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The Challenge of Combinatorial Knowledge Dynamics to Study of Institutions

Towards an Actor-centric Bottom-up View of Institutions

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Abstract

This paper argues that obstruction of agency, intention and interest is a weakness in institutional studies in geography. There is a need to systematically anchor a role for agency in institutionally oriented combinatorial knowledge dynamics studies, and thus to reach beyond snapshots of top-down institutions, and to produce a more nuanced view on institutions bottom up. Without in-depth studies on how actors perceive institutions, reflect upon them and either comply with them or aim to push for institutional change, it may impossible to fully understand the true impact of them. The aim here is to construct a link between agency and institutions in the context of combinatorial knowledge dynamics. To elaborate the conceptual link between institutions and combinatorial knowledge dynamics, this paper discusses three intertwined theoretical lenses. First, a conceptual distinction between cumulative and combinatorial knowledge dynamics is introduced; second, the basic tenets of institutions in regional economic development are discussed; and, third, a conceptual framework to study institutions in the context of combinatorial knowledge dynamics is constructed. The main scientific motivation here is to open a bottom-up view on institutions by linking them to the combinatorial knowledge dynamics approach by using agency as an intermediating framework.

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1 Introduction

Studies focusing on regional innovation systems have explained how territorial economies evolve according to specific path dependencies. They show how cities and regions may specialize their economies in regard to technological innovations, and how specialization enables them to compete in the global economy. These studies also show how institutions frame the evolutionary processes of economic development in regions and related innovation processes (Grillitsch 2014; Rodríguez-Pose 2013). Morgan's (1997) outline summarizes nicely the key ingredients of this research agenda: "capitalism is an *evolutionary process* driven by technical and organizational innovation; a process in which firms face a greater degree of *uncertainty* and *instability* than is ever admitted in neo-classical theory; a process in which *social institutions* other than the market play a major role" (p. 492; italics by the author). As Grillitsch (2014) observes, in evolutionary economic geography, path dependence that is framed by institutions is approached as an open-ended process that due to both endogenous and exogenous mechanisms may lead to new development paths. He also observes that in institutional studies, more broadly speaking, industries and institutions are often seen to coevolve along one development path until an exogenous force of some kind breaks the trajectory and a new one begins to emerge.

Even though it is generally accepted that institutions guide evolutionary trajectories of regions in subtle but pervasive ways, their role is still poorly understood (Gertler 2010, 2). Rodríguez-Pose (2013) points out that institutional theory has remained at a too abstract level which makes it difficult to truly analyze the role of institutions here and now as well as institutional change. However, as Rodríguez-Pose (2013, 1038) also argues, "despite the absence of solid evidence linking institutions … to regional economic development, there is a firm belief by institutionalists that informal

institutions, such as culture, history, religion or identity, play a non-negligible role on the potential of any territory to develop economic activity". Consequently, there is a growing need to find fresh approaches in the study of institutions that have been put forward in recent theorizing as well as empirical evidence around knowledge bases (Asheim, Boschma, and Cooke 2011) and combinatorial knowledge dynamics (Jeannerat and Crevoisier 2009). They suggest that new types of territorial relations are emerging. This is due to a qualitative shift from cumulative knowledge dynamics towards combinatorial knowledge dynamics (Crevoisier and Jeannerat 2009; Strambach and Klement 2012; Grillitsch and Trippl 2013). The combinatorial knowledge dynamics approach offers a novel conceptual framework to rethink not only how new knowledge is generated but also how the role of institutions may be changing within the regional innovation puzzle. Simultaneously, the continuously evolving global economy makes it even more difficult to detect which institutions frame evolution of specific industries and regions and in which ways. More often than not institutions are seen from top down, as there is a tendency to use the concept as a generic guide to identify the 'rules of the game' rather than as an analytical tool to investigate what actually frames the actions and decisions of actors. As Hassink (2010) argues, each case needs to be considered individually because of the complex interplay of institutions between different scales.

Rodríuguez-Pose (2013, 1037) maintains that as institutions are subjective and often controversial, they are much more difficult to operationalize than the traditional targets of interest in regional development studies, e.g., investment in infrastructure, innovation and education. This paper argues that obstruction of agency, intention and interest is a weakness in institutional studies in geography. There is a need to systematically anchor a role for agency in institutionally oriented combinatorial knowledge dynamics studies,

and thus to reach beyond snapshots of top-down institutions, and to produce a more nuanced view on institutions bottom up. This may be of utmost importance, as institutions are not coherent but often in conflict with each other. Institutions do not provide actors with clear answers on how to act (Beckert 1999, 780), and, as van den Broek and Smulders (2014, 158) show, actors may fall into institutional gaps if the institutions conflict. Zukauskaite (2013) shows how institutional diversity leads to multiple regional development paths, as the actors are not only diverse but their rationales are by necessity bounded (see Simon 1991).

The strength of regional innovation and knowledge dynamics studies lies in their capability to reveal how actors are connected with each other, and the geographical orientations of these connections, but they often underestimate the complex nature of institutions that frame these connections and related innovation processes. Without in-depth studies on how actors perceive institutions, reflect upon them and either comply with them or aim to push for institutional change, it may impossible to fully understand the true impact of them. The aim here is to construct a link between agency and institutions in the context of combinatorial knowledge dynamics. To elaborate the conceptual link between institutions and combinatorial knowledge dynamics, this paper discusses three intertwined theoretical lenses. First, a conceptual distinction between cumulative and combinatorial knowledge dynamics is introduced; second, the basic tenets of institutions in regional economic development are discussed; and, third, a conceptual framework to study institutions in the context of combinatorial knowledge dynamics is constructed. The main scientific motivation here is to open a bottom-up view on institutions by linking them to the combinatorial knowledge dynamics approach by using agency as an intermediating framework.

2 Knowledge dynamics and institutions

2.1 Cumulative and combinatorial knowledge dynamics

Maskell and Malmberg (1999) provide the basic point of departure for the scrutiny of knowledge and institutions by arguing that knowledge is embedded in a region's distinct institutional endowment, and that is the basis on which knowledge is created. Grillitsch and Trippl (2013) continue this reasoning, maintaining that the knowledge approach aims to offer a differentiated view on knowledge sourcing patterns that are deeply inserted into various forms of networks and institutional environments and arrangements. So far, studies focusing on regional innovation systems have relied heavily on a conceptual link between geographical (institutional) proximity and innovation; this link has indeed been extensively studied, and its relevance demonstrated. For example, Gertler (1995) famously maintains that just by "being there" firms can exploit the benefits of effective, frequent, and often unplanned interaction that is embedded into common institutions: language, modes of communication, customs, conventions and social norms. Strambach and Klement (2012, 1847) argue that continuity that builds upon selective and stabilizing institutions reduces uncertainty for cumulative knowledge-related innovation processes, and this allows competence building and knowledge accumulation in time. All this reduces cognitive distance and in turn facilitates the building of a common understanding that again is seen as the basis for new knowledge creation (Nooteboom et al. 2007). These kinds of cumulative knowledge dynamics refer to the degree to which new knowledge builds upon existing knowledge (Strambach and Klement 2012, 1847). Grillitsch and Trippl (2013) identify the three dimensions that knowledge dynamics revolve around: sources of knowledge, knowledge channels and combinations of these with spatial understanding.

By asking "how does one account for and understand the layering of institutions and their multiscalar interaction" Gertler (2010, 7) points to one of the most crucial questions concerning not only regional economic development but also emerging forms of combinatorial knowledge dynamics that build upon integration of separated knowledge (Strambach and Klement 2012, 1847). So far, in studies focusing on cumulative knowledge dynamics the emphasis, both explicitly and implicitly, often is on national and regional institutions, as the local/regional networks under scrutiny share, or are assumed to share, more or less the same institutional environment and institutional arrangement, and thus the analysis is targeted at finding out how the identified institutions affect innovation processes, or coevolve with them. However, the question is not only how institutions affect innovation processes but also how actors involved in innovation processes work to change the very same institutions that shape their activities. Ritvala and Kleymann (2012) show that scientists (related to functional food) are not only involved in pure knowledge-generating work but they also are engaged in "institutional work with the aim to create, maintain and disrupt institutions" which has a significant impact on the emergence of new science-based clusters (see also Sotarauta and Mustikkamäki, forthcoming). Therefore, knowledge dynamics studies should also be interested in how actors change institutions and how they use knowledge in their efforts to bridge epistemic and disciplinary boundaries, i.e., work across many institutional arrangements, to influence disconnected actors and bring together their competencies and resources.

Additionally, as Crevoisier and Jeannerat (2009, 1231) hypothesize, the capacity to mobilize knowledge external to a region and to combine it with the continuously evolving internal knowledge bases changes significantly our notions about cumulative knowledge dynamics, and presumably also institutions. Indeed, as they maintain (2009,

1231), “today, it is no longer simply a question of accumulating knowledge along a trajectory but to an increasing extent of articulation it with knowledge from the exterior”. In other words, the sources, channels and combinations of knowledge are in transition due to globalization and digitalization of the economy. For Crevoisier and Jeannerat (2009) the knowledge economy is a vast global playground for different knowledge and different players to interact in complex production–consumption systems that are multi-locational in nature. As knowledge dynamics, and their spatial manifestations, are evolving into new directions, there is a need to identify the interaction between cumulative and combinatorial knowledge dynamics to detect what kinds of challenges are posed to our understanding of institutions, and what roles institutions may have in enhancing and/or constraining combinatorial knowledge dynamics. Most likely, combinatorial knowledge dynamics will not completely overrule place-specific cumulative knowledge dynamics but they will intertwine in many ways depending on the place and time in question. As Olsen (2012, 1788) says, geographical proximity is not necessarily a precondition for interactive learning and innovation but we should not rule it out either. It may well be that in some cases strong local/regional accumulation of knowledge is one of the prerequisites for successful combinations of knowledge at a global level, for example.

The emerging literature on combinatorial knowledge dynamics suggests that many innovation networks and other constellations are turning out to be more diverse than what we have become used to in local/regional cumulative knowledge dynamics. Simultaneously, knowledge dynamics unfold on many spatial scales, and there is a mix of interaction patterns at short and long distances (Strambach and Klement 2012, 1847). Patterns of innovation can thus be described as ‘multi-scalar’ as well as multi-locational (see Crevoisier and Jeannerat 2009). As Chaminade, Castellani, and Plechero (2014)

show, the number of international R&D projects, especially between Asian and US firms, but also between Asian and European firms, is increasing. With the rise of combinatorial knowledge dynamics, we can rephrase Gertler's (2005) observation about the importance of "being there" by asking "Being where, how and with whom?", and what rules, conventions and habits we need to follow. All in all, combinatorial knowledge dynamics suggests that actors operate in increasingly complex institutional environments and arrangements. The World Trade Organization, European Commission, OECD and other transnational organizations, for their part, and in their own ways, aim to stabilize the global landscape to enable many economic actors to pursue their own goals in a slightly more predictable institutional environment. The more innovation networks become global, and the more knowledge flows across the many institutional boundaries, the more we need to produce knowledge on how it is possible to maneuver in a riptide of multi-layered institutions. Indeed, as cognitive distances and institutional overlaps are increasing, more investments in the efforts to reach mutual understanding and bridging of technological, organizational and sectoral interfaces are called for (Strambach and Klement 2012).

2.2 The three ways of knowing

Asheim, Boschma, and Cooke (2011, 896) remind us that the fairly common notion of the binary nature of knowledge, divided into codified and tacit (Nonaka and Takeuchi 1995), can lead to a restrictively narrow understanding of knowledge, learning and innovation, and thus, to provide a more nuanced framework, they introduce a taxonomy that builds on differentiated knowledge bases (Asheim et al. 2007; Asheim, Boschma, and Cooke 2011; Asheim and Coenen 2005; Asheim and Gertler 2005). These are synthetic, analytical and symbolic knowledge bases (SAS taxonomy). As Manniche (2012, 1824–1825) observes, the SAS taxonomy refers to different types of knowing

rather than different types of knowledge as such. Therefore, the question is not about 'epistemological knowing' but rather 'epistemology of practice'. In any case, the SAS taxonomy is a useful framework for further elaborations of combinatorial knowledge dynamics, and for a bottom-up study of institutions.

Analytical knowledge generation is essentially science-based and deductive in nature. In an analytical knowledge base 'know-why' knowledge is especially focused on (Gertler 2008, 211), and therefore the knowledge stemming from analytical knowledge processes is to a large extent codified. As Manniche (2012, 1825) reminds us, the outcomes of rational processes of analytical knowing are based on scientific methods, principles and formal models, and reported in scientific papers, files, patents, etc. A synthetic knowledge base, for its part, is based on novel combinations of existing knowledge, and it is geared towards producing context-specific instrumentally constructed, practical solutions to specific and identifiable problems. Therefore, synthetic ways of knowing stress the importance of applied and focused knowledge that is more inductive than deductive in nature (Asheim and Coenen 2005). The 'know-how' type of knowledge is at the core of the synthetic knowledge base and its meanings can vary considerably (Gertler 2008; Asheim et al. 2007, 664–666). A creativity-based symbolic way of knowing revolves around communication of cultural meanings, ethics, symbols and aesthetics as well as design and creation of images, e.g., cultural artifacts (Asheim, Boschma, and Cooke 2011). Symbolic ways of knowing are therefore mainly, but not totally, tacit in nature (Manniche 2012, 1826). Manniche (2012, 1837) interestingly summarizes the three knowledge bases, or ways of knowing, by labeling the analytical knowledge base as 'theoretical understanding'; synthetic as 'instrumentally solving problems'; and symbolic as 'culturally creating meanings'.

There is indeed an emerging body of evidence that our understanding of knowledge dynamics is deepening (Grillitsch and Trippl 2013; Asheim, Boschma, and Cooke 2011; Tödtling, Asheim, and Boschma 2013). What has already been shown, for example, is that firms combining the science-based (science, technology, innovation) and the experience-based (doing, using, interacting) modes of innovation are more efficient in improving innovation capacity and competitiveness than those firms that follow only one mode of innovation (Isaksen and Nilsson 2012), and that often combination of different knowledge bases occurs by mixing different ways of knowing (Grillitsch and Trippl 2013; Strambach and Klement 2012). Moodysson and Zukauskaite's (2014) analysis, for example, reveals how different industries (media, food, life science) drawing on different knowledge bases are characterized by a different geography of networks as well as different development needs. Thus institutions shaping these three different industries in one location also differ from each other. However, in spite of the differences in institutional arrangements, the regional development agencies pursue their policies implicitly assuming that the same types of policy initiatives would serve all three. Importantly, Moodysson and Zukauskaite (2014) observe that, in all three cases, policy initiatives are not intervening with regulative institutions, but are rather seeking to implement new norms within the industry, and hence the 'institutional message' received by the firms may be conflicting and confusing.

The propositions of the combinatorial knowledge dynamics approach and its relationship with the concept of institution can be summarized as follows:

- SAS taxonomy adds analytical leverage in explaining differences between innovation processes, but it has potential to add analytical leverage also in studies focusing on institutions that frame different ways of knowing (Asheim, Boschma, and Cooke 2011; Tödtling, Asheim, and Boschma 2013).

- Many firms in many industries draw from more than one knowledge base in their innovation processes (Strambach and Klement 2012; Manniche 2012; Halkier 2012; Grilitsch and Trippl 2013), and symbolic knowledge dynamics play an important role throughout the economy and not only in creative and cultural industries (Manniche 2012). Therefore they presumably need to learn and accommodate themselves to several 'rules of the game', i.e. several institutional arrangements.
- Innovation processes are becoming both more multi-locational and multi-scalar in nature (Crevoisier and Jeannerat 2009; Chaminade, Castellani, and Plechero 2014; Strambach and Klement 2012). This increases institutional complexity, as in addition to several national and regional institutions, transnational institutions may also frame specific knowledge processes.
- In sum, there is an increased need to explain how innovation emerges from multi-scalar and multi-locational institutional environments and arrangements that frame: (a) different ways of knowing; but also (b) interactive innovation processes across many institutional boundaries. All this calls for novel ways to study institutions and the ways they either enhance or hamper knowledge generation, valorization and circulation processes.

It is assumed here that the importance of studying institutions is not diminishing, as the combinatorial knowledge dynamics approach will gain a more prominent role both in research and policymaking; it is more than likely that a need to study institutional change will acquire even more prominent a place in innovation and knowledge dynamics-related studies. What seems to be obvious is that shared institutions, being embedded in a geographical proximity, seem to be an insufficient basis to understand and explain combinatorial knowledge dynamics. Indeed, as the heterogeneity of actors

involved in innovation processes is increasing, as well as cognitive distance between them, institutions may provide bridges across the differing knowledge bases and cognitive dissonances, or be a source of additional confusion.

As Gertler (2003) stresses, the geography of tacit knowledge, in particular, cannot be understood without considering the institutional foundation of economic activities; but how can we take hold of this issue in a situation where the actors may be embedded in significantly differing institutional settings? Based on their case study on a maritime cluster in Norway, Halse and Bjarnar (2014) show that combining knowledge from various sources is not a joyride but a highly challenging endeavor. They argue that this is due to divergence between the social fields the knowledge linkages are surrounded by. Halse and Bjarnar's analysis reveals how 'the cluster field' is characterized by values that are related to long-term social relations, small social distances, and little formalization and openness when it comes to knowledge exchange (Halse and Bjarnar 2014, 116). In the spirit of this article, it is possible to conclude that the 'cluster field' is based on cumulative knowledge dynamics and shared institutions. As the authors (2014, 116) argue further, 'the exploitation field' draws upon short-term relations where reduction of costs is far more important than generation of new knowledge. For its part, 'the exploration field' revolves around long-term relations and global knowledge exchange. Halse and Bjarnar also show how difficult it is to build trust in globally oriented exploration networks, while regionally oriented cluster linkages are deeply embedded in trust and reciprocity. Without digging deeper into one specific case study, it is possible to argue that Halse and Bjarnar's study shows how different institutions frame not only actors from different countries but also different social fields of one specific industry and collaborative patterns within it, and how this affects combinatorial knowledge dynamics in many ways.

In spite of a shared social field, actors often find it difficult to draw on common modes of communication, customs, conventions and social norms. They need to learn from each other's ways of knowing, learning and acting on a shared object of interest, and essentially they need to find ways to understand the different ways actors are rewarded and sanctioned by differing institutional arrangements. If this kind of situation raises several challenges in the regions when they are aiming to enhance combinatorial knowledge dynamics, they are multiplied in situations where, for example, European high-tech engineers collaborate with Chinese ones, and hence modes of communication, customs, conventions and social norms are embedded in several institutional arrangements that may differ significantly from each other – what is then the common institutional arrangement that allows actors to construct mutual understanding? Should the differing institutional arrangements be harmonized, or should we learn to collaborate by combining not only different knowledge bases but also reward and sanction mechanisms? Or, what might be the correct balance between these extremes? These kinds of contemplations are relevant not only in transnational innovation networks but also in the efforts to combine the three different ways of knowing.

Strambach and Klement (2012) call for 'interpretively flexible' institutions to overcome the issues discussed above, and thus to support combinatorial knowledge dynamics. This is a fairly paradoxical, and as such highly interesting, call. It would be difficult to completely disagree with Strambach and Klement but as institutions imply permanence and stability, they are by definition resistant to change, and thus interpretations are not easily 'flexibilized'. Additionally, as institutions by definition are socially constructed belief systems that produce routine-like behavior (Pacheco et al. 2010, 980), there are often sanctions for actions deviating from what is framed as appropriate by institutions in one way or another. Consequently, flexibly interpreted

institutions might also lead to confusion over changing reward, incentive and sanction systems. Therefore, it is important to study the ways institutions might more flexibly enhance combinatorial knowledge dynamics, without the danger of losing their stabilizing effect. In any case, Strambach and Klement (2012) implicitly call for more studies on institutions bottom up, and from the point of view of agency. Conversely, it may well be that instead of flexible institutions there is a need to find out how predictable and enduring institutions might enhance but not hamper combinatorial knowledge dynamics. Consequently, following Beckert's (1999) thinking, institutions play a paradoxical double role as they provide the stable basis for strategic agency in complex systems as well as future options that partly arise from violation of institutionalized practices and rules. As often is the case, various actors need to innovate against the logic of the institutional arrangements that are supposed to support them (Hung and Whittington 2011) and thus push for flexibility. Conscious violation of institutional arrangements and flexible interpretations of them is beyond any doubt a demanding effort, as it requires entrepreneurial spirit as well as adequate intellectual and material resources (Sotarauta and Mustikkamäki, forthcoming). Therefore, it ought not to be the main strategy proposal for the increase of institutional flexibility, although it is often necessary. All in all, it is an interesting question whether stable and predictable institutional arrangements support combinations of different knowledge better than highly flexible ones. In other words, we ought to know more about the balance between institutional flexibility and consistency in the context of combinatorial knowledge dynamics.

3 Framing the concept of institution

The need to study institutions in the context of combinatorial knowledge dynamics is based on a conviction that it is not possible to fully understand the form and evolution of local and regional economic landscapes as well as combinatorial knowledge dynamics without understanding how various institutions shape the ways key actors cooperate across the many institutional boundaries to generate, diffuse and valorize knowledge. According to North (1991, 107) institutions are "the underlying determinant of the long-run performance of economies", and as such he sees them as "the humanly devised constraints that shape human interaction" (p. 477). In Hodgson's (2006, 2) simplified account, institutions are "the kinds of structures that matter most in the social realm, they make up the stuff of social life"; moreover, they are "enduring systems of socially ingrained rules" (Hodgson 2007, 331). For their part, March and Olsen (2005) note that institutions are:

> "a relatively enduring collection of rules and organized practices, embedded in structures of meaning and resources that are relatively invariant in the face of turnover of individuals and relatively resilient to the idiosyncratic preferences and expectations of individuals and changing external circumstances." (p. 4)

Students of regional innovation fairly generally differentiate between institutions as a set of rules, regulations and constraints on the one hand, and organizations in the form of economic, political, social and educational bodies, on the other hand (Storper 1997; Rodríguez-Pose and Storper 2006). Institutions usually change slowly over longer periods of time, and hence they preserve current social practices and routines. Furthermore, via institutional reproduction ingredients of them pass into the future (Martin 2000); institutions are carriers of history (David 1994).

Martin (2000) makes a distinction between the institutional environment and institutional arrangements. According to him, the former consists of the social conventions, rules and routines, and the latter the shape of specific organizational forms (such as firms, unions, city councils and state organizations, etc). Institutional environment therefore defines the informal incentives of the economy while institutional arrangements incorporating the political structure and the property rights structures define the ways political choices are developed, and how formal economic incentives are identified (Rafiqui 2009). Rodríguez-Pose (2013) argues that structural factors associated with the institutional environment are relatively unimportant in the efforts to shape the development trajectories of individual regions, while factors associated with the arrangement of institutional processes are much more influential. Martin (2000) sees it especially important to analyze how institutional environment and institutional arrangement interact with each other, and how they shape economic outcomes in different places (see also Rodríquez-Pose and Storper 2006, 1). It is important to note that while institutions can facilitate novel opportunities for economic activity, they may also construct lock-ins that then cause vicious circles of suboptimal development – rigid institutions that are not adaptive to changes in the economy may be the cause of lock-in situations (Unruh, 2000). An institutional arrangement is only a platform to seek new collective strategies; it does not produce results without the actors having the capabilities to act on them, or change them if necessary.

Institutions mediate in subtle but pervasive ways combinatorial knowledge dynamics. In spite of this fairly shared observation, their specific roles in the innovation puzzle are still poorly understood and perhaps even under-appreciated. What we know well is that institutions are built on stability and permanence; by definition they are resistant to change. Consequently, actions deviating from what is framed as suitable by

institutions are often sanctioned, one way or another (Battilana 2006; Battilana, Leca, and Boxenbaum 2009). And as such they shape actors' understandings of what is feasible and acceptable and what is not, and thus they reduce uncertainty by influencing expectations and providing incentives (Rafiqui 2009, 347–348). The institutional approach has, however, been criticized for its inability to explain transformation and institutional change, and more generally for predicating compliance and conformity. In the literature, this restrictive view has been actively complemented and the enabling role of institutions is also being acknowledged (Hage and Meeus 2006). Therefore, an institution can be interpreted both as an object of changes itself and as constraining as well as an enabling and incentivizing structures for change (Soskice 1999, 102). Additionally, the critique has generated increasing interest in the role of agency and power in institutional change (DiMaggio 1989; Battilana, Leca, and Boxenbaum 2009; Sotarauta and Pulkkinen 2011; Grillitsch 2014).

The question that follows from the conceptual discussion above is: Which institutions govern knowledge dynamics in a specific region in specific times? And also why and how do certain institutional arrangements facilitate economic development and innovation while others seem to hinder them? To answer these questions, it is suggested here that the top-down view on institutions should be balanced with a bottom-up view. In regional innovation system studies, the top-down view on institutions emphasizes such visible and fairly easily detectible 'rules of the game' as intellectual property right laws; other laws; various standards; environment, safety and ethical regulations; industry specialization and structure; governance structure; financial systems; R&D structure; R&D investment systems; and training and competence building system (see e.g. Edquist 2005; Edquist 2008; Autio 1998; Braczyk, Cooke, and Heidenreich 1998; Howells, 1999). Grillitsch (2014) argues that more often than not empirical studies on

institutional change in the context of regional development focus on national institutions. As he points out, this is not helpful in our efforts to understand institutional changes as well as the ways institutions affect regional economic development. Further, in innovation studies, institutions are often conceptualized as 'rules of the game' while organizations are seen as players (e.g., Edquist 2005). Hodgson (2006), however, also argues that an organization can be, but not always is, an institution in itself. Some of the organizations may evolve so that they end up framing the actions and choices of other actors (e.g., universities in their own countries and regions and Nokia in Finland), and hence become institutions. Parliament is an example of an organization that beyond any doubt is also an institution. All in all, to answer the above questions, the fairly clear-cut distinction between institutions and organizations needs to be reconsidered and the notoriously complex and context-sensitive nature of the concept appreciated (Sotarauta 2013).

By adopting a bottom-up view on institutions, we might find out that their significance varies greatly between actors, knowledge processes and places. The top-down view, both explicitly and implicitly, emphasizes such institutions that regulate or in other ways normatively frame knowledge processes, and hence such institutions that governments can fairly directly influence to direct the market economy. Additionally, the top-down view does not integrate cognitive–cultural institutions in the way Scott (2001) suggests for organizational studies. At least implicitly, top-down-oriented studies often aim to somehow identify an optimal set of institutions for knowledge generation, diffusion and valorization, while the bottom-up view of institutions is more open to the possibility that industries and knowledge processes evolve along with different institutions even if located in the same region. Wolfe and Gertler (2004) show how companies of a same cluster are actually influenced by diverging institutional

arrangements. To put it short and simply, the top-down view uses pre-defined 'lists of institutions' while the bottom-up view would simply ask what the institutions in the case under scrutiny are – what frames actions and decisions of the main economic agents and their interaction – and in this way constructs a more nuanced view of institutions. As the analysis of institutions in studies focusing on innovation systems has mainly progressed top down by focusing on institutions as organizations (higher education institutions, public sector actors, major corporations, etc.) (Farole et al 2013; Zukauskaite 2013), a bottom-up approach might change our view on what institutions actually are and what not.

4 An actor-centric bottom-up view of institutions

As became evident in the previous sections, institutions mould the capacities and behavior of economic actors in many ways; they structure, constrain and enable individual behavior. Amin (2001, 1238) maintains that actors act on institutions without being blind followers, but are not fully autonomous actors either. An agency-oriented research strategy side by side with other forms of inquiry might shed light on the issue how actors interact with institutions in their efforts to combine knowledge from several sources. This might be crucial, as institutions are not only some external factors but constructed by the actors themselves. In the words of Hodgson (2006, 8): "institutions are simultaneously both objective structures 'out there', and subjective springs of human agency 'in the human head'" (p. 8). Jessop (2001, 1226) continues this line of reasoning by arguing that institutions never exist outside of specific action contexts, and thus, they do not matter as such, but, "in terms of their structurally inscribed strategic selectivity" Jessop (2001, 1226) - institutions select behaviors. Jessop (2001) also argues that institutionalization "involves not only the conduct of agents and their

conditions of action, but also the very constitution of agents, identities, interests, and strategies" (p. 1230). Indeed, if we focus solely on the top-down effect of institutions, we neglect the diversity of actors and assume that they are all more or less the same, while it is institutions that differ. Consequently, institutions cannot be meaningfully studied without locating actors and their intentions, interests and strategies within a wider institutional environment and institutional arrangement. By doing so, we might be able to avoid the trap of methodological collectivism that, according to Hodgson (2006), makes "the individual the mere puppet of social forces" (100–101). Simultaneously, the trap of methodological individualism ought to be avoided too, as it incorporates reductionist allegations that structures, institutions or organizations ought to be analyzed mainly in terms of individuals and their properties (Hodgson 2006, 96).

Methodological collectivism not only shrinks agency but also does not fully acknowledge how institutions change actors and how actors aim to change them. Consequently, there is a danger of losing sight, not only of the actor, but also of the mechanisms of social power and influences that reconstitute intentions and preferences (Hodgson 2006, 100–101). Halse and Bjarnar (2014, 103) maintain that global knowledge flows are built on the intentions of actors, and studies focusing on combinatorial knowledge dynamics need to provide a central place also for intentions of various actors, who need to navigate through multiple and multi-layered sets of institutions that often are complementary and conflicting at the same time. This would be especially important in studies focusing explicitly on combinatorial knowledge dynamics. The main rationale to adopt a more actor-oriented and thus also intention-driven approach is to better understand the importance of institutions for different kinds of actors, and not to assume that their impact would somehow be uniform across different forms of agency. Zukauskaite (2013, 17) points out the importance of this kind

of approach by observing that there are only few studies that analyze how institutions actually influence innovation activities at a regional level. Drawing upon her literature review, Zukauskaite (2013, 17) argues further that it is generally believed that such an institutional arrangement, where trust and interactive learning are enhanced, and where financial support is available, is beneficial for innovation performance. However, as she importantly observes, more detailed analyses of what kinds of institutions at different stages of innovation influence the processes, and how, is still lacking. Drawing on her study on evolving medical research in Scania, Sweden (Zukauskaite, forthcoming), she shows that institutions can be complementary, reinforcing or contradictory and, importantly, this suggests that individuals initiating change need to take advantage of reinforcing and complementary norms, rules and procedures (see Sotarauta and Mustikkamäki, forthcoming). Additionally, some institutions play a stronger role in certain parts of a change process while others may gain prominence later (Zukauskaite, forthcoming).

The question is not only about novel policies to support combinatorial knowledge dynamics but also how actors, independently or in collaboration, change the institutional arrangements, and how they navigate within complex institutional arrangements. For these reasons, this paper adopts a view that by studying strategies and actions of institutional agents – i.e., such organized actors who possess adequate resources and capabilities to change institutions (institutional entrepreneurs) (DiMaggio 1989; Battilana, Leca, and Boxenbaum 2009; Sotarauta and Pulkkinen 2011); and such actors who in their own work combine knowledge across three ways of knowing and/or across national (and regional) institutional boundaries (navigators) – we might actually gain analytical leverage to understand the reciprocal relationship between institutions and combinatorial knowledge dynamics. This kind of approach might add to our

knowledge on the multi-layered and multi-scalar nature of institutions as well as their impact (see also Grillitsch 2014). It also might help us to move beyond circular reasoning of institutions. Fairly often, as Zukauskaite (2013) observes, the impact of institutions is measured by their outcomes. Thus, the successful cities and regions are those that are shaped by appropriate institutional arrangements (or so is assumed) while appropriate institutional arrangements are found in the territories that perform well (Maskell and Malmberg 2007). Consequently, the circular reasoning of institutions may be one of the main causes of a global search for one-size-fits-all models. It is tempting to think that if we were able to identify the proper institutions that undoubtedly produce good results in one place, they would do the same elsewhere. As has been shown, this is not the case, and therefore a more nuanced view of institutions is called for.

4.1 Institutional entrepreneurship

As observed by Washington and Ventresca (2004), the institutional entrepreneurship literature has not only made a valuable empirical and theoretical contribution to our understanding of agency but also of institutionalization as an ongoing multi-actor process, and therefore it might serve institutionally oriented knowledge dynamics studies well. Institutional entrepreneurs are actors who initiate divergent institutional changes and actively participate in the implementation of them (Battilana, Leca, and Boxenbaum 2009). These efforts reflect the strategies that actors adopt when aiming to break away from the institutional path previously followed and create new ones. Among other rationales, identifying and analyzing the strategies and actions of institutional entrepreneurs to influence combinatorial knowledge dynamics is also a way to identify the most relevant institutions in a given context.

Earlier studies on institutional entrepreneurship in innovation systems show that institutional entrepreneurship is a multi-actor and multi-scalar process in time (Drori

and Landau 2011; Hung and Whittington 2011; Ritvala and Kleymann 2012; Sotarauta and Mustikkamäki, forthcoming). Often it is an unplanned, highly personal and intuitive form of agency (Ritvala and Kleymann 2012) that is more a patchwork of individual measures leading to a same direction than an implementation of a predesigned vision. Institutional entrepreneurs softly frame the institutional conditions for something new to emerge (Kulve 2010). Earlier studies also reveal that the introduction of a new institutional element into an innovation system, and related institutional changes, are a result of: (a) several intentions being aligned in time; (b) continuous adjustment to surprises caused by changes in the broader institutional environment and arrangement; and (c) navigating in a riptide of policies and institutions (Sotarauta and Mustikkamäki, forthcoming). Following institutional entrepreneurship and related change processes provide us additional leverage to identify institutions bottom up. All this also calls for nuanced analyses of strategies of institutional entrepreneurs.

For example, in the emergence of functional foods in Finland, the identified institutional entrepreneurs, according to Ritvala and Kleymann (2012), worked across several institutional boundaries framing medicine, pulp and paper, and food chemistry. The process was essentially about combinatorial knowledge dynamics, as the key actors sought for ways to connect previously decoupled logics and knowledge. It is obvious that the institutional entrepreneurs reached beyond 'synthetic and analytical knowledge bases' that were the core of science and innovation processes in question. They also used political and process knowledge to connect more substantial forms of knowledge for institutional change. They aimed at disturbing the existing beliefs and knowledge bases of the root industries and scientific communities by raising awareness of extant and alternative logics, thus enabling the possibility of change. All this aimed at finding

solutions that would serve all the participants and comply with several institutional arrangements by stretching their boundaries.

4.2 Navigation

Understanding the relationship between specific combinatorial knowledge processes and institutions calls for analysis of actors who are capable of navigating multiple institutional arrangements and ways of knowing. While institutional entrepreneurship refers to such agency that aims to change institutional arrangements to better support combinatorial knowledge dynamics, 'navigator' refers to actors who work to position themselves, and more importantly also other agents, in the jungle of complementing and conflicting sets of institutions so that combining knowledge would be possible. Therefore, navigators may plan activities, advise both decision-makers and knowledge workers, anticipate hazards and reduce uncertainty. Any knowledge process that crosses knowledge bases and/or boundaries of designed institutional arrangements is complex by nature. They are shaped by nonlinear feedbacks mechanisms, cross-scale interactions and uncertainty. In the literature, there has been a strong emphasis on social capital (bridging, bonding, linking) (Woolcock 1998), boundary spanning brokerage (Tushman 1977) and various types of communities (Amin and Roberts 2008) to overcome the divides between different organizations, disciplines and knowledge bases. However, we do not know much about the ways actors navigate through the maze of institutions in their efforts to combine knowledge. If boundary spanning and brokerage focus on the ways actors in one field are encouraged to learn from developments in other fields, navigation focuses on the ways actors learn from each others to deal with mixed messages of many institutions.

Drawing on an in-depth case study on an innovation network around the optoelectronic agglomeration in Tampere, Finland, Suvinen (2014) shows how actors

navigate in an innovation network across institutional boundaries. She identifies the ways network members overcome many geographical and institutional boundaries to boost shared and individual objectives. Suvinen also shows how changes in institutional arrangements provide the network new opportunities, or otherwise shape both its direction and composition. Interestingly, Suvinen's analysis reveals that many actors hold double and multiple institutional positions in the network. In her analysis, Suvinen does not draw upon institutional theory, but one might assume that possessing multiple institutional positions is a way to combine different institutional arrangements to support the development of optoelectronics and efforts to combine knowledge from different sources, and hence navigate in a riptide of institutional influences. This assumption is supported by her observation (2014, 154) that actors are simultaneously embedded in many arrangements at several levels.

Agency oriented studies focus on the ways actors strategize and mobilize tangible and intangible resources for institutional change (Garud, Hardy, and Maguire 2007) and/or aim to comply with institutional environments and arrangements. This leads us to ask, what exactly are the institutions they aim to change or comply with – how and why? Thus we might be able to approach institutions with a different lens from earlier attempts. This would be important, as there is a tendency to identify a set of institutions and then take them for granted – reified or naturalized (Jessop 2001, 1230). Following Jessop (2001), it is proposed here that institutions ought to be studied as complex emergent phenomena that are always incomplete, provisional and unstable, and that coevolve with many other complex phenomena. It would also be important to know more about intentions of actors, and how their social positions either enable or constrain their activities.

4.3 The meta-strategies of institutional change and the key concepts of the bottom-up approach

The role of institutional agency may take the form of five meta-strategies: (a) *reform* (institutional change explicitly initiated, directed and/or lead by actors to better support combinatorial knowledge dynamics); (b) *defection* (key actors cease behaving according to the rules and practices prescribed by a preexisting institution if it hampers their knowledge combination efforts); (c) *reinterpretation* (actors learn new ways of thinking and consciously create new interpretations of themselves, rules as well as practices, without abolishing the institution itself) (Hall and Thelen 2009); (d) *compliance* (bending to a wish, command, regulation or other external factors); and (e) *ignorance* (actors simply are unaware of new or changed institutions). At first glance, ignorance does not appear as a form of agency but, in the field of regional economic development, there may be national or transnational rules, conventions and regulations that are not known at the grassroots level. This kind of situation would open up the question whether unknown institutions are institutions at all. Indeed, as the bottom-up perspective on institutions sees them as actually framing the actions and decisions of actors, an institution that remains in the shadows, and is not properly enforced, and thus does not influence actors at all, would not be seen to be an institution in the first place. Reversely, the top-down view would identify it as institution, even though it has no impact at all. These kinds of contemplations might open new horizons in our efforts to understand how institutions influence combinatorial knowledge dynamics, and what the most important institutions actually are.

All this leads to a conceptual framework that revolves around the following generic concepts that frame the more detailed analysis of institutions from the bottom up.

- *Agency* refers to action or intervention to produce a particular effect, and as such it is a temporally embedded process of social engagement, informed by the past but also oriented toward the future as well the present capacity to interpret past habits and future projects within institutional arrangements of the moment (slightly modified from Emirbayer and Mische 1998).
    - *Institutional entrepreneurship* is a specific form of agency that links micro-level action and strategic interventions to institutional environments and institutional arrangements in a selected context.
    - *Navigator* is a specific form of agency that links micro-level action and the multiple ways actors aim to comply with conflicting and complementary sets of institutions.
- *Institutions* are composed of regulative, normative and cultural–cognitive elements (Scott 2001); they frame the actions and decisions of actors.
- *Intention* refers to a determination of an actor or group of actors to: (a) act in a certain way; and (b) achieve something or to produce predefined effects on something.
- *Social position* is a specified relationship with other actors. An individual brings not only his or her own qualities or powers to the position, but acquires additional qualities or powers associated with it (Hodgson 2001, 99). Institutions define social positions, and thus institutional entrepreneurs aim to also change those institutions that frame their own position.

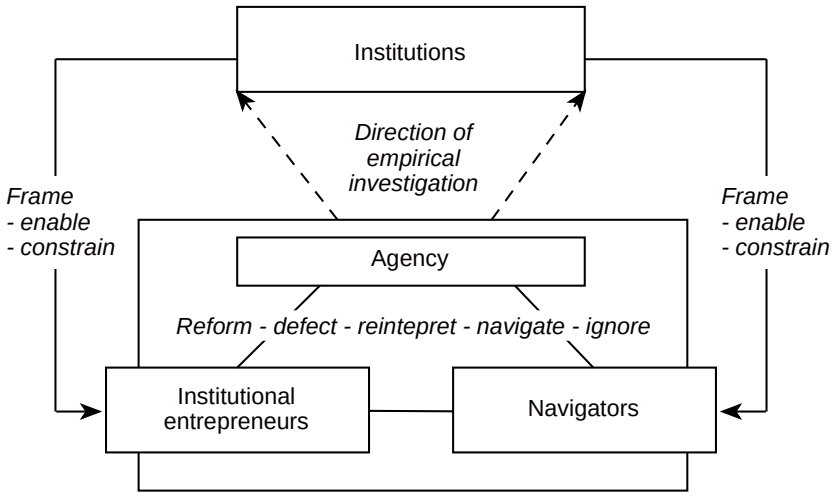

Figure 1. The conceptual framework for a study of institutions bottom up.

5 Conclusion

The institutional environment and arrangement in the context of combinatorial knowledge dynamics consist of national, global, regional and industry-specific institutions, and this kind of multi-layered institutional framework has a joint impact on actors. It also seems to be clear that several institutional layers affect any given case, and the conclusion that we need to approach institutions as multi-scalar and multi-layered phenomena is generally shared. Additionally, rapidly emerging literature on combinatorial knowledge dynamics directs our attention to: (a) ways different institutions frame 'combinatorial knowing processes' across the three ways of knowing (analytical, synthetic, symbolic); and (b) the ways actors coming from varying institutional environments and arrangements combine different ways of knowing even though drawing upon the same knowledge base (Zukauskaite 2013; Grillitsch 2014). Beyond any doubt, institutions play a significant role in regional economic development, and presumably also in combinatorial knowledge dynamics – there seems to be no disagreement over this observation. Additionally, institutions, especially

informal institutions, are specific to certain contexts and geographies, and therefore what is an efficient institutional arrangement in one place may not be so in another. Moreover, effective institutions may not produce the same kinds of economic results elsewhere (Rodríguez-Pose 2013, 1040). Indeed, as Rodríguez-Pose (2013, 1042) summarizes, institutional interventions cannot apply 'one-size-fits-all' policy frameworks. As institutions and economic development coevolve and are mutually reinforcing (Rodríguez-Pose and Storper 2006), the actor-centric perspective would reveal the micro-foundations of institutional change. Therefore, institutional change is to be studied as an emergent process where, "the existence and nature of an upper level entity depends upon entities at a lower level, but the property is neither reducible to, nor predictable from, properties of entities found at the lower level" (Hodgson 2001, 103).

Consequently, as combinatorial knowledge dynamics is becoming more and more embedded into economic activity, there is a need to dig deeper into how agency, and thus also institutions, are changing with it. To emphasize agency is not to propose anything specifically novel (see, e.g., Hägerstrand 1970) but remind us that by studying actors we can add to the literature on knowledge dynamics, innovation systems and other forms of systemic interactions as well as social and group practices. In spite of visible steps forward in institutional analysis as well as knowledge dynamics studies, it is evident that there is a gap in our understanding of how actors cope with multi-layered, and therefore conflicting and complementary, institutions, and with mixed messages to be drawn from them. To avoid the trap of 'day-to-day' minutiae of specific actors, and thus overly detailed accounts of actors' behavior without a proper understanding of how they relate to institutions and the main issues of economic development (Gertler 2010), it is proposed that the concepts of institutional entrepreneurship and navigation may offer a way forward.

All this calls for better understanding of intentions, interests and strategies of actors, and the ways they come together or into conflict. As Hodgson (2001) says, "very few social scientists would deny the role of individual intentions in the explanation of social phenomena" (p. 97). This paper joins earlier studies that call for a more nuanced understanding of how actors may change institutions in and for innovation systems (Hung and Whittington 2011; Ritvala and Kleymann 2012; Sotarauta and Mustikkamäki, forthcoming) by searching for conceptual links between combinatorial knowledge dynamics, institutions and agency. It suggests at least three possible avenues for future empirical investigations: (a) empirical analysis of institutions and agency in a comparative study of *different knowledge bases in a single location*; (b) empirical analysis of institutions and agency in a comparative study of *the same knowledge base in different locations*; (c) empirical analysis of institutions and agency in efforts to combine knowledge *across the three knowledge bases* (in one location or across many) and/or across one knowledge base across locations. This would allow us to better understand how institutions might be changed to fit combinatorial knowledge dynamics, and thus serve their development with less conflicting messages.

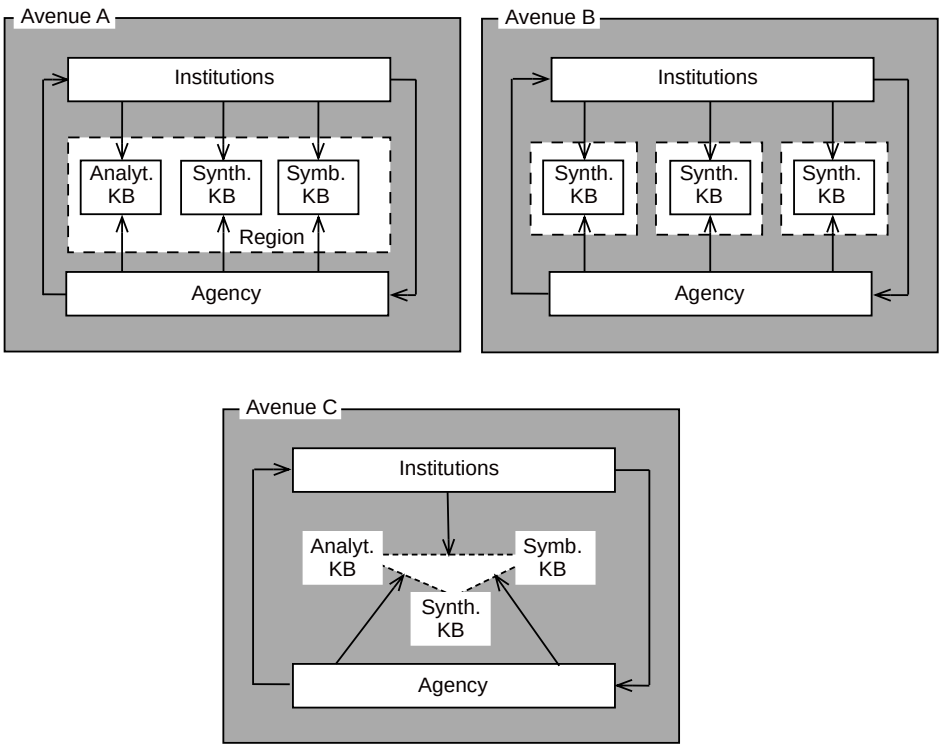

Figure 2. Three different stylized comparative research avenues on the relationships between institutions, agency and knowledge dynamics.

One of the problems, both in regional innovation and combinatorial knowledge dynamics studies, is that they offer organizational and system-level explanations for issues that also involve agency from many levels without providing a conceptual link between institutions and micro-level agency, and thus there is not an adequate basis for the construction of a theory of institutional agency in combinatorial knowledge dynamics. The concept of institutional entrepreneurship, complemented by navigation, is proposed to offer the missing link in the efforts to understand how strategic agency, institutions and combinatorial knowledge dynamics come together in time. By offering some conceptual guidelines to overcome this conceptual gap, the framework developed in this paper contributes to the setting up of micro-foundations for the construction of such a theory of agency within the theoretical framework of combinatorial knowledge

dynamics. The guiding notion here is that institutions not only confine and mould aspirations of actors but also are dependent on them. Therefore, having explicit focus on institutions and agency might significantly add to our knowledge of what institutions actually are and who the main actors of combinatorial knowledge dynamics are.

All said, this has major implications for both theoretical and empirical investigations. The solution to the agency/institutions problem is not to walk away from it, or to pretend it does not exist, but to dive into it.

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