

# **Diverse diversities – Open innovation in small towns and rural areas**

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**Abstract:** It is generally accepted that cities and other forms of geographic agglomerations are conducive to innovation because their density and variety of firms, sectors and individuals create a diverse environment. However, a growing body of work shows that innovation also occurs in peripheral regions and small towns. Furthermore, work on rural social networks shows that diversity is multi-dimensional, and that along certain dimensions networks developed in rural areas are more diverse than those observed in cities. In this paper we develop these arguments, then report our observations of seven successful firms in Swiss small towns. These firms benefit from at least three types of diversity: internal diversity; multiplexed interactions between workers at different hierarchical levels; and external diversity as firms reach beyond the region. We conclude that diversity conducive to firm-level innovation is not a specifically urban attribute: at least some of its dimensions are present in small towns and more peripheral areas.

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### **Introduction**

Innovation is not a closed process: open innovation – i.e. the gathering, compiling and use of information and knowledge derived from external sources, and collaboration with external partners in view of innovating - is key to high performance (Chesbrough 2003; Huizingh 2011). This idea has been explored by a wide variety of researchers, and is now entrenched in many economic development policies (Canada 2015; OECD 2015).

As open innovation has been better understood and applied, one consequence has been to reinforce the belief that dense – usually urbanized – areas are most conducive to innovation: the geographical co-location of many potential information sources fosters exchange of knowledge and information that can be rapid, intense and deep (Bathelt, Malmberg, and Maskell 2004; Boschma 2005). Indeed, cities have been referred to as "machines for innovation" (Florida, Adler, and Mellander 2017), echoing a strong current in the economic geographic literature that stretches back many decades (Glaeser, Kallal, Scheinkman, and Shleifer 1992; Jacobs 1969): "the city with its greater levels of density and diversity is the more eternally conducive environment for generating the human creativity that underpins innovation, entrepreneurship and economic growth." (Florida, Adler, and Mellander 2017, 93).

Notwithstanding the apparent convergence of economic geographic and innovation theories, there has for a long time been evidence that diversity and multiple sources of information also have their limits. For instance, research in management literature reveals that there exist optimum levels of diversity, and that too many external partners can reduce innovativeness (Laursen and Salter 2006). Work on related variety has qualified diversity, pointing out that in some cases it is *within-sector* or *within-value-chain* local variety that is associated with firm performance (Frenken, van Oort, and Verburg 2007). Evidence from psychology shows that, at the level of the individual, creativity and innovation rest as much on isolation as they do on intense interactions – the two need to be combined, and each plays a role at different moments in the creative and innovative process (Cain 2012; Little 2016). Furthermore, researchers have observed a tendency

towards network homophily (McPherson, Smith-Lovin, and Cook 2001), which has been modelled by economic theorists such as Fujita (2009): these sorting processes mean that people tend to interact with similar people and, over time, (geographic) diversity tends to dissipate as initially different people begin to mirror each other's traits and ideas.

These observations and results mean that any straightforward connection between urban density, local context and diversity of interactions should be questioned. The assertions of Florida, Adler, and Mellander (2017), Jacobs (1969) and others, whilst applicable to certain environments, cannot be generalized. Indeed, there is a small but growing body of work showing that there are successful and innovative firms in peri-urban (e.g. Bain 2013; Johnson 2012) and non-core (e.g. Grillitsch and Nilsson 2015; Shearmur and Doloreux 2016) regions, regions with fewer opportunities for local external interaction because they are small (i.e. lack of critical mass), sparse (i.e. lack of physical proximity between actors) and/or lacking in diversity. This research has begun to explore how open innovation – of which it accepts the premise – can occur in environments which are not dense or urban, and which benefit from little local diversity, related or unrelated. At least three overlapping processes are suggested: firms in more peripheral<sup>1</sup> environments compensate by networking beyond the region (Grillitsch and Nilsson 2015; Phelps 2012); firms in peripheral environments are more introspective and rely more on slow-decay technical information (Shearmur and Doloreux 2016); firms in peripheral regions identify problems that are specific to the region and draw upon local knowledge and culture to find innovative solutions (Petrov 2011; Cooke 2011; Shearmur 2015; Bain 2013).

Whilst acknowledging that these processes contribute to explaining how firms can engage in open innovation when located in non-core environments, in this paper we explore a fourth possibility

<sup>1</sup>The term 'peripheral' is relative. In the light of work such as Bain's (2013) and Phelps's (2012), suburbs and peri-metropolitan locations are peripheral relative to the dense and buzzing creative neighbourhoods described by Florida (2014) and Jacobs (1969) that are towards the core of metropolitan regions. They are also of lower density and are thought to harbour less diversity and potential for interactions than urban cores.

complementary to these three: we examine whether small towns outside of metropolitan regions are in fact as homogeneous as the discourse on urban diversity would have us believe. Economic geographers have tended to put forward a one-dimensional view of diversity – places are positioned along a single spectrum ranging from diverse to not diverse, with diversity considered as either related or unrelated. However, if diversity is understood as multi-dimensional (for example tie strength, dissimilarities among network members, group processes, access to extra-regional knowledge, etc.), then it is feasible – and indeed has been shown to be so – that networks in rural areas are more diverse along some dimensions, and less so along others, than networks in cities (Wellman and Wortley 1990). These ideas have rarely been explored by economic geographers in the context of innovation studies: the common working assumption is that diversity is assessed by examining the number and variety of different economic actors within the study area. This approach provides information on the *potential* for economic actors to engage in diverse local networks, but does not provide information about the *actual* networks engaged in, or about whether these networks are necessarily local.

In this paper, we begin to address this gap by performing an in-depth examination of seven successful high-tech firms in five small towns<sup>2</sup> in the eastern part of Switzerland. The analysed firms are national or worldwide leaders in their niche industries. We explore whether, and how, these firms can operate in a diverse environment whilst being located in apparently homogeneous small town contexts. Although isolation, quiet and internal processes can also be important for innovation (Shearmur and Doloreux 2016), we do not investigate these, as we assume that firms operating in small towns are able to provide these

<sup>2</sup>In a European setting, small towns are defined as having between 5000 – 25,000 inhabitants and a density of between 300 to 1500 people per km<sup>2</sup> (based on cells with 1km edge length). However, the definition of small towns in Switzerland differs somewhat: the size criteria rests not only on population, but also on the density of inhabitants, jobs or equivalent for overnight stays, which must sum to greater than 500 per km<sup>2</sup> in a grid cell with an edge length of 300 meters (see Meili and Mayer 2017, for a discussion of these definitions). The European definition is easier to conceptualize and small towns in Switzerland are of similar size.

conditions to their employees when necessary: thus, we are especially interested in how these firms stimulate diversity and/or overcome the lack of it.

We explore three different processes: First, we examine whether the size of the firm, as well as its prominence in the niche industry, help to generate internal diversity to substitute for external diversity (Cohen and Levinthal 1990). Second, notwithstanding the apparent lack of external diversity, firms might also benefit from external diversity as an outcome of different social interactions and ties occurring within small towns (Wellman and Wortley 1990). Third, following Fitjar and Rodríguez-Pose (2011a), Grillitsch and Nilsson (2015) and Shearmur and Doloreux (2016), we explore the extent to which firms seek firm-external knowledge from sources *beyond* small towns that diversify their networks and knowledge sources.

Our research is qualitative in nature: it searches for evidence that these small town firms benefit from diversity. Whilst finding such evidence within the case-study firms would not mean it can be generalized, it would provide a solid basis for conducting a more systematic search for these types of diversity. It would also serve to question the idea that – partly by virtue of their diversity – core urban areas are quintessentially innovative (and that, by extension, smaller towns and more remote areas are not) by qualifying the idea that diversity is the preserve of cities or clusters that benefit from local related or unrelated variety. It is important, at the outset, to clarify that we are not arguing that agglomeration-related innovation processes do not exist, nor do we deny that the marketing and diffusion of innovation rely heavily on urban resources: our argument is, rather, that innovation can *also* occur in small towns whose knowledge bases and industrial profiles do not apparently reflect diversity or variety. One of the elements that explains this is that firms in small towns actually have access to more diversity than is currently thought.

## **Literature Review and theoretical framework**

### ***Open Innovation: rethinking the connection between geography and innovation***

The idea that density, diversity and innovation are connected – indeed, that innovation primarily emerges in cities because they are dense and diverse – rests upon two self-reinforcing arguments. The first is that innovation occurs in an open fashion, requiring interactions, collaborations and exchanges between agents. The second is that cities are at the heart of innovation processes, an argument partly based upon a reading of history (Hall 1999), partly on the fact that they are dense and diverse environments within which processes of open innovation can thrive.

The seminal work of Chesbrough (2003) brought attention to the open innovation concept, a term used to describe firm strategies that aim at finding knowledge, partners and ideas beyond their boundaries. Firms invest time and money to appropriate ideas and knowledge held by research institutions, competitors, customers, suppliers or other organizations in different industries (Chen 2008; Huizingh 2011). Dahlander and Gann (2010) provide an overview, showing that firms can adopt either an outbound strategy - revealing their ideas to the external environment (with or without financial reward) to further develop their innovation - or an inbound strategy - they scan the external environment for knowledge or purchase it to develop their innovation internally. Each of these strategies has its advantages and disadvantages. Whilst the outbound strategy is useful for finding partners who can exploit or market an innovation, and for generating a reputation for innovation, openness and cooperation, there is a risk of opportunistic behaviour on the part of external actors who may appropriate information and knowledge without providing any return. The inbound strategy, for its part, involves an active search for knowledge and interlocutors: if conducted strategically this can complement a firm's internal capacities, but can also, if unfocused, lead to information overload (i.e. to a volume of information that the firm cannot process) or to search costs that are not justified by the returns.

In this context, each firm needs to identify a suitable open innovation strategy, since not every firm has the same capabilities and requirements regarding knowledge and new ideas, and not every type of innovation

requires the same type and degree of openness (Shearmur and Doloreux 2016; Phelps 2012). To identify a strategy of open innovation and to decide upon suitable collaboration partners, firms might either apply a backward-looking or a forward-looking strategy, meaning that they either base their decision to interact with certain partners on experience or on the evaluation of potential outcomes (Gavetti and Levinthal 2000). The decision to interact with external partners might happen at different stages of the innovation process. Fetterhoff and Voelkel (2006), for example, see the knowledge-seeking process at the very beginning, whereas Walling and von Krogh (2010) see it happening after an innovation process has begun. However, as Gassmann, Enkel, and Chesbrough (2010, p216) conclude, open innovation is “still more trial and error than a professionally managed process.” The key items of relevance to this paper that emerge from the management literature are that open innovation can have various configurations, is a continuous process, and is multi-dimensional (Dahlander and Gann 2010; Huizingh 2011).

Although the term 'open innovation' was coined and elaborated in the management literature, Marshall's (1890) contention that there were "mysteries in the air" of successful industrial districts in nineteenth century Britain referred to the circulation of ideas and know-how within these districts, and to the collaborative nature of production processes therein. Marshall was not, of course, a geographer: however his theories have been influential in economic geography (Dicken and Lloyd 1990; Asheim, Boschma, and Cooke 2011), and are congruent with the work of urban theorists who argue that cities (and other dense environments such as localized clusters) are where innovation most readily occurs because their density and diversity (related or unrelated) enable knowledge externalities to develop. For instance, Jacobs' (1969) seminal work on the economies of cities suggests that dense urban areas allow diverse people to interact, leading to clashes of ideas that lead to novelty<sup>3</sup>. Work on related variety, more closely aligned with research on regional innovation systems and districts (which require a certain density of local institutions, workforce and

<sup>3</sup>It is worth noting that Jacob's (1969) first chapter, titled '*Cities First – Rural Development Later*' explicitly argues that innovation does not emerge from small towns or rural areas but originates in cities. This notion pervades much current thinking on the geography of innovation (Shearmur 2017), though it has been refuted by archaeologists (Smith et al. 2014).

infrastructure), suggests that the local presence of a wide variety of inter-related firms (i.e. which share overlapping knowledge bases or participate in similar value chains) is conducive to firm performance and growth (Frenken, van Oort, and Verburg 2007; Asheim, Boschma, and Cooke 2011). Innovation is further enabled because of the resources and local markets available in cities or dense industrial regions, which allow for experimentation, access to specialized suppliers and sub-contractors, and to discerning clients (Duranton and Puga 2001). A high density of diverse people is thought to encourage interactions - whether serendipitous (Olma 2016) or planned (Fitjar and Rodriguez-Pose 2017) - within the boundaries of cities, which in turn fosters innovation and economic growth. Influential scholars such as Florida and Glaeser have developed and popularized this understanding of the role of cities. Florida (2014, p190) claims that “cities are host to a wider variety of talents and specialists, the broad diversity of which is a vital spur to creating things that are truly new”. Glaeser et al. (1992, p1126) could empirically show that “local competition and urban variety, but not regional specialization, encourage employment growth in industries.” Also, the “local buzz” concept, which suggests that geographical proximity among actors favours unintended as well as an intended exchange by virtue of face-to-face interactions (Storper and Venables 2004) contributes to the prevalent understanding that dense and highly urbanized regions are more likely to produce innovations compared to non-core regions.

Hence, there is a dominant tendency in the literature on the geography of innovation to posit dense urban areas as the type of place hosting sufficient diversity (whether within the same industry, within related industries, or more generally) to foster and sustain innovative processes. It has recently been argued, however, that this tendency now amounts to a bias (Shearmur, 2017). The existence of this bias does not mean that processes associated with density and buzz do not occur: rather, it means that the way innovation processes have been portrayed and understood from a geographic perspective has systematically emphasized the role of urban cores and has, by omission (see, for example, Florida et al. 2017), suggested they do not occur in peri-urban, small town and rural contexts (Phelps 2012; Shearmur 2017; Fitjar and Rodriguez-Pose 2017; Eder 2018).



In light of this bias, the way innovation processes are conceived – as they relate to geographic space – requires rethinking. Borrowing from Phelps (2012), Shearmur (2017), Eder (2018) and others, we suggest that innovation can, and does, occur in a many different types of place, and, in particular, in places that do not benefit from the diversity and density usually understood as prerequisites for local innovation processes to emerge (Jacobs 1969; Florida et al. 2017). For this suggestion to be compatible with the literature that documents urban processes of innovation, it follows that innovation processes must vary according to location, and that some do not call upon local density and diversity in the way that is observed in dense urban cores. Furthermore, the way innovation itself is understood requires broadening (Eder 2018), as the concept is often co-opted by urban ‘gate-keepers’ who may simply choose not to recognize the type of innovation that occurs in other settings (Phelps 2012; Shearmur 2017). Given these arguments, we focus, in the remainder of this paper, on the specific question of diversity: we acknowledge that no innovation can occur without actors obtaining ideas and stimulation from a diversity of sources (Chesbrough 2003; Dahlander and Gann 2010), and therefore explore how firms in small town settings (low critical mass, socially homogeneous, distant from buzzing urban cores) achieve this.

### ***Diverse diversities: diversity in small towns and remote settings***

When appropriate data are used (i.e. data that distinguish different innovation types, that observe internal and external capabilities and that have detailed locational coordinates - Lee and Rodriguez-Pose 2013; Grillitsch and Nilsson 2015; Shearmur 2017), and when researchers are open to teasing out non-clustered innovative establishments<sup>4</sup>, innovation is observed in remote locations and small towns. Innovative firms in non-core regions rely strongly on extra-regional knowledge linkages and use different knowledge sources

<sup>4</sup>One of the problems with much research on the geography of innovation is that it searches for clusters and/or regional concentrations of innovative actors. The paucity of innovative clusters in low-density and remote regions is taken as evidence of lack of innovation there. However, a low-density cluster is a contradiction in terms: the search for innovation in low-density areas should cast a wide net, and not start with the expectation that it will be geographically focused in a few locations, an expectation that reflects urban bias inherent in the discipline (Shearmur 2017).

compared to their urban counterparts (Fitjar and Rodríguez-Pose 2011a; Grillitsch and Nilsson 2015; Shearmur and Doloreux 2016; De Noni, Orsi, and Belussi 2018). They tend to focus more on internal resources and technical knowledge (Shearmur and Doloreux 2016), they compensate for lack of local partners by relying more on social networks (Grillitsch and Nilsson 2015), and their information and partner searches are strategic, relying on targeted contacts with well-researched interlocutors rather than on serendipity (Fitjar and Rodríguez-Pose 2017). Furthermore, some know-how and knowledge is geographically specific – thus, certain problems cannot be understood in abstraction from particular local contexts, and innovative solutions to these problems emerge where the problems occur, be it cities or remote areas (Shearmur 2015; Phelps 2012). None of these processes are closed – all innovators rely to some extent on information external to the firm, and all researchers confirm that, up to a point, a variety of different knowledge inputs is essential. However, firms outside core-regions are located in less dense and diverse environments and therefore have different opportunities and constraints regarding open innovation.

As we have seen, one of the key arguments put forward to justify that dense or urban regions are inherently innovative is that they foster diversity. However, there exists a body of work – somewhat remote from economic geography - that questions the positive relationship between diversity and innovation. Some researchers in management have questioned whether diversity (or breadth) of information sources and collaborators is always conducive to innovation. Laursen and Salter (2006), for instance, reveal an inverted U-shape relationship between number of external partners and firm performance. Likewise, Katila and Ahuja (2002) show that too many linkages to the external environment can negatively influence innovation performance, and Mors (2010) shows that innovation can decline if managers are overloaded with information. If a firm exposes itself to too many external ideas and knowledge, it becomes difficult to manage and approach these with the necessary focus (Koput 1997). Research even shows that innovative firms in metropolitan regions benefit to a higher extent from international partners than from local interactions (Fitjar and Rodríguez-Pose 2011b).

If these observations are transposed to geography, they suggest that – for some firms at least - the levels of diversity available in small towns might not only be sufficient, but might also protect them from knowledge overload. As Fitjar and Rodriguez-Pose (2017) show, if more partnerships or information are required, firms in this type of environment can strategically seek them out. Furthermore – and this has been a fundamental change over the last twenty years (McPherson 2008) – geographic isolation no longer implies isolation from the news-cycle, from technical changes or from scientific discovery: quasi-ubiquitous access to the Internet means that, except for firms whose innovations rely on the immediate exploitation of knowledge, the small time-lag that now exists between its production and wide availability has negligible effect (Shearmur 2015). This line of reasoning is consistent with Puga's (2010) questions concerning the nature of agglomeration economies: whereas static agglomeration externalities (linked to the division of labour, to shared infrastructure and to labour availability) have been well documented empirically, dynamic externalities – and in particular the connection between diversity of larger cities and firm-level learning – have not been observed so unequivocally (Fitjar and Rodriguez-Pose 2017). A further key change brought about by Internet is the capacity of firms in remote areas to effectively identify shortlists of potential information sources and collaborators, thereby targeting communications and contacts, and generating sizable efficiency gains when travelling for face-to-face encounters (McPherson 2008). Once collaboration or information exchanges are established (which often requires face-to-face – Bathelt 2011), they can be maintained at a distance (McPherson 2008): indeed, external contacts are particularly important in small towns and rural settings because without outside information and knowledge there is danger of lock-in (Boschma, 2005), as smaller groups of people more quickly share their ideas and tend towards homogeneity (Fujita, 2009)

In this context, it is also useful to consider arguments and observations concerning the nature of interpersonal networks and how they vary between urban and rural areas. It is well established that people interact differently depending on whether they live in a city or small town (Tönnies 1881; Wirth 1938). City characteristics, such as large numbers of people with different socio-economic characteristics, increased mobility, segregation of people according to language, income and race, can lead to impersonal, homogeneous and short-term relationships, which contrast with deeper and more socially heterogeneous

interactions in rural areas. Oddly enough, some support can be found for this in Florida's (2014) work on the creative class: according to him cities foster talent, technology, and tolerance. Tolerance is a form of low-level acceptance of the other that can emerge because social groups are isolated from each other in cities, self-organizing into mutually exclusive groups (McPherson, Smith-Lovin, and Cook 2001). The capacity of people, when faced with overwhelming diversity, to self-organize into homogeneous groups is also evidenced in the debates about post-truth, partisanship and information silos (Suiter 2016; McIntyre 2018).

Thus, whether in cities, social networks or cyberspace, there is little evidence that a connection exists between the diversity of actors within a particular space and the actual diversity experienced by individuals within that space. Indeed, it is this confusion between *statistical measures of potential diversity* and *actual diversity experienced by individuals* that informs our dissatisfaction with the implications - for more remote areas - of Jacob's (1969), Florida's (2014), Glaeser's et al. (2011) arguments about the connection between urban diversity and innovation processes.

Some recent empirical evidence lends support to Tönnies' and Wirth's early ideas about the differences between urban and rural social networks. Beggs, Haines, and Hurlberg (1996) show that the interpersonal networks of nonmetropolitan residents are based more on long-term relationships, are smaller and are denser than those of urban dwellers. However, they are more likely to cut across social classes and to occur in a wider variety of settings (they are more multiplex). Furthermore, they find no significant differences of network diversity with respect to age, gender or education between urban and rural dwellers. These results not only reveal diversity's multidimensional nature, but show that – depending on the dimension considered - the social networks of metropolitan dwellers are not necessarily more diverse than those of rural dwellers. Going further, White and Guest (2003) find that urbanization encourages highly voluntarist ties, which lead to more segmentation and less interconnection than found in rural regions. This is in keeping with the work on silos and on network homophily – i.e. that people who share characteristics are more likely to connect (McPherson, Smith-Lovin, and Cook 2001). Indeed, as Wellmann and Wortley (1990, p589) put it, city

dwellers are more likely to “shop for support at specialized interpersonal boutiques rather than at general stores.”

This evidence casts doubt on the idea that cities and dense regions are necessarily more 'diverse' than small towns or remote areas. Whilst this is true from a statistical perspective – diversity indices almost always reveal greater heterogeneity in larger regions – these statistics tell us nothing about the actual diversity that individuals experience. To the extent that evidence can be marshalled, it reveals theoretical and empirical arguments that do not corroborate the idea that individuals in cities or concentrated industrial districts are necessarily evolving in more diverse environments than individuals in smaller towns and remote areas. If this is also true of firms – which are made up of individuals, though not reducible to them – then one of the central arguments about the connection between innovation and cities needs to be re-evaluated.

*Figure 1 around here*

Figure 1 summarizes the arguments set out above, and highlights the specific geography-related innovation processes that we explore in the empirical section. Whilst we present a simplified view of geographic space – we reduce its complexity to variation along a spectrum from urban core to outer periphery – our review of the literature has shown that innovation processes are often thought to vary across these dimensions in a broadly monotonic, if discontinuous, way.

Our research takes a close look at seven successful firms that operate out of small towns in Switzerland, exploring how they generate diversity despite their location. The towns they are located in are approximately an hour<sup>5</sup> or so from Zurich metropolitan area. Whilst an hour is not much by some standards, the cultural distance between localities in Switzerland is often much greater than road distances imply: it is this relative geographic and cultural remoteness that characterizes their location, and situates them somewhere between

<sup>5</sup>We refer to time since this is the principal barrier for interactions. In terms of road distance, these small towns are about 50 to 90km from central Zurich. Another relevant metric would be cost: all of these would be close to zero (zero minutes, zero km, zero costs) for firms located in Zurich's highest density neighbourhoods in and around its core.

the suburbs and peri-metropolitan locations studied by Phelps (2012) and Bain (2013) and the more remote small town and rural areas studied by others (Grillitsch and Nilsson 2015; Shearmur and Doloreux 2016). The lack of variety and density of people, companies and knowledge institutions in the investigated small towns – the lack of “local buzz” (Bathelt, Malmberg, and Maskell 2004) or related variety - distinguishes them from cities.

## **Method**

### **Research setting**

Our empirical analysis draws on the case of high-tech firms in small towns in the eastern part of Switzerland. The eastern part of Switzerland – which does not belong to the metropolitan region of Zurich – comprises many small towns and has a long industrial history. Besides the western part of Switzerland with the watchmaking industry, the eastern part is a hot spot for high-tech industry. Most large firms in this region were established in small towns in the early 1900s as suppliers for the textile industry concentrated in this region. After the textile industry’s decline these firms reinvented themselves. Hence, the region has continued its industrial heritage, today gathering a large share of the nations’ high-tech industry (BFS 2008). This means that the eastern part of Switzerland is important to the Swiss economy. Indeed, high-tech industry (such as precision optics, communications equipment and automotive engineering) has been an engine of the Swiss economy’s growth between 2000 and 2012 (BAK Basel Economics 2014).

Our choice to study high-tech firms rests upon the fact that they require constant new knowledge in order to remain competitive and innovative: the high levels of salaries and other costs in Switzerland make it critical for high-tech firms to be, technically and qualitatively, top players in their industry. Thus, high-tech firms are ideal units of analysis for a study on innovation dynamics: their presence in small towns begs the question of how they manage to perform so well whilst being remote from the buzz, density and diversity of core urban areas. There already exist certain elements of response: Swedish data show that knowledge intensive firms grow faster in the knowledge periphery (Grillitsch and Nilsson 2017). Prior research that

helps explain this result shows that firms with strong in-house capabilities (which most high-tech firms have) compensate for a lack of local knowledge spillovers with collaborations and do not depend on local knowledge (Grillitsch and Nilsson 2015). In this paper we explore other factors – specifically those related to various dimensions of diversity - that may explain the success of high-tech firms outside of core regions.

From a geographic perspective, it is important to distinguish the metropolitan region of Zurich from the region of east Switzerland, a distinct NUTS2 region which extends to the East and South-East of Zurich. It is Switzerland's largest region, and has a relatively low population density (93 inhabitants per km<sup>2</sup>), well below the Swiss average of 212, but still high relative to remote regions of Sweden or Canada. Population is concentrated to the east of Zurich, along the valley to Saint-Gallen and along the shores of Lake Constance; the middle and Southern (more mountainous) parts have low levels of population, even in the valleys. The region – characterized as “Zurich's quiet neighbour” by Fodors (nd) - has remained sparsely urbanized and has attracted few knowledge-intensive service firms or start-ups. The absence of a technological university (though St.Gallen does have a regional university with a good management school), coupled with a sparse labour market, make it harder to train employees within the region and difficult to prevent the drain of ambitious young people. Firms in the region face a thin labour market, low levels of firm density and diversity, and few opportunities for local or regional knowledge exchange. However, fast transport connections to the city of Zurich (the interviewed firms are in towns 40 to 80 minutes from Zurich), and also with Germany or Austria, facilitate meetings with external actors (without, however, the convenience of co-location or the possibility of serendipity which, it is argued, facilitate interactions in cities). Hence, towns in Eastern Switzerland can be characterized as medium-interaction environments, meaning that they have limited possibility for local knowledge exchange but easy access to non-local factors of innovation (Shearmur 2012).

### **Data collection and analysis**

This research investigates how firms in small towns deal with the apparently limited diversity of their immediate surroundings. We hypothesize that diversity has various dimensions, some of which are not

related to urban density. In our analysis we identify different types of diversity mentioned by interviewees in order to provide corroborative evidence supporting the claims made recently by some economic geographers, as well as the observations on the nature of rural social networks (which were unconnected to economic or innovation concerns). To the extent that we identify various dimensions of diversity in small town firms, these will be described and discussed, thereby extending work on rural social networks into the sphere of economic geography.

For the identification of different dimensions of diversity, we rely on an in-depth multiple case study (Yin 2009). A multiple case study design allows cross-case analysis and hence greater external validity than is possible with a single case study. For the literal replication, we chose high-tech firms in small towns. In every small town that lies between Winterthur (last city inside the metropolitan region of Zurich) and St.Gallen (Kreuzlingen, Romanshorn, Arbon, Rorschach, Amriswil, Frauenfeld, Wil, Uzwil, Flawil, Herisau, Gossau, Weinfelden) we looked for high-tech firms that have their headquarters as well as R&D departments in the small towns. We intentionally chose small towns in the same region in order to control for regional context. Conditions in smaller villages, larger towns or in different regions might provide different environments for creating diversity, though we suggest (Figure 1) that diversity will vary along similar dimensions as one moves towards smaller and more remote places. To identify high-tech firms, we applied Eurostat's (2016) high-tech industry definition, which groups sectors according to their technology intensity, calculated as R&D expenditure relative to value added. We then selected firms according to their NACE (European Classification of Economic Activities) codes. Moreover, we sought firms that have been in the towns for some years to ensure that they are able to succeed in this environment. An initial group of 13 firms was identified. We contacted these firms either directly or through an enabler. Seven firms in five different small towns agreed to take part in the study. Figure 2 shows the geographic location of the small towns the case study firms are located in.

*Figure 2 around here*



To understand the different dimensions of diversity that firms draw upon, we spoke to several key people in each firm, each holding different functions but responsible - in some capacity - for ensuring the firm's innovativeness and competitiveness: we spoke to CEOs, innovation managers, production managers, and human resource managers. Additionally, we also performed in-depth interviews with directors of industry organizations in each town. This enabled us to obtain external viewpoints and to develop a feeling for the general situation in each location. In total, we interviewed 28 people. With these interviews we reached theoretical saturation, meaning that towards the end of this run of interviews no new information was being gathered: interviewees were repeating information we had already heard. Table 1 provides an overview of the firms, and Table 1A (in the appendix) of the people interviewed.

Interviews were semi-directed. Our questions first covered the general climate for innovation in each town. They then addressed how new knowledge from different sources is generated or obtained, how exchanges between employees and managers within the firm occur, and how exchanges with outside actors occur. Interviews lasted from 14 minutes to 84 minutes (with fourteen lasting over 30 minutes) and were conducted between February and June 2017. Interviews, conducted in German, were recorded, fully transcribed and analysed with the MAXQDA software. The first round of coding was performed inductively, and characterized how firms access different knowledge and how interactions among employees take place. After the first round, coding that reflects the conceptual framework derived from the literature (Figure 1) was applied leading to a second round of deductive coding, focused on the different forms of diversity that firms draw on externally or generate internally.

*Table 1 around here*

## **Results**

In the presentation of results which follows, we focus on different dimensions of diversity reported by the interviewees. To identify these dimensions, we explored interaction patterns, different knowledge sources used by the firms, and the extent to which firms are able to diversify their knowledge base. Three broad

dimensions of diversity emerge from the interviews: i. internal diversity of employees; ii. interactions between employees across formal boundaries; and iii. external knowledge sources. The following sections describe what each of these dimensions consists of.

### ***Dimension 1: Diverse employees***

The first dimension relates to the internal diversity of firms, which, given the small town context, spills over to the town itself. The thinness of the regional labour market and the need for many well-educated, highly specialized employees, force firms to recruit people nationally and internationally. Hence, the interviewed firms create – intentionally or not - a diverse internal employment structure with people from different national backgrounds:

*“We combine production and development at one location. To do that, we are in need of many specialists – we need chemists and engineers. That`s a challenge; the local market is too small to find them.” (Firm 4, Interviewee 8)*

*“We have an autumn market [in this town]. I think, if you would sit down at a table there, it is more international than a table at a market in Zurich (...). Our people are from everywhere in the world and come to our town and participate.” (Firm 2, Interviewee 27)*

These citations support the idea of Beggs, Haines, and Hurlbert (1996) who argue that small towns are not necessarily less diverse – along some dimensions – than cities. The necessity for firms to have a wide range of employees brings people to the town. As a number of interviewees from different firms told us, the reasons why firms do not simply outsource their activities are the existing production infrastructure, social embeddedness, location advantages (such as stable political conditions) as well as the advantages of having production and development geographically close to each other.

The town’s small size enhances interactions in diverse contexts. Indeed, interactions at the individual level may be more diverse given the lower possibilities for selective networking: the autumn market in a small town ‘forces’ interactions between different types of people. Commuting statistics (BFS 2018) and the

interviews show that the majority of employees live in the small town or in the region and do not commute from further away, such as from the metropolitan centre of Zurich.

People that work in small town firms are attracted by various firm characteristics, such as good reputation, being leaders in their niche industry, global orientation and firm size that makes job progression possible. Less globalized firms may experience greater difficulty in diversifying the structure of their employees.

*“International, innovative, challenging jobs – we have that” (Firm 1, Interviewee 23)*

*“We are able to attract employees with our interesting jobs, firm internal career opportunities, many different disciplines, and our headquarter status” (Firm 4, Interviewee 8)*

Another vector of internal diversification is internal mobility within multinational firms: firms that have subsidiaries often transfer employees between locations, with employees from subsidiaries coming to work at headquarters for some time (Glückler 2011). Hence, large and/or multinational firms are able to increase diversity at their headquarters more easily.

*“I believe that our international orientation is very important. We have 26 locations in 15 different countries and we have an active exchange and people from other subsidiaries come to our headquarters.” (Firm 1, Interviewee 20)*

### ***Dimension 2: Interaction patterns across formal boundaries***

The second dimension of diversity involves interaction among employees within the firms. Employees at different hierarchical levels and in different departments interact quite intensely. Whilst this is of course related to firm culture, it is striking that this was observed in all firms that were interviewed. We therefore suggest that it may also reflect the social structures prevalent in small towns, which have been described as more multiplexed (i.e. people interact with each other in a wider variety of environments), and more prone to cut across social boundaries (Beggs, Haines, and Hurlbert 1996).

Being a large firm in a small town - i.e. in a town with few other major economic actors and with fewer possibilities for interaction – means that the firm’s identity and culture will tend to align with that of the town (and vice-versa). Thus, social patterns external to the firm spill over into the firm, and those within the firm extend to the wider community, similarly to what was described by Tönnies and Wirth over a century ago:

*“The firm belongs to our town and our town belongs to the firm, it is reciprocal.” (Firm 5, Interviewee 14)*

*“If someone comes to us – from Zurich or elsewhere – they are astonished that everyone says “Grüezi<sup>6)</sup>”. There is a huge feeling of shared identity [within the firm].” (Firm 2, Interviewee 27)*

Such firm culture, and the limited possibilities of meeting people outside the firm who are not connected to it, foster exchanges between employees that cut across formal boundaries, and leads to the development of dense networks among employees and other involved actors, such as government officials, - sometimes with the same, and sometimes with different, status:

*“Our CEO is like a colleague. He eats lunch at the same table we do. We wear a tie sometimes, sometimes not. Respect does not have anything to do with such things – we know how life works. It means listening to each other and taking each other seriously. That is a breeding ground for innovation.” (Firm 3, Interviewee 11)*

*“Our canton is small; everyone knows everyone. The way we collaborate is based on the fact that we know each other. We call each other by the first name (...) it is very personal.”  
(Firm 5, Interviewee 14)*

<sup>6</sup>Swiss German greeting

In line with White and Guest (2003) and Wellmann and Wortley (1990) these quotes suggest that the presence of fewer people, and hence the difficulty of building groups of similar people, lead people who would otherwise not interact to adjust to each other, as these citations illustrate:

*"We know each other – this way, the communication way is different than when you have to follow the normal organigram" (Firm 2, Interviewee 28)*

*"No one drives a Mercedes S here, the highest of models is maybe a BMW X5 – that is also a really good car, but yes – we also do not have private helicopters – that is the secret of our success."*  
*(Firm 1, Interviewee 16)*

This reveals a paradox: it suggests that by adhering to a certain degree of homogeneity (e.g. limiting social distinctions linked to car models, food and dress), greater diversity of interactions can be fostered across formal boundaries within the firm. Whilst this has been understood, and promoted somewhat self-consciously, in firms such as Facebook, Google and Yahoo, it seems to have occurred spontaneously in small towns in Switzerland. A key difference between these small town firms and the better known multinationals is that, within the small town context, homogeneity extends beyond firm boundaries as interactions across departments and hierarchy spill over to interactions that occur in other social contexts (such as whilst shopping, picking kids up from school, etc...). Multiplex relationships emerge – meaning that employees or/and managers can entertain social relationships outside of the firm, notwithstanding their hierarchical relationship within it:

*"I think there are dense relationships because everyone knows everyone in the community. There are people that play soccer or something like that together."* (Firm 6, Interviewee 26)

Firms benefit from these personal relationships since they reduce barriers between employees across formal within-firm boundaries. This type of diversity may, in turn, increase knowledge exchange within firms (Glücker 2011).

Employees in the firms we studied were characterized as loyal by the interviewees. When a person decides to move to the region and work in one of these firms, they stay in the firm for a long time:

*“People carefully think about coming to our town. That’s the reason, why the fluctuation is small. It is great if you find good people. Otherwise, it is not that great” (Firm 2, Interviewee 28).*

At first sight this suggests less diversity, since the ‘churning’ of employees – associated with industrial districts, clusters and cities - has often been understood as a way of sharing know-how and of increasing interaction between people. The limited availability of equivalent jobs in the region contributes to this low fluctuation. However, although it seems like a disadvantage for diversity, this circumstance may be conducive to stable social relationships and to trust between employees, thereby further encouraging relationships that overcomes status barriers. Homophily might, therefore, be less common in a large firm within which people know each other well, trust each other, and entertain multiplexed social connections (McPherson, Smith-Lovin, and Cook 2001).

A final factor that we identify as contributing to interactions between different types of employee is geographical proximity between production and R&D departments. The co-location of production and R&D – which Clark (2013) highlights as advantageous for innovation - makes communication between employees of these different departments easier.

*“In my previous job I had to do design transfer between Switzerland and China. Everyone who has experienced that knows that having production and development at the same location is an absolute advantage. My developers can slide the prototypes on a small trolley to production, and we do not have a time difference nor different languages. We also do not have to spend days flying the newly developed prototypes around the world. It is an absolute advantage!” (Firm 4, Interviewee 7)*

Whilst such co-location *can* occur in cities, it is often more straightforward to arrange in smaller towns given real-estate values and site availability, and given the closer connection between city leaders and firm directors. Since these large firms are key to the small towns’ economic health, local planning and land-use

policies take careful account of the firms' needs in a way that administrations in larger cities are often unable to. The advantage that smaller jurisdictions have in adapting policy to the needs of local economic actors has been noted by Polèse and Shearmur (2002) in their study of regional development in Canada: this does not (necessarily) reflect corruption or underhand tactics, but rather the better understanding by decision makers of the particularities of their local economy, and the possibility of directly engaging with both citizens and firm directors when decisions are made.

### ***Dimension 3: External knowledge sources***

Our analysis confirms, in keeping with other cited studies, that firms in small towns draw upon non-local knowledge sources, thereby overcoming possible deficiencies in local knowledge sources. It should be noted that firms in clusters and cities also draw upon non-local sources (Bathelt, Malmberg, and Maskell 2004) – so the relevance of this finding is that location in a small town does not inhibit this in any particular way.

We identify three main firm-external knowledge sources: clients; universities and research institutions; and fairs and conferences. Interviewees are aware of the importance of non-local knowledge and actively engage in its acquisition:

*"From the beginning, we could not rely on local or regional markets or partners – we always had to go beyond local borders." (Firm 3, Interviewee 11)*

Networks involving non-local partners, subsidiaries and willingness to travel are key to acquiring this non-local knowledge, lending confirmation to work such as Torre's (2008) and Bathelt's (2011) on travel and temporary co-location. Whilst it has been shown that in-house capabilities play a major role in how firms absorb external knowledge (for example Grillitsch and Nilsson 2015), this is beyond the scope of our study.

Most of the firms we interviewed established a worldwide presence in order to be physically close to clients:

*"If you want to work on a global basis, with Ericsson, Nokia, and Siemens for example, then you have to follow them. If they go to the east, to Poland or China, then we have to be there as well."*

*You have to have their mentality, you have to be close to them and do something locally." (Firm 3, Interviewee 19)*

Interviewees said that direct dialogue between the firm and its clients is more effective than contact established through distributors:

*"It is important that we do not rely solely on distributors but also invest in subsidiaries. They are essential for the success of the firm, especially in weak times. If we are in trouble the distributors drop us and look where they can earn money to survive. It is different if you have your own people around the world." (Firm 1, Interviewee 20)*

*"If you have your own locations the dialogue and the access from here to there and vice-versa is better than if you only work with distributors." (Firm 1, Interviewee 21)*

Because R&D departments remain next to headquarters, tools for knowledge and information transfer have been developed, allowing subsidiaries to communicate effectively with headquarters. For example, video or audio conferences are regularly used to communicate with subsidiaries and clients. Nevertheless, communication with clients – asking the right questions, understanding answers correctly, transmitting information correctly to headquarters, etc. - is not an easy task and is being continuously improved.

*"We discovered that we either do not ask the right questions, don't listen right, or do not understand or transmit the information right so that it does not work many times.(...). Many clients also do not have a concrete idea what they want." (Firm 3, Interviewee 18)*

Hence, employees working at headquarters sometimes travel to clients across the world to gain a broader picture of the situation.

*"From time to time we do visits. Colleagues from the product management or development go to the clients or our local people go for a visit and we support them with a video or phone-conference." (Firm 3, Interviewee 18)*



Contact with universities is established principally by searching for research groups in Europe, sometimes globally. Hence, for the interviewed firms, geographic proximity to the university or research institute is not important – these are strategic partners and it is their specific expertise rather than convenience of location that is paramount (Shearmur and Doloreux 2015). If the firm and university decide to cooperate, they meet periodically in face-to-face meetings or via video or audio conferences. Cognitive proximity is therefore essential (Capello 2017; Fitjar and Rodríguez-Pose 2011a). The firms interviewed confirm that temporary visits are sufficient for cooperation. Either the firms' innovation managers or the university employees travel for meetings.

Most of the time going to fairs, workshops or conferences involves travel for managers and employees. However, because of the firms' strong reputations (they are all leaders in their field) and thanks to good transport connections to core cities such as Zurich or Munich, distant travel is not always necessary: firms can hold workshops or conferences at their headquarters, bringing people to the small towns:

*"People also like to come to us. We have a nice laboratory and nice venues for meetings.*

*We have committee meetings that are normally in Bern or Zurich. They like to come to us from time to time" (Firm 7, Interviewee 4)*

This raises an important point: as Shearmur (2012) emphasizes, innovation in outlying regions rests not so much on local dynamics as on ease of access to metropolitan regions and on the connections they provide to the world beyond. Whilst 'ease of access' will be defined differently by different firms, reliability, predictability, and reasonable cost of travel are essential. Basic physical infrastructure – good roads, reliable airports, good internet access, efficient trains, etc. – is often neglected when factors of innovation are considered, but emerge as critical for the firms that we interviewed.

Finally, collaborations with consultants and specialized firms were mentioned a couple of times as sources of knowledge. However, these are not seen as main sources of external knowledge: in particular, collaboration with firms within the same industry is presented as difficult, since the interviewed firms are afraid to lose their competitive advantage by sharing valuable information and know-how (Dahlander and

Gann 2010). Working with firms that serve a different geographical market seems more likely to happen, as this citation shows:

*"We want to protect ourselves. But there are committees where we have exchanges [with firms in the same industry], for example, the Iron Link Network. We meet at symposiums or places like that (...) However, exchanges with firms from the same niche are easier if they serve different geographical markets. The Japanese market is, for example, difficult to access, and the Japanese would rather buy products from Japanese firms than from European ones (...) hence, it is easier to collaborate with these firms than with European firms with which we would also have to compete for clients" (Firm 6, Interviewee 26)*

This result seems to support the finding of Grillitsch and Nilsson (2017) that knowledge-intensive firms might *suffer* from (negative) knowledge spillovers likely to happen in urbanized regions.

## **Conclusion**

This paper questions one of the dominant ideas in the economic geography and innovation literature: that cities and dense regions are key loci for innovation because they alone can foster the diversity that is required to generate new ideas and innovations. It is argued that the co-location and density of diverse people, firms and institutions make spontaneous knowledge exchange possible and contribute to the economic success of cities (Jacobs 1969; Florida, Adler, and Mellander 2017). It is also argued that the co-location of related industries can lead to collaborations and to the development of new ideas drawing on knowledge and know-how that are partly shared (Asheim, Boschma, and Cooke 2011; Frenken, van Oort, and Verburg 2007). Whilst studies of social networks in rural areas show that diversity is multidimensional (and not always higher in urban areas), and whilst research from management has begun to question whether more diversity always leads to more innovation, economic geographers have by and large not questioned the fact that diversity is uniquely associated with urban areas and density: rather, the minority of economic geographers

who have seriously examined innovation outside of cities and clusters have focused more on how firms can overcome lack of local diversity.

In this paper, following the work on rural social networks, we have chosen to view diversity as a multi-dimensional phenomenon. This choice allows us to look for different dimensions of diversity, and to consider forms of diversity that may be more prevalent in small town contexts. Studies that point out the greater heterogeneity (along certain dimensions) of social networks in rural regions inspired our idea of diverse diversities. Hence, this paper puts forward a differentiated view of diversity and illustrates how small towns can be diverse, often along dimensions that differ from those that characterize urban areas.

From our qualitative interviews, three dimensions of diversity are identified in small towns and seem to be associated with innovation:

- **Diverse employees:** The thinness of the regional labour market and the need for many well-educated, highly specialized employees, force firms to look for people nationally and internationally. Thus, firms build up diversity internally, which, given their size relative to the towns they are in, also increases diversity of the towns themselves.
- **Interaction patterns among employees across formal boundaries:** Dense social structures and a strong firm identity, as well as the co-location of production and development, fosters exchange between firm members and across specialization and hierarchies. Being in a small town reinforces non-workplace interactions across formal boundaries as employees interact in shops, schools, sports clubs and other venues.
- **External knowledge sources:** Firms access non-local knowledge from different sources, both from within the firm's network of subsidiaries and from external actors such as collaborators and universities and clients.

Only the second dimension is, arguably, specific to small towns. The two other dimensions, whilst not specific to small towns, reveal that small town locations do not impede access to these types of diversity.

Indeed, our analysis shows that firms are able to foster diversity and that the paucity of actors in small towns can in fact lead to types of diversity (cross-hierarchical and multiplexed) which are more difficult to foster in urban areas or in regions where workers rarely cross paths outside of the workplace. The strength as well as the heterogeneity of social networks in small towns, as already emphasized by Tönnies (1881), Beggs, Haines, and Hurlbert (1996), and Wellmann and Wortley (1990), combined with the fact that the (large and successful) firms interviewed can attract diverse people and knowledge to small towns, create a different atmosphere for the generation of new ideas. Having said this, we acknowledge that strong social ties between people in a small environment can lead to negative lock-in: yet the danger of lock-in also exists within urban environments, in which variety of potential interlocutors can lead to selectivity and homophily (McPherson et al, 2001).

In our study, exchanges with non-local partners as well as new employees from other regions mitigate the danger of lock-in effects. Our observations contribute to understanding why Grillitsch and Nilsson (2017) find no evidence that knowledge-intensive firms grow faster in knowledge-rich regions, and shed light on the question of how firms in small towns are able to maintain up-to-date and relevant knowledge. Diversity is diverse, and once this is acknowledged then it is possible to explore the variety of ways firms seek and find it.

In the cases we have studied, diversity in small towns is generated by the firms themselves: it is not “in the air”. The firms that we study are large and successful; they require diverse employees and have sufficient reputation to attract employees nationally and internationally. Furthermore, access to non-local knowledge sources is expensive, so firm size and financial strength play a role. However, there is no reason to believe that interaction among employees will differ between small and large firms, since this rests more squarely on small town dynamics.

Although our results illustrate that large successful firms can emerge and operate outside of core cities, and also show that certain types of diversity are available to these firms, they remain exploratory. Our principal contribution is to introduce the idea that diversity – when considered as a geographic attribute conducive to

innovation – should not be thought of as one-dimensional: there are *diverse diversities*, some of which we illustrate in this study.

Our results allow us to draw practical implications for decision-makers in small towns. In order to have well-functioning social networks within a town, it is necessary for people to be willing to live, spend their free time and interact within it. Hence, ensuring a high quality of life and a strong town identity, which local sports and cultural clubs may help to build, are important elements in retaining people and fostering exchanges. Moreover, to enable firms to access non-local knowledge, it is necessary to provide infrastructure, such as rapid and reliable transportation connection to cities and airports, and such as reliable and high-capacity internet. Finally, even if workers may be willing to forego some of the advantages of city life in exchange for those of small town life, services such as education and health need to be of high standard to ensure that employees and their families are not required to make compromises in these key areas.

This study is qualitative and exploratory and has, therefore, limitations. First, our study focuses solely on knowledge-intensive firms that were able to develop successfully in small towns in a specific region. To widen the scope of our observations, research is necessary that includes less knowledge-intensive, smaller and younger firms, and other geographical settings. Second, whilst we illustrate that three dimensions of diversity are present in small towns, we do not know which of the identified dimensions contribute most to knowledge generation and processing. The importance of each of these dimensions might vary for different steps in the innovation process. Furthermore, these three dimensions are not necessarily exhaustive: they are merely those that emerge from our observations. Finally, case-study work, whilst important for understanding and exploring concepts, cannot lead to generalisation: once a clearer idea emerges of the relevant dimensions of diversity, indicators should be devised that replace the one-dimensional diversity indices commonly found in statistical approaches to understanding the geography of innovation.

This exploratory study is an invitation for economic geographers to think in differentiated ways about diversity, and to recognize that its equation with cities and with high-density regions – whilst it appears commonsensical, and is in keeping with statistical indices and much of the literature – requires reappraisal.

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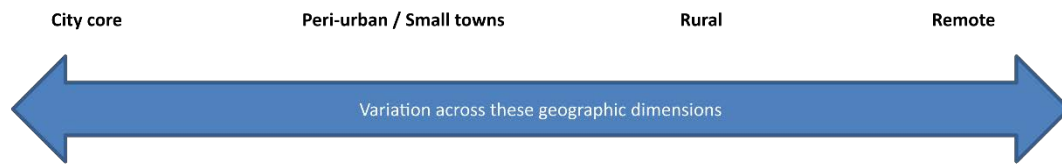
*Table 1 Details of case study firms*

Firm	NACE* Rev. 2	Number of employees	Duration from the town`s train station to the city centre of Zurich (Zurich main station) <i>(calculated with google maps on the 9<sup>th</sup> of May 2018)</i>		Nr. of Interviews
			By train	By car	
Firm 1	26	> 250	60	60	6
Firm 2	27/28	>250	60	55	4
Firm 3	27	>250	80	60	3
Firm 4	26	>250	80	60	3
Firm 5	21	<250	80	60	3
Firm 6	26/27	>250	40	40	4
Firm 7	21	<250	75	75	5

\*Statistical classification of economic activities in the European Community (Eurostat 2016)

*Figure 1 Variation across space of innovation factors and processes: conceptual framework drawn from literature review*

**Geography (approximate continuum\*):**



**Salient geographic features:**

Higher density  
 More apparent diversity (industrial, social, real-estate)  
 Access to global economy (airports, converging road and rail networks...)

Lower density  
 More apparent social and economic homogeneity\*  
 Distance (time) from markets

**Dominant innovation processes (as they relate to geography):**

More reliance on external sources of information and collaboration  
 Serendipity and chance encounters  
 Immediate contact with markets  
 Geographic access to wide variety of agents and ideas  
 Lower reliance on actors and agents outside region  
 Sharing of ideas and know-how through labour processes

More reliance on internal capabilities\*  
 Targeted interactions and collaborations\*  
 More reliance on local and technical knowledge  
 Interactions and familiarity across social classes\*  
 Higher reliance on actors and agents outside region\*  
 More secrecy and less labour turnover

**Selected drawbacks:**

Information overload  
 High costs  
 Informal leakage through social interactions  
 Social, information and knowledge silos

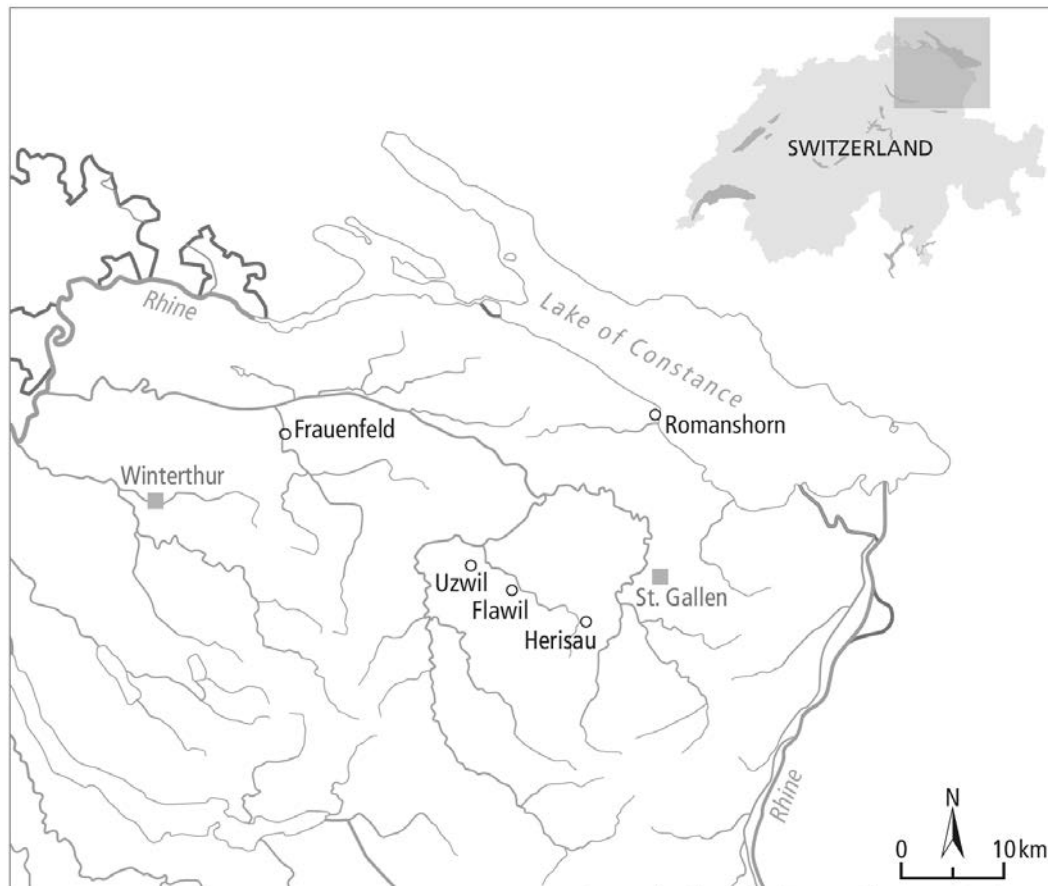
Difficulty in recruiting labour  
 Remoteness from urban gatekeepers  
 Fewer chance encounters\*  
 Low geographic access to wide variety of agents\*

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Notes: This figure summarizes key elements of the literature review. Within this general framework, our paper explores how successful firms in small towns at the outer-reaches of Zurich metropolitan region (roughly 50 - 90km from the core) manage some of the processes that relate to the starred (\*) factors listed above, with specific focus on how they overcome low levels of local diversity. The crux of our findings is that diversity exists in small towns, but differs from the diversity attainable at the core of large metropolitan regions: diversity is multi-dimensional, and certain dimensions of diversity ( e.g. mixing across social and professional classes) is greater in small towns than in cities. Furthermore, firms in small towns generate internal diversity through the mobility of their workforce and collaborators.

\* Except for 'City Core' these geographic dimensions are not necessarily mutually exclusive: factors, processes and features presented in the lower part of the table vary across these dimensions, with features to the right more pronounced in small towns, rural and remote areas, those to the left more pronounced in city cores.

*Figure 2*



Cartography: Alexander Hermann / base map © swisstopc

## Appendix

Table A1 Details of interviews

Interviewee Nr.	Firm Nr.	Function	Date	Duration
1	7	Executive Manager	15.02.2017	57min 21sec
2	7	Senior Manager R&D	15.02.2017	25min 20sec
3	7	Quality Manager	15.02.2017	14min 14sec
4	7	Analytical Development Manager	15.02.2017	29min 13 sec
5	7	Deputy Head of Production	15.02.2017	25min
6	4	Head of Production	17.03.2017	22min 13sec
7	4	Head of Development	17.03.2017	19min 41sec
8	4	Head of Human Resources	17.03.2017	22min 41 sec
9	2	Director of the cantonal chamber of commerce and industry	22.03.2017	40min 05sec
10	1	Chairman of the town`s trade association	24.03.2017	36min
11	3	Head Global Training	24.03.2017	66min 05sec
12	5	Head of Operations	24.03.2017	31min30sec
13	5	Head of Human Resources	24.03.2017	14min 43sec
14	5	Director of town`s economic and local promotion department	27.03.2017	38min 45sec
15	6	Director of the cantonal chamber of commerce and industry	28.03.2017	48min 27sec
16	1	Chairman of the town`s industry association	29.03.2017	67min 43sec
17	2	Regional location adviser	19.04.2017	84min 15sec
18	3	Head Product Management & Development RF	19.04.2017	35min 29sec
19	3	Head Mechanics / Tool Shop	19.04.2017	47min
20	1	Head of Innovations	03.05.2017	21min
21	1	Head of Business Development	03.05.2017	19min 54sec
22	1	CEO & Head of Production	03.05.2017	15min 33sec
23	1	Head of Human Resources	03.05.2017	16min 09sec
24	6	CEO	11.05.2017	33min 23sec
25	6	Plant Manager/Managing Director	11.05.2017	20min 46sec
26	6	Head of Development	30.05.2017	21min 15sec
27	2	Head of Human Resources	14.06.2017	73min 32sec
28	2	Former CEO, Share holder	19.06.2017	15min 22sec