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Innovating in the Periphery: Firms, Values and Innovation in Southwest Norway

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Abstract *How do peripheral and relatively isolated regions innovate? Recent research has tended to stress the importance of agglomeration economies and geographical proximity as key motors of innovation. According to this research, large core areas have significant advantages with respect to peripheral areas in innovation potential. Yet, despite these trends, some remote areas of the periphery are remarkably innovative even in the absence of critical innovation masses. In this paper, we examine one such case—the region of southwest Norway—which has managed to remain innovative and dynamic, despite having a below average investment in R&D in the Norwegian context. The results of the paper highlight that innovation in southwest Norway does not stem from agglomeration and physical proximity, but from other types of proximity, such as cognitive and organizational proximity, rooted in soft institutional arrangements. This suggests that the formation of regional hubs with strong connections to international innovative networks may be a way to overcome peripherality in order to innovate.*

1. Introduction

In a more integrated world, innovation and innovative capacity have become increasingly concentrated in cores. Core areas have the best endowments in human and physical capital dedicated to research, and also benefit from large economies of agglomeration, specialization and diversification externalities, as well as from important knowledge spillovers (Verspagen, 1997; Leamer & Storper, 2001). Peripheral locations, in contrast, struggle to attain the necessary critical mass in order to generate innovation and tend to be regarded as too remote to benefit from knowledge spillovers. The combination of insufficient clustering, limited economies of agglomeration and externalities and geographical remoteness

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generally tends to trump even the potential returns of high investment in research and development (R&D). This has led some researchers to question whether it is worth investing in R&D in the periphery (Rodríguez-Pose, 2001).

Yet, and in spite of the powerful forces that favour the generation and diffusion of innovation in large urban agglomerations in economic cores, some small, peripheral regions have managed to remain highly innovative in the absence of strong clusters, critical research masses and even with relatively low investments in R&D in their respective national contexts. This is the case of southwest Norway, which has continued to be not only one of the richest regions in Norway and in the world—measured by GDP *per capita*—but also one of the most innovative, despite its remote location and small population size. This has happened even though R&D investment inputs in the region have been relatively low in the Norwegian national context.

This paper seeks to explain why this is the case and to examine the reasons behind the continued high levels of innovation and competitiveness of local firms in southwest Norway. In order to do so, it uses data from a survey of 436 managers of regional businesses. This survey matches the level of innovation of local firms to their managers' values and attitudes and allows us to discern the level of collaboration of individual firms with other local and non-local companies and the importance managers attach to soft institutional factors such as trust and open-mindedness.

The results of the analysis find that, contrary to the expectations of theories that highlight the importance of local collaboration, agglomeration and clustering, face-to-face regional cooperation and agglomeration are not relevant factors in the generation of product innovation in southwest Norway. Neither the diversity of regional partners used in innovation processes, nor the level of local interaction between managers seems to make a difference for the likelihood of local firms developing new products. In contrast, long-distance international cooperation is the most conducive factor to product innovation. Companies that use a wide range of international partners in innovation processes are significantly more likely to develop new products, as well as to generate radical innovations. The findings suggest that regional hubs in the periphery with strong connections to international collaborative networks can successfully produce innovation and economic development.

The paper goes on to explore why cooperative relationships with international partners seem easier to achieve in some remote regions, such as southwest Norway, arguing that the values and attitudes of managers are important in explaining why some businesses are more internationally connected than others. Businesses with more open-minded managers cooperate with a wider range of international partners, whereas businesses with more trusting managers tend to develop more extensive regional networks. This suggests that regional management culture may be an important factor in explaining variation in the innovative capacity of remote regions.

2. Do Regional Cooperation and Proximity Matter for Innovation?

2.1. *Agglomeration, Clusters, Institutions and Innovation*

Innovation is not only the consequence of the level of investment in R&D of a given firm or in a given territory, but also the result of complex systemic interactions between innovative and economic actors that often take place in close geographical proximity.

In many ways, innovation can be regarded as "a territorially embedded process and cannot be fully understood independently of the social and institutional conditions of every space" (Rodríguez-Pose & Crescenzi, 2008, p. 54). Every region has a unique set of circumstances that affects the absorption and diffusion of new knowledge among businesses. These regional factors include institutions, policies, networks and social values and norms that facilitate interaction, the exchange of knowledge and, ultimately, innovation (Morgan, 2004).

Local formal and informal institutions are essential in facilitating these exchanges. The presence of firms and other socioeconomic actors in close geographical proximity often leads to the generation of "dense institutionalized" markets (Trigilia, 1992) that contribute to the sharing of knowledge resources and to the formation of social and political capital (Amin & Thomas, 1996; Morgan, 1997; Cooke & Morgan, 1998). Within these agglomerations, intricate institutional systems are created that facilitate and encourage interaction, resulting in the formation of what are known as regional systems of innovation, "learning regions" (Morgan, 1997; Cooke & Morgan, 1998; Gertler *et al.*, 2000; Bathelt, 2001) or "innovation prone societies" (Rodríguez-Pose, 1999).

The cooperation and collaboration among economic actors is at the heart of the emergence of these "learning regions" or "innovation prone" societies. The presence of regular face-to-face contacts within agglomerations and clusters and the frequent associations among socioeconomic stakeholders (Cooke & Morgan, 1998) produce a series of relational and non-substitutable locational assets (Storper, 1997; Brenner, 2002). These lead to the creation of a unique set of local institutional conditions that influence the rate at which firms individually—and societies collectively—generate and adopt innovations. Constant interaction thus becomes key for the formation of public and semi-public goods, such as trust and open-mindedness, that are essential in the reduction of transaction costs and the diffusion of knowledge and innovation (Storper & Venables, 2004; Florida, 2005; Rodríguez-Pose & Storper, 2006). These factors, in turn, create self-reinforcing virtuous circles by facilitating further cooperation and interaction. Hence, agglomeration and geographical proximity tend to produce closely knit institutional networks within limited geographical spaces. These networks become key vehicles for the generation of collective learning, all types of innovation and knowledge spillovers (Asheim & Coenen, 2006).

According to these theoretical views, we can hypothesize that (a) the collaboration with a wide range of partners will have a positive impact on the innovative capacity of firms and (b) the generation of certain public or semi-public goods, such as trust and open-mindedness, will affect a firm's propensity to collaborate with external partners and, consequently, its capacity for innovation.

2.2. *Does Location Matter for Innovation?*

Does the geographical location of firms matter for their capacity and potential to share knowledge and generate innovation? Despite recent claims that progress in information and communications technologies has made physical proximity less and less relevant and rendered the "world flat", allowing companies to innovate without having to migrate (Friedman, 2005, p. 217), most new theoretical strands tend to stress the importance of agglomeration and physical proximity for innovation (Cantwell & Iammarino, 2000; Audretsch & Feldman, 2004; Storper & Venables, 2004). Hosts of researchers from different disciplinarian backgrounds have posited that Friedman's (2005) landscape

of firms capable of drawing on available resources from far afield, and which are subsequently able to sell their products in distant markets, regardless of geographical distance, is nothing but a pipe dream (e.g. Florida, 2002; Scott & Storper, 2003). The dominating point of view is that, far from businesses increasingly being decoupled from their geographical location, physical proximity is essential for the generation and absorption of innovation and for growth.[1] Furthermore, as a consequence of globalization and regional economic specialization, innovation and economic development will be even more geographically concentrated in the future (Scott & Storper, 2003). Regions with higher concentrations and better endowments of physical and human capital and with a greater density of top universities and research centres tend to innovate more and to generate greater knowledge spillovers, which, in turn, contribute to the creation of virtuous circles of innovation. Closely knit clusters facilitate constant interaction in the form of face-to-face contacts that diffuse knowledge and innovation.

Recent empirical evidence seems so far to have corroborated these views, with large urban agglomerations becoming the epitome of this type of concentrated innovation and development. As Florida (2002) argued, a surprisingly low number of cities account for the vast majority of innovation in the world, and their importance is growing. Within large cities "[i]deas flow more freely, are honed more sharply, and can be put into practice more quickly when large numbers of innovators, implementers, and financial backers are in constant contact with one another, both in and out of the office" (Florida, 2005, p. 50). In this view, it matters not only who you cooperate with, but also how closely your partners are located geographically. Face-to-face contact will make it easier to develop ideas into marketable products, and one should expect most innovation to result from cooperation between partners located in the same region. The theories of regional business clusters (Porter, 1990) have similar foundations. The presence of territorial concentrations of interconnected firms with complementary skills generate greater interaction, more innovation and ultimately more economic growth than do individual or dispersed local enterprises.

In addition, the diffusion of innovation is costly and tends to suffer from distance decay effects. Knowledge spillovers become less relevant and eventually ineffective with distance. The distance decay effect is strong. In the European Union, for example, knowledge spillovers are hardly felt beyond 250 km from the place of origin (Moreno *et al.*, 2005; Rodríguez-Pose & Crescenzi, 2008), while in the case of the US, the effects of knowledge innovation disappear beyond 80 km from its source (Varga, 2000; Ács, 2002; Sonn & Storper, 2008).

All this implies that innovation is most likely to be generated in and diffused within large agglomerated economies—what Florida *et al.* (2008) called the rise of the mega-region—and that peripheral areas are bound to be disadvantaged because of their relative shortage of agglomeration economies and their geographical distance to the hotspots of innovation. Following Brenner, the sources of competitiveness are prone to be "embedded within territorially localized production complexes [. . .] which provide firms with place-specific clusters of non-substitutable locational assets" (2002, p. 14), such as labour, technology and infrastructure. Remoteness, isolation and the absence of a critical mass of economic actors working in the same and/or related sectors with whom to establish close ties would, in contrast, act as a barrier for the diffusion of information and knowledge and, consequently, for innovation. In sum, peripherality can be regarded as an important barrier for the pursuit of innovative activities, as "high knowledge-intensive activities

are produced primarily in increasing returns to scale environments that are dependent on urban agglomeration, while low knowledge-intensive activities are produced rather more in environments of constant returns to scale" (McCann, 2008, p. 367), which tend to be associated with peripheral locations.

Yet, despite the disadvantages of peripherality for the genesis of innovation, some remote regions have managed to remain innovative. This is the case of southwest Norway, in general, and of the region of Stavanger, in particular, whose firms have kept generating and adapting innovation, in spite of the meagre local economies of agglomeration and a low level of investment in R&D within the Norwegian national context. How do these peripheral regions manage to remain innovative?

As stated by Torre and Rallet (2005) and Boschma (2005), geographical proximity is only one expression of distance. There are other dimensions of distance which can be completely detached from geographical proximity. Boschma (2005, p. 62) identified four such dimensions that may help firms in peripheral regions maintain cooperation with innovative firms in cores and boost their capacity both to generate and absorb innovation. The four dimensions are cognitive, organizational, social and institutional distance. Cognitive and organizational distances refer to the cumulative and localized outcomes of processes of exchange of tacit knowledge among firms and to the organizational similarities and interdependencies among firms, respectively. Social distance refers to the social context in which economic activities are embedded, whereas institutional distance controls for the presence of similar institutional features, such as language, norms, habits and legislation (Boschma, 2005, pp. 63–65). All these proximities may help peripheral regions overcome the handicap of their physical distance with respect to the main centres of innovation. By using these types of proximities, firms in peripheral areas may become globally connected and draw on assets and capabilities from far afield. The innovative capacity of firms in remote areas will thus hinge on the number and quality of the connections between the regional economy and international networks (Gereffi & Sturgeon, 2004; Prahalad & Krishnan, 2008).

However, the belief in the role played by different types of proximities for the genesis and/or diffusion of innovation is not exempt from controversy. Resorting to types of proximities other than geographical distance leads to the assumption that some kind of resemblance or closeness suffices to start off and spread innovation. It is also often implied that one type of proximity can be substituted by another type. However, overcoming geographical distance by exploiting other types of proximities is easier said than done. Human agency cannot be substituted by abstract proximities: while cognitive and organizational proximities may facilitate communication, without direct human interaction—which, in turn, is affected by geographical distance—they are likely to generate little or no innovation. Hence, the innovative capacity of regions will rely on what Bathelt *et al.* (2004) have called a combination of local buzz, for the internal capacity for innovation, and global pipelines, in order to be able to assimilate innovation produced elsewhere (see also Wolfe & Gertler, 2004). The buzz related to agglomeration and short geographical distances facilitates the generation and diffusion of tacit knowledge though face-to-face contacts and other forms of human interaction (Storper & Venables, 2004; Gertler & Wolfe, 2010). Global pipelines are based on institutional, social and even cognitive contacts which build, overcoming geographical distance, the channels of communication, at the root of the diffusion of tacit knowledge (Bathelt *et al.*, 2004). Different types of proximities may thus not provide a perfect substitution, but simply

a complement to geographical proximity, facilitating interaction both within and outwith the region (Wolfe & Gertler, 2004; Rodríguez-Pose & Crescenzi, 2008).

But which are the mechanisms that may help overcome isolation and establish links of cooperation between individuals, researchers and firms located in distant regions? As in the case of geographical distance, soft institutions may be at the root of the setting up of links and networks. These soft institutions, such as social capital, provide the means to reduce uncertainty and suspicion between economic actors and facilitate coordination and the generation of trust. Consequently, as in the formation of local networks, more open-minded and trusting individuals and economic actors are likely to make the most of the potential benefits that cognitive, organizational, social and institutional proximities offer. Through these soft institutions and their outcomes, firms will be more capable of establishing cognitive proximity links and to share organizational arrangements. In addition, relationships between equally trusting and open-minded individuals, using a common language as a vehicle for communication, are likely to result in bonds of shared experiences and friendships that promote the exchange of knowledge and innovation and reduce organizational and social distance. Finally, a common base of institutional rules and cultural customs and habits—that is a small institutional distance—will also facilitate interaction and knowledge exchange (Boschma, 2005).

These soft institutional mechanisms can help boost the importance of both local contacts essential for the establishment of local networks and of non-geographical types of distance, contributing to overcome the shackles of physical proximity in the establishment of economic networks and links and contributing to the formation of channels for the diffusion of knowledge and innovation, even at large geographical distances. Hence, the values and attitudes, such as the trust and open-mindedness of economic actors, may not just be essential for the formation of local networks, but also for the establishment of collaborations with individuals, research centres and firms in distant regions and for the creation of complex and ageographical systemic networks of innovation. From this perspective, soft institutions may help peripheral regions address the problems of weak local innovation systems, on the one hand, and of remoteness for innovation, on the other, and help transform what otherwise may just be backwaters into "innovation prone areas". In this paper, we apply these ideas to study the remarkable innovation capacity and dynamism shown by firms in southwest Norway in the face of relative geographical isolation.

3. Innovation in Southwest Norway

Despite a remote location in the northern periphery of Europe, a small domestic market, and a relatively low level of R&D expenditure in the Scandinavian context, Norway has remained a remarkably competitive economy throughout the post-war period. In recent years, the Norwegian GDP *per capita* has consistently been among the top in the world. In 2008, the International Monetary Fund ranked Norway's GDP second in the world in nominal terms, and third in purchasing power parities (International Monetary Fund, 2009). The success of the Norwegian economy is partly linked to natural resources, in particular the export of oil and gas from the Norwegian Continental Shelf, and partly to the development of political and social institutions that have enabled Norway to avoid the resource curse and become a fundamentally knowledge-driven economy (Karl, 1997; Mehlum *et al.*, 2006).

Soft institutions have played an important role in keeping Norway knowledge- and innovation-driven and dynamic. One particularly interesting case of this dynamism is the coastal southwestern region around the cities of Stavanger and Kristiansand. The region is in some ways a microcosm of the Norwegian economy, being the most economically developed peripheral region in the country in terms of regional GDP (GDPR) despite having some of the lowest levels of R&D expenditure of the major city regions.

Southwest Norway is a meta-region encompassing the counties of Aust-Agder, Vest-Agder and Rogaland, as well as the Sunnhordland district of Hordaland county (Figure 1). The region has around 700,000 inhabitants and encompasses three major urban areas around the cities of Stavanger, Kristiansand and Haugesund. It hosts the main petroleum cluster in Norway, which, given the global characteristics of the industry, is dominated by multinational firms. The cluster accounts for more than half of the country's total oil and gas employment. The other main industries in southwest Norway are maritime industries, petroleum-related chemical processing, shipping, ICT, fisheries and agriculture.

In a comparative study of the economic potential of the six major Norwegian city regions,[2] Blomgren *et al.* (2007) showed that the Stavanger and Kristiansand regions were the two city regions with the lowest rates of R&D expenditure per inhabitant. In 2007, the total R&D expenditure *per capita* in southwest Norway was NOK 4441, compared with NOK 21,174 in south Trøndelag and a national average of NOK 7993 (NIFU STEP, 2009). The two cities also had the lowest proportion of university educated adults of the major Norwegian city regions. In 2005, 23.1% of people in southwest Norway had a university degree, compared with 34.0% in Oslo and a national average of 24.8% (Statistics Norway, 2009a).

However, this did not prevent the region from remaining competitive and innovative. From 2000 to 2006, the Stavanger region had the highest number of registered patents *per capita* of all Norwegian city regions. Companies located in the region were granted 3.0 patents per 10,000 inhabitants, compared with 2.2 in the Trondheim region, 1.7 in the Oslo region and a national average of 1.0 (Blomgren *et al.*, 2007). Rogaland county

Figure 1. Map of southwest Norway

also had the highest GDPR *per capita* outside the capital region. Rogaland's GDPR *per capita* in 2006 was NOK 384,521, whereas the Norwegian GDP *per capita* excluding the Continental Shelf was NOK 336,667 (Statistics Norway, 2009b). While not matching the Stavanger region in terms of patents or GDPR,[3] Kristiansand had the highest number of registered new companies per inhabitant apart from the capital, suggesting a high level of dynamism in the regional economy. The Kristiansand region registered 8.0 new companies, and the Stavanger region 7.4, per 1000 inhabitants in 2006. Excluding the capital region (which had 9.5 new companies per 1000 inhabitants), the national average was 6.8 new companies (Blomgren *et al.*, 2007).

The high level of innovation in southwest Norway coupled with a low rate of investments in R&D makes the region an outlier in the traditional models positing a causal relationship between R&D inputs and innovation outputs. Two potential reasons can be advanced as to why this is the case. First, southwest Norway's innovation performance can partly be attributed to the division of labour between Stavanger as the petroleum capital of the country and Trondheim as the main centre of research in the natural sciences. Second, the region has pursued a policy of encouraging local firm interaction, with the notion of regional innovation systems at the heart of policy development for a number of years (Fitjar, 2009, p. 124; Hatakenaka *et al.*, forthcoming). Cluster support and the active promotion of a regional innovation system may thus have acted as a substitute for the relative absence of direct R&D investment and helped to propel innovation. However, the question of why southwest Norway is so innovative remains open. This paper examines the determinants of innovation among companies in the region, discussing the impact of cooperation on innovation, as well as the impact of soft regional institutions on patterns of network formation and cooperation.

4. Method

This paper seeks to examine why the region of southwest Norway has managed to remain competitive and innovative, despite a remote location and the lack of a critical innovation mass. On the basis of the discussion in Section 2, the central hypotheses are that (H1) collaboration with a wide range of partners will have a positive effect on innovation and that (H2) global connectedness is particularly important for businesses in a peripheral region such as this. A third hypothesis is that (H3) soft institutions leading to the generation of public or semi-public goods such as trust and open-mindedness affect the levels of collaboration.

In testing these hypotheses, the paper draws on data from an autumn 2007 survey of business managers in southwest Norway. The survey was developed and administered by the authors. The sampling frame included the CEOs of all companies with five or more employees in the region, making up a total of 3928 businesses. These companies are required by law to be listed in the Norwegian Register of Business Enterprises. The data were collected through a combination of telephone interviews and a follow-up online questionnaire; 1151 managers completed the telephone interview, and 436 of these also filled in the follow-up questionnaire. Comparing the data from those who completed the follow-up questionnaire with those who only took part in the telephone interview section, the average company size and education levels are slightly higher in the former sample, and the managers tend to exhibit higher levels of openness. The median number of employees was 17, with 35% of the businesses having between 5 and 10

Table 1. Innovation in southwest Norway

	New products < 3 years?	Products new to market?
Yes	227 (52.7 %)	85 (19.7 %)
No	204 (47.3 %)	346 (80.3 %)
N	431	431

employees, 55% having between 10 and 100 employees and 10% having more than 100 employees up to a maximum company size of 3000.

The dependent variable in hypotheses 1 and 2 is the innovativeness of the companies. As a measure of this, managers were asked whether their company had introduced any new or significantly improved products during the last 3 years. A total of 53% of the respondents reported that their company had introduced a product innovation during this period. Managers were then asked whether the products were marketed ahead of similar products by competing companies (radical product innovation) or whether they were only new to that company (product innovation). Of the innovative companies, 40% reported that their innovations were new to the market. This equates to 20% of all companies surveyed. These operationalizations of product innovation and radical product innovation were based on the OECD and Eurostat's (2005) guidelines for collecting and interpreting innovation data (the *Oslo Manual*). The findings are summarized in Table 1. In order to examine product innovation from the widest possible perspective, both of these indicators are used as dependent variables in the study. The same models are run separately for each of the two dependent variables "product innovation" and "radical product innovation".

The empirical section of the paper adopts a two-stage approach. It first examines whether cooperation with different types of partners in different geographical locations makes a difference to the likelihood of innovation in local companies, using a logistic regression analysis[4] to ascertain whether the sources of innovation are local or stem from collaboration with agents and organizations outside the region. It then analyses the factors that lead to the establishment of cooperation with partners for innovation through an ordinary least squares (OLS) regression analysis of the range of partner types used by companies, focusing in particular on the soft institutional factors of trust and open-mindedness.

5. Innovation and Cooperation

In order to assess the influence of cooperation on the development of new products, the survey asked managers of the companies that had introduced new products in the last 3 years how these products were developed. The respondents were given three options: mainly by their own company, mainly by their company in cooperation with other companies and/or organizations or mainly by other companies or organizations. Table 2 shows the results of this question.

Slightly more than half the companies developed their product innovations in-house, while 46.6% of companies relied on the help of others in developing new products. Most of these cooperated actively with their partners in the development of the products, while a smaller proportion simply relied on other companies to develop product innovations for them. This suggests that cooperation is important in the development of

Table 2. Development of new products

Products were developed ...	
mainly by our company	118 (53.4 %)
in cooperation with companies/organizations	81 (36.7 %)
mainly by other companies or organizations	22 (9.9 %)
N	221

product innovation for a large share of companies and does not rule out that many of the companies which have developed innovation in-house may also have benefited from interaction with other actors and organizations. However, in order to address the question of whether cooperation actually makes companies more innovative, it is necessary to examine the relationship between the diversity of companies' networks and actual innovation outcomes. This also allows for an examination of the effects of networks at different levels of geographical proximity.

For the purposes of analysing whether cooperation led to innovation (H1), a logistic regression analysis of the relationship between levels of cooperation and innovation was applied. The independent variable cooperation was operationalized in two different ways, pertaining to passive sources of information and active partnerships. Each of these was regressed on the likelihood of developing new products, as well as of radical product innovation.

Passive sources of information were measured by the variable "diversity of information sources", which was based on a survey question asking the managers to rate the importance of each of 14 different types of sources[5] to their company's innovation activities on a four-point scale ranging from "not used" to "very important". Companies that make good use of a wide range of information sources could be expected to be in a better position to innovate. The range of different types of information sources rated as being "very important" by the managers was used as an indicator of the diversity of information sources used by the companies; 85% of companies rated at least one source of information as very important for their company, and 56% rated at least two sources in that category.

Active partnerships were measured by the variable "diversity of partner types". This indicator was based on a question asking managers whether or not they had cooperated with other companies or organizations on innovations over the last 3 years. This question was asked in relation to seven different types of partners: (1) other companies within the conglomerate, (2) suppliers, (3) customers, (4) competitors, (5) consultancies, (6) universities and (7) research institutes. More than 90% of respondents stated that they had used some kind of partner in innovation processes, with the average company using 2.9 different types of partners. Even among companies stating that they had not actually introduced any new products within the last 3 years, 86% reported having used a partner in an innovation process, with the average being 2.7 different types of partners.

In order to test hypothesis 2, a separate logistic regression analyses the impact of partner location. For each of the different partner types, respondents were asked whether their partners were located regionally, nationally or internationally. This allowed for the construction of an indicator measuring the extensiveness of the companies' regional, national and international networks, forming the basis for the three independent variables

"diversity of regional partners", "diversity of national partners" and "diversity of international partners". We expect companies cooperating with a variety of types of international partners to be able to tap better into value chains and networks of innovation and to draw on a wider range of assets and capabilities than firms with low levels of cooperation outside the region. Conversely, companies cooperating fundamentally with regional partners are more likely to find local companies with compatible skills and fresh ideas, thus profiting from more face-to-face interaction and lower adjustment problems when cooperating. In total, 55% of the companies surveyed used at least one regional partner for innovation, while 61% used a national partner and 35% used an international partner. The average company used 1.22 types of local partners, 1.31 types of national partners and 0.66 types of international partners.

The regression model adopts the following form:

$$\text{logit}(\pi_i) = \alpha + \beta_1 \text{ Partners}_\text{i} + \gamma_2 \text{ Controls}_i + \varepsilon_\text{i}, \quad (1)$$

where π refers to two different dependent variables, measuring (a) the probability that company i has introduced a new or significantly improved product within the past 3 years (product innovation), and (b) the probability that company i has developed a product new to the market within the past 3 years (radical product innovation). The variable of interest is *Partners* and covers three types of collaborations: (a) a measure of the diversity of passive sources of information (Table 3, Regression 1); (b) a measure of the diversity of active partner types (Table 3, Regression 2) and (c) the geographical origin of active partners, distinguishing between regional, national and international partners (Table 3, Regression 3).

The model also introduces a vector of controls, inserting a number of factors that can be expected to affect product innovation. The controls include the level of education, age and number of directorships of the manager of company i, as well as the size and the level of foreign ownership of the company. The education of the manager is expected to be positively associated with innovation. The age of the manager may also make a difference, with young managers being expected to be more conducive to innovation due to them being less risk-averse—having less to lose—and often more creative. The size of the company is likely to have a positive effect on innovation, given the greater access to resources enjoyed by larger companies. The personal network of the manager is measured in terms of the number of directorships held on company boards, and it is also expected to have a positive impact on the likelihood of product innovation. Finally, the level of foreign ownership is measured in terms of the percentage of shares held by non-Norwegian owners. Foreign-owned companies will, in all likelihood, be more advanced technologically and therefore in a better position to develop new products. In addition, the introduction of the size of the company and foreign-ownership helps to control for the influence of the petroleum industry in innovation in the region. As mentioned earlier, oil firms in the region not only tend to be foreign-owned multinationals, but are also significantly larger in size than the average local firm. Controlling for foreign ownership also helps to weed out the firms external to the region in the petroleum industry from the smaller in number, but nevertheless significant, number of oil multinationals of local origin. Finally, ϵ represents the error term.

The results of running Model (1) for each of the two dependent variables are presented in Table 3. A number of tests were run on the model, with the variance inflation factor

Table 3. Logit regression estimation of the empirical model: innovativeness

	$\pi = E$ (Product innovation)			$\pi = E$ (Radical product innovation)		
	Regression 1	Regression 2	Regression 3	Regression 1	Regression 2	Regression 3
Diversity of info sources	0.22*** (0.07), 1.25			0.16** (0.08), 1.18		
Diversity of partner types		0.12* (0.07), 1.13			0.13 (0.08), 1.14	
Diversity of regional partners			−0.03 (0.08), 0.97			0.06 (0.10), 1.06
Diversity of national partners			0.14 (0.08), 1.15			0.01 (0.10), 1.01
Diversity of international partners			0.30** (0.13), 1.34			0.42*** (0.14), 1.52
Manager's education level	0.41*** (0.14), 1.51	0.38*** (0.14), 1.46	0.31** (0.14), 1.37	0.64*** (0.18), 1.90	0.60*** (0.18), 1.82	0.57*** (0.18), 1.77
Manager's age	−0.01 (0.01), 0.99	−0.01 (0.01), 0.99	−0.01 (0.01), 0.99	0.03* (0.02), 1.03	0.02 (0.02), 1.02	0.03* (0.02), 1.03
Company size (100 employees)	−0.05 (0.06), 0.95	−0.03 (0.06), 0.97	−0.06 (0.07), 0.94	0.00 (0.07), 1.00	0.01 (0.08), 1.01	−0.02 (0.08), 0.98
No. of company directorships held	0.00 (0.06), 1.00	−0.00 (0.05), 1.00	−0.02 (0.06), 0.98	0.01 (0.06), 1.01	0.00 (0.06), 1.00	−0.00 (0.06), 1.00
Share held by foreign owners	0.01*** (0.00), 1.01	0.01*** (0.00), 1.01	0.01 (0.01), 1.01	0.01** (0.00), 1.01	0.01* (0.00), 1.01	0.00 (0.01), 1.00
Constant	−1.20* (0.69)	−1.01 (0.69)	−0.79 (0.70)	−4.99*** (0.96)	−4.79*** (0.93)	−4.80*** (0.95)
N	376	376	376	376	376	376
$-2 \log L$	487.25	495.11	488.64	356.82	358.74	352.01
$P > \chi^2$ Hosmer-Lem	0.27	0.19	0.11	0.63	0.75	0.88

Note: The first number in each cell denotes the coefficient, with the standard error listed in parentheses followed by the odds ratio.

*$P < 0.10$.

**$P < 0.05$.

***$P < 0.01$.

(VIF) tests reporting no multicollinearity problems and the linktest detecting no specification error in the model.

The results of the analysis indicate that the odds of achieving both product innovation and radical product innovation are positively and significantly influenced by the diversity of information sources used by companies. The odds of having developed new products in the past three years improve by 25% for every new source type consulted by the company, while those of introducing products that are new to the market improve by 18% (Table 3, Regression 1).

The range of different types of partners used in innovation processes also has a statistically significant positive effect on the likelihood of introducing new products. The odds of product innovation improve by 13% for every new type of partner used in innovation processes. However, the range of partners does not have a significant effect on the likelihood of developing radical product innovations (Table 3, Regression 2).

Factoring in the proximity of partners yields some interesting results. While, as mentioned in previous sections, research on the geographical aspects of networks and partnerships has tended to emphasize the importance of geographical proximity in achieving positive economic outcomes, our analysis shows that, in the case of southwest Norway, the range of regional and national innovation partners used by firms does not make a difference for product innovation or for radical product innovation. In contrast, the range of international partners is positively and significantly associated with innovation and matters both for the likelihood of introducing new products and for the likelihood of radical product innovation (Table 3, Regression 3). The odds of implementing a product innovation improve by 34% for every additional type of international partner with whom the company cooperates, while the odds of radical product innovation grow by a staggering 52%.

The introduction of controls in the model underlines the robustness of these results. Only two of the control variables have a statistically significant association with product innovation. The education level of the manager is a strong predictor of product innovation across all three models: the higher the level of education of the manager, the higher the probability of a firm having introduced innovations over the last three years. Similarly, the level of foreign ownership of the company has a significant positive effect on the models that do not control for the geographical location of partners in innovation processes (Table 3). The results of the models explaining radical product innovation are similar, although the effects of education are even stronger in this case. The manager's age also has a significant positive effect on radical product innovation in two out of the three models. Conversely, the size of the company and the manager's personal network seem to be completely dissociated with the introduction of innovations, in general, or radical product innovations, in particular, by firms. This is an indicator of the remarkable innovativeness of firms regardless of size, with small firms in the region likely to be as innovative as medium and large firms, once other factors are controlled for.

6. The Impact of Culture on Cooperation

Having established the connection between innovation and cooperation, in particular with international partners, the paper moves on to examine how the diversity of companies' networks can be explained. H3 states that we expect soft institutional factors to play a role in determining whether companies will cooperate with external partners on product

innovations. These soft institutional factors will be reflected in the values and attitudes of the manager of the firm. The paper furthermore assumes that the values and attitudes of local managers will have an impact on their company strategies regarding cooperation and partnerships. In this part of the analysis, the independent variables in the preceding section—measuring active partnerships, in general and at specific geographical levels—make up the dependent variables.

The independent variables explaining different levels of cooperation are the values and attitudes of the businesses' managers. The paper focuses on trust and open-mindedness as the key managerial values in promoting cooperation. Trust and open-mindedness are expected to be positively associated with cooperating with a wide range of partners. Furthermore, trust is expected to be particularly important for regional cooperation, while open-mindedness is more important for the development of international networks. A distinction has also been made between general (or Putnam-type) and work-related (or Olson-style) aspects of trust and open-mindedness, with the expectation that work-related aspects of the values will have a stronger impact on cooperation.

The variables representing managers' values of trust and open-mindedness have been derived using principal components analysis combining a series of questions included in the survey of managers in southwest Norway. The "general trust" dimension captures levels of trust in other people in general, as well as in regional public officials and politicians. "Work-related trust" deals with trust in settings that relate more directly to business conduct, such as trust in other business managers in the region and in lower-level employees within the company. "General open-mindedness" is a measure of open-mindedness towards diversity and change, both when it comes to technology and culture. Specifically, it examines attitudes towards new ideas, foreign cultures and the outside world. Finally, "work-related open-mindedness" captures open-mindedness towards life outside the workplace. The details of the analysis are presented in the appendix.

The regression model takes on the following form:

$$Y_i = \alpha + \beta_1 \text{ General trust}_i + \beta_2 \text{ Work-related trust}_i + \beta_3 \text{ General open-mindedness}_i + \beta_4 \text{ Work-related open-mindedness}_i + \gamma_5 \text{ Controls}_i + \epsilon_i, \quad (2)$$

where Y refers to four different dependent variables measuring (a) the total range of partner types used by the company in innovation processes, (b) the range of partner types located within the region, (c) the range of partner types located elsewhere in Norway and (d) the range of partner types located outside Norway. $\beta_1 - \beta_4$ are the coefficients for the variables representing the managers' values of general and work-related trust and open-mindedness described above. Model 2 uses the same controls described for Model 1, in order to control for other factors that may affect the likelihood of firm i cooperating. ϵ depicts, once again, the error term.

Table 4 presents the results of the four models explaining the total range of partners, as well as the range of regional, national and international partners, respectively. The models are tested by means of heteroskedasticity-consistent ordinary least squares regressions, using robust standard errors. VIF tests were conducted, with no multicollinearity problems detected.

The analysis shows that trust and open-mindedness play different roles in the decision to cooperate with other partners and, more significantly, in the geographical dimension of

Table 4. H-C OLS estimation of the empirical model. Diversity of partners by geographical distance

	Total	Regional	National	International
General trust	−0.11 (0.07)	−0.00 (0.07)	−0.10 (0.06)	−0.06 (0.05)
Work-related trust	0.18** (0.08)	0.16* (0.08)	0.03 (0.07)	0.05 (0.05)
General open-mindedness	0.21*** (0.07)	0.01 (0.06)	0.14** (0.05)	0.09*** (0.03)
Work-related open-mindedness	−0.07 (0.07)	−0.08 (0.07)	−0.03 (0.06)	0.06 (0.04)
Manager's education level	0.07 (0.11)	−0.27** (0.11)	0.18* (0.10)	0.15*** (0.05)
Manager's age	−0.00 (0.01)	0.00 (0.01)	−0.00 (0.01)	−0.00 (0.01)
Company size (hundreds of employees)	0.15*** (0.03)	0.11** (0.05)	0.17*** (0.03)	0.10*** (0.03)
No. of company directorships held	0.08* (0.04)	−0.03 (0.03)	0.07* (0.04)	0.04 (0.02)
Share held by foreign owners	0.01** (0.00)	−0.01*** (0.00)	−0.00 (0.00)	0.02*** (0.00)
Constant	2.49*** (0.54)	1.97*** (0.53)	0.68 (0.47)	0.12 (0.25)
N	355	355	355	355
R^2	0.10	0.08	0.10	0.34

Note: The first number in each row denotes the coefficient, with robust standard errors in parentheses.
*$P < 0.10$.
**$P < 0.05$.
***$P < 0.01$.

this cooperation. Work-related trust, i.e. trust in other managers and in own staff, has a positive impact on cooperation. More trusting managers tend to cooperate with a wider range of partners in general, as well as with a wider range of regional partners. On the other hand, work-related trust does not have a significant impact on the development of non-regional networks, be they national or international. There is also no evidence that a general sense of trust, detached from business relations, leads to greater levels of cooperation. General trust, in a high trust society such as southwest Norway,[6] is not significantly related to cooperation, whether in general or at any particular level of geographical proximity (Table 4).

General open-mindedness has a positive effect on the range of national and international partners used by the company. A general sense of open-mindedness—to change, foreign cultures, and the outside world—is the only one among the value dimensions included in the analysis that makes a difference to promoting cooperation with partners outside the region. Work-related open-mindedness—i.e. acknowledging that there is a life outside the workplace—by contrast, does not have an impact on cooperation with partners at any level of geographical proximity.

Among the control variables, company size has, as expected, a significant positive impact on cooperation at all levels of geographical proximity. Larger companies tend to cooperate with a wider range of partners in innovation processes, and they tend to use more regional, national and international partners than smaller companies. The personal network of the manager also matters, as the number of company directorships held by the manager has a positive effect on the range of partners. The number of directorships also matters to the range of national partners used by the company, but not to the range of regional or international partners (Table 4).

The manager's level of education has a positive impact on cooperation at the national and international levels, but a significant negative impact at the regional level. Managers with lower levels of education seem to cooperate mostly with regional partners, while

more educated ones tend to cooperate with non-regional partners. This might be related to the supply of education in southwest Norway, with the majority of students having their degrees from outside the region, as the only university in the region, the University of Stavanger, is too small to meet local demand for higher education and was also only awarded university status in 2005. Educated managers could therefore be expected to have access to a wider non-regional network of potential partners than their less educated counterparts (Table 4).

The combination of the level of education and of the values of individual managers yields an interesting dichotomy in the types of cooperation of firms in southwest Norway. On the one hand, managers with lower levels of education tend to rely more on work-trust in order to establish what are fundamentally local cooperation links. This is possibly because managers with lower levels of education are less likely to have moved out of the region in order to study or for other purposes. Therefore, their work relationships become necessarily more place-based and more akin to those observed by the traditional industrial district and cluster literature. On the other hand, managers with high levels of education would have been forced in the past—due to the absence of a local university—to go elsewhere in Norway or even abroad in order to complete their studies. This personal trajectory would have prepared more educated individuals to expand their horizons and encouraged them, on their return to southwest Norway, to continue developing collaborations that are not necessarily place-based. The general open-mindedness associated with the life experience of moving in order to improve their level of education can be considered as a fundamental factor in overcoming place-boundedness in their work relationships.

Finally, as expected, foreign ownership also encourages collaboration with a wider range of international partners. This is the single most important factor in explaining the variation in international cooperation, as measured by the beta-coefficients. Conversely, foreign ownership has a significant negative effect on the range of regional partners and a non-significant negative effect on the range of national partners. The geographical profile of company ownership therefore seems to have a strong effect on the location of partners.

Conclusion

The high level of innovation in southwest Norway is not a consequence of well-developed inter-company cooperative networks within a regional petroleum cluster, as could have been expected by traditional cluster and agglomeration-based theories. Rather, the companies that reach outside the region to build international networks are the most successful in developing new products. This may partly be related to the size of the region, as smaller regions should be expected—because of their smaller markets and critical masses of industry and innovative centres—to be forced to look for the key resources needed in innovation processes outside the region. This seems indeed to be happening in southwest Norway, where the most innovative companies appear to be combating the disadvantages associated with a peripheral location and a small population size through developing strong cooperative relationships with relevant global production networks within their industries. Their efficiency in doing so is crucial to the high level of innovation in the region.

In building these international networks, the values and attitudes of the managers play a role in determining the activities of their companies. The companies that cooperate with a wider range of international partners tend to have managers who are open-minded about the potential of learning from foreign cultures and who are open to change and new ideas. A general sense of open-mindedness appears to be a fundamental soft institution for collaboration in the regional business culture, contributing to an explanation of the innovation proneness of southwest Norway. In contrast, traditionally place-based factors, such as trust, do not appear to be particularly important for regional managers in building international networks. This may be associated with the high levels of trust existing in the region, which may have made trust a social institution that benefits all companies. In a high trust region, being a particularly trusting individual may not matter as much as it would in a low trust region, but the willingness to be open to new contacts and experiences may make all the difference in securing the level of innovation which has become a lifeline for the prosperity of the region.

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Notes

1. See, for example, the contributions to the special issue of the *Cambridge Journal of Regions, Economy and Society* (McCann, 2008) on "The world is not flat".
2. These are Oslo (including Akershus county), Bergen (in Hordaland), Stavanger, Trondheim (in south Trøndelag), Kristiansand and Tromsø (in Troms).
3. The GDPR *per capita* of Vest-Agder was NOK 296,478 and that of Aust-Agder NOK 251,242. Companies in the Kristiansand city region were granted 0.4 patents per 10,000 inhabitants in 2006.
4. The choice of a logistic regression analysis above alternative methods is determined by the fact that we are using a dichotomous dependent variable (innovative or non-innovative). The logistic regression analyses factors affecting the likelihood of a business having introduced an innovation.
5. These were internal sources, suppliers, customers, competitors, companies in other industries, consultancies, universities, research institutes, conferences, scientific journals, industry magazines, business associations, authorities and informal networks.
6. Among the business managers surveyed, 84.2% agreed that "most people can be trusted".

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Appendix. Principal Components Analysis

The value dimensions have been created through principal components analysis of responses to a set of survey questions capturing the managers' values and attitudes. Most of these questions asked respondents to state their level of agreement with certain statements on a five-point scale running from "agree completely" to "disagree completely". The exception was one of the questions in the "general trust" dimension, where a dichotomy with the response options "most people can be trusted" and "one cannot be too careful in dealing with other people" was used. The statements used to construct the four dimensions "general trust", "work-related trust", "general open-mindedness" and "work-related open-mindedness", along with their factor loadings on the component and the remaining variance unexplained by the components, are shown in Table 5. The table also shows the eigenvalues of the four components. For each of the four dimensions, we ran a separate principal components analysis of the relevant statements and extracted the first component identified by the analysis.

Table 5. Principal components analysis

Dimension	General trust	Work-related trust	General open-mindedness	Work-related open-mindedness	Unexplained
"Most people can be trusted" (dichotomy)	0.34				0.80
"I trust public officials in this region"	0.66				0.26
"I trust politicians in this region"	0.66				0.26
"I trust other business managers in this region"		0.44			0.76
"It is right to include employees in decision-making, even if the processes take longer"		0.66			0.47
"It can be right to let the employees get their way even in cases where other options in my opinion would have been better"		0.61			0.55
"I'm most comfortable around people who are open to change and new ideas"			0.52		0.52
"I need to improve my understanding of other countries' cultures"			0.57		0.43
"I wish Norway and Norwegians were more open to the world around us"			0.63		0.30
"Work is what gives meaning to life"				−0.71	0.32
"Work provides identity and belonging"				−0.71	0.32
Eigenvalue	1.67	1.22	1.75	1.36	
ρ	0.56	0.41	0.58	0.68	

Notes: For each set of questions, the first component was extracted. No rotation was applied in the analysis.