

# The Role of Domestic and International External Cluster Linkages Explored on the Example of Buyer–Supplier Relations in Learning Regions: A Cross-Functional Assessment

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**ABSTRACT** *This paper analyses three levels of interaction among firms: regional, domestic and international, the analysis relying on cross-functional supplier evaluations by their customers. The statistical analysis reveals that indeed three groups with different evaluation results can be distinguished. Contrary to expectations, though, regional suppliers were not better evaluated than domestic suppliers, while international suppliers scored weakest. Cross-functional differences in assessment were found, which urges researchers to collect cross-functional data for cluster assessment. We conclude that external linkages play an important role in understanding clusters and that the domestic level has to be taken into consideration of an analytical entity of its own.*

## Introduction

The concept of the learning region addresses the role of knowledge, innovation and learning in cluster-based regional development. Learning regions are geographically confined multi-actor entities which “function as collectors and repositories of knowledge and ideas, and provide an underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning” (Florida, 1995, p. 528). In this context, it is widely acknowledged that there is hardly any self-sustaining learning region. Indeed, regional competitive advantages often rely on the performance of local industrial clusters which display complex external linkages. The increasing relevance of these linkages is usually discussed as a phenomenon of globalization, thus highlighting international linkages of

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regional clusters. In confronting this analytical dichotomy of the local versus the global, we argue in favour of a multi-level perspective and suggest that the national level of economic, social and political interactions enduringly has a major role to play in the competitive orientation of clusters and regions. We maintain that learning regions are framed by an institutional multi-level architecture that combines local, national and international domains of interaction. In unbundling the complexity of these linkages, we suggest that learning regions need to be conceived as open systems that are nested in the diverse institutional and structural patterns of national business systems which provide complementary resources. Corresponding motives for inter-firm cooperation such as operational, price and innovation causes are based on expectations regarding reliability and trustworthiness that reflect the impact of national regulations, standards and norms—both in formal terms and in informal terms. Thus, the often neglected national business environment needs to be viewed as a major factor in shaping the external linkages of learning regions.

In its empirical content, our paper compares the quality of regional, national and international supply linkages. We were able to analyse a set of secondary data containing 228 supplier evaluations prepared by manufacturers that are based in a single cluster in Germany. These data are special in that they not only show high reliability and validity, but also are the result of a multi-functional evaluation. Each supplier was evaluated by the firms' research and development (R&D), quality, logistics and purchasing departments.

Findings indicate that three statistical levels of cluster linkages are indeed worth distinguishing, namely regional, national and international relations. Our findings further indicate that national relationships tend to be evaluated more positively than international relationships while evaluated on a similar level as regional relations. This implies that firms in learning regions are profiting from the positive effects of national linkages, which also means that the impact of the national business environment remains highly relevant as a crucial provider of resources in supporting the openness of learning regions. From this perspective, regionally bound firms might not want to neglect potential partners on the national level when inquiring complementary partners outside their region. Therefore, also in policy terms, national linkages need to be reassessed as a strategic factor in support of learning regions.

Further scrutinizing the cross-functional data set, we found indications for varying evaluations of regional linkages by different departments in the firms. In our sample of firms, the respondents from the R&D departments tended to evaluate cluster benefits more positively than their colleagues from the purchasing and quality departments. To account for such perceptual differences, and to address possible biases, the analysis included a careful monitoring of the nature of the respondents. Preferably a cluster assessment relies on a cross-functional set of respondents.

In Second section, we provide a theory embedding of the discussion on external cluster linkages. In Third section, empirical evidence is presented, which will eventually be analysed, so that implications for theory as well as public and private management could be drawn.

## **Clusters, Competitiveness and Learning Regions: The Role of National Linkages**

### *Cluster Dynamics, Learning Regions and External Linkages*

The economic relevance of regions is usually derived from the competitive advantages of firm-specific interactions within a particular regional setting of industries and institutions,

usually addressed in terms of regional industrial clusters. While it is well known that industrial clusters serve as the backbone of regional competitiveness, however, it is still unclear which approaches to the analysis of clusters provide conceptually sound, empirically significant and politically viable research perspectives (Benneworth *et al.*, 2003; Benneworth & Henry, 2004; Martin & Sunley, 2003). A paradigmatic definition by Porter (1998, p. 199) defines clusters as “a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities” (p. 199). Cluster dynamics are shaped by the competitive conditions of firms, namely factor supply and demand profile conditions and industrial structure in related and supporting industries, as well as firm strategy and structure. The underlying relationships that form a distinct cluster within a national economy are either of the vertical type that links buyers and suppliers or of the horizontal type that links common customers, technologies and distribution channels, while the interchange among industries in a cluster is best organized in geographical agglomerations (Porter, 1990, p. 149, 157). This means, in the Porterian framework, that regional development with its comprehensive innovation, income and employment effects is driven by the dynamic constellations of industrial clusters (Porter, 2000, 2003). Yet Porter’s approach has been repeatedly criticized for its somewhat mechanistic, structurally oriented cluster concept, which essentially implies that as long as all actors deemed necessary are present in a region, a cluster with all associated benefits is likely to emerge. Accordingly, the research challenges of the Porterian “microeconomics of competitiveness” focus on the institutional and structural match between company sophistication and business environment (Ketels, 2006).

Porter’s arguments tend to neglect the institutional substance of clusters, that is, their social structuration, their organizational outlook and the related logic of complementarity and coherence (Steinle *et al.*, 2007). A more interaction-oriented perspective developed in parallel to Porter’s work, with authors mainly rooted in the Marshallian tradition of industrial district research (Becattini, 1991; Brusco, 1982). This was soon complemented by research on the “innovative milieu” of interconnected firms in dynamic regions (Aydalot, 1984; Crevoisier, 2004; Fromhold-Eisebith, 1995; Maillat, 1990). An innovative milieu can be defined as

the set of relationships that occur within a given geographical area that bring unity to a production system, economic actors, and industrial culture, that generate a localized dynamic process of collective learning and that act as an uncertainty-reducing mechanism in the innovation process. (Camagni, 1995, p. 320)

In these views, local culture plays an important role in cluster formation, with a particular form of collaboration and competition being made possible by a common socialization and a common ideal of regional allegiance. In addressing these issues, the institutionalist perspective of transaction cost analysis approaches clusters in terms of “clubs” reducing transaction cost. Such clubs serve to promote knowledge-based cooperation among their members, through establishing rules and norms, thus fostering an innovative milieu of the cluster (Steinle & Schiele, 2002; Steinle *et al.*, 2007). Furthermore, the aspect of institutional networks and their impact on cluster dynamics has been assessed more prominently, for clusters contain inter-organizational networks that are indispensable for generating and disseminating knowledge and innovations (Bergmann, Charles & den

Hertog, 2001; Visser, 2009). In this manner, clusters may be interpreted as structures of co-located industry insiders that engage in flexible modes of experimentation with distinct network arrangements within and between clusters. This implies that the organization of learning processes within and between clusters becomes a decisive aspect of regional development (Malmberg & Maskell, 2002; Maskell & Lorenzen, 2004).

The concept of the “learning region” focuses on these regional learning processes, though, in some readings, one learning region could host more than one cluster (Hassink, 2005). Accordingly, the notion of the learning region addresses innovation as an interactive process among networking firms, driven by institutional endowments of social capital and supported by adequate policy measures (Morgan, 1997; Rutten & Boekema, 2007). A delicate balance between competition and cooperation among firms is a necessary feature of this constellation, as the interlinking of cooperative partnerships is strategically important to capture the benefits of learning-based competitiveness (Asheim, 2007). Thus, learning regions resemble a Porterian cluster structure, which is augmented by the institutional architecture of regional coalitions for learning and innovation (Polenske, 2008).

In this manner, the notion of the learning region combines the concepts of innovation and territorialized learning with a systemic point of view (Boekema *et al.*, 2000; Lorenzen & Foss, 2003; Maskell *et al.*, 1998; Simmie, 2005). The region is viewed as a geo-institutional set of socio-economic resources and relations, involving components such as human capital and production routines. Spatial proximity matters, too. It enhances the competitiveness of firms by facilitating inter-personal processes of learning and innovation, which tend to reduce transaction costs by establishing common symbols and codes (Maskell & Malmberg, 1999). Crucially, then, the competitive profile of a learning region is determined by the structure of the corresponding innovation networks with their systemic linkages among knowledge-producing organizations such as universities, intermediary organizations such as government agencies and the regional set of industrial clusters with its profile of both small and large firms (Cooke, 1998; Cooke & Schienstock, 2000).

Yet again, firms do not operate in isolation. The assessment of the endogenous development potential of clusters and regions needs to be combined with a reconsideration of the external linkages of the involved firms and related organizations, confirming the overall pattern of an increasing openness of clusters (Cassolato *et al.*, 2003; Giuliani *et al.*, 2005; Guerrieri *et al.*, 2001). The importance of non-regional networks is decisive for the absorption of new technologies and organizational practices in a region, which points out the need for acknowledging the role of “extrovert firms” in building connections with non-local networks (Malecki & Oinas, 1999). The scope of these strategic interactions contributes to various degrees of external economies and increasing returns in an evolving setting of organizational as well as territorial modularity (Whitford & Potter, 2007). This kind of modularity may be assessed in terms of the system theoretical notion of open systems, which may be understood as a type of system that promotes interactions between its complex environments, which leads to an adaptive reconfiguration of its internal components (Bertalanffy, 1988).

Accordingly, applied to regional development, the external linkages of cluster firms in learning regions serve as systemic carriers of knowledge transfers and learning effects. They promote the systemic openness of clusters and thus tend to counter an institutional and technological lock-in of development trajectories by promoting adaptive flexibility: an

aspect that becomes paramount when the cluster life cycle reaches maturity (de Martino *et al.*, 2006; Menzel & Fornahl, 2010; Zucchella, 2006;). Moreover, with increasing relevance of “open innovation”, the traditional, laboratory-based “closed” innovation process is losing its appeal (Chesbrough, 2003). Thus, the availability of external partners for innovation promotes the openness of regional clusters. Apart from “local buzz” and localized capabilities, then, the requirement for knowledge exchange leads to a reconsideration of “global pipelines” in cross-cluster knowledge flows (Bathelt *et al.*, 2004; Maskell *et al.*, 2006; Rychen & Zimmermann, 2008). The learning process of a regional cluster combines local and non-local strategies and relationships. Yet the ability to integrate new knowledge into local routines depends on its complementarity with established routines and skills (Loasby, 2001). Pieces of knowledge originating in a context too far away from the recipient may be difficult to absorb: an instance that can eventually lead to poorer evaluation of long-distance inter-organizational relationships. At this point, the national level of interaction proves to be most relevant.

#### *Assessing External Linkages: The National Dimension*

Approaching learning regions as open systems involves acknowledging their multi-scalar structuration, which is reflected in the multi-level governance structures of internal and external linkages. Crucially, such a perspective implies the need for a more elaborate differentiation of external linkages, thus transcending the simple dichotomy of the local versus the non-local by addressing issues such as network interactions (Legendijk & Oinas, 2005). As a point of departure, it is useful to maintain that the evolution of the competitive capabilities of cluster firms and related organizations in learning regions is subject to local, national and international interactions (Hassink, 2005). In this setting, the national level of business environment and regulatory regimes, which is usually overlooked in the exploration of local versus non-local linkages, still stands out in shaping the routines and practices of regionally embedded cluster firms (Gertler, 2001). It matters first of all in terms of a national business environment that provides the regulatory standards and rules of the diverse national administrative and legal subsystems. In addition to these formal institutions, the national business environment also matters with regard to informal institutions such as social norms and cognitive models that constitute a specific national culture. Aspects of cultural similarity, for instance, which overwhelmingly materialize at the national level, promote a common understanding of business routines and therefore also support the formation of commonly shared values and expectations (Hofstede, 1991). As Wade (1996) puts it: “National boundaries demarcate the nationally specific systems of education, finance, corporate management and government that generate social conventions, norms, and laws and thereby pervasively influence investment in technology and entrepreneurship” (p. 85). Indeed, in the setting of local, national and global linkages, the institutional specificity of the national level is to be taken into account as a potentially hegemonic factor in the external interaction of cluster firms in learning regions—despite the fact that the national level is mainly absent in the established discourse on knowledge spillovers within and across cluster boundaries (Isaksen, 2009; Lundvall & Maskell, 2000; Maskell, 2001).

This basic assessment is well reiterated in Porter’s notion of the “competitive advantage of nations”, which suggests that competitive industrial clusters mirror distinct advantages that are rooted in the historically evolving institutional and structural features of national

economies. Porter (1990) formulates on the persisting role of the national business environment: “Competitive advantage is created and sustained through a highly localised process. Differences in national economic structures, values, cultures, institutions and histories contribute profoundly to competitive success” (p. 19). The corresponding innovative capacity of the national innovation system with its interactions among firms, research institutes, universities and other innovation-oriented players reflects specialization patterns that are derived from interlinked factor conditions such as skilled human resources, adequate R&D endowments and an efficient financial system (Furman *et al.*, 2002). However, despite its non-spatial reasoning, Porter’s original emphasis on the national level of the business environment does not contradict the concern with local agglomerations of cluster firms. Instead, it matches both the multi-scalar and multi-level qualities of the innovation-driven process of regional development. Indeed, Porter’s recent emphasis on the role of clusters as export-oriented agglomerations with distinct external linkages points in this direction (Simmie, 2008).

This position goes well together with the systems of innovation framework and its proposition that industrial structures and the institutional set-up of a national economy and its policy orientation stand out in determining the innovation performance of firms and industries, thus complementing regional and supranational constellations (Lundvall *et al.*, 2002). Also with regard to learning and innovation, the national level matters, because the policies of national governments, national laws and a shared culture delineate an institutional arena that affects the intensity and direction of innovation (Lundvall, 1998; Nelson & Rosenberg, 1993). Even in the context of ongoing globalization pressures that seem to hollow out the nation-state, therefore, specific national standards, regulations and policy strategies are to be reckoned with (Pavitt & Patel, 1999). This persistent relevance of national institutional frameworks shapes national styles on the accumulation and dissemination of knowledge—and thus the evolution of national styles of innovation (Ebner, 1999; Ebner, 2012). This is of particular relevance for the structuration of inter-organizational relations among innovative firms. Due to the complex qualities of user–producer interactions, which are outlined as key interactions in a systemic view on innovation processes, the national business environment may reduce uncertainty and thus promote collective learning (Lundvall, 1992). This holds for collective learning within as well as across firms, clusters and regions—and thus addresses once more the most decisive impact of external linkages on the developmental dynamics of learning regions.

Accordingly, national systems of innovation may be perceived as multi-scalar layers of international, national, regional and sectoral ensembles which inform multi-level governance structures that shape the competitive performance of firms (Freeman, 2002). This type of multi-level architecture draws on systemic complementarities. An adequate example is the matter of local collective goods that cannot be provided by small firms although they are required in maintaining competitiveness, due to aspects such as workforce training and market information. These collective goods are at the basis of cluster dynamics. However, their provision is shaped by the prevailing national institutional frameworks. Thus, the orientation of internal as well as external cluster linkages is subject to national influences in the provision of rules, regulations and standards. All of this may lead to a national bias in the formation of linkages that is well designed to complement the regional bonds of cluster firms (Crouch, 2004).

In summary, we may suggest that the external linkages of cluster firms in learning regions are a key factor in promoting innovativeness and competitiveness. This is why a perception of learning regions as open systems seems to be most fruitful. It allows for the recognition of knowledge flows and collective learning on various scalar and institutional levels of interaction. The evolution of cluster-based learning regions is thus shaped by a delicate balance of openness and coherence, which underlines the need for an adequate structuration of external linkages. A further analytical understanding of these external linkages proves to be conceptually most challenging. The usually employed dichotomy of local versus non-local relations tends to overemphasize the strategic perspective of internationalization while neglecting the lasting impact of the national business environment as a key factor in promoting the competitive advantage of firms. Therefore, further explorations into the cluster-based developmental dynamics of learning regions will have to account for the assessment of external cluster linkages in terms of an explicit distinction of national and international linkages. Based on these considerations, and following the idea of cluster-based learning regions as open systems which are subject to persistent flows of knowledge and related resources, we put forward the following hypotheses:

1. In analysing the linkages of a cluster, it will be possible to distinguish regional, national and international levels of relationships, with all of them exhibiting a different character.
2. Cluster firms will evaluate regional linkages better than national linkages and these better than international linkages.

While theoretically compelling, the challenge lies in empirically testing these theses. Third section reports the results of a secondary data analysis aiming to do this by means of an evaluation of supplier linkages.

### **Empirical Analysis: An Evaluation of Supplier Linkages on the Regional, National and International Levels**

#### *Complementing Secondary Data with Targeted Information*

The empirical assessment of our hypotheses uses data on supplier linkages. In the kind of knowledge-intensive sectors under study here, supplier linkages constitute the basic structuration of value chains in regional clusters. More specifically, they are key components in the outreach of cluster relations beyond the confines of regional constellations, and at the core of knowledge transfers, collective learning and systemic innovation efforts, which shape the outlook of learning regions. As reliability and governability play a major role in supplier relations, the latter also provides most adequate insights into the qualities of common rules, norms, regulations and standards at the national level.

Therefore, we conducted a secondary data analysis, using a set of supplier evaluation data complemented by information gathered for this research. The advantage of this method is to draw back on highly reliable and valid data. Moreover, data used in such a kind of business context are set on an inherently higher level of relevance and credibility (Cowton, 1998). A total of 228 suppliers were evaluated by nine factories belonging to a single group of firms, all located in the same regional cluster in Germany. The cluster has recently been selected as one of the most promising

competitive clusters by the Federal Ministry of Education and Research. The core firm is an export-oriented world market leader in a segment of the electronics market, producing small batches of sophisticated machines. German industry exhibits major specialization advantages in this sector. This firm cross-functionally evaluates suppliers on an annual basis following a uniform method of evaluation. Each supplier is assessed by four functions: purchasing, quality, production logistics and R&D. If a supplier is used by several locations or supplies several categories of products, the responsible interface partners harmonize their assessment and agree on a common evaluation for the supplier.

The main data were collected by firm personnel. This implies that our data set comprises secondary data. However, our data do not show the common disadvantage that they may map only approximately onto the research questions (Cowton, 1998, p. 429). As opposed to many other firms, the supplier evaluation system of this firm is not based on objective data derived, for example, from the SAP software. Instead, each key contact person for this supplier is asked for a subjective evaluation, assigning points to a set of questions. In this way, aspects such as cooperation can be included in the evaluation, which is essential for our purpose. Information not available in the original set, in particular, the location of the supplier, was added during our research.

For our analysis, we used a total of 16 variables, that is, 4 from each function. Each of these variables was aggregated from different sub-questions. The total score that a supplier gets is the arithmetical mean of the points scored on the four functions. A maximum of 100 points could be awarded. Reliability of the data can be considered as very high, because anchor phrases help the evaluators calibrate the responses. Moreover, the system has been in place since several years and is well known with the factories. A cross-functional approach supports the validity of the measurements and avoids single informant bias (Croom, 2009; Punch, 2005). We separated the data into three categories:

- Suppliers from within the region. Using the postal sorting code as a distinction mark, a region of approximately 50-km diameter emerged. To a large extent, this matches the reach of the cluster, expressed through the relevant cluster associations.
- Suppliers located in the rest of Germany.
- International suppliers. Together with the responsible purchasers, this distribution was validated. In some cases, the postal address had to be adjusted, as it did not correspond to the main location of the supplier, but was that of a sales organization or of a shared service centre of accounting.

#### *Analysing the Variance of Relations at Regional, National and International Levels*

In order to test our hypotheses on the relevant levels of analysis—regional, national and international—and on the tendency that regional suppliers will be evaluated more positively than national and international ones, we conducted a series of statistical tests with the help of the SPSS software. We explored these questions first at the aggregate level. Then, we obtained more details in order to better explain our observations.

First, a one-way analysis of variance was conducted. This allows for testing whether the three groups of suppliers can be distinguished from each other. The Levene test for homogeneity of variances was insignificant ( $p = 0.177$ ), indicating that the assumptions for the analysis of variance were not violated (Janssen & Laatz, 2007). The difference

**Values**

Evaluation Total								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for			
					Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
International	44	78,500	9,5028	1,4326	75,611	81,389	54	96
Domestic	139	83,856	7,8052	,6620	82,547	85,165	62	98
Region	45	82,933	6,6517	,9916	80,935	84,932	70	97
Total	228	82,640	8,1831	,5419	81,572	83,708	54	98

**ANOVA**

Evaluation Total					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	963,586	2	481,793	7,614	,001
Within Groups	14236,922	225	63,275		
Total	15200,509	227			

**Figure 1.** Analysis of variance of the total supplier evaluation.

between the groups was highly significant, providing support for our first hypothesis (see Figure 1). Since the difference in mean evaluation of “other domestic” and “regional” suppliers was small, we conducted three additional tests, the Student–Newman–Keuls, the Duncan and the Waller–Duncan tests, which all belong to the category of *post hoc* tests for homogeneous subsets. All three tests identified two subsets, merging the other national set with the regional set, thus effectively distinguishing between domestic and international suppliers and challenging the differentiation on the regional level.

In line with our second hypothesis, international suppliers achieved a lower score in the supplier evaluation than the group of other domestic suppliers. Contrary to the hypothesis, though, the regional suppliers were not evaluated more positively than “other domestic suppliers”. Regional suppliers scored, on average, significantly better than international suppliers, but slightly lower than the other domestic suppliers.

In order to better describe the identified effect, we conducted a series of *t*-tests comparing the evaluation of international and domestic suppliers and distinguishing the domestic suppliers into regional and other domestic suppliers (see Figure 2). We controlled for material group specificity. The variance between international and domestic suppliers in the evaluation of buyers can be attributed to arguments on common standards and regulations. For instance, domestic suppliers complied better with special strategic requirements of the purchasing department, thus being more responsive to customer wishes. Purchasing and logistics departments also evaluated the cooperation with domestic suppliers as significantly more positive than that with international suppliers. Finally, from the perspective of production logistics, that is, in the view of those material planners dealing on a day-to-day basis with the supplier to ensure timely supply, domestic suppliers scored better in almost all dimensions (see Figure 2). The total evaluation was highly significantly different in favour of the domestic suppliers.

		t-test for Equality of Means					
domestic vs. international		t-value	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval	
						Lower	Upper
1.							
Purchasing	1.1. Total cost and price	0,454	n.s.	1,184	2,605	-3,950	6,318
	1.2. Initiatives for cost reduction	1,515	n.s.	5,499	3,630	-1,657	12,656
	1.3. Compliance to strategic requirements	2,253	0,025	4,948	2,196	0,621	9,275
	1.4. Cooperation, service and support	2,742	0,008	8,718	3,180	2,340	15,096
2. Quality	2.1 Quality performance	2,012	0,049	8,746	4,347	0,040	17,451
	2.2 Quality system	-0,066	n.s.	-0,236	3,573	-7,278	6,806
	2.3 Quality agreement	1,042	n.s.	5,659	5,431	-5,288	16,607
	2.4. Cooperation, service and support	1,204	n.s.	5,508	4,574	-3,518	14,535
3. Logistics	3.1 Logistic performance	3,338	0,002	12,027	3,603	4,780	19,274
	3.2 Logistics strategy and systems	3,819	0,000	16,536	4,330	7,841	25,231
	3.3 Environmental aspects	-1,761	0,080	-6,820	3,872	-14,458	0,817
	3.4. Cooperation, service and support	2,193	0,033	6,214	2,834	0,513	11,914
4. Technology	4.1 Current technological position	0,961	n.s.	2,343	2,438	-2,466	7,151
	4.2 Compliance to specific requirements	2,790	0,006	6,032	2,162	1,770	10,294
	4.3 Innovation- and technology roadmap	-0,333	n.s.	-0,976	2,935	-6,768	4,816
	4.4. Cooperation, service and support	0,355	n.s.	1,001	2,816	-4,552	6,554
Total		3,848	0,000	5,130	1,333	2,503	7,758

**Figure 2.** *t*-Tests distinguishing between international and domestic suppliers.

On comparing regional suppliers with those headquartered in another domestic location outside the region, few differences emerged. In fact, the slightly weaker—though in total not significantly lower—score of regional suppliers stems from the way buyers evaluate their price and cost position. In particular, they may tend to comply with the requirements of regional purchasing department less than with those of other national firms, because of the former's focus on cost issues. The slight advantage that regional organizations had in terms of cooperation with the R&D department in sum did not outweigh the lack of regional purchasers' drive. Most remarkably, regional firms do not seem to benefit from demands for logistical services, despite the latter's need for vicinity. Overall, regional firms hardly seem to be able to take advantage of being located in the same region. Proximity fails to provide better conditions for cooperation or service provision (Figure 3).

### **Discussion: Differentiating the Scales and Levels of Interaction**

The finding of a significantly better evaluation of domestic suppliers than of international suppliers fits well into the results of previous research on international buyer–supplier relations. Callahan (2000) surveyed US and Canadian managers asking to compare domestic suppliers with those from Mexico. While both rated Mexican suppliers lower,

		t-test for Equality of Means					
	Other domestic vs. regional	t value		Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval
							Lower Upper
1. Purchasing	1.1. Total cost and price	2,501		0,013	6,206	2,481	1,310 11,101
	1.2. Initiatives for cost reduction	0,337	n.s.		1,156	3,426	-5,606 7,918
	1.3. Compliance to strategic requirements	3,073		0,003	7,195	2,341	2,512 11,878
	1.4. Cooperation, service and support	-0,835	n.s.		-2,150	2,575	-7,231 2,930
2. Quality	2.1 Quality performance	0,219	n.s.		0,802	3,669	-6,436 8,041
	2.2 Quality system	1,419	n.s.		5,288	3,727	-2,069 12,646
	2.3 Quality agreement	-0,527	n.s.		-2,395	4,544	-11,381 6,592
	2.4. Cooperation, service and support	-0,257	n.s.		-1,085	4,227	-9,437 7,267
3. Logistics	3.1 Logistic performance	-0,110	n.s.		-0,232	2,102	-4,415 3,952
	3.2 Logistics strategy and systems	-1,292	n.s.		-4,327	3,351	-10,940 2,285
	3.3 Environmental aspects	1,783		0,084	10,597	5,942	-1,496 22,690
	3.4. Cooperation, service and support	-0,325	n.s.		-0,662	2,036	-4,680 3,357
4. Technology	4.1 Current technological position	0,005	n.s.		0,011	2,257	-4,444 4,466
	4.2 Compliance to specific requirements	-0,814	n.s.		-1,565	1,924	-5,364 2,233
	4.3 Innovation- and technology roadmap	0,109	n.s.		0,293	2,692	-5,026 5,613
	4.4. Cooperation, service and support	-3,095		0,002	-7,500	2,423	-12,286 -2,714
Total		0,713	n.s.		0,9228	1,293	-1,629 3,475

Figure 3. t-Tests distinguishing between regional and other domestic suppliers.

the US and Canadian firms rated suppliers from the respective other country lower, as well. Along these lines, Nellore *et al.* (2001) identified particular problems in the context of lean supply and complex parts. Again with similar results, Homburg *et al.* (2002) surveyed German and American transnational relationships, unveiling problems in quality and flexibility as antecedents to a lower satisfaction with international suppliers. They identified logistics, flexibility and cooperation as antecedents to poor evaluation. Our data, however, indicate that transnational constellations, in particular, the absence of a shared set of regulatory norms and cultural attributes, may be a part of the issue, because of the lower scores in collaboration. Also, in discussing the importance of external cluster linkages, the absorption of new knowledge has been highlighted. Indeed, we found evidence for this, for instance, when analysing the international suppliers with the lowest scores. For instance, in cases where international suppliers held a quasi-monopoly on a specific technology, it was common that they only provided market access at their own restrictive terms and conditions. This thwarted attempts by regional firms to find outside partners in global production networks to compensate for the weaknesses of their regional cluster.

Furthermore, finding that domestic partners were more responsive to strategic requirements, and here in particular to specific demands in R&D, can indicate that there is a

strategic dimension involved, which has been neglected so far. At this point, the novel concept of “preferred customer” may prove to be useful, as it underlines that suppliers are selective with whom to collaborate (Schiele *et al.*, 2011; Steinle & Schiele, 2008). Accordingly, the better responsiveness of domestic suppliers can be interpreted as a strategic issue: they consider domestic partners as preferred customers, while international partners are more often served as standard customers, only.

To further substantiate the preferred customer thesis, we asked two of the factories to additionally rate their key suppliers from this perspective. From the 43 core suppliers, they had the impression of being a preferred customer with 32. In the group of suppliers which in the perception of the buying firm were not awarding the latter with preferential treatment, four of the seven international suppliers were included. In combination with the findings displayed in Figure 2, this observation illustrates the need to add a strategic dimension in explaining the benefits of regional clusters and learning regions. Obviously, the usual caveats apply regarding sample size. Cluster benefits are usually explained in terms of better cooperation leading to higher innovativeness, contributing to higher productivity. In addition, our findings suggest that cluster firms may consider each other as strategically more important preferred customers. This line of reasoning may be extended to the national domain at large, due to the prevalence of common standards and codes of conduct, thus making the case for the relevance of competitive national advantages.

The latter aspect also sheds light on our intriguing finding that regional suppliers show no advantages over those from other domestic locations. Local suppliers perform less well on cost aspects, on compliance with special requirements and on dealing with environmental systems. The only benefit that regional firms manifest is the capacity for collaboration on engineering projects and issues. These findings prompt two interpretations. First, in this particular case, the local firms may be less sophisticated while they economize on asset specificity and locational advantages by asking for higher prices. In fact, it would indicate major weaknesses within the cluster if its firms were less sophisticated than those from other domestic regions. Second, regional firms scored better in the cooperation dimension only in R&D, but not in purchasing, quality and logistics. Experimental research has shown that, compared with face-to-face interaction best performed in regional proximity, electronic media such as e-mail-based data exchange and video conferences decrease affection-based and cognition-based trust (Rockmann & Northcraft, 2008). Possibly, R&D collaboration involves more direct contact than what, for instance, the logistics or purchasing departments need. In that case, regional proximity would pay off more in the case of R&D and benefit trust forming between members of the development department and the supplier, which would explain why only in the evaluation of this function regional proximity was outperforming domestic proximity in the assessment of collaboration quality. The finding of different perceptions in different departments alerts researchers not to view firms as homogeneous “black boxes”. Rather, firms are complex organizations that display differentiated views on their business situation. For instance, there may be a positive bias involved when R&D professionals have to assess the state of regional clusters from their own viewpoint.

However, our finding may also have to do with the nature of the particular cluster at hand. We surveyed the firms identified by the cluster association as being the core firms of the cluster. In total, 40% of the respondents indicated that they had never conceived their region as being based on cluster dynamics. Likewise, respondents indicated that they did not treat their local business partners differently from those located in other

areas. These findings may imply that in the explored cluster agglomeration a strategic type of regional interaction is still underdeveloped. These findings do not provide terminal evidence for a fully developed innovative milieu, but lead to the assumption that the inter-regional interaction is less well developed there. This result may offer some clarification as to why the scores of the supplier evaluation of regional partners did not exceed the scores of the other domestic partners. Suffice is to mention that this pattern was also mirrored in the data of the European Community Innovation Survey CIS-3, as innovative collaborations were recorded most extensively for national partners—with international linkages becoming increasingly relevant (Simmie, 2008, pp. 27–29).

Nonetheless, some methodological limitations of our research have to be acknowledged. Empirically, we analysed firms from a single cluster. Having the character of a single case study, all limitations to such approaches apply (Yin, 2003). Due to the exploratory character of our study, further research is needed to explore whether our findings can be generalized or if they have been excessively influenced by particularities of the analysed regional cluster setting. A further limitation of our study is that it focuses on buyer–supplier relations. The customer side is not included, though sophisticated home demand is a key argument in cluster analysis (Beise & Gemünden, 2004). Also, interactions between firms, research institutes, universities and government organs, all which are crucial for defining learning regions, are left out of the picture, leaving ample space for further research on cluster linkages in learning regions.

## **Conclusion**

As outlined with regard to our open systems approach to clusters in learning regions, clusters and regions are subject to evolutionary processes of innovation and structural change. The inevitable result is a permanent remaking of clusters and their regional embeddedness. External linkages play a key role in that respect, for they maintain the openness of clusters in the global flows of knowledge and related resources. Systemic openness is stabilized by coherent configurations among internal and external cluster linkages. Regional, national and international linkages become part of a multi-scalar constellation of flows and interactions. Not at least due to the unparalleled capacity of nation-states in maintaining institutional infrastructures and being mirrors of cultural homogeneity, the national business environment plays a key role in shaping the competitive behaviour of firms—and thus also in promoting the dynamics of innovative clusters in learning regions. In empirically testing the distinction of regional, national and international levels of cluster linkages, we took a cluster firm as a point of departure. The evaluation of supplier data yields mixed evidence. First, the distinction between different levels is maintained. In particular, the domestic–international differentiation revealed to be significant. Second, our hypothesis that regional buyer–supplier relations would be evaluated more positively had to be rejected. There were hardly any differences in the perception of regional suppliers and that of other national locations.

In conclusion, we highlight four contributions from our empirical research:

1. The national level proves significant for cluster linkages, based on comparatively higher evaluations in domestic buyer–supplier relations when compared with international partners. This finding also implies that fostering these linkages may be adequate from the viewpoint of actors in learning regions. Also in terms of analysis, the

- national level holds as a distinct object of analysis with idiosyncratic properties, impinging upon other levels. International linkages have virtues of their own and complement the national nestedness of learning regions.
2. Regional, national and international supplier relations have been assessed by representatives of different business functions. This proves the need to take into account the multi-actor character of firms, as well as the differentiation in their strategic outlook on cluster linkages. Cluster research should embrace a cross-functional picture, as firms may not be considered as homogeneous black boxes.
  3. Distinguishing between the diverse scales and levels of cluster linkages makes particular sense when the related region has developed a milieu of collective learning and thus exhibits the characteristics of a learning region. Overall, overcoming structural fragmentation by building a strong regional knowledge base presents a decisive policy option.
  4. Our study supports a not-so-often-considered benefit of intra-regional or domestic relations: firms may benefit more easily from gaining preferred customer status with partners at home (Steinle & Schiele, 2008). Being the partner of choice could explain typical benefits that firms enjoy in clusters, such as higher productivity and higher power of innovation. Exploring this benefit and the mechanisms involved is likely to present a fruitful path for future research.

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