



## **Agency in regional path development: Towards a bio-economy in Värmland, Sweden**

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Despite significant interest in regional industrial restructuring in economic geography, surprisingly scarce attention has been paid to the changing role of agency over time. The current paper develops a framework for understanding the role of multiple types of agents and the agency they exercise for new path development. The framework is employed in a longitudinal study of industry development in Värmland, Sweden, from forestry towards a bio-economy. The analysis highlights how actors exercise very different types of agency in different periods of path development.

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## 1. INTRODUCTION

The topic of structural changes in the economic composition of regions is central in current debates in both academia and policymaking. Contributions on path development processes in different regional contexts have provided insights into how and where new regional paths emerge, and the reasons for other regional paths not emerging (Martin, 2010; Simmie, 2012). Similarly, policymaking is increasingly focused on understanding the opportunities for stimulating new regional paths, most prominently exemplified by the Smart Specialisation program of the European Union (Foray et al., 2012; McCann & Ortega-Argilés, 2015).

Existing accounts have emphasised the idea that new industries in a region develop out of existing industries through a branching process (Boschma & Frenken, 2012) as well as through combinations of unrelated knowledge and resources (Grillitsch et al. 2018). The birth and development of new industries are often seen as occurring due to the presence of dense regional networks and structures, a combination of different knowledge bases, a vibrant entrepreneurial culture and innovative firms. However, despite this interest in preconditions and processes related to structural change, there continues to be surprisingly little interest in the micro-level processes that drive industrial restructuring. As argued by Boschma (2017; 358) “*little to no attention has yet been paid to the role of agency, and the different types of agents that may drive regional diversification.*” Similarly, Uyarra et al. (2017) argue that there has been little theoretical and empirical work that connects the behaviour of individual agents to institutional change and regional development.

In the current paper, we address this gap by developing a framework for understanding the role of multiple types of agents and the agency they exercise for new path development. Following the Dictionary of Human Geography, human agency stands for “*the ability of people to act, usually regarded as emerging from consciously held intentions, and as resulting in observable effects in the human world*” (Gregory et al. 2009; pp 347).

In this paper, we firstly build on work that draws attention to the need for a broad conceptualisation of change agents in new path development processes. Experienced practitioners and public policy agents play central roles in transforming regional institutional arrangements (Miörner & Trippel, 2017; Isaksen & Jakobsen, 2017). Recent work has also paid attention to the interplay between regional policy and private sector actors in different phases of regional development processes (Holmen & Fosse, 2017). Thus, employing a broad perspective on influential agents in new path development processes appears to be particularly important to understand regional industrial restructuring in a long-term perspective. Secondly, we draw on insights concerning the types of agency exercised by various agents. Respective work foregrounds how regional actors construct and exploit opportunity spaces for regional development through processes where actors draw upon regional and extra-regional assets, identify change strategies, and demolish, renew and build new structures by projecting possible visions of the future (van Grunsven, L. & Hutchinson, 2016; Grillitsch & Sotarauta, forthcoming).

Empirically, we employ the developed framework in analysing new path development

processes in the Swedish region of Värmland. A strong specialisation in forestry-related industries characterises Värmland, traditionally focused on the production of pulp and paper products. This industry has been a central source of economic growth and employed both high- and low-skilled workforce in the region. The analysis in this paper provides a broad perspective on changing conditions in the pulp and paper sector in Värmland seeking alternative ways to extract and appropriate more value from forest biomass for new industrial initiatives while also reducing industrial emissions, and improving energy efficiency and environmental performance (Grundel & Dahlström, 2016; Bugge et al., 2016). Due to the strong specialisation in this industry, it represents a suitable case for identifying core agents and the types of agency they exercise in a longitudinal perspective. The remainder of this paper is organised as follows. We start with an overview of the role of strategic agency in regional path development, and subsequently, develop the theoretical framework of the study. The next section discusses the research method. The fourth section presents the analysis of the role of agency in path development processes in Region Värmland. Here we trace the development from pulp and paper industry towards a broader bio-economy in three distinct temporal phases. Finally, the fifth section concludes the paper by discussing and summarising the main theoretical contribution of the study, policy implication, and scope for future research.

## 2. THEORETICAL FRAMEWORK

This paper aims to develop an account of new industrial path development in specialised, semi-peripheral regions, which is relevant for the transition towards a bio-economy. It foregrounds the agency of heterogeneous actors, their strategic improvisation and continuous learning from successful and unsuccessful efforts in shaping new industrial paths. The question of structural change comes to the fore in specialised regions when previous growth paths are exhausted, turning them into what has been referred to in the literature as old industrial regions (Cooke, 1995, Tödting & Tripl, 2004, Hassink, 2010). Specialised regions have some distinct features such as a strong but usually rather homogeneous knowledge base, networks that are rather rigidly and hierarchically organised in value chains, and institutions that are adapted to the field of specialisation – all of which contribute to negative lock-ins (Grabher, 1993, Tödting & Tripl, 2005).

New industrial path development can take many forms (Martin & Sunley 2006). Grillitsch and Asheim (2018) differentiate in upgrading, diversification, and emergence. Upgrading refers to qualitative changes in existing industries. Diversification captures processes “*where knowledge and resources from existing industries are used in new industries*” (ibid, p. 1641). Emergence is about the development of new industries that are technologically unrelated to existing industries in the region. In specialised regions, vested interests are strong due to the accumulated past investments in knowledge, networks, and support infrastructure in the field of specialisation. Change strategies are thus most promising that allow re-using existing capabilities

either by upgrading existing industries or by diversifying in new but higher value-added economic activities (Grillitsch & Asheim, 2018; Grillitsch & Trippel, 2018).

These change strategies, however, have to be devised and implemented by regional stakeholders and a deeper understanding of 'agency' is considered a missing link in the understanding of regional growth (Rodriguez-Pose, 2013; Uyyara et al., 2017; Asheim et al., 2016, Boschma, 2017). An important analytical distinction has been made between agency as the underlying capacity to act, and the actors who exercise the agency in distinct temporal and spatial contexts (Emirbayer & Mische, 1998; Abdelnour et al., 2017). Agency is essentially focused on actions or interventions to produce a desired social effect, but is also temporally embedded as agency is informed by the past but oriented towards the future (Garud et al., 2010; Cattani, Ferriani & Lanza, 2017; Sotarauta & Suvinen, 2018).

A distinction has been made in the literature between types of agency that transform existing structures and such that reproduce them (Coe and Jordhus-Lier, 2011). In the context of regional path emergence, Grillitsch and Sotarauta (forthcoming) identify three essential types of transformative agency. First, Schumpeterian innovative entrepreneurship as mindful deviations from existing paths and willful attempts to create new paths by seeking new opportunities. Second, institutional entrepreneurship, which involves challenging existing institutional norms, raise legitimacy and institutionalise alternative practices and norms. Third, place-based leadership is about coordinating and pooling efforts and resources for the stimulation of new regional development opportunities. Together these three types of transformative agency are presumed to play an important role in the emergence of new growth paths and are clearly distinguished from other types of agency that are agnostic, resisting or opposing change.

## **Types of agency**

*Schumpeterian innovative entrepreneurship* aims at path-breaking innovations and is a key driver for structural change (Shane & Venkataraman, 2000; Feldman et al., 2005). Recent studies in economic geography have discussed the role of innovative entrepreneurship in regional industrial path development and diversification. Innovative entrepreneurship is about acting on perceived opportunities by combining different knowledge bases, often from distinct institutional fields (Strambach & Klement, 2012) and creating new value-added activities. Innovative entrepreneurs take risks to enter new terrain and thereby support regional industrial renewal processes (Rypestø; 2017; Neffke et al., 2018; Grillitsch, 2018). However, Schumpeterian innovative entrepreneurship alone is often not sufficient to develop new regional growth paths and may require institutional change and the collective mobilisation of efforts from various actors. Therefore, institutional entrepreneurship and place-based leadership are important types of transformative agency to be considered (Grillitsch & Sotarauta, forthcoming).

The literature on *institutional entrepreneurship* focuses on the role of actors who initiate institutional change and actively participate in framing a vision for change and implementing it (Battilana et al., 2009). Scholars have emphasised the strategies of different types of actors such as mobilising resources, framing new agendas, developing new relationships and networks, and

legitimising new belief systems. These strategies are exercised to break away from dominant institutional arrangements and to create possibilities for change such as the development of new industries (Sotarauta & Pulliken, 2011; Sotarauta & Mustikkamäki, 2015). Some studies have shown that institutional entrepreneurs draw on unplanned and iterative learning processes to adjust their strategies and learn from failures. Furthermore, institutional entrepreneurship involves a collective process where multiple actors, with potential incongruous visions and aims, work together to transform dominant institutional arrangements (Sotarauta, 2016; Sotarauta & Suvinen, 2018).

*Place-based leadership* is a form of collective leadership to coordinate regional development efforts with a wide range of actors, extending from the individual private interests to the benefit of the region as a whole (Sotarauta, Beer & Gibney, 2017). Place-based approaches to leadership put regions at the centre of economic development rather than allowing the central government and wider policy networks to roll out top-down plans and decide the future regional pathways. Place-based leadership essentially focuses on mobilising heterogeneous actors and competencies for managing conflicting visions and discourses about the future of the region and simultaneously negotiating with different actors at the municipal, regional, national and transnational scales for pushing forward the regional growth agenda (Normann et al., 2017).

Finally, *structural maintenance* points to actions that contribute to reproducing existing structures. As emphasised by Martin & Sunley (2006, p. 406), “[t]he past thus sets the possibilities, while the present controls what possibility is to be explored.” Thus, agency is often strengthening existing structures and specialisations due to a number of different lock-in mechanisms (Klitkou et al., 2015). These include learning effects, i.e., that specialisation leads to increasing returns from learning about existing products and processes, and economies of scale where earlier investments in production equipment lead to increasing returns from further investments in existing production systems.

## **Types of actors**

The literature on innovation systems highlights the need for considering a wide spectrum of actors to understand the development of industries and regions. Essentially, multiple types of actors may exercise the various forms of agency outlined above. Further, an actor, or group of actors, can simultaneously be engaged in several types of agency or may exercise different types of agency over time. Thus, while attention has primarily been devoted to the role of firms – and in particular new firms – and universities in shaping regional industry development paths, there is a range of other types of actors that may be of importance, including public, private and civil society actors (Fredin et al., 2018; Holmen & Fosse, 2017; Miörner & Trippel, 2017).

Usually, *incumbents* are considered as opponents of radical industrial change, which is rather attributed to new firms and entrepreneurs, but some incumbent actors show ambidextrous behaviour by being open to and resisting change at the same time (Patala et al., 2019). Thus, while many incumbent firms are resistant to change (Karlton & Sanden, 2012; Smink et al., 2015; Steen & Weaver, 2017), some nevertheless incorporate disruptive innovations in their

operations and move into new industries to exploit new opportunities and engage in defensive maintenance strategies to avoid disruption (Kumaraswamy et al., 2018; Ziestma et al., 2018). Incumbents that invest in new managerial competencies, establish new specialised divisions and business units, and actively engage in creating new markets are more likely to drive the development of new industrial paths (Hansen & Coenen, 2017).

*Regional support organisations* including industry associations, regional development agencies, and cluster organisations can play a powerful role in framing regional policy issues through careful storytelling and mobilising legitimacy and resources for new regional initiatives, drawing on both regional and extra-regional resources (Isaksen & Trippel, 2017). Public policy agents also act as risk-takers when they support new regional initiatives and push new agendas forward against opposition from other actors in the regions (Boon et al., 2015; Holmen & Fosse, 2017). Similarly, other accounts have highlighted that regional policy agents support and facilitate the development of new regional industrial paths by promoting new ideas in front of regional and national decision-makers and prioritising them for political support (Dawley, 2014; 2015).

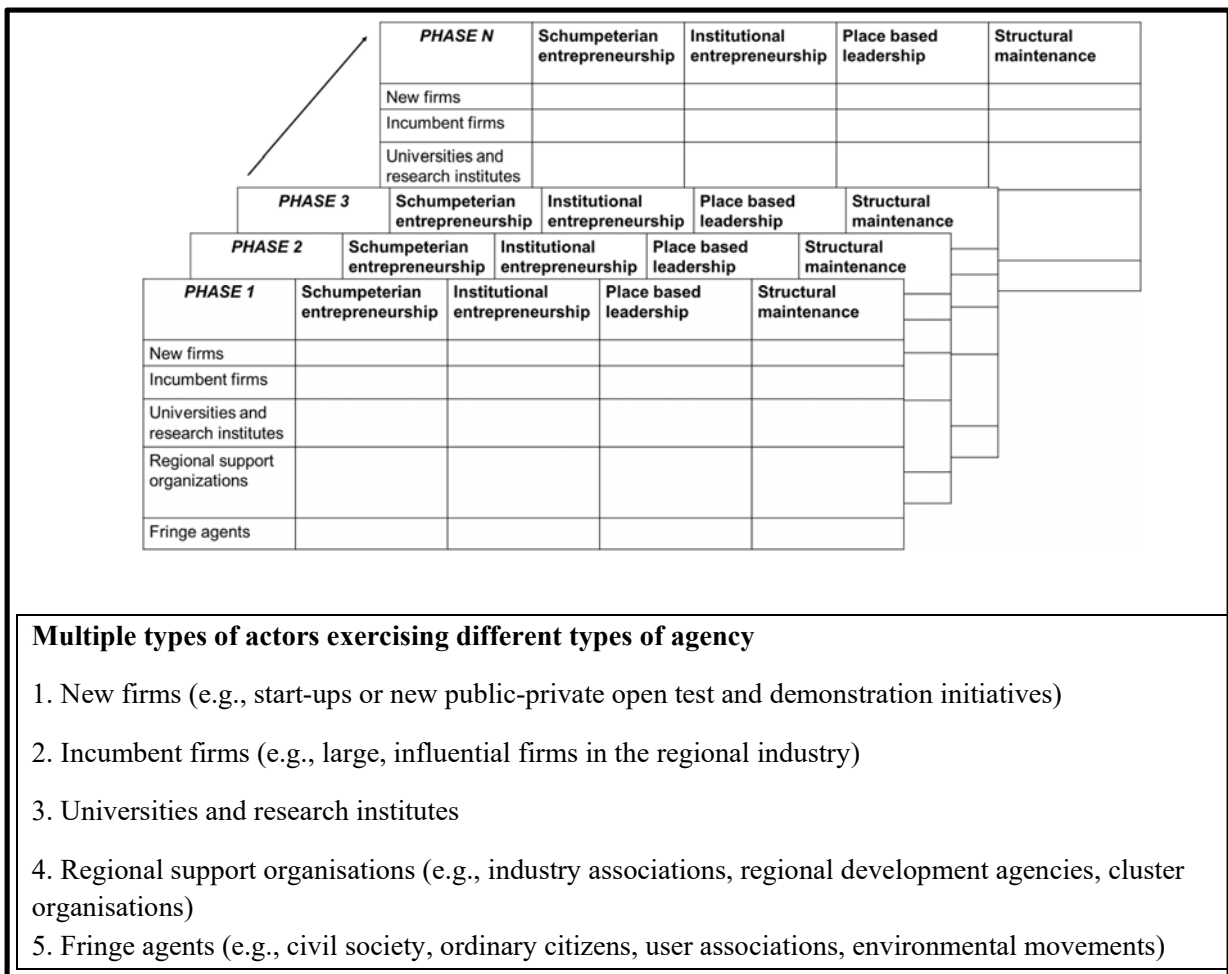
Finally, *fringe agents* understood as outsiders with limited power and resources can play an important role in shaping regional development paths in unforeseen and unexpected ways (Ziestma et al., 2017). Actors such as civil society organisations, user associations and environmental movements can be a source of radical change as they have a greater degree of freedom in challenging existing regional institutional structures (Fredin et al., 2018). Thus, even if the agency of fringe actors is often dispersed, disconnected and with limited impact due to power relations and structural inequalities (Arora et al., 2014; 2017), in some instances, civil society stakeholders can use disruptive tactics to pressure incumbent actors to radical transformation and instigate wider institutional change (Bakker et al., 2013; Briscoe & Gupta, 2016). Strategies of fringe agents include mobilisation of public opinion, direct engagement with politicians, and other engagement actions such as protests (Aranda & Simons, 2018).

## **Summary of the analytical framework**

Our point of departure is that new regional industrial paths are the outcome of actions taken by agents embedded in their regional environments. To take account of the variegated facets of change agency, we propose an analytical framework along three dimensions: time, types of actors and types of agency (see figure 1).



Figure 1. Analytical framework



A longitudinal perspective on regional change processes allows for capturing shifts regarding the importance of particular types of change agency or change actors (Semper, 2019); thus, distinguishing between development periods characterised by different patterns of agentic processes.

### 3. RESEARCH METHOD

We utilised a qualitative case study methodology (Gehman et al., 2018) to conduct an in-depth and historically rich investigation of the development of bio-economy in Värmland. A qualitative case study approach is also useful for understanding interlinkages between agency and structure through deep contextualisation to uncover regional industrial renewal processes (Njøs, 2018; Mackinnon et al., 2019). Furthermore, to understand the interplay between the role of actors and underlying institutional structures for regional path development, it is also suitable to adopt a long-term longitudinal and process-oriented approach (Strambach & Pflitsch, 2017).

## Data collection

We relied on extensive archival data sources and semi-structured interviews with 11 regional experts. The data collection process started in November 2017 with a field visit to Värmland region where five face-to-face interviews were conducted. The interviews focused on understanding the combination of change strategies adopted and how opportunities for regional path development were established.

Subsequently, six semi-structured phone interviews were conducted in December 2017 and January 2018. Interviews generally lasted between 60 and 90 minutes. The interviews were transcribed verbatim with a clear set of guidelines by a professional transcription firm. The interviewees have had vast experience in different aspects of the value chain in the regional pulp and paper industry and have followed the development towards a bioeconomy in the region quite closely. The details of the interviewees are mentioned in table 1.

*Table 1. Semi-structured interviews*

<b>Interview No.</b>	<b>Professional designation and type of organization</b>	<b>Date of interview</b>
1	Strategist, regional growth development, regional development agency	24 <sup>th</sup> November 2017
2	CEO, regional cluster organisation	27 <sup>th</sup> November 2017
3	Director, business development, research institute	28 <sup>th</sup> November 2017
4	Strategist, energy and environment, regional development agency	29 <sup>th</sup> November 2017
5	Professor, regional university	30 <sup>th</sup> November 2017
6	Consultant, pulp and paper industry	14 <sup>th</sup> December 2017
7	Innovation Manager, municipality and project coordinator, open testbed initiative	20 <sup>th</sup> December 2017
8	Consultant for cluster development	22 <sup>nd</sup> December 2017
9	Mill Director, pulp and paper firm	5 <sup>th</sup> January 2018
10	Researcher, regional university	12 <sup>th</sup> January 2018
11	Former CEO of pulp and paper firm and business consultant	25 <sup>th</sup> January 2018

Observations were also carried out during a two-day study visit in Värmland focused on bio-economy development. About 40 video recordings were carried out during the event capturing the main discussions, providing rich material to understand the various regional policy debates. The event was also useful in personally meeting regional stakeholders and identifying informants for more in-depth interviews.

In addition to the interviews and observations, the archival data sources included a wide variety of sources such as scientific articles, documents, newspaper articles, industry newsletters, regional strategy reports, legal documents, policy documents, and video material. In total, around 200 archival documents about the development of the pulp and paper industry in Värmland were analysed. To reduce the effects of retrospective bias from the semi-structured interviews, we triangulated the insights from the semi-structured interviews with the archival data.

## **Data analysis**

We relied on process research (Langley et al., 2013) and qualitative data analysis (Gehman et al., 2018) to develop a theoretical account of the development of bioeconomy in Värmland. First, we worked towards developing a deep understanding of the broader regional and historical context (e.g., Ziestma & Lawrence, 2010). We identified discrete phases based on the chronological ordering of the emergent data. The idea behind bracketing the chronological data in distinct temporal phases was to observe distinctive patterns in the distinct phases. These phases also represented critical junctures where important developments took place (Langley et al., 2013).

In the initial round of the coding and analysis of the data, various details of the regional development in Värmland were summarised in different documents to demarcate it in different temporal phases, i.e., from historical developments in the 1990s to contemporary issues in 2018. Quotes from the transcribed interviews, which depicted instances of regional agents challenging or reinforcing the regional institutional structures, were picked out for the case study account. We then identified the key regional change agents from the summarised raw data in the region and focused on understanding their roles and strategies in transforming the regional industry from existing activities in the pulp and paper activities to bio-economy. The data analysis occurred iteratively as we went back between emerging theoretical concepts and emerging data multiple times to make sense of the regional industrial development process (Gehman et al., 2018). The data analysis process allowed us to develop an empirical account focusing on the role of different types of agency in different temporal phases of regional development in Värmland, i.e. (1990-1999; 1999-2011; 2011-2018). The next section provides a detailed empirical analysis of bio-economy development in the Värmland region.

## **4. CASE STUDY ANALYSIS**

### **4.1 Phase 1 (1990-1999): Deepening existing specialisations**

The first phase was characterised by structural maintenance exercised by incumbent firms, new firms and regional support organisations, which contributed to deepening specialisation of the regional pulp and paper industry. Conversely, the different forms of change enabling agency were largely absent, leading to a period characterised by path extension (see table 2).

### **Structural maintenance**

The pulp and paper industry in Värmland started to grow during the beginning of the 19<sup>th</sup> century due to easy access to timber, efficient water transportation as well as access to cheap hydroelectricity. From the 1930s, the Värmland region had a mixture of pulp and paper mills and engineering firms building machinery for the paper firms (Karlsson et al., 2001). As the number of pulp and paper mills grew, the region soon attracted process equipment and other suppliers, making Värmland a unique centre for process innovations that would later be used by the pulp and paper industry all around the world (Sölvell, 2009; Interview 11).

In the 1990s, many businesses in the paper industry succumbed to fierce competition from firms in South America and Asia. Increasing cost pressure and consequently need for economies of scale, high environmental requirements, and structural changes in the industry forced regional incumbent firms to reconsider their business practices (Interview 8; Interview 11; Manickam, 2016). The dominant approach taken by the industry was to deepen specialisation in the production of packaging materials, as it was not able to match global competition in the printing paper market (Sörensson & Jonsson, 2014; Interview 11).

The main emphasis in innovation efforts by incumbent firms was to increase energy and production efficiency to improve profitability (Interview 6). Furthermore, investments focused on extending competitiveness in packaging materials, which had for long been a stronghold in Värmland. As one of the interviewee's remarks:

“ By pure luck, it was not a skilled decision, but the mills in Värmland never went into printing and writing or other printing grades or newsprint, neither fluting board and some specialty papers. So, we are not affected by the Internet. So, that is the biggest thing here in Värmland, which means then, since, I mean, we have been making liquid board [used for packaging beverages] for 30 years, and now, when the consumption in the world of liquid board is increasing Värmland will become the world centre of producing liquid board.” (Interview 11)

An increasing number of new firms offering specialised support services further amplified the continuing specialisation of incumbent firms in packaging. During the 1990s, the large pulp and paper firms in the region created opportunities for new spinoffs and entrepreneurial businesses serving specialised demands in the pulp and paper industry (Tsuchida, 2013). Suppliers of process equipment, consultants and service providers increasingly created a high density of competencies in the region, which matched the requirements of the pulp and paper producers (Interview 8; Interview 9). These suppliers gradually started serving the global market (Interview 11), however, as noted by Interviewee 6, the Värmland pulp and paper mills benefitted

from proximity to the suppliers, and the resulting opportunities for regular interaction and dialogue, which helped the mills to improve their production processes and competitiveness.

During the 1990s, regional support organisations started to consider more carefully how the pulp and paper industry could be nurtured. The cluster concept was introduced, and the regional authorities started to map all the firms related to the pulp and paper industry in the region and explored the relationship between them including how they were doing business with each other. The rationale behind this effort was to explore common problems faced by firms, such as labour shortages, and to identify potential ways for actors to work together in addressing these challenges (Sölvell et al., 2009; Interview 8).

*Table 2. Role of agency and influential agents in phase 1*

<i>PHASE 1</i>	<i>Schumpeterian entrepreneurship</i>	<i>Institutional entrepreneurship</i>	<i>Place-based leadership</i>	<i>Structural maintenance</i>
<i>New firms</i>				Focusing on support services to pulp and paper production  Building specialised regional value chain
<i>Incumbent firms</i>				Investing in existing processes and efficiency improvements  Industry consolidation  Further specialisation in cardboard packaging
<i>Universities and research institutes</i>				
<i>Regional support</i>				Problem-solving for incumbent

<i>organisations</i>				industry
<i>Fringe agents</i>				

#### **4.2 Phase 2 (1999-2011): Promoting a vision for industrial change**

In the second phase, we have observed efforts to create a collaborative culture with an increasing role of the regional support organisations and Karlstad University in promoting a vision for industrial change. The dominant forms of change agency in this phase are institutional entrepreneurship, place-based leadership, and Schumpeterian innovative entrepreneurship, contributing to establishing path diversification (see table 3).

##### **Institutional entrepreneurship**

One factor contributing to the structural crisis during the 1990s was the dominant practice of individual firms rivalling on regional markets. Karlstad Municipality and some other regional actors anticipated that the crisis could be overcome by changing this dominant practice and enhance collaboration between regional stakeholders to share experiences, learn, develop new business practices and compete on world markets (Interview 8).

With the aim to change the business environment, these actors joined forces and established the regional cluster organisation “The Paper Province.” The Paper Province was initiated as a unique business cluster connecting different pulp and paper firms, SMEs, university and training institutes, public organisations including VINNOVA and Tillväxtverket, regional authorities and civil society groups in the region (Interview 2). Karlstad municipality initially started The Paper Province as a small project in 1999. Some of the large member companies included firms like Andritz, Billerud Korsnäs, Metso, Mondi, Stora Enso, Tetra Pak and Voith (Sörensson & Jonsson, 2014). The development of the Paper Province required strategic work by motivated individuals who engaged in diplomatic efforts to convince the large pulp and paper firms to get together for solving common challenges.

Another focus was to reframe the crisis into an opportunity for developing new products and markets, i.e., to shift from a defensive strategy of protecting old business models to an offensive strategy of developing innovative solutions. In this regard, The Paper Province promoted a pragmatic and experimental approach to find new solutions to the problems in the industry with the limited resources available. The idea was to shift from endless debates and discussions rooted in rivalries between firms to concrete and joint actions to make things happen (Interview 8). In that spirit, The Paper Province started various initiatives to promote

experimentation and testing such as Packaging Greenhouse, Packaging Arena, and Energy Square (Chen, 2009). Combined, this process of institutional entrepreneurship made a significant change as compared to the structural crisis, which emerged in Phase 1.

### **Place-based leadership**

Place-based leadership and institutional entrepreneurship complemented each other in Phase 2. Place-based leadership played a role in identifying key competence areas, developing a regional strategy, and coordinating and mobilising various stakeholders in the region. Key actors were regional support organisation such as Region Värmland (established in 2001), which collaborated with The Paper Province and Karlstad University for supporting the pulp and paper sector, creating new meeting places, developing new incentives and co-operation between the different regional stakeholders (Interview 1; Interview 5).

In 2001, Värmland Region identified forests and the forest-based industry as a strong business area with strong potential for promoting regional growth. In 2005, a new regional strategy called Sustainable Regional Growth was launched, which identified the pulp and paper industry as a strong area of future development (Interview 1; Olsson, 2007). The Regional Growth Programme initiated in Värmland offered a suitable context for sustainable regional development. Support and funding for the regional growth programme were secured from the County Administrative Board, County council and Regional Värmland (Van Vught, 2006).

Region Värmland encouraged regional collaboration by supporting the development of different cluster initiatives such as in pulp and paper (The Paper Province), ICT (Compare), packaging (The Packaging Arena), steel and engineering (Steel & Engineering), tourism (Visit Värmland), local food (Nordic Innovation Food Arena) and healthcare (Innovation Hub VIVAN Health Care) (Chen, 2009; Tsuchida, 2013). Furthermore, Region Värmland collaborated closely with Karlstad University, which in its own right pursued place-based leadership by actively strengthening educational and research fields with links to regional industries. Karlstad University engaged in co-operative research on pulp and paper technology, as well as material and chemical engineering (Vught, 2006; Interview 5).

During 2005-2006, a study conducted on regional development in Värmland in connection with the OECD educational initiative "Supporting the Contribution of Higher Education Institutions to Regional Development" created a formal network between Region Värmland and Karlstad University. The regional engagement of Karlstad University was strengthened leading to an agreement with Region Värmland on co-financing ten professorships from 2010-2014 in sectors and topics of importance to the regional industry. Region Värmland also established facilities for better interaction with the university and enhancing research co-operation (Interview 1; Tsuchida, 2013).

### **Schumpeterian innovative entrepreneurship**

*In this phase, Schumpeterian innovative entrepreneurship emerged to develop new value-added products based on lignin. The dominant form of action were demonstration projects. For instance, Innventia, a research institute, set up a demonstration plant to showcase the effectiveness of a lignin extraction process, which was a first step towards the development of new lignin-based products, e.g., carbon fibre (Interview 3; Interview 7).*

Karlstad University also supported new entrepreneurial initiatives. From 2010, the Grants & Innovation Office established at Karlstad University focussed on increasing collaboration between the university and the business sector as well as with three other Swedish universities. The idea of stimulating innovation collaboration was to support new entrepreneurial initiatives within the university as well as across the regional boundaries (Kempton, 2015).

*Table 3. Role of agency and influential agents in phase 2*

<i>PHASE 2</i>	<i>Schumpeterian entrepreneurship</i>	<i>Institutional entrepreneurship</i>	<i>Place-based leadership</i>	<i>Structural maintenance</i>
<i>New firms</i>				
<i>Incumbent firms</i>			Support a vision for industrial change	
<i>Universities and research institutes</i>	Establishing demonstration plant		Identifying and strengthening educational and research fields with a connection to regional industries  Engage in regional outreach activities	
<i>Regional support</i>		Nourishing of collaborative culture, including	Identifying strategic areas for development and	



<i>organisations</i>		<p>changing the role of university and government</p> <p>Promoting a pragmatic and experimental approach to stimulate new product development and utilisation of side-streams</p>	<p>mobilising support and funding for industrial change</p> <p>Supporting coordination between regional actors</p>	
<i>Fringe agents</i>				

#### 4.3 Phase 3 (2011-2018): Diversification into higher value-added activities

In phase 3, the dominant forms of agency shifted from institutional entrepreneurship to place-based leadership by a variety of regional actors and Schumpeterian innovative entrepreneurship driven by new firms but supported by incumbents. These activities led to a diversification into higher value-added activities. In addition, we observe institutional agency of fringe agents aiming at revaluing forest resources (see table 4).

##### Place-based leadership

As regards place-based leadership, regional support organisations together with universities have played a key role. In 2012, Region Värmland and Karlstad University introduced the new regional cluster strategy ‘Värmland model 2.0’, which focused on upgrading and enhancing existing competencies by increasing national and international co-operation (Goddard et al., 2013; Grundel & Dahlström, 2016). Further, in 2012, the Paper Province was successful in mobilising long-term funding for new bio-economy initiatives from VINNOVA’s Vinnväxt programme. This funding aims at experimenting with new bio-economy initiatives and enables the region to capitalise on its existing strengths as a leading pulp and paper cluster (Interview 2). Furthermore, a new initiative called ‘Paper Province 2.0’ received funding from various partners to support a bio-based economy. The financing for Paper Province 2.0 came from VINNOVA and other regional co-financiers such as Region Värmland, County Administrative Board, Karlstad University, municipalities in Värmland, County council, the forest board, and the member firms in the Paper Province. The objective of this initiative has been to stimulate greening and diversification of the pulp and paper sector in Värmland and transformation of the economy to a more bio based and circular economy. The aim has been to make Värmland a large-scale demonstrator of forest based bioeconomy (Interview 2; Interview 5; Grundel & Dahlström,

2014).

Place-based leadership has thus focused on coordinating regional interests and mobilising resources to not only upgrade the existing industry but also diversify into new fields of higher-value added activities. This has resulted in several new initiatives enriching the regional support system for innovation and entrepreneurship. Furthermore, these activities have been complementary to Värmland's Smart Specialisation strategy, which identifies the forest-based bio-economy as one of its priorities. Värmland's Research and Innovation Strategy for Smart Specialisation (VRIS3), was approved in 2015 in close co-operation between Karlstad University, regional clusters and related industry with the aim for developing the potential of the region by supporting areas prioritised based on identified strengths, market demand, potential to meet societal challenges and gaining international competitiveness (Interview 1; Henriksson, 2016).

The establishment of the Academy for Smart Specialisation in 2016 underpinned the smart specialisation strategy. The academy is a collaboration between Karlstad University and Region Värmland to support new industrial path development. In this context, the academy invested in key areas such as value-creating services, forest based bioeconomy, digitalization of welfare services, advanced manufacturing, and complex services, nature, culture and place-based digitalized experiences and systems solutions with photovoltaics. The Academy for Smart Specialisation has been designed to be integrated into the university's research and education strategy and thereby reinforces the university's goal to collaborate with society actively (Academy for smart specialization, 2016; Henriksson, 2016). In the spirit of smart specialisation, this initiative builds on existing strengths but aims at diversifying into new promising industrial paths (Interview 1).

Building on the developments in phase 2, when the first demonstration plant in Bäckhammar was implemented, new regional initiatives were realized assisting firms to develop new concepts for lignin fuel. Innventia, Kristinehamn municipality, and Paper Province collaborated to develop the LignoCity initiative with the purpose to create a space for the identification and promotion of new ideas on alternative lignin applications (Interview 3). The demonstration plant constructed in 2007 was reused and rebuilt for the open test bed initiative LignoCity. Lignin is used for producing new types of fuels, materials, and chemicals. Lignocity aims at helping firms to test, evaluate and refine new ideas and bridge the gap between experimental initiatives and actual commercial applications (Interview 3; Tomani, 2017).

Furthermore, regional business development officers in Värmland have showcased current bio-economy initiatives to civil servants and officials in the Ministry of Enterprise and Innovation to get attention and mobilise support from the national government. At the European level, Region Värmland has attempted to lobby for supportive policies by having representatives from the region participate in policy debates concerning the development of the bio-economy (Interview 1; Interview 4).

### **Schumpeterian innovative entrepreneurship**

Largely thanks to the developed support structures for innovation and entrepreneurship in phase 2 and 3, we observed an increasing activity in Schumpeterian innovative entrepreneurship. New firms have been the main drivers of Schumpeterian innovative entrepreneurship. Incumbent firms have also provided support to and engaged in new ventures. Schumpeterian innovative entrepreneurship has contributed in particular to two forms of new path development: i) technological upgrading where new technologies make a significant change to existing products or processes, and ii) diversification based on combinations of related and unrelated knowledge.

For example, Modvion develops wind tower technology by replacing steel and concrete constructions with an environmentally friendly wood-based material. Re:newcell develops solutions for converting used cotton and other natural fibers into new biodegradable pulp, which can be fed into the textile production cycle. Cellcombe focuses and specializes in developing environmentally friendly absorbent products for the healthcare, food and the hygiene industry. Drinor focuses on solutions that allow for higher utilisation of biomass through an innovative mechanical dewatering process. As argued by one interview partner, there is a huge potential for innovative start-ups to utilise the waste streams from the regional industry, but challenges remain, as most of the start-ups have yet to develop commercially viable products and services (Interview 2).

As for the incumbents, pulp and paper firms in the region have gained a positive image for improving their environmental performance. During phase 3, incumbent firms have been in a relatively advantageous position where current activities have yielded good profits. Hence, incumbents have continued exploiting their current business opportunity but have also invested in new technologies, reducing energy consumption, and creating value-added products from waste streams and upgrading the machines (Interview 6; Interview 9; Interview 11). Even though incumbents have not had a short-term business incentive to diversify, they have been co-operating in different testbed initiatives for extracting lignin and for producing other high value-added products. Other firms have been investing in pilot projects concerning biorefinery development and new board machines for packaging solutions. The incumbent firms have been participating and investing in the testbed initiatives to stay close to future developments and profit opportunities. They have been interested in open innovation environments where they have collaborated with start-ups for novel R&D activities (Interview 9). The incumbents have been less willing to collaborate on activities that potentially compete with existing core product groups for raw material supply (Interview 8). Overall, therefore, the incumbent firms have taken a supportive but not very proactive role in Schumpeterian innovative entrepreneurship (Interview 1). However, incumbents are potentially important for start-ups for their competencies, networks, and resources.

### **Alternative industrial paths: Institutional entrepreneurship of fringe actors**

In contrast to the strong partnership in the Värmland region between business, academia and the government, the links are rather weak to civil society actors, forest associations, female forest organisations and owners, and ordinary citizens. As remarked by one interviewee

“So, I think that there is a lack of connections between the industry and the civil society [...]. The paper industry is an industry, which is far from civil society. The products are not directly sold to the consumer. The value chain is quite long before the finished product reaches the consumer.” (Interview, 10)

Therefore, actors beyond dominant business clusters, academia, and the government have had a low influence on the definition of priorities in regional development documents. For instance, the association of forest women in Värmland (Skogskvinnorna) has advocated for more equality in the traditionally male-dominated regional industry and has argued that new initiatives are needed to enhance the attractiveness of the industry for young female engineers (Grundel & Dahlström, 2016; Interview 10).

Furthermore, there are civil society initiatives (in line with trends in other European countries) aimed at defining the value of forests differently, for instance in terms of nature and landscape conservation, ecosystem services such as carbon capture, wildlife protection, or resource for tourism and recreation. These actions of fringe actors have so far not influenced the dominant development trajectories. A broader discourse on regional development priorities with current fringe actors could both open new pathways but also limit the exploitation of others (Interview 5; Interview 10).

*Table 4. Role of agency and influential agents in phase 3*

<i>PHASE 3</i>	<i>Schumpeterian innovative entrepreneurship</i>	<i>Institutional entrepreneurship</i>	<i>Place-based leadership</i>	<i>Structural maintenance</i>
<i>New firms</i>	Launch innovative products and processes targeting multiple new markets			
<i>Incumbent firms</i>	Provide support to new ventures			
<i>Universities</i>			Engage in defining	

<i>and research institutes</i>			<p>regional priorities</p> <p>Engage in mobilising funding for new regional initiatives and establishing co-operation with testbeds</p> <p>Establish open testbed “Lignocity.”</p>	
<i>Regional support organisations</i>			<p>Coordinate interests in regional strategies</p> <p>Mobilise resources for the bio-economy through new regional initiatives</p> <p>Promote diversification as part of the smart specialisation strategy</p> <p>Establish Academy for Smart Specialisation together with Karlstad University</p> <p>Lobby national and international decision makers</p>	
<i>Fringe agents</i>		<p>Promote different valuation of forests (conservation, tourism, recreation)</p>		

## 5. CONCLUSION

The current paper contributes by developing a framework for understanding the role of multiple types of agents and the agency they exercise for new path development processes over time. Arguably, limited attention has hitherto been given to micro-level processes in studies of regional industry development (Boschma, 2017; Uyarra et al., 2017). First, our analytical framework focuses on change enabling types of agency, i.e., Schumpeterian entrepreneurship, institutional entrepreneurship and place-based leadership (Grillitsch & Sotarauta, forthcoming) as well as on agency that contributes to maintaining existing structures.

We suggest that paying attention to all four types of agency allows for a complete understanding of the dynamics of new path development processes. Second, our framework calls for attention to a broader set of actors involved in exercising the various forms of agency (Semper, 2019). While so-called fringe actors did not significantly affect the path development process in our empirical case, other recent contributions highlight the variety of actors that may drive or influence path development (Holmen & Fosse, 2017; Fredin et al., 2018).

Our empirical analysis of path development processes in Värmland illustrates the significant variation in the roles played by different types of agents over time. For example, incumbent firms exercised structural maintenance in the first phase, place-based leadership in the second phase, and Schumpeterian entrepreneurship in the third phase. Further, the analysis highlights how a type of actor may carry out multiple types of agency at the same time, e.g., universities and research institutes, which exercised both Schumpeterian entrepreneurship and place-based leadership in the second phase.

Following this, a central policy implication is that policymakers should not necessarily attribute specific types of agency to specific actor groups. Rather than for instance assuming that new firms are necessarily the central sources of Schumpeterian innovative entrepreneurship, we suggest that policymakers should consider a broader spectrum of actors and identify which agents are working for or against change in a given time and place, what strategies they pursue, and what effects their doing has on regional structural change. Further, policymakers should pay attention to changes in the role of different types of actors over time – the actors driving change agency today, will not necessarily do so tomorrow. Finally, we propose that policies supporting new path development processes should not only focus on supporting change enabling agency, but also weakening agency that contributes to structural maintenance.

We see at least two promising avenues for future research. First, we encourage more comparative research to arrive at more generalizable mechanisms for regional path development. Future research would include analysing the role of agency in industry development processes across a number of regions with varying characteristics. It could also entail cross-case analysis according to different types of path development processes – upgrading, diversification, and emergence. Second, there is a need for focusing on better understanding the relationship between

change enabling and structural maintenance agency and how they co-evolve with each other during the different phases of regional path development.

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