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# The impacts of urban location on the involvement of knowledge-intensive services in international innovation collaboration

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# **The impacts of urban location on the involvement of knowledge-intensive services in international innovation collaboration**

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## Abstract

Research on territorial innovation systems has traditionally put a very strong emphasis on intra-economy collaborative linkages as they allow valuable tacit knowledge to flow between co-located firms and institutions. Frequent face-to-face contact between producers and demanding users combined with institutionalized trust nurtured by proximity has been seen as conducive to advanced new knowledge development, structural change and growth. This is visible not least in the literature on knowledge-intensive business services, which emphasizes the role of proximity between providers and a demanding client base.

However, collaborative linkages can span large distances and are increasingly regarded as a mechanism by which firms overcome local supply and demand side limitations. The rapid diffusion of ICTs has increased the scope for service firm, by increasing tradability and by allowing more efficient international market search. At the same time, regions remain important as 'containing social structures' for labor flows and information diffusion through interpersonal networks, for new firm formation based on localized knowledge assets, and as platforms for growth and internationalization. The locus of innovation is therefore shifting away from individual firms, towards territorial economies and the distributed innovation networks by which they are linked.

Knowledge intensive business services are important in this context, as they are positioned at the intersection between corporate demand for specialized knowledge, and the supply of this knowledge from various actors and locations. Yet, the literature on internationalization in services focuses primarily on demand side enablers in the form of trade liberalization and modern ICTs, and drivers in the form of larger and more diverse markets. Consequently, it has yet to acknowledge the embeddedness of knowledge-intensive business services in international innovation collaboration networks more broadly.

This paper starts from the recognition that collaborative linkages may be conditioned by contexts of location, in particular when they are extended into distant business communities. This paper analyses the link between urban locations, and the involvement of knowledge-intensive business service firms in international innovation collaboration. It extends current research on the internationalization of business services by distinguishing between demand and supply side linkages in international innovation collaboration. The empirical analysis uses establishment level innovation data available from the Sixth Norwegian Community Innovation Survey (CIS2008) to investigate whether urban location affects a firm's involvement in global innovation collaboration. Everything else equal knowledge-intensive business service firms located in the Norwegian capital region are found to be more involved in international collaboration than establishments located at any other level of centrality. This is not driven by the more intense interaction with clients and customers. Rather, it is most distinctively driven by broader linkages with knowledge supplying actors.

## Introduction

Research on territorial innovation systems has traditionally put a very strong emphasis on intra-economy collaborative linkages (Asheim, 1996, 1999; Edquist, 1997; Fritsch & Franke, 2004; Henderson, 2007; Krugman, 1991; Romer, 1990), as they allow valuable tacit knowledge (Currah & Wrigley, 2004; G Szulanski, 2003; Tether, 2002; von Hippel, 1994) to flow between co-located firms and institutions. Frequent face-to-face contact between producers and demanding users combined with institutionalized trust nurtured by proximity has been seen as conducive to advanced new knowledge development, structural change and growth. This is visible not least in the literature on knowledge-intensive business services, which emphasizes the role of proximity between providers and a demanding client base (Aslesen & Isaksen, 2007a; Aslesen & Jakobsen, 2007).

However, collaborative linkages can span large distances (Adams, 2002; Torre, 2008; Torre & Rallett, 2005) and are increasingly regarded as a mechanism by which firms overcome local supply and demand side limitations (e.g. Bathelt, Malmberg, & Maskell, 2004; Herstad, Bloch, Ebersberger, & van De Velde, 2010; Laursen, Reichstein, & Salter, 2011; Owen-Smith & Powell, 2004; Sturgeon, 2003). The rapid diffusion of ICTs has increased the scope for service firm internationalization (Castellacci, 2010; Knight & Cavusgil, 2004; Wymbs, 2000), by increasing tradability (O'Farrell, Zheng, & Wood, 1996) and by allowing more efficient international market search. At the same time, regions remain important as 'containing social structures' (Lam, 2000) for labor flows and information diffusion through interpersonal networks (Agrawal, Cockburn, & McHale, 2006; Dahl & Pedersen, 2004; Sturgeon, 2003; Verspagen & Schoenmakers, 2000), for new firm formation based on localized knowledge assets (Agarwal, Echambadi, Franco, & Sarkar, 2004; Anselin, Varga, & Acs, 1997; Bottazzi & Peri, 2003; Feldman, 2000; Klepper, 2001), and as platforms for growth (Gilbert, McDougall, & Audretsch, 2006) and internationalization (Fernhaber, Gilbert, & McDougall, 2008; Porter, 1990). The locus of innovation is therefore shifting away from individual firms, towards territorial economies (Nachum & Keeble, 2003; Owen-Smith & Powell, 2004) and the distributed innovation networks (OECD, 2008; Unctad, 2005) by which they are linked (Raco, 1999; Samiee, 1999; Simmie, 2003, 2004; Wood, 2006).

Knowledge intensive business services are important in this context, as they are positioned at the intersection between corporate demand for specialized knowledge, and the supply of this knowledge from various actors and locations (Bettencourt, Ostrom, Brown, & Roundtree, 2002; Evangelista, 2000; Gallouj & Weinstein, 1997; Hargadon & Sutton, 1997; Miozzo & Soete, 2001; Sundbo & Gallouj, 2000). Yet, the literature on internationalization in services focuses primarily on demand side enablers in the form of trade liberalization and modern ICTs, and drivers in the form of larger and more diverse markets (Bryson, 2001; Clark & Rajaratnam, 1999; Clark, Rajaratnam, & Smith, 1996; Javalgi, Griffith, & White, 2004; Samiee, 1999). Consequently, it has yet to acknowledge the embeddedness of knowledge-intensive business services in international innovation collaboration networks more broadly (Castellacci, 2010; Todtling, Lehner, & Trippl, 2006).

This paper starts from the recognition that collaborative linkages may be conditioned by contexts of location (Laursen, et al., 2011), in particular when they are extended into distant business communities (Fernhaber, et al., 2008; O'Farrell, et al., 1996). It uses establishment level innovation data available from the Sixth Norwegian Community Innovation Survey (CIS2008) to investigate whether urban location affects a firm's involvement in global innovation collaboration. To isolate the impact of the business context, the empirical analysis is restricted to establishments, which are

independent, i.e. not among several sub-units of enterprises, which may or may not have service provision as their primary field of activity.

## Conceptual framework

International innovation collaboration entails the extension of new knowledge development into the realm of global networks. It is different from information search and processing (Laursen & Salter, 2006; Rosenkopf & Almeida, 2003; Rosenkopf & Nerkar, 2001; Sofka & Grimpe, 2010) in that it involves direct contact with external actors (Ebersberger & Herstad, 2011b; Fey & Birkinshaw, 2005; Tether, 2002). Furthermore, it is different from technology transfer through commodity markets (Hauknes & Knell, 2009), global production networks (Coe, Dicken, & Hess, 2008; Gereffi, Humphrey, & Sturgeon, 2005; Sturgeon, Van Biesebroeck, & Gereffi, 2008) and contract R&D (Grimpe & Kaiser, 2010; Weigelt, 2009) in that it involves not only knowledge developed at arm's length, the results of which are codified in documents or embodied in products, but it extends into what is disembodied, tacit and evolving (Dachs, Ebersberger, & Pyka, 2008; de Jong & Freel, 2009; Fey & Birkinshaw, 2005; Tether, 2002). Collaboration involves varying degrees of direct access to the competences of partners and therefore indirect linkages to their networks. The diversity of foreign business contexts into which an establishment is linked by means of a collaborative relationships is therefore a strong indicator of its embeddedness in global innovation networks (Asheim, Ebersberger, & Herstad, 2012).

Social, cultural and institutional distance (Boschma, 2005) reinforces strategic and organizational challenges inherent to collaboration (Arranz & de Arroyabe, 2007; de Jong & Freel, 2009; Doz, Wilson, & Veldhoen, 2006; Lane & Lubatkin, 1998; Nootboom, Van Haverbeke, Duysters, Gilsing, & van den Oord, 2007), as distance imposes constraints related to partner search, monitoring, and weak institutionalized trust. Distant collaboration therefore necessitates active partner search and construction of administrative and organizational contexts around the subsequent interaction (Torre & Rallett, 2005). Consequently, it is prone to lock-in effects due to the high marginal costs involved in identifying new partners, changing current network configurations (Narula, 2002) and adapting organizational systems to new needs. The geographical reach of collaboration is therefore the outcome of how firm-level characteristics and strategies evolve with various – often exogenously given, and often contradictory – centrifugal and centripetal forces (Benito, Larimo, Narula, & Pedersen, 2002).

At present, high rates of technological development combine with territorial industrial specialization and geographical differentiation of advanced demand, and translate into opportunities for service development and provision which can be harnessed through internationalization on both demand (customers) and supply (other knowledge providers) sides. However, these centrifugal forces merge with search constraints imposed on the firm by its pre-existing network linkages (Rosenkopf & Almeida, 2003), with transaction costs (Arranz & de Arroyabe, 2007) related to complexity and uncertainty in development work (Torre, 2008), and with 'stickyness' (von Hippel, 1994) due the embeddedness of learning and innovation in the minds and ongoing practices of individual experts (Dougherty, 1992, 2004). The sensitivity of any KIBS towards centrifugal and centripetal forces are likely to be particularly strong on the supply side, i.e. with respect to international linkages beyond those maintained with customer firms as an integral part of ongoing service provision.

The geographic location of the firm represents a physical space within which resource become available to it (Dunning, 1998; Fernhaber, et al., 2008; O'Farrell, Hitchens, & Moffat, 1993; Porter, 1990), and can therefore mediate the centrifugal and centripetal forces of globalization. Service development and provision is tightly linked to customer interaction (Gallouj, 2002; Gallouj & Weinstein, 1997; Skjølsvik, Løwendahl, Kvålshaugen, & Fosstenløykken, 2007; Tether, 2003), and thus to the diverse demand base offered by urban economies (Aslesen & Isaksen, 2007a; Aslesen & Jakobsen, 2007; Frenken, Oort, & Verburg, 2007; Glaeser, Kallal, Scheinkman, & Shleifer, 1992). This enables the firm to more rapidly build the specialized knowledge resources and organizational capabilities necessary to internationalize. At the supply side, service providers rely on individual expert knowledge (Mats Alvesson & Kärreman, 2007; Freel, 2006; Løwendahl, 2000; von Nordenflycht, 2011). This translates into a strong dependence on knowledge upgrading by means of employment (Freel, 2006; Keeble & Nachum, 2002; Tether, 2003; Todtling, et al., 2006). Because job mobility is a key localized externality of urban agglomerations (Eriksson, Lindgren, & Malmberg, 2008; Henry & Pinch, 2000), the external labor markets of urban economies provide abundant access to competences, which reflect the diversity of its industrial base (O'Farrell, et al., 1993; Zardkoohi, Bierman, Panina, & Chakrabarty, 2011). Furthermore, it contributes to the embedding of the establishment in the interpersonal networks that reflect the diverse backgrounds of its employees (Agrawal, et al., 2006; Dahl & Pedersen, 2004). These networks evolve through the local (Sturgeon, 2003) , domestic (Aslesen, Isaksen, & Stambøl, 2008; Stambøl, 2005) and international (Oettl & Agrawal, 2008) mobility flows, which converge on urban economies, and which are of particular importance for the ability of KIBS to identify new opportunities (Aslesen & Isaksen, 2007b; Keeble & Nachum, 2002; Robertson, Scarbrough, & Swan, 2003; Todtling, et al., 2006).

Establishments, which are independent, can be assumed to be more sensitive to external demand and supply conditions, than establishments which are part of larger enterprise systems. Although rarely recognized by the literature, this is an important point because it is increasingly common for enterprises in different industries to establish dedicated R&D, marketing or financial services units. The reliance of business services on face-to-face contact with the customer suggests a particularly strong need to set up marketing and sales establishments in different geographical markets. Affiliation with multi-establishment enterprises may come with internal knowledge supply and services demand, and reduce the sensitivity of the service providing unit towards contextual influences as well as reduce their ability to act according to such.

Furthermore, contextual influences as such can be expected to be strongest in capital regions. This is because higher order government functions, public knowledge institutions and corporate headquarter functions concentrate in such regions (Aslesen & Jakobsen, 2007; Wood, 2006), and position them as gravitation nodes in international industrial, academic and public administration networks (Breschi & Lenzi, 2010; Fischer, Revilla Diez, & Snickars, 2000; Graf, 2010; Keeble & Nachum, 2002; Simmie, 2003, 2004; Wood, 2002). This increases the exposure of within-region informal networks to information originating outside (Giuliani & Bell, 2005; Lazaric, Longhi, & Thomas, 2008; Owen-Smith & Powell, 2004). Headquarters (Gupta & Govindarajan, 2000) and other strategic functions with a coordinating role (Benito, Larimo, Narula, & Pedersen, 2002) form information gravitation points within multinational corporate network. Labor market (Balsvik, 2011 ; Ebersberger, Lehtoranta, & Herstad, 2011; Pesola, 2011) and supply linkages (Karagozoglu & Lindell, 1998), to these information gravitation points come with the potential of information spillovers

(Aslesen & Jakobsen, 2007; Ebersberger & Herstad, 2011a; Jakobsen & Onsager, 2005) according to which the independent KIBS establishment can act.

From this follows that location-specific information externalities (Bennett, Robson, & Bratton, 2001:1553, 1540-1548; Casson, 1997; Keeble & Nachum, 2002) should serve as a catalyst for international innovation collaboration by independent capital region KIBS (Coviello & Munro, 1995; Fernhaber, et al., 2008; O'Farrell, et al., 1996). Furthermore, it suggests that this effect should be strongest for collaborative linkage formation beyond those following from market presence and serve provision itself, i.e., supply side linkages.

## Empirical analysis

### Community innovation survey data

The empirical analysis is based on data from the Sixth Norwegian Community Innovation Survey (CIS2008), collected by Statistics Norway in 2008 as an extended version of the harmonized European survey (Eurostat, 2010; OECD, 2005). Participation was compulsory for sampled Norwegian firms. This resulted in a comparatively large data set, which is not plagued by a non-response bias. CIS2008 was sampled and reported at the enterprise level. Because the commercial and technological activities of the enterprise may be carried out by several individual establishments, which may be located in other regions than the legal entity reporting the activity, multi-establishment enterprises were in Norway asked to provide information on the basic characteristics of all such establishments. This allows single establishment enterprises, and thus independent establishments, to be identified.

### Knowledge-intensive business services

The data set contains information on the innovation activities of 6,029 enterprises, with supplementary information on 9,942 establishments in manufacturing industries, construction and infrastructure activities, wholesale trade and logistics, and knowledge-intensive business services. Among these, a total of 2,359 KIBS establishments are identified. Because different subsectors can be characterized by different incentives to engage in innovation activity (Faulconbridge, 2007; Robertson, et al., 2003; Tether & Hipp, 2002; Tether & Tajar, 2008), all regressions compare postal and communication (NACE 64), computer (NACE 72), R&D (NACE 73) and other consultancy services (NACE 74) to a reference group consisting of financial services (NACE 65-67)<sup>1</sup>.

### Locations

Previous empirical work using register data on housing and employment has identified 161 Norwegian labor market regions (Jukvam, 2002), and classified these on a centrality scale ranging from 5 (capital region) through 4 (large city regions) into 1 (peripheral). The results of the first set of regressions (Model 1 and Model 2 in Table 1) are used to correct for the selection bias in the analysis of collaborative linkages, which emerge because only independent and innovation-active establishments are included. In these selection regressions, dummy variables indicating location in the capital region (CAPITAL) and any other large city region (BERGEN, STAVANGER, TRONDHEIM) are compared to a reference group consisting of labor market regions at centrality level 1-3. In the final regression of collaborative linkages the capital labor market it is split into three regions. CAPITAL C

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<sup>1</sup> Standard for Industrial Classification (SIC), revision 1.1

captures location within the capital city itself, whereas CAPITAL W and CAPITAL NE capture location in the bordering western and north-eastern municipalities.

In 2008 the capital region contains almost one third of all Norwegian R&D personnel, and it represents over 40 per cent of domestic industry expenditures on research, development and innovation (Foyn et al., 2011). It has the highest educated workforce of any Norwegian region (ibid), and throughout the 1990s it experienced net inflow of employees into the KIBS sector (Stambøl, 2005). This overall concentration of human resources, knowledge institutions and industrial R&D come with a strong revealed comparative advantage in knowledge intensive services (Aslesen & Isaksen, 2007a; Aslesen, et al., 2008; Herstad, Paalshaugen, & Ebersberger, 2011).

**Sample selection issues**

As the empirical analysis include only independent, innovation active KIBS, two selection stages are included based on which Mills’ ratios are calculated. These are both included in the outcome regressions. The age of the establishment strongly affects its growth pattern (Ebersberger, Marsili, Reichstein, & Salter, 2010) . Growth is associated not only with the expansion of the establishment at a given location, but also with new establishments in different locations. Hence the age (LnAGE), measured on a logarithmic scale, should influence the likelihood of independence negatively. As it can be argued that age should not affect the firm’s decision to engage in innovation activity or collaborate for innovation (e.g., Wong & He, 2009), LnAGE is included throughout as an instrument.

The first stage uses only the information on characteristics of all 2,359 KIBS observations provided by the enterprise respondent, and estimate the likelihood of that the focal observation is an independent KIBS (INDEP=1). The results displayed in Table 1 (Model 1) shows that age and size, measured as their respective natural logarithms, significantly reduces the likelihood of independence. The strong, positive impact of capital region location is notable because no significant impacts are detected from location in any of the other urban labor market regions.

The second stage uses the information available from the enterprise level to estimate innovation activity (ACTIVE) among independent KIBS. This variable takes on the value 1, when observations report positive innovation expenditures, ongoing or abandoned innovation projects, or the successful launch of an innovation onto the market during the reference period 2005-2007. This definition of innovation activity is in accordance with the routing structure in the CIS questionnaire. Additional variables included in the regression capture affiliation with a foreign enterprise group (FOREIGN) because these may come with information exposure and financial resources conducive to innovation activity (Ebersberger & Herstad, 2011a; Frenz, Girardone, & Ietto-Gillies, 2005; Frenz & Ietto-Gillies, 2007). However, it also comes with sensitivity of KIBS activity to the roles assigned by distant parents (Cantwell & Mudambi, 2005). The size of the establishment (LnEMP) is known to influence its resource base and thus propensity to engage in innovation (Ebersberger & Herstad, 2011c; Gilbert, et al., 2006), and it is therefore included.

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*Table 1 approximately here*  
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The dependence of KIBS on face-to-face contact with demanding local customers leads to the assumption that a strong orientation towards these demanding customers triggers innovation



activity. On the other hand, foreign market presence entails larger market size (Achs & Audretsch, 1988; Bhattacharya & Bloch, 2004; Crepon, Duguet, & Mairesse, 1998; Harris & Li, 2005; Rammer, Czarnitzki, & Spielkamp, 2009) and exposure to more diverse information, which signals market and technology opportunity. As this should translate into stronger incentives to engage in innovation, a dummy variables capturing whether the main market is foreign (FORMAR) is included. In the survey all firms are asked to assess how severely their innovation activities are constrained by various factors. HAMPFIN captures strong constraints from lack of internal funding, whereas HAMPKOST captures constraints imposed by high innovation costs. Finally, HAMPRIOR captures whether prior innovations launched by the firm reduces its incentive innovative further.

The results displayed in Table 1 (Model 2) show that the likelihood of innovation activity increases with size. It is higher when the main market is foreign, compared to when it is not. Foreign ownership reduces the likelihood, which suggests that incoming FDI into the Norwegian knowledge-intensive services sector is not predominantly motivated by knowledge seeking strategies. As expected, HAMPRIOR reduces the incentive to engage, whereas perceived funding and cost constraints are positively associated with innovation activity. This indicates that active establishments are more aware of such constraints, than establishments which are not active.

Location in the capital region significantly reduces the likelihood of innovation activity, while location in the second largest town of Bergen significantly increases it. This suggests that knowledge spillovers available through the labor market which surround the dense concentrations of KIBS in the capital region (Aslesen, et al., 2008; Stambøl, 2005) may be reducing their individual incentive to engage in systematic new service development (M Alvensson, 2000; von Nordenflycht, 2011; Zardkoohi, et al., 2011).

**Involvement**

The CIS2008 questionnaire specifies a total of eight potential collaboration partner groups, which span from downstream customers through suppliers and competitors, into research institutes and universities upstream. The respondent firm is asked to exclude pure contractual relationships, and include only linkages which involve direct exchanges of knowledge (Eurostat, 2010; OECD, 2005). For each partner group, the firm is asked to indicate whether a collaborative interaction has taken place in own region (subjectively defined by the firm itself), elsewhere in Norway or in either one of five world regions specified (Nordic countries, EU excl. Nordic countries, North America, Asia, other).

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*Table 2 approximately here*  
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This information is used to capture the involvement of the establishment in global innovation collaboration. Our involvement index is constructed in accordance with recent work by Bozeman, Gaughan and Corley (Bozeman & Gaughan, 2011; Gaugan & Corley, 2010) by multiplying each single collaborative linkage with the likelihood that it is *not* present, as calculated based on the average occurrence in the respective NACE 2-digit sector groups. This weights up (relatively) rare linkages, and weights down common ones. We compute a total involvement index (all partner types) and separate indexes for involvement in demand (customers) and supply (suppliers, universities and higher education institutions, private and public R&D laboratories, consultancy firms) collaboration. The descriptive statistics included in Table 2 show particularly strong involvement scores in the

fourth largest city, Trondheim, while involvement scores for capital region KIBS are only slightly above the national average.

## Control variables

According to the literature on KIBS internationalization, the main driver of such is foreign markets and the main constraint imposed related to distance decay effects on service provision. Furthermore, the literature suggests that the local demand base is an important determinant of organizational learning conducive to subsequent internationalization. We therefore include two demand side controls. MARLOC capture the presence of the firm on a local market, whereas MARBREADTH capture the share of regions specified (seven in total) in which a market presence is stated.

Collaboration reflects the innovation strategy and absorptive capacity of the firm (Cohen & Levinthal, 1989, 1990), that is the strength and diversity of the internal knowledge base (Nooteboom, et al., 2007) and the organizational systems in which it is embedded (Lane & Lubatkin, 1998; Ocasio, 1997). These characteristics can be assumed to be related to firm size, as increasing size entails more diverse competences, stronger management capabilities and better developed organizational systems (e.g. Gilbert, et al., 2006). Smaller size, by implication, increases the sensitivity of the firm towards resources in their external environments (Fernhaber, et al., 2008). Consequently, larger size may either increase the propensity of the firm to collaborate, due to absorptive capacity effects, or reduce this propensity due to the lower dependence on external resources which can follow from stronger internal capabilities. We therefore control for size by comparing small establishments (< 25 employees) and large establishments (>100 employees) to a reference group consisting of medium sized establishments.

Investments in research and development as share of turnover (RDINT) are used to capture the firm's emphasis on systematic knowledge development (Ebersberger, Herstad, Iversen, Som, & Kirner, 2011; Tether, 2002). R&D intensive firms are more likely to exhaust their local learning potentials quickly (Drejer & Vinding, 2007), and thus strengthen their involvement in global collaboration. Conducting systematic intramural R&D as defined by CIS furthermore implies externalization of knowledge from ongoing practice (Dankbaar, 2003). Such externalization is conducive to the more independent exploration of knowledge (Dougherty, 2004; Lane & Lubatkin, 1998; Løwendahl, 2000), and thus not only to more distant collaboration in general (de Jong & Freel, 2009) but also to stronger involvement on the supply side in particular. R&D also builds internal knowledge resources (DeSarbo, Di Benedetto, & Song, 2007; Fey & Birkinshaw, 2005; Weigelt, 2009). Such internal resources are on the one hand necessary to engage in collaborative work effectively (Cohen & Levinthal, 1989, 1990; Nooteboom, et al., 2007; Zahra & George, 2002), but may on the other reduce the incentive of the establishment to do so. Investments may also take the form of contractual R&D sourcing from external actors (Grimpe & Kaiser, 2010; Teece, 1988). External R&D may serve as a first step towards denser collaborative linkages (Maskell, Pedersen, Petersen, & Dick-Nielsen, 2007); complement existing linkages or eliminate the need for collaboration altogether. A strong orientation towards external R&D may also weaken absorptive capacity, as it leads to less knowledge accumulation within the contracting firm (Fey & Birkinshaw, 2005; Weigelt, 2009).

Different sectors differ with respect to overall R&D intensity; the share of turnover, which can be spent on R&D and the share of R&D, which can be contracted out. This cannot be fully captured by the sector controls. The dummy variable RDINV thus takes on the value one if the R&D intensity of the firm is above the median for innovation active firms in the subsector group. Similarly, the dummy variable RDEXINV takes on the value 1 if the share of total R&D contracted out is above the subsector median for innovation active firms.

The networks of foreign enterprise groups may serve as a channel for collaboration partner search (Asheim, et al., 2012; Hansen, 1999) in a wider range of business contexts than individual firms can cover (Björkman, Barner-Rasmussen, & Li, 2004; Currah & Wrigley, 2004; Ebersberger & Herstad, 2011a; Ebersberger, Lehtoranta, et al., 2011; Ivarsson, 2002; G. Szulanski, 1996). Yet, such affiliation also requires attention (Forsgren, 1996; Ocasio, 1997), potentially at the expense of attention towards collaborative knowledge development (Asheim, et al., 2012; Asheim & Herstad, 2005; Blanc & Sierra, 1999; Gulbrandsen & Godoe, 2008; Phelps & Fuller, 2000). The variable FOREIGN is included to capture this effect. Public innovation funding schemes often aim to achieve behavioral additionally (Clarysse, Wright, & Mustar, 2009; Czarnitzki, Ebersberger, & Fier, 2007; Falk, 2007). The variable PUBFIN capture receipt of such funding from either one of five specified domestic or EU public sources. Last, as collaborative work involve exposure of proprietary knowledge (Ebersberger, Herstad, et al., 2011), the willingness to engage can be assumed contingent on formal IPR protection (e.g. Iversen, 2011). PROPAT captures whether the firm has used patents to protect proprietary knowledge.

## Results

Table 3 below show the results of the regressions on overall involvement (Model 3) and supply versus demand side involvement (Model 4). In accordance with expectations we find that overall involvement increases with high R&D intensity, patenting and the breadth of market presence. A highly significant positive impact is also detected from public funding, while no significant impacts are associated with foreign group affiliation or any of the size groups. This is notable; because it means that the actual involvement of the establishment is decoupled from organizational characteristics, which should be conducive to such. By contrast, the impact from location in the capital region labor market on overall involvement is positive and highly significant, while the impact from location in the second largest city of Bergen is significantly negative. Notable is also how the strong average involvement scores of KIBS in Trondheim (Table 2) are attributable to individual firm characteristics, not to contextual effects.

By disentangling supply and demand side involvement we can more clearly see the different mechanisms at play. In accordance with theoretical expectations, the positive impact from high R&D intensity remains on the supply side, but disappears on the demand side. Demand side involvement is driven by the breadth of market presence, patenting and public funding, and not influenced by establishment size or foreign group affiliation. Yet, it is significantly lower in the second and third largest cities of Norway. This suggests that the more diverse demand base of these large cities is reducing the need of KIBS within them to engage in geographically broad demand side collaboration, compared to firms in rural locations. Apparently contradictory to this we find KIBS in the inner city of Oslo to be significantly more involved on the demand side, than firms on rural locations. This indicate that the diversity of internationalized industrial, academic and government functions present in the capital region broadens search and mediate information asymmetries involved in transactions with

knowledge (Arrow, 1962; Lundvall & Johnson, 1994) on both supply and demand sides, thus supporting collaboration at those spatial scale most sensitive to the pre-existing search space of the independent service providing establishment.

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*Table 3 approximately here*  
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## Conclusion

This paper has contributed to the literature on knowledge-intensive services and internationalization along three main lines. First, it has argued that the impact of location on the innovation activity and behavior of knowledge-intensive business services can be expected to be dependent not only on the nature of the location itself, but also on the independence of the service providing establishment. Second, it has suggested that demand and supply side international collaboration are distinct from each other and should be considered subjected to different centrifugal and centripetal forces. Based on these recognitions, it has, third, shown empirically that it is location in the capital region which is associated with positive contextual impacts on involvement. Knowledge-intensive business services located within this region are truly linking advanced client demand to sources of knowledge residing outside their prior and existing demand base. Yet, this cannot be attributed to contextual conditions offered by urban economies in general as the contextual impacts found for other large Norwegian cities are, if significant, negative. This is consistent with other studies, which have pointed to the unique characteristics of the capital region KIBS base (e.g. Wood, 2006).

The analysis has notable limitations, which reflect characteristics of the data used. First, our dependent variables do not capture the geographical reach (e.g. de Jong & Freel, 2009; Laursen, et al., 2011) or diversity, at the individual country level, of collaboration. Second, we only capture the existence of a collaborative linkage towards a certain partner group, independent of its intensity and the number of actual partners involved. In other words, we cannot e.g. distinguish KIBS that are involved with many, potentially diverse, clients at a certain geographical scale, from those involved with only a limited number.

Last, the propensity to collaborate is deeply interwoven with the institutions, industrial development paths and policy legacies which combined define national innovation systems (Dachs, et al., 2008; Ebersberger, Herstad, et al., 2011; Narula, 2002). This means that findings from a single, highly specialized small economy cannot at the outset be assumed to be valid in different other national contexts. Still, our findings clearly suggest that the internationalization of business services cannot be understood merely within the context of market access and service provision. Knowledge intensive business services firms engage in international innovation collaboration irrespective of such and these linkages may under certain circumstances be conditioned by the locations in which they reside. Consequently, the further study of KIBS internationalization patterns on a broader basis than merely within the context of demand pull is not only a possible venture, but also a necessary one.

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**Table 1: Establishment independence and innovation activity**

	<b>Model 1: INDEP=1</b>		<b>Model 2: ACTIVE=1</b>	
	<i>Marg. Eff</i>	<i>SE</i>	<i>Marg. eff</i>	<i>SE</i>
CENTRALITY 1-4	<i>Reference</i>		<i>Reference</i>	
TRONDHEIM	-0,007	0,041	0,039	0,078
STAVANGER	-0,003	0,036	0,095	0,072
BERGEN	-0,014	0,040	0,210	0,070***
CAPITAL	0,250	0,022***	-0,233	0,104**
AGE	-0,029	0,012**	0,038	0,024
LEMP	-0,118	0,009***	0,153	0,051***
FOREIGN			-0,126	0,073*
FORMAR			0,198	0,049***
HAMPMARK			-0,227	0,099**
HAMPFIN			0,213	0,056***
HAMPKOST			0,150	0,060**
N	2359		1144	
Wald Chi2 (10)	378,67		170,37	
Prob>Chi2	0,000		0,000	
Pseudo R2	0,181		0,146	

Note: Probit regression models. Robust standard errors and marginal effects computed at the mean of the other variables. \*\*\*, \*\* and \* indicate significance at 1 per cent, 5 per cent and 10 per cent level respectively. Five subsector controls are included in both regressions, but not reported. MILLS\_INDEP, calculated on the basis of model 1, is included in model 2 but not reported. Statistics are available upon request.

**Table 2: Involvement by region**

	<b>International involvement</b>		
	INV_TOT	INV_CUST	INV_SUPPLY
TRONDHEIM	0,510	0,312	0,366
STAVANGER	0,304	0,107	0,236
BERGEN	0,098	0,034	0,097
CAPITAL	0,343	0,150	0,266
NORWAY, ALL	0,300	0,148	0,230

Note: Average involvement scores for independent and innovation active establishments.

**Table 3: Involvement**

	Model 3		Model 4			
	INV_TOT		[A] INV_SUPPLY		[B] INV_CUST	
	<i>Coeff.</i>	<i>SE</i>	<i>Coeff.</i>	<i>SE</i>	<i>Coeff.</i>	<i>SE</i>
CENTRALITY 1-3	<i>Reference</i>		<i>Reference</i>		<i>Reference</i>	
TRONDHEIM	0,083	0,135	0,054	0,093	0,083	0,086
STAVANGER	-0,101	0,098	-0,054	0,088	-0,135	0,082*
BERGEN	-0,223	0,087**	-0,148	0,085*	-0,148	0,080*
OSLO NE	0,451	0,132***	0,355	0,149**	0,193	0,139
OSLO W	0,525	0,151***	0,487	0,111***	0,164	0,103
OSLO C	0,474	0,118***	0,426	0,093***	0,162	0,086*
InAGE	-0,042	0,033	-0,040	0,028	-0,008	0,026
SMALL	0,077	0,099	0,085	0,072	0,043	0,067
MEDIUM	<i>Reference</i>		<i>Reference</i>		<i>Reference</i>	
LARGE	-0,184	0,180	-0,169	0,148	-0,213	0,138
FOREIGN	0,055	0,120	-0,118	0,086	-0,011	0,080
RDINV	0,162	0,063**	0,111	0,053**	0,027	0,050
RDEXINV	0,019	0,086	0,029	0,063	-0,032	0,058
PROPAT	0,421	0,144***	0,257	0,083***	0,174	0,077**
MARLOC	0,091	0,059	0,073	0,051	0,050	0,048
MARBREADTH	0,409	0,137***	0,270	0,102***	0,437	0,095***
HAMPMARK	-0,040	0,082	-0,045	0,119	-0,045	0,111
PUBFIN	0,407	0,159**	0,390	0,077***	0,225	0,072***
N	671		671		671	
F/Chi2	F = 6,37		Chi2=158,69		Chi2=86,38	
Prob>F/Chi2	0,000		0,000		0,000	
R2	0,2084		0,1913		0,1141	

Note: Coefficients and standard errors from OLS regression (model 3) and seemingly unrelated regression (model 4, A-B). \*\*\*, \*\* and \* indicate significance at 1 per cent, 5 per cent and 10 per cent level respectively. MILLS\_INDEP and MILLS\_ACTIVE, calculated on the basis of model1 and 2 respectively, are included but not reported. Sector controls are included but not reported. Statistics are available upon request

**Table 4: Correlations**

	Mean	SD	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1 INV_TOT	0,300	0,740	5,551	1,000																			
2 INV_SUPP	0,230	0,592	4,260	0,902	1,000																		
3 INV_CUST	0,148	0,531	5,774	0,778	0,603	1,000																	
4 LnAGE	2,164	0,840	3,807	0,006	-0,004	0,019	1,000																
5 TRONDH	0,062	0,242	1,000	0,073	0,060	0,080	0,068	1,000															
6 STAVANG.	0,078	0,269	1,000	0,002	0,003	-0,022	-0,036	-0,075	1,000														
7 BERGEN	0,092	0,289	1,000	-0,087	-0,071	-0,068	-0,036	-0,082	-0,093	1,000													
8 CAPITAL NE	0,033	0,178	1,000	-0,047	-0,055	-0,029	0,071	-0,048	-0,054	-0,059	1,000												
9 CAPITAL W	0,095	0,294	1,000	0,058	0,067	0,021	-0,068	-0,084	-0,095	-0,103	-0,060	1,000											
10 CAPITAL C	0,343	0,475	1,000	0,040	0,041	0,003	-0,002	-0,186	-0,211	-0,230	-0,133	-0,234	1,000										
11 SMALL	0,734	0,442	1,000	-0,141	-0,122	-0,065	-0,081	0,017	0,017	0,091	0,088	-0,128	-0,128	1,000									
12 MEDIUM	0,237	0,426	1,000	0,110	0,097	0,063	0,048	-0,023	-0,024	-0,087	-0,087	0,131	0,101	-0,927	1,000								
13 LARGE	0,029	0,167	1,000	0,095	0,076	0,011	0,092	0,015	0,016	-0,017	-0,012	0,005	0,079	-0,285	-0,096	1,000							
14 FOREIGN	0,071	0,256	1,000	0,069	-0,003	0,023	0,090	0,014	-0,055	-0,072	-0,025	0,076	0,089	-0,245	0,180	0,190	1,000						
15 RDINV	0,510	0,500	1,000	0,166	0,155	0,098	-0,111	0,033	-0,066	-0,085	0,007	-0,036	0,072	0,136	-0,126	-0,039	-0,045	1,000					
16 RDEXINV	0,757	0,429	1,000	-0,099	-0,104	-0,058	0,017	-0,037	0,015	-0,048	0,063	-0,090	0,098	0,056	-0,047	-0,028	0,029	-0,311	1,000				
17 PROPAT	0,081	0,273	1,000	0,265	0,225	0,152	-0,055	0,104	0,127	0,008	-0,042	0,001	-0,046	-0,073	0,024	0,133	0,056	0,147	-0,081	1,000			
18 MARLOC	0,245	0,430	1,000	-0,029	-0,019	-0,002	0,094	-0,071	0,001	0,036	-0,037	-0,046	-0,145	0,086	-0,078	-0,031	-0,073	-0,082	-0,015	-0,103	1,000		
19 MARBR.	0,437	0,219	1,000	0,229	0,199	0,230	-0,027	0,020	0,143	-0,028	-0,081	0,044	0,001	-0,086	0,078	0,029	0,075	0,102	-0,020	0,153	-0,017	1,000	
20 HMARK	0,033	0,180	1,000	-0,072	-0,068	-0,052	0,040	0,075	0,003	0,013	-0,034	0,062	-0,092	-0,030	0,043	-0,032	-0,051	-0,114	-0,013	-0,055	0,002	-0,071	1,000
21 PUBFIN	0,097	0,296	1,000	0,242	0,264	0,180	-0,059	0,098	-0,061	0,036	-0,060	0,044	-0,077	-0,003	0,011	-0,020	-0,043	0,256	-0,200	0,121	-0,089	0,144	-0,050

Note: Active establishments only. The minimum value for all variables is zero.