007). Innovations with a high degree of novelty typically rest on the combination of unrelated types of knowledge and are the source for new industrial path development based on unrelated diversification (Strambach and Klement 2012; Asheim, Boschma, and Cooke 2011). One example is the creation of fashionable, functional foods based on the combination of knowledge from the food industry (synthetic knowledge), biotechnology (analytical knowledge), and design (symbolic knowledge).

Finally, new industries may emerge in regions that are unrelated to existing industries. The most radical form of new path development is the creation of completely new industries. Sources for path creation are new technologies, scientific breakthroughs, or radical innovations based on new business models, user-driven or social innovations. From a regional perspective, it is also possible that an industry

emerges that is new to the region but not new to the world, which is labeled as importation of an industrial path. Path importation rests on the inflow of actors and resources from outside the region.

Table 1: Types of new regional industrial path development

Types	Mechanisms
Upgrading	
I – Climbing GPN	Major change of a regional industrial path related to enhancement of position within global production networks; moving up the value chain based on upgrading of skills and production capabilities
II – Renewal	Major change of an industrial path into a new direction based on new technologies or organisational innovations, or new business models
III – Niche development	Development of niches through the integration of symbolic knowledge
Diversification	
I – Related	Diversification into a new related industry for the region, building on competencies and knowledge of existing industries
II – Unrelated	Diversification into a new industry based on unrelated knowledge combinations
Emergence	
I – Importation	Setting up of an established industry that is new to the region (e.g. through non-local firms) and unrelated to exiting industries in the region.
II – New creation	Emergence and growth of entirely new industries based on radically new technologies and scientific discoveries or as an outcome of search processes for new business models, user-driven innovation and social innovation

Source: based on Grillitsch, Asheim, and Trippl (2017) and Isaksen, Tödtling, and Trippl (2016)

2.2 Regional pre-conditions for industrial path development

The entrepreneurial eco-system concept is one of many systemic approaches to innovation and entrepreneurship. In defining regional pre-conditions for industrial path-development, it is suggested to draw more widely on these systemic approaches, in particular the regional innovation systems approach, which has a long tradition of developing regional typologies based on structural characteristics and policy challenges (Asheim, Grillitsch, and Trippl 2016). However, it is often difficult to relate empirical cases to the respective types. For this reason, this section elaborates a more fine-grained evaluation framework for the sophistication of the regional system of innovation and entrepreneurship (see Table 2). In particular, it is acknowledged that such systems comprise many aspects, each of which deserve specific attention in empirical contexts. The evaluation framework builds on three fundamental system properties: actors, networks and institutions.

As regards actors, a qualitative and quantitative dimension can be distinguished (Grillitsch and Asheim 2016). The former captures the capabilities of regional actors, which refers among others to the use of cutting-edge knowledge and technologies, high resource endowment and financial capabilities. High capabilities imply that actors perform high-value and high skill activities. The quantitative dimension refers to the scope and scale of actors present. A variety of actor types (scope) contributes to and provides resources for innovation and entrepreneurship, including firms, higher education and training institutes, research organizations, regional support organizations such as incubators, knowledge parks, cluster organizations, etc. (Autio 1998; Doloreux and Parto 2005). The entrepreneurial ecosystem concept further foregrounds actors such as high-growth start-ups, serial entrepreneurs, banks, angel groups, and venture capital firms (Mason and Brown 2014). Scale refers to the number of actors and size of organizations present in the region. A high system sophistication as regards actors would imply that the region is endowed with a large number of variegated, and highly capable actors. In the literature, this constituent of system sophistication has been captured as organizational thickness (Tödtling and Tripl 2005; Isaksen and Tripl 2016).

As regards networks, systemic approaches to innovation and entrepreneurship highlight the importance of localized learning (Malmberg and Maskell 2006) both within sectors as well as across sectors. Within sectors this corresponds for instance to user-producer interaction and user-driven innovation (von Hippel 2005; Lundvall 1988). As regards new path development and more radical innovation, there is, however, increasing evidence that networks between sectors play an important role. This refers to interactions between industry, research, public services, and civil society (Cooke and Morgan 1994; Etzkowitz 2012; Carayannis and Rakhmatullin 2014) as well as to interactions between different industries (Asheim, Boschma, and Cooke 2011). Such networks between sectors create opportunities for novel combinations of knowledge and resources (Grillitsch 2016). Furthermore, regions are conceptualized as open systems, which are embedded in a national and international context (Asheim, Grillitsch, and Tripl 2016). Local and global networks are both of complementary as well as compensatory nature. Local learning dynamics benefit from the inflow of knowledge from the global scale (Bathelt, Malmberg, and Maskell 2004). Firms also tend to be more innovative when combining knowledge from different scales (Tödtling and Grillitsch 2015) and an overreliance on local sources may create lock-in and reduce innovativeness (Westlund and Kobayashi 2013; Fitjar and Rodríguez-Pose 2011). In addition, extra-regional networks are a way to compensate for a lack of knowledge available regionally (Shearmur and Doloreux 2016; Grillitsch and Nilsson 2015). High system sophistication is thus characterized by a combination of networks within and between sectors, as well as regional and global embeddedness.

From an institutional perspective, system sophistication also includes a number of factors. Building a fundament for regional development, the quality of governance influences the innovativeness in regions as well as the effectiveness of policy instruments (Charron, Dijkstra, and Lapuente 2014; Rodríguez-Pose and Di Cataldo 2015). Quality of governance refers among others to low corruption, impartial public services and rule of law. More specifically, the regional innovation systems literature points to the pervasive influence of policy and regulations (Cooke 1992; Asheim 2007). Morgan (2016) illustrates how policy repertoires are stable over time and are a major factor for diverging economic performance in regions that otherwise have similar preconditions. This points to the necessity of adapting the support systems to the region-specific needs and opportunities. Another important institutional aspect refers to governance processes. Recent policy approaches to regional innovation and entrepreneurship emphasize a complex governance process covering multiple-scales (local,

regional, national, international), multiple-actor coordination, as well as the importance of bottom-up processes. A prime example of this is the smart specialization policy approach, currently promoted by the EC (2012) and OECD (2013). This approach foregrounds among others entrepreneurial discoveries that should inform policy priorities in bottom-up processes; interregional connectedness and cooperation; as well as the engagement of civil society and consumers in order to address major societal challenges. Innovation and entrepreneurship are also influenced by the existence of a regional entrepreneurial culture, which finds expression among others in a low degree of risk aversion and a high rate of new-firm formation, (Fritsch and Wyrwich 2014; Lee, Florida, and Acs 2004; Davidsson and Wiklund 1997). System sophistication thus also results from high quality of governance, adequate policy repertoires, multi-level policy processes, and the existence of an entrepreneurial culture.

Table 2: Sophistication of systems of innovation and entrepreneurship

System elements	Indicators of sophistication
Actors	
Capabilities	Use of cutting-edge knowledge & technologies; high resource endowment and financial capabilities
Variety of types	Actors presenting large parts of the value chain as well as complementary organizations in the fields of research, education, finance, technology mediation, incubators, public administration, etc.
Scale	Number and size of organizations and entrepreneurs
Networks	
Within sectors	Density of innovation and production networks within value chains
Between sectors	Bridging social capital, existence of collaborations, networks between industries, as well as between industry, research, governance (triple helix) and civil society.
Local-global	Combination of linkages at the local and global scale
Institutions	
Quality of governance	Low corruption, impartial public services and rule of law
Adequate policy repertoires	Adaptation of the support system to the region-specific needs and opportunities
Governance process	Involvement of actors at multiple-scales (local, regional, national, international) and of different sectors; interplay between bottom-up and top-down policy making
Entrepreneurial culture	Low risk aversion, high rate of new firm formation

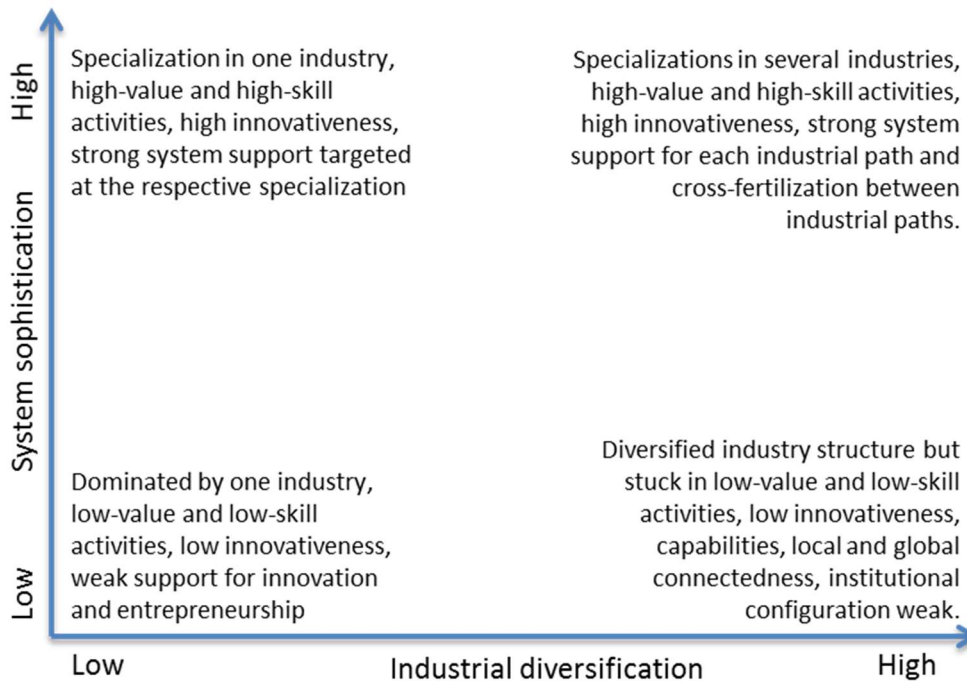
The second dimension for determining regional pre-conditions refers to the industrial profile. There has been a long debate in economic geography on the virtues of specialization and diversity. Specialization in one industry can be understood as a cluster (Porter 1998, 2000) with strong traded and untraded interdependencies between related firms and organizations (Storper 1995). Storper et al. (2016) argue for the importance of distinguishing between specialization in growing and dynamic industries versus specialization in mature and declining industries. The former are the major source

for superior economic growth in core regions. As industries mature, lower-skilled production relocates to more peripheral regions. Also, industrial diversification is typically not a top policy priority if regions are specialized in a dynamic and growing industry. In contrast, industrial diversification and renewal is the main policy objective in stagnating regions with a specialization in older industries (Hassink 2010; Trippl and Otto 2009).

As regards diversity, evolutionary scholars have introduced a debate on the contributions of related and unrelated variety to economic growth (Neffke, Henning, and Boschma 2011; Frenken, Van Oort, and Verburg 2007). The related variety proponents argue that “inter-industry spillovers occur mainly between sectors that draw on similar knowledge [...] (about technology, markets, etc.).” (Content and Frenken 2016, p. 1). Consequently, firms mainly diversify into technologically related products. Unrelated variety, in contrast, refers to industries that do not share similar knowledge. In particular when discussing industrial diversification and industrial path creation, the combination of unrelated knowledge is thought to be of high importance (Grillitsch, Asheim, and Trippl 2017; Boschma et al. 2017). Thus, while related diversification may be the rule, the rarer but more radical forms of industrial path development often involve unrelated knowledge combinations.

The two dimensions – system sophistication and industrial diversification – are continuous and any empirical case needs to be evaluated on a continuous scale (see Figure 1). At the lower end of system sophistication, regions will exhibit low-value and low-skill industrial activities, and low levels of innovation. Such regions may be dominated by one industry (typically small peripheral regions) or be relatively diversified (typically urban centers in less developed countries). In the latter case, it may even be possible that many of the actor types supporting innovation and entrepreneurship are present but their capabilities, local and global connectedness, and institutional configurations are weak. At the higher end of system sophistication, high-value and high-skill activities are pursued with a high level of innovativeness. If such regions are dominated by one industry, they typically have a support system for innovation and entrepreneurship that is targeted at the respective sector. On the other hand, regions with a sophisticated system for innovation and entrepreneurship and a high degree of industrial diversification can be best understood as regions that have developed a variety of strong specializations or, in other words, a variety of strong industrial paths. Due to the required critical mass for developing strong industrial paths, thick and diversified regions are found in larger urban areas. In such regions, the system for innovation and entrepreneurship is supportive for each industrial path as well as for cross-fertilization between paths.

Figure 1.: Representation of regional pre-conditions along two dimensions – system sophistication and industrial diversification



2.3 Place-based opportunities and barriers for industrial path development

The regional context shapes the opportunities for new industrial path development (Grillitsch and Trippl 2016). In this section, the opportunities and barriers for new industrial path development are discussed depending on the regional pre-conditions. As regards the barriers, a differentiation is made in barriers for breaking with existing paths and barriers for growing new paths.

Regions with low system sophistication lack a critical mass of strong actors in any particular field by definition and regardless the degree of industrial diversification. This implies that entrepreneurs in thin regions cannot draw on regional sources for combining related or unrelated knowledge. Also, entrepreneurs in thin regions are deprived of strong systemic support for innovation and entrepreneurship. Given these preconditions, the more challenging and novel forms of new industrial path development are often out of reach for such regions. Diversification into new industries would imply that the already thin resources are spread even thinner. The creation of completely new industries typically rests on a variety of high-level competences that need to come together. Lacking one of these may obstruct the creation of a new industry (Sotarauta and Heinonen 2016). Thus, even though exceptions may prove the rule (Simmie 2012), the creation of new industries will be unfeasible in regions with low system sophistication. Thus, the most feasible options are path upgrading and importation. Path upgrading includes moving into higher-value added niches, climbing the hierarchy in value chains, and renewing the industry by introducing new technologies and business models. Path importation rests on extra-regional sources of knowledge and resources, which are anchored in the region. This includes both direct investments as well as the inflow of people (Trippl, Grillitsch, and Isaksen 2017).

In many ways, path upgrading and path importation are closely related to increasing regional system sophistication. This includes increasing capabilities of local actors, enhancing the positions of local actors in global networks, and strengthening institutional configurations. The main challenge resembles a catch-22 situation. Actors need extra-regional linkages to compensate for the lack of knowledge and resources available locally (Grillitsch and Nilsson 2015). However, in order to access knowledge and resources through extra-regional networks, it is necessary that the regional actors have the capability to identify sources of relevant knowledge, establish knowledge transfer mechanisms (e.g. collaborations, recruitment), and absorb new knowledge. Hence, path upgrading will need to work simultaneously at enhancing actors' capabilities and network embeddedness. As regards breaking with existing paths, strong incumbent firms are potential barriers. If such firms exist, they will be very powerful as compared to the other regional actors. Accordingly, the likelihood is high that networks and policies are monopolized by key firms in regions with a low degree of system sophistication.

In contrast to regions with low system sophistication, opportunities and barriers differ for regions with high system sophistication depending on the degree of industrial diversification. High system sophistication but low industrial diversification implies a critical mass of strong actors concentrated in one particular field. Under these preconditions, the emergence of completely new industries either through importation or new path creation would face opposition as existing competences, routines, and investments would devalue. On the one hand, if the region experiences growth in the industry of specialization, the production factors will be occupied and achieve high rents in the existing specialization. This will make it relatively unattractive for entrepreneurs and workers to move into a new industry where pay-offs are lower or still uncertain. On the other hand, a specialization in maturing and declining industries may release resources for other uses but it will be difficult to unlearn existing competencies and build up new ones. In comparison, related and unrelated diversification is more feasible because it allows entrepreneurs to re-use existing competencies in new industries where higher value can be achieved.

An important barrier for developing new growth paths through diversification is that regions with one dominant industry have a relatively homogeneous knowledge base. This means that there are limited opportunities through regional sources to apply existing competencies in other industries (related diversification) or to combine knowledge from different industries (unrelated diversification). This points to the need to develop extra-regional networks outside the field of specialization. Furthermore, breaking with the existing specialization is difficult due to cognitive, functional and political lock-ins (Grabher 1993). Cognitive lock-in describes a situation when actors find it difficult to take in new information, unlearn existing routines, and learn new ones. Functional lock-in relates to interdependencies in production networks where making a small change requires changes in other parts of the value chain. Political lock-in captures institutional rigidities where powerful incumbent firms together with policy makers engage in self-sustaining coalitions. Incumbent firms aim at protecting vested interests while policy makers want to avoid job cuts due to downsizing or shutting down existing industrial activities.

Regions with high industrial diversification and high system sophistication have the largest range of opportunities for new industrial path development. Such regions exhibit a critical mass in several related and unrelated industries and are endowed with many of the elements that make a strong system for entrepreneurship and innovation. This provides the best preconditions for related and

unrelated diversification as well as the creation of completely new industries. Nevertheless, also such regions may face difficulties in developing new growth paths or breaking with existing ones. A potential barrier relates to weak linkages between industries and sectors. This barrier is likely in such types of regions because of the high degree of specialization in different fields. With specialization, cognitive and institutional barriers tend to increase between each field and thereby also the challenge for knowledge transfers (Boschma 2005). This links to another challenge, namely the exploitation of research-based knowledge created at universities and research facilities. The lack of exploitation capacity relates to a mismatch between scientific excellence and industrial specializations, which implies that regional industrial actors are not able to use and absorb the research-based knowledge generated in the region (Isaksen and Trippel 2016). Furthermore, such regions may face difficulties in breaking with existing industrial paths and reallocating public support and resources to new industrial paths due to rigidities in policy repertoires (Morgan 2016).

Table 3: Place-based barriers and opportunities for industrial path development

Major Opportunities and Barriers	Low system sophistication	High system sophistication	
		Low industrial diversification	High industrial diversification
Most promising forms of industrial path development	<ul style="list-style-type: none"> •Path importation and Path upgrading 	<ul style="list-style-type: none"> •Related and unrelated diversification 	<ul style="list-style-type: none"> •Related and unrelated diversification •New path creation
Barriers to develop new growth paths	<ul style="list-style-type: none"> •Low capabilities of actors •Peripheral position in global innovation and production networks 	<ul style="list-style-type: none"> •Homogeneous knowledge base •Limited networks outside the field of specialization 	<ul style="list-style-type: none"> •Lack of networks between industries and sectors; •Lack of exploitation capacities
Barriers to break with existing industrial paths	<ul style="list-style-type: none"> •Potential monopolization of networks and policies through key firms 	<ul style="list-style-type: none"> •Pervasive lock-in due to existing specialization (political, functional, cognitive) 	<ul style="list-style-type: none"> •Potential barrier to reallocate resources to new industrial paths

Source: based on Grillitsch and Trippel (2016).

3 Implications for a place-based policy for new industrial path development through entrepreneurship and SME policies

Following the discussion above, the opportunities and barriers for new industrial path development depend on the regional context. Responding to these place-specific opportunities and barriers, innovation and entrepreneurship policy has an important role for enabling and facilitating new industrial path development. Based on the conceptual framework elaborated above, place-based

policy options for industrial path development can be developed (Table 4). The policy options are discussed from a systemic perspective, addressing actors, networks, and the institutional and organizational support structure. It is important to mention that this section does not discuss generic preconditions such as promoting entrepreneurial culture or good governance, which are beneficial for all types of regions.

3.1 Place-based policy for regions with low system sophistication

As regards regions with low system sophistication, a reasonable policy objective is frequently to gain a strong position in a niche and increase system sophistication. This implies a qualitative change of the regional industry, based on path upgrading or importation, which is more feasible than diversification processes or the creation of completely new paths. The long-term goal would be to transform the region into one that has a high degree of sophistication in one (or potentially several) specialization(s). In order to achieve this goal, it is paramount to strengthen the skills and competences of local actors in relation to a niche, because only knowledgeable and resourceful entrepreneurs and firms will be able to establish and draw benefit from extra-regional linkages. This combination of strong internal capabilities with extra-regional linkages is central in such regions. As regards networks, policy may support the positioning of local actors within global production networks or the establishment of linkages with universities and other knowledge providers. Such networks provide access to competencies and technologies (support renewal) and may open up opportunities for higher-value added activities in global production networks.

In line with that, institutional and organizational support needs to target the level of capabilities of local actors. As regards education and training, regional characteristics should be taken into account. It may be more useful to invest in training and education (life-long learning) of individuals that are grounded (e.g. by family ties, lifestyle choices) in the region, rather than providing training and education to a highly mobile group of people that may want to move to core regions. A cultural aspect deserving attention is the openness of regional actors towards external influences. Peripheral regions suffer more often than other regions from tight regional networks at the expense of the highly necessary interactions with external knowledge sources (Westlund and Kobayashi 2013; Fitjar and Rodríguez-Pose 2011). This is problematic because it is often unfeasible to build (at least in the short-/medium-run) all the functions of strong systems of innovation and entrepreneurship. Remedies to these shortcomings are to stimulate a “global mindedness” among local actors, i.e. an attention to and openness for global developments, as well as to facilitate access to resources and support structures in core regions. However, the inflow of knowledge and resources is often hampered due to the relatively low attractiveness of the region for external actors (e.g. highly skilled labor, firms) (Trippel, Grillitsch, and Isaksen 2017). This justifies policies that aim at enhancing regional attractiveness (e.g. good public services, conditions for doing business, development of a regional identity) in order to retain and attract entrepreneurs, firms and skilled labor.

3.2 Placed-based policy for specialized regions with high system sophistication

A reasonable general policy objective for regions with high system sophistication and low industrial diversification is often to move towards more dynamic industrial growth paths by exploiting related and unrelated diversification processes. Some regions may even attempt to develop strengths in

several specializations, thus becoming a more diversified region. The latter is a policy option if the region is large enough (or can reasonably be expected to grow respectively) to allow for a critical mass in several specializations. As discussed previously, the relatively homogenous knowledge base in specialized regions is a major barrier for diversification. Therefore, actor related policy measures should aim at developing new skills and competencies in complementary fields among regional actors or by attracting new actors from outside the region.

As regards networks, the main barrier for new path development is not a lack of embeddedness in global production networks related to the existing specialization but the connectedness to related or unrelated fields. Therefore, policy should focus on the promotion of extra-regional linkages to sources of related and unrelated knowledge, comprising both industry and research. Despite this extra-regional focus, specialized regions may have some competencies in complementary fields that may be worth exploring. Furthermore, as regional industries move towards more dynamic growth paths through diversification, capabilities are built gradually in the emerging specialization. In the course of this process, opportunities for local knowledge interactions supporting the new growth path will increase. In addition, policy makers need to be attentive as regards networks with incumbent firms. It is natural that policy makers listen to powerful players representing the existing specialization. However, incumbent firms have vested interests that may conflict with the efforts to grow new industrial paths. Hence, it is important that policy makers engage in a broad dialogue, both regionally and extra-regionally, in order to break potential self-sustaining coalitions with incumbent firms.

In relation to institutional and organizational support structures, specialized regions with high system sophistication are expected to benefit from regional visioning exercises because such processes contribute to aligning the interests of influential and powerful players in the existing specialization with those of potential newcomers and to mobilize collective efforts for the shared objective of industrial diversification. In line with this, a reorientation of existing innovation and entrepreneurship policies is frequently required. It has been a common policy approach (e.g. cluster policies) to support existing specializations. This is also reasonable when clusters emerge and grow. However, such policies may be counter-productive when the desired outcome shifts from growth in the existing specialization towards industrial diversification. Then, the focus of cluster, entrepreneurship and innovation policy also needs to shift from strengthening existing fields to promoting competencies, networks, as well as innovation and entrepreneurship in new fields. This includes mobilizing collective resources for new activities and changing education and training programs to support building competencies in new complementary fields. Furthermore, even though system sophistication is high in the field of specialization, some of the generic capabilities of systems of innovation and entrepreneurship are frequently difficult to build (e.g. the diversity of skills and knowledge available at main universities, provision of high-level business services for entrepreneurship, provision of risk capital, etc.). This suggests that policy should support access to such capabilities available in core regions.

3.3 Placed-based policy for diversified regions with high system sophistication

For diversified and highly sophisticated regions, the overall policy objective typically includes the move towards more dynamic industrial growth paths but may also target the creation of completely new industries. As regards the former objective, diversified regions differ from specialized ones, as diversification will often result in a shift of resources between industries that are already present in

the region. More concretely, the main feature of diversified regions with high system sophistication is that they have achieved a critical mass in several specializations. These specializations may be in different stages of development. Some may be emerging or growing, while others may be maturing or even declining. However, resources may not flow seamlessly from old to new industrial paths within the region due to e.g. skill mismatch or organizational rigidities. A valid policy rationale is thus to support actors in the weaker industrial paths to gain competencies related to the stronger industrial paths.

Diversified regions with high system sophistication host major universities and research centers. New scientific discoveries have the potential for creating completely new industrial paths. However, the path to innovation and growth from research-based knowledge is long. A relevant policy at the level of actors is therefore to increase capacities to commercialize research-based knowledge. These capacities may rest on local entrepreneurship, and for this end nourishing an entrepreneurial ecosystem plays an important role, or the inflow of external actors. As regards the latter, the development of the biotech industry in Vienna is a good example (Trippel and Tödtling 2007). Vienna has strong competencies in (bio)medicine based on research, education and a leading university hospital. However, there was a lack of local actors with the capacities to absorb and innovate based on these competencies. Therefore, international companies that established branches and R&D units in Vienna were essential for creating a growth path pivoting around biotech activities.

As regards networks, entrepreneurs and firms will maintain extra-regional linkages within their fields of specialization due to the embeddedness of industries in global production and innovation networks. Furthermore, strong universities are typically linked internationally through research collaborations. The barrier to be addressed by policy is thus typically not a lack of extra-regional networks. The barrier is that networks usually evolve in response to interdependencies within social structures such as industries or academic fields. This implies that networks are typically thin between industries, technological fields and sectors. Hence, there is a policy rationale for enhancing connectedness between social structures, which in turn increases the likelihood for novel combination of knowledge and resources from related and unrelated fields, thereby promoting radical innovations, and in consequence industrial diversification or even the creation of novel industrial paths (Grillitsch 2016).

As regards institutional and organizational support structures, diversified regions with high system sophistication are by definition endowed with many of the elements that make a strong system of innovation and entrepreneurship. It is a reasonable target to provide all core resources and generic capabilities for innovation and entrepreneurship locally. This means addressing potential bottlenecks in any of the crucial elements of systems of innovation and entrepreneurship as well as strengthening the interconnectedness between the elements as discussed previously. Interconnectedness may be facilitated by removing barriers for interactions and mobility between sectors (e.g. through extended leave policies), or creating possibilities for actors to have positions in different social structures (e.g. university professor engaged in entrepreneurial ventures; participation in advisory boards). Also, the establishment and promotion of platforms or organizations that cut across social sectors promote interconnectedness within diversified systems (e.g. associations for young entrepreneurs or business leaders) (Grillitsch 2017). Finally, an important policy implication is to shift public support from established low-growth paths to new, dynamic industrial paths, which may be difficult due the rigidities associated with existing policy rationales and repertoires (Morgan 2016).

Table 4: Place-based policy framework for new industrial path development

Main policy features	Low system sophistication	High system sophistication	
		Low industrial diversification	High industrial diversification
Overall Objective:	Gain strong position in a niche and increase system sophistication	Move towards more dynamic industrial growth paths	Move towards more dynamic & create new industrial growth paths
Actors:	<ul style="list-style-type: none"> Strengthen skills and competencies of local actors in relation to a niche. 	<ul style="list-style-type: none"> Strengthen skills and competencies in complementary fields Attract new players 	<ul style="list-style-type: none"> Support actors to build competencies relevant for dynamic industrial paths. Increase capacities to commercialize research-based knowledge (locally or through inflow of external actors)
Networks:	<ul style="list-style-type: none"> Strengthen networks within GPN Strengthen global networks with universities & other knowledge providers 	<ul style="list-style-type: none"> Promote global networks with related industries Promote global networks to sources of unrelated knowledge in research & industry Break self-sustaining coalitions between incumbents and policy makers 	<ul style="list-style-type: none"> Increase regional connectedness between industries and sectors
Institutional and organizational support:	<ul style="list-style-type: none"> Provide training, education, and capacity building to local actors Promote “global mindedness” Facilitate access to resources and support structures available in core regions Enhance attractiveness (incentives for inflows of individuals and organizations) 	<ul style="list-style-type: none"> Encourage regional visioning for diversification towards new growth paths Reorient cluster, entrepreneurship, and innovation policy from supporting existing to developing new industrial paths (including reallocation of public resources) Introduce / strengthen education and training in complementary fields Facilitate access to finance and other general capabilities available in core regions 	<ul style="list-style-type: none"> Provide all core resources and generic capabilities for innovation and entrepreneurship locally (targeting bottlenecks and enhancing connectedness) Removing barriers for interactions and mobility between sectors Create or promote platforms that connect industries and sectors Shift public support and resources from established low-growth paths to new, dynamic industries

Source: Inspired by Grillitsch and Trippl (2016).

4 Conclusions

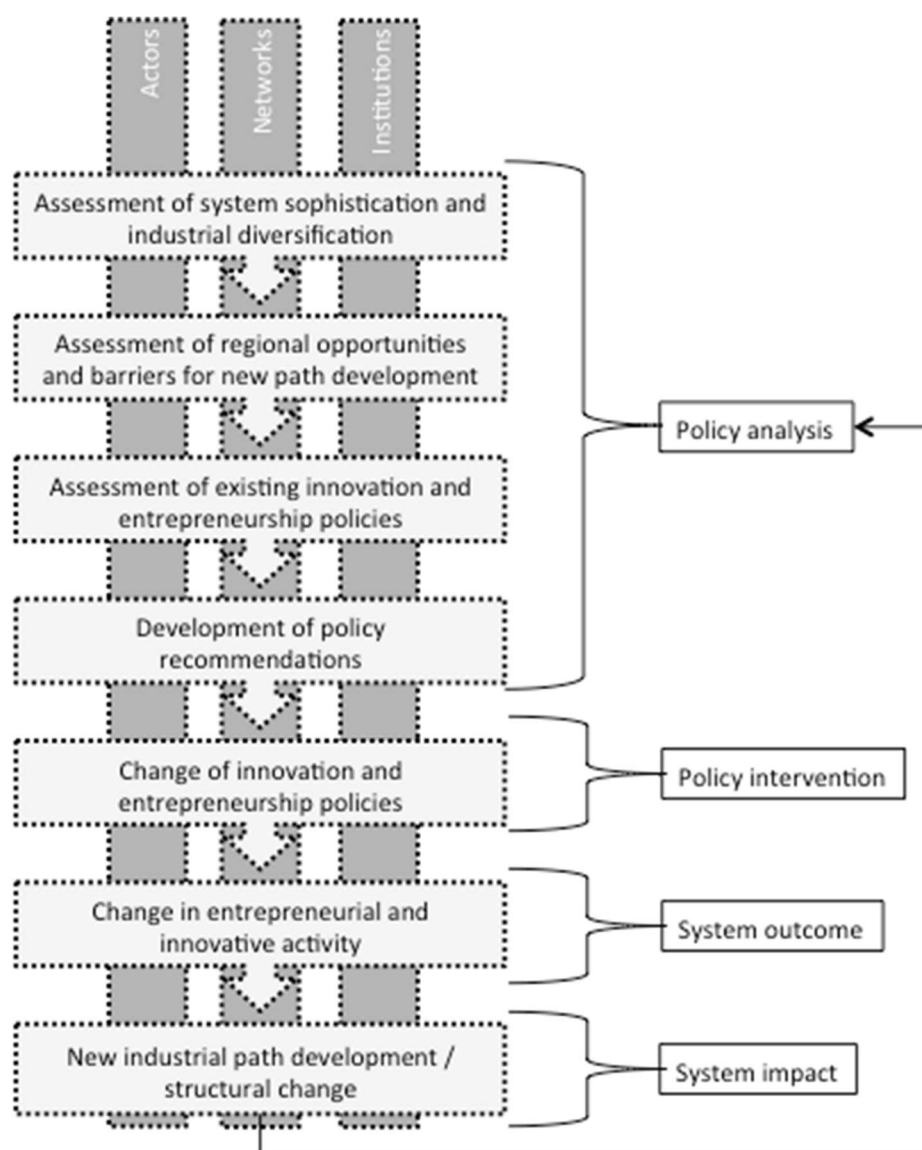
Building on systemic approaches of innovation and entrepreneurship, the main objective of this paper is to provide a conceptual and analytical framework to design and improve place-based policies for innovation and entrepreneurship with a focus on economic diversification and new industrial path development. This framework suggests that policy analysis should cover the assessment of regional preconditions as captured by the degree of system sophistication and industrial diversification (see section 2.2), the assessment of regional opportunities and barriers for new regional industrial path development (see section 2.3), and the assessment of existing innovation and entrepreneurship policies. These assessments provide a basis for the design of innovation and entrepreneurship policies or respective recommendations (see section 3), which are solidly grounded in place-specific context conditions.

The proposed framework for policy analysis is part of a reflective policy cycle as illustrated in Figure 2. The analysis feeds into the design of innovation and entrepreneurship policies. Changes to those policies and consequently changed regional preconditions for innovation and entrepreneurship are the concrete and measurable outputs of the policy intervention. The effects of these changes on innovation and entrepreneurship activities are the systemic outcome of the policy intervention. The contribution of innovative entrepreneurship to economic diversification and new industrial path development in turn is the intended system impact. This changes regional preconditions, opportunities and barriers for further development and therefore becomes the new foundation for analysis.

Two qualifications shall be added to the proposed framework. First, while hard data provides background information about structural preconditions, the opportunities for new path development will rest largely on factors that are not measurable quantitatively. Opportunities are not only reflections of structural preconditions but also shaped by perceptions about the future (Garud, Kumaraswamy, and Karnøe 2010; Grillitsch and Sotarauta 2018). In this regard, entrepreneurship extends from actors chasing market opportunities to institutional entrepreneurs, policy makers, and possibly even civil society. Hence, while the structural preconditions are important, this picture needs to be complemented with the inspirations and perceived future of regional actors, which is only possible through qualitative approaches (e.g. interviews, focus groups). Such an approach is in line with the idea that entrepreneurial discovery processes should inform policy design as propagated by the smart specialization approach (Foray, David, and Hall 2009; OECD 2013; Grillitsch 2016).

Second, in concrete empirical contexts, it cannot be expected that ideal regional types will be observed as regional preconditions contain many aspects that manifest on a continuous scale. Few regions will score high or low on all aspects that define the sophistication of systems of innovation and entrepreneurship. Furthermore, regions may be dominated by one industry but related and unrelated activities will often co-exist. This implies that policy recommendations need to be adapted to the specific regional context and consequently differ from the “ideal” cases. In a specific case, it may for instance include a mix of policy actions that address on the one hand increasing system sophistication through path upgrading, while on the other hand utilizing opportunities for diversification. The value of ideal cases is to develop an understanding of the cause-effect relationships between regional preconditions and opportunities/barriers for regional industrial path development. Knowledge about these cause-effect relationships is necessary for designing effective policies.

Figure 2.: Analytical framework for the design of place-based policy recommendations for new industrial path development



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