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The emergence of new industries at the regional level: alignment of organizational and regional industrial culture

Emelie Langemyr Eriksen ^a and Arne Isaksen ^b

ABSTRACT

This article provides insights into how and where new industries emerge and grow through theoretical reasoning and the advancement of relevant arguments through empirical examples from industry emergence in two Norwegian regions: the establishment of the boatbuilding and the electronics industry in Arendal; and the cancer medicine and educational technology industry in Oslo. The article focuses on culture as an important asset for new industry emergence. We argue that industry emergence is supported if organizational culture in emerging industries and existing or altered regional industrial culture become aligned. The four industry cases demonstrate how in some situations industries emerge through a branching route, for example, related spin-offs, while in other cases they emerge through a creation route based on unrelated local start-ups or importation. We argue that an alignment of organizational and regional industrial culture is more easily achieved in the branching than in the creation route.

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INTRODUCTION

The question of where and how new industries emerge and grow has received renewed attention in economic geography and related disciplines. Many current discussions centre on the view that new industries grow out of existing technological knowledge and other assets that have been historically created in a region (Neffke et al., 2011). New industries often arise through diversification based on related variety or through related path importation, while unrelated diversification, which ‘embodies new combinations of (local) capabilities that were not previously combined’ (Boschma, 2017, pp. 355–356) is seen to occur less frequently (according to Boschma, 2017).

This article of new industry emergence at the regional level departs from recent theorizing in economic geography and, in particular, of new regional industrial path development (Isaksen

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et al., 2019a; Martin, 2010). Regional industrial paths portray the main developments in industries in regions over time. Such paths contain a number of related firms in a region that are supported by specific locational factors, including a knowledge and institutional infrastructure (Hassink et al., 2019). New regional industrial paths include (1) the upgrading of existing industries in a region, (2) the diversification of new industries for a region based on existing related or unrelated knowledge, and (3) the emergence of entirely new industries for a region from importation or from the use of new knowledge and innovation activity (Grillitsch & Asheim, 2018).

Industrial paths are embedded in innovation systems, and the literature emphasizes that well-coordinated innovation systems often must be changed to support the emergence of new industries and paths (Boschma et al., 2017). Changes in innovation systems take place through the modification of assets, which also includes assets other than technological knowledge, skills and firm capabilities (MacKinnon et al., 2019; Trippel et al., 2020). The literature further argues that asset modification is performed by strategic agency (Garud & Karnøe, 2001), and a distinction has been made between organizational- and system-level agency (Isaksen et al., 2019a). The last type of agency is carried out by actors in knowledge and support organizations in regional innovation systems (RISs) with power and decision-making authority to alter organizations, but also by firm leaders who aim to create better conditions for regional industry in general. System-level agency resembles institutional entrepreneurship, which can be defined as 'actions that are directed towards transforming existing or creating new institutions', where institutions 'in very general terms can be defined as rules of the game' (Grillitsch & Sotarauta, 2020, p. 708). System-level agency includes institutional entrepreneurship, but is a wider concept as it also involves initiatives to establish and change organizations within RISs, for example, a new product test lab or a new study programme at a university.

We extend these existing approaches in several ways by trying to explain how new industries arise. First, we centre stage culture as an important, but little studied, asset for industry emergence. We then distinguish between organizational culture and regional industrial culture, which provides an operationalization of organizational- and system-level traits, respectively. That is, development of organizational culture takes place through organizational-level agency, and modification of regional industrial culture mainly through system-level agency. Second, we argue that the growth of new industries in a region is supported when organizational and regional industrial culture become aligned. Third, we distinguish between two types of new industry emergence; the branching route based on related new firms from spin-off processes, and the creation route of unrelated start-ups. The branching route resembles related diversification in the new regional industrial path development conceptualization (Grillitsch & Asheim, 2018), while the creation route is an aggregate concept for several new regional industrial paths, both unrelated diversification, importation and new creation, when following the path development terminology. Lastly, we argue that alignment of organizational and regional industrial culture is more easily achieved in the branching route than in the creation route. We reason that the branching route may build upon inherited assets, such as culture originating from mother companies and historically developed regional industrial culture. Industries emerging through the creation route, on the other hand, may combine organizational cultures from quite different industries, draw on sector-specific culture, or create the culture from scratch, and the regional industrial culture may then be adapted to fit the situation in emerging local industries.

The remainder of the paper is structured as follows. Next, we develop an analytical framework that demonstrates how the branching route to industry emergence can build on the replication and reuse of culture (and other regional assets), while the creation route demands more comprehensive adaptations and development of culture. The relevance of the analytical framework is then illustrated and advanced by two empirical examples: the establishment of the boat-building and the electronics industry in Arendal, and of the cancer medicine and the educational technology industry in Oslo. The final section concludes.

THEORETICAL FRAMEWORK

The article argues that the growth of new industries for a region requires backing from RISs, in which industrial and innovation activity are embedded in an institutional infrastructure of laws and regulations, and guiding norms and routines (Asheim et al., 2019). RISs develop over time first of all to support key industries and clusters in a region and may thus not be appropriate for supporting emerging industries that challenge existing leading firms and regional industries and dominating cultural practices. Rather, well-developed innovation systems can be 'prone to lock-in and path dependency and largely geared to generate incremental innovations and gradual change' (Boschma et al., 2017, p. 36), that is, they mainly support existing industries and industrial practises. This argument demonstrates that RISs need to be changed to a greater or lesser extent to better support the emergence of new industries. The following theoretical sections discuss how RISs can be reconfigured through asset modifications, where we focus on changes in organizational and regional industrial culture, and how this reconfiguration can support new industries emerging in specific regions.

Assets

Innovation processes include building knowledge and other assets in organizations, as well as acquiring supplementary knowledge and assets from both a regional level and beyond. Such assets are broadly defined to include institutionally embedded rules, routines and habits, regulations and laws, infrastructure, natural resources, knowledge and skills among the labour force, and embedded capabilities in terms of competence and technology within organizations (Maskell & Malmberg, 1999). These assets have been shaped by historical processes in and around organizations and are part of the history of the region and country in which they are located.

Based on the model of RISs, which states that industries are surrounded by knowledge actors and an institutional infrastructure, we distinguish between assets on the organizational level and assets on the system level (Isaksen et al., 2020). The rise of new industries depends upon the creation of new firms, such as spin-offs and unrelated start-ups from several sources. However, firms in new industries in a region may also need support from the RIS, for example, labour with relevant expertise and attitudes, and regulations that do not hinder firms with new solutions in competing with established firms. In this way, assets at both the organizational and innovation system level can provide a basis for the emergence of new industries. This article focuses on the role of culture at the firm level and the regional industrial level for industry emergence, as one specific type of asset. Below, we argue that the role of culture for regional industrial development is little studied, which means that the article can contribute to the literature on regional industrial development and industry emergence in particular.

Culture as a vital asset for industry emergence

Institutional endowments of rules, routines and norms are identified as regional assets by Maskell and Malmberg (1999). In the same vein, Storper (1995) argues that conventions, informal rules and habits are unique, and regional assets that can create competitive advantage because they provide predictability of behaviour among economic actors. However, it can be difficult to understand the role of institutions in regional industrial development, not least for industry emergence. Thus, 'in the overall puzzle of explaining regional economic development, the area of institutions is perhaps the most complex and least well-explored space' (Storper, 1995, p. 2036). Likewise, Rodriguez-Pose (2020) a decade later argues that 'examining how informal institutions impinge on urban and regional performance at a subnational level would address a fundamental gap in our knowledge' (p. 378). *One* reason for this knowledge gap can be a very broad definition of informal institutions which makes this phenomenon difficult to identify

and study. According to Rodriguez-Pose, informal institutions include ‘such as values, culture, trust, openness, networks, tolerance, diversity, creativity or social capital’ (p. 375). Such an all-inclusive definition makes us use the notion of culture instead of informal institutions in this article, and below we distinguish between, and attempt to clarify what is meant by, culture at the organizational level and the system level, the last one centred on the culture that characterizes specific parts of the regional industry.

Organizational culture

We argue that the culture in emerging firms and industries, and the alignment between organizational culture and regional industrial culture, affects the success of new industries emerging in a region. However, there is a lack of agreement on what the term ‘organizational culture’ should mean and how it should be observed and measured (Schein, 1990). This article follows Schein’s definition of organizational culture as: ‘Fundamental assumptions and perceptions shared by all the members of an organization, which operate unconsciously and as in a fundamental and “taken for granted” way defines the organization’s view of itself and its environment’ (Schein, 1985, p. 5). The assumptions and perceptions are learned responses by members in an organization on the challenges of ‘survival’ in their external surroundings, and on the challenges associated with internal integration. If the assumptions solve such challenges in a positive way each time, they are eventually taken for granted informal rules in an organization, that is, organizations’ cultures are formed and shaped by experiences by members of the organizations.

Organizational culture ‘basically equates to the pattern of shared values, beliefs and agreed norms, which shape behaviour’ – in other words, it is ‘the way we do things around here’ in any organization’ (Tidd & Bessant, 2013, p. 140). The components of norms, values, philosophy, rules of the game and routine behaviour all form parts of the culture of an organization. As organizational culture is manifested in the typical characteristics of organizations (Martins & Terblanche, 2003); *one* key characteristic is whether innovation activity occurs as trial and error based on persons’ experience-based competence or as scientific projects, that is, similar to the doing, using and interacting (DUI) or the science, technology and innovation (STI) modes (Jensen et al., 2007).

In order to understand how culture may hamper or trigger the emergence of new industries in a region, we argue that the context and the type of regional industrial culture is important to examine. While organizational culture differs among firms, firms in regions and in specific regional industries can nonetheless be distinguished by particular cultural characteristics (Gertler, 2010; Saxenian, 1994). James (2005) argues for a regional cultural hierarchy made up by (1) individual organizational cultures, (2) a regional industrial culture and (3) a broader regional culture in which the first two layers are set. This article focuses on the characteristics of organizational and regional industrial culture and on the relation and overlap between these.

Regional industrial culture

Industrial culture is, as informal institutions, often given a broad meaning. In the words of Gömar and Harfst (2019, p. 1), industrial culture is ‘defined as a particular cultural setting made up of certain intangible assets, such as skills, attitudes, traditions, tangible monuments, and artefacts’. We rather argue in line with Sayer (1992) that it is essential to ‘give concise definitions to important but vaguely understood terms through reworking their relations with other terms’ (p. 81). In this case, we link regional industrial culture to the concept of conventions (Storper & Salais, 1997), which we relate to dominant conventions found in specific industries in a region. Conventions emphasizes ‘the cultural dimension of economic activity’ (Sunley, 2011, p. 339). Conventions are interpreted as the ‘shared understanding and norms of behaviour that allows actors to reduce uncertainty about each other’s decision-making’ (pp. 339–340).

They are rules and routines of ‘what to do’ in specific situations that are often taken for granted, and which result from experience (Storper & Salais, 1997), which is quite similar to our interpretation of organizational culture. Conventions are affected by the types of products that dominate in (parts of) a region’s industry; if the product is standardized, focused on price competition, or specialized, centred on quality (Sunley, 2011).

Conventions, as regional industrial culture, are created through experiences by firm leaders and other stakeholders in a region. We propose that the creation of industrial culture can be understood through the lens of legitimation. Legitimation is an important concept in organization studies, social studies and political sciences (Binz et al., 2016), and according to Zelditch (2001, p. 33), ‘something is legitimate if it is in accord with the norms, values, beliefs, practices, and procedures accepted by a group’. In other words, legitimacy can be seen as a product of a socially constructed belief system, a culture that goes beyond the scope of individual actions. Thus, legitimacy may be an important element to provide the basis for a new industry in a region with, for example, other skill requirements and working routines than established regional industries. Thus, in our definition a regional industrial culture (1) includes unwritten ‘rules of the game’ in a regional industry (Gertler, 1997); (2) is legitimized, produced and reproduced over time by day-to-day practices in firms and regional industries (Sadler & Thompson, 2001); (3) is thus dynamic, but also a slowly changing, ‘sticky’ institution (North, 1994); and (4) is shaping practices, customs and norms of behaviour in a region’s industry (Gertler, 1997).

The dynamic aspect through legitimation may be particularly relevant in studies of industry emergence as it is acknowledged that ‘legitimacy is a prerequisite for the formation of new industries’ (Bergek et al., 2008, p. 417; Binz & Gong, 2021). Legitimation influences on to what extent market is created, resources mobilized and policy designed to support emerging industries (Markard et al., 2016). *How* important legitimacy is for the growth of a new industry in a region is nevertheless dependent on how the industry emerges, whether through the branching or the creation route. New industries that branch from existing regional industries with related technological knowledge will probably inherit much of the knowledge, skills and culture from incumbent industries. Hence, legitimation of, for example, new skills and new ways of doing things in an emerging industry may not be a key issue in this case.

The situation may be different when a new industry for a region arises through unrelated start-ups. New organizational principles and new technology in an emerging industry may then differ from ‘ways of doing things’ in existing regional industries, that is, from the prevailing regional industrial culture, which may hamper new industry emergence. Activities to legitimate, for example, new technology and new working routines in the emerging industry among regional actors may then be a key for a new industry to grow in a region. This resonates with Markard et al. (2016, p. 331), who argue that ‘creation of legitimacy is particularly vital for novel technologies, especially if they are radically different from existing ones’. Emerging industries often need to be supported by intentional system-building, performed by so-called system builders, around a new innovation (Musiolik et al., 2020). System builders create important system-level assets for innovating firms in new industries, and assets that result from a co-evolutionary process between firms and ‘system elements’, including culture. ‘Conscious institutional work by individual and collective actors to create new institutions or transform existing ones is critical to overcome’ the ‘liability of newness’ of many new technologies (Gherhes et al., 2021, p. 4). These arguments point to the fact that the question of alignment of the cultural context in firms in emerging industries and in regional industries is a pertinent issue in studies of how and where new industries arise.

Alignment of organizational and regional culture for industry emergence

Based on the arguments above, we contend that alignment of the organizational culture in firms in emerging industries and the regional industrial culture can happen in two main ways.

We argue that the organizational culture in new industries that develops through the branching route is partly inherited from existing industrial activity in a region, while organizational culture is created more from scratch in industries that develop through the creation route. These different pathways of organizational culture creation provide various challenges to the alignment with regional industrial culture (and with sectoral-level culture).

Emergent industries from the branching route may inherit parts of their culture from the mother companies of which the pioneer firms in new industries arise from. This is because spin-offs, for example, often choose actions and ways of doing things that are similar to those of their respective mother firms (Cronqvist et al., 2009). Industries emerging through the branching route may then benefit from longer term and fundamental regional industrial cultural contexts. Regions may hold social legitimacy, understood as common perceptions (Stuetzer et al., 2016) that support (or hamper), for example, entrepreneurship in specific industries. Nevertheless, new firms in emerging industries, even if the industry follows the branching route, often pursue specific sector-level knowledge, practice, network relations, organizational forms and culture (Malerba, 2002). The organizational culture of new firms in emerging industries then sometimes differs from the pre-existing regional industrial culture, and new firms may strive to detach from the regional industrial culture, and they can also contribute to changing this culture.

The creation route to industry emergence involves the establishment of industries that are new to the region and not related to any existing regional industry. We therefore argue that the organizational culture emerging in pioneer firms that are created through the creation route most often align with the existing regional industrial culture to a lesser extent than firms in new and related industries. In many instances, the most relevant alignment will be between organizational culture in new firms and sectoral-level culture and practices.¹ It may then be the case that unrelated start-ups from the creation route lack both credibility and familiarity to fit in with the existing regional industrial culture, such as social legitimacy or the common understanding of the types of industrial activity that are 'accepted' in a region. In such cases, manoeuvring within the existing regional industrial culture may not suffice. It may also be necessary to create new elements of, or at least alter parts of, the existing regional industrial culture to fit more with sector-level organizational culture adapted by new firms for a region.

Based on such reasoning, we argue that alignment between culture in emerging firms and industries and existing and adapted regional industrial culture depends on how industries emerge through the branching route or the creation route. Such alignment is important as it determines to what extent the emerging industry is supported by a regional industrial culture.

ANALYTICAL FRAMEWORK

The overall line of argument, based on the above theoretical discussions, is illustrated in the analytical framework shown in [Table 1](#). The framework distinguishes between two main pathways of industry emergence: the branching route and the creation route. Firms in the two types of emerging industries create their organizational culture somewhat differently, to a large extent inherited from related regional industries when it comes to the branching route and more combined from different existing industries or following sector-level standards in the creation route. We reason that both routes demand support from a regional industrial culture to grow into fully fledged industries in a region. The existing regional industrial culture is mainly supportive of firms and industries emerging through the branching route, and manoeuvring within the regional industrial culture can secure alignment between organizational culture in the emerging industry and the adapted regional industrial culture. Emerging firms and industries through the creation route may demand larger changes in the regional industrial culture to achieve alignment

Table 1. Analytical framework for studying two types of industry emergence based on organizational and regional culture alignment.

	Creation of organizational culture in new firms for a region	Role of the existing regional industrial culture	Adaption of the regional industrial culture for alignment
Branching route	Influenced by related regional industries	Mainly supportive of new regional industries	Manoeuvre within the existing regional industrial culture
Creation route	Combined from different existing industries and influenced by sector-level standards	May hamper emerging industries if the organizational culture is in conflict with the prevailing regional culture	Create new elements of regional industrial culture through legitimation

between organizational and regional culture. This may demand work to legitimate new types of industries and ways of doing things in the regions.

We examine the relevance of these theoretical considerations to empirical studies. We employ the theoretical framework in Table 1 in reanalyses of existing studies of industry emergence in two Norwegian regions: the establishment of the boatbuilding and the electronics industry in Arendal; and the cancer medicine and the educational technology industry in Oslo. The existing studies do not directly target the role of culture for industry emergence, while the task of our reanalyses is exactly to carve out the type of route of emergence of the four industries, the development and characteristics of the organizational culture of the new industries and its degree of alignment with the industrial culture of the regions.

The two industries in Arendal emerged in the 1950s and 1960s in very different ways. The boatbuilding industry focusing on the production of leisure boats in glass fibre benefitted much from traditions in wooden boatbuilding and continued a culture of handicraft, a DUI innovation mode and specialized products. The electronics industry emerged mainly from a large firm that moved from Oslo. This firm mass-produced standardized products (telephones) in a Fordist way and imported a new organizational culture to the region. The two industries in Oslo emerged just before and after the year 2000. The Oslo region (Oslo and former Akershus county) had 46% of the research and development (R&D) cost and also 46% of the R&D employment in Norwegian industry in 1999 (Gundersen, 2002, tab. 3.2) compared with 27% of all employed in Norway,² that is, Oslo had a highly R&D-intensive industry. The cancer medicine industry builds on indigenously developed scientific knowledge and continues an organizational culture of R&D in academic spin-offs. The small cancer medicine firms focused on the first part of the product development phase, while leaving commercialization, production and marketing to large companies. The education technology industry in Oslo is also based on mainly local entrepreneurs and competence. However, it builds much more on a DUI innovation mode, using experience-based knowledge and performing both product development, production, marketing and sale. The industry then breaks with the science-based organizational culture found in important parts of the industry in Oslo as well as with the 'paper culture' in the large publishing houses in Oslo.

Emergence of the boatbuilding and electronics industries in Arendal

Arendal, in southern Norway, saw the rise of two new industries for the region in the 1960s and 1970s: the boatbuilding industry following the branching route, and the electronics industry through the creation route. Arendal (consisting of current Arendal and Grimstad municipalities) had nearly 30,000 inhabitants in 1960.³ It was a stagnant and peripheral region at that

time. The manufacturing industry employed about 5000 people,⁴ and as shown below did not include much ‘modern’ industrial activity.

The organizational culture in the boatbuilding industry

An industry focused on the building of leisure boats in fibreglass emerged in Arendal from the mid-1950s. The industry grew quickly in number of firms and jobs, and Arendal became a leading area for production of motorboats in Europe in the 1960s and early 1970s (Isaksen, 2016).

The new industry had two roots. First, a long tradition in wooden boatbuilding in the Arendal region. Wooden boatbuilding is a craft that demands much practical training, and boats were mainly built on order for individual customers. The other root was competence in glass fibre and the use of this material in boat production. This competence came with a returned engineer who had learned about the material in the United States. Much practical experimentation with production techniques took place in the pioneer firms. The new competence about fibreglass boat production was combined with local traditions and practical competence in boatbuilding and boat construction from the long tradition of wooden boatbuilding in the region (Isaksen, 2016).

The boatbuilding industry in Arendal grew quickly through spin-offs from the pioneer firms. The typical entrepreneurs had few formal qualifications, but achieved their own practical competence and benefitted from local expertise in the development of production equipment (the forms used to mould hulls and other parts of the boat) and in boatbuilding and construction. The legacy of wooden boatbuilding influenced the organizational culture of the new firms toward craft production with an emphasis on practical expertise in the development and production of boats.

However, the production of glass fibre boats enabled the industrialization of boatbuilding. The fast growth of the boatbuilding industry in Arendal until the mid-1970s occurred particularly in one large firm that produced several boat models in series, following the then dominant, among industrialist and management consultants, Fordist mass production logic. The firm ran into difficulties caused by a stock of boats that was difficult to sell in the wake of the 1973 oil crisis. That experience led to a common understanding in the boat industry in Arendal that industrialized boatbuilding does not fit in this region. A joint narrative among leaders of many small boat firms, several with experience as managers in the large, Fordist firm, was that the shutdown of this firm demonstrated that boatbuilding should be a craft based on skilled workers who produce high-quality boats that are to some extent adapted to individual customers. That is, the industry returned to the craft culture that originated from wooden boatbuilding and that suited the regional industrial culture. It can be added that this type of production contributed strongly to the fact that the industry lost international competitiveness and disappeared from Arendal after the oil crisis in 2008 (Isaksen, 2018).

The organizational culture in the electronics industry

An electronics industry started to grow in Arendal in the 1960s. The start followed the emergence route, necessitated by the fact that Arendal lacked any precondition for a locally based development of this industry. Thus, Aust-Agder county (where Arendal accounted for just over half of the population in 1960) had slightly more than 100 jobs in the electro-technical industry, which often constituted an important basis for the growth of the electronics industry (Isaksen & Trippl, 2017). By comparison, Oslo had about 9000 jobs in the electro-technical industry in 1961.

The electronics industry started by the establishment of two firms during the 1960s. The first was the then Oslo-based Elektrisk Burea (EB). The company established a factory for the production of telephone sets in Arendal. The establishment was supported by the Development Fund for Rural Areas (DU) and had the state-owned telephone company Televerket

as its main customer. The other firm was established in 1966 by a local ship owner with the intention to develop and produce electronics equipment for ships. Engineers were recruited from other parts of Norway, which also implies the emergence route. The firm soon experienced problems with product development and turned to contract production – a development that also led to a few spin-offs. The contract production later merged with the production part of EB into becoming the leading Norwegian electronics contract supplier.

The EB telephone production company in Arendal operated in accordance with Fordist production principles. The production consisted of a few telephone models to Televerket, and included quite simple, standardized and labour-intensive work. The factory had about 900 employees in 1975, of which 70–80 were office workers (Isaksen & Trippel, 2017). An important task at first was to train workers and establish a culture of manual manufacturing work among many (largely female) newcomers on the local labour market.

The EB factory in Arendal was eventually divided into a production and an engineering firm, the last owned by the Swedish Ericsson company. Ericsson decided to move the engineering department to Oslo in 1997, but it was retained in Arendal after local protests. One argument among local protestors was that the Ericsson department was important as a locomotive for regional industrial development, while local managers in the department replied that, if so, the locomotive was without wagons.

Alignment of organizational and regional industrial culture and changes in culture

This statement and the establishment of telephone production in a region without traditions in this type of large-scale manufacturing production suggest that the emergence of the electronics industry in Arendal led to the introduction of new industrial cultures in the area, both the culture of efficient factory production and the culture of development work, in this case of telecommunications software. The latter was developed through the creation of bachelor's, master's and eventually doctoral education at the local university campus, which demonstrates development of the RIS to the needs of the electronics industry. The boatbuilding industry, on the other hand, to a large extent continued a traditional craft culture when international competitors industrialized their production (Isaksen, 2018), which eventually led to the closure of this industry in Arendal.

Emergence of the cancer medicine and educational technology industries in Oslo

The Oslo region includes a thick and diversified RIS, giving firms access to heterogeneous sources of knowledge and other assets (Bugge & Thune, 2016). In 2000, the number of inhabitants in the Oslo region was about 774,000,⁵ and the main employment was in the public sector in addition to private and business services (Braadland, 2000). Analytical knowledge and R&D activity have been important for industrial growth in Oslo. Benefitting from long term R&D activity in hospitals and dedicated research institutes, the Oslo Cancer Cluster (OCC) arose through the branching route in the early 2000s. According to Edtech (2017), the dynamic industrial structure in Oslo also paved the way for the foundation of the educational technology industry through the creation route in the 2010s.

The organizational culture in the Oslo Cancer Cluster (OCC)

The research into oncology in the Oslo region has long roots as the collaboration between the University of Oslo and Radiumhospitalet, a specialized hospital for cancer treatment, going back to the 1930s. It is now part of Oslo University Hospital (OUS) and has developed into a 'Comprehensive Cancer Centre', with specialized workers within all areas of cancer and treatment methods (Oxford Research, 2013). Radiumhospitalet is the largest hospital specialized within cancer treatment in Northern Europe, with long tradition within both basic research

and clinical initiated research. Norway also holds a unique resource with the cancer register (*Kreftregisteret*), one of the oldest and largest cancer registers in the world, and within the bio-banks, especially within cancer pathology (Smith, 2018).

The cancer cluster project was established in the late 1990s when a number of cancer treatment and medicine-related firms emerged in the Oslo region. The cluster project includes about 100 members, where 12% are international members represented by Norwegian divisions of large pharmaceutical multinationals (Isaksen, 2016). While the latter represents the bulk of jobs among the members of the OCC, the cluster also includes several small, independent pharmaceutical firms, both academic and industrial spin-offs and start-up companies founded by Norwegian entrepreneurs. The process of developing cancer medicine involves a complex value chain and a vast number of resources. Cancer medicine firms build on an analytical knowledge base in basic research, and a combination of both analytical and synthetic knowledge for clinical research. The development of new cancer medicine in Norway mainly starts with R&D activities in hospitals or universities, often through small, dynamic groups of researchers with international backgrounds. The further development of products occurs through pre-clinical and clinical phases within small biotechnical firms (Isaksen, 2016). This process of developing medicine has become a learned effort or routine within the cluster, where various actors trust each other to manage different parts or phases of an 'end-product' resulting from joint efforts. Small firms in Oslo that develop cancer medicine draw on decades of research activity and a research and entrepreneurship culture based on inherited assets and experiences made by various firms and stakeholders within this niche (Isaksen, 2016). Individuals within the niche of cancer medicine research know each other in one way or another, and the common goal of fighting cancer also stimulates a culture of collaboration (Ngongoni & Grobbelaar, 2017).

The organizational culture in the Oslo education technology (edtech) industry

The edtech industry in Oslo has organized much collaborative activity within the Edtech cluster project. This was established in 2015 and includes 56 member organizations in 2020.⁶ About 35 of these are fairly small companies, which were mainly established in the last 10 years and focus on producing digital teaching and learning materials. The cluster also includes four large publishers and a number of supporting firms, for example, information technology (IT) firms, companies that focus on information diffusion and an e-learning experience centre.

The emergence of the Oslo edtech industry has occurred very differently than the emergence of the OCC. The edtech industry has largely developed outside of, and as a competitor to, the traditional analogue publishing industry, indicating the emergence through the creation route as a result of the combination of unrelated assets. The development outside the traditional publishing industry partly reflects a segmentation of the traditional book publishing industry created by ownership structures (the biggest publishing houses own the booksellers) and cultural policies to support Norwegian textbooks (Bugge & Øiestad, 2015). The edtech industry marks a break of the publishing of teaching materials for the Norwegian school system, from textbooks to far more digital teaching materials based on knowledge and competence in information and communication technology (ICT). This shift also entails changing the organizational culture when it comes to what is regarded as proper teaching materials, and in acquiring competence in developing digital teaching materials, in established publishing houses. In other words, old attitudes and experience of what is regarded as appropriate teaching materials and how this is produced is no longer prevailing, making large parts of the old publishing culture less relevant. Although traditional publishers develop digital products and services, the edtech industry in Oslo consists mainly of young firms in a new industrial sector for the region. Isaksen et al. (2019b) reveal that new edtech firms in Oslo are often small (with 10 employees or fewer) and with local entrepreneurs who have previously worked in the Oslo region. Newly established edtech firms build a culture based on interdisciplinary collaboration in projects, which also seems to be the case in

the publishing houses that draw in external specialists and suppliers to develop digital learning materials.

Alignment of organizational and regional industrial culture and changes in culture

Studies of the OCC demonstrates a homogeneous organizational culture based on a joint 'mission' with old roots that is continued through spin-offs through the branching route when the cancer medicine industry emerged in the early 2000s. The organizational cluster of small, research-intensive cancer medicine firms fit with the regional industrial culture centred on long traditions and infrastructure of cancer research.

Further, in the case of the OCC, system-building was a result from the collaboration between the University of Oslo and Radiumhospitalet.

The edtech industry, on the other hand, had to build an organizational culture more or less from scratch based on entrepreneurial activity outside of the traditional publishing houses. Still, the Oslo region is dynamic, measured by start-up rates, compared with other Norwegian regions. Oslo and Akershus counties (constituting the Oslo region) had the fastest start-up rate among Norwegian counties from 2008 to 2017.⁷ This signifies that the Oslo region has an entrepreneurial culture that may have triggered the formation of new edtech firms. Still, the traditional publishing industry, built around some large companies, is threatened by the growth of new firms based in new publishing technology. This indicates that a change in the regional industrial culture within the publishing industry was required in order to support the development of digital learning tools.

CONCLUSIONS

The question of where and how new industries emerge and grow has received much attention in economic geography and related fields in recent years. This article provides further insight to this question by conceptually examining the emergence of industries based on the notion of organizational and regional industrial culture, and by further exploring this topic by examining cases of industry emergence from Norway.

The article distinguishes between two pathways to new industries in a region: the branching route based on related new firms and the creation route based on unrelated start-ups and/or external competence and other assets imported to the region. The article focuses on how the organizational culture in emergent industries is formed and to what extent and how the regional industrial culture is or becomes aligned with cultures in new organizations. We argue that alignment of organizational and regional industrial culture is fairly simple when new industries emerge through the branching route. The organizational culture is then inherited from existing, related industries in a region and alignment with the regional culture may already be more or less in place. Alignment may be more demanding to achieve in the creation route. The organizational culture in emergent industries may then be created from scratch and in many instances coincides with sectoral-level culture and practices, which may differ from existing dominant regional industrial culture. The organizational culture in new industries may then need to be legitimized by key regional actors so that the emerging industries receive regional backing.

The illustrative cases demonstrate the relevance of our theoretical arguments to understand key elements of the emergence of new industries in regions. The boatbuilding industry in Arendal and the cancer medicine industry in Oslo have their roots in a craft culture and a research culture, respectively, that characterized both emerging firms and the regional industrial culture. The electronics industry in Arendal and the edtech industry in Oslo to a large extent introduced new organizational cultures to their regions, linked to Fordism in the first example and to the view of digital educational materials as proper solutions in the second example. These cultural

traits in new firms led to development and change in industrial cultures in the two regional industries.

The focus on organizational and regional industrial culture is far from the only or necessarily the most appropriate explanation for the emergence of the four industries. However, we think the cultural focus in the article and our idea of the need for alignment between the culture in firms in emerging industries and the existing or adapted regional industrial culture to back the growth of emerging industries, provides a valuable perspective on understanding the emergence of the industries. We also contend that the theoretical framework in the article contributes to the literature of new industry emergence and growth, and thus to the literature on regional industrial development.

However, the framework can be further developed by introducing a clearer geographical perspective. The four industries emerged in two very different locations, in a small and quite peripheral region in the 1950s and 1960s and in the by far largest region in Norway around the year 2000. In further studies we could study in what way regional contexts affect the organizational culture of firms in new industries and the alignment of organizational and regional industrial culture. Large regions with diverse industries will in general have several key industries with different cultures. This may make it quite straightforward to adapt the regional industrial culture to industries emerging through both the branching and the creation route. Smaller regions, on the other hand, have often few industries of any size and thus little variety in industrial cultures, which can make it challenging to adapt industrial cultures to the organizational culture in industries emerging through the creation route, in particular. Therefore, further research could include more in-depth studies of different types of emerging industries located in various types of regions.

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NOTES

- ¹ Thanks to an anonymous referee for raising this point.
- ² Source: Table 03257 in Statistical Banks of Statistics Norway; numbers for 2000.
- ³ Table 06913 in Statistical Banks of Statistics Norway.
- ⁴ The population census 1960, Table III in Booklet III.
- ⁵ See <https://www.ssb.no/tabell/04859/>.
- ⁶ Source: osloedtech.no/.
- ⁷ The share of new firms surviving their first year, based on Tables 10219 and 07196 in the Statistical Banks of Statistics Norway.

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