

Culture for Innovation

Cooperation and Regional Innovation in Southwest Norway

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Abstract: 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 remain remarkably innovative even in the absence of critical innovation masses. In this paper we examine one such case – the region of Stavanger in southwest Norway – which has managed to remain innovative and dynamic, despite having a below average significant 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, which allow the region to innovate, suggesting that the formation of regional hubs with strong connections to international innovative networks can be at the root of innovation in peripheral areas.

Keywords: Innovation, institutions, distance, trust, open-mindedness, periphery, Norway.

1. Introduction

In a more integrated world, innovation and innovative capacity have become increasingly concentrated in cores, which host the best endowments in human and physical capital dedicated to research, as well as benefit from large economies of agglomeration, specialization and diversification externalities, and from important knowledge spillovers (Verspagen, 1997; Leamer and Storper 2001). Peripheral locations, in contrast, struggle to attain the necessary critical masses 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 generally tend 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 relatively low investments in R&D in their respective national contexts. This is the case of southwest Norway, in general, and of the region of Stavanger, in particular, which has managed to continue 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 worth managers attach to 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 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 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 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 and Crescenzi. 2008: 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, which facilitate interaction, the exchange of knowledge, and 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 institutionalised’ markets (Trigilia, 1992) that contribute to the sharing of knowledge resources and to the formation and social and political capital (Amin and Thomas, 1996; Morgan, 1997; Cooke and 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 and Morgan, 1998; Gertler, Wolfe and Garkut 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 frequent face-to-face contacts within agglomerations and clusters, the frequent associations among socioeconomic stakeholders (Cooke and Morgan, 1998) produce a series of relational and non-substitutable locational assets (Storper, 1997; Brenner, 2002) which 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 becomes thus essential 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 and Venables, 2004; Florida, 2005). These factors, in turn, create self-reinforcing virtuous circles by facilitating greater cooperation and interaction. Hence, agglomeration and geographical proximity tend to produce closely-knit institutional networks within limited geographical spaces which become key vehicles for the generation of collective learning, all types of innovation, and knowledge spillovers (Asheim and Coenen, 2006),.

According to these theoretical views, we can hypothesise that a) collaboration with a wide range of partners will have a positive impact on the innovative capacity of firms and that 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 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 for innovation without having to migrate (Friedman, 2005: 217), most new theoretical strands tend to stress the importance of agglomeration and physical proximity for innovation (Cantwell and Iammarino 2003; Audretsch and Feldman 2004; Storper and Venables 2004). Host of researchers from different disciplinary backgrounds have posited that Friedman’s (2005) landscape of firms capable of drawing on available resources from far a field, and subsequently able to sell their products on foreign markets, regardless of geographical distance, is nothing but a pipe dream (e.g. Scott and Storper, 2003). The dominating point of view is that, far from businesses increasingly being decoupled from their geographical location, proximity is key for the generation and absorption of innovation and for growth¹ and that, as a consequence of globalization and regional economic specialization, innovation and economic development will be even more geographically concentrated in the future (Scott and 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 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 face-to-face contacts that diffuse knowledge and innovation. Large urban agglomerations are the epitome of this type of concentrated innovation and development. As Florida (2002) argues a surprisingly low number of cities are responsible 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: 50). In this view, it matters not only who you cooperate with, but also how closely your partners are located geographically. Face-to-

¹ See, for example, the contributions to the special issue of the *Cambridge Journal of Regions, Economy and Society* [2008] on ‘The world is not flat’.

face contact will make it easier to develop ideas into marketable products or services, 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 strong distance decay effects. Knowledge spillovers become less relevant and eventually ineffective with distance. And the distance decay effect is strong. This is, for example, the case in Europe. The diffusion of knowledge is costly and many studies have demonstrated that it is geographically bounded. That is, for example, the case of the European Union where knowledge spillovers are hardly felt beyond 250 kms from the place of origin (Moreno et al. 2005; Rodríguez-Pose and Crescenzi 2006) and even more in the case of the United States, where the effects of knowledge innovation are hardly felt beyond 80 kms from its source (Varga 2000; Ács 2002).

This implies that innovation is most likely to be generated in and diffused within large agglomerated economies 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: 14), such as labour, technology and infrastructure. Remoteness and isolation and the absence of a critical mass of economic actors working in the same 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.

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 that are completely detached from geographical proximity. Boschma (2005: 62) identifies four such dimensions that may help firms in peripheral regions maintain cooperation with innovative firms and boost their capacity both to generate and absorb innovation. The four dimensions are cognitive, organizational, social, and institutional distance. Cognitive and organization distance refer to the cumulative and localised 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 in different contexts, whereas institutional distance controls for the presence of similar institutional features, such as language, norms, habits, and legislation (Boschma, 2005: 63-65). As Boschma (2005) states, all these distances can be unrelated to geographical distance and may help peripheral regions overcome the handicap of their physical distance with respect to the main centres of innovation. By using these types of distances, firms in peripheral areas may become globally connected and draw on assets and capabilities from far a field. 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. The innovative capacity of regions relies thus not only on their internal capacity for innovation, but also on their capacity to assimilate innovation produced elsewhere (Gereffi and Sturgeon, 2004; Prahalad and Krishnan, 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 distances 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 derive in bonds of

shared experiences and friendships that promote the exchange of knowledge and innovation. 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 boost the importance of non-geographical types of distance, overcoming the shackles of 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 systemic networks of innovation. From this perspective, soft institutions may help peripheral regions overcome the problems of remoteness for innovation 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

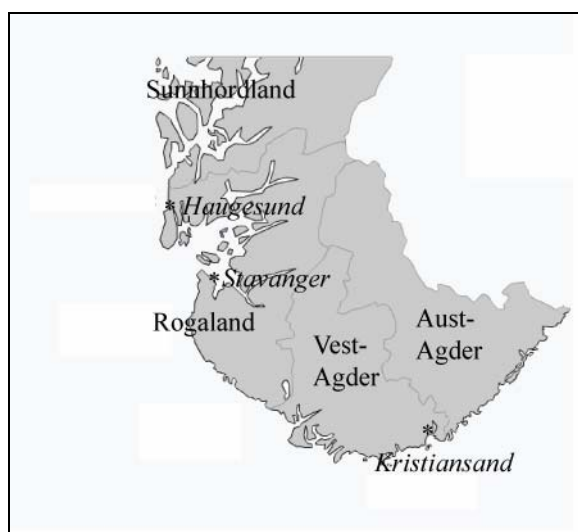
Despite a remote location on the northern periphery of the European continent, a small domestic market and a relatively low level of R&D expenditure in the Scandinavian context, Norway has remained a remarkably competitive economy throughout the post-war period. In recent years, the Norwegian GDP per capita has consistently ranked 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 (IMF 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, Moene and Torvik 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 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 (see figure 1). The region has around 700,000 inhabitants and encompasses three major urban areas around the cities of Stavanger, Kristiansand and Haugesund. The region hosts the main petroleum cluster in Norway, accounting for more than half of the country's total oil and gas employment. The other main industries in southwest Norway are maritime industries, chemical processing, shipping, ICT, fisheries and agriculture.

Figure 1: Map of Southwest Norway



In a comparative study of the economic potential of the six major Norwegian city regions, Blomgren, Gjelsvik, and Holmen (2007) show that the Stavanger and Kristiansand regions were the two cities with the lowest rate of R&D expenditure per inhabitant. The two cities also had the lowest proportion of university educated adults of the major Norwegian city regions. However, this did not prevent the region from remaining competitive and innovative. From 2000 to 2006, Stavanger had the highest number of registered patents per inhabitant of all Norwegian cities, and Rogaland county the highest regional GDP per capita outside the capital region. Apart from the capital, Kristiansand had the highest number of registered new companies per inhabitant

and the second highest number of innovative companies (Blomgren, Gjelsvik and Holmen, 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. While this 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, it does also raise the question of whether southwest Norway is a particularly innovation prone region, and if so, why. 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 the soft regional institutions of culture, values and attitudes on patterns of network formation and cooperation.

The paper draws on data from an autumn 2007 survey of business managers in southwestern Norway. The sampling frame included the CEOs of all companies with five or more employees in the region of southwest Norway. These companies are required by law to be listed in the Norwegian Register of Business Enterprises. The data was collected through a combination of telephone interviews and a follow-up online questionnaire. In total, 436 managers completed both the telephone interview and the follow-up questionnaire.

As a measure of the innovation activities in the companies, the managers were asked whether their company had introduced any new or significantly improved products during the last three years. A total of 53 percent of the respondents reported that their company had presented a product innovation during this period. These were then asked whether the products were introduced into the market ahead of similar products by competing companies, or whether they were only new to that company. Of the innovative companies, 40 percent reported that their innovations were new to the market. This equates to 20 percent of all companies surveyed. These operationalisations 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 summarised in table 1.

Table 1: Innovation in south-western Norway

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

This paper examines why some local companies are innovative, while others are not. It also analyses what are the factors behind some companies introducing radical innovations, while others limit their innovation to imitating existing products.

4. Innovation and cooperation

In order to assess the regularity of cooperation on the development of new products, the survey asked managers of the companies that had introduced new products in the last three 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 organisations, or mainly by other companies or organisations. Table 2 shows the distribution of companies on this dimension.

Table 2: Development of new products

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

Slightly more than half the companies developed their product innovations mainly in-house. Conversely, 46.6 percent 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 portion simply relied on other companies to develop product innovations for them. This suggests that cooperation is important in the development of product innovation for a large proportion of companies. 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.

In order to examine the first set of hypotheses, the survey examined the impact of active and passive sources of information on the likelihood of developing new products, as well as on radical product innovation. In terms of passive sources, the managers were asked to rate the importance of each of 14 different types of sources 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 percent of companies rated at least one source of information as very important for their company, and 56 percent rated at least two sources as very important.

In order to examine the effect of active partnerships, managers were also asked whether or not they had cooperated with other companies or organisations on innovations over the last three years. This question was asked in relation to seven different types of partners: Other companies within the conglomerate, suppliers, customers, competitors, consultancies, universities and research institutes. More than 90 percent 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 the companies stating that they had not actually introduced any new products within the last three years, 86 percent reported having used a partner in an innovation process, with the average being 2.7 different types of partners.

For each of the different partner types, respondents were also asked whether the partners were located regionally, nationally or internationally. This allowed for the construction

of a measure of the extensiveness of the companies' regional, national and international networks. Companies that cooperate with international partners within several different categories are well-connected with geographically dispersed economic networks of relevance to them and can draw on a wide range of assets and capabilities from across the world. Conversely, companies that cooperate with regional partners within several different categories are more likely to find local companies with compatible skills and fresh ideas, and they can rely on face-to-face contact for better communications and a freer flow of ideas. In total, 55 percent of the companies surveyed used at least one regional partner on innovation, while 61 percent used a national partner and 35 percent 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 analysis controls for a number of factors that can be expected to affect product innovation. Education has previously been shown to have a positive effect on innovativeness, and the manager's level of education is therefore included in the model. The age of the manager is also included, with young managers being expected to be more conducive to innovation due to their more creative and less conservative nature. The size of the company is expected 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 are expected to be more advanced technologically and therefore in a better position to develop new products.

The regression models take on the following forms:

$$\text{Model 1: } \text{logit}(\pi_i) = \alpha + \beta_1 \text{ Info sources}_i + \beta_2 \text{ Education}_i + \beta_3 \text{ Age}_i + \beta_4 \text{ Company size}_i + \beta_5 \text{ Directorships}_i + \beta_6 \text{ Foreign owned}_i + \varepsilon_i$$

$$\text{Model 2: } \text{logit}(\pi_i) = \alpha + \beta_1 \text{ Innovation partners}_i + \beta_2 \text{ Education}_i + \beta_3 \text{ Age}_i + \beta_4 \text{ Company size}_i + \beta_5 \text{ Directorships}_i + \beta_6 \text{ Foreign owned}_i + \varepsilon_i$$

$$\text{Model 3: } \text{logit}(\pi_i) = \alpha + \beta_1 \text{ Regional partners}_i + \beta_2 \text{ National partners}_i + \beta_3 \text{ International partners}_i + \beta_4 \text{ Education}_i + \beta_5 \text{ Age}_i + \beta_6 \text{ Company size}_i + \beta_7 \text{ Directorships}_i + \beta_8 \text{ Foreign owned}_i + \varepsilon_i$$

where π refers to two different dependent variables measuring a) the probability that the company has introduced a new or significantly improved product within the past three years (product innovation), and b) the probability that the company has developed a product that was new to the market within the past three years (radical product innovation).

Table 3 presents the results of the three models for each of the two dependent variables explaining the logged odds of product innovation and of radical product innovation. The variance inflation factors of the models have been tested, with no multicollinearity problems detected. The linktest detected no specification error in the model.

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

	$\pi = E(\text{Product innovation})$			$\pi = E(\text{Radical product innov})$		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
<i>Diversity of info sources</i>	0.22*** (0.07)			0.16** (0.08)		
<i>Diversity of partner types</i>		0.12* (0.07)			0.13 (0.08)	
<i>Diversity of regional partners</i>			-0.03 (0.08)			0.06 (0.10)
<i>Diversity of national partners</i>			0.14 (0.08)			0.01 (0.10)
<i>Diversity of internat'l partners</i>			0.30** (0.13)			0.42*** (0.14)
<i>Manager's education level</i>	0.41*** (0.14)	0.38*** (0.14)	0.31** (0.14)	0.64*** (0.18)	0.60*** (0.18)	0.57*** (0.18)
<i>Manager's age</i>	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.03* (0.02)	0.02 (0.02)	0.03* (0.02)
<i>Company size (100 employees)</i>	-0.05 (0.06)	-0.03 (0.06)	-0.06 (0.07)	0.00 (0.07)	0.01 (0.08)	-0.02 (0.08)
<i>No. of company directorships held</i>	0.00 (0.06)	-0.00 (0.05)	-0.02 (0.06)	0.01 (0.06)	0.00 (0.06)	-0.00 (0.06)
<i>Share held by foreign owners</i>	0.01*** (0.00)	0.01*** (0.00)	0.01 (0.01)	0.01** (0.00)	0.01* (0.00)	0.00 (0.01)
<i>Constant</i>	-1.20* (0.69)	-1.01 (0.69)	-0.79 (0.70)	-4.99*** (0.96)	-4.79*** (0.93)	-4.80*** (0.95)
<i>N</i>	376	376	376	376	376	376
<i>-2 log L</i>	487.25	495.11	488.64	356.82	358.74	352.01
<i>$P > \chi^2$ Hosmer-Lem</i>	0.27	0.19	0.11	0.63	0.75	0.88

Note: * = $P < 0.10$ ** = $P < 0.05$ *** = $P < 0.01$

The top number in each row denotes the coefficient, with the standard error listed below in parentheses.

Not surprisingly, the diversity of information sources used by companies in innovation processes has a positive effect on the likelihood of developing new products, as well as of developing radical product innovations. The odds of having developed new products in the past three years improve by 25 percent for every new source type consulted by the company, while those of introducing products that are new to the market improve by 18 percent. 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 percent 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.

Factoring in the proximity of partners yields some surprising results. Previous research on geographical aspects of networks and partnerships has emphasised the importance of geographical proximity in achieving positive economic outcomes. However, this analysis does not show a significant impact of the range of regional and national innovation partners on product innovation or on radical product innovation. On the other hand, the range of international partners has a strong positive effect. The range of international partners used matters both for the likelihood of introducing new products and for the likelihood of radical product innovation. The odds of product innovation improve by 34 percent for every additional type of international partner with whom the company cooperates, while the odds of radical product innovation improve by 52 percent.

Only two of the control variables have a statistically significant effect on product innovation. The education level of the manager is a strong positive predictor of product innovation across all three models, while the level of foreign ownership of the company has a significant positive effect in the models that do not control for the geographical location of partners in innovation processes. 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 do not have a significant effect on either product innovation in general or radical product innovation in particular, once other factors are controlled for.

The impact of culture on cooperation

Having established the connection between innovation and cooperation, in particular with international partners, the article moves on to examining how the diversity of companies' networks can be explained. The hypotheses presented earlier in this article state that cultural factors play a role in determining whether companies will cooperate with external partners on product innovations. These cultural factors are reflected in the values and attitudes of the manager. The article furthermore assumes that the values and attitudes of the manager have an impact on the company strategies regarding cooperation and partnerships.

The article 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 and work-related aspects of trust and open-mindedness, with the expectation that work-related aspects of the values will have a stronger impact on cooperation.

The values have been derived through principal components analysis. 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. Details of the analysis are shown in the appendix.

As in the models explaining the likelihood of product innovation and radical product innovation, the analysis still controls for the effects of education, age, company size, directorships and foreign ownerships.

The regression models take on the following form:

$$Y_i = \alpha + \beta_1 \text{ General trust}_i + \beta_2 \text{ Work-related trust}_i + \beta_3 \text{ General open-mindedness}_i + \beta_4 \text{ Work-related open-mindedness}_i + \beta_5 \text{ Education}_i + \beta_6 \text{ Age}_i + \beta_7 \text{ Company size}_i + \beta_8 \text{ Directorships}_i + \beta_9 \text{ Foreign owned}_i + \varepsilon_i$$

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.

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, i.e. using robust standard errors. The variance inflation factors of the models have been tested, with no multicollinearity problems detected.

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

	Total	Regional	National	Internat'l
<i>General trust</i>	-0.11 (0.07)	-0.00 (0.07)	-0.10 (0.06)	-0.06 (0.05)
<i>Work-related trust</i>	0.18** (0.08)	0.16* (0.08)	0.03 (0.07)	0.05 (0.05)
<i>General open-mindedness</i>	0.21*** (0.07)	0.01 (0.06)	0.14** (0.05)	0.09*** (0.03)
<i>Work-related open-mindedness</i>	-0.07 (0.07)	-0.08 (0.07)	-0.03 (0.06)	0.06 (0.04)
<i>Manager's education level</i>	0.07 (0.11)	-0.27** (0.11)	0.18* (0.10)	0.15*** (0.05)
<i>Manager's age</i>	-0.00 (0.01)	0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)
<i>Company size (100s of employees)</i>	0.15*** (0.03)	0.11** (0.05)	0.17*** (0.03)	0.10*** (0.03)
<i>No. of company directorships held</i>	0.08* (0.04)	-0.03 (0.03)	0.07* (0.04)	0.04 (0.02)
<i>Share held by foreign owners</i>	0.01** (0.00)	-0.01*** (0.00)	-0.00 (0.00)	0.02*** (0.00)
<i>Constant</i>	2.49*** (0.54)	1.97*** (0.53)	0.68 (0.47)	0.12 (0.25)
<i>N</i>	355	355	355	355
<i>R²</i>	0.10	0.08	0.10	0.34

Note: * = P < 0.10 ** = P < 0.05 *** = P < 0.01

The top number in each row denotes the coefficient, with robust standard errors listed below in parentheses.

The analysis shows that 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 is not significantly related to cooperation, whether in general or at any particular level of geographical proximity.

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 of the value dimensions that makes a difference to promoting cooperation with partners outside the region. On the other hand, work-related open-mindedness – acknowledging that there is a life outside the workplace – does not have an impact on cooperation with partners at any level of geographical proximity.

Among the control variables, company size has 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.

The manager's level of education has a positive impact on cooperation at the national and international levels, but a significant negative impact on the regional level. Uneducated managers seem to cooperate mostly with regional partners, while educated ones prefer 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. Educated managers could therefore be expected to have access to a wider non-regional network of potential partners than their uneducated counterparts.

As might be expected, foreign ownership has a similar effect. Foreign-owned companies tend to cooperate with a wider range of international partners, and indeed 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. Rather, the companies that reach outside the region to build international networks are the most successful in developing new products. This might partly be related to the size of the region, as smaller regions should be expected to find more of the key resources needed in innovation processes located outside the region. The most innovative companies in southwest Norway appear to be combating the disadvantages associated with peripheral location and 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 form a soft institution of regional business culture, contributing to an explanation of the innovation proneness of southwest Norway. On the other hand, trust does not appear to be particularly important for regional managers in building international networks. This might 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 might not matter as much as it would in a low trust region.

Bibliography

Ács Z.J. (2002) *Innovation and growth in cities*. Edward Elgar, Northampton, MA

- Amin, A and Thomas, D. (1996) The negotiated economy: state and civic institutions in Denmark. *Economy and Society*, 25: 255-81.
- Asheim B.T. and Coenen L. (2006) Contextualising Regional Innovation Systems in a Globalising learning Economy On Knowledge Bases and Institutional Frameworks, *Journal of Technology Transfer* 31(1): 163-173.
- Audretsch, D. B. and Feldman, M. P. (2004): “Knowledge Spillovers and the Geography of Innovation” in Henderson, J. V. and Thisse, J.-F. (eds.): *Handbook of Regional and Urban Economics*. Amsterdam: Elsevier.
- Bathelt, H. (2001) Regional competence and economic recovery: Divergent growth paths in Boston’s high technology economy. *Entrepreneurship and Regional Development* 13: 287–314.
- Blomgren, A., Gjelsvik, M. and Holmen, A.K.T. (2007): *Verdiskapingsevnen i norske storbyregioner: Indikatorer for kompetansekapital, nyskapingsevne, infrastruktur, konkurransedyktig kommunal sektor og internasjonalisering/nettverk*. IRIS report no. 32. Stavanger: International Research Institute of Stavanger.
- Brenner, N. (2002): “Decoding the Newest ‘Metropolitan Regionalism’ in the USA: A Critical Overview”. *Cities*, 19: 3-21.
- Cooke, P, and Morgan, K. (1998) *The associational economy: Firms, regions and innovation*. Oxford: Oxford University Press.
- Crescenzi, R., Rodríguez-Pose, A. and Storper, M. (2007): “The Territorial Dynamics of Innovation: A Europe - United States Comparative Analysis”. *Journal of Economic Geography*, 7: 673-709.
- Florida, R. (2002) *The Rise of the Creative Class, and how it’s transforming work, leisure, community and everyday life*. New York, Basic Books.
- Florida, R. (2005): “The World is Spiky”. *The Atlantic Monthly*.
- Friedman, T. L. (2005): *The World Is Flat: A Brief History of the Twenty-first Century*. New York: Farrar, Straus and Giroux.
- Gereffi, G. and Sturgeon, T. (2004): “Globalization, Employment and Economic Development: A Briefing Paper”. MIT Industrial Performance Center.

- Gertler, M. S., Wolfe, D. A., and Garkut, D. (2000) No place like home? The embeddedness of innovation in a regional economy. *Review of International Political Economy* 7:688–718.
- International Monetary Fund (2009): *World Economic Outlook Database: April 2009 edition*. Available at: <http://www.imf.org/external/pubs/ft/weo/2009/01/weodata/weoselgr.aspx>. Accessed 14.05.2009.
- Karl, T.L. (1997): *The Paradox of Plenty: Oil Booms and Petro-States*. Berkeley, Los Angeles and London: University of California Press.
- Keating, M. (1998): *The New Regionalism in Western Europe: Territorial Restructuring and Political Change*. Cheltenham and Northampton: Edward Elgar.
- Leamer, E. E. and Storper, M. (2001): “The Economic Geography of the Internet Age”. *Journal of International Business Studies*, 32: 641-665.
- Mehlum, H., Moene, K.O. and Torvik, R. (2006): “Cursed by Resources or Institutions?” *World Economy*, 29: 1117-1131.
- Moreno, R., Paci, R., Usai, S. (2005) Spatial spillovers and innovation activity in European regions. *Environment and Planning A*, 37: 1793–1812.
- Morgan K. (1997) The Learning Region: Institutions, Innovation and Regional Renewal. *Regional Studies*, 31: 491-503.
- Morgan, K. (2004): “The Exaggerated Death of Geography: Learning, Proximity and Territorial Innovation Systems”. *Journal of Economic Geography*, 4: 3-21.
- OECD and Eurostat (2005): *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*. 3rd edition. Paris: OECD Publishing.
- Porter, M. E. (1990): *The Competitive Advantage of Nations*. New York: Free Press.
- Prahalad, C. K. and Krishnan, M. S. (2008): *The New Age of Innovation: Driving Co-Created Value through Global Networks*. New York: McGraw-Hill.
- Rodríguez-Pose, A. (1999): “Innovation Prone and Innovation Averse Societies: Economic Performance in Europe”. *Growth and Change*, 30: 75-105.

- Rodríguez-Pose, A. 2001. Is R&D investment in lagging areas of Europe worthwhile? Theory and Empirical evidence. *Papers in Regional Sciences* 80: 275-295.
- Rodríguez-Pose, A. and Crescenzi, R. (2008): “Research and Development, Spillovers, Innovation Systems, and the Genesis of Regional Growth in Europe”. *Regional Studies*, 42: 51-67.
- Scott, A. J. and Storper, M. (2003): “Regions, Globalization, Development”. *Regional Studies*, 37: 579-593.
- Storper, M. (1997): *The Regional World: Territorial Development in a Global Economy*. New York: Guilford.
- Storper, M. and Venables A.J. (2004) Buzz: face-to-face contact and the urban economy, *Journal of Economic Geography*, 4: 351-370.
- Torre, A. and Rallett, A. 2005 'Proximity and localization', *Regional Studies* 39(1): 47-59.
- Trigilia, C. (1992) *Sviluppo senza autonomia. Effetti perversi delle politiche nel Mezzogiorno*. Bologna: Il Mulino.
- Varga, A. (2000) Local academic knowledge spillovers and the concentration of economic activity, *Journal of Regional Science* 40: 289–309.
- Verspagen, B., (1997) Measuring Intersectoral Technology Spillovers: Estimates from the European and US Patent Office Databases, *Economic Systems Research*, 9(1) : 47-65.

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 following statements were used to construct the four dimensions:

General trust	Eigenvalue: 1.67	Rho: 0.56
<i>Question</i>	<i>Component 1</i>	<i>Unexplained</i>
‘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

Work-related trust	Eigenvalue: 1.22	Rho: 0.41
<i>Question</i>	<i>Component 1</i>	<i>Unexplained</i>
‘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

General open-mindedness	Eigenvalue: 1.75	Rho: 0.58
<i>Question</i>	<i>Component 1</i>	<i>Unexplained</i>
‘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-related open-mindedness	Eigenvalue: 1.36	Rho: 0.68
<i>Question</i>	<i>Component 1</i>	<i>Unexplained</i>
‘Work is what gives meaning to life’.	-0.71	0.32
‘Work provides identity and belonging’.	-0.71	0.32