

## **STRUCTURAL ADJUSTMENT, EMERGING BUSINESS ECOSYSTEMS AND NEW INDUSTRIAL POLICY**

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### **Abstract**

Industrial policy is back, but in a new form. The information technology revolution and globalization of business activities have led to a structural crisis in industrialized economies. This crisis cannot be solved with macroeconomic austerity or stimulus policies. Instead, it calls for new type of industrial policies aimed at diversifying and renewing the national economies with new, higher value-added and internationally-competitive business activities. Industrial upgrading is a wicked policy challenge that requires a systemic policy approach. This paper lays out a new evolutionary policy approach which facilitates the growth of emerging business ecosystems. In this framework, policy makers support the collaboration, experimentation, sense making, strategic choice and development activities among the ecosystems' key stakeholders. The government customizes its industrial policies to particular business contexts in order to remove system failures, bottlenecks and rigidities that slow down the development process. This new stewardship role of government does not necessarily involve massive government outlays. The government plays the roles of a match-maker and facilitator that support the collaboration and innovation of various interdependent players in promising new business areas where national advantages match the long-term business opportunities in global value systems. Like all entrepreneurial activity, this role involves some risk-taking. However, the risks of government failures are minimized by tapping into the superior business knowledge firms and entrepreneurs, focusing on new business activities instead of established sectors, avoiding major investments and public production whenever possible, continuously evaluating the progress of development activities, and by being ready to end the public support if the project seems likely to fail. Most economic analyses of new industrial policies focus on the question of whether or not they should be pursued in the first place. This paper answers that question in the affirmative and describes how those policies should be carried out in practice.

## 1. Introduction

Industrial policy is back. National governments, international organizations (e.g. OECD, World Bank and European Union) and prominent economists are discussing industrial policy in ways that would not have been possible in the hay days of the Washington consensus in the 1980s and 90s.<sup>1</sup> Moreover, many developing and developed countries have intensified policy selectivity by sector, location and ownership since the 2008 financial crisis (Wade 2014). What explains this sudden revival of interest in the policy domain that had not been central to economic policy discourse for many decades?

There are many reasons for the renaissance of industrial policy (Wade 2012; Stiglitz, Lin & Monga 2013; Warwick 2013). First, the world economy is going through a major historical transformation. The new information and communication technologies, globalization of business activities and the rise of new industrial powers are fundamentally reshaping the comparative advantages of nations and regions. The leading firms in many industrialized countries have become increasingly multinational and closed down many of their domestic operations. This has created structural adjustment problems and unemployment in their home countries which cannot be solved by the market mechanism (Wade 2014) or the traditional macroeconomic and horizontal industrial policies.<sup>2</sup>

Second, the market-oriented, neoclassical Washington Consensus, whose proponents believed that governments could only create costly failures if they pursued active industrial policies, was challenged by the rapid economic development of the East Asian countries in the 1970s and 80s, and more recently by the rise of China as the world's manufacturing hub. Governments have played an active role in the industrialization and economic upgrading processes of these countries (World Bank 1993; Xu 2011; Heilmann & Shih 2013). At the same time, the market-oriented structural reforms recommended by the international institutions did not achieve the expected results in many other developing countries (Naude 2010; IDB 2014). However, perhaps the most devastating blow to the Washington Consensus was given by the financial and economic crises that began in 2008.

In recent years, there has also been a growing realization that even the economic success of the United States has not been as market-driven as was previously thought (Naude 2010; Wade 2012). The funding and research programs of the U.S. government have played a major role behind all major American technological

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<sup>1</sup> See, for example, Warwick (2013), Lin (2012), Stiglitz & Lin (2013), Foray, David & Hall (2009), Foray & Goenaga (2013), Rodrik (2004), Hausmann, Rodrik & Sabel (2007), Aghion, Boulanger & Cohen (2011), Wade (2012) and IDB (2014).

<sup>2</sup> Horizontal industrial policies refer to policies aimed at creating equally good framework conditions for all firms, regardless their industry or activity.

breakthroughs that became commercial successes since the Second World War (Mazzucato 2013).

Finally, there are theoretical arguments for the importance of industrial policy. The structure, diversity and complexity of the economy are important drivers of economic performance and resilience (Hausmann et al. 2007; Naude 2010; Greenwald & Stiglitz 2013; Hidalgo 2015). Moreover, as industrial policy researchers have pointed out, all policies are industrial policies in that all policy making affects economic activities unevenly – even supposedly neutral macroeconomic and horizontal industrial policies (Stiglitz, Lin & Monga 2013; Warwick 2013). So criticizing industrial policies is useless. As Greenwald and Stiglitz argue (2013): “The debate should not be whether governments should pursue industrial policy. It should center on the directions in which it should attempt to shape the economy and the best way of doing so”.<sup>3</sup>

That will also be the focus of this paper. However, before moving any further, we must define what we mean by industrial policy. Although the nature of industrial policy has changed over the years, it is generally defined as *policy aimed at influencing the economic structure of a nation*. The main purpose of industrial policy is to speed up the structural change towards higher productivity activities (Rodrik 2004; Hausmann, Rodrik & Sabel 2007; Warwick 2013).

The second section of this paper provides the rationale for proactive government role in industrial upgrading. The third section discusses the various ways in which governments can minimize the risk of government failures in policy interventions. The fourth section analyzes which kinds of new business activities are good candidates for targeted policy interventions. The fifth section examines how policy makers can facilitate the growth of emerging business ecosystems. The sixth section analyzes the geographical scope of new business ecosystems. And finally, the seventh section concludes the paper by suggesting that an evolutionary policy approach of *variation, selection* and *growth* is particularly well-suited to fostering highly complex and uncertain new business ecosystems.

## **2. Why is government needed in industrial upgrading?**

The traditional (neoclassical) rationale for government intervention in economic activities focuses on *market failures*. This approach assumes that markets are the ideal way to organize economic activities and the need for other organizational arrangements only arises when markets fail. However, complex economies involve many different types of organizational arrangements besides markets – corporate

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<sup>3</sup> See also Naude (2010), Warwick (2013), IDB (2014) and Mazzucato (2015).

hierarchies and networks, public sector organizations, civic associations, etc. – which have their specific organizational strengths and weaknesses (Hämäläinen 2003; Nelson 2011). As a result, the government should take a more pragmatic policy approach and focus on interventions and activities in which it has a comparative organizational advantage vis-à-vis the alternative organizational arrangements. In the broader comparative analysis, the government can still start with market failures but it must not limit its analysis to them.<sup>4</sup>

The traditional market failures in economic development include the uncertainty and coordination problems of investments into new business activities, knowledge spillovers from innovative activities, the lack of necessary tacit and context-specific knowledge, high transaction costs of dealing with new partners, and the “entrepreneurial spillovers” related to firms pioneering in new activities (Rodrik 2004; Hausmann et al. 2007). The entrepreneurial spillovers stem from a situation in which the success of the pioneering firm attracts other firms to enter the same business to compete away the profits without having born any of the original risks or set up costs. These failures are a useful starting point in defining the government role in economic upgrading but they are not sufficient in a complex and dynamic economy.

In recent years, there has been a growing policy interest in *network and system failures* (Hämäläinen 2003; Wade 2012; Weber & Rohracher 2012; Warwick 2013). They provide a more useful and more holistic perspective to the government role in today’s more dynamic, complex and uncertain economies. Taking an evolutionary approach to economic development (Nelson 1995; 2011), the system perspective focuses on the *relationships* and development *processes* among economic agents. Successful cases of industrial upgrading and economic development usually take place in *ecosystems* of highly interdependent and complementary entrepreneurs, firms, public policy makers and civic sector actors.<sup>5</sup>

The emergence of new business ecosystems requires contributions from various stakeholders who can provide important *complementary* and *co-specialized* inputs for the system (Hausmann & Rodrik 2006), such as *strategic intelligence activities* (foresight, benchmarking, evaluation analysis), *platforms and processes for collective learning, cooperation and strategy processes, direction and coordination, infrastructure and institutional rules, skills and capabilities, venture capital, sophisticated demand, experimenting environments and pilot projects, knowledge-*

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<sup>4</sup> Hämäläinen (2003) provides an analytical framework for evaluating the evolving comparative organizational advantage of government in different economic activities.

<sup>5</sup> Some researchers would call these evolving multi-agent systems as ‘sectoral innovation systems’ (Malerba & Orsenigo 1998; Nelson & Malerba 2012). We have chosen to use the word ‘ecosystem’ because ‘sector’ is a negatively loaded term in the critique of traditional industrial policy which over-emphasizes government failures.

*intensive business services (marketing, design, engineering, law, etc.) as well as timely and well-coordinated policy interventions (see Table 1 below).*

<b>Infrastructure failure</b>	<ul style="list-style-type: none"> <li>• Lack of appropriate physical or knowledge infrastructure</li> </ul>
<b>Institutional failure</b>	<ul style="list-style-type: none"> <li>• Absence or shortcomings in formal or informal institutional rules (laws, regulations, standards, norms, values)</li> </ul>
<b>Interaction or network failure</b>	<ul style="list-style-type: none"> <li>• Strong social ties that bind (lock-in) or too weak ties for interaction and knowledge exchange</li> </ul>
<b>Capabilities failure</b>	<ul style="list-style-type: none"> <li>• Lack of appropriate capabilities or resources for adaptation or utilizing opportunities</li> </ul>
<b>Directionality failure</b>	<ul style="list-style-type: none"> <li>• Lack of shared vision about the direction and goal of the transformation process</li> <li>• Lack of coherence in policy portfolio and local activities (PPP alignment)</li> </ul>
<b>Demand articulation failure</b>	<ul style="list-style-type: none"> <li>• Lack of understanding and foresight about user needs</li> </ul>
<b>Policy coordination failure</b>	<ul style="list-style-type: none"> <li>• Lack of coordination vertically, horizontally and in timing among interdependent policy measures.</li> </ul>
<b>Reflexivity failure</b>	<ul style="list-style-type: none"> <li>• Insufficient capacity for proactive systemic adaptation</li> <li>• Lack of strategic intelligence capacity</li> <li>• Lack of shared reflexive processes</li> <li>• Lack of experiments and policy options</li> </ul>

Table 1. Network and system failures

Source: Weber & Rohrer (2012)

Providing solutions to these network and system failures involves a *public good problem*. They are valuable for the whole ecosystem but usually it does not pay off for any particular organization to provide them because the benefits diffuse so widely.

Thus, there is a potential role for government in overcoming these failures.<sup>6</sup> The government interest in ecosystem-level policy is also increased by the fact that firms in innovative ecosystems are more likely to compete on a high road (high skills, innovation and value) strategy than on a low road (low cost) strategy (Wade 2012). In the long term, the high road strategies are more sustainable against foreign price and cost competition. The high uncertainty and systemic complexity of a new business ecosystem makes the competitive advantage of participating firms very difficult to copy from outside (Hämäläinen 2003).

Once the ecosystem has become established and the benefits of these inputs and services have become obvious to the participants it is easier for them to bear their fair share of the costs. At this stage, a co-financing requirement can guarantee that the public goods and services provided are really useful to firms (Hämäläinen & Schienstock 2001; IDB 2014).

National and local governments are not the only institutions that can deal with the market and system failures. Third sector organizations (industry associations, chambers of commerce, etc.), development banks and even large firms can also take the role of facilitating industrial upgrading and renewal (Hausmann & Rodrik 2006; IDB 2014; Fernandez-Arias, Sabel, Stein & Trejos 2016). Moreover, before assuming a more active role in industrial upgrading, the government must weigh the benefits of possible intervention against the potential risk of government failure.

### **3. How to minimize the risk of government failure?**

The specter of government failures is often evoked to stop discussions about a more proactive government role in industrial upgrading and economic development. In particular, neoclassical economists argue that governments should not “pick the winners”, markets can do it much better. They often point to the costly failures of traditional industrial policy in countries whose governments did not pay enough attention to the comparative advantage of their economies and became victims of rent-seeking and capture (IDB 2014). However, as we have seen, there are countries that have successfully pursued active industrial policy, which defied their traditional comparative advantages, and managed to create new growth areas in their economy.

The neoclassical argument against industrial policy is based on the assumption that the market (price) mechanism is usually the most efficient way of organizing economic activities. This is an unrealistic assumption in today’s highly complex, uncertain and knowledge-intensive world economy where market, network and system failures are

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<sup>6</sup> Wade (2014) notes that “[firm] networks not encompassed in public network programmes have a higher rate of decline or breakup, which on the face of it argues for the value of public involvement”.

pervasive (Stiglitz 1989; Weber & Rohrer 2012). Moreover, as Greenwald and Stiglitz (2013) argue, “[t]here is neither theory nor evidence to support the conclusion that governments will always mess up things when they intervene”. For example, the private sector capture does not seem to be as big a problem as assumed in neoclassical economics (Fernandez-Arias et al. 2016).

Still, the likelihood of both market failures and government failures has grown with the increasing specialization, complexity and uncertainty of the world economy and industrialized societies (Hämäläinen 2003). Thus, governments must pay special attention to minimizing the risk of government failures. The research on new industrial policies suggests the following safeguards.

High-quality strategic intelligence activities and cross-examination by multiple experts and stakeholders can improve the quality of strategic choices (Fernandez-Arias et al. 2016). Governments need to cooperate closely with firms, entrepreneurs and industry associations in order to utilize their superior knowledge about local circumstances and international business conditions (Rodrik 2004; Hausmann et al. 2007; Warwick 2013; Hughes 2015; Fernandez-Arias et al. 2016). Policy makers should make a maximum use of the tacit and context-specific knowledge of the private sector in identifying the most promising new growth areas, most important market and system failures, and the most effective interventions to deal with them. The close private-public collaboration can be supported with decentralized implementation agencies that operate at different systemic levels and locations (Wade 2012; 2014). Governments should target their policies on activities that have already been identified by the “entrepreneurial discovery” process. However, they should be careful of not becoming too close to, or even captured by, the established business interests (IDB 2014).

The risks of rent-seeking and capture can be reduced by the transparency of the policy making process and public-private cost-sharing during the development process. These risks can also be alleviated by not using the riskier policy instruments, such as public subsidies or protectionism, or by focusing the policy interventions on emerging business activities instead of established sectors (Hughes 2015; Fernandez-Arias et al. 2016). The latter requires strong political support. Successful industrial diversification initiatives have typically had a cabinet-level political champion (Rodrik 2004; Monga 2013; Wade 2014; Hämäläinen 2016). However, as we will discuss below, the industrial policy initiatives should not stretch a country’s (or region’s) comparative advantage too much (Lin & Monga 2013). To create dynamic effects, the targeted activities should also involve scale or agglomeration economies and have positive spillovers in the ecosystem (Rodrik 2004; Foray & Goenaga 2013).

The risks of government failures are also reduced by the fact that, in the new industrial policy approach, the government role is a lighter and softer one. It is a facilitator and orchestrator instead of the traditional producer and investor (Asheim, Boschma &

Cooke 2011; Warwick 2013). The policy interventions focus mainly on shared learning and discovery processes (Rodrik 2004). The prime policy instrument is new information and knowledge rather than public investment or subsidies (Warwick 2013; Fernandez-Arias et al. 2016). This makes the new industrial policy also compatible with fiscal austerity.

The likelihood of industrial policy successes can be further increased by having clear policy goals, rules and measures from the outset and using continuous developmental evaluation to feed interim results back to the policy process (Rodrik 2004; Hausmann, Rodrik & Sabel 2007; Foray & Goenaga 2013; Wade 2012; IDB 2014; Fernandez-Arias et al. 2016). The evaluation results can be used as inputs to the collective learning processes with stakeholders and for policy assessments in which the policy goals and methods can be reshaped, or the whole initiative stopped if its results are unsatisfactory. The same evaluation reports can also be used to increase the transparency of the policy initiatives in order to build public support and legitimacy (Warwick 2013). Since the policy makers usually aim to create a new ecosystem that could at some point survive without government involvement an automatic sunset clause may also be included in the industrial policy initiatives (Rodrik 2004).

Targeted industrial policies require competences that not all public bureaucracies have (Stiglitz, Lin & Monga 2013; Warwick 2013; IDB 2014; Mazzucato 2015). Policy makers should have strategic and dynamic capabilities that allow them to pursue consistent and anticipatory policies in a rapidly changing global business environment (Sercovich & Teubal 2013). Policy interventions must be based on a sophisticated understanding of global value chains and the potential domestic competitive advantages for serving them. Policy makers should understand where local firms and other stakeholders could benefit from closer systemic collaboration and how best to promote and support such collaboration (Hughes 2015). Moreover, the policy makers ought to have political skills in order to secure high-level political support and to protect the process from vested interests, be they economic or political (IDB 2014).

The authority for targeted industrial policy should only be vested with agencies which have the necessary competence and learning capacity. This may often require the setting up of a special organizational unit to attract and gather together the needed human talent (Fernandez-Arias et al. 2016). Some capabilities may have to be developed. For example, the task of ecosystem facilitator and orchestrator may require new social, organizational and collaboration skills that can only be acquired through customized training and practical learning-by-doing.

Finally, industrial policy makers operate with great uncertainty and complexity. The industrial upgrading challenge is a *wicked problem* (Hausmann, Rodrik & Sabel 2007; Hämäläinen 2016). Hence, all policy interventions will not be successful. Policy makers must take some conscious risks while, at the same time, minimizing all unnecessary

“dum” risks (Rodrik 2004; Warwick 2013; IDB 2014). They act like public venture capitalists with a long-term perspective. Instead of picking-the-winners, they “place bets” on future business opportunities that can diversify and strengthen the economic structure. However, they are also ready to cease their support if the ecosystem does not develop as expected (Hughes 2015).

In a rapidly changing socio-economic environment, not trying to upgrade and diversify the economic structure would expose the economy to an even greater risk. The entrepreneurial discovery and policy making processes should be continuous (Rodrik 2004; Stiglitz, Lin & Monga 2013). The policy maker must be able to make rapid policy adaptations whenever needed (Foray & Goenaga 2013).

#### **4. What kinds of new business activities should be targeted?**

Industrialized societies are not prisoners of their established economic and social structures though their policy discourses are often constrained by the established collective frames and economic interests. As Roberto Unger (2015, 242) argues there is always “the ‘adjacent possible’ surrounding every state of affairs: the ‘theres’ to which we can get from here, from where we are now, with the materials at hand.”

Industrial diversification and renewal typically take place as extensions or combinations of an economy’s existing knowledge, capabilities and economic activities (Asheim, Boschma & Cooke 2011). The knowledge, capabilities and assets of existing activities can be used as a springboard to related new business activities that can utilize similar resources. Some researchers have used the metaphor of “a monkey jumping to a new tree in the jungle” to describe this process (Hausmann & Rodrik 2006). It cannot jump too far and often lands a bit lower. The new activities tend to pose special challenges in the beginning. This underlines the policy maker’s need to identify and understand his country’s (or region’s) existing and latent competitive endowments and capabilities.

In a highly specialized world economy, these local advantages should be analyzed at the level of potential business activities and vis-à-vis the requirements of rapidly changing global value-adding systems (Greenwald & Stiglitz 2013). Moreover, as discussed before, the policy makers’ SWOT-analysis must be complemented with tacit and context-specific knowledge from local “entrepreneurial discovery” processes (Rodrik 2004). Emerging entrepreneurial activity, even if nascent, provides important complementary information and validation for the policy makers’ desk-top analysis (Warwick 2013).<sup>7</sup> If there is no existing entrepreneurial activity around a highly

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<sup>7</sup> There are some analytical techniques with which policy makers can search for potential new business activities for their economies. These techniques usually compare the economic or foreign trade structure of the country to other, similarly-endowed countries at comparable or somewhat higher levels of

potential competitive advantage policy makers can consider setting up incubation programs to catalyze the entry of domestic firms or try to attract foreign investors to set up new ventures (Lin & Monga 2010).

The question of how far a country should attempt to diversify from its existing endowments is debated among development economists. Some of them argue that governments should not attempt to reach too far because the risks of government failure tend to grow with the distance from the existing economic structure and comparative advantages (Lin & Monga 2013). However, other economists point out that the most successful countries, like the East Asian tigers and Finland, had much bolder development strategies which built on the continuous upgrading of their countries' productive assets and capabilities (World Bank 1993; Chang 2013). They argue that sticking tightly to a country's existing comparative advantages does not give much guidance or leave room for industrial upgrading and diversification. New advantages can be developed by combining existing and acquired assets in imaginative ways (Crevoisier & Jeannerat 2009).

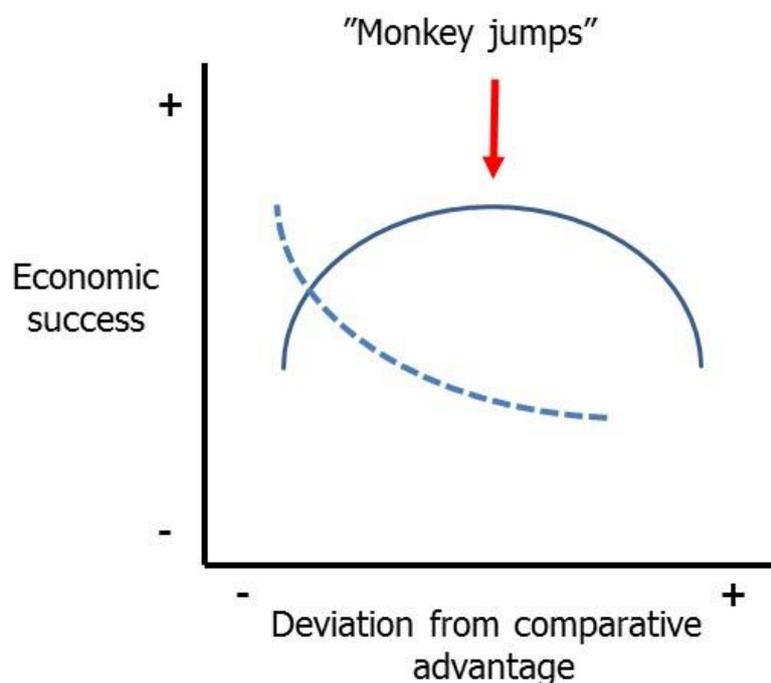


Figure 1. Comparative-advantage-defying (solid line) vs. comparative-advantage-conforming view (dashed line) of economic development

Source: Chang (2013)

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economic development (Hausmann et al. 2011; Lin & Monga 2013; IDB 2014). The aim is to find out what new business activities would be "within reach" from the country's current endowment base and economic structure.

The relationship between the deviation from a country's existing comparative advantage and its long-term economic success is likely to be an inverted U-shaped curve (Chang 2013; Greenwald & Stiglitz 2013; Figure 1). Identifying the apex of the curve is the key challenge – i.e. how far should a country try to diversify?

Besides having clear business potential and competitive advantages on which to build, the targeted activities should also promise wider public benefits to warrant policy interventions. These benefits may stem from *scale, scope and agglomeration economies, knowledge spillovers* or solutions to other *market or system failures* which support the development of a whole business ecosystem (Foray & Goenaga 2013).

## **5. How should governments intervene in emerging business ecosystems?**

After the Second World War, many governments in both developed and developing countries pursued rather 'heavy-handed' industrial policy that involved import tariffs, state-ownership and investment coordination. Market failures such as spillovers and coordination failures were thought to be pervasive and prevent industrial upgrading without government intervention. This period of 'traditional' industrial policy was followed by a more critical approach to public sector role that started in the 1970s and culminated in the 'Washington Consensus' of the 1980s and 1990s. This approach, strongly promoted by the IMF and the World Bank, laid much more emphasis on the potential of government failures such as insufficient information and the lobbying of special interest groups. The appropriate role of government and industrial policy was seen to be much more limited, only involving specific market failures, such as spillovers in education and public goods in infrastructure, or general market-friendly policies such as deregulation, privatization and trade liberalization (Naude 2010). In the more advanced OECD countries, this market-oriented policy turn emphasized 'horizontal' policies which aimed creating good 'framework conditions' for all firms and industrial sectors. Selective 'picking-the-winners' policies of the 1960s and 1970s became an anathema.

At the same time, the growing global competition paved the way for another policy approach which emphasized the competitiveness of geographically clustered industries. This policy approach was catalyzed by an influential study by Michael Porter (1990) which highlighted the systemic nature of economic competitiveness and suggested that governments should focus on improving the key competitiveness factors in the country's core industrial clusters. These factors included i.a. factor and demand conditions, related and supporting industries, rivalry and government role.

The framework conditions and cluster policies were widely adopted by the industrialized countries in the 1990s. However, their results in terms of industrial renewal and upgrading have not been very impressive. Most industrialized countries

are suffering from major structural adjustment problems in their economies as new technologies, rapid globalization of value-adding systems and intensified international competition have put pressure on their established industries and workers. Very often, the losses of established industries have not been replaced by the emergence and growth of new economic activities. With the hindsight, there are good reasons for the failure of established industrial policy approaches.

First, the cluster approach focused on established industrial agglomerations. This left potential new growth areas and business ecosystems out of policy focus and attention. There are also strong vested interests to highlight the needs of established industries but very few to speak for the new business areas. Second, the horizontal framework conditions policies rest on the narrow market failure theory of neoclassical economics which assumes efficient markets and excludes proactive government support to promising new business areas. Hence, it is no surprise that these two policy approaches tend to produce path-dependent economic development which decreases the resilience of national economies in times of rapid environmental change.<sup>8</sup>

As a result, the cluster and market failure approaches have very little to say about the key question of modern industrial policy - i.e. *how could governments could facilitate industrial upgrading* (Autio & Levie 2014)? A new industrial policy approach is needed to guide policy makers in their efforts support the emergence and growth of new business ecosystems. Due to the complexity of industrial upgrading processes, we must look beyond economics to develop such an approach. Hence, we will build on research on *innovation studies, complexity governance, collective impact, transition management* and *innovation ecosystems*. These research streams emphasize the following interrelated governance challenges in industrial upgrading processes:

- (a) experimentation, collaboration and radical innovation,
- (b) complexity and uncertainty of emerging business ecosystems,
- (c) strategic intelligence and choice,
- (d) strategic agenda setting,
- (e) orchestration and co-development, and
- (f) inertia of established cognitive frames, economic interests and social ties.

We will now analyze each of them in turn.

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<sup>8</sup> Sabel and Saxenian (2007) provide an interesting case study of the path-dependent development of the Finnish pulp & paper and telecommunications sectors in the early 2000s. In the late 2016, the Finnish economy has not yet fully recovered from the structural crisis that began in 2008.

*Creating contexts for radical innovations.* The development of new growth areas and business ecosystems is an uncertain and complex undertaking that underlines the importance of experimentation, collaboration and radical innovation. The high level of complexity and uncertainty in a modern economy and emerging business fields requires an explorative approach in which knowledge creation takes place in numerous parallel experiments. Such experimentation can be supported by traditional horizontal policy measures but most radical innovations tend to require closer collaboration among different knowledge areas and innovators. Radical innovations typically combine various fields and types of knowledge - both practical (tacit and context-specific) and more formal (explicit, analytical, scientific) (Nonaka Takeuchi 1995; Boisot & Cox 1999; Sabel & Zeitlin 2012). The close interaction of experts from different sectors and backgrounds can provide a holistic understanding of the challenges and opportunities of the problem at hand and a fertile ground for new insights and inventions. Industrial policy can support the provision of various platforms, processes and organizational arrangements for such interaction in promising areas of knowledge development (Hollingsworth 2009; Lester & Piore 2006; Kania & Kramer 2013; Sercovich & Teubal 2013; Autio & Levie 2014).

The growing specialization, mobility and geographical spread of economic activities and knowledge assets has emphasized the importance of *combinatory innovations*. As a result, innovation processes have become increasingly complex, interactive and open. New business ideas and activities increasingly emerge from collective learning processes that combine related fields of activity and expertise (Crevoisier & Jeannerat 2009; Strambach & Klement 2012; Grillitsch & Tripl 2013; Curley & Salmelin 2015).

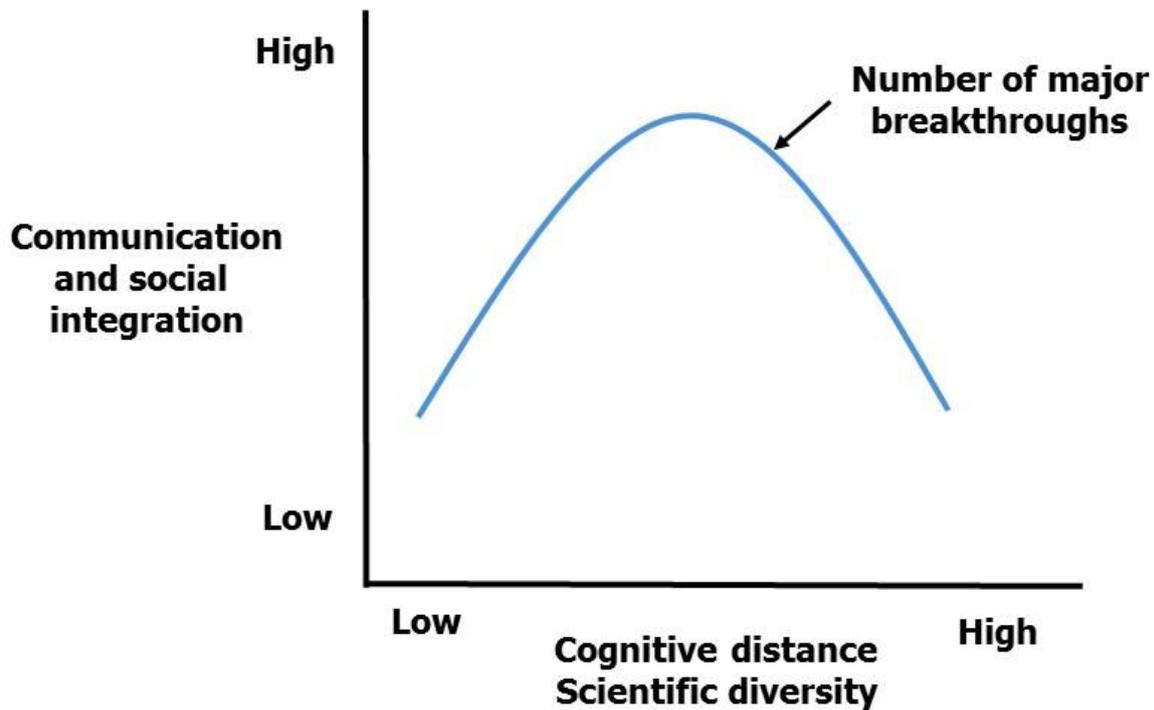


Figure 2. The ideal environment for radical innovations

Adapted from: Hollingsworth (2009)

Radical innovations that create the potential for new business activities and ecosystems tend to emerge from environments in which experts from related fields of activity and knowledge can engage in *intensive communication* with each other (Gilsing et al. 2007; Hollingsworth 2009; Grillitsch & Trippel 2013; Curley & Salmelin 2015). The most fertile ground for radical innovations is the one in which the knowledge backgrounds of the collaborators are of *intermediate diversity* - not quite similar but not totally different either. Some degree of cognitive proximity is needed to ensure effective communication and interactive learning. However, too much cognitive proximity may hamper interactive learning and radical innovations because the actors have identical competences which may lead to cognitive lock-ins (Noteboom 2000; Asheim, Boschma & Cooke 2011). Figure 2 is adapted from a study of major scientific breakthroughs but a similar inverted U-relationship has also been found in technological innovation processes (Gilsing et al. 2007; Strambach & Klement 2012).

*Spontaneous order in highly complex and uncertain systems.* Different business environments require different governance solutions (Lawrence & Lorch 1967). Kurtz and Snowden (2003) provide a useful typology for our purposes by distinguishing between "orderly" and "un-orderly" environments. In orderly environments, the degree of complexity and uncertainty is low, causalities are linear and known, and outcomes are predictable; or at least they are "knowable" and predictable through analysis, expert knowledge and controlled experiments. These kinds of environments

are suitable for hierarchical planning, reductionistic analysis and evidence-based decision making. On the other hand, in un-orderly environments, the relationships among actors are complex, behavioral patterns emergent and outcomes unpredictable, or the system is altogether chaotic. These kinds of environments require more decentralized and evolutionary governance arrangements. In reality, most systems have both orderly and un-orderly parts which are intertwined, like the planned hierarchical and emergent evolutionary orders in cities.

Emerging business ecosystems are highly uncertain and complex systems which include multiple actors (private, public, civic), intricate relationships, various types of resources and capabilities, technological novelty, institutional embeddedness and dynamic change (Möller & Svahn 2009; Sercovich & Teubal 2013; Curley & Salmelin 2015). Such systems cannot be efficiently governed by the market (price) mechanism or top-down planning. These governance solutions are too prone to market and bureaucratic (government) failures. As a result, as Friedrich Hayek (1945; 1983) argued, highly complex systems must be governed by a decentralized "spontaneous order":

"Since spontaneous order results from the individual elements adapting themselves to circumstances which directly affect only some of them, and which in their totality need not be known to anyone, it may extend to circumstances so complex that no mind can comprehend them all. Consequently, the concept becomes particularly important when we turn from mechanical to such 'more highly organized' or essentially complex phenomena as we encounter in the realms of life, mind and society. Here we have to deal with 'grown' structures with a degree of complexity which they have assumed and could assume only because they were produced by spontaneous ordering forces" (Hayek 1983, 41).

Hayek's argument for spontaneous order has often been used to argue for the superiority of the market mechanism. However, he rarely emphasized the market mechanism as a governance solution. Instead, he underlined the importance of *systemic coordination* (Hayek 1945) in the form of *behavioral rules, principles* and *shared visions*:

"[I]t is only by constantly holding up the guiding conception of an internally consistent model which could be realized by the consistent application of the same principles, that anything like an effective framework for a functioning of the spontaneous order will be achieved." (Hayek 1983, 64-65).

Unger makes a similar argument in his experimentalist model of governance (Unger 2015; see also Sabel & Zeitlin 2012). Like Hayek he emphasizes the importance of decentralized decision making guided by a shared vision that provides the direction for the autonomous but interdependent agents. Unger argues that adaptive systems support multiple small-scale experiments and identify the most promising ones for

further development. The experiments take place in the “adjacent possible” and point the way towards a shared vision. At the same time, the knowledge gained from the experiments can modify the vision. This dialectic interaction between the experiments and the vision leads to a gradual adaptation process which can ultimately produce a major systemic transformation.

Consistent with the arguments of Hayek and Unger, Mazzucato’s (2015) analysis of new industrial policy emphasizes the importance of policy makers “providing directions of change around which bottom-up solutions can then experiment”. For example, Chu (2009, 292) argues that the South Korean government uses vision statements to “guide, and even coordinate, the strategies of relevant public and private actors”.

*Making strategic policy choices.* Neoclassical economists have criticized governments who make strategic choices about which sectors, business activities or firms to support in industrial policy. In an earlier section, we have already sought to alleviate concerns about possible government failures by showing how their risk can be minimized. However, there are also important reasons for why governments should make strategic choices in industrial policy. First, governments make choices all the time about the use of public funds. These scarce funds can be put into more effective use in industrial policy by focusing them on the most promising areas of economic activity. Second, strategic choices reduce the complexity and uncertainty in economic development and help to coordinate complementary business activities, investments and development efforts. This kind of policy guidance can create *network economies* (positive feedbacks and synergies) which lead to rapid productivity growth and a sustained competitive advantage for an emerging business ecosystem. Finally, strategic choices can create visibility, commitments and references which increase the attractiveness of the new ecosystem in the eyes of skilled workers and investors.

Strategic choices about the most promising new business areas and ecosystems to be developed should not be made in a haphazard way. Policy makers need a systematic and neutral selection process which integrates the best possible knowledge and information about (a) the emerging business activities, ecosystems, innovations and competitive advantages in different regions of the country on the one hand, and (b) the emerging and future opportunities in international markets and global value adding systems on the other hand. This requires an advanced business intelligence and foresight system both at home and in relevant foreign countries. The knowledge and information that policy makers need for making strategic choices includes both analytical ‘hard data’ and local, contextual and experiential ‘soft data’. Access to the latter calls for broad stakeholder participation in the evaluation of potential new business areas. The needed BI- and foresight system is a public good that must be arranged by the government. However, its activities can be carried out in a collaborative network of various public, private and third sector contributors. For example, the Swedish and Danish governments have arranged open calls to identify

the most promising new innovation and business areas in their economies. The Finnish innovation agency Tekes did the same in the broad area of bioresources.

*Shared strategic agenda for key stakeholders.* The development of a new business ecosystem requires the participation and contribution of multiple stakeholders with different backgrounds, worldviews and interests (Möller & Svahn 2009; Kania & Kramer 2011; OECD 2010; Helbing 2013). The key stakeholders must be identified and invited to a shared development process. They include the entrepreneurs and pioneering firms, public authorities and third sector actors, such as research institutions and relevant associations. The more embedded the new business opportunities are with the existing infrastructure and institutions, and the more the latter need to be changed to develop the ecosystem, the more important is the role of political and social actors in the ecosystem (Möller & Svahn 2009). A large number of interdependent key stakeholders calls for a *systemic and relationship-oriented policy approach* (Helbing 2013) that focuses on the communication, coordination and learning processes among them.

The various stakeholders tend to have their own specific worldviews, values and interests. This makes the development process fragile before mutual trust and language have been developed (Lester & Piore 2006; Gulati, Puranam & Tushman 2012; Senge, Hamilton & Kania 2015). Hence, the process must first focus on building them. Face-to-face interaction, clear community boundaries, participatory rule making, transparent activities, and the clarity of long-term payoffs support trust building (Ostrom 2012). Early practical gains, such as the provision of interesting foresight and market knowledge, can help to sustain the participants' interest until more tangible benefits of collaboration emerge.

The first phase of the collaboration process focuses on the development of a *shared strategic agenda* and a more holistic understanding of the development challenge. This requires intensive, sustained and well-facilitated dialogues among the top leadership of the key stakeholders. These dialogues develop a shared understanding of the development challenge and its context, identify the core competitive advantages of the ecosystem, and prioritize the key development challenges (bottlenecks). In addition, they need to produce a strong commitment of the participants to a *shared vision and goals, strategic road map(s), division of responsibilities, behavioral rules* and a *measurement and evaluation system*. The leaders of the key stakeholder groups can form a *steering committee* to oversee the development process in regular meetings (Kania & Kramer 2011; Hanleybrown, Kania & Kramer 2012).

A shared strategic agenda has many benefits for a nascent business ecosystem. It reduces the perceived uncertainty of the system's participants and increases their willingness to invest in its development.

“The purpose of agenda construction is to reduce the uncertainty and ambiguity inherent in radical emergence. This uncertainty about the technological alternatives, required investments, business potential in terms of volume and revenue, and potential business models, impedes the birth of a new business field. These perceived uncertainties concern not only companies and their management but also research institutions, financing institutions, and public authorities and political agents” (Möller 2010, 367-8).

The shared agenda provides a direction and focus for the decentralized sense making, decision making and development activities in the ecosystem (Möller & Svahn 2009, 457). And, it can be adapted during the development process based on accumulating experience and evaluation feedback.<sup>9</sup>

*Orchestrating and facilitating the co-development process.* The key stakeholders must also agree on who takes the responsibility for *orchestrating* and *facilitating* the collaborative development process. The orchestrator requires a separate staff with a very specific skill set. It needs to manage and support the initiative with ongoing facilitation, coordination, relationship brokering, new participant selection, market and technology knowledge, data collection and reporting, investment promotion and business attraction, international branding and marketing, social events, skills development, sustainability initiatives as well as lobbying for favorable standards and specialized infrastructure (Möller & Svahn 2009; OECD 2010; Kania & Kramer 2011).

The orchestrator should not try to “micro-manage” the ecosystem’s activities (Hayek 1983, 42). It can only have informal authority over the ecosystem participants based on expertise, reputation, status, gate-keeping privileges and control of some key resources, competences or technologies (Gulati, Puranam & Tushman 2012). Thus, an orchestrator should pursue *adaptive (system) leadership*. An adaptive leader (Heifetz & Laurie 1997; Grint 2005; Lester & Piore 2006; Senge, Hamilton & Kania 2015):

- understands the true complexity and scope of the challenge,
- builds trust and shared language among the participants,
- arranges safe ‘niches’ or ‘interpretive spaces’ for long-term interaction and reflection (e.g. study trips and collaboration platforms),
- facilitates, motivates and participates in the collective learning processes,
- provides ‘boundary objects’ or key challenges that focus the collaborative activities,
- protects dissident voices from lower levels of organizations,

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<sup>9</sup> Collecting data and measuring results consistently on a short list of indicators at the community level and across all participating organizations not only ensures that all efforts are aligned, but also enables the participants to hold each other accountable and learn from each other’s successes and failures (Kania & Kramer 2011). The baseline indicators should be measured in the beginning of the development process (World Bank 2014).

- exposes conflicts and ambiguity, viewing them as engines of creativity and learning,
- manages the rate of change to protect the participant from excessive (paralyzing) uncertainty,
- challenges unproductive norms and orients people to new behavior and roles,
- uses the “soft power” of persuasion, ideological legitimacy and attractive values rather than command and control, and, when necessary,
- refreshes the dialogue with new information and participants, as well as
- energizes the collaboration by highlighting the tension between the shared goals and the current state of affairs.

The lack of separate orchestrating and facilitating organization is one of the most frequent reasons for why network collaboration fails (Kania & Kramer 2011). Moreover, the credibility, resources and capabilities of the orchestrator influence the ecosystem’s attractiveness to potential new participants (Möller & Svahn 2009). Despite their importance, the ecosystem orchestration and facilitation services do not often emerge automatically from the private sector. They involve a *public good problem* because these activities require real resources while the benefits diffuse widely in the ecosystem (Schientock & Hämäläinen 2001). Thus, individual entrepreneurs or firms often do not have sufficient incentives to undertake this role although it would be socially beneficial. This is a system failure that calls for policy intervention.

The first agenda setting and organizing phase of the process may take anywhere from six months to two years. During this phase, the prioritized development tasks are delegated to *multi-functional working groups* which include the relevant stakeholders (Möller & Svahn 2009). The working groups meet regularly during the planning and development process. The orchestrator can also organize shared events among the working groups to communicate their results and facilitate learning across the ecosystem (Kania & Kramer 2011; Hanleybrown, Kania & Kramer 2012). These learning processes can be supported with continuous *developmental evaluation* that focuses on the relationships among people and organizations over time (Möller & Svahn 2009; Kania & Kramer 2013; Sercovich & Teubal 2013). Organizing the work in this way increases the likelihood that the collaborative effort will “find emergent solutions that simultaneously meet the needs of all relevant constituents, resulting in a much more effective feedback loop that enables different organizations to respond in a coordinated and immediate way to new information...enabling a more aligned, immediate, and coordinated response” (Kania and Kramer 2013).

The working groups develop their own plans, goals, division of labor and evaluation criteria that contribute to the overall development strategy. However, their plans should not be very detailed due to the fundamental uncertainty and complexity of the

process (Lester & Piore 2006). In complex environments, “[t]he solutions and resources are often not known in advance. They are typically emergent, arising over time through collective vigilance, learning, and action” (Kania & Kramer 2011).

The collaborative efforts are most effective when they build on what already exists - honoring current efforts, utilizing established collaborative institutions (chambers of commerce, industry or professional associations, etc.) and engaging existing organizations - rather than creating entirely new activities from scratch (Kettel 2009).

*Overcoming inertia and rigidities.* There are important *cognitive, economic, social* and *systemic* rigidities that may block the development of the new ecosystem (Hämäläinen 2007a; Autio & Levie 2014). The cognitive inertia stems from the outdated or narrow cognitive frames of some key stakeholders which may lead them to oppose the development process. The economic inertia comes from the opposition of established economic groups who stand to lose from the policy makers’ focus on new business activities. Social rigidities, in turn, are caused by tight social relationships which prevent a key stakeholder’s contribution because he does not want to “rock the boat” by doing something that would not be welcomed by his social network.

Cognitive rigidities can be overcome with shared dialogue and learning processes. These processes are necessary for building a shared, deeper and more holistic understanding of the development challenge. They can be supported by a “sense of urgency” – i.e. by creating a *collective cognitive dissonance* among the participants (Hämäläinen 2007b; Hanleybrown, Kania & Kramer 2012). This can be achieved by emphasizing the gap between the shared vision and current realities (Senge, Hamilton & Kania 2015). Foresight studies, analysis new business opportunities, evaluation of current industrial trends and performance, competitiveness benchmarking and foreign study trips can be used to motivate the dialogue and collective learning processes among stakeholders (Hämäläinen 2007b).

The economic and social rigidities can be overcome by a strong *political champion* that creates a safe “niche” for the nascent ecosystem where it can develop without the interference of the established interests (Chu 2009; Hanleybrown, Kania & Kramer 2012).<sup>10</sup> For example, the development of the Danish wind turbine ecosystem was strongly defended by minister Svend Auken when the public subsidies for wind power were criticized by the established energy industry and the Ministry of Finance (Karnøe & Buchhorn 2010). Besides providing financial incentives, policy makers may have to invest in customized infrastructure, which can be opposed by the established interests who are afraid of losing some of their existing budget allocations. The development

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<sup>10</sup> This is similar to the infant industry argument in development economics. According to this argument, the “protection of selected industries is justified on the grounds that market failures inhibit the growth of certain industries that would be competitive if given temporary period of protection, yielding positive net welfare gains” (Wade 2012, 225).

of new business activities may also require regulatory changes (or deregulation) that is not in their interest either. The public policy makers must then weight the society's long-term economic and social interests against the short-term interests and lobbying power of the incumbents. The collective voice of the new ecosystem's participants may then prove decisive.

Even without strong established interests, the mere coordination of complex systemic change processes may prove to be difficult in practice. There may also be supplier-related, technological, institutional and infrastructural bottlenecks in different parts of the ecosystem that slow down the systemic change process (Rosenstein-Rodan 1943; Hirschman 1958; Adner & Kapoor 2010). Overcoming such bottlenecks and coordinating the complex co-development process requires an active orchestrator and facilitator with requisite capabilities and resources. As we have noted, this role is a public good for the ecosystem participants.

The development of a new business ecosystem is not a sprint, it is a marathon. It can last a decade or more (Sercovich & Teubal 2013). For example, the active development of the Finnish information technology ecosystem began already in the early 1980s but broke through as the Nokia-led telecommunications cluster only in the mid-1990s. The development of the New Zealand film ecosystem took twenty years (Glydesdale 2014). This is a particular challenge for the orchestrating organizations that must maintain the development momentum and for policy makers accustomed to much shorter electoral cycles.

## **6. Where do emerging business ecosystems flourish?**

We have already analyzed the governance of highly uncertain and complex business ecosystems but we have not, yet, discussed their geographical location and scope. The very uncertainty and complexity of these ecosystems requires some reflection of the traditional analysis of economic geography.

Ever since the classic work of Alfred Marshall (1890, reprinted 1968), economists and regional development scholars have emphasized the benefits of geographical concentration of related business activities in cities, industrial districts or geographically concentrated clusters (Jacobs 1984; Porter 1990; Krugman 1993; Hämmäläinen 2003; Strambach & Klement 2012). These benefits include the:

1. better availability of scarce natural and human resources,
2. proximity to specialized supplier and related industries,
3. information and knowledge spillovers,
4. increased inter-firm rivalry (incentives),
5. improved inter-organizational coordination, and
6. proximity to large and often sophisticated markets.

These benefits of geographical concentration are particularly evident in well-established business ecosystems and industrial clusters but many of them are also important in the early phases of ecosystem development. For example, the easy availability of various resources, capabilities, specialized suppliers and services, partners and markets provide the necessary degrees of freedom and adaptability for the emerging business ecosystem. The interaction of various actors and resources is intensified by low transportation and communication costs (Bettencourt 2013). Moreover, the geographical proximity of key stakeholders supports the trust-building, collective learning, sense-making and innovation processes that require face-to-face interaction, dialogue and plenty of tacit and context-specific knowledge (Morgan 1997; Boisot & Cox 1999). Physical proximity is also important for the mutual adjustment and coordination of highly interdependent activities. Finally, local governments are often more agile and collaborative actors in private-public development projects than national governments. Local officials and politicians have better contextual knowledge and information, they are directly responsible to their local constituencies, and need not commit themselves to the rigid equality and universalism principles of national governments (Oates 1999).

Despite all the above benefits of geographical concentration, business ecosystems have become less concentrated in recent years (Crevoisier & Jeannerat 2009; Strambach & Klement 2012). The same driving forces that have emphasized combinatory innovations in knowledge creation – i.e. growing specialization, mobility and geographical spread of knowledge assets and the need for increased knowledge diversity in innovation processes – have also made innovation processes geographically more dispersed. The improved communications technologies have greatly facilitated this trend (Olsen 2012; Gulati, Puranam & Tushman 2012). More often than before, key partners in knowledge creation processes are located in other regions. As a result, we have to analyze the nature and content of these processes more carefully in order to understand the geographical scope of new business ecosystems.

We argued above that complementary knowledge assets, related business activities and combinatory innovations play a major role in the emergence of new business ecosystems. The “monkey jumps” to new business activities are based on combinations of existing knowledge assets or diversification from them to related business fields. The collaborative learning and innovation processes take place either locally and regionally or across different geographical locations depending on the spatial dispersion and nature of the necessary knowledge assets and resources. In order to better understand the geographical scope of new business ecosystems, we must differentiate their between *analytical*, *synthetic* and *symbolic knowledge bases* (Asheim, Boschma & Cooke 2011).

1. Analytical knowledge consists of science-based, formal models and theories. It is deductive and codified knowledge and its meaning is relatively constant between places.
2. Synthetic knowledge stems from new combinations of related knowledge. It is problem-based, inductively derived from experimental activities (doing-using-interaction), and hence more tacit and context-specific. The meaning of synthetic knowledge varies substantially among places.
3. Symbolic knowledge relates to creative and artistic activities as well as to cultural interpretations, meanings, values, desires, aesthetics and norms. If the analytical and synthetic knowledge relate to the world as it is, the symbolic knowledge is about the world as people subjectively perceive it. It is highly tacit and context-specific knowledge whose meaning differs between communities and places.

Different business activities, industries and contexts involve different amounts and mixes of analytical, synthetic and symbolic knowledge. For example, science-based industries, such as pharmaceuticals or biotechnology, are dominated by analytical knowledge; while more locally-embedded foodstuffs and construction industries involve more synthetic knowledge. In a similar vein, emergent business ecosystems are characterized by great uncertainty and lots of tacit and context-specific synthetic knowledge; while mature industries and business activities involve more codified, analytical knowledge.<sup>11</sup> Finally, the symbolic knowledge plays a key role in cultural and creative industries. It has also become increasingly important in other consumer businesses in which contributions to subjective well-being are an important source of value (Manniche 2012).<sup>12</sup>

The different knowledge bases of specific business activities shape the geographical scope of their knowledge creation activities. Thus, activities strongly characterized by synthetic and symbolic knowledge tend to involve local and regional innovation processes. On the other hand, firms in businesses with a predominantly analytical and codified knowledge base can create and transfer knowledge over greater geographical distances (Strambach & Klement 2012). The collaboration with partners from other

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<sup>11</sup> The choice of an appropriate knowledge-creation strategy for dealing with the complexity and uncertainty of a particular ecosystem can be crucial. For example, the American wind turbine manufacturers chose a science-based development strategy in the emerging wind turbine industry in the 1980s. However, their wind turbines could not match the quality and reliability of the Danish wind turbines that were developed with a more synthetic knowledge and interactive process. The knowledge base of the emerging industry was not yet ripe enough for the analytical approach (Garud & Karnoe 2003).

<sup>12</sup> Hämmäläinen (2015) argues that many psychological human needs are under severe pressure in today's highly complex and uncertain society. These include their 'sense of coherence' – i.e. the 'comprehensibility', 'manageability' and 'meaningfulness' of an individual's life (Antonovsky 1987) – as well as higher social needs such as 'love and belonging' and 'social esteem' (Maslow 1970). Symbolic knowledge plays an important role in meeting these psychological needs.

locations increases the diversity of knowledge available for new combinations and reduces the risk of cognitive rigidities and path-dependence.

The “local buzz and global pipelines” can complement each other in the knowledge creation processes of new business ecosystems. While the “local buzz” refers to unintended knowledge spillovers, the “global pipelines” are typically deliberately established knowledge connections (Bathelt, Malmberg & Maskell 2004; Grillitsch & Tripl 2013). The relative importance of local or distant knowledge relationships is not related to particular phases of the innovation process. The knowledge dynamics are rather idiosyncratic and do not appear to develop in a linear way from proximal to more distant relations. Moreover, firms may create “temporary geographical proximity” to gain access to important but distant knowledge (Strambach & Klement (2012).

As a result, regional development is not anymore based only on economic specialization and path-dependent innovation processes (Crevoisier & Jeannerat 2009). It stems increasingly from collective learning processes and new combinations of knowledge on local, regional, national and international scales. Depending on the specific business, context and knowledge types in question, policy makers should provide customized support for the interaction and collaboration among related activities and knowledge bases at different geographical scales (Grillitsch & Tripl 2013). The policy makers should also encourage diversification and attract investments - both domestic and foreign - into related knowledge areas and higher value-added business activities in order to diversify, renew and upgrade their economic structures.

The growing mobility of knowledge and competences underlines the importance of regions becoming local hubs in geographically-dispersed knowledge flows and networks. They need to build, attract and anchor valuable constellations of knowledge and competence. Hence, policy makers and local firms need to get the emerging business ecosystems “on the map” of global knowledge flows and potential partners (Crevoisier & Jeannerat 2009). Early development of buzz and international interest in a new ecosystem plays a key role in building its attractiveness.

## **7. Conclusions: towards evolutionary industrial policy**

The rapid structural change in industrialized economies calls for new industrial policy approaches. The traditional cluster and framework conditions policies have not created enough new growth areas to replace the economic activities lost due to new technologies and globalization of value adding systems. Instead, they have reinforced the path-dependence of economic development and weakened the resilience of national economies.

Our analysis of “spontaneous order” provides an important starting point for a policy new approach. An emerging business ecosystem typically involves various private, public and third sector actors at multiple levels of the system: entrepreneurs, workers, firms, interest groups, associations, research institutions, as well as local, regional and national governments. In a well-functioning ecosystem, these actors form a decentralized spontaneous order that develops according to the evolutionary principles of *variation*, *selection* and *growth*. Unlike most natural evolution, however, the evolution of social systems can be influenced by human interventions.

The analysis of Hayek and Unger suggests that policy makers and other orchestrators can play an important coordinating role in shaping the *rules* and *direction* of evolutionary processes (Hayek 1945; 1983; Unger 2015).<sup>13</sup> Indeed, management researchers have studied how individual firms shape the evolution of new business fields (Möller & Svahn 2009; Möller 2010; Gulati, Puranam & Tushman 2012) and institutional scholars have suggested that governments can “guide” or “cultivate” socio-economic evolution towards socially desirable goals (Commons 1924; Vanberg 1997; Sercovich & Teubal 2013). In practice, this means that policy makers can *purposefully shape the conditions and context of variation, selection and growth processes* in emerging business ecosystems. The government can have both a *participant’s* and *facilitator’s* role in the development of new business ecosystems (Hayek 1983).

In complex and uncertain business ecosystems, the decision making of individuals, organizations and policy makers involves various information, coordination and public good problems. The evolutionary policy making approach attempts to overcome these governance problems with customized interventions but without sacrificing the benefits of decentralized decision making. This requires a flexible use of various policy instruments at different phases of the development process (Sercovich & Teubal 2013).

We can adopt the term “nudge” from the behavioral psychology and economics to describe this policy approach (Thaler & Sunstein 2008; Sunstein 2014). In the present context, *nudge policies* facilitate the development of new business ecosystems by shaping the participants’ “choice architecture” in ways that preserves their freedom of choice as much as possible. As we have seen before, such nudge policies may involve the development of shared cognitive frames, visions, goals, norms, rules and standards. They could also include the provision of financial incentives or influencing the competitive situation – for example, by providing a safe development “niche” for the nascent ecosystem. Moreover, the government can nudge industrial upgrading by providing specialized public goods and services for which it has a comparative

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<sup>13</sup> “[I]t is possible that an order which would still have to be described as spontaneous rests on rules which are entirely the result of deliberate design” (Hayek 1983, 46).

organizational advantage. This includes collaborative platforms and processes, network facilitation, strategic intelligence, training, customized infrastructure, and so forth.<sup>14</sup>

The evolutionary policy approach does not require a policy revolution. Quite the contrary. It fits nicely together with existing horizontal policies. The horizontal framework conditions policies create a variety of micro-level experiments and variation from which potential new business ecosystems can emerge. These experimental activities can then be reinforced in promising new business areas that build on the economy's existing or latent competitive advantages.

The evolutionary policy approach supports and leverages the horizontal firm-level policies with "evolutionary targeting" which identifies and selects promising new ecosystems for systematic long-term development (Avnimelech & Teubal 2008; Rosiello, Mastroeni, Avnimelech & Teubal 2013). The systemic, collaborative and multi-level approach improves the likelihood of individual firms' success. The government should take a *portfolio approach* to its strategic choices because many of the new ecosystems are likely to fail (Mazzucato 2015).

The evolutionary policy paradigm is spreading in different policy and research domains. The evolutionary approach characterizes new research in entrepreneurship (Saraswathy 2008; Autio & Thomas 2014; Thomas & Autio 2014), social innovation (Unger 2015), system transitions (Grin, Rotmans & Schot 2011), public service innovation (Sabel & Zeitlin 2012; Sabel, Saxenian, Hautamäki, Kristensen & Miettinen 2011), regional development (Heilman 2008; Xu 2011), sectoral innovation systems (Malerba & Nelson 2012), open innovation (Curley & Salmelin 2015) and industrial upgrading (Chu 2009; Rosiello, Mastroeni, Avnimelech & Teubal 2013; Sabel & Jordan 2014).

The widespread policy and research interest suggests that the evolutionary approach could become a more general policy paradigm for the increasingly complex and uncertain world. It minimizes the interference with individual choice and the spontaneous order but shapes the choice architecture towards individually and socially beneficial goals. At the same time, the government support for exploration, strategic choice and long-term development processes represents the twin strategies of *complexity absorption* and *complexity reduction* which make complex and uncertain

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<sup>14</sup> The South Korean government has used many of these policy tools to upgrade its IT sector since the turn of the Millenium. These tools have included: public purchasing, standard setting, coordination of interdependent activities, provision of technological and economic intelligence, various platforms for interaction and collaboration, stakeholder consultations, arbitration of labor market disputes, development of long term visions, and high-level political support. These policies have had a strong nudge element. Chu describes: "These mechanisms have not dictated the actions of individual private enterprises, but rather have tried to alter the opportunity structure of the market, change the formula of risk calculation, award the most competent enterprises and help them to reap the benefits of leapfrogging where possible" (Chu 2009, 292).

ecosystems more adaptable and governable (Boisot & McKelvey 2010). Indeed, the evolutionary model may represent a new governance paradigm with the requisite variety and resiliency for the ever-more complex world of the future (Laszlo 1987).

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