



# Networking, context and firm-level innovation: Cooperation through the regional filter in Norway



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## ABSTRACT

The paper assesses the role for innovation of one aspect which has been generally overlooked by evolutionary economic geography: context. It analyses how context shapes the impact of collaboration on firm-level innovation for 1604 firms located in the five largest city regions of Norway. Specifically, the analysis shows how the benefits to firms of collaborating within regional, national, and international innovation networks are affected by the knowledge endowments of the region within which the firm is located. Using a logit regression analysis, we find, first, that only national and international networking have a significant positive impact on the likelihood of innovation (the former only for process innovation), whereas the regional knowledge endowments have no direct effect. Second, regional cooperation is particularly effective in regions with high investments in R&D, whereas international cooperation is important in regions with an educated workforce – and regional and national collaboration may be ineffective in such cases. We conclude that, in the case of Norway, context is essential in determining the capacity of firms to set up networks and innovate. Regions with an educated workforce can use the resulting absorptive capacity to successfully assimilate knowledge being diffused through global pipelines from faraway places. However, this absorptive capacity is likely to be heavily filtered if regional firms mainly rely on internal connections within Norway.

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## 1. Introduction

In evolutionary economic geography, innovation is fundamentally the consequence of the interaction of firms with other firms in the same or in nearby locations. Context also matters, as firms are considered to be the outcome of their history, and their potential future trajectory is strongly shaped – in a path dependent manner (Martin and Sunley, 2006: 399) – by past events. However, within evolutionary economic geography it is mainly firms that shape their surroundings and not vice versa. Firms have the capacity to affect and change their environment, but the mechanisms through which the geographical context in which a firm operates influences its economic trajectory tend to be weakly operationalised. This is acknowledged by Boschma and Frenken who state that “we expect the effect of (territory-specific) institutions on [firm-specific] routines to be small as firms develop routines in a path-dependent and idiosyncratic manner” (Boschma and Frenken, 2009: 153).

In this paper, we tackle the issue of context head-on, by concentrating on how outcomes linked to the capacity of individual firms to learn and adapt through interaction are strongly influenced by the educational and research environment in which the firm conducts its activity. We will argue that the benefits of firm collaboration, whether conducted within the region or at a distance, may not be equally distributed across regions, but may instead be strongly affected by the conditions of the local environment in which the firm conducts its main operations. From our perspective, innovation activities are territorially embedded and fundamentally affected by the social, institutional, and political conditions in which they take place (Rodríguez-Pose, 1999; Asheim and Isaksen, 2002), a notion which has been developed under different theoretical guises in the form of industrial districts, learning regions, innovative milieus, and regional innovation systems (Aydalot, 1986; Becattini, 1987; Asheim and Isaksen, 1997; Cooke et al., 1997). We will further posit that the type of collaboration firms engage in – i.e. collaborating locally versus engaging with other actors at a distance – may depend crucially on the institutional conditions and resource endowments of the region within which the firm is located (Rodríguez-Pose and Fitjar, 2013).

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In order to do this, we will assess how, in the case of Norway, firms' collaboration with actors at different geographical scales – regional, national, and international – is conditioned by the socio-economic environment in which they operate and how this affects the firms' capacity to introduce innovations. In particular, we focus on the two aspects of the regional economy which have traditionally been regarded as the main motors for innovation: research and development activities (R&D) and education levels. Our aim is to analyse how these factors may act as filters of the innovative potential of firms directly, and – crucially – how they mediate the effects of collaborations established by individual firms in order to achieve greater innovation, both within the region and with actors outside the region. We will test whether this is the case using a tailor-made survey of firm-level innovation and collaboration involving 1604 firms located in the five largest city regions of Norway.

The results show that local conditions in R&D and human capital endowment strongly shape the innovative returns derived from the interaction of Norwegian firms with other stakeholders in the economy at different geographical scales. In particular, the analysis underlines how – in accordance with what has been highlighted in recent literature on other countries (e.g. [de Jong and Freel, 2010](#)) – although regional levels of R&D and education may have a limited or no direct effect on firms' probability of innovation, they play an important role in determining not only how firms collaborate ([Fitjar and Rodríguez-Pose, 2014](#)), but also the returns to such collaboration in terms of increased innovative capacity. Our results indicate that the local social economic environment in Norway thus operates as a filter which either favours or limits the innovative capacity of firms, depending on their level of interaction both with neighbouring and distant economic actors. Specifically, regional collaboration only contributes to radical product innovation in regions with high levels of internal R&D, while it is ineffective in regions with medium or low levels of R&D. The effect of national collaboration on radical product innovation is also enhanced when regional R&D is higher. Conversely, international collaboration does not interact significantly with regional R&D, but its effect on innovation is enhanced in those regions with a good endowment of human capital. The effects of international collaboration on product innovation tend to be stronger in regions with an educated workforce, whereas regions with lower levels of education derive fewer benefits from global pipelines, due to the lower levels of absorptive capacity. In contrast, education has a negative interaction with regional and national collaboration, which are more likely to lead to innovation in regions with a less educated workforce.

The paper is structured into the following five sections: First, we elaborate on our theoretical framework and hypotheses. Second, we present the case of Norway and the data. Third, we explain how the main variables were operationalised and present some descriptive data for each region. Fourth, we introduce the results of the regression models analysing the impact of collaboration, regional knowledge endowments, and their interaction on different innovation outcomes. Finally, we conclude with some implications for the literature on innovation and regional development, as well as for regional policy in Norway and beyond.

## 2. Resource endowments, interaction and innovation

Since at least the work of [Marshall \(1920\)](#), cooperation between firms and external agents has been considered to be of fundamental importance for innovation (e.g. [Porter, 1998](#); [Chesbrough, 2003](#); [Nooteboom, 2004](#); [Tapscott and Williams, 2006](#)). Firms which are able to draw on knowledge and new ideas generated both within and outside the firm are better placed to develop marketable new products and more efficient production processes.

In recent years, cooperation has in particular been at the heart of evolutionary economic geography. Evolutionary economic geographers have adopted firms as the main protagonists of the analysis, and the organisation and routines of individual firms, together with their capacity to learn and adapt through interaction and externalities, has been central in a large number of analyses in recent economic geography (cf. [Mackinnon et al., 2009](#)). Evolution – and therefore change and innovation – is determined by firm interaction in networks which selectively shape the environment in which economic activity takes place. Firm learning, technological change, and self-organisation shape the geographical context in which a firm operates ([Mackinnon et al., 2009](#)). This shaping of the local context and how, as a consequence, it subsequently affects the performance of firms in a path dependent manner has been increasingly analysed by evolutionary economic geographers (e.g. [Boschma and Martin, 2010](#)). However, the mechanisms through which contextual factors associated with regional overall educational, innovative or institutional endowments affect the performance of individual firms and their capacity to learn, change and organise themselves are still poorly understood. There is no well-established two-way road. While in an evolutionary economic geography framework, firms affect and change their environment and this change, in turn, affects their performance, the mechanisms through which the geographical context – understood as the set of local or regional conditions which make territories more innovation prone or averse – in which a firm operates influences its economic trajectory have attracted much less attention in evolutionary economic geography. It is generally believed that overall local conditions would have a small or negligible effect on firm behaviour, as the specific routines of firms will be the result of path dependency ([Martin and Sunley, 2006](#); [Boschma and Frenken, 2009](#)). The consequence is that the role of context and local conditions tend to be weakly operationalised.

While this focus by evolutionary economic geographers on the internal institutional factors which shape the innovative and economic trajectory of a firm is welcome, it tends to neglect that firms are embedded in geography and local institutions which they may not always be able to influence ([Amin and Thrift, 1995](#); [Morgan, 1997](#); [Martin and Sunley, 2006](#)). A thorough understanding of context in particular geographical spaces is needed in order to grasp firm trajectories. Context and geography create the territorial conditions and social relationships which shape the potential of firms to emerge, network, learn, and thrive (and/or die) in different environments ([Rodríguez-Pose, 2013](#)). This indifference of context and of how interactions are constructed, evolve, and/or endure over time thus represents a significant barrier for fully comprehending where and how economic activity takes place. It also ignores a large body of literature in economic geography assessing how local conditions shape the learning and innovative capacity of the economic agents acting in a particular territory. These conditions generate learning regions ([Morgan, 1997](#)), creating environments that are more or less conducive or hostile to frequent formal and informal interaction among individuals, firms and other institutions and, consequently, to innovation and growth ([Leydesdorff, 2000](#); [Storper and Venables, 2004](#); [Cooke et al., 2005](#)). Likewise, local conditions may affect the capacity of firms to first engage and then successfully establish pipelines that allow them to tap into and exploit knowledge produced elsewhere ([Bathelt et al., 2004](#); [Fitjar and Rodríguez-Pose, 2011](#); [Morrison et al., 2013](#)). As argued by [Cohen and Levinthal \(1990\)](#), a firms' ability to discover and exploit external knowledge – its absorptive capacity – depends crucially on the endowments of the area in which it operates. Building on this work, successive studies have discussed the importance of regional or cluster-level conditions (e.g. [Giuliani, 2005](#); [Azagra-Caro et al., 2006](#)), such as R&D availability or the presence of skilled labour in the region, as factors on which firms

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