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# The road towards autonomous driving – A differentiated view of institutional agency in path transformation

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## ABSTRACT

The purpose of the article is to contribute to conceptual and empirical understandings of institutional agency in path transformation. Previous studies of links between institutional change and industrial transformation have focused mainly on the institutionalization of new practices and influence of territorially defined institutional preconditions, leaving a need to disentangle different types of institutional agency and the rationales behind actors' activities. The author elaborates on different dimensions of the institutional environment in which path transformation occurs and proposes a new analytical framework for investigating the role of institutional agency in path development. The framework identifies different types of institutional agency, respectively targeting the 'legitimation', 'anchoring' and 'enabling' of new paths. It is applied to a case study of the automotive industry in the NUTS2 region West Sweden, based on the development of self-driving cars. The analysis reveals that actors utilized the relationship between existing institutions when formulating strategies, rather than primarily targeting institutional change. The author concludes that actors deploy a combination of different types of institutional agency that exhibit varying spatial patterns, and discusses the implications for how the relationship between the past, present and future is understood in path development research.



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## Introduction

The question of how and under what conditions regional industries are developed, or existing ones are renewed, has emerged as a core topic in economic geography in recent decades. A considerable body of literature analysing how regional industrial change unfolds has started to emerge, invoking frameworks and models developed in 'evolutionary economic geography' (EEG) (Boshma & Frenken 2006; Boschma & Martin 2010). Building on concepts such as related and unrelated variety and regional diversification, EEG has shed light on the influence of existing industrial structures and how new industrial specializations 'branch out' from existing ones (Neffke et al. 2011; Boschma 2017). However, recurring criticism has been raised by scholars who argue for the importance of social, cultural and institutional influences at different

spatial scales (Dawley 2014; MacKinnon et al. 2019b) and a research agenda has started to take form, situating the path development debate at the intersection of EEG and other approaches in economic geography (Hassink et al. 2019; MacKinnon et al. 2019a).

Scholars have elaborated on the conduciveness of different types of regional configurations (Isaksen & Trippel 2016) and the role of agency in new path development (Dawley 2014; Isaksen & Jakobsen 2017; Miörner & Trippel 2017; Isaksen et al. 2018; Zhu et al. 2018). However, with a few notable exceptions (Dawley 2014; Sotarauta & Mustikkamäki 2015; Cortinovis et al. 2017; Zukauskaitė et al. 2017), the institutional dimension of path development has so far only received limited attention in the literature. This is particularly true in terms of studies investigating agency and is connected to a broader neglect of 'reflexive agency' in EEG

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(Martin & Sunley 2015), and a tendency to downplay structure-agency dynamics in the study of path development.

In this article I explore the concept of ‘path transformation’ (Baumgartinger-Seiringer et al. 2019; Miörner & Trippl 2019), referring to processes underpinning radical innovation-based renewal of established industries. The characteristics of path transformation, which is taking place in an elaborated institutional environment shaped by existing industries, have implications for how to approach institutional agency conceptually and empirically. First, the temporal dimension of agency needs to be given due attention, as it is crucial to understand how the past, in the form of existing industrial and institutional structures, is related to future outcomes. The point of departure in this article is that actors ‘shape the future’ (Hassink et al. 2019) by translating existing preconditions into future outcomes through their strategies and activities (Miörner 2019). Second, studies of institutions and new path development have so far focused mainly on the influence of certain territorially defined institutional preconditions on processes of path creation and renewal (Sotarauta & Pulkkinen 2011; Binz et al. 2016; Cortinovis et al. 2017).

The aim of this article is to fill the above-mentioned gaps in the literature and thereby contribute to our understanding of institutional agency in path transformation. The theoretical section of the article elaborates on different dimensions of the institutional environment in which path transformation takes place and contains my proposal for a new analytical framework for investigating the role of institutional agency. The framework moves beyond existing theorizing and distinguishes between different types of institutional agency, allowing for a temporally and spatially sensitive analysis of how actors engage with and shape institutions in the context of path transformation. The framework is used to analyse a case study of the transformation of the automotive industry in West Sweden<sup>1</sup> based on the development of self-driving cars (SDCs), to illustrate the value of the framework and to provide additional empirical insights.

## Literature review and analytical framework

Recent studies have started to broaden the focus of path development research and new models increasingly take into account social and cultural factors, as well as multi-actor and multiscale perspectives (e.g. Hassink et al. 2019; MacKinnon et al. 2019b). Also, researchers have begun to investigate different types of path development,

ranging from the creation of entirely new industries to the renewal of existing ones (Martin & Sunley 2006; Tödtling & Trippl 2013; Isaksen & Trippl 2016; Grillitsch et al. 2018). However, little attention has been given to processes underpinning changes taking place ‘on the path’ (Martin 2010). Drawing on previous studies, ‘path transformation’ refers to radical changes to existing, often mature, industrial paths and institutional settings (Baumgartinger-Seiringer et al. 2019; Miörner & Trippl 2019). In other words, it refers to processes underpinning the substantial transformation of an established industrial path and the institutional context in which it is embedded, rather than a distinct type of path development per se.

A growing body of literature is concerned with how regional structures are ‘reconfigured’ in relation to industrial change processes (Tödtling & Trippl 2013; Trippl et al. 2019). Established structures tend to support activities of existing paths rather than new ones, meaning that structures need to change in order to enable new path activities (Isaksen et al. 2018). At the centre of this perspective lies a broader conceptualization of the regional environment and factors impacting industrial change processes than is traditionally found in EEG (Dawley 2014), including a greater focus on institutions. With regard to understanding the modes through which regional structures evolve over time, many influential studies have been inspired by the work by Mahoney & Thelen (2010) on different types of institutional change. They distinguish between four modes of institutional change, namely layering (introduction of new rules in parallel with existing ones), drift (changed impact of existing rules to due environmental changes), conversion (strategic redeployment of existing rules), and displacement (replacing existing rules with new ones).

Various forms of the typology developed by Mahoney & Thelen (2010) have been adopted in studies of change processes in economic geography, most notably the seminal work by Martin (2010), and they have in common the inclusion of both new elements and the changed interpretation of existing ones. For example, in a previous article, I and my co-author distinguish between some form of layering processes – referring to the creation of new arrangements, adaptation processes – referring to changes to existing arrangements, and novel application – referring to the new interpretation and re-application of existing arrangements in new and possibly unforeseen ways (Miörner & Trippl 2017).

Path transformation involves the institutionalization of new practices, but also the adaptation of ‘old’

<sup>1</sup>The NUTS2 region, named Västsverige in Sweden, which comprises the counties of Halland and Västra Götaland

structures belonging to the existing path (Baumgartinger-Seiringer et al. 2019), and the strategic adaptation and redeployment of existing institutions (Miörner & Trippel 2017; Sotarauta 2017). These processes might be aimed at the regional institutional set-up, but there are reasons to consider also other institutional ‘fields’ at other spatial scales.<sup>2</sup> In addition, path transformation is heavily reliant on ‘sense-making’ and ‘collective belief formation’ (Steen 2016) in order to unlock existing resources and reconfiguring the innovation system related to the existing path.

### *Institutions and their spatial dimension*

In the early 2000s, questions about the role of institutions in economic development were put on the agenda (Amin 1999; Martin 2000). This ‘institutional turn’ in economic geography played a crucial role in the development of territorial innovation models such as the innovation systems approach (Braczyk et al. 1998; Cooke 2001; Asheim & Isaksen 2002; Asheim et al. 2016). The innovation systems approach emphasizes how processes of knowledge generation and exploitation are enabled or constrained by institutional frameworks (Gertler & Wolfe 2004; Tödting & Trippel 2005). In other words, institutions are embedded in space and shape regional economic activities (Martin 2000; Gertler 2010). Studying institutions is thus crucial for understanding how regional economic evolution unfolds. In this article, institutions are defined as the rules of the game that enable or constrain activities performed by organizations and individuals (North 1990). In other words, institutions are not organizations (Zukauskaite et al. 2017), but are part of the structure in which actors, such as organizations, are embedded. The institutional environment refers to both formal institutions (legally sanctioned and codified rules and regulations) and informal institutions (norms that are enacted and enforced by social conventions or cultural-cognitive beliefs, values and attitudes) (North 1990; Martin 2000; Scott 2010; Zukauskaite 2013).

Both formal and informal institutions are often place-specific and delineated by geographical boundaries, making them interesting objects of study for economic geographers. It is commonly acknowledged that territorial institutions structure the behaviour of economic agents, forming frameworks of formal and informal institutions that influence innovation and industrial change (Storper 1997; Gertler & Wolfe 2004; Rodríguez-Pose & Di Cataldo 2015). When looking at the institutional dimension of regional industrial change, economic geographers

have tended to focus on the role of territorially defined institutional environments (Hassink & Gong 2017) and while researchers have started to highlight the role of exogenous sources of knowledge and other resources in path development (Trippel et al. 2018; Fredin et al. 2019), the institutional environment has remained being treated as a result of territorial hierarchical institutional interactions in which ‘higher’ levels influence institutions at the ‘lower’ levels (Bathelt & Glückler 2013; Evenhuis 2017; Hassink & Gong 2017).

However, institutions are not only geographically delineated, as also territorial and non-territorial institutions may influence their path transformation processes. Institutional theorists have long investigated the emergence and existence of shared meanings, norms and social logics at the ‘institutional field’ level, shaping the behaviour of agents belonging to the same sector or domain (Scott 2008). An institutional field is defined as ‘a set of interdependent populations of organizations participating in the same cultural and social sub-system’ (Scott 2008, 434). The field argument is useful in the context of path transformation, as it highlights the fact that local actors who are engaging in path transformation may be affected also by distant actors and forces. Field dynamics may be shaped by actors with power and authority elsewhere (Scott 2008), which resonates with the idea that regional industrial paths may belong to global institutional frameworks formed around a particular industry (Binz & Truffer 2017). In other words, institutions are defined at the level of a particular industry in addition to being geographically delineated. Such ‘path-specific’ institutional arrangements do not originate from higher spatial scales in the traditional hierarchical sense but may be shaped by industrial activities in a few global cores (Binz & Truffer 2017; Fuenfschilling & Binz 2018). The influence of such institutions on path transformation can be expected to differ substantially between regions, depending on the position of the regional industrial path in these global structures. In some regions, path-specific and regional territorial institutions may be closely interwoven, whereas in others they might exhibit substantial differences in terms of functions and incentives.

### *Institutional agency in path transformation*

In studies of regional path dependence and new path development researchers have argued that institutional alignment of newly emerging paths is crucial (Grillitsch & Trippel 2018), and processes of institutional change

<sup>2</sup>Paper titled ‘Institutional infrastructure for innovation-based industrial path-renewal’ by L. Fuenfschilling and others, presented at the Regional Innovation Policy (RIP) Conference in Bergen, Norway, in 2018

as an element of new path development have been highlighted as an important area for research (Boschma 2017). Researchers have started to investigate the role of agency and institutional change in path development (Holmen & Fosse 2017; Sotarauta & Suvinen 2018; Grillitsch & Sotarauta 2019) and have pointed to the need for more conceptual and empirical insights. This is particularly true for cases of path transformation, as per definition the activities take place in a pre-existing, often strongly aligned, institutional environment.

Agency refers to actions and interventions with the purpose of producing certain effects. Agency should be regarded as a process of social engagement that is embedded in both time and space (Emirbayer & Mische 1998). In previous studies the concept of ‘institutional entrepreneurship’ has been used as a conceptual lens to understand institutional agency in path development (Sotarauta & Pulkkinen 2011; Marquis & Raynard 2015; Sotarauta & Mustikkamäki 2015; Benneworth et al. 2017; Holmen & Fosse 2017; Miörner & Trippel 2017). Institutional entrepreneurs are actors who initiate divergent institutional behaviour, mobilize resources for the purpose of creating or transforming existing institutional arrangements and actively participate in their implementation (DiMaggio 1988; Battilana et al. 2009). Through institutional work (Lawrence & Suddaby 2006), they engage in activities targeting the creation, maintenance and disruption of institutional arrangements. However, in order to qualify as ‘institutional entrepreneurs’ according to this definition, actors must both break with existing institutional logics and engage in the institutionalization of alternative ones (Garud & Karnøe 2001; Battilana et al. 2009). In this article, the broader notion of ‘institutional agency’ refers to the processes through which actors (with different intentions) facilitate institutional change, alter the impact of existing institutions, or identify and reinforce institutions that serve their purpose (Sotarauta 2017).

The analysis of institutional agency must not be limited to identifying the actors who exercise agency, nor to analysing narrowly defined activities. The broader underlying meta-rationales of institutional agency remains unexplored in the literature to date, particularly

with regards to their temporal dimension. The temporal dimension of agency is crucial in path development in general and in path transformation in particular, as it highlights the ways through which the past, in the form of industrial and institutional structures, related to future outcomes. Researchers have argued that agency is simultaneously linked to the past and the future, and approach agency as the ‘lens’ through which the past is interpreted and mobilized for the future (Grillitsch & Sotarauta 2019). Thus, it involves all three moments in time, as actors use knowledge about the past to generate future opportunities (Garud et al. 2010; MacKinnon et al. 2019a). For example, the role of expectations among actors in terms of shaping visions and strategies has been investigated (Steen 2016). Nevertheless, the conceptual and empirical work presented in the literature to date has remained rather general in terms of specifying how these processes play out, as well as how agentic processes are both spatially and temporally embedded.

### *Types of institutional agency: meta-rationales and temporality*

In a recent article, MacKinnon et al. (2019a) introduce the notion of ‘path advocates’ to describe a type of agent who engages in activities targeted at legitimating and anchoring an emergent regional path in the broader environment. Using this view as point of departure, I outline in the following subsections three different types of ‘meta-rationales’ of institutional agency in path transformation: legitimation, anchoring and enabling (Table 1). It should be emphasized that the same actors may engage in different types of institutional agency and that the processes are not necessarily sequential.

#### *Legitimation*

Inspired by transition studies, ‘legitimation’ refers to processes through which new industrial activities ‘overcome their “liability of newness”’ (MacKinnon et al. 2019a, 9). Legitimation can be regarded as a way to provide the direction for industrial change processes by developing visions and roadmaps for how

**Table 1.** Types of institutional agency

Agency	Types of change	Temporal orientation	Outcomes
Legitimation	Developing legitimacy through the layering of new institutions such as norms and visions, and by deinstitutionalizing existing ones	Future – institutionalizing change directions	Development of direction of change and legitimacy for transformation activities
Anchoring	Identifying and understanding existing institutions and exploiting their incentives through novel application	Past – relating to historically developed institutions	Knowledge about existing institutions’ incentives, alignment of transformation activities to such incentives, ‘mobilizing the past’
Enabling	Overcoming the constraining effect of existing institutions through adaptation	Present – dealing with institutions that constrain activities in the present	Changed institutions; dismantled institutional barriers, ‘overcoming the past’

transformation could unfold in the future. The creation of legitimacy is often associated with the creation of new institutions, such as narratives in support of emerging activities, developed through joint visions and strategies, product testing and demonstration, and lobbying and platform building (Bork et al. 2015; MacKinnon et al. 2019a). However, in order to achieve conformity and compliance with formal and informal aspects of the institutional environment (MacKinnon et al. 2019a), actors may have to engage in a broader set of activities. This means that existing strategies and dominating narratives may have to be deinstitutionalized to facilitate experimentation in new fields.

Path transformation is often triggered by events happening in other regions and by emerging global trends (Baumgartinger-Seiringer et al. 2019) and can reflect contradictory relations between established territorial and rapidly changing path-specific institutions. Previous studies have demonstrated how legitimation processes differ between regional contexts (Huenteler et al. 2016; Binz & Truffer 2017), focusing on how new technologies have been legitimized. For path transformation to occur, legitimacy needs to be developed not only in terms of supporting a shift to new technologies, but also for industrial change processes in a broader sense. It is important to factor in the territorial dimension of such processes, as actors need to legitimize industrial change processes at the regional and national scale, in addition to developing legitimacy for new technologies within the existing regional path.

### *Anchoring*

Anchoring refers to how a new path becomes connected to the institutional environment (Elzen et al. 2012) by ‘linking it to the broader conventions, rules and networks that structure the existing socio-technical regime or to broader discourse coalitions and political formations that are pursuing institutional reforms to the established regime’ (MacKinnon et al. 2019a, 16). Rather than referring to the anchoring of distant knowledge between regions (Vale & Carvalho 2013), the term refers to ways of ‘mobilizing the past’, by making use of existing institutions and aligning new activities so that they are incentivized by institutions that have evolved in the past. Anchoring is thus less concerned with institutional change and more with navigating institutional frameworks (Sotarauta 2017), identifying and understanding existing institutions, and harnessing the potentials of aligning activities to them. If legitimation is about setting change directions for the future, anchoring is about aligning change activities so that they do not conflict with existing institutions and identifying relevant institutions that

can be used in new ways. In other words, actors can work to identify relevant institutional arrangements at different levels, strategically comply and adapt to a set of institutions that ensures the maintenance of their strategic intentions (Sotarauta 2017), and selectively couple with intact elements of existing institutional arrangements (Pache & Santos 2013; MacKinnon et al. 2019a). A concrete example of the case in point is how actors can anchor their activities in previously developed norms and values related to ‘sustainability’ in a broad sense. In search of competitiveness, regional actors could associate themselves with institutions that value either environmental or socio-economic sustainability, which are the results of processes far beyond the ongoing path transformation process.

### *Enabling*

Enabling refers to the process of dealing with constraining institutions in the present. There may be laws and regulations that restrict path transformation efforts such as experimentation and market creation. Policies and funding programmes may be strongly aligned with old paths, favouring incremental changes over more radical ones (Grabher 1993; Hassink 2010), meaning that institutional reform is needed to enable path transformation to take place. However, regional actors do not always have the power to engage in institutional change directly but can mobilize other actors (e.g. via lobbying) or exploit existing institutional complementarities (Klatt & Herrmann 2011; Stöber 2011). The importance of this type of institutional agency is well documented in the existing literature on institutional entrepreneurship and new path development (e.g. Sotarauta & Mustikkamäki 2015; Holmen & Fosse 2017).

While anchoring is referring to the ways through which actors relate to the past by navigating and aligning to institutions developed historically, enabling agency is problem-oriented and focused on obstacles of the present. In other words, it refers to processes through which actors contend and oppose incentives (and disincentives) provided by existing institutions and actively engage in the adaptation of existing institutions. Enabling thus differ from anchoring in terms of aiming at ‘overcoming’ the past through institutional change in the present, rather than ‘mobilizing’ it.

### **Towards self-driving cars in West Sweden**

In order to illustrate the value of the analytical framework, and to provide additional insights, the framework is applied to a case study of path transformation in the

automotive industry in West Sweden, based on the development and introduction of self-driving cars. In other words, a case study method (Flyvbjerg 2006; Yin 2013) is used to complement the conceptual discussion with in-depth knowledge. The case region was selected based on a pre-study of existing data sourced from, for example, newspaper articles and reports, with the intention of reducing selection biases (Eisenhardt 1989). The aim was to identify a case that could serve as a ‘paradigmatic case’ (Flyvbjerg 2006) for path transformation as a type of path development. A paradigmatic case can be useful to illustrate, and to some extent to challenge, theoretical assumptions about the proposed analytical framework and serve as a reference point for future studies.

An initial document study was performed, during which I reviewed material from different sources, such as newspaper articles, newsletters, reports, public relations (PR) material, financial information, legal documents, policy documents, and video material. The document study served to identify key aspects guiding the second step of the empirical data collection and as a way to identify relevant interviewees. It also provided material that was used for data triangulation, in combination with data from the interviews (Denzin 1970). In a second step, semi-structured interviews were conducted with key actors involved in the automotive industry in West Sweden, namely representatives (including high-level executives) of the automotive industry, regional and national public actors, innovation support organisations, academics, and industry experts. In addition to the initial selection of interviewees, additional study participants were selected based on a ‘snowball sampling’ method (May 2011). The interviews, each lasting 60–90 minutes and covering topics identified during the initial document study and data from previous interviews, were conducted between March 2017 and May 2018, until interview material in combination with findings from the document study resulted in a situation in which it was possible to argue that ‘data saturation’ (Glaser 2017) had been reached (i.e. no additional insights were expected by holding additional interviews). In total, 19 interviews were conducted and informal meetings were held with three actors who provided complementary material. All interviews were transcribed and coded. The coding procedure started with an ‘in-vivo’ coding of interesting themes (King 2008) and was continued with focused coding (Saldaña 2015) using categories corresponding to the analytical framework.

### **Case background and institutional context**

The automotive industry in West Sweden hosts a wide range of firms from all parts of the value chain, from

original equipment manufacturers (OEMs) such as Volvo Cars and Volvo AB (trucks), to global suppliers such as Autoliv, and to automotive technology firms and consultants. The industry is supported by strong regional and national innovation systems, with universities and research institutes, innovation support organizations and other intermediaries. The region is heavily dependent on the automotive industry for regional growth and employment, and the regional automotive path is important from a national perspective. This has led to a strong co-evolution of territorial and path-specific institutions, manifested in a two-way relationship. On the one hand, logics and rationales of the automotive industry have shaped national and regional institutions, such as funding schemes, regulations, and standards. For example, regional innovation policies have a strong focus on changes in the automotive industry, and national strategic innovation programmes (Grillitsch et al. 2019) such as ‘Drive Sweden’ are currently explicitly targeting the automotive industry. On the other hand, the strong historical focus on safety technology favoured by territorial institutions have, through Volvo Cars’ strong role in the global arena, influenced path-specific norms and conventions.

Regional path transformation processes in West Sweden were ‘triggered’ by developments taking place at the global level (Baumgartinger-Seiringer et al. (2019). Path-specific institutions of the automotive industry have been rapidly changing, leading to new rationales and logics favouring, for example, sustainability, increased safety and new ideas regarding mobility. An announcement by Google about its autonomous driving unit in 2009 has been highlighted as a trigger for several regional traditional automotive industries to engage in the development of SDCs (Miörner & Trippel 2019).

Path transformation efforts targeting the development and introduction of self-driving cars in West Sweden are currently taking place in an institutional environment that is strongly shaped by the long history of automotive development and manufacturing in the region. However, the interview findings also pointed to the importance of path-specific institutions associated with the dominating industries in the region, also those other than the automotive industry. In the 1990s, an information technology (IT) industry emerged in West Sweden. It was shaped by path-specific informal institutions favouring radical innovation, not only in terms of technological development but also in terms of business models and agile development concepts, promoting more radical change and thinking ‘outside the box’ among policymakers and research and development (R&D) funding organizations. Interviewees highlighted this regional innovation ‘climate’ as being of high importance in terms of facilitating SDC development.

At the start of the path transformation process, the institutional environment prevailing in the region had two defining features. First, the boundaries were blurry, as the transformation process had not yet led to a clear set of institutional logics and rationales shaping SDC development efforts. This provided some interpretative leeway for actors in terms of aligning to certain institutional rationales, but also to an unclear direction of change. Second, both territorial and path-specific institutions, which were generally strongly aligned with the existing automotive path, had an influence on the path transformation process.

### *Institutional agency: legitimizing, anchoring and enabling path transformation*

The following empirical analysis is structured according to the three categories of institutional agency outlined in the analytical framework and focuses on the role played by agency in shaping the institutional environment throughout the path transformation process.

#### *Legitimizing new industrial activities and processes of change*

Legitimation represents the main type of institutional agency observed in the empirical case study, which is in line with other studies that highlight the importance of technology legitimation (MacKinnon et al. 2019b) and sense-making processes in path transformation (see Footnote 1). However, the findings presented in this article point to legitimation efforts targeting not only new technologies, but also new actors and legitimacy for the transformation process itself.

Through demonstration projects and platform building, the main actors in the automotive industry have been intentional in their efforts at targeting the layering of institutions defining the direction of path transformation in West Sweden. By formalizing membership criteria for taking part in the Drive Me project and by forming networks sanctioning certain practices, actors such as Volvo Cars have successfully put pressure on other actors to associate themselves with the transformation towards SDCs. For example, as part of its participation in the Drive Me project, the City of Gothenburg produced an information video about the future of urban planning with SDCs. This could be seen as an attempt to develop a cognitive map of the emerging field of SDCs by framing SDCs in an urban planning context. As it was, and still is, unclear what SDCs will

imply for mobility, institutional agency led by the main actors in the automotive industry explicitly targeted the layering of institutions in order to develop a framing that would legitimize a wide range of different activities and incentivize different types of actors to become involved in the field. One interviewed representative of the City of Gothenburg (Västra Götaland County) stated:

The first thing we did was to think about what we wanted to ‘get from’ this technology. We started with developing our vision [...] Then it was a rather long knowledge and discovery journey, to learn more about what this could mean for society, for our role as caretakers of the roads, and so on.<sup>3</sup>

The development of autonomous technology and the transformation of existing industrial activities have been monitored closely by researchers active in the case study region. Through a weekly newsletter,<sup>4</sup> they have reported on the global development of autonomous technology, with a special focus on what is going on in West Sweden. Although the contributors are often reflexive and sometimes even critical of the potentials of this technology, the newsletter has contributed to specifying categories and concepts underpinning SDCs. While this might not have been intentional, the newsletter has also contributed to creating a ‘sense of urgency’ (Sotarauta & Pulkkinen 2011) among regional public actors, by informing about the rapid development pace at the global level of the automotive industry.

The involvement of public actors, such as the City of Gothenburg and the NUTS 2 region West Sweden (Statistics Sweden n.d.), is the outcome of efforts by automotive actors to legitimize their path transformation efforts. At the same time, public actors have been engaging in institutional agency to rationalize their renewed attention to the automotive industry. The regional government in West Sweden has a long history of supporting the regional automotive industry and has been legitimizing increased support for new activities related to SDCs by challenging the ‘car ownership norm’ and by focusing on shifts in urban mobility. This is demonstrated by the government’s involvement in a wide range of projects in the context of the Drive Sweden programme, which contributes to undermining the definitions and assumptions defining the long-term goals of the regional automotive industry. In other words, while automotive firms are trying to persuade public actors to become involved by defining SDCs as the solution to societal challenges, public actors are legitimizing their involvement by trying to undermine the core assumptions of the automotive

<sup>3</sup>Towards a stage model of regional industrial path transformation’, by S. Baumgartinger-Seiringer, J. Mörner, and M. Trippel, presented at the Regional Innovation Policy (RIP) Conference 2018, in Bergen, Norway

<sup>4</sup>All translations from Swedish into English were made by the author of the present article.



industry (cf. Lawrence & Suddaby 2006). This is manifested through low-intensive conflicts between public actors and actors in the automotive industry, as illustrated by one interviewee when asked to recapitulate a discussion with a representative of one of the major automotive firms in the region: ‘The discussion became very intense, as the representative [...] absolutely could not accept one or two of these points, [related to] the need to share SDCs [...] to avoid cars just going around.’ With regard to more formalized efforts to create legitimacy for the path transformation as such, one notable example is the activities performed by private and public actors to create visions branding West Sweden as a ‘Self-driving Region’, led by the region of West Sweden and the City of Gothenburg.

Although some national actors have been involved in legitimation efforts, the analysis presented above indicates a strong regional dimension to institutional agency targeting the legitimation of new activities. With regard to legitimizing autonomous technology, regional actors are currently engaging in a wide range of activities targeting also the global level, the mapping of which is beyond the scope of this article. However, in relation to the transformation of the existing regional industrial (automotive) path, institutional agency has targeted mainly the creation of legitimacy at the regional level among private actors, as well as among public actors. The main target has not been technological legitimacy, but to legitimize the path transformation process itself and the actors involved in making change happen. This has been particularly important with regard to attracting public support, but also in terms of an increased engagement in autonomous technology by researchers, the start-up community and existing technology firms, though triggering them to enter the field of autonomous driving technology.

### *Anchoring transformation efforts*

In terms of anchoring, the empirical findings provided several examples of how actors have selectively coupled some elements of territorial and path-specific institutions while disregarding others. It is possible to identify two subtypes of anchoring activities.

First, activities target the identification of institutions that could influence path transformation. For example, the HEAD project (operational 2016–2018), led by Volvo Cars together with Halmstad University, was an ethnographic research project which in part targeted the identification of how SDCs were perceived by potential users, specifically the identification of informal institutions that might have an influence on how SDCs should be designed and marketed. Projects have also investigated the public acceptance of SDCs, in order to

provide valuable information about the preconditions for trials and experiments:

It is important to investigate the public acceptance [...] How will people actually use these cars? Will they trust them? How much will they be used in self driving mode? How much in manual mode? It is about user acceptance and user behaviour. (Interview, project manager at a research institute)

Thus, rather than aiming at changing the mainly informal institutions, actors in the automotive industry have focused on identifying and mapping them, and instead have adapted their activities to comply strategically with the existing set of institutions. As trial and other experimentation activities have mainly been a regional matter, efforts to identify informal institutions that matter for these experimentation and trial projects have mainly targeted the regional and national level. Nevertheless, at a later stage, the context-sensitivity of norms and attitudes among potential consumers is likely to point the strategies of actors towards legitimation rather than anchoring, as was also confirmed in the interviews.

Second, institutional agency has contributed to anchoring new activities in the existing institutional environment. For example, actors have been trying to associate SDCs with challenges related to urban mobility and future transport, creating leverage for path transformation processes. The new technology has thus been associated with existing practices, for example related to spatial planning and public transport management. Within the Drive Me project, Volvo Cars have been working closely with the City of Gothenburg with regards to spatial planning principles in relation to SDCs. These efforts have been framed as if the city is adapting its spatial planning principles, but if taking the perspective of the automotive industry, the engagement with public actors responsible for spatial planning is a way to anchor their new activities in existing practices rather than targeting institutional change. In a similar manner, the public transport company in West Sweden has engaged in projects related to the future of SDCs in the public transport system. However, instead of changing institutions in order to shape the role of SDCs in the public transport system, automotive firms have used existing institutions in new ways. Rather than trying to change the underlying principles for public transport, they have worked to anchor the idea of SDCs in existing strategies, for example by highlighting SDCs as an integral part of intermodal public transport principles. This was reflected in interviews with representatives of the spatial planning division of the City of Gothenburg, one of whom stated:

Drive Me is more about testing these cars, and this is not what [we] are doing in our daily activities. But at the same time [...] we are dragged into these questions automatically and we can either sit and wait while it is happening or we try to get to know more. The project is about getting to know more, to learn, but also to think about these questions from our perspective. (Interview, representative of the spatial planning division with responsibility for issues relating to self-driving cars)

Actors also engage in activities that identify institutions that are in line with their planned or ongoing path transformation efforts and promote them as traits of SDCs, thereby providing examples of novel application of existing institutions. For example, by drawing on the historical importance of safety technology in the regional automotive industry, firms such as Volvo Cars and Zenuity have been intentional when it comes to labelling their new technology as ‘safety features’ in the early stage of transformation. One of the interviewees, who represented a major automotive firm, even expressed the SDCs as representing the ‘revival of safety’ in the global automotive industry. The interviewee pointed out that the industry in West Sweden was well positioned to exploit this, in contrast to, for example, actors in Silicon Valley who tend to brand their SDCs as ‘technologically ground breaking’ rather than anchoring them in historically developed value systems promoting safety.

### *Enabling new activities*

Institutional agency aimed at enabling path transformation differs from anchoring and legitimation by being more explicitly ‘problem-oriented’, thus departing from a formulated need that is normally related to some concrete goals and activities. First, actors are currently operating highly regulated fields, both in terms of rules and standards governing the manufacturing and marketing of the product, be it a component, software or the car itself, and in terms of the regulations governing the use of the product (e.g. traffic regulations). For some activities to take place, such as experimentation and product trials, regulations needed to be adapted. The study findings showed that actors engaged in typical lobbying activities, mobilizing political and regulatory support for enabling product trials. For example, Volvo Cars gave input to a national investigation of automated transport and was involved in discussions with the Swedish Transport Agency and the Swedish Transport Administration. Many of these discussions took place within the Drive Me project, in which these national actors were also participating. The interview findings highlighted these discussions as an important factor in shaping regulatory adaptation at the national level:

I think that during the last four to five years, if you take [the Swedish Transport Administration], we have moved from being a bit sceptical [towards believing that] SDCs are one of the most important contributors to reach zero fatal injuries in traffic. (Interview, Swedish Transport Administration)

After a long process led by actors at the national level, the regulatory framework was adapted with a trial legislation in 2017, allowing automotive firms to perform trials on public roads after obtaining a license from the Swedish Transport Agency. However, the agency did not grant Volvo Cars permission to go ahead with trials involving the consumers they had recruited in Gothenburg, as the ‘driver’ had to be employed by Volvo Cars for them to be able to take legal responsibility. Through targeted efforts involving discussions in which Volvo Cars explained how the cars would work, a permit with certain restrictions was finally granted during the autumn of 2018.

Second, a less direct form of enabling agency was observed in relation to the adaptation existing of test infrastructure in the region. Actors early identified the need for a strong organizational support structure, for example in the form of R&D facilities and test infrastructure. It is possible to observe a process of enabling the use of existing support structures, originally targeting the active safety segment of the industry, for path transformation efforts. For example, public funds targeting R&D of active safety were ‘rebranded’ by participating firms to fit their new activities (Miörner & Trippel 2019). While being mainly a matter of wording and terminology, the rebranding enabled access to funding for SDC development.

Third, an important type of institutional agency targeting the enabling of new activities was found within the main automotive firms, such as Volvo Cars and Autoliv. Over time, it became apparent that SDCs would entail a much greater focus on software and software development than was the case previously in the automotive industry. One way of dealing with this has been to spin off software-intensive activities, as observed in the cases of Zenuity and Veoneer. However, actors have also been engaging in institutional work to adapt informal institutions within the firms, namely internal practices and organization models, as expressed by one interviewee:

It is a big mindset change. If we look historically [...] we have done in the same way for decades. [...] We have sent specifications to suppliers far away, and they code, and then after six to twelve months the software arrives, and we try to fit it into a system. This creates a lot of dependencies. But in the agile way of doing things, we are developing the software in small increments, run it in a continuous integration machinery, [and] get quick feedback.

According to the findings from the study, the adaptations were not isolated to a few firms in Gothenburg but reflected broader change processes throughout the global automotive industry. The empirical analysis particularly points to ways through which actors engaged in following other paths in a strategy to ‘transplant’ arrangements and adapt path-specific institutions of the automotive industry. In efforts learn new organizational models, particularly ‘agile’ software development, Volvo Cars had recruited competence from the IT industry in West Sweden, to help in the transition to the new ways of working. For example, in addition to developers and software engineers, the company recruited a high-level executive from Ericsson, which was downsizing in the region at the time (i.e. in 2016). In addition, and equally importantly, the shift included a mindset change among existing engineers in the company. One interviewee said:

We try to include also the hardware people, to involve them in the same kind of thinking. This is where we see the biggest challenge, to make them accept that things are now done in small increments and forget about old ways of working.

In other words, the engineers’ old views of how development took place were adapted in order to become more agile, by providing incentives not only to ‘learn the new’ but also to ‘unlearn the old’.

## Discussion

The findings presented in this article support the idea of an institutional environment being reshaped and redefined by actors throughout the path transformation process. This does not mean that there is no top-down influence of institutions, but rather that the findings are in line with those of previous studies in which authors argue for taking a bottom-up approach to the analysis of institutions in economic geography (Sotarauta 2017). In other words, actors utilize the relationship between existing institutions in their strategies. This is well known from previous studies of the relationship between formal and informal institutions (Scott 2010; Miörner et al. 2017) and the study findings presented in the present article points to a similar situation with regard to different territorial and path-specific institutions. The findings also point to the important role of types of institutional agency concerned with defining and mobilizing aspects of the institutional environment rather than changing it (cf. ‘institutional navigation’ (Sotarauta 2017)). Nevertheless, the empirical analysis provides additional insights beyond the conceptual discussion and indicates areas for future research.

First, the empirical analysis revealed an interesting spatial pattern in relation to the different types of

institutional agency. With regard to legitimation, the underlying institutional work performed by regional actors targeted mainly institutions at the regional level. This finding illustrates the importance of accounting for the geography of legitimation processes. In the studied case, legitimation involved the creation of legitimacy not only for new technologies, but more importantly also for new regional actors and for new activities in the regional path itself. In a similar manner, both anchoring and enabling involved activities targeting a combination of path-specific and territorial institutions, regional and national respectively. Taken together, the observed patterns might reflect the industry characteristics and factors specific to the context of the case study, meaning that the pattern might differ between cases. Nevertheless, based on the findings in this case, it can be assumed that other cases will exhibit spatial patterns reflecting the prevailing combination of territorial and path-specific institutions. Thus, more research is needed to disentangle what produces different patterns of institutional agency and how that affects outcomes.

Second, the findings point to a strong interrelatedness of different types of institutional agency. For example, processes of legitimation required regulatory changes that enabled product trials to take place. In line with findings from previous studies (Steen 2016; Grillitsch & Sotarauta 2019), the observed interrelatedness between types of institutional agency revealed the importance of better integrating considerations of the future in studies of path development (Hassink et al. 2019). The framework developed in this article allows for a more nuanced analysis of the relationship between the past, present and future than previous conceptualizations. Furthermore, the empirical analysis showed that one actor could be involved in different types of institutional agency simultaneously.

Third, the interaction with other regional industrial paths is highlighted in both the analysis of the institutional environment and the analysis of institutional agency. In echoing calls to acknowledge different types of relatedness in studies of path development (Tanner 2014; Boschma 2017; Carvalho & Vale 2018), and interpath relationships (Frangenheim et al. 2018; Steen and Hansen 2018; Hassink et al. 2019), the present article highlights how path-specific institutions of other regional paths might influence processes of path development. The ‘transplantation’ of institutions, such as new ways of working or organizational models, was facilitated by geographical and cognitive proximity between the two industries.

## Conclusions

In this article I set out to investigate the institutional dimension of path transformation and to develop an

analytical framework by adopting a broad definition of the institutional environment as consisting of a combination of multiscale territorial and path-specific institutions, and by specifying different types of institutional agency involved in path transformation. My conceptual discussion targets several aspects of path development that so far have been relatively neglected by evolutionary economic geography (EEG). It provides a more nuanced perspective of institutional agency by distinguishing between three types, namely enabling, anchoring and legitimation, which represent the meta-rationales behind activities and the modes of change performed by various actors in path transformation processes. The framework also contributes to an understanding of the reflexivity of agency in path development, a fundamental aspect of structure-agency dynamics that have largely been neglected by EEG (Martin & Sunley 2015).

I have demonstrated the value of the framework through an empirical case study of path transformation. Not only was the institutional environment conducive to path transformation, but also the existence of constraining elements motivated institutional agency aiming to shape a more beneficial environment for actors' activities. The empirical study set out to investigate institutional agency throughout the path transformation process. The study highlighted how activities were motivated by different rationales, ranging from legitimizing path transformation by (1) layering new institutions, developing perceptions about future potentials, and undermining the core assumptions of existing ones, (2) anchoring the process in arrangements existing in the institutional environment through novel application and the redeployment of existing institutions, to (3) enabling path transformation activities by targeting institutional barriers through the adaptation of constraining institutional frameworks. The findings have been discussed in terms of their implications for path development research, highlighting the merit of taking into account the varying spatial and temporal patterns and the interrelatedness of different types of agency, as well as using the framework for a better understanding the interaction with other regional industrial paths.

Arguably, the direct generalizability of the study findings is limited, due to the nature of a single case study. The case of self-driving cars (SDCs) in the NUTS2 region West Sweden was selected as a paradigmatic case to illustrate the conceptual arguments. Future studies would have to investigate their applicability to other cases of path transformation in different industrial and regional contexts. Nevertheless, the findings are analytically generalizable, as they provide

a conceptual lens for the analysis of such cases in future studies.

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